VOLUME II OF II
(Appendices A to J)

Final Environmental Assessment

PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS VILLAGES OF LEIALI‘I, VILLAGE 1-B SUBDIVISION AND RELATED IMPROVEMENTS, LAHAINA, MAUI, HAWAI‘I

(TMK Nos. (2)4-5-021:007(por.), 010(por.), 014(por.), 020, 021(por.), (2)4-5-036:109, 110, 112(por.), and Honoapi‘ilani Highway Right-of-Way)

Prepared for:

State of Hawai‘i,
Department of Hawaiian Home Lands

November 2023

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VOLUME II OF II

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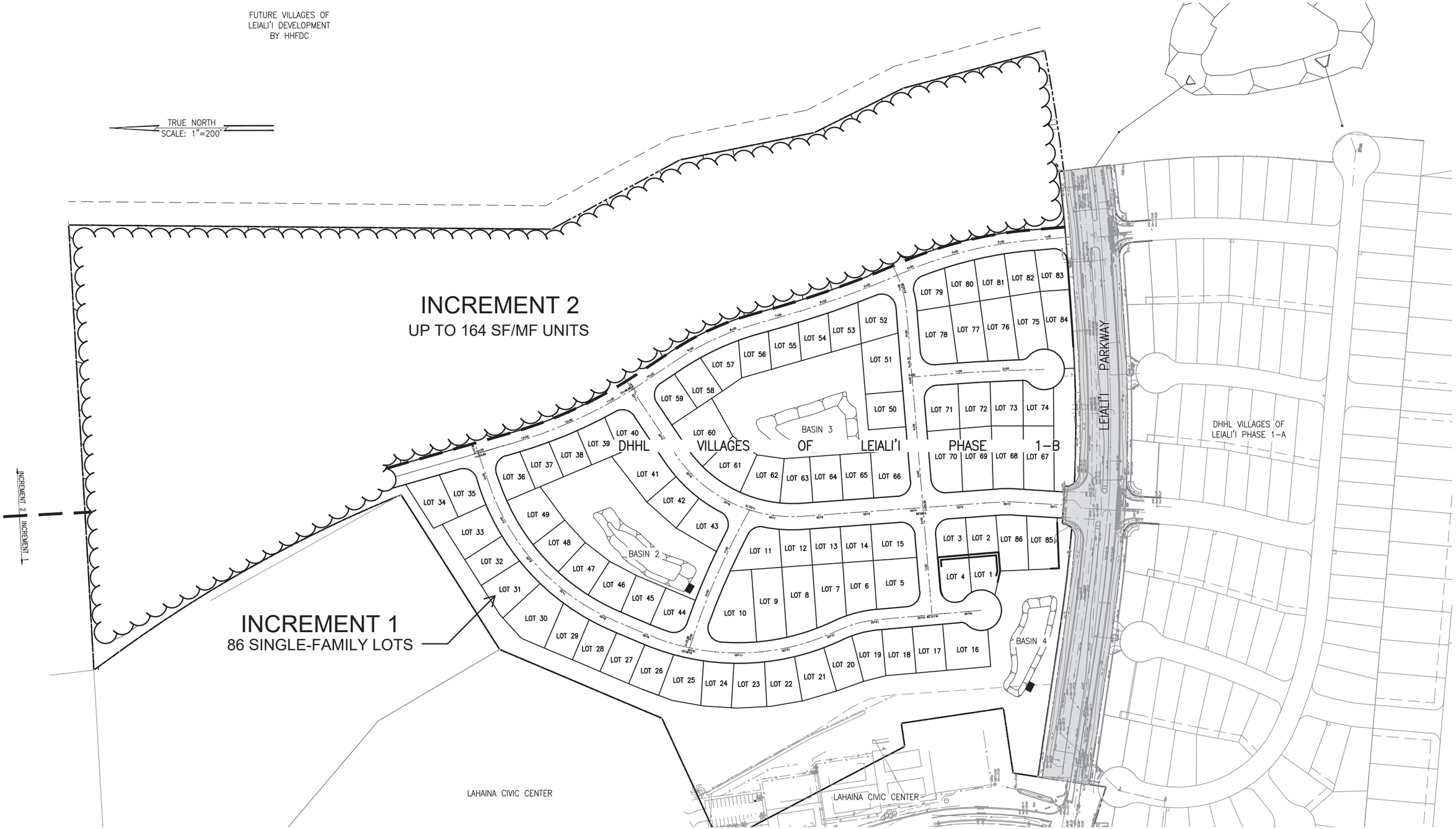
APPENDIX A



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CONCEPTUAL SITE PLAN OF VILLAGES OF LEIALI'I PHASE 1-B - INCREMENT 1

SCALE: 1"=200'

0 1 2

LINE IS 2 INCHES AT FULL SIZE
(If NOT 2-inches : Scale Accordingly)

VILLAGES OF LEIALI'I SUBDIVISION PHASE 1-B

LAHAINA, MAUI, HAWAII

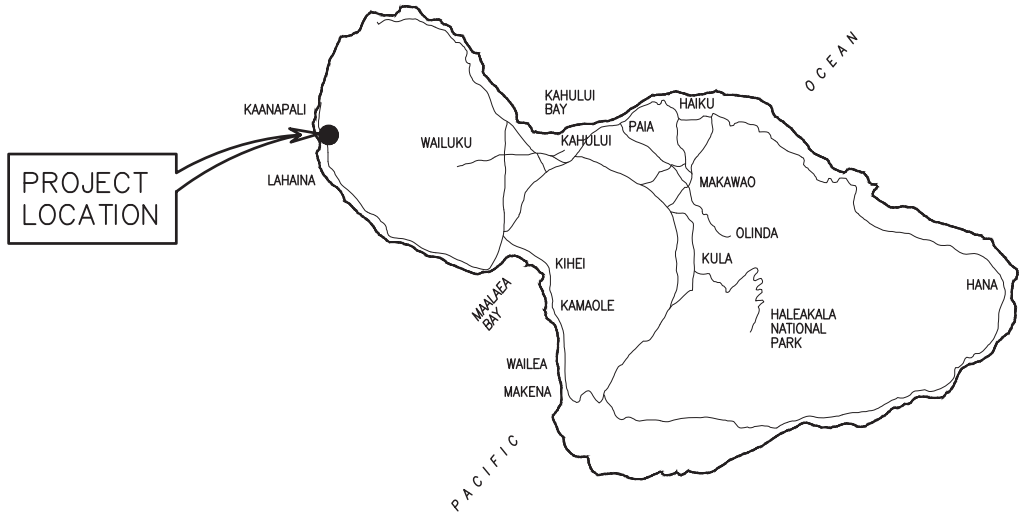
Austin Tsutsumi & Associates, Inc.
Engineers & Surveyors

CONCEPTUAL SITE PLAN OF VILLAGES OF LEIALI'I PHASE 1-B - INCREMENT 1

EXHIBIT

1

DATE: January 25, 2022

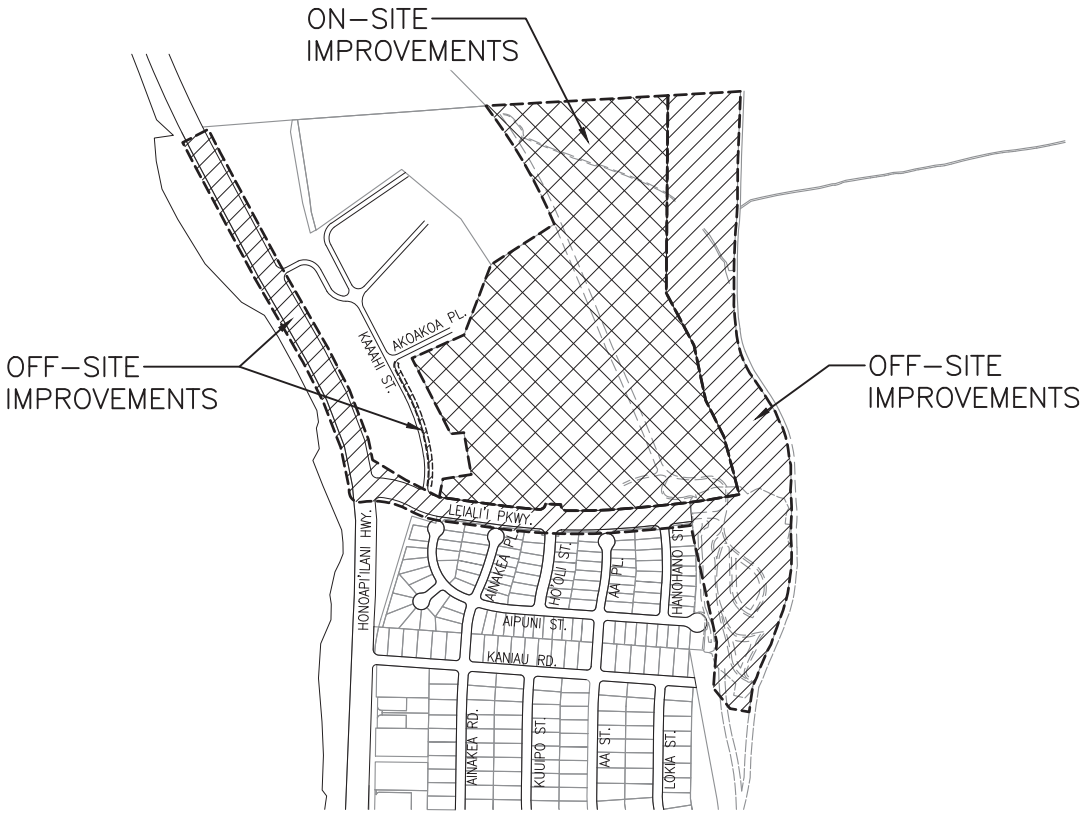


ISLAND OF MAUI

NORTH

LOCATION MAP

NOT TO SCALE



NORTH

VICINITY MAP

NOT TO SCALE

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS ● HONOLULU, WAILUKU, HAWAII

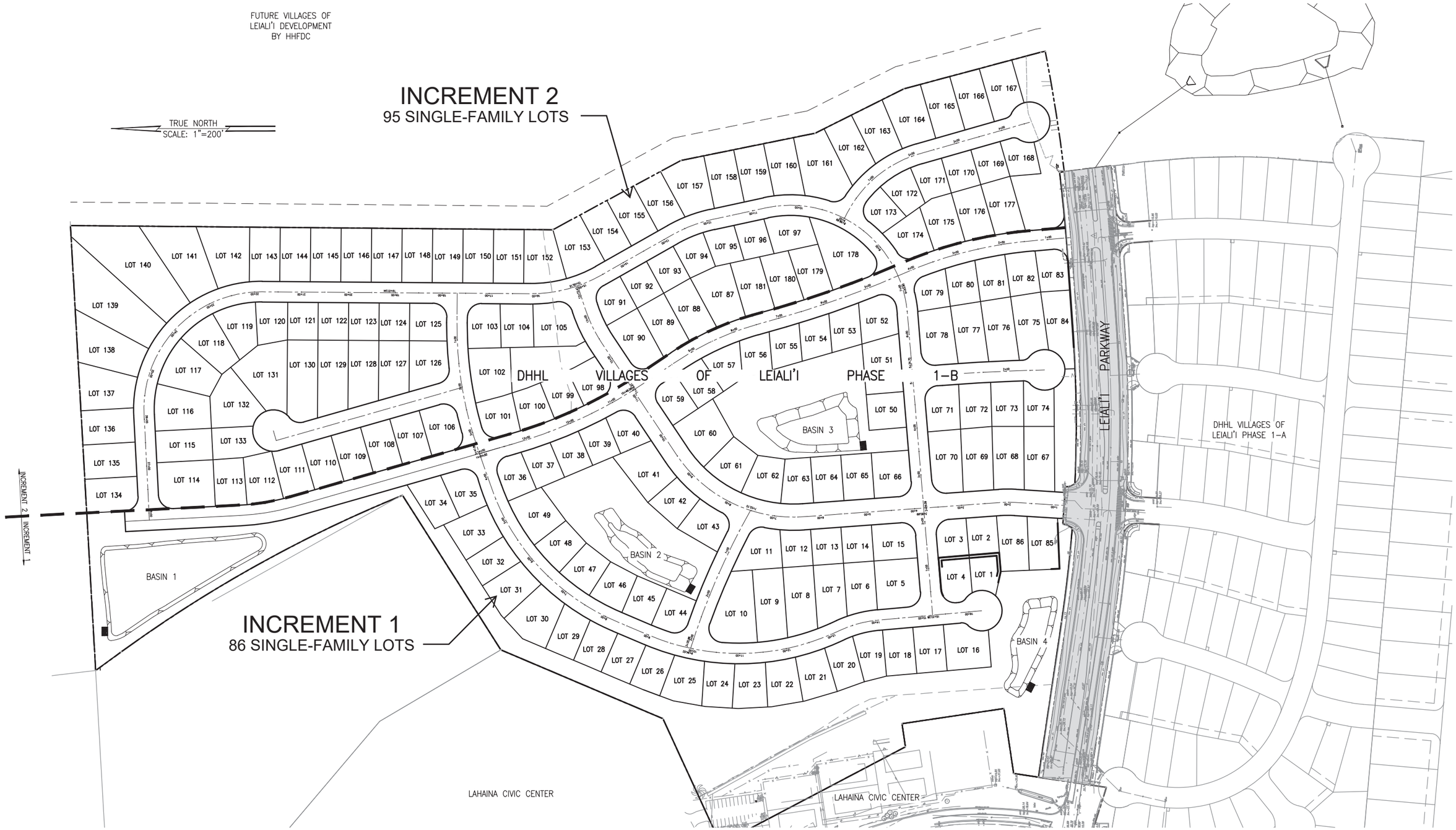
LOCATION AND VICINITY MAP

EXHIBIT

1

JOB NO. 18-552

JANUARY 2022



CONCEPTUAL SITE PLAN OF VILLAGES OF LEIALI'I PHASE 1-B – INCREMENT 2 SINGLE-FAMILY

SCALE: 1"=200'

0 1 2

LINE IS 2 INCHES AT FULL SIZE
(If NOT 2-inches : Scale Accordingly)

VILLAGES OF LEIALI'I SUBDIVISION PHASE 1-B

LAHAINA, MAUI, HAWAII

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

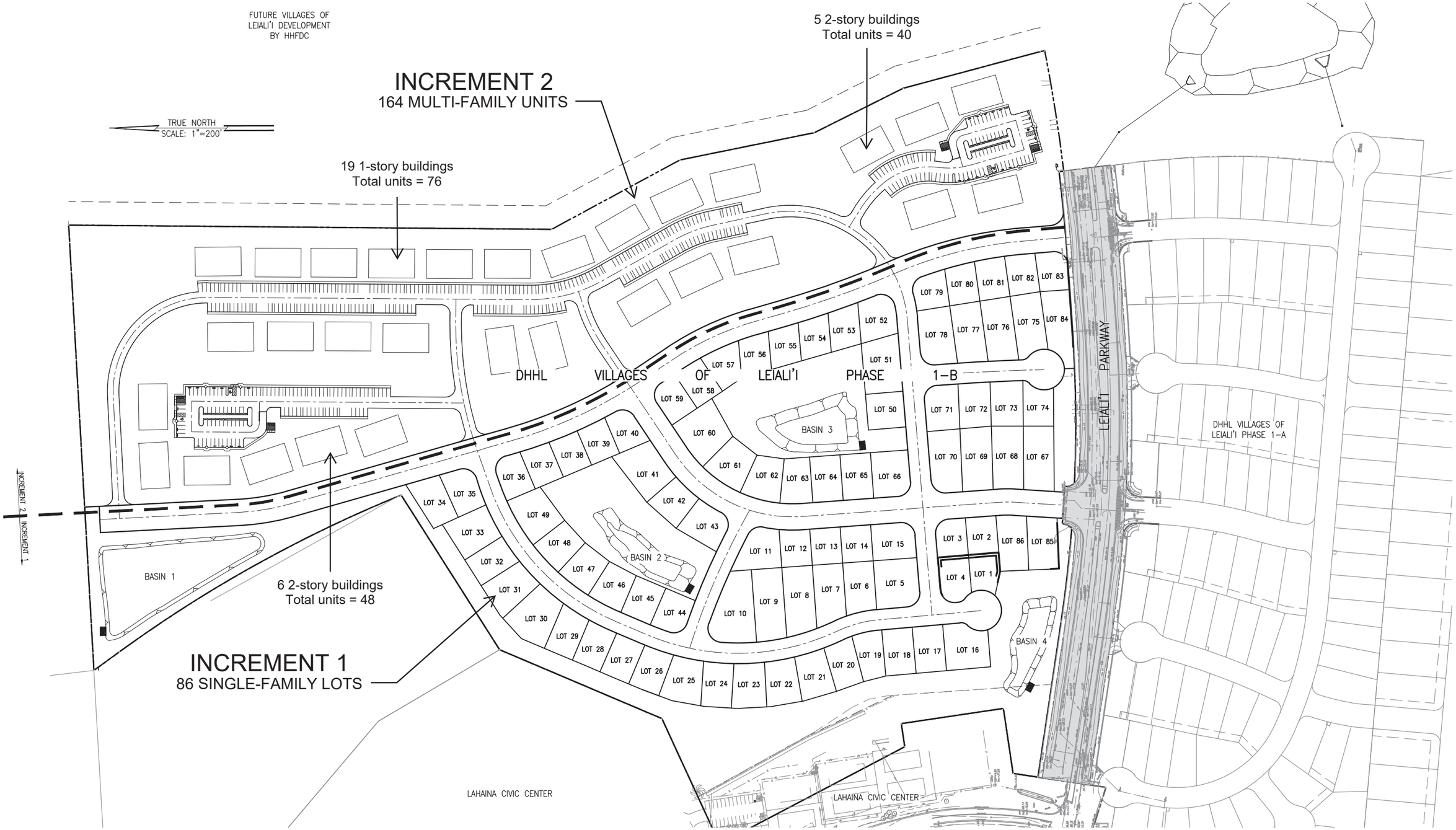
CONCEPTUAL SITE PLAN OF VILLAGES OF LEIALI'I PHASE 1-B - INCREMENT 2 SINGLE-FAMILY

EXHIBIT

2A

DATE: January 25, 2022

Z:\2018\18-552\ENGINEERING\DWG\PRELIM WORK\Exhibit 2A – Conceptual Subdivision Site Plan – Incr 2 SF– 11x17.dwg; January 25, 2022



CONCEPTUAL SITE PLAN OF VILLAGES OF LEIALI'I PHASE 1-B – INCREMENT 2 MULTI-FAMILY

SCALE: 1"=200'

0 1 2

LINE IS 2 INCHES AT FULL SIZE
(If NOT 2-inches : Scale Accordingly)

VILLAGES OF LEIALI'I SUBDIVISION PHASE 1-B

LAHAINA, MAUI, HAWAII

Austin Tsutsumi & Associates, Inc.
Engineers & Surveyors

CONCEPTUAL SITE PLAN OF VILLAGES OF LEIALI'I PHASE 1-B - INCREMENT 2 MULTI-FAMILY

EXHIBIT

2B

DATE: January 25, 2022

Z:\2018\18-552\ENGINEERING\DWG\PRELIM WORK\Exhibit 2B - Conceptual Subdivision Site Plan - Incr 2 MF- 11x17.dwg; January 25, 2022

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

APPENDIX

B

PRELIMINARY ENGINEERING REPORT AND DRAINAGE STUDY FOR PROPOSED VILLAGES OF LEIALI'I, PHASE 1B

Lahaina, Maui, Hawai'i
TMK: (2) 4-5-021: 010, 020, 021
and (2) 4-5-036: 109, 110, 112

June 23, 2023

Prepared for:

Department of Hawaiian Home Lands
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PRELIMINARY ENGINEERING REPORT AND DRAINAGE STUDY FOR PROPOSED VILLAGES OF LEIALI'I, PHASE 1B

Lahaina, Maui, Hawai'i
TMK: (2) 4-5-021: 010, 020, 021 and
(2) 4-5-036: 109, 110, 112

Prepared for:
Department of Hawaiian Home Lands

Prepared by:
Austin, Tsutsumi & Associates, Inc.
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June 23, 2023

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PRELIMINARY ENGINEERING AND DRAINAGE REPORT FOR THE PROPOSED VILLAGES OF LEIALI'I PHASE 1B PROJECT

Lahaina, Maui, Hawaii

I. INTRODUCTION

The purpose of this report is to provide an overview of the preliminary civil engineering design of the Villages of Leiali'i Phase 1B (Project). This report evaluates the existing on-site and off-site conditions, and presents proposed grading, drainage, water, wastewater, and other site improvements needed to meet the County of Maui Standards.

II. PROPOSED PROJECT

A. LOCATION

The Project is located in Lahaina, Maui, Hawaii. (See Exhibit 1, Location and Vicinity Map.) The Project site is currently undeveloped and is bounded by Honoapi'ilani Highway to the west and Leiali'i Parkway to the south. The owner and developer for the Project is the Department of Hawaiian Home Lands (DHHL), and the parcels are identified as Tax Map Keys (TMKs): (2) 4-5-021: 020, (2) 4-5-036: 109 and (2) 4-5-036: 110. (See Exhibit 2, Tax Map Key.) The Lahaina Civic Center Tennis Courts (LCCTC) encroaches into the limits of Parcel 020, however, DHHL has granted License Agreement 696 (LA 696) to the Department of Parks and Recreation for operation and maintenance of the facility. Off-site work will be performed on TMK: (2) 4-5-021: 010 (owned by the State of Hawaii), and TMKs: (2) 4-5-021: 021 and (2) 4-5-036: 112 (owned by Hawaii Housing Finance and Development Corporation (HHFDC)).

B. PROJECT DESCRIPTION

The Project site is approximately 51 acres and will be developed in two increments. Increment 1 includes 86 Single-Family units all below an elevation of 130 feet mean sea level (msl). Increment 2 includes development of the area above an elevation of 130 feet msl. Two alternatives for Increment 2 are being pursued, as presented below:

- **Alternative 1 of Increment 2** will provide 95 Single-Family units with lot sizes of approximately 5,000 square feet.
- **Alternative 2 of Increment 2** will provide up to 164 Multi-Family units.

A combination of Single-Family and Multi-Family units could also be pursued for Increment 2. At this time, the final unit count and product mix for Increment 2 has not been determined. It is anticipated that the final unit count and product mix will be developed following consultation with DHHL beneficiaries on their preferences.

Development of the Project will include on-site and off-site improvements. On-site improvements will include grading of the site and installation of an exterior perimeter fence; construction of buildings, roadways, and walkways; and installation of utility services including water, sewer, drainage, electrical, television, and cable.

Off-site work to the west of the Project site will include roadway, grading, and drainage improvements. Leiali'i Parkway (within Parcel 110) will be widened with traffic signal improvements at the intersection of Leiali'i Parkway and Honoapi'ilani Highway. Striping improvements will be provided along Honoapi'ilani Highway approaching Leiali'i Parkway. The existing segment of Leiali'i Parkway (within Parcel 112) will be rehabilitated as a requirement for dedication to the County of Maui. Rehabilitation work includes asphalt pavement restoration, median landscape remediation, upgrade of wheelchair ramps, concrete sidewalk repair, and graffiti removal from walls. A concrete sidewalk will be added along the west side of Kaaahi Street for access to the LCCTC site.

Off-site drainage improvements will be provided on the east side of the Project site. A 50-feet wide buffer that is free of vegetation will be provided between the Project and the off-site drainage improvements. The existing

detention basin east of Villages of Leiali'i Phase 1A (Phase 1A) will be enlarged. A new interceptor ditch and detention basin will be located east of the Project site. (See Exhibit 3A, General Site Plan – Alternative 1 and Exhibit 3B, General Site Plan – Alternative 2.)

III. EXISTING CONDITIONS

A. TOPOGRAPHY AND SOIL CONDITIONS

The Project site is currently undeveloped fallow agricultural land and covered mostly by cane and weeds with the exception of existing paved and dirt cane haul roads. In general, groundcover is poor and infiltration is fair to moderate.

The majority of the Project site slopes downward to the west with a grade of approximately nine percent. Elevations on-site range from 68 to 170 feet msl.

The Natural Resources Conservation Service (NRCS) soil types found on the Project site are predominantly Wahikuli Stony Clay, 3 to 7 percent slopes (WcB), and Wahikuli Very Stony Silty Clay, 3 to 7 percent slopes (WdB). (See Exhibit 4, Soils Map.)

WcB soils make up the majority of the of the Project site and are located toward the north side of the site. According to the NRCS, a representative soil profile consists of approximately 0 to 8 inches of stony silty clay, 8 to 27 inches of silty clay, 27 to 32 inches of very gravelly silty clay, and 32 to 42 inches of bedrock. Bedrock is typically found at a depth of 31 to 34 inches. Approximately a tenth of a percent of the surface area is typically covered with cobbles, stones or boulders. It has a "well-drained" drainage class and a "medium" runoff class. The Hydrologic Soil Group (HSG) for runoff is "C" and the depth to water table is more than 80 inches.

WdB soils make up the remainder of the Project site and are located along the southern boundary. According to the NRCS, WdB soils are similar to WcB soils but slightly rockier. The representative soil profile consists of approximately 0 to 8 inches of very stony silty clay, 8 to 27 inches of silty clay, 27 to 32 inches of very gravelly silty clay and 32 to 42 inches of bedrock. Bedrock is typically found at a depth of 31 to 34 inches. Approximately two percent of the surface area of WdB soils is typically covered with cobbles, stones or boulders.

It also has a "well-drained" drainage class and "medium" runoff class. The HSG for runoff is also "C" and the depth to water table is also more than 80 inches.

The NRCS soil types found in the off-site improvement area include WcB, WdB, and Wahikuli stony silty clay, 7 to 15 percent (WcC). WdB soil is located on the west side along Honoapi'ilani Highway and south side along Leiali'i Parkway. WcC and WdB soil is located southeast of Leiali'i Parkway. WcB soil is located to the east of the on-site improvements. WcC soils have similar profiles as WcB soils but occur in steeper sloped areas.

The above soil classifications and descriptions are taken from the United States Department of Agriculture (USDA) NRCS Web Soil Survey of the Island of Maui, Hawaii, Version 18, dated June 10, 2020.

B. CLIMATE AND RAINFALL

The Lahaina area is generally warm and sunny throughout most of the year with average temperatures ranging from a low of 63.8 degrees in the winter to a high of 84.8 degrees Fahrenheit during the summer. The annual average high and low temperatures are 80.8 degrees Fahrenheit and 67.5 degrees Fahrenheit, respectively. March is the wettest month in Lahaina with approximately 3.69 inches of rain, while June is the driest month with approximately 0.64 inches. The total precipitation per year is approximately 23.33 inches. Lahaina is subject to strong Kona Winds from the south and west direction during the fall and winter months and trade-winds from the north and east direction during the summer months.

C. INFRASTRUCTURE

1. ROADWAY AND ACCESS

The existing Project site is primarily accessed from Leiali'i Parkway where there are two access points. The first access point is located at the intersection of Leiali'i Parkway and Ho'oli Street. The second access point is located at the east (mauka) end of Leiali'i Parkway, approximately 150 feet east of the intersection of Leiali'i Parkway and Hanohano Street.

Leiali'i Parkway is a four-lane collector road that is divided by a median, however, only the two lanes south of the median are currently being used for two-way travel as the two lanes north of the median terminates prior to approaching Kaaahi Street. Access to the two northern lanes is blocked off. The posted speed limit is 25 miles per hour (mph).

Leiali'i Parkway is connected to Honoapi'ilani Highway which provides access to areas of West Maui. Honoapi'ilani Highway is a four lane State Highway with a speed limit of 35 mph in this area.

Within the parcel, there are existing cane haul roads that once provided access to adjacent agricultural lands for Pioneer Mill. A paved cane haul road runs just east of the Project boundary while a dirt cane haul road runs north to south through the middle of the Project site near the Increment 1 and Increment 2 split. The paved cane haul road connects to Komo Mai Street 1.5 miles south of the Project site while the north end leads to Old Stuart Road.

In the western corner of the Project site, there is a driveway and graveled overflow parking lot for the LCCTC, which is accessed through Akoakoa Place.

In the northwestern corner of the Project site, there is another driveway and graveled overflow parking lot. This graveled overflow parking lot can be accessed through the Lahaina Civic Center past the parking lot for the Lahaina Tennis Courts.

2. DRAINAGE

The Project site is undeveloped and has no on-site drainage infrastructure, except for a portion of the LCCTC that lies within the LA 696 area. Stormwater runoff generally sheet flows overland from east to west, where it then flows towards the Civic Center, Akoakoa Place, the LCCTC, or Leiali'i Parkway. Ultimately, all runoff flows to the drainage infrastructure at Honoapi'ilani Highway.

There are five drainage areas (Drainage Areas E-1 to E-5) within the Project site. (See Exhibits 5A, Drainage Area Map 1 – Existing Conditions and Exhibit 5B, Drainage Area Map 2 – Existing Conditions.)

Drainage Areas E-4 and E-5, specifically, contribute to an existing triple 48-inch culvert at Honoapi'ilani Highway, which is located 250 feet south of Leiali'i Parkway.

There are two off-site undeveloped drainage areas to the east (mauka) of the Project, Drainage Area O-1 and Drainage Area O-2. Runoff from Drainage Area O-1 sheet flows into the existing Project site. Runoff from Drainage Area O-2 flows through an existing minor gulch and collects at an existing detention east of Leiali'i Phase 1A. Modeling shows the existing 20.3 ac-ft detention basin will overtop with the 100-year, 24-hour storm runoff from Drainage Area O-2. Outflow from the basin primarily flows through existing 48-inch and 78-inch drainlines, which lead toward the triple 48-inch culvert at Honoapi'ilani Highway.

There are six off-site drainage areas (Drainage Areas O-3 to O-8) to the west (makai) of the Project and one off-site drainage area south of the Project (Drainage Area O-9) that also contribute runoff to the triple 48-inch culvert at Honoapi'ilani Highway.

The existing conditions runoff for both the on-site and off-site areas is summarized in Table 1 on the following page. Detailed drainage calculations can be found in Appendix "A".

Table 1: Summary of Existing Conditions Runoff

Drainage Area	Area (ac)	Exist. Q_{50} (cfs)	Exist. Q_{100} (cfs)	Flows to
E-1	8.108	19.62	22.38	North of Civic Center, Honoapi'ilani Hwy
E-2	12.122	25.94	29.58	Akoakoa Place, Honoapi'ilani Hwy
E-3	11.617	26.63	30.67	Civic Center Tennis Court Drainage System, Honoapi'ilani Hwy
E-4	10.55	22.04	25.34	24" Inlet Headwall at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
E-5	8.958	19.85	22.57	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
On-site Total	**50.860**	**114.08**	**130.54**	
O-1	97.7	205.17	235.95	On-site Project Area, 3-48" Culvert at Honoapi'ilani Hwy
O-2	260.0	822.45	1,020.23	Exist. Off-site Basin (Q_{50} Out = 569.04 cfs, Q_{100} Out = 704.97 cfs)
O-3	1.395	11.67	13.38	24" Inlet Headwall at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-4	0.005	0.05	0.06	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-5	0.734	5.22	5.99	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-6	0.517	2.57	2.95	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-7	0.195	1.89	2.16	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-8	1.194	3.79	4.36	3-48" Culvert at Honoapi'ilani Hwy
O-9	24.7	67.00	80.00	3-48" Culvert at Honoapi'ilani Hwy
Off-site Total	**386.440**	**866.40**	**1,049.81**	(After Detention)
To 3-48" Culvert	**405.453**	**908.29**	**1,097.72**	(Excludes DAs E-1, E-2, and E-3)

As shown in Table 1, a total of just over 405 acres of on-site and off-site areas drain to the triple 48-inch culvert at Honoapi'ilani Highway. The existing conditions 100-year runoff is estimated to be 1,098 cfs, while the capacity of the culvert is 331 cfs.

3. WATER

The County of Maui (County), Department of Water Supply (DWS) provides water to developed lots in the vicinity of the Project, including Phase 1A which is on the south side of Leiali'i Parkway. (See Exhibit 6, Overall Water System Map.) However, the Project site does not currently have water service.

The existing water system was constructed in 1992 as part of the Lahaina Master-Planned Community, Village I, Phase I project (now referred to as the Villages of Leiali'i Phase 1A). The water system is part of DWS's Lahaina water system, and it was designed to accommodate the Project by providing stub-outs to allow for a new water system to connect to the existing system.

There is an existing 8-inch waterline that runs along Leiali'i Parkway. The existing 8-inch waterline has two stub-outs located at the intersection of Leiali'i Parkway and Ho'oli Street and the intersection of Leiali'i Parkway and Hanohano Street. There are five existing fire hydrants: two on the north side of Leiali'i Parkway near the southern boundary of the Project site and three on the south side of Leiali'i Parkway. The 8-inch waterline that runs along Leiali'i Parkway connects to a 16-inch water transmission main that runs along the mauka side of Honoapi'ilani Highway.

The existing tennis courts, which are located makai (west) of the Project, are serviced off of an existing DWS 8-inch waterline in Akoakoa Place.

DWS's Lahaina water system has two different pressure zones. The Lower Pressure Zone (LPZ) services lots up to an elevation of approximately 130-150 feet msl. The Upper Pressure Zone (UPZ) encompasses a minimal DWS service area along Lahainaluna Road

between the elevations of approximately 150 to 250 feet msl. (See Exhibit 7, Overall Water System Schematic.)

The LPZ is associated with the water level within the existing 1.5-million-gallon (MG) Wahikuli Reservoir with overflow elevation of 257.33 feet msl. The LPZ encompasses most of DWS's Lahaina service area, depending on the location of the service area along Honoapi´ilani Highway. Phase 1A is serviced off a 16-inch main in Honoapi´ilani Highway, and is within the LPZ.

Currently, the UPZ pressure is associated with the water level within the existing 500,000-gallon Upper Lahaina Reservoir with overflow elevation of 456.33 feet msl. However, this pressure is only available from the waterlines within a segment of Lahainaluna Road and streets off of this segment, and is too distant to service Phase 1A or the Project.

As part of Phase 1A, DWS installed a portion of 12-inch waterline above the end of Leiali'i Parkway to allow for a connection to a future higher pressure service zone.

4. NON-POTABLE IRRIGATION

The Wahikuli Irrigation Well, located in the adjacent HHFDC property and east of the East Aipuni Place cul-de-sac, will provide the irrigation needs for the proposed project. The non-potable water system currently services Leali'i Parkway and the Villages of Leiali'i Phase 1-A. The non-potable well contains a submersible pump with a capacity of 200-gallons per minute (gpm) at a total dynamic head (TDH) of 475 feet, which was installed in October 2021. The maximum day pump rate would be 288,000 gallons per day (gpd), based on operating the well 24 hours per day. However, the expectation is that the pump would not be operated more than 10 hours per day, which equates to a maximum irrigation use of 120,000 gpd.

The well water is pumped into an adjacent 10,000-gallon storage tank at the well site. From the storage tank, the non-potable water is pumped to Leali'i Parkway by a booster pump with a capacity of 178 gpm at 140 feet TDH. There are also five hydropneumatic tanks at the well

site that help maintain pressure in the irrigation system. The water is conveyed to the top of Leali'i Parkway by an existing 6-inch waterline from the well site. This 6-inch waterline will be used to provide irrigation flows to Phase 1-B.

A pressure reducing valve (PRV), with an outlet pressure setting of 55 pounds per square inch (psi), is located near the end of the 6-inch waterline. After the PRV, 2-1/2-inch waterlines convey the water to Leiali'i Parkway for irrigation. Currently, the well is only used to irrigate the parkway.

5. WASTEWATER

The Project currently generates no wastewater flow and there is no existing wastewater collection system within the Project limits. However, there is an 8-inch sewer line within Leiali'i Parkway that was constructed as part of the wastewater collection system for Phase 1A. (See Exhibit 8, County Wastewater System Map.) There are existing stub-outs from the sewer manholes in the Parkway that were installed to provide for future connections from the Project.

The 8-inch sewer line within Leiali'i Parkway extends west (makai) to the easement for the railroad right-of-way. The 8-inch sewer line then heads south within the railroad easement approximately 500 feet to an existing sewer manhole in the southwest corner of Phase 1A. A 12-inch sewer line from this manhole heads west across Honoapi'ilani Highway, and then south towards the Lahaina Wastewater Pump Station (WWPS) No. 3.

The wastewater from Phase 1A is combined with wastewater being received at WWPS No. 3 from Lahaina Town, and conveyed to Maui County's existing Lahaina Wastewater Reclamation Facility (WWRF) through a series of two other WWPSs and force mains and gravity transmission lines along Honoapi'ilani Highway. The WWRF is located approximately three miles north of the Project.

The Lahaina WWRF has been upgraded in recent years to have a treatment capacity of 9 million gallons per day (mgd). Currently, the

WWRF treats an average daily flow between 3.4 mgd and 4.1 mgd, and the County has already allocated approximately 5.4 mgd of the 9 mgd capacity.

Phase 1A was the first phase of a larger overall project called the Lahaina Master-Planned Community, which is being developed by HHFDC. As part of this larger project, approximately 1,000 feet of 24-inch gravity sewer line was installed about 170 feet from the east (mauka) end of Leiali'i Parkway during construction of Phase 1A. This sewer line, which slopes downwards from south to north, is currently capped at both ends and not in use.

The intention was to convey wastewater from HHFDC's larger overall project directly to the Lahaina WWRF, rather than use the County's existing collection and transmission system. However, this 24-inch sewer line is now not expected to be used, as the indication is that when HHFDC develops their lands, they will construct a new on-site wastewater treatment plant.

6. ELECTRICAL

Existing overhead powerlines run along Honoapi'ilani Highway which provides service to nearby properties to the east. Existing powerlines provide service to the United States Postal Service, Lahaina Civic Center, and additional adjacent properties.

There is an existing underground Electrical/Television/Cable system located along the southern side of Leiali'i Parkway with laterals across Leiali'i Parkway towards the Project site at Ho'oli Street and Hanohano Street.

D. FLOOD ZONE

The Project site is within Federal Emergency Management Agency (FEMA) Zone X which is an area determined to be outside of the 0.2 percent annual chance (500-year) floodplain. Zone X is not subject to inundation by the 100-year (one percent annual chance) floods. A portion of the off-site improvements at the intersection of Honoapi'ilani Highway and Leiali'i Parkway is

within FEMA Zone A, which is an area subject to inundation by the 100-year (one percent annual chance) floods, but with no base flood elevations determined.

Flood zone classifications are based on the FEMA Flood Insurance Rage Map (FIRM) number 1500030353F, Revised September 19, 2012. (See Exhibit 9, Flood Zone Map.)

The Project site is outside of the sea level rise exposure area based on the 3.2 feet sea level rise scenario determined by the Pacific Islands Ocean Observing System. A portion of the off-site improvements west of the Project site along Leiali'i Parkway and Honoapi'ilani Highway is within the 3.2 feet exposure area. (See Exhibit 10, Sea Level Rise Map.)

IV. PROPOSED IMPROVEMENTS

A. ROADWAYS AND ACCESS

There are two access points from Leiali'i Parkway proposed for the Project site: one opposite Ho'oli Street and another opposite Hanohano Street. The Project will contain a spine collector road that will connect to Leiali'i Parkway at the access point opposite Ho'oli Street. The spine road will be a two-lane undivided street with a 56-foot right-of-way (ROW).

In Alternative 1, all other roadways besides the spine road will be two-lane undivided streets with a ROW of 44-feet. In Alternative 2, the roadway at the Increment 1 and Increment 2 split will be a two-lane undivided street with a ROW of 56-feet. Sidewalks and landscape strips will be provided on both sides of all roadways.

Off-site roadway improvements are proposed within State-owned land in order to accommodate the increased traffic volume and to improve traffic circulation around the Project site. The northern lanes along Leiali'i Parkway will be widened and connected to Kaaahi Street and Honoapi'ilani Highway. Improvements proposed at the aforementioned intersections will require slight realignments at both intersections. New concrete sidewalks will be provided between Honoapi'ilani Highway and the widened area of Leiali'i Parkway on both sides of Leiali'i Parkway. A concrete sidewalk will also be added along the west side of Kaaahi Street for access to the LCCTC site. Traffic signal improvements will be made to Honoapi'ilani Highway. In addition, improvements will be made

to the turning lanes along Honoapi'ilani Highway in order to accommodate for increased traffic volume entering the Project site.

B. GRADING

This Project will involve excavation and embankment as required to install new roadways, utilities, and level building pad areas. The site will be graded to collect runoff in retention basins and drainage systems within the Project site. Efforts will be made to maintain a balance between excavation and embankment (cut and fill) quantities to reduce the import and/or export of earthwork materials. See Exhibit 11A, General Grading Plan – Alternative 1 and Exhibit 11B, General Grading Plan – Alternative 2.

The grading of the on-site and off-site work will be phased with the site development. The initial phase of work will include grading related to the off-site detention basins mauka of the Project. Material from excavation of the detention basins will be used as fill material for grading work within Increment 1. Increment 2 construction will occur subsequent to the completion of Increment 1.

C. DRAINAGE

For the purposes of this report, the drainage analysis has been done based on Alternative 1 of Increment 2 where the entire Project site is laid out as single-family units. This is the most highly developed scenario that is being considered and contains the most impervious coverage. The drainage analysis will be revised to reflect the scoping of the Project for single-family and multi-family units once that is determined. The basis of the drainage design will generally remain the same, however, the specific runoff flows noted below will be revised accordingly.

The Project drainage improvements will include catch basins, drain inlets, manholes, drain lines, and detention basins. Runoff will be collected by catch basins or drain inlets along the roadways and then be conveyed via underground piping to one of four proposed on-site detention basins. Basins 1, 2, and 3 will be sized to retain the 50-year, 1-hour storm runoff from Drainage Areas P-1, P-2, and P-3, respectively. Basin 4 receives runoff from Drainage Area P-4 and will have a 50-year outflow of approximately 29 cfs to the existing 42-inch drain line stub at Leiali'i Parkway. Overflow pipes be installed at Basins 1, 2, and 3 to

safely manage excess runoff and keep it within the Project's storm drain system. Emergency overflow weirs will also be installed at each proposed detention basin in order to avoid berm overtopping.

A portion of the site nearest the LCCTC is located makai of the proposed residential lots. This area (Drainage Areas P-5 to P-7) will flow towards the LCCTC drainage system or toward Leiali'i Parkway as the site does now, but in lesser quantities because more of the area is captured in the subdivision's proposed drainage system. See Exhibit 12A, Drainage Area Map 1 – Proposed Conditions and Exhibit 12B, Drainage Area Map 2 – Proposed Conditions.

As described in Existing Conditions, there are two off-site drainage areas east (mauka) of the Project (Drainage Areas O-1 and O-2) within HHFDC's property. Two new off-site detention basins will be installed to manage the runoff from these areas. Proposed Off-site Basin – North will collect runoff from Drainage Area O-1, while Proposed Off-site Basin – South will collect runoff from Drainage Area O-2. The capacities of the two basins are 10.0 and 67.3 ac-ft respectively. Proposed Off-site Basin – South is an expansion of the existing off-site detention basin and will utilize the same outlet drainlines.

The proposed conditions runoff for both the on-site and off-site areas is summarized in Table 2 on the following page. Detailed drainage calculations can be found in Appendix "A".

Table 2: Summary of Proposed Conditions Runoff

Drainage Area	Area (ac)	Prop. Q_{50} (cfs)	Prop. Q_{100} (cfs)	Flows to
P-1	12.447	49.74	56.91	Basin 1 (Q_{50} out = 0 cfs, Q_{100} out = 0 cfs)
P-2	7.066	30.53	34.98	Basin 2 (Q_{50} out = 0 cfs, Q_{100} out = 3.48 cfs)
P-3	12.423	53.30	61.05	Basin 3 (Q_{50} out = 0 cfs, Q_{100} out = 0 cfs)
P-4	15.030	62.49	71.51	Basin 4 (Q_{50} out = 28.59 cfs, Q_{100} out = 37.61 cfs)
P-5	2.650	8.81	10.10	Civic Center Tennis Court Drainage System, Honoapi'ilani Hwy
P-6	0.843	3.28	3.75	24" Inlet Headwall at Leiali'i Pkwy, 3-4"" Culvert at Honoapi'ilani Hwy
P-7	0.397	1.78	2.04	CB at Leiali'i Pkwy, 3-4"" Culvert at Honoapi'ilani Hwy
On-site Total	**50.856**	**42.56**	**56.98**	(After Detention)
O-1	97.7	205.17	235.95	Prop. Off-site Basin North (Q_{50} out = 0 cfs, Q_{100} out = 0 cfs)
O-2	260.0	822.45	1,020.23	Prop. Off-site Basin South (Q_{50} Out = 119.70 cfs, Q_{100} Out = 144.35 cfs)
O-3	1.395	11.67	13.38	24" Inlet Headwall at Leiali'i Pkwy, 3-4"" Culvert at Honoapi'ilani Hwy
O-4	0.005	0.05	0.06	CB at Leiali'i Pkwy, 3-4"" Culvert at Honoapi'ilani Hwy
O-5	0.734	4.82	5.53	CB at Leiali'i Pkwy, 3-4"" Culvert at Honoapi'ilani Hwy
O-6	0.517	2.03	3.06	CB at Leiali'i Pkwy, 3-4"" Culvert at Honoapi'ilani Hwy
O-7	0.195	1.89	2.16	CB at Leiali'i Pkwy, 3-4"" Culvert at Honoapi'ilani Hwy
O-8	1.194	3.62	4.15	3-4"" Culvert at Honoapi'ilani Hwy
O-9	24.7	67.00	80.00	3-4"" Culvert at Honoapi'ilani Hwy
Off-site Total	**386.440**	**210.78**	**252.69**	(After Detention)
To 3-48" Culvert	**383.790**	**244.43**	**299.57**	(Excludes DA P-5)

The existing conditions Project site generates a 50-year, 1-hour runoff of 114 cfs, while the proposed conditions site generates 210 cfs (prior to detention). The reason for the increase in runoff is the development of the site and the increase in impervious cover. As discussed, detention basins will be used to mitigate this runoff increase. The total 50-year, 1-hour storm outflow from the Project site after detention will be 42 cfs, which is a 72 cfs reduction from the existing condition.

As shown in Table 2, there will also be a reduction in the total flow to the triple 48-inch culvert at Honoapi'ilani Highway. Following detention of on-site and off-site areas, the 100-year flow to the culvert is anticipated to be 300 cfs, which will be within the culvert's capacity of 331 cfs.

The Project site is approximately 3.5 miles from the Kapalua Airport. The State of Hawaii Department of Transportation, Airports Division (HDOT-A) requires that the proposed development does not provide landscape and vegetation that will create a wildlife attractant. Due to the existing dry climate in the area and soils on the Project site, it is not anticipated that there will be standing water in open swales, storm drains, and detention/retention basins 48 hours after a storm event. As recommended by HDOT-A, every effort will be taken to prevent the development of wildlife attracting habitats and to discourage wildlife from taking refuge on the proposed site.

D. EROSION CONTROL

Temporary erosion control measures will be implemented throughout construction to lessen soil loss and erosion hazards. Best Management Practices (BMPs) utilized may include temporary sediment basins, temporary diversion berms and swales to intercept runoff, silt fences, dust fences, slope protection, stabilized construction entrances and truck wash-down areas. In addition, loose soils will be periodically sprayed with water to minimize air-borne dirt particles from reaching adjacent properties. An application for a National Pollution Discharge Elimination System (NPDES) permit for construction will be submitted to the State Department of Health for review and approval prior to the start of construction. Permanent sediment control measures will be utilized once construction is completed.

E. STORMWATER QUALITY

The proposed stormwater management system will reduce peak flows to maintain existing hydrology and will provide water quality treatment to meet the County of Maui storm water treatment standards. The four proposed on-site detention basins will act as the Project's stormwater treatment best management practices (BMPs). In accordance with Low Impact Development (LID) principles, the basins will fully retain the Water Quality Design Volume (WQDV), allowing suspended particles to settle and water to infiltrate. An appropriate maintenance plan will be developed during the design phase of the Project. The plan will include requirements for removal of accumulated sediments and debris, maintaining vegetation, and inspection.

F. WATER SYSTEM

1. Water Demands

DWS's Water System Standards (WSS) average daily water demand is 600 gallons per day (gpd) per single-family residence and 560 gpd per multi-family residence.

The Project will be divided into two increments, based on two service areas. Increment 1 will be in the LPZ, below elevation 130 feet msl. The maximum number of Single Family lots in Increment 1 is 86, and they will be serviced from the existing Wahikuli Reservoir. At this time, there will not be any Multi-Family units in Increment 1.

The average day demand for Increment 1 would be 51,600 gpd. The maximum day demand is calculated as being 1.5 time the average day demand, and would be approximately 77,400 gpd.

Increment 2 will be in the UPZ, above elevation 130 feet msl, and will be serviced by the new off-site 500,000-gallon water storage reservoir located at an approximate elevation of 370 feet msl.

Two alternatives for Increment 2 are being considered. For Alternative 1, 95 Single Family lots would be developed, which would result in an average day demand of 57,000 gpd, and a maximum day demand of approximately 85,500 gpd.

For Alternative 2, 164 Multi-Family lots would be developed, which would result in an average day demand of 91,800 gpd, and a maximum day demand of approximately 137,800 gpd. See Table 3 on the following page for a summary of the water demands.

Table 3: Proposed Water Demands

Description	No. of units	Average Day Unit Demand (gpd)	Average Day Demand (gpd)	Maximum Day Demand (gpd)
Increment 1	86 SF	600	51,600	77,400
Increment 2 Alternative 1	95 SF	600	57,000	85,500
Increment 2 Alternative 2	164 MF	560	91,800	137,800

The fire flow requirement for single-family residences is 1,000 gallons per minute for a duration of 2 hours. For Increment 2, Alternative 2, the Multi-Family residences would be considered to be "PUD Townhouse and Low-Rise Apartments", which requires a fire flow of either 1,500 gpm (for A-1 developments) or 2,000 gpm (for A-2 Developments) for a duration of 2 hours.

2. Water Storage

The lots in Increment 1 below elevation 130 feet msl will be supplied by the existing 1.5 MG Wahikuli Reservoir. Since there is no existing reservoir in the UPZ that would be able to service the Increment 2 lots above elevation 130 feet, a new off-site storage reservoir will be required. The reservoir will be included in off-site improvements that will be designed and constructed as part of DHH''s Honokowai Water System Improvements project. The off-site improvements are discussed further in Section F.5.

3. Water Source

The water source for DWS's existing Wahikuli Reservoir is supplied by groundwater wells and treated surface water. Currently, the primary source of water is treated water from the Mahinahina Water Treatment Facility (M-WTF) in Honokowai. In addition, DWS is proposing to develop two wells above the M-WTF, collectively called the West Maui Source Development project. These wells will be able to contribute water to DWS's water system. DHHL is also developing its separate Honokowai Water System Improvements project, which will be able to contribute water to DWS's water system. The Honokowai Water System Improvements project is discussed in Section F.5.

4. Water Distribution System

New on-site distribution waterlines will be constructed within the roadways of the Project. (See Exhibit 13A, On-Site Water System – Alternative 1, and Exhibit 13B, On-site Water System – Alternative 2.) The distribution system for Increment 1 of the Project will consist of 8-inch waterlines that will connect to the existing 8-inch waterline stub-outs Leial''i Parkway. The 8-inch waterlines would provide water for potable, irrigation and fire suppression purposes.

The distribution system for Increment 2, Alternative 1 would consist of 8-inch waterlines that would connect to a new off-site transmission waterline that would convey water from a new off-site reservoir to Increment 2 of the Project. The 8-inch waterlines would provide water for potable, irrigation and fire suppression purposes. The new off-site transmission waterline and reservoir will be constructed as part of the off-site improvements, discussed in Section F.5.

The distribution system for Increment 2, Alternative 2 would consist of 4-inch waterlines to provide potable and irrigation water to the units, and a separate 12-inch fire waterline that would provide water for fire suppression purposes. As with Alternative 1, the two waterlines would connect to a new off-site transmission waterline that will convey water from a new off-site reservoir to Increment 2 of the Project.

The distribution waterlines and fire lines will be of ductile iron pipe. The waterlines will be sized to meet the WSS pressure and velocity requirements.

For Increment 1 and Increment 2, Alternative 1, fire hydrants would be installed at a maximum of 350-foot intervals within the site, per the WSS for Single Family developments. For Increment 2, Alternative 2, fire hydrants would be installed at a maximum of 250-foot intervals within the site, per the WSS.

Further analysis of the water transmission and distribution system will be undertaken as part of the detailed engineering design process for this Project.

5. Non-Potable Irrigation System

The existing irrigation system is currently operating without any issues. The existing booster pump, which has a capacity of 178 gpm at 140 feet TDH, was installed in October 2022. The existing booster pump is considered adequate to provide irrigation water to Increment 1 of Phase 1-B. However, the irrigation periods for irrigating Leiali'i Parkway and Increment 1 would need to be coordinated so as not to be operational at the same time.

When Increment 2 is developed, a new booster pump with a higher head capacity would be required, since the existing booster pump would not be able to provide adequate pressure to the upper areas of Increment 2. The recommendation would be to install a duplex pump system (with one pump operational and one standby pump) that could provide adequate water to the existing Leiali'i Parkway system as well as Increments 1 and 2. Since Leiali'i Parkway and Increment 1 are lower elevation than Increment 2, the existing PRV would be used to reduce the pressure to acceptable pressures for these lower elevation areas.

Offsite improvements to the existing non-potable water system may include necessary repairs to the existing transmission lines. These repairs will be done as necessary based on the condition of existing pipes.

The average daily irrigation demand for Phase 1B is estimated to be 74,600 gpd. Non-potable water for Increment 1 and Increment 2 will be used to irrigate the general landscaping along the edges of subdivision parcel as well as landscape planters and retention basin parcels. The onsite irrigation line size and demand is based on providing water for Increment 1 and Increment 2 - Alternative 2, as the multi-family option has a larger irrigation requirement.

The estimated average daily irrigation demand for Phase 1B and existing and future irrigation demands for Leiali'i Parkway, is estimated at 81,450 gpd. A discussion of the existing and proposed irrigation demands is as follows:

Existing flows include irrigation for Leiali'i Parkway planters and medians. Existing planter demand is 4,600 gpd and existing median demand is 2,000 gpd. The total estimated existing demand is 6,600 gpd.

Proposed demands include irrigation for Leiali'i Phase 1B planter sections within new roadway lots and onsite and offsite retention basins. Phase 1B planter sections irrigation demand is estimated at 2,600 gpd and Phase 1B onsite retention basin irrigation demand is estimated at 27,000 gpd. Phase 1B offsite retention basin irrigation demand is estimated at 45,000 gpd. Therefore, the total Phase 1B estimated demand is 74,600 gpd.

The Leiali'i Parkway future roadway expansion is estimated to create a proposed irrigation demand of 250 gpd.

Phase 1A irrigation will operate independently from Phase 1B as well as Leiali'i Parkway. Proposed non-potable irrigation flows for Leiali'i Phase 1A planter sections within roadway lots is estimated to be 1,700 gpd.

6. DHHL Honokowai Water System Improvements Project

Water for Increment 2 of the Project, which are the lots above elevation 130 feet msl will be provided by the proposed Honokowai Water System Improvements project, which is a regional infrastructure effort that will also provide water to multiple West Maui developments. The

proposed improvements will include the development of new reservoirs, waterlines, as well as improvements to an existing test well developed by the DHHL to put it into production. The following sections describe the Honokowai Water System Improvements project.

Honokowai Well (State Well No. 5639-04), is proposed to be used as a potable water source for West Maui. Honokowai Well is an existing drilled and cased test well located in Honokowai, Maui. It was developed as an exploratory well by DHHL on State-owned lands on Tax Map Key (TMK) No. (2) 4-4-004:002(por.). The well site is approximately 2.5 acres. Water from the Honokowai Well will be conveyed approximately 8,000 feet north through a new 12-inch transmission main that will connect with DWS's existing water system near the M-WTF. A new 50,000-gallon control tank will be constructed at the well site. The Honokowai Well and 12-inch transmission main are intended to be dedicated to DWS by DHHL upon completion of the project.

Due to the limitation of the LPZ of being able to only service elevations below 130 feet, a new water storage reservoir (HHFDC Reservoir) will be required at a higher elevation to service the UPZ above elevation 130 feet. The primary purpose of the HHFDC Reservoir would be to have sufficient storage capacity to meet water demands concurrent with water for fire protection, and to be at an elevation that can provide adequate pressure by gravity to all users. (See Exhibit 14, Existing and Proposed Water System.)

The recommendation is to construct a 500,000-gallon reservoir to allow for a variety of possible future developments to be serviced by this reservoir.

The new 500,000-gallon HHFDC Reservoir will be built at elevation 370 feet msl on HHFDC property, and would be able to service up to about elevation 220 feet msl. A new booster pump station (BPS) is proposed within an expansion of the existing Wahikuli Reservoir site to pump water from the Wahikuli Reservoir up to the new HHFDC Reservoir.

To convey water from the proposed BPS to the new HHFDC Reservoir, approximately 4,700 feet of a new 12-inch waterline will be installed. In addition, approximately 3,700 feet of a new 12-inch waterline will be installed that utilizes gravity to convey the water from the new HHFDC Reservoir to the Project site. The waterline will begin at the new HHFDC Reservoir and will terminate near the mauka end of Leiali'i Parkway, where it will connect to DWS's existing 12-inch waterline.

G. WASTEWATER SYSTEM

1. Wastewater Flows

Wastewater flows expected to be generated by the Project were calculated based on the requirements of the County of Maui, Wastewater Reclamation Division, Wastewater Flow Standards, dated February 2006. The design average wastewater flow for Increment 1, based on 86 Single Family lots, is expected to be approximately 32,000 gallons per day (gpd). For Increment 2, Alternatives 1 and 2, the design average wastewater flow is expected to be approximately 35,000 gpd and 44,000 gpd, respectively. (See Appendix "B" for the wastewater flow calculations.)

2. Wastewater Collection system

New on-site gravity sewer collection lines will be constructed within the roadways of the Project. The sewer lines will connect to the existing 8-inch sewer line stub-outs from the sewer manholes in Leiali'i Parkway. (See Exhibit 15A, On-Site Wastewater Collection System – Alternative 1 and Exhibit 15B, On-Site Wastewater Collection System – Alternative 2.) The wastewater from both increments of the Project will join with the wastewater flows from Phase 1A, and will flow by gravity to the Lahaina WWPS No. 3.

The sewer lines will be of PVC pipe,and will be sized to carry the expected design peak flow from the Project. The sewer lines are expected to be between 8-inch and 12-inch in diameter.

3. Wastewater Treatment

Wastewater flows from the Project will be conveyed to the Lahaina WWRF by the County's existing infrastructure. It is not expected that off-site improvements to the County's existing wastewater collection and transmission system will be required. The County has indicated that there is available capacity at the Lahaina WWRF to treat the wastewater flows from the Project.

H. ELECTRICAL SYSTEM

The Project will be serviced underground with electrical connections along Leiali'i Parkway. In addition to power, telephone, cable and DSL services will be provided. Existing underground Electrical/ Television/ Cable lines are currently located along Leiali'i Parkway where it intersects with Ho'oli Street and Hanohano Street.

DHHL will be responsible for the installation of all underground infrastructure including conduit, handhole, and equipment pads to the Maui Electric Company (MECO) standards and requirements. MECO will be pulling cables and making terminations.

V. CONCLUSION

The proposed improvements for this Project will be designed in accordance with the applicable rules and regulations of the County of Maui and State of Hawaii.

The Department of Public Works (DPW) Storm Water Rules require mitigation of increase in stormwater runoff between the pre and post-development conditions. The Project will reduce and manage stormwater runoff to meet the DPW requirements. Erosion control and water quality measures will be provided to minimize pollution during and after construction.

The existing Wahikuli Reservoir will service lots within Increment 1. Lots within Increment 2 will be serviced by a new off-site 500,000-gallon water storage reservoir that will be designed and constructed as part of the regional Honokowai Water System Improvements project. The existing non-potable well east of Phase 1A will service Irrigation demand for Phase 1B Increments 1 and 2.

The on-site wastewater collection will essentially follow the proposed roadway systems of the Project. The network of gravity sewer lines will collect wastewater from the residential lots throughout the Project site, which will then flow to the Lahaina WWPS No. 3.

Based on the information presented in this report, the Project will have no adverse effects on the existing facilities or on the surrounding environment.

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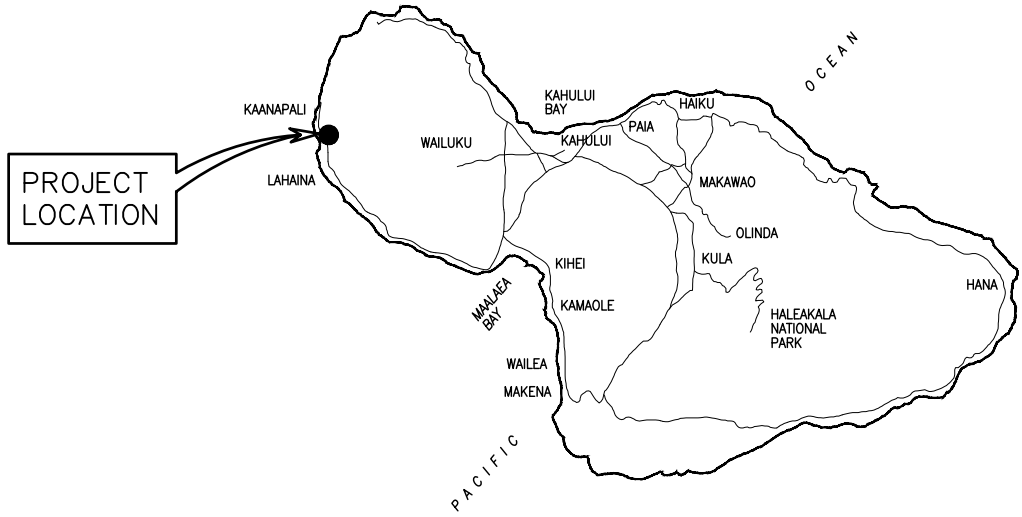
EXHIBITS

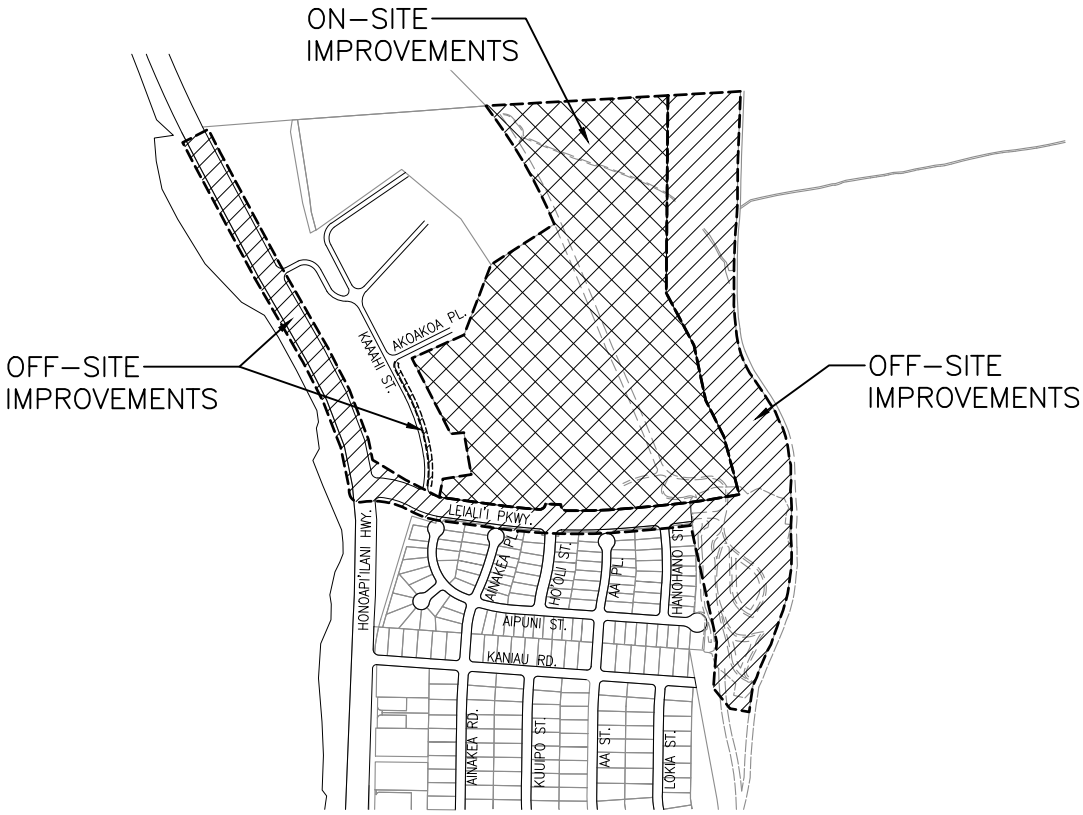


ISLAND OF MAUI

NORTH

LOCATION MAP

NOT TO SCALE



NORTH

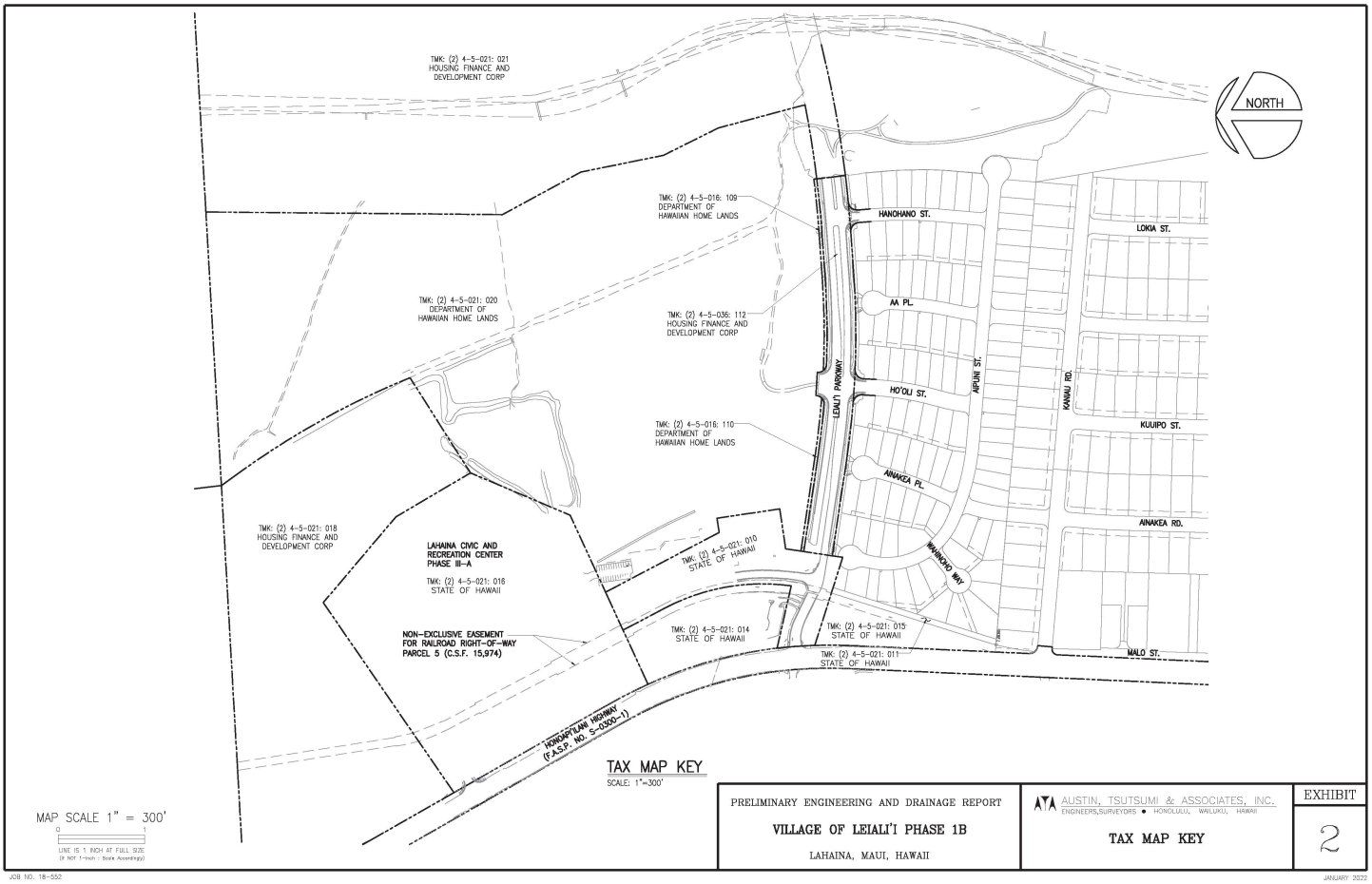
VICINITY MAP

NOT TO SCALE

PRELIMINARY ENGINEERING AND DRAINAGE REPORT VILLAGE OF LEIALI'I PHASE 1B LAHAINA, MAUI, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS ● HONOLULU, WAILUKU, HAWAII LOCATION AND VICINITY MAP	EXHIBIT 1

JOB NO. 18-552

JANUARY 2022



PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

TAX MAP KEY

EXHIBIT 2

JOB NO. 18-552

JANUARY 2022

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

GENERAL SITE PLAN – ALTERNATIVE 1

EXHIBIT 3A

JOB NO. 18-552

JANUARY 2022

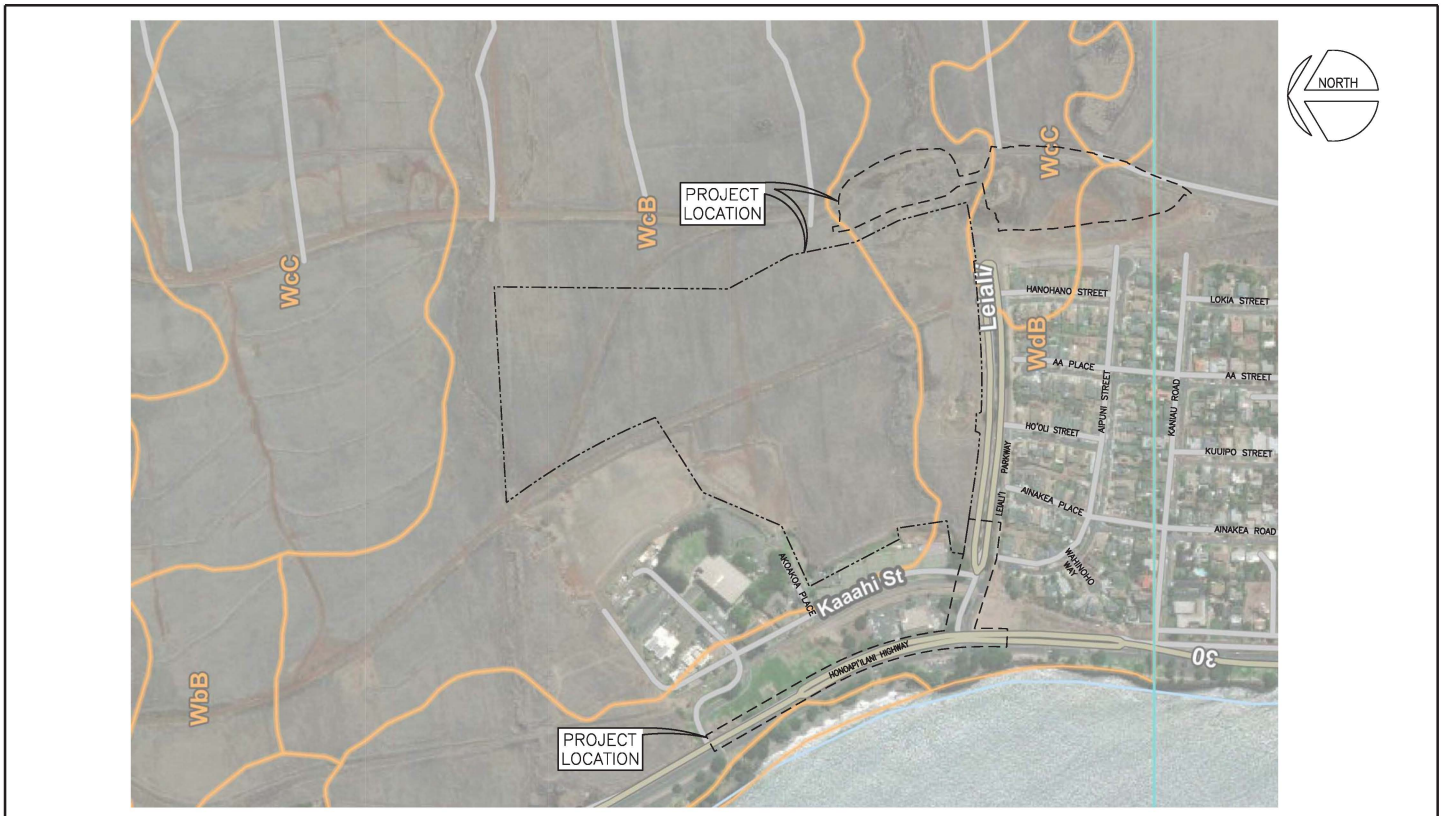
GENERAL SITE PLAN – ALTERNATIVE 2

SCALE: 1"=300'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT VILLAGE OF LEIALI'I PHASE 1B LAHAINA, MAUI, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII GENERAL SITE PLAN – ALTERNATIVE 2	EXHIBIT 3B

JOB NO. 18-552

JANUARY 2022



MAP SCALE 1" = 400'

LINE IS 1 INCH AT FULL SIZE (IF NOT 1-Inch : Scale Accordingly)

LEGEND:

WbB: WAHIKULI SILTY CLAY, 3 TO 7 PERCENT SLOPES, HSG "C"

WcB: WAHIKULI STONY CLAY, 3 TO 7 PERCENT SLOPES, HSG "C"

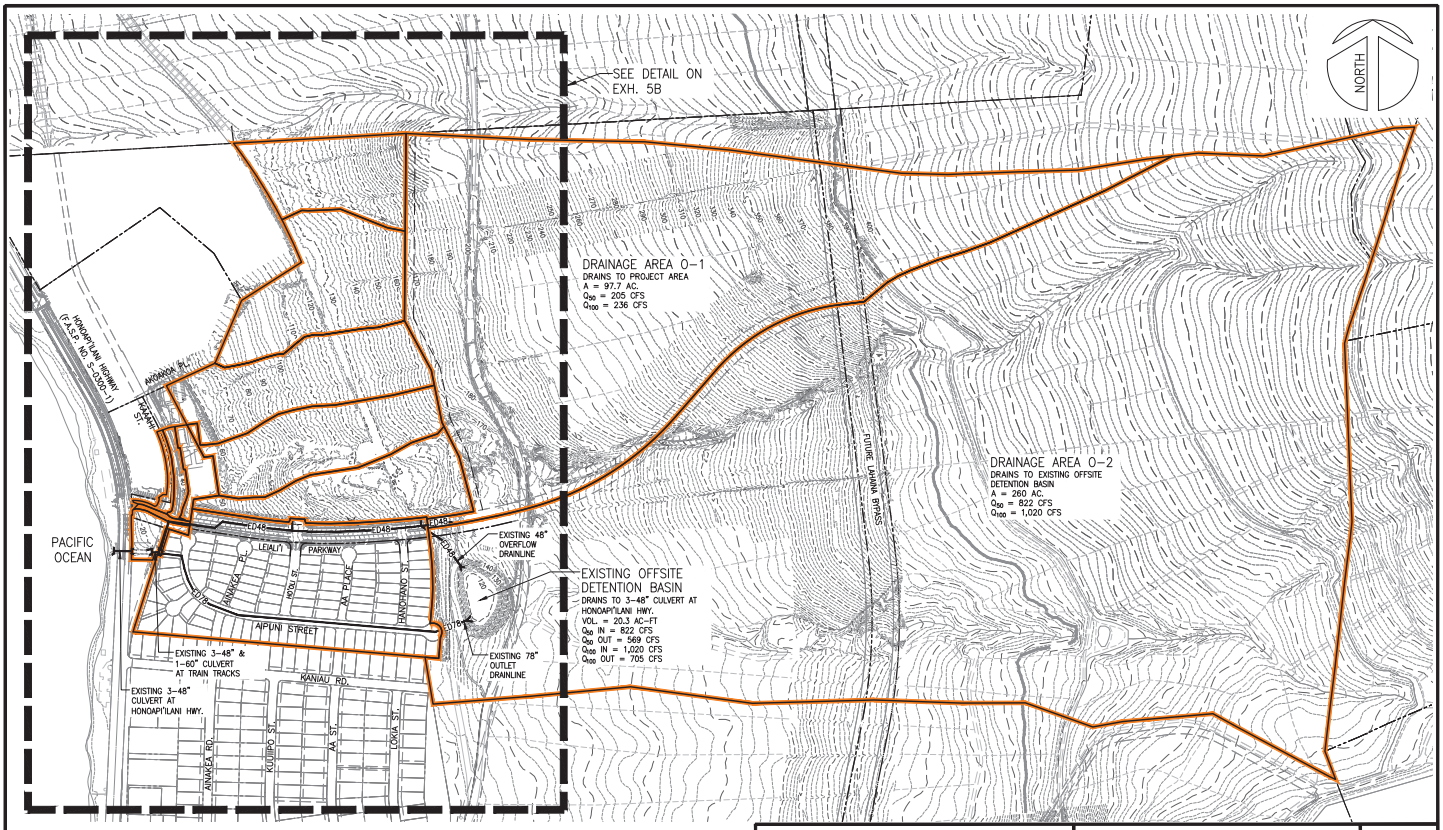
WcC: WAHIKULI STONY SILTY CLAY, 7 TO 15 PERCENT SLOPES, HSG "C"

WdB: WAHIKULI VERY STONY SILTY CLAY, 3 TO 7 PERCENT SLOPES, HSG "C"

PRELIMINARY ENGINEERING AND DRAINAGE REPORT VILLAGE OF LEIALI'I PHASE 1B LAHAINA, MAUI, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII SOILS MAP	EXHIBIT 4

JOB NO. 18-552

JANUARY 2022



MAP SCALE 1" = 500'

0 1

LINE IS 1 INCH AT FULL SIZE (If NOT 1-Inch : Scale Accordingly)

DRAINAGE AREA MAP 1 – EXISTING CONDITIONS

SCALE: 1"=500'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

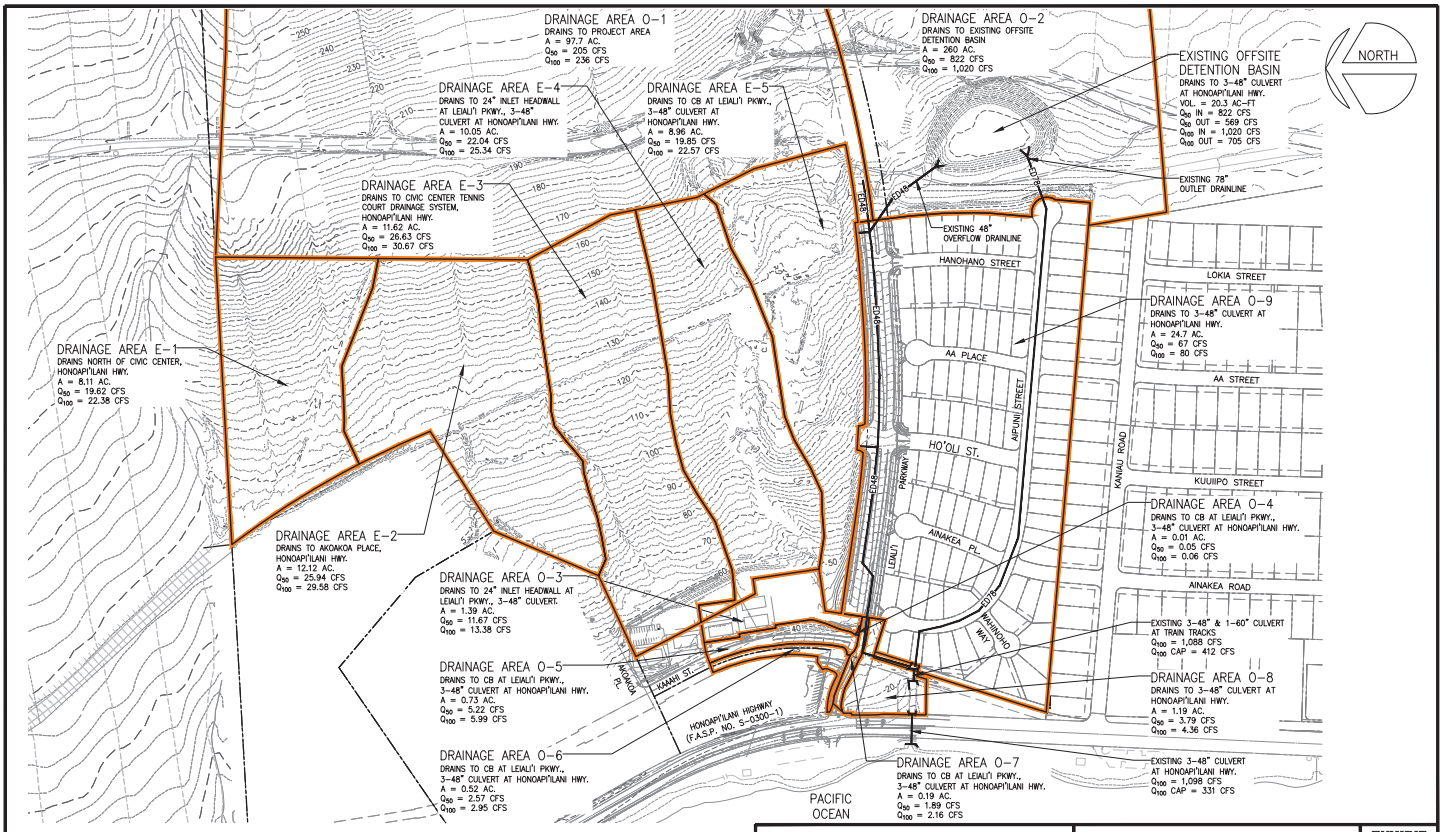
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

DRAINAGE AREA MAP 1 – EXISTING CONDITIONS

EXHIBIT 5A

JOB NO. 18-552

JANUARY 2022



MAP SCALE 1" = 300'

0 1

LINE IS 1 INCH AT FULL SIZE (If NOT 1-Inch : Scale Accordingly)

DRAINAGE AREA MAP 2 – EXISTING CONDITIONS

SCALE: 1"=300'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

DRAINAGE AREA MAP 2 – EXISTING CONDITIONS

EXHIBIT 5B

JOB NO. 18-552

JANUARY 2022

DWS KANAHA WELL WITH 100,000 GAL. CONTROL TANK 1333± O.F.
DWS MAHINAHINA WELL
MAHINAHINA WTF
WEST MAUI AIRPORT
APPROXIMATE LOCATION OF CONNECTION TO DWS'S WATER SYSTEM
FUTURE 500,000 GAL STORAGE TANK 945.0 O.F.*
DHHL HONOKOWAI WELL WITH 50,000 GALLON CONTROL TANK*
PROPOSED 12" TRANSMISSION MAIN FROM WELL TO DWS CONN.*
LEIALI'I PHASE 1B
TRANSMISSION MAIN TO LEIALI I PHASE 1B*
NEW HHFDC RESERVOIR*
TRANSMISSION MAIN TO HHFDC RESERVOIR*
NEW BOOSTER PUMP STATION*
WAHIKULI 1.5 MG RESERVOIR 257.33 O.F.
UPPER LAHAINA 500,000 GAL. RESERVOIR 474.33 O.F.
50,000 GAL. TANK 2 WELLS ELEV=441'
LOWER LAHAINA 1.0 MG RESERVOIR 257.0 O.F.
FROM ALAELOA 1.0 MG RESERVOIR 270 O.F.
HONOKOWAI 2.0 MG RESERVOIR 270.0 O.F.
LAHAINA CIVIC CENTER
VILLAGES OF LEIALI'I PHASE 1A
HONOAPI'ILANI HWY
ROYAL KANANAOLI
GOLF COURSE
NORTH
SCALE: 1" = 2500'
LEGEND
PROPOSED DHHL WELL*
PROPOSED DHHL TANK/RESERVOIR*
PROPOSED DHHL WATERLINE*
DWS WELL
DWS TANK/RESERVOIR
DWS WATERLINE
PROPOSED DWS WELL
PROPOSED DWS TANK/RESERVOIR
PROPOSED DWS WATERLINE
LEIALI'I PHASE 1B
* TO BE CONSTRUCTED AS PART OF DHHL'S HONOKOWAI WATER SYSTEM IMPROVEMENTS PROJECT.
PRELIMINARY ENGINEERING AND DRAINAGE REPORT
VILLAGE OF LEIALI'I PHASE 1B
LAHAINA, MAUI, HAWAII
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII
OVERALL WATER SYSTEM MAP
EXHIBIT
6
JANUARY 2022
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EXIST. DWS KANAHA WELL WITH PROPOSED 100,000 GAL CONTROL TANK 1333± O.F.
EXIST. DWS MAHINAHINA WELL
DHHL FUTURE 500,000 GAL STORAGE TANK * 945.0 O.F.
DHHL HONOKOWAI WELL WITH 50,000 GAL CONTROL TANK * 945.0 O.F.
PROPOSED TRANSMISSION MAIN FROM WELL *
DWS M-WTF 2.0 MG FINISHED WATER RESERVOIR 643.85 O.F.
HONOKOWAI GULCH
EL. 530
APPROX. LOCATION OF CONNECTION TO DWS WATER SYSTEM.
DWS HONOKOWAI 2.0 MG RESERVOIR 270.0 O.F.
DWS LOWER LAHAINA 1.0 MG RESERVOIR 257.0 O.F.
DWS UPPER LAHAINA 500,000 GAL. RESERVOIR 474.33 O.F.
PROPOSED HHFDC 500,000 GALLON RESERVOIR * 388.0 O.F.
UPPER PRESSURE ZONE INCREMENT 2 LOTS TO BE SERVICED FROM NEW HHFDC RESERVOIR.
PROPOSED BOOSTER PUMP STATION AT DWS WAHIKULI 1.5 MG RESERVOIR *
DWS WAHIKULI 1.5 MG RESERVOIR 257.33 O.F.
130 CONTOUR
LOWER PRESSURE ZONE INCREMENT 1 LOTS TO BE SERVICED FROM WAHIKULI RESERVOIR
LEIALI'I 1B
1300
900
800
700
600
500
400
300
200
100
0
LEGEND
EXISTING DWS TANK/RESERVOIR
PROPOSED DWS TANK/RESERVOIR
EXISTING DWS WATERLINE
PROPOSED DHHL TANK/RESERVOIR*
PROPOSED DHHL WELL*
PROPOSED DHHL WATERLINE*
NOT TO SCALE
LINE IS 1 INCH AT FULL SIZE (IF NOT 1-inch : Scale Accordingly)
* TO BE CONSTRUCTED AS PART OF DHHL'S HONOKOWAI WATER SYSTEM IMPROVEMENTS PROJECT.
PRELIMINARY ENGINEERING AND DRAINAGE REPORT
VILLAGE OF LEIALI'I PHASE 1B
LAHAINA, MAUI, HAWAII
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII
OVERALL WATER SYSTEM SCHEMATIC
EXHIBIT
7
JOB NO. 18-552
JANUARY 2022

MAP SCALE 1" = 400'

0 1
LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch - Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

FLOOD ZONE MAP

EXHIBIT 9

JOB NO. 18-552

JANUARY 2022

LEGEND

- LEIALI'I PHASE 1B
- COUNTY SEWER FORCE MAIN
- COUNTY GRAVITY SEWER LINE

COUNTY WASTEWATER SYSTEM MAP

SCALE: 1" = 2,500'

0 1
LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch - Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

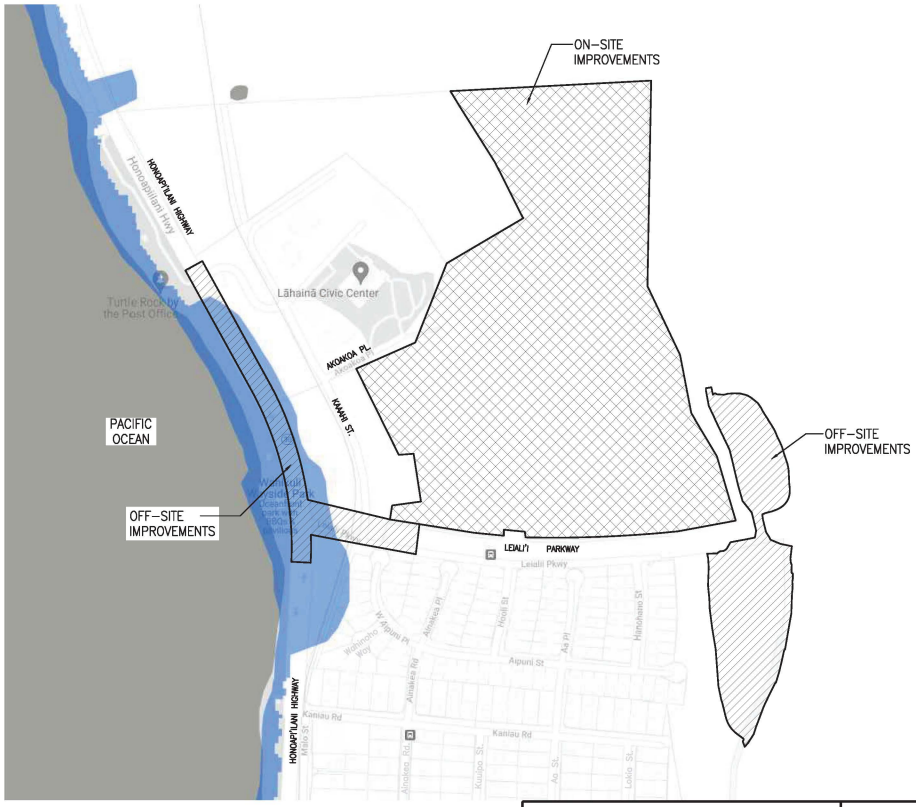
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

COUNTY WASTEWATER SYSTEM MAP

EXHIBIT 8

JOB NO. 18-552

JANUARY 2022



MAP SCALE 1" = 400'

0 1

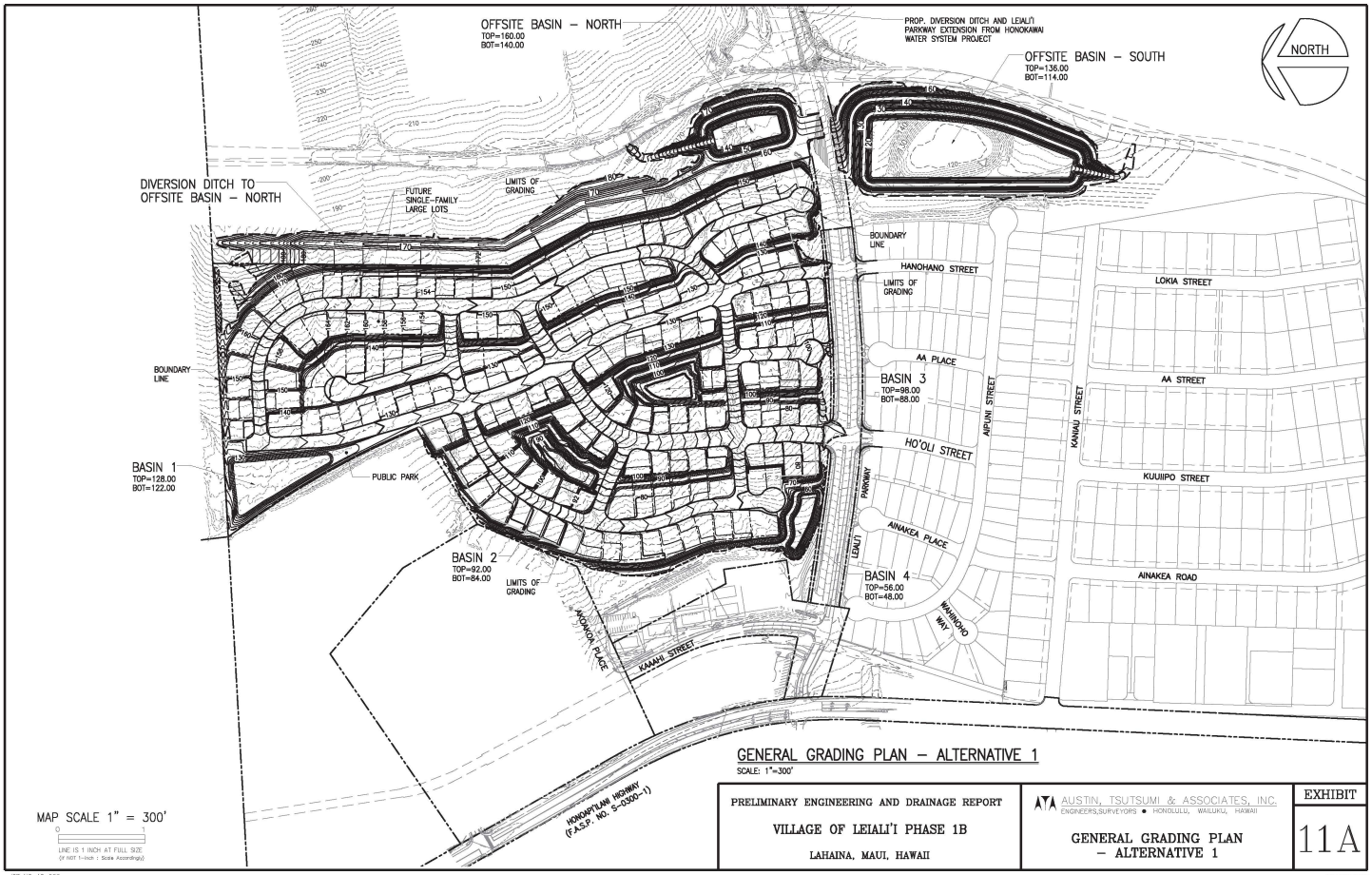
LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch : Scale Accordingly)

Source: Pacific Islands Ocean Observing System, Hawaii Sea Level Rise Viewer

PRELIMINARY ENGINEERING AND DRAINAGE REPORT VILLAGE OF LEIALI'I PHASE 1B LAHAINA, MAUI, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII SEA LEVEL RISE MAP	EXHIBIT 10

JOB NO. 18-552

JANUARY 2022



GENERAL GRADING PLAN – ALTERNATIVE 1

SCALE: 1"=300'

MAP SCALE 1" = 300'

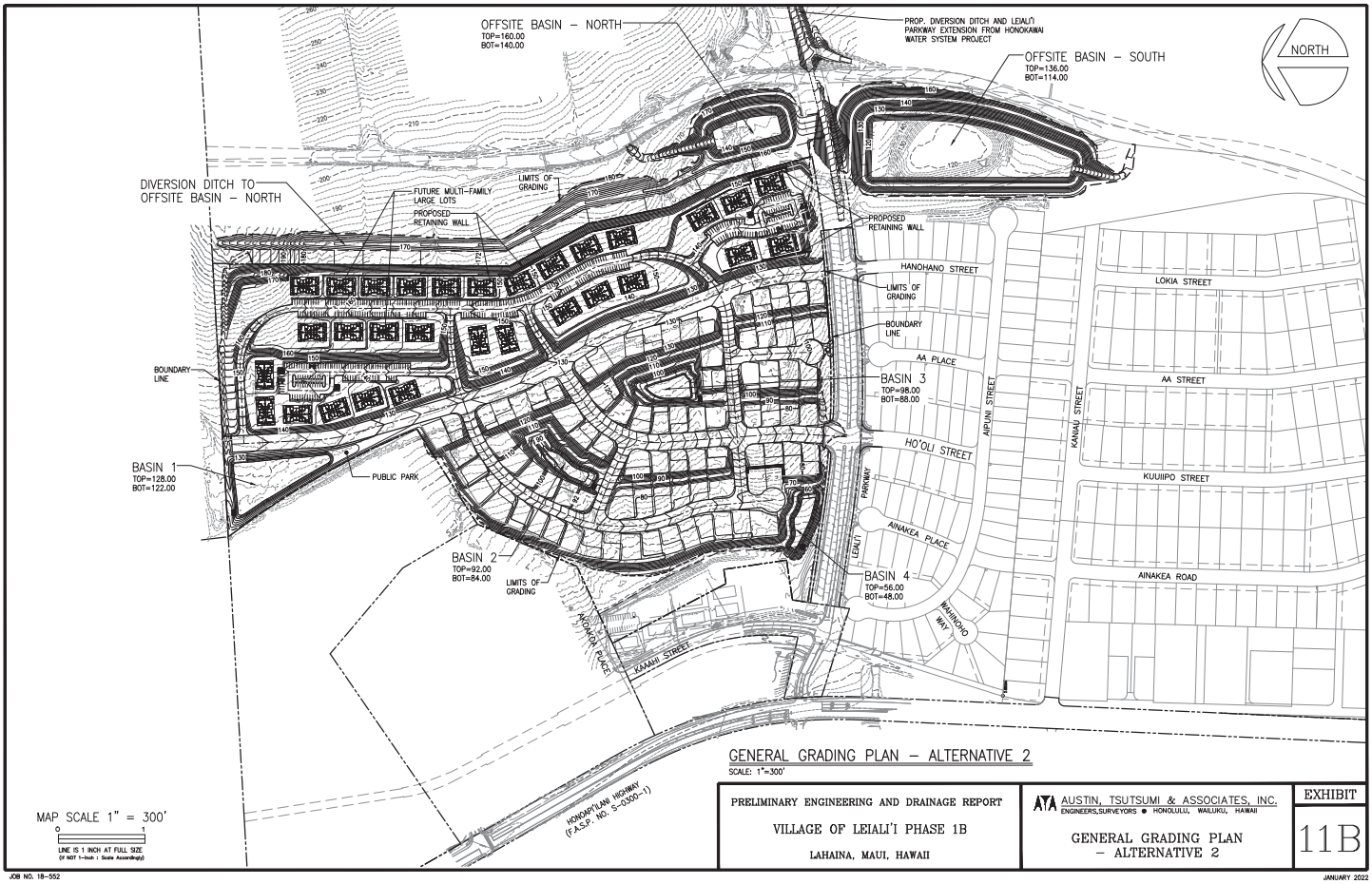
0 1

LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT VILLAGE OF LEIALI'I PHASE 1B LAHAINA, MAUI, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII GENERAL GRADING PLAN – ALTERNATIVE 1	EXHIBIT 11A

JOB NO. 18-552

JANUARY 2022



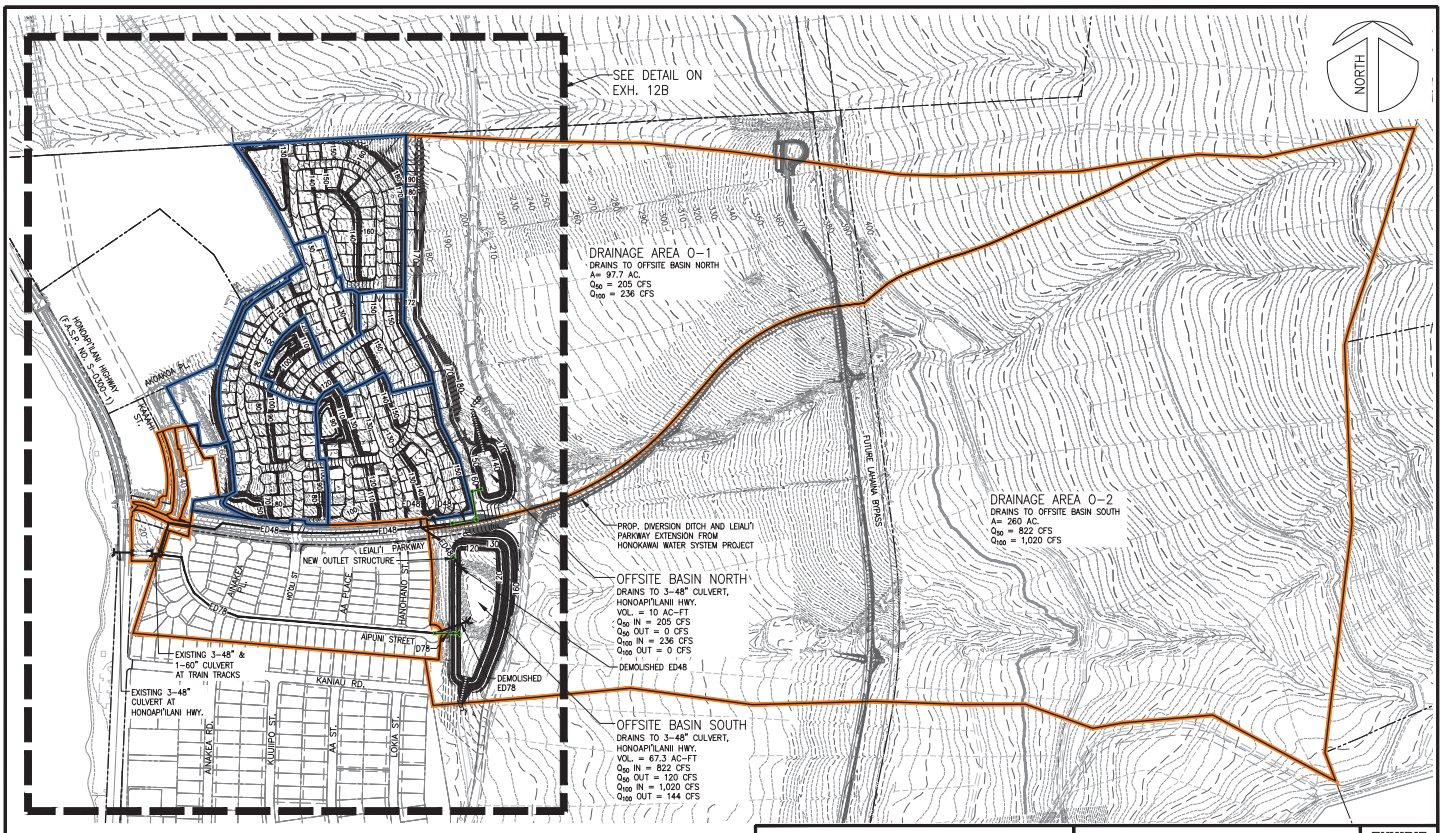
GENERAL GRADING PLAN – ALTERNATIVE 2

SCALE: 1"=300'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT VILLAGE OF LEIALI'I PHASE 1B LAHAINA, MAUI, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII GENERAL GRADING PLAN – ALTERNATIVE 2	EXHIBIT 11B

JOB NO. 18-552

JANUARY 2022



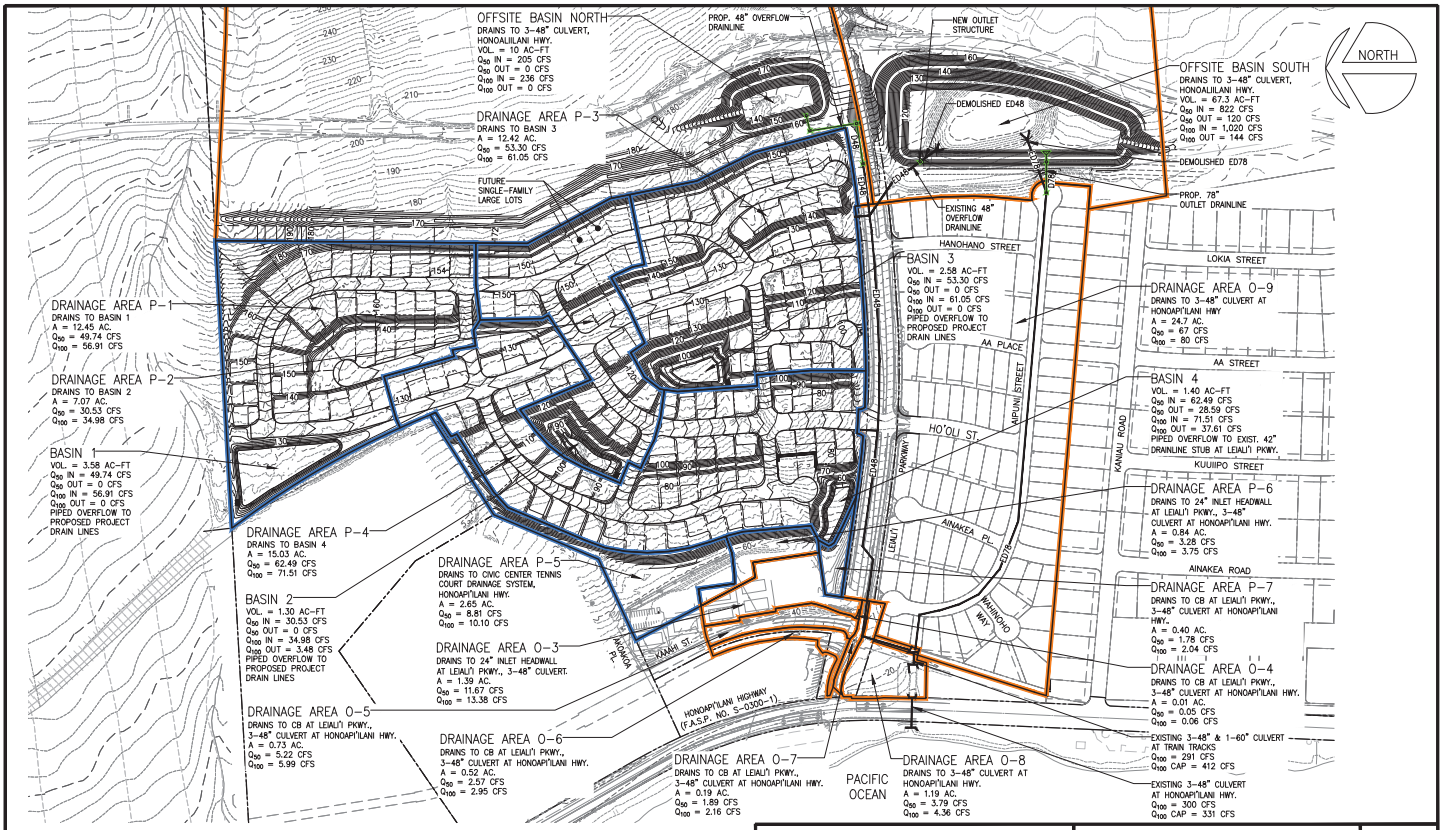
DRAINAGE AREA MAP 1 – PROPOSED CONDITIONS

SCALE: 1"=500'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT VILLAGE OF LEIALI'I PHASE 1B LAHAINA, MAUI, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII DRAINAGE AREA MAP 1 – PROPOSED CONDITIONS	EXHIBIT 12A

JOB NO. 18-552

JANUARY 2022



MAP SCALE 1" = 300'

LINE IS 1 INCH AT FULL SIZE (If NOT 1-Inch : Scale Accordingly)

DRAINAGE AREA MAP 2 – PROPOSED CONDITIONS

SCALE: 1"=300'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

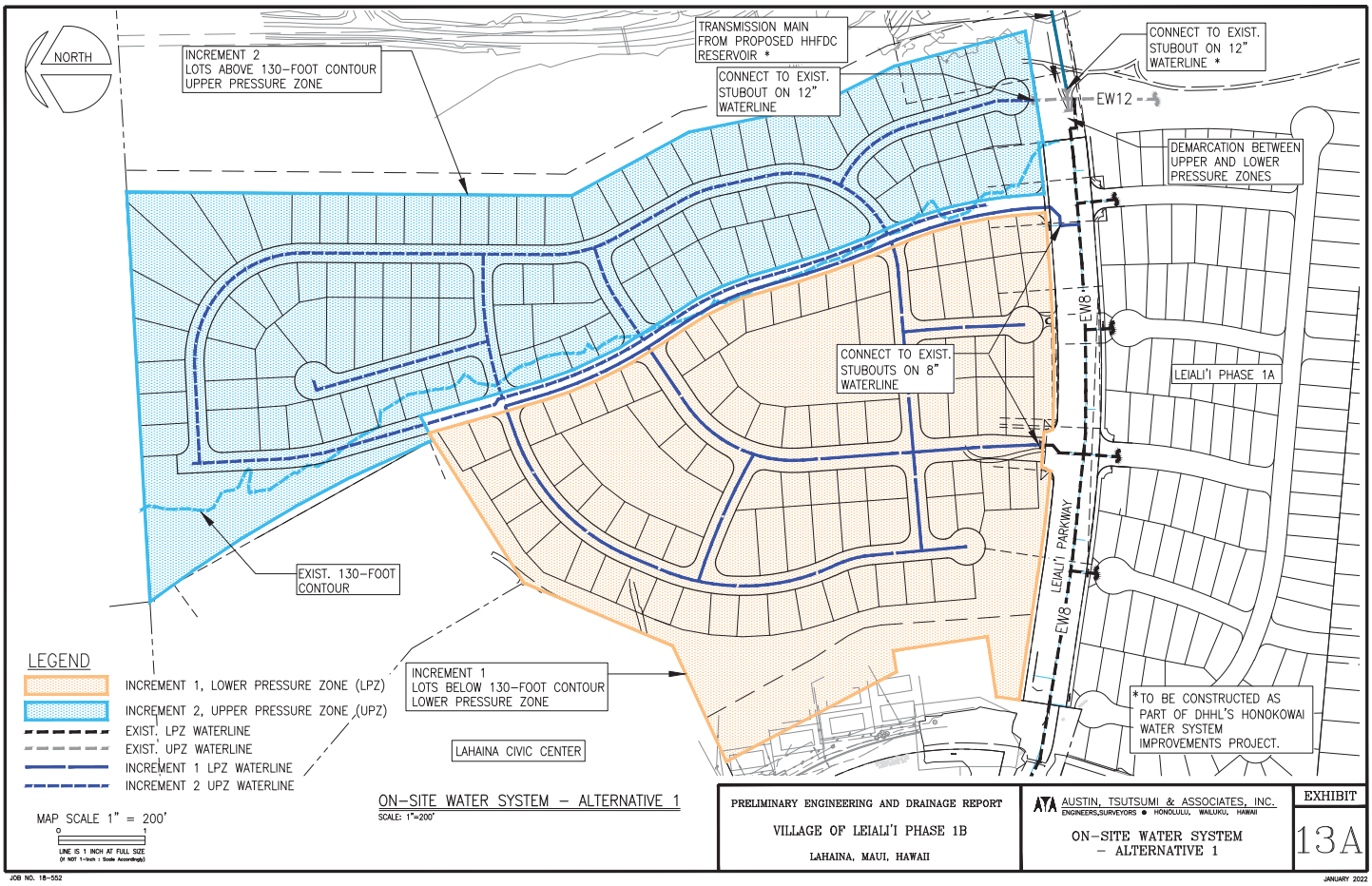
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

DRAINAGE AREA MAP 2 – PROPOSED CONDITIONS

EXHIBIT 12B

JOB NO. 18-552

JANUARY 2022



MAP SCALE 1" = 200'

LINE IS 1 INCH AT FULL SIZE (If NOT 1-Inch : Scale Accordingly)

ON-SITE WATER SYSTEM – ALTERNATIVE 1

SCALE: 1"=200'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

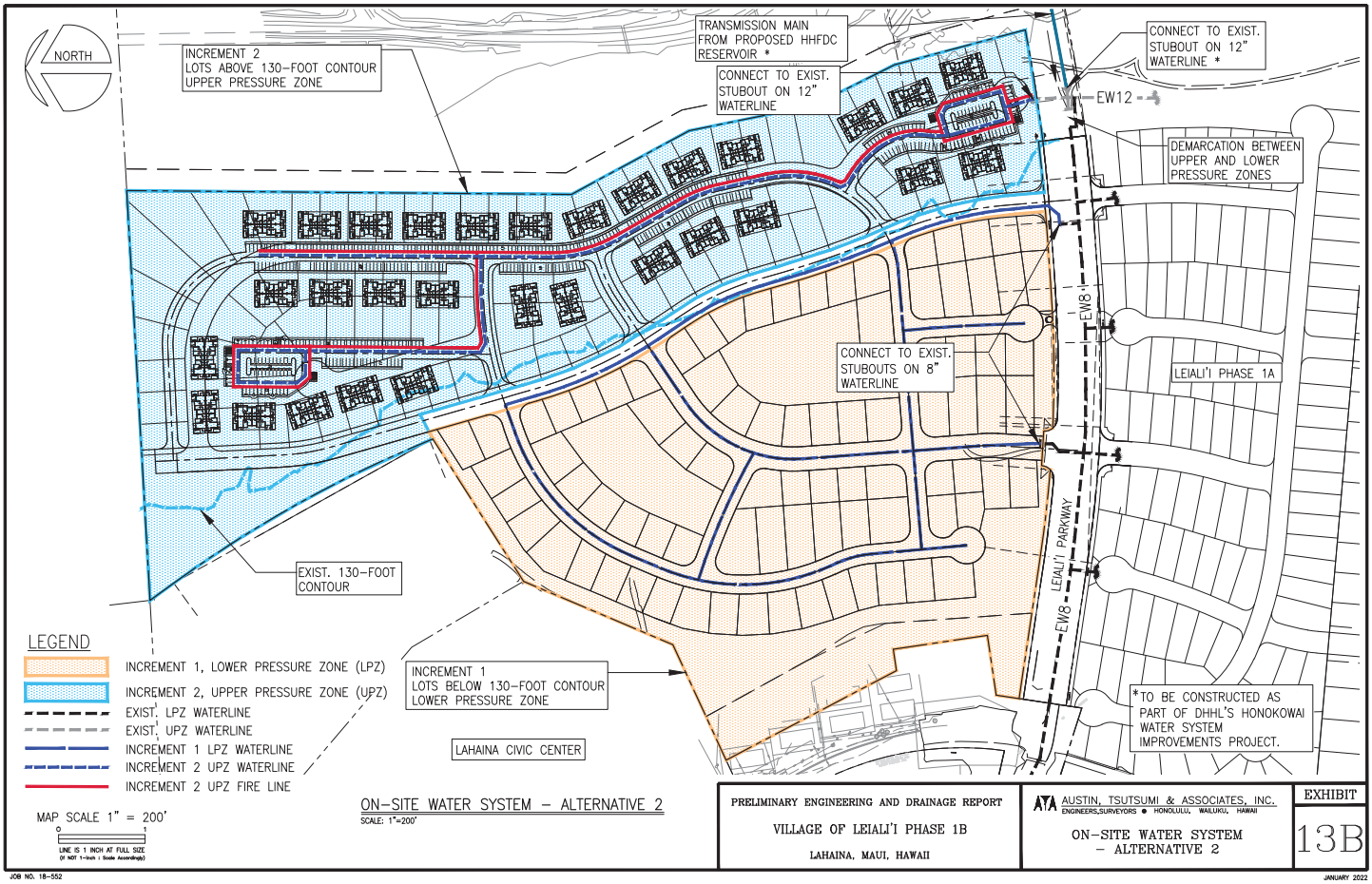
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

ON-SITE WATER SYSTEM – ALTERNATIVE 1

EXHIBIT 13A

JOB NO. 18-552

JANUARY 2022



ON-SITE WATER SYSTEM – ALTERNATIVE 2

SCALE: 1"=200'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

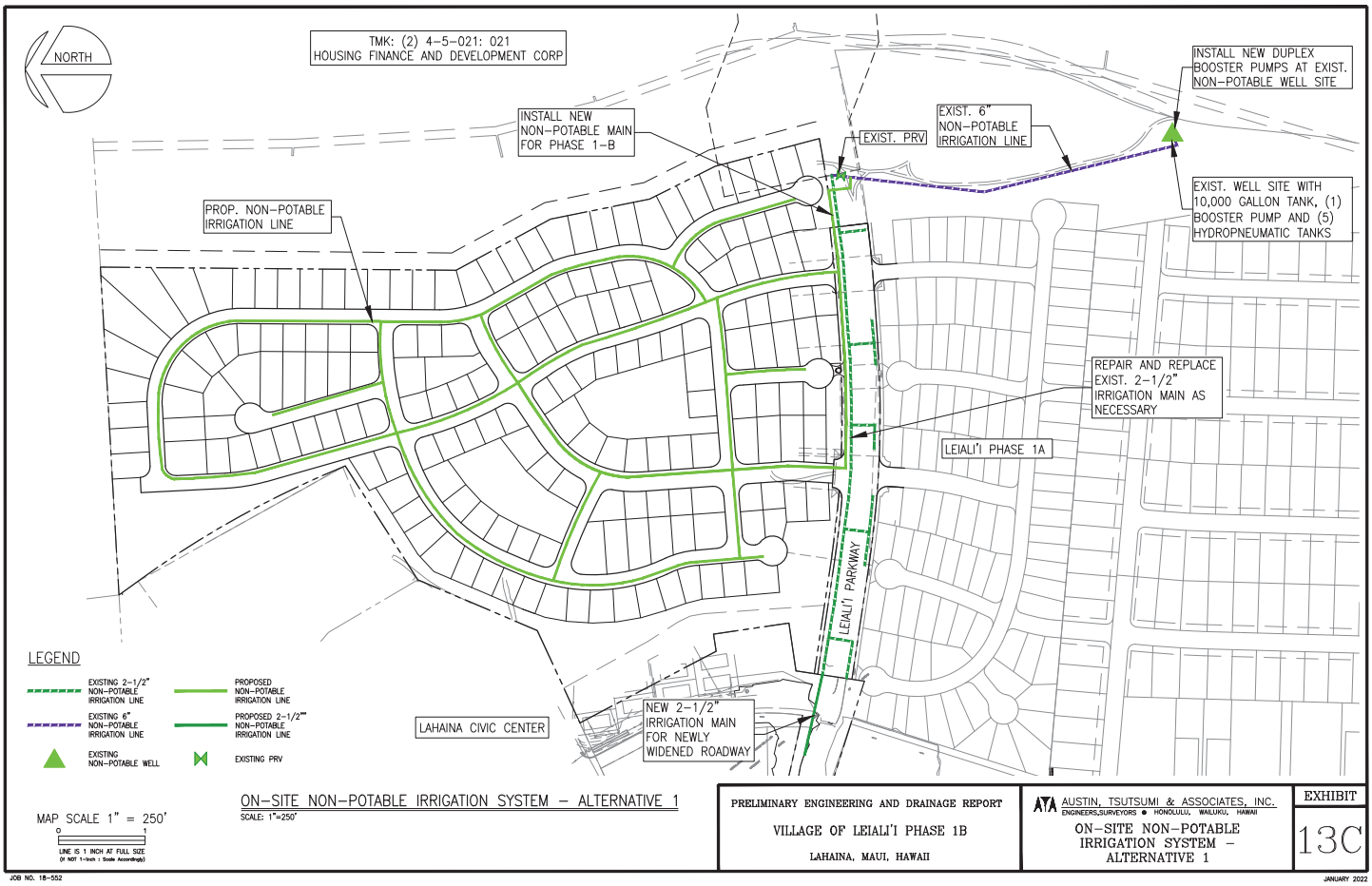
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

ON-SITE WATER SYSTEM – ALTERNATIVE 2

EXHIBIT 13B

JOB NO. 18-552

JANUARY 2022



ON-SITE NON-POTABLE IRRIGATION SYSTEM – ALTERNATIVE 1

SCALE: 1"=250'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

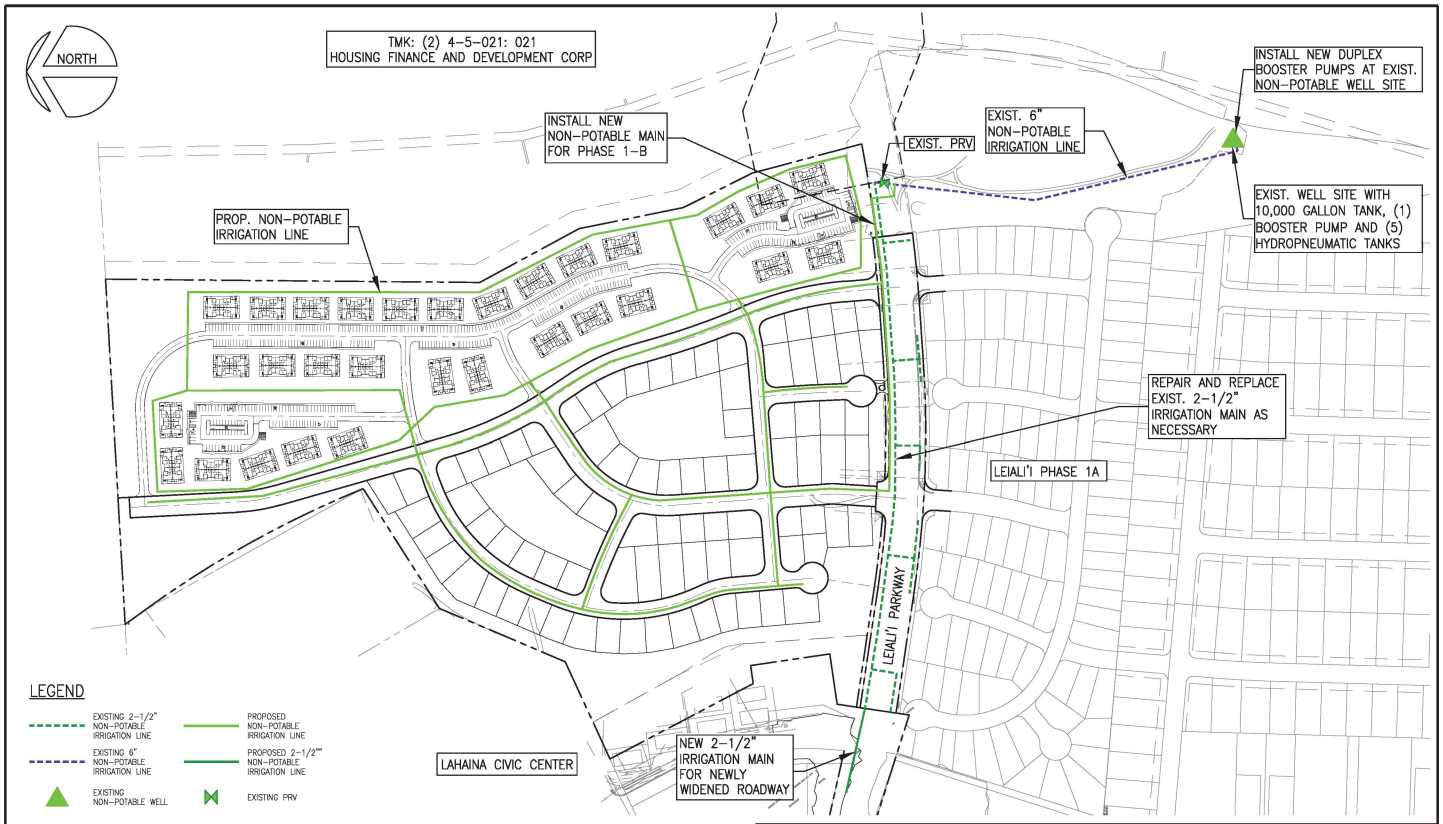
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

ON-SITE NON-POTABLE IRRIGATION SYSTEM – ALTERNATIVE 1

EXHIBIT 13C

JOB NO. 18-552

JANUARY 2022



MAP SCALE 1" = 250'

LINE IS 1 INCH AT FULL SIZE (IF NOT 1-Inch : Scale Accordingly)

ON-SITE NON-POTABLE IRRIGATION SYSTEM – ALTERNATIVE 2

SCALE: 1"=250'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

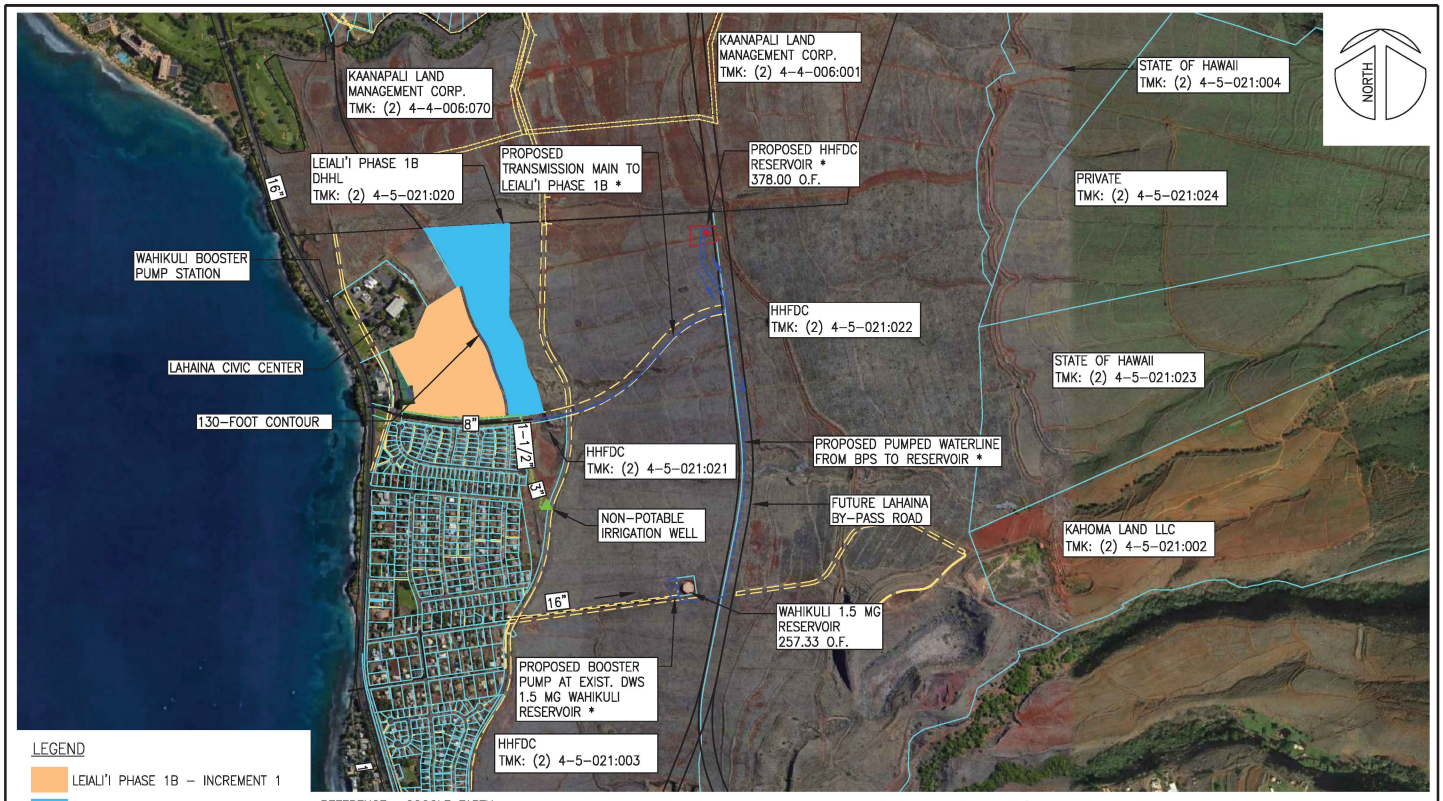
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

ON-SITE NON-POTABLE IRRIGATION SYSTEM – ALTERNATIVE 2

EXHIBIT 13D

JOB NO. 18-552

JANUARY 2022



REFERENCE: GOOGLE EARTH

* TO BE CONSTRUCTED AS PART OF DHHL'S HONOKOWAI WATER SYSTEM IMPROVEMENTS PROJECT.

MAP SCALE 1" = 1000'

LINE IS 1 INCH AT FULL SIZE (IF NOT 1-Inch : Scale Accordingly)

EXISTING AND PROPOSED WATER SYSTEM

SCALE: 1"=1000'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

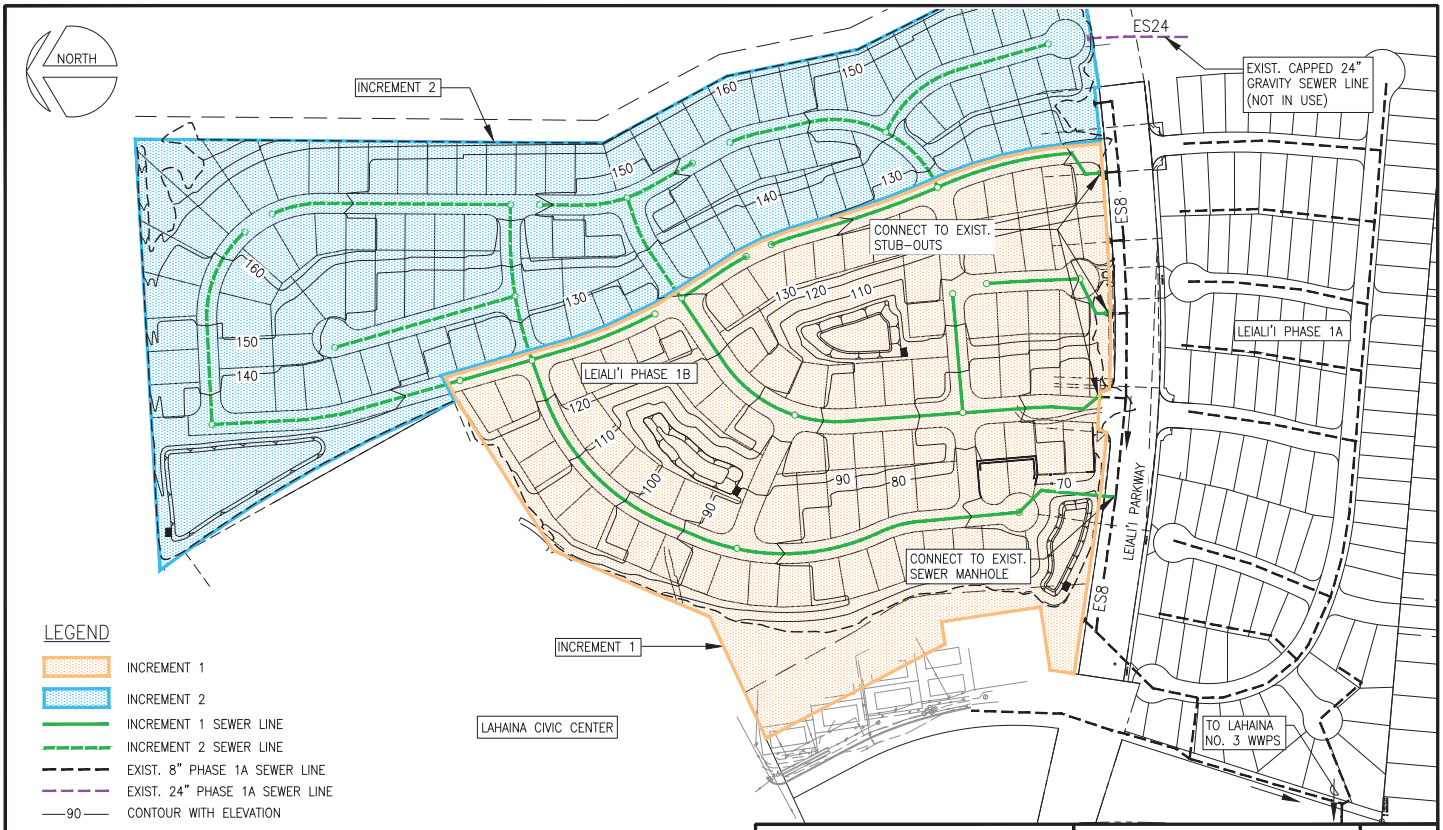
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

EXISTING AND PROPOSED WATER SYSTEM

EXHIBIT 14

JOB NO. 18-552

JANUARY 2022



ON-SITE WASTEWATER COLLECTION SYSTEM – ALTERNATIVE 1

SCALE: 1"=200'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

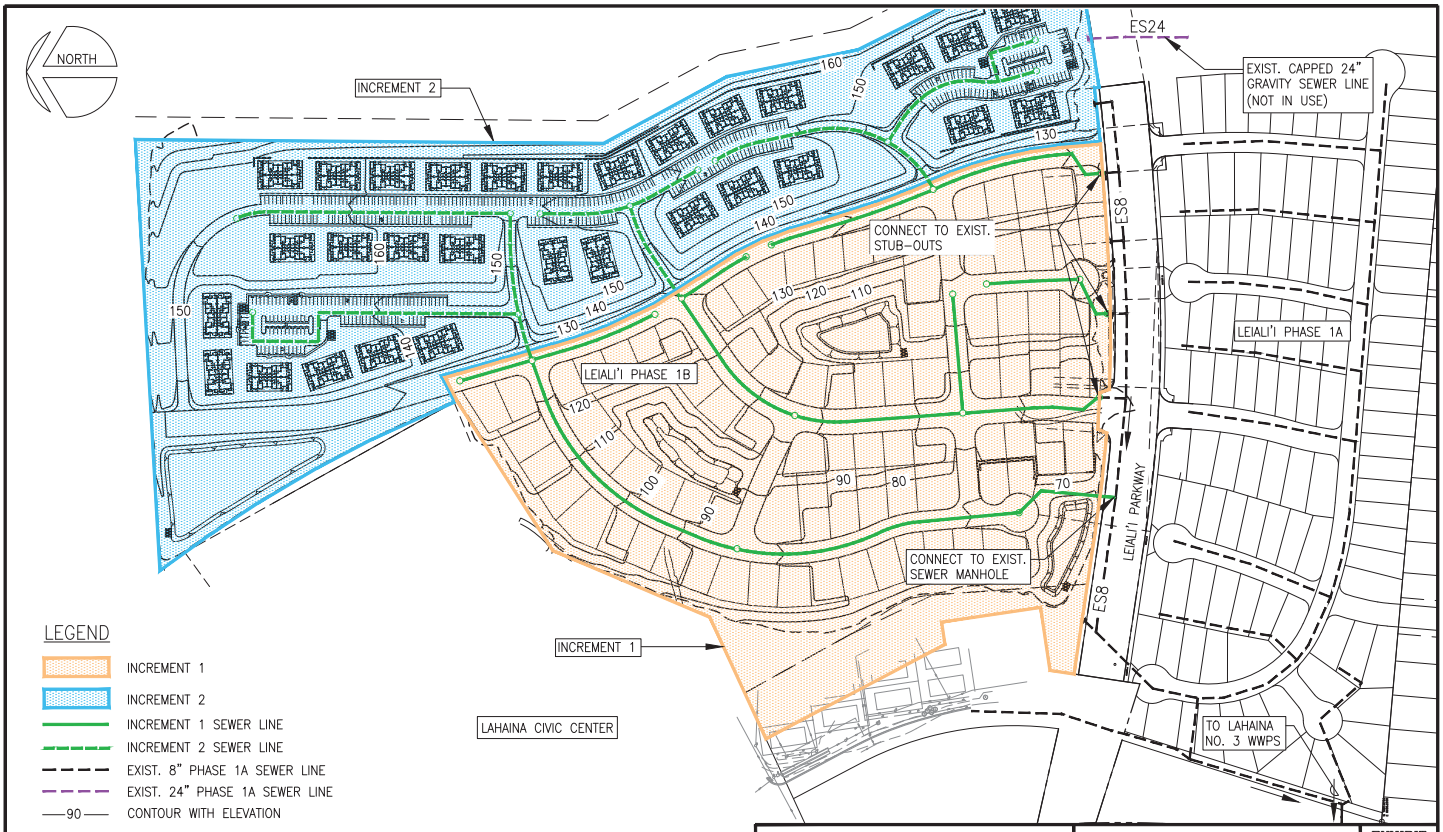
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

ON-SITE WASTEWATER COLLECTION SYSTEM-ALTERNATIVE 1

EXHIBIT 15A

JOB NO. 18-552

JANUARY 2022



ON-SITE WASTEWATER COLLECTION SYSTEM – ALTERNATIVE 2

SCALE: 1"=200'

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

VILLAGE OF LEIALI'I PHASE 1B

LAHAINA, MAUI, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HAWAII

ON-SITE WASTEWATER COLLECTION SYSTEM-ALTERNATIVE 2

EXHIBIT 15B

JOB NO. 18-552

JANUARY 2022

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX A

Preliminary Drainage Calculations

APPENDIX A

RUNOFF CALCULATIONS
EXISTING CONDITIONS

Drainage Area Label	Area (acres)	C Runoff Coeff.	T_c (min)	50-Yr I Intensity (in/hr)	50-Yr Q Flow (cfs)	50-Yr V Volume (cf)	100-Yr I Intensity (in/hr)	100-Yr Q Flow (cfs)	100-Yr V Volume (cf)	Flows To
E-1	8.108	0.40	17.5	6.05	**19.62**	**35,316**	6.90	**22.38**	**40,280**	North of Civic Center, Honoapi'ilani Hwy
E-2	12.122	0.40	23.0	5.35	**25.94**	**46,692**	6.10	**29.58**	**53,242**	Akoakoa Place, Honoapi'ilani Hwy
E-3	11.617	0.40	20.0	5.73	**26.63**	**47,934**	6.60	**30.67**	**55,202**	Civic Center Tennis Court Drainage System, Honoapi'ilani Hwy
E-4	10.055	0.40	22.0	5.48	**22.04**	**39,672**	6.30	**25.34**	**45,607**	24" Inlet Headwall at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
E-5	8.958	0.40	21.5	5.54	**19.85**	**35,730**	6.30	**22.57**	**40,634**	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
Onsite Total	**50.860**				**114.08**			**130.54**		
O-1	97.7	0.35	17.7	6.00	**205.17**	**369,306**	6.90	**235.95**	**424,702**	Onsite Project Area, 3-48" Culvert at Honoapi'ilani Hwy
O-2	260.0	-	25.9	-	**822.45**	**-**	-	**1,020.23**	**-**	Exist. Offsite Basin (Q_{50} Out =569.04 cfs, Q_{100} Out =704.97 cfs
O-3	1.395	0.82	5.0	10.20	**11.67**	**21,006**	11.70	**13.38**	**24,085**	24" Inlet Headwall at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-4	0.005	0.95	5.0	10.20	**0.05**	**90**	11.70	**0.06**	**101**	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-5	0.734	0.70	5.0	10.20	**5.22**	**9,396**	11.70	**5.99**	**10,775**	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-6	0.517	0.53	6.7	9.30	**2.57**	**4,626**	10.70	**2.95**	**5,315**	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-7	0.195	0.95	5.0	10.20	**1.89**	**3,402**	11.70	**2.16**	**3,895**	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-8	1.194	0.43	11.1	7.30	**3.79**	**6,822**	8.40	**4.36**	**7,841**	3-48" Culvert at Honoapi'ilani Hwy
O-9	24.7 *	-	-	-	**67.00 ***	**-**	**-**	**80.00 ***	**-**	3-48" Culvert at Honoapi'ilani Hwy
Offsite Total	**386.440**				**866.40**			**1,049.81**		(After Detention)
Grand Total					**980.48**			**1,180.35**		(After Detention)
Total to 3-48" Culvert					**908.29**			**1,097.72**		(Excludes DAs E-1, E-2, and E-3)

Notes:
1. The Rational Method (Q= CIA) is used to determine runoff for drainage areas < 100 acres.
2. The NRCS TR-20 Method is used to determine runoff for drainage areas > 100 acres. Refer to attached HydroCAD calculations for Drainage Area O-2.
3. Refer to Runoff Coefficient Calculations for determination of "C" value.
4. Refer to Time of Concentration Calculations for determination of "Tc" value.
5. Rainfall Intensity obtained from the NOAA Precipitation Frequency Data Server, available online at: https://hdsc.nws.noaa.gov/hdsc/pfds
6. Runoff volume determined based on triangular 1-hour Rational Method hydrograph. Hydrograph Volume = (Q ft^3/sec) x (60 sec/min) x (60 min/hr) x (1/2)
7. * Drainage Area O-9 area and flow areas are from the 1991 Leiali'i Phase 1-A Drainage Report by Warren S. Unemori Engineering, Inc.

APPENDIX A

RUNOFF CALCULATIONS
PROPOSED CONDITIONS

Drainage Area Label	Area (acres)	C Runoff Coeff.	T_c (min)	50-Yr I Intensity (in/hr)	50-Yr Q Flow (cfs)	50-Yr V Volume (cf)	100-Yr I Intensity (in/hr)	100-Yr Q Flow (cfs)	100-Yr V Volume (cf)	Flows To
P-1	12.447	0.60	13.8	6.66	**49.74**	**89,532**	7.62	**56.91**	**102,438**	Basin 1 (Q_{50} out = 0 cfs, Q_{100} out = 0 cfs)
P-2	7.066	0.60	11.6	7.20	**30.53**	**54,954**	8.25	**34.98**	**62,964**	Basin 2 (Q_{50} out = 0 cfs, Q_{100} out = 3.48 cfs)
P-3	12.423	0.60	11.8	7.15	**53.30**	**95,940**	8.19	**61.05**	**109,890**	Basin 3 (Q_{50} out = 0 cfs, Q_{100} out = 0 cfs)
P-4	15.030	0.60	12.7	6.93	**62.49**	**112,482**	7.93	**71.51**	**128,718**	Basin 4 (Q_{50} out = 28.59 cfs, Q_{100} out = 37.61 cfs)
P-5	2.650	0.60	21.5	5.54	**8.81**	**15,858**	6.35	**10.10**	**18,180**	Civic Center Tennis Court Drainage System, Honoapi'ilani Hwy
P-6	0.843	0.60	14.5	6.48	**3.28**	**5,904**	7.42	**3.75**	**6,750**	24" Inlet Headwall at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
P-7	0.397	0.60	10.5	7.47	**1.78**	**3,204**	8.56	**2.04**	**3,672**	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
Onsite Total	**50.856**				**42.46**			**56.98**		(After Detention)
O-1	97.7	0.35	17.7	6.00	205.17	369,306	6.90	235.95	424,702	Prop. Offsite Basin North (Q_{50} Out = 0 cfs, Q_{100} Out = 0 cfs)
O-2	260.0	-	25.9	-	822.45	-	-	1,020.23	-	Prop. Offsite Basin South (Q_{50} Out =119.70 cfs, Q_{100} Out =144.35 cfs)
O-3	1.395	0.82	5.0	10.20	11.67	21,006	11.70	13.38	24,085	24" Inlet Headwall at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-4	0.005	0.95	5.0	10.20	0.05	90	11.70	0.06	101	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-5	0.734	0.70	5.0	10.20	5.22	9,396	11.70	5.99	10,775	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-6	0.517	0.53	6.7	9.30	2.57	4,626	10.70	2.95	5,315	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-7	0.195	0.95	5.0	10.20	1.89	3,402	11.70	2.16	3,895	CB at Leiali'i Pkwy, 3-48" Culvert at Honoapi'ilani Hwy
O-8	1.194	0.43	11.1	7.30	3.79	6,822	8.40	4.36	7,841	3-48" Culvert at Honoapi'ilani Hwy
O-9	24.7 *	-	-	-	67.00 *	-	-	80.00 *	-	3-48" Culvert at Honoapi'ilani Hwy
Offsite Total	**386.440**				**211.89**			**253.25**		(After Detention)
Grand Total					**254.35**			**310.23**		(After Detention)
Total to 3-48" Culvert					**245.54**			**300.13**		(Excludes DA P-5)

Notes:
1. The Rational Method (Q= CIA) is used to determine runoff for drainage areas < 100 acres.
2. The NRCS TR-20 Method is used to determine runoff for drainage areas > 100 acres. Refer to attached HydroCAD calculations for Drainage Area O-2.
3. Refer to Runoff Coefficient Calculations for determination of "C" value.
4. Refer to Time of Concentration Calculations for determination of "Tc" value.
5. Rainfall Intensity obtained from the NOAA Precipitation Frequency Data Server, available online at: https://hdsc.nws.noaa.gov/hdsc/pfds
6. Runoff volume determined based on triangular 1-hour Rational Method hydrograph. Hydrograph Volume = (Q ft^3/sec) x (60 sec/min) x (60 min/hr) x (1/2)
7. * Drainage Area O-9 area and flow rares are from the 1991 Leiali'i Phase 1-A Drainage Report by Warren S. Unemori Engineering, Inc.
8. Basin Capacities: Basin 1 = 155,790 cf; Basin 2 = 56,700 cf; Basin 3 = 112,320 cf; Basin 4 = 61,020 cf; Offsite Basin North = 543,594 cf = 12.5 ac-ft; Offsite Basin South = 2,933,183 cf = 67.3 ac-ft

APPENDIX A

RUNOFF COEFFICIENT CALCULATIONS
EXISTING CONDITIONS

Drainage Area Label	C_{50} = 0.25 Cover E1 Woods/Brush Area (ac)	Area (%)	C_{50} = 0.20 Cover E2 Grass, Fair, Rapid Area (ac)	Area (%)	C_{50} = 0.35 Cover E3 Brush, Fair Area (ac)	Area (%)	C_{50} = 0.40 Cover E4 Grass, Poor, Mod. Area (ac)	Area (%)	C_{50} = 0.95 Cover E5 Roads Area (ac)	Area (%)	Weighted Avg. Coeff. TOTAL Area (ac)	Runoff Coeff.
Existing Conditions												
E-1	0	0	0	0	0	0	8.1	100.0	0	0	8.1	**0.40**
E-2	0	0	0	0	0	0	12.1	100.0	0	0	12.1	**0.40**
E-3	0	0	0	0	0	0	11.6	100.0	0	0	11.6	**0.40**
E-4	0	0	0	0	0	0	10.1	100.0	0	0	10.1	**0.40**
E-5	0	0	0	0	0	0	9.0	100.0	0	0	9.0	**0.40**
O-1	0	0	0	0	97.7	100.0	0	0	0	0	97.7	**0.35**
O-2	-	-	-	-	-	-	-	-	-	-	-	**n/a**
O-3	0	0	0	0	0	0	0.330	23.7	1.065	76.3	1.395	**0.82**
O-4	0	0	0	0	0	0	0	0	0.005	100.0	0.005	**0.95**
O-5	0	0	0	0	0	0	0.337	46.0	0.397	54.0	0.734	**0.70**
O-6	0	0	0	0	0	0	0.392	75.7	0.126	24.3	0.517	**0.53**
O-7	0	0	0	0	0	0	0	0	0.195	100.0	0.195	**0.95**
O-8	0	0	0	0	0	0	1.120	93.8	0.074	6.2	1.194	**0.43**
O-9	-	-	-	-	-	-	-	-	-	-	-	**n/a**

Surface Type Details:

Cover E1	Woods/ Brush Mix, Fair Cover, Mod. Infiltration, Lt Slope	C =	0.25
Cover E2	Grass/ Weed Mix (Fallow Ag. Land), Fair Cover, Rapid Infiltration, Lt Slope	C =	0.20
Cover E3	High grasses, brush, and trees. Fair infiltration (HSG "C"), Fair to moderate cover, Semi-Arid, 10% Slope	C =	0.35
Cover E4	Grass/ Weed Mix (Fallow Ag. Land), Poor Cover, Mod. Infiltration, Lt Slope	C =	0.40*
Cover E5	Roads- Paved or Dirt	C =	0.95

* A runoff coefficient of 0.40 was used based on the large pockets of bare soil, sparse weed mix and Wahikuli silty clay soils.

APPENDIX A

RUNOFF COEFFICIENT CALCULATIONS
PROPOSED CONDITIONS

Drainage Area Label	C_{50} = 0.60		C_{50} = 0.20		C_{50} = 0.30		C_{50} = 0.40		C_{50} = 0.95		Weighted Avg. Coeff.	
	Cover P1 Residential		Cover P2 Grass, Good, Mod		Cover P3 Grass, Fair, Mod.		Cover P4 Grass, Poor, Mod.		Cover P5 Impervious		TOTAL	
	Area (ac)	Area (%)	Area (ac)	Area (%)	Area (ac)	Area (%)	Area (ac)	Area (%)	Area (ac)	Area (%)	Area (ac)	Runoff Coeff.
Proposed Conditions												
P-1	12.447	100.0	0	0	0	0	0	0	0	0	12.447	**0.60**
P-2	7.066	100.0	0	0	0	0	0	0	0	0	7.066	**0.60**
P-3	12.423	100.0	0	0	0	0	0	0	0	0	12.423	**0.60**
P-4	15.030	100.0	0	0	0	0	0	0	0	0	15.030	**0.60**
P-5	2.650	100.0	0	0	0	0	0	0	0	0	2.650	**0.60**
P-6	0.843	100.0	0	0	0	0	0	0	0	0	0.843	**0.60**
P-7	0.397	100.0	0	0	0	0	0	0	0	0	0.397	**0.60**

Surface Type Details:

Cover P1	Residential Development	C =	0.60*
Cover P2	Grass, Good Cover, Mod. Infiltration, Lt. Slope	C =	0.20
Cover P3	Grass/ Weed Mix (Fallow Ag. Land), Fair Cover, Mod. Infiltration, Lt. Slope	C =	0.30
Cover P4	Grass/ Weed Mix (Fallow Ag. Land), Poor Cover, Mod. Infiltration, Lt. Slope	C =	0.40
Cover P5	Impervious Areas (Paved or Dirt Roads)	C =	0.95

Note: * For preliminary drainage calculations, a runoff coefficient of 0.60 was assumed based on previous similar residential developments.

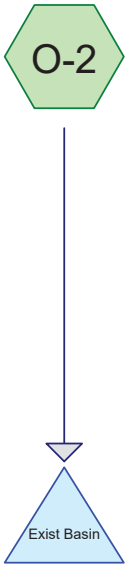
APPENDIX A

TIME OF CONCENTRATION CALCULATIONS

Drain Area Label	Flow Segment 1 Overland Flow				Flow Segment 2 Concentrated Flow				Flow Segment 3 Channel Flow				TOTAL Time (min)
	Surf. Type	Length (ft)	Slope (%)	Time (min)	Surf. Type	Length (ft)	Slope (%)	Time (min)	Surf. Type	Length (ft)	Slope (%)	Time (min)	
Existing Conditions													
E-1	Grass, Poor	850	8.5	17.5	-	-	-	0	-	-	-	0	**17.5**
E-2	Grass, Poor	1,370	6.9	23.0	-	-	-	0	-	-	-	0	**23.0**
E-3	Grass, Poor	1,240	8.9	20.0	-	-	-	0	-	-	-	0	**20.0**
E-4	Grass, Poor	1,530	7.8	22.0	-	-	-	0	-	-	-	0	**22.0**
E-5	Grass, Poor	1,480	8.4	21.5	-	-	-	0	-	-	-	0	**21.5**
O-1	Grass, Poor	100	12.0	6.8	Grass, Poor	3,280	9.5	10.9	-	-	-	0	**17.7**
O-2	-	-	-	-	-	-	-	-	-	-	-	-	**25.9**
O-3	Paved	150	1.7	2.5	-	-	-	0	Pipe	130	2.0	0.3	**2.8 ***
O-4	Paved	32	8.7	0.5	-	-	-	0	-	-	-	0	**0.5 ***
O-5	Grass, Poor	45	33.0	2.5	Paved	160	6.0	0.2	-	-	-	0	**2.7 ***
O-6	Grass, Poor	25	33.0	1.4	Grass, Poor	400	3.0	5.3	-	-	-	0	**6.7**
O-7	Paved	80	3.5	1.3	Paved	250	3.5	0.8	-	-	-	0	**2.1 ***
O-8	Grass, Poor	180	6.0	10.0	Grass, Poor	80	2.0	1.1	-	-	-	0	**11.1**
O-9	-	-	-	-	-	-	-	-	-	-	-	-	**n/a**
Proposed Conditions													
P-1	Grass, Avg.	200	15.0	11.2	Gutter	1,400	3.0	2.6	-	-	-	0	**13.8**
P-2	Grass, Avg.	110	10.9	9.5	Gutter	1,140	6.0	2.1	-	-	-	0	**11.6**
P-3	Grass, Avg.	120	11.7	9.7	Gutter	1,140	4.9	2.1	-	-	-	0	**11.8**
P-4	Grass, Avg.	130	14.6	9.6	Gutter	1,660	4.4	3.1	-	-	-	0	**12.7**
P-5	Grass, Fair	960	7.3	21.5	-	-	-	0	-	-	-	0	**21.5**
P-6	Grass, Fair	360	7.8	14.5	-	-	-	0	-	-	-	0	**14.5**
P-7	Grass, Fair	210	11.0	10.5	-	-	-	0	-	-	-	0	**10.5**

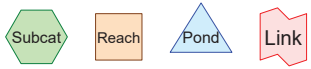
Notes:
1. County of Maui Storm Drain Manual Plate 1 used for the determination of overland flow time.
2. County of Maui Storm Drain Manual Table 4 used for the determination of concentrated flow time.
3. The Manning's Equation is used for the determination of channel flow time.
4. Time of concentrations marked with asterisk (*) are rounded up to 5 minutes minimum for runoff calculations.

Existing Conditions



Q50 runoff = 822 cfs
Q100 runoff = 1,020 cfs

Q50 out = 569 cfs
Q100 out = 705 cfs



Routing Diagram for Leialii 1B DA O-2 and Exist Offsite Basin
Prepared by Austin, Tsutsumi & Associates, Inc., Printed 1/6/2022
HydroCAD® 10.10-6a s/n 03149 © 2020 HydroCAD Software Solutions LLC

Summary for Subcatchment O-2:

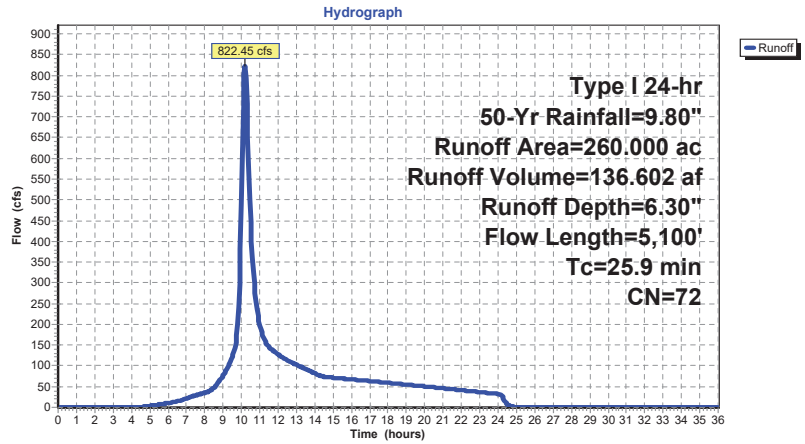
Runoff = 822.45 cfs @ 10.20 hrs, Volume= 136.602 af, Depth= 6.30"
Routed to Pond Exist Basin :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type I 24-hr 50-Yr Rainfall=9.80"

Area (ac)	CN	Description
75.000	62	Herbaceous range, Good, HSG B
161.000	74	Herbaceous range, Good, HSG C
24.000	85	Herbaceous range, Good, HSG D
260.000	72	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1500	0.28		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.70"
14.7	2,350	0.1450	2.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	2,650	0.0500	8.34	166.88	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=2.00' Z= 3.0 '/' Top.W=16.00' n= 0.045
25.9	5,100	Total			

Subcatchment O-2:



Summary for Pond Exist Basin:

Existing Offsite Detention Basin
Inflow from DA "O-2"
Q 50 in = 822 cfs, Vol. 50 in = 136.6 ac-ft
Q 100 in = 1,020 cfs, Vol. 100 in = 168.5 ac-ft
Basin Bottom = 119.5
Top of Bank = 135.2
Storage Vol. at 135.2 = 20.3 ac-ft
Exist. 78" Primary Outlet at 122.5
Exist. 48" Overflow Outlet at 127.10
Overflows top of bank at 135.2

Find:
50-Yr Max Ponding = 133.4
Q 50 out = 569 cfs
100-Yr Max Ponding = 135.6
Q 100 out = 705 cfs

Inflow Area =	260.000 ac,	Inflow Depth =	6.30"	for	50-Yr event
Inflow =	822.45 cfs @	10.20 hrs,	Volume=	136.602 af	
Outflow =	569.04 cfs @	10.41 hrs,	Volume=	134.325 af,	Atten= 31%, Lag= 12.5 min
Primary =	443.02 cfs @	10.41 hrs,	Volume=	126.854 af	
Secondary =	126.02 cfs @	10.41 hrs,	Volume=	7.471 af	
Tertiary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 133.44' @ 10.41 hrs Surf.Area= 76,620 sf Storage= 743,213 cf
Flood Elev= 135.20' Surf.Area= 86,672 sf Storage= 886,040 cf

Plug-Flow detention time= 43.6 min calculated for 134.325 af (98% of inflow)
Center-of-Mass det. time= 32.7 min (830.3 - 797.6)

Volume	Invert	Avail.Storage	Storage Description
#1	119.50'	957,508 cf	**Custom Stage Data - Per Survey Topo (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.50	0	0	0
120.00	26,457	6,614	6,614
122.00	41,680	68,137	74,751
124.00	47,332	89,012	163,763
126.00	53,024	100,356	264,119
128.00	59,071	112,095	376,214
130.00	65,088	124,159	500,373
132.00	71,343	136,431	636,804
134.00	78,681	150,024	786,828
136.00	91,999	170,680	957,508

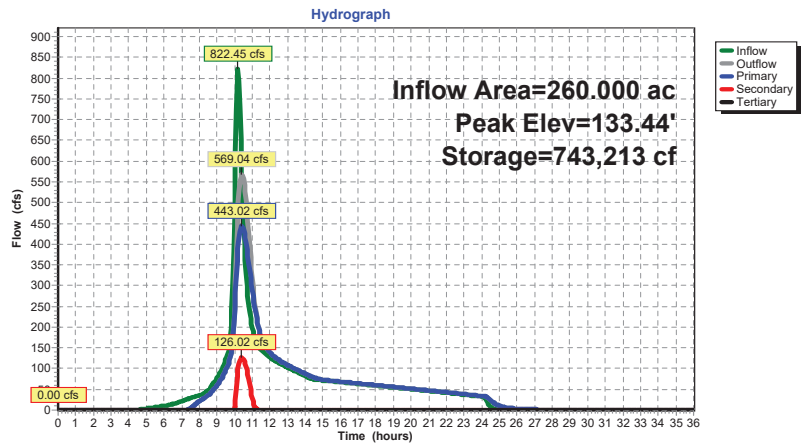
Device	Routing	Invert	Outlet Devices
#1	Primary	122.50'	**78.0" Round Primary Outlet** L= 186.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 122.50' / 112.91' S= 0.0516 '/' Cc= 0.900 n= 0.024, Flow Area= 33.18 sf
#2	Secondary	127.10'	**48.0" Round Overflow Outlet** L= 186.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 127.10' / 119.59' S= 0.0403 '/' Cc= 0.900 n= 0.011, Flow Area= 12.57 sf
#3	Tertiary	135.20'	**70.0' long x 20.0' breadth Emergency Release-Broad-Crested Rectangular W** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=442.78 cfs @ 10.41 hrs HW=133.43' (Free Discharge)
└**1=Primary Outlet** (Inlet Controls 442.78 cfs @ 13.34 fps)

Secondary OutFlow Max=125.90 cfs @ 10.41 hrs HW=133.43' (Free Discharge)
└**2=Overflow Outlet** (Inlet Controls 125.90 cfs @ 10.02 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.50' (Free Discharge)
└**3=Emergency Release-Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Exist Basin:



Summary for Subcatchment O-2:

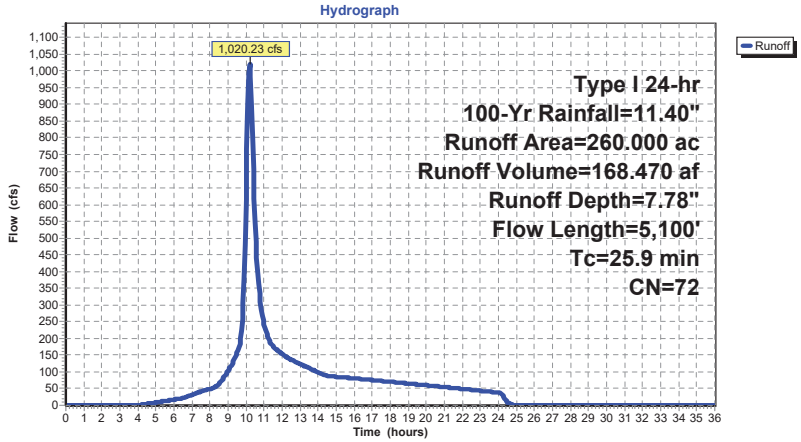
Runoff = 1,020.23 cfs @ 10.19 hrs, Volume= 168.470 af, Depth= 7.78"
Routed to Pond Exist Basin :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type I 24-hr 100-Yr Rainfall=11.40"

Area (ac)	CN	Description
75.000	62	Herbaceous range, Good, HSG B
161.000	74	Herbaceous range, Good, HSG C
24.000	85	Herbaceous range, Good, HSG D
260.000	72	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1500	0.28		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.70"
14.7	2,350	0.1450	2.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	2,650	0.0500	8.34	166.88	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=2.00' Z= 3.0 '/' Top.W=16.00' n= 0.045
25.9	5,100	Total			

Subcatchment O-2:



Summary for Pond Exist Basin:

Existing Offsite Detention Basin
Inflow from DA "O-2"
Q 50 in = 822 cfs, Vol. 50 in = 136.6 ac-ft
Q 100 in = 1,020 cfs, Vol. 100 in = 168.5 ac-ft
Basin Bottom = 119.5
Top of Bank = 135.2
Storage Vol. at 135.2 = 20.3 ac-ft
Exist. 78" Primary Outlet at 122.5
Exist. 48" Overflow Outlet at 127.10
Overflows top of bank at 135.2

Find:
50-Yr Max Ponding = 133.4
Q 50 out = 569 cfs
100-Yr Max Ponding = 135.6
Q 100 out = 705 cfs

Inflow Area = 260.000 ac, Inflow Depth = 7.78" for 100-Yr event
Inflow = 1,020.23 cfs @ 10.19 hrs, Volume= 168.470 af
Outflow = 704.97 cfs @ 10.41 hrs, Volume= 166.193 af, Atten= 31%, Lag= 12.7 min
Primary = 501.54 cfs @ 10.41 hrs, Volume= 154.477 af
Secondary = 154.31 cfs @ 10.41 hrs, Volume= 11.207 af
Tertiary = 49.12 cfs @ 10.41 hrs, Volume= 0.509 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 135.60' @ 10.41 hrs Surf.Area= 89,361 sf Storage= 921,583 cf
Flood Elev= 135.20' Surf.Area= 86,672 sf Storage= 886,040 cf

Plug-Flow detention time= 39.7 min calculated for 166.193 af (99% of inflow)
Center-of-Mass det. time= 30.7 min (819.4 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	119.50'	957,508 cf	**Custom Stage Data - Per Survey Topo (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
119.50	0	0	0
120.00	26,457	6,614	6,614
122.00	41,680	68,137	74,751
124.00	47,332	89,012	163,763
126.00	53,024	100,356	264,119
128.00	59,071	112,095	376,214
130.00	65,088	124,159	500,373
132.00	71,343	136,431	636,804
134.00	78,681	150,024	786,828
136.00	91,999	170,680	957,508

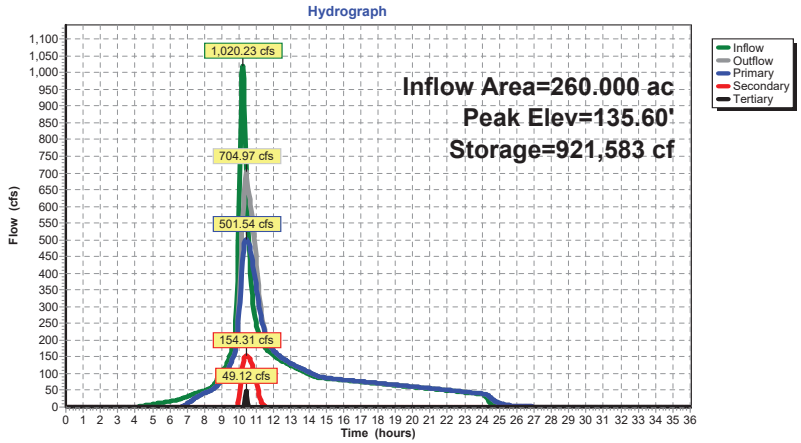
Device	Routing	Invert	Outlet Devices
#1	Primary	122.50'	**78.0" Round Primary Outlet** L= 186.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 122.50' / 112.91' S= 0.0516 '/' Cc= 0.900 n= 0.024, Flow Area= 33.18 sf
#2	Secondary	127.10'	**48.0" Round Overflow Outlet** L= 186.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 127.10' / 119.59' S= 0.0403 '/' Cc= 0.900 n= 0.011, Flow Area= 12.57 sf
#3	Tertiary	135.20'	**70.0' long x 20.0' breadth Emergency Release-Broad-Crested Rectangular W** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=501.24 cfs @ 10.41 hrs HW=135.59' (Free Discharge)
└**1=Primary Outlet** (Inlet Controls 501.24 cfs @ 15.11 fps)

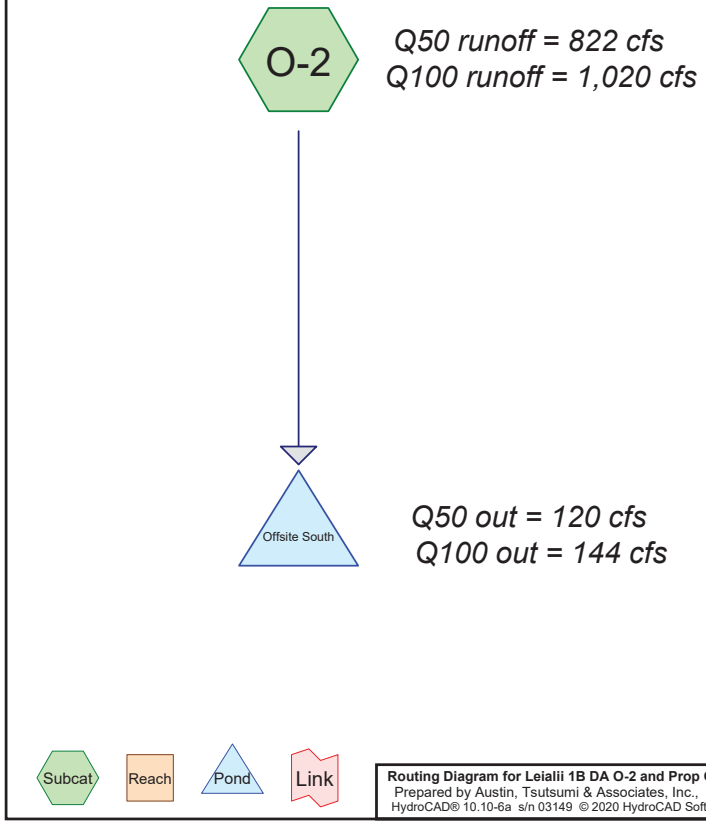
Secondary OutFlow Max=154.16 cfs @ 10.41 hrs HW=135.59' (Free Discharge)
└**2=Overflow Outlet** (Inlet Controls 154.16 cfs @ 12.27 fps)

Tertiary OutFlow Max=46.51 cfs @ 10.41 hrs HW=135.59' (Free Discharge)
└**3=Emergency Release-Broad-Crested Rectangular Weir** (Weir Controls 46.51 cfs @ 1.69 fps)

Pond Exist Basin:



Proposed Conditions



Routing Diagram for Leialii 1B DA O-2 and Prop Offsite Basin South
Prepared by Austin, Tsutsumi & Associates, Inc., Printed 1/6/2022
HydroCAD® 10.10-6a s/n 03149 © 2020 HydroCAD Software Solutions LLC

Summary for Subcatchment O-2:

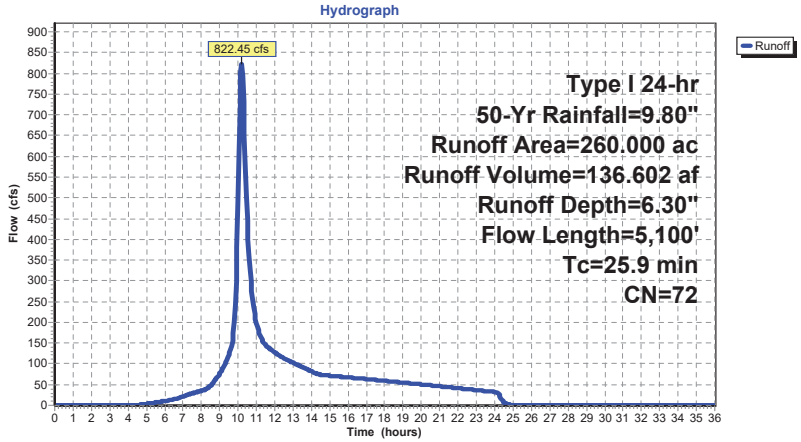
Runoff = 822.45 cfs @ 10.20 hrs, Volume= 136.602 af, Depth= 6.30"
Routed to Pond Offsite South :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type I 24-hr 50-Yr Rainfall=9.80"

Area (ac)	CN	Description
75.000	62	Herbaceous range, Good, HSG B
161.000	74	Herbaceous range, Good, HSG C
24.000	85	Herbaceous range, Good, HSG D
260.000	72	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1500	0.28		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.70"
14.7	2,350	0.1450	2.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	2,650	0.0500	8.34	166.88	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=2.00' Z= 3.0 '/' Top.W=16.00' n= 0.045
25.9	5,100	Total			

Subcatchment O-2:



Summary for Pond Offsite South:

Expanded Offsite Detention Basin
Inflow from DA "O-2"
Q 50 in = 822 cfs, Vol. 50 in = 136.6 ac-ft
Q 100 in = 1,020 cfs, Vol. 100 in = 168.5 ac-ft
Basin Bottom = 114
Overflow Weir = 133
Top of Bank = 136 (3 ft of freeboard)
Storage Vol. at 133 = 67.3 ac-ft
Provide 36" low-flow outlet at 116 (to 78" Drainline)
Provide Overflow Riser Structure at 133 (to 78" Drainline)
Provide Secondary Overflow Riser at 133.5 (to 48" Drainline)

Find:
50-Yr Max Ponding = 129.9
Q 50 out = 120 cfs
100-Yr Max Ponding = 133.2
Q 100 out = 144 cfs

Inflow Area = 260.000 ac, Inflow Depth = 6.30" for 50-Yr event
Inflow = 822.45 cfs @ 10.20 hrs, Volume= 136.602 af
Outflow = 119.70 cfs @ 12.25 hrs, Volume= 129.431 af, Atten= 85%, Lag= 123.3 min
Primary = 119.70 cfs @ 12.25 hrs, Volume= 129.431 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 129.87' @ 12.25 hrs Surf.Area= 186,905 sf Storage= 2,327,944 cf

Plug-Flow detention time= 275.9 min calculated for 129.431 af (95% of inflow)
Center-of-Mass det. time= 243.3 min (1,040.9 - 797.6)

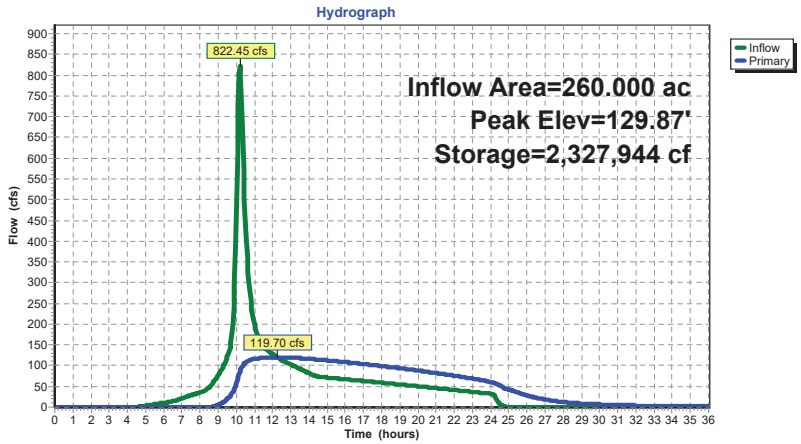
Volume	Invert	Avail.Storage	Storage Description
#1	114.00'	3,551,661 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
114.00	113,833	0	0
116.00	120,684	234,517	234,517
118.00	127,668	248,352	482,869
120.00	134,804	262,472	745,341
122.00	142,093	276,897	1,022,238
124.00	149,534	291,627	1,313,865
125.00	153,331	151,433	1,465,298
125.01	167,566	1,604	1,466,902
126.00	171,475	167,825	1,634,727
128.00	179,376	350,851	1,985,578
130.00	187,431	366,807	2,352,385
132.00	195,638	383,069	2,735,454
134.00	203,999	399,637	3,135,091
136.00	212,571	416,570	3,551,661

Device	Routing	Invert	Outlet Devices
#1	Device 3	116.00'	**36.0" Round Culvert - Low-Flow Outlet** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 116.00' / 116.00' S= 0.0000 '/' Cc= 0.900 n= 0.015, Flow Area= 7.07 sf
#2	Device 3	133.00'	**28.0' long Sharp-Crested Rectangular Weir - Overflow** 0 End Contraction(s)
#3	Primary	116.00'	**78.0" Round Culvert** L= 114.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 116.00' / 113.00' S= 0.0263 '/' Cc= 0.900 n= 0.012, Flow Area= 33.18 sf

Primary OutFlow Max=119.70 cfs @ 12.25 hrs HW=129.87' (Free Discharge)
└─**3=Culvert** (Passes 119.70 cfs of 520.67 cfs potential flow)
  ├─**1=Culvert - Low-Flow Outlet** (Inlet Controls 119.70 cfs @ 16.93 fps)
  └─**2=Sharp-Crested Rectangular Weir - Overflow**(Controls 0.00 cfs)

Pond Offsite South:



Summary for Subcatchment O-2:

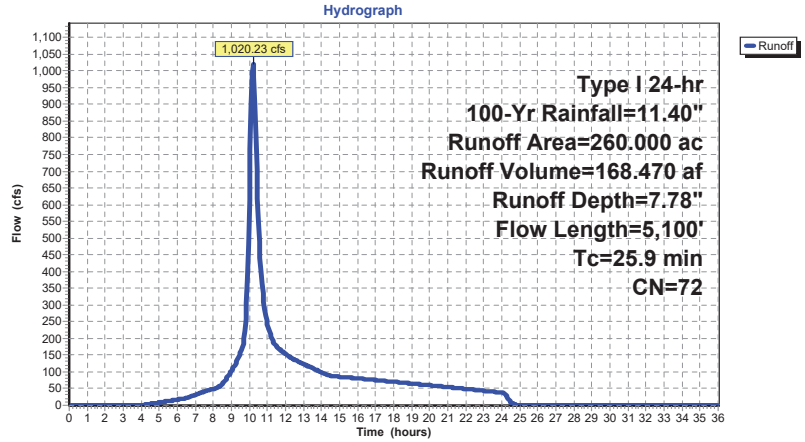
Runoff = 1,020.23 cfs @ 10.19 hrs, Volume= 168.470 af, Depth= 7.78"
Routed to Pond Offsite South :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type I 24-hr 100-Yr Rainfall=11.40"

Area (ac)	CN	Description
75.000	62	Herbaceous range, Good, HSG B
161.000	74	Herbaceous range, Good, HSG C
24.000	85	Herbaceous range, Good, HSG D
260.000	72	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1500	0.28		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.70"
14.7	2,350	0.1450	2.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	2,650	0.0500	8.34	166.88	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=2.00' Z= 3.0 '/' Top.W=16.00' n= 0.045
25.9	5,100	Total			

Subcatchment O-2:



Summary for Pond Offsite South:

Expanded Offsite Detention Basin
Inflow from DA "O-2"
Q 50 in = 822 cfs, Vol. 50 in = 136.6 ac-ft
Q 100 in = 1,020 cfs, Vol. 100 in = 168.5 ac-ft
Basin Bottom = 114
Overflow Weir = 133
Top of Bank = 136 (3 ft of freeboard)
Storage Vol. at 133 = 67.3 ac-ft
Provide 36" low-flow outlet at 116 (to 78" Drainline)
Provide Overflow Riser Structure at 133 (to 78" Drainline)
Provide Secondary Overflow Riser at 133.5 (to 48" Drainline)

Find:
50-Yr Max Ponding = 129.9
Q 50 out = 120 cfs
100-Yr Max Ponding = 133.2
Q 100 out = 144 cfs

Inflow Area = 260.000 ac, Inflow Depth = 7.78" for 100-Yr event
Inflow = 1,020.23 cfs @ 10.19 hrs, Volume= 168.470 af
Outflow = 144.35 cfs @ 12.25 hrs, Volume= 161.079 af, Atten= 86%, Lag= 123.4 min
Primary = 144.35 cfs @ 12.25 hrs, Volume= 161.079 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 133.21' @ 12.25 hrs Surf.Area= 200,690 sf Storage= 2,974,922 cf

Plug-Flow detention time= 300.9 min calculated for 160.856 af (95% of inflow)
Center-of-Mass det. time= 273.8 min (1,062.5 - 788.7)

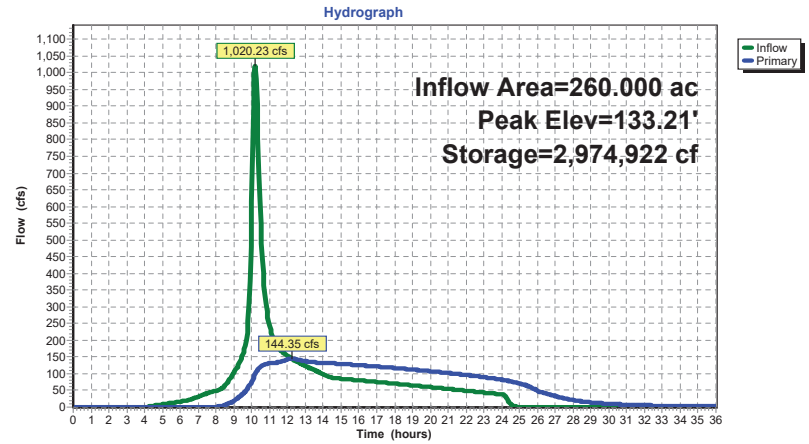
Volume	Invert	Avail.Storage	Storage Description
#1	114.00'	3,551,661 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
114.00	113,833	0	0
116.00	120,684	234,517	234,517
118.00	127,668	248,352	482,869
120.00	134,804	262,472	745,341
122.00	142,093	276,897	1,022,238
124.00	149,534	291,627	1,313,865
125.00	153,331	151,433	1,465,298
125.01	167,566	1,604	1,466,902
126.00	171,475	167,825	1,634,727
128.00	179,376	350,851	1,985,578
130.00	187,431	366,807	2,352,385
132.00	195,638	383,069	2,735,454
134.00	203,999	399,637	3,135,091
136.00	212,571	416,570	3,551,661

Device	Routing	Invert	Outlet Devices
#1	Device 3	116.00'	**36.0" Round Culvert - Low-Flow Outlet** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 116.00' / 116.00' S= 0.0000 '/' Cc= 0.900 n= 0.015, Flow Area= 7.07 sf
#2	Device 3	133.00'	**28.0' long Sharp-Crested Rectangular Weir - Overflow** 0 End Contraction(s)
#3	Primary	116.00'	**78.0" Round Culvert** L= 114.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 116.00' / 113.00' S= 0.0263 '/' Cc= 0.900 n= 0.012, Flow Area= 33.18 sf

Primary OutFlow Max=143.61 cfs @ 12.25 hrs HW=133.21' (Free Discharge)
└─**3=Culvert** (Passes 143.61 cfs of 596.94 cfs potential flow)
  ├─**1=Culvert - Low-Flow Outlet** (Inlet Controls 134.89 cfs @ 19.08 fps)
  └─**2=Sharp-Crested Rectangular Weir - Overflow**(Weir Controls 8.71 cfs @ 1.49 fps)

Pond Offsite South:



Existing 3-48" Culvert at Honoapi'ilani Hwy - Capacity Check

Given:

Size	3-48"	
Pipe Material	RCP	
Entrance Type	Headwall with Bell End	
Inv. In 48" (P1 North)	8.71	
Inv. In 48" (P2 Middle)	8.32	
Inv. In 48" (P3 South)	8.65	
Inv. Out 48" (P1 North)	7.12	
Inv. Out 48" (P2 Middle)	6.63	
Inv. Out 48" (P3 South)	6.88	
Length	101	
Slope (P1 North)	0.0157	
Slope (P2 Middle)	0.0167	
Slope (P3 South)	0.0175	
Point of Overflow	14.81	(Overflow path is to the south and not over Hwy)
Max. Allowable HW	13.81	(1 ft below point of overflow)
Tailwater	None	
Manning's n	0.015	(Slightly weathered conc.)

Find:

48" (P1 North) Capacity	107	(Capacity at Headwater = 13.81)
48" (P2 Middle) Capacity	116	(Capacity at Headwater = 13.81)
48" (P3 South) Capacity	108	(Capacity at Headwater = 13.81)
Total Capacity	**331**	**cfs**

Notes:

Inverts and elevations based on ATA Topographic Survey
Each Pipe modelled separately due to the different inverts.

Culvert Report

Project filename: Leialii Culvert Calc.cst

Culvert Studio v 2.0.0.26

01-06-2022

Exist. 3-48" Culv. at Hwy (P1 North Barrel) — Culvert 3

CULVERT

Shape	= Circular
Inlet Edge	= Beveled
Material	= Concrete
Manning's n	= 0.015
Rise	= 48 in
Span	= 48 in
Invert Elev. Down	= 7.12 ft
Length	= 101 ft
Slope	= 0.016 ft/ft
Invert Elev. Up	= 8.71 ft
No. Barrels	= 1
Plan Skew Angle	= 0 degrees

EMBANKMENT

Top Width	= 10.00 ft
Top Elevation	= 14.81 ft
Crest Length	= 100.00 ft

DISCHARGE

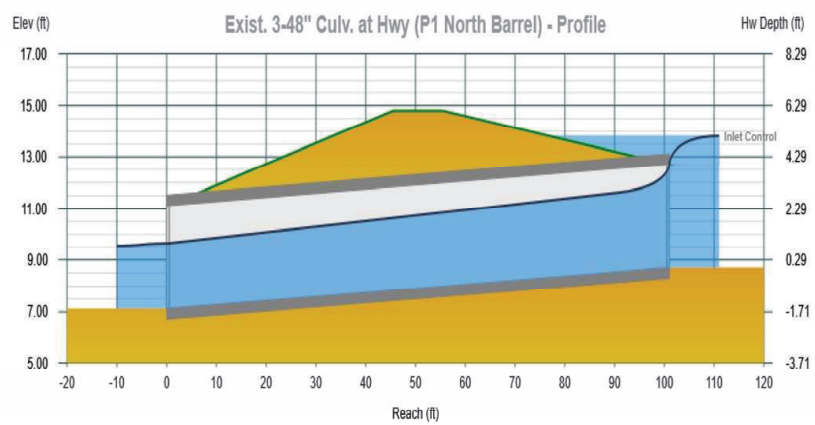
Method	= User-defined

TAILWATER

Tailwater Elevation	= Normal Depth

CALCULATION SAMPLE

Discharge			Velocity		Depth		HGL @ Hw/D = 1.28		
Total	Culvert	Over Top	Down	Up	Down	Up	Down	Up	Hw
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)
107.00	107.00	0.00	12.82	10.12	30.3	37.6	9.64	11.85	13.81



Culvert Report

Project filename: Leialii Culvert Calc.cst

Culvert Studio v 2.0.0.26

01-06-2022

Exist. 3-48" Culv. at Hwy (P2 Middle Barrel) — Culvert 4

CULVERT

Shape	= Circular
Inlet Edge	= Beveled
Material	= Concrete
Manning's n	= 0.015
Rise	= 48 in
Span	= 48 in
Invert Elev. Down	= 6.63 ft
Length	= 101 ft
Slope	= 0.017 ft/ft
Invert Elev. Up	= 8.32 ft
No. Barrels	= 1
Plan Skew Angle	= 0 degrees

EMBANKMENT

Top Width	= 10.00 ft
Top Elevation	= 14.81 ft
Crest Length	= 100.00 ft

DISCHARGE

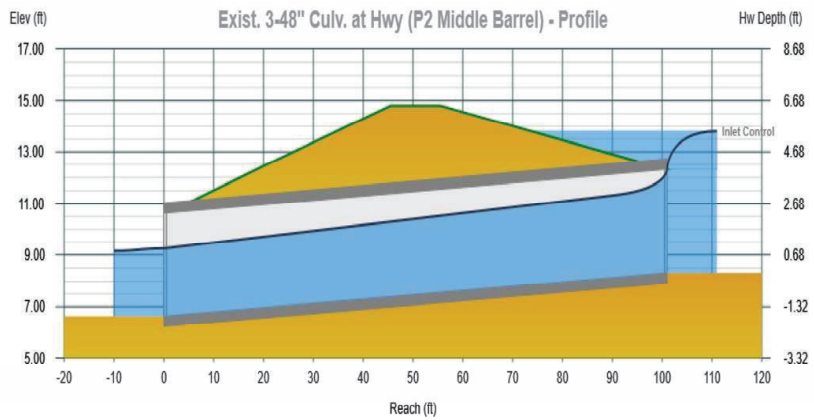
Method	= User-defined

TAILWATER

Tailwater Elevation	= Normal Depth

CALCULATION SAMPLE

Discharge			Velocity		Depth		HGL @ Hw/D = 1.37		
Total	Culvert	Over Top	Down	Up	Down	Up	Down	Up	Hw
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)
116.00	116.00	0.00	13.31	10.59	31.4	39.1	9.25	11.58	13.80



Culvert Report

Project filename: Leialii Culvert Calc.cst

Culvert Studio v 2.0.0.26

01-06-2022

Exist. 3-48" Culv. at Hwy (P3 South Barrel) — Culvert 5

CULVERT

Shape	= Circular
Inlet Edge	= Beveled
Material	= Concrete
Manning's n	= 0.015
Rise	= 48 in
Span	= 48 in
Invert Elev. Down	= 6.88 ft
Length	= 101 ft
Slope	= 0.018 ft/ft
Invert Elev. Up	= 8.65 ft
No. Barrels	= 1
Plan Skew Angle	= 0 degrees

EMBANKMENT

Top Width	= 10.00 ft
Top Elevation	= 14.81 ft
Crest Length	= 100.00 ft

DISCHARGE

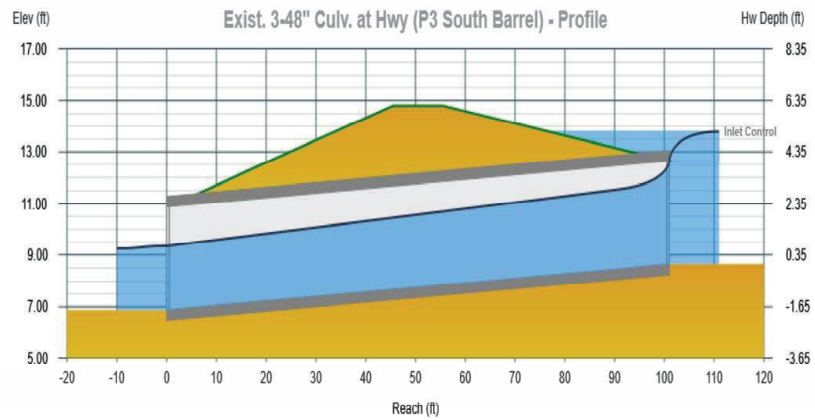
Method	= User-defined

TAILWATER

Tailwater Elevation	= Normal Depth

CALCULATION SAMPLE

Discharge			Velocity		Depth		HGL @ Hw/D = 1.29		
Total	Culvert	Over Top	Down	Up	Down	Up	Down	Up	Hw
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)
108.00	108.00	0.00	13.30	10.17	29.6	37.8	9.34	11.80	13.79



Existing Culvert at Railroad Tracks - Capacity Check

Given:

North Pipe Size	1-60"	
Other Pipe Size	3-48"	
Pipe Material	RCP	
Entrance Type	Headwall with Bell End	
Inv. In 60"	14.13	
Inv. In 48" (P1 North)	14.10	
Inv. In 48" (P2 Middle)	14.16	
Inv. In 48" (P3 South)	14.23	
Inv. In 48" (avg)	14.16	
Inv. Out 60"	13.18	
Inv. Out 48" (P1 North)	13.06	
Inv. Out 48" (P2 Middle)	13.09	
Inv. Out 48" (P3 South)	13.07	
Inv. Out 48" (avg)	13.07	
Length	41	
Slope 60"	0.0232	
Slope 3-48"	0.0266	
Point of Overflow	19.80	(Overflow path is south and not over RR tracks)
Max. Allowable HW	18.80	(1 ft below point of overflow)
Tailwater	0	
Manning's n	0.013	(Smooth Conc.)

Find:

1-60" Capacity	126	(Capacity at Headwater = 18.80)
3-48" Capacity	286	(Capacity at Headwater = 18.80)
Total Capacity	**412**	**cfs**

Notes:

Inverts and elevations based on ATA Topographic Survey
1-60" and 3-48" modeled separately.
3-48" modeled as a single triple barrel system since all pipes are at a similar invert.

Culvert Report

Project filename: Leialii Culvert Calc.cst

Culvert Studio v 2.0.0.26

01-06-2022

Exist. 1-60" Culv. at RR

Culvert 1

CULVERT

Shape	= Circular
Inlet Edge	= Beveled
Material	= Concrete
Manning's n	= 0.013
Rise	= 60 in
Span	= 60 in
Invert Elev. Down	= 13.18 ft
Length	= 41.0 ft
Slope	= 0.023 ft/ft
Invert Elev. Up	= 14.13 ft
No. Barrels	= 1
Plan Skew Angle	= 0 degrees

EMBANKMENT

Top Width	= 10.00 ft
Top Elevation	= 19.80 ft
Crest Length	= 100.00 ft

DISCHARGE

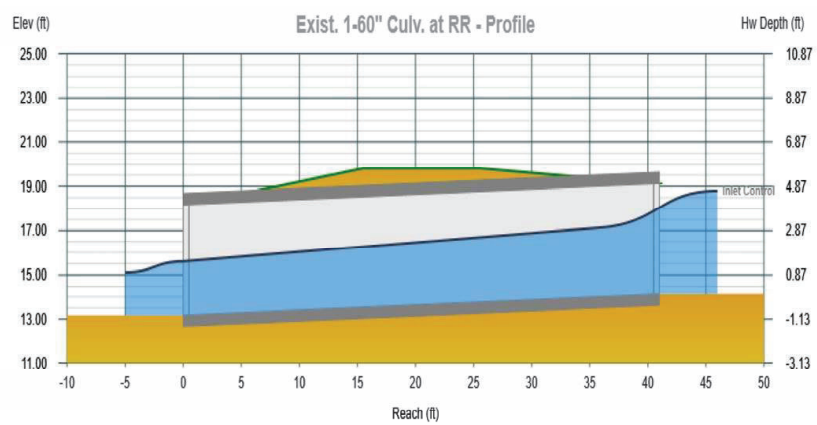
Method	= User-defined

TAILWATER

Tailwater Elevation	= Normal Depth

CALCULATION SAMPLE

Discharge			Velocity		Depth		HGL @ Hw/D = 0.93		
Total	Culvert	Over Top	Down	Up	Down	Up	Down	Up	Hw
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)
126.00	126.00	0.00	13.36	9.41	29.1	38.7	15.60	17.35	18.80



Culvert Report

Project filename: Leialii Culvert Calc.cst

Culvert Studio v 2.0.0.26

01-06-2022

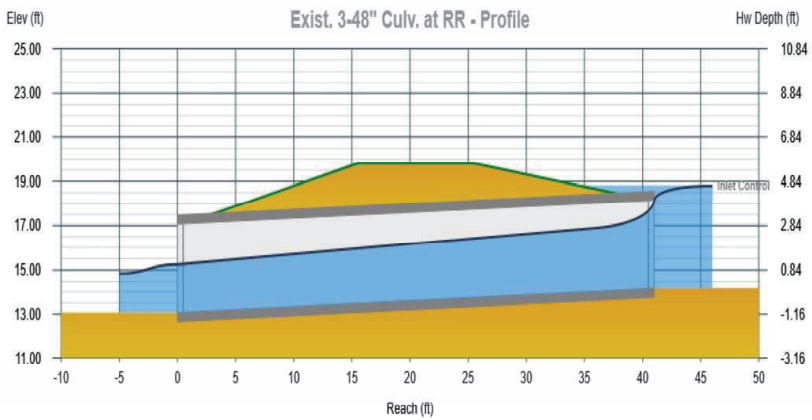
Exist. 3-48" Culv. at RR

Culvert 2

CULVERT		**EMBANKMENT**	
Shape	= Circular	Top Width	= 10.00 ft
Inlet Edge	= Beveled	Top Elevation	= 19.80 ft
Material	= Concrete	Crest Length	= 100.00 ft
Manning's n	= 0.013		
Rise	= 48 in	**DISCHARGE**	
Span	= 48 in	Method	= User-defined
Invert Elev. Down	= 13.07 ft		
Length	= 41.0 ft		
Slope	= 0.027 ft/ft		
Invert Elev. Up	= 14.16 ft		
No. Barrels	= 3	**TAILWATER**	
Plan Skew Angle	= 0 degrees	Tailwater Elevation	= Normal Depth

CALCULATION SAMPLE

Discharge			Velocity		Depth		HGL @ Hw/D = 1.16		
Total	Culvert	Over Top	Down	Up	Down	Up	Down	Up	Hw
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)
286.00	286.00	0.00	13.63	9.54	26.1	35.6	15.25	17.13	18.79



AUSTIN, TSUTSUMI & ASSOCIATES, INC
CIVIL ENGINEERS • SURVEYORS

APPENDIX B

Preliminary Wastewater Flow Calculations

Wastewater Flow Calculations: Based on County of Maui Wastewater Flow Standards, 2006.

Dry Weather Infiltration:	5	gpd per capita
Wet Weather Infiltration:	1250	gpd per acre

Leiali'i Phase 1B														
Description	**Total Area (acres)**	**Number of lots**	**People per lot (capita)**	**Total capita**	**Contribution per residence (gpd)**	**Avg. Flow (gpd)**	**Calculated Flow Factor[1]**	**Modified Flow Factor[2]**	**Max. Flow (gpd)**	**Dry Weather Infil. (gpcd)**	**Wet Weather Infil. (gpd)**	**Design Avg. Flow (gpd)**	**Design Max Flow (gpd)**	**Design Peak Flow (gpd)**
Increment 1	26	86	4	344	350	30,100	6.2	5.0	150,500	1,720	32,500	**31,800**	152,200	184,700
Increment 2, Alternative 1	25	**95**	4	380	350	33,250	6.1	5.0	166,250	1,900	31,250	**35,200**	168,200	199,500
Total	51	181		724		63,350			317,000	4,000	64,000	**67,000**	320,000	**384,000**
Increment 1	26	86	4	344	350	30,100	6.2	5.0	150,500	1,720	32,500	**31,800**	152,200	184,700
Increment 2, Alternative 2	25	**164**	2.5	410	255	41,820	6.0	5.0	209,100	2,050	31,250	**43,900**	211,200	242,500
Total	51	250		754		71,920			360,000	4,000	64,000	**76,000**	363,000	**427,000**

[1]Calculated Flow Factor from Babbit Chart based on equation for population: Factor = 5/(population in thousands)^0.2.
[2]Maximum Flow Factor on Babbit Chart is 5.0. Therefore, calculated flow factors above 5.0 are modified to be 5.0.

PERMIT DETERMINATION REQUEST LETTER TO U.S. ARMY CORPS OF ENGINEERS DATED APRIL 13, 2022

APPENDIX

C

MUNEKIYO HIRAGA
Planning. Project Management. Sustainable Solutions.

Karlynn K. Fukuda
PRESIDENT
Mark Alexander Roy AICP, LEED AP
VICE PRESIDENT
Tessa Munekiyo Ng AICP
VICE PRESIDENT

Michael T. Munekiyo AICP
SENIOR ADVISOR

April 13, 2022

Via email: CEPOH-PA@usace.army.mil

Linda Speerstra, Chief
Regulatory Office
U.S. Army Corps of Engineers, Honolulu District Office
U.S. Department of the Army
Building 230
Fort Shafter, Hawai‘i 96858-5440

SUBJECT: Request for U.S. Army Corps of Engineers Determination of No Permit Required for Proposed Department of Hawaiian Home Lands Villages of Leiali‘i Phase 1-B Subdivision Offsite Improvements; Lahaina, Maui, Hawai‘i

Dear Ms. Speerstra:

We are writing to you on behalf of the State of Hawai‘i, Department of Hawaiian Home Lands (DHHL) to request a determination of No Permit Required for the unnamed gulch in relation to the proposed Villages of Leiali‘i, Phase 1-B (Phase 1-B) subdivision and related improvements project in Lahaina, Maui, Hawai‘i. This submittal supersedes our earlier submittal of March 7, 2022 and has been revised based on your guidance to amend the request based on the information provided on the subject gulch.

DHHL proposes to develop the Phase 1-B subdivision on lands identified by Tax Map Key (TMK) (2)4-5-021:020 (Parcel 20), an approximately 51-acre area of land owned by DHHL located north of Leiali‘i Parkway and the existing DHHL Villages of Leiali‘i Phase 1-A (Phase 1-A) subdivision. See **Figure 1**. Both Phase 1-A and Phase 1-B were acquired by DHHL from the Housing Finance and Development Corporation (HFDC) (predecessor to the current Hawai‘i Housing Finance and Development Corporation (HHFDC)) in the early 2000’s. It is noted that HHFDC still owns the lands mauka of Phase 1-A and Phase 1-B, and has plans to develop a separate master planned community on its lands in the future. Phase 1-B, as currently planned, consists of a mix of single-family lots and multi-family units, which together total approximately 250 units. Access from the subdivision will be provided from Leiali‘i Parkway. The new housing units will be made available to DHHL Native Hawaiian beneficiaries currently on the waitlist for a residential lease on Maui. The subdivision will be developed in two (2) phases.In order to develop the proposed subdivision, the following offsite improvements are required, and will also be developed as part of the proposed action:

Maui: 305 High Street, Suite 104 • Wailuku, Hawaii 96793 • Tel: 808.244.2015 • Fax: 808.244.8729
Oahu: 735 Bishop Street, Suite 412 • Honolulu, Hawaii 96813 • Tel: 808.983.1233
www.munekiyohiraga.com

- Development of two (2) new offsite retention basins mauka of Phase 1-B, on lands owned by HHFDC
- Adjustment of the outlet drainage pipes in the existing retention basin mauka of Phase 1-A, on lands owned by HHFDC, and enlargement of the basin
- Grading and development of drainage interceptor ditches mauka of Phase 1-B, on lands owned by HHFDC
- Roadway improvements to Leiali‘i Parkway and Honoapi‘ilani Highway
- Roadway repairs to existing portions of Leiali‘i Parkway

The improvements to the existing retention basin mauka of Phase 1-A will be on a portion of lands identified by TMK (2)4-5-021:021 (Parcel 21) owned by the HHFDC. A review of this property has indicated that an unnamed gulch traverses Parcel 21, above Phase 1-A. See **Figure 2**.

To aide in the request, DHHL has engaged Robert Hobdy, environmental consultant, to prepare a Waters of the U.S. Assessment for the gulch. See **Exhibit “B”**.

According to the assessment, the gulch was once approximately four (4) miles in length, running from an elevation of approximately 2,600 feet, has a total watershed of approximately 400 acres, and can be characterized as an ephemeral intermittent stream that only runs briefly 2-3 times a year following major rainfall events. Most of the land where the channel runs was formerly part of a large sugar cane plantation, but is now fallow. A network of plantation irrigation ditches spans the area, and one (1) ditch crosses the gulch at the 1,300 foot elevation and captures whatever modest flow is generated from the upper reaches of the watershed. A plantation cane haul road was developed laterally across the gulch and its shallow depression at an elevation of 160 feet. No culvert was placed under the road to allow periodic stream flow to pass beneath and as a result, a shallow basin was created where any stream flow would accumulate and eventually percolate into the ground. Stream flow has been modest and infrequent as the basin shows no signs of ponding or high water marks and no signs of over-topping. The assessment notes that should over-topping occur onto the roadway which slopes downward, the water would follow the roadway surface down to gently sloping open land away from the lower gulch channel where it would be dispersed, thereby essentially dewatering the lower portion of the channel.

The lower portion of the channel below the project area has been altered by development, including the existing Wahikuli subdivision that was developed in the 1970s and the DHHL Phase 1-A subdivision, developed in the early 2000s which resulted in the channel being filled and leveled to establish roadways and house lots. In addition, the excavation required to develop the detention basin above Phase 1-A also altered this lower portion

of the channel. The detention basin includes two (2) underground overflow drain pipes that connect to two (2) storm drain pipes running through the Phase 1-A subdivision, before joining at the bottom of the subdivision in an open box culvert that runs under Honoapiʻilani Highway and to the ocean. The assessment notes that the detention basin receives very little runoff due to the dewatered nature of this lower part of the channel.

As such, the assessment found the gulch to be an ephemeral aquatic resource that has no nexus with the Pacific Ocean Traditional Navigable Water. For this reason, the assessment proposed that the gulch be determined to be a Non-Jurisdictional aquatic resource. Nonetheless, development of the project and the related offsite improvements will not impact the historical alignment of the gulch. As such, a Department of the Army (DA) permit is not anticipated to be required.

DHHL is an Agency of the State of Hawaiʻi, the proposed use of State lands and funds triggers environmental review requirements pursuant to Hawaiʻi Revised Statutes, Chapter 343. As such, an environmental assessment will be prepared to evaluate the technical characteristics, environmental impacts and alternatives, as well as to advance findings relative to the proposed project.

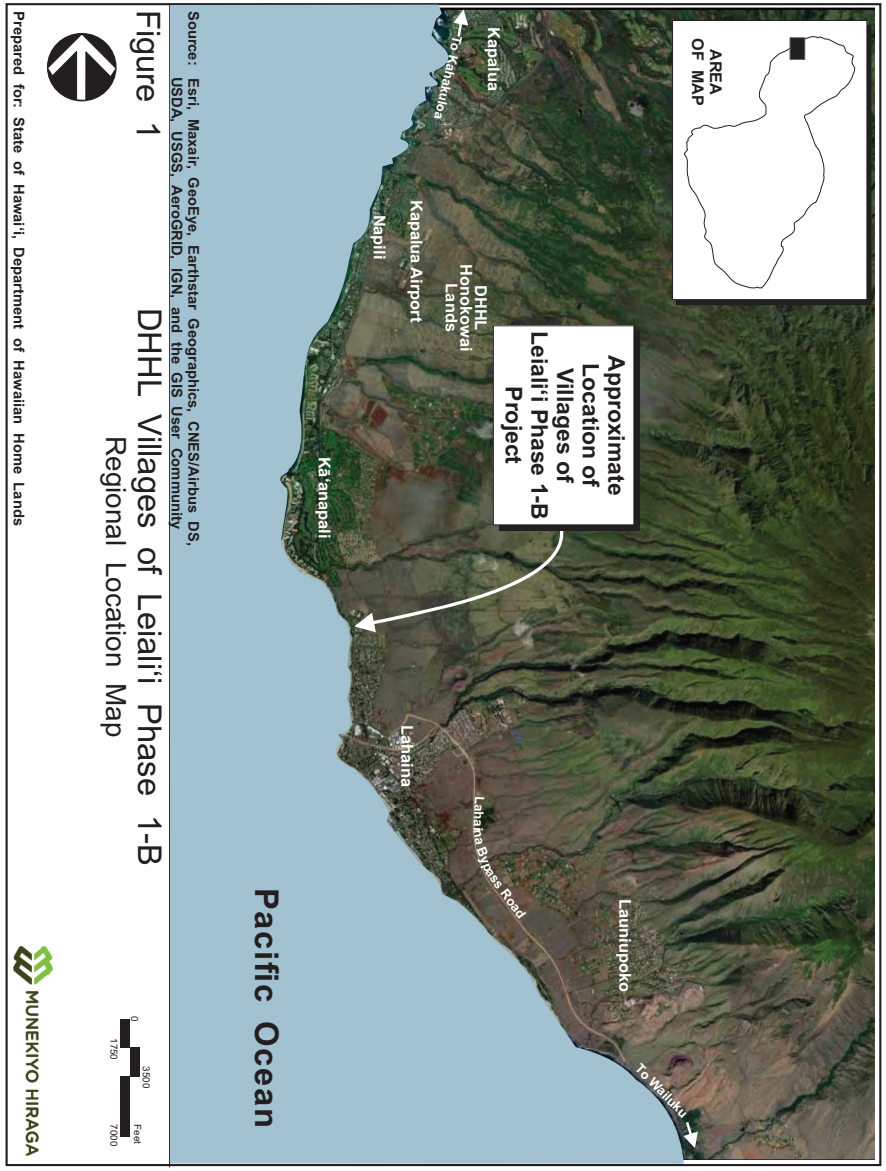
Given the foregoing, on behalf of DHHL, we are writing to respectfully request a determination which confirms that no permit would be required for the proposed action based on the fact that the unnamed gulch is not a Water of the U.S., and that it will not be impacted by the proposed project. Refer to **Exhibit "B"**. A completed JD request form is provided in **Exhibit "A"**.

Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233 or via email at planning@munekiyohiraga.com.

Very truly yours,

Emily Murai
Associate

BKE:de
CC: Bryan Toda, Department of Hawaiian Home Lands
Stewart Matsunaga, Department of Hawaiian Home Lands
Adrienne Wong, Austin, Tsutsumi & Associates, Inc.
K:\DATA\ATA\2371 DHHL Vill of Leialii Ph 1B PERMITTING\Applications\JD\(draft) JD Request Ltr incl. Guidance from USACE.docx



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 1 DHHL Villages of Leialiʻi Phase 1-B
Regional Location Map

Prepared for: State of Hawaiʻi, Department of Hawaiian Home Lands

MUNEKIYO HIRAGA

A7A\2371 DHHL Vill of Leiali Ph 1B PERMITTING\Applications\Figures\Regional Location Map

EXHIBIT A

Jurisdictional Determination Request Form

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. County of Maui, Department of Planning. The Pacific Islands Ocean Observing System

Figure 8 DHHL Villages of Leiali'i Phase 1-B Streams Map

Prepared for: State of Hawai'i, Department of Hawaiian Home Lands

ATM/2371 DHHL Vill of Leiali Ph 1B PERMITTING/Application/Figures/Streams and Wetlands

REQUEST FOR CORPS JURISDICTIONAL DETERMINATION (JD)

To: Honolulu District

- I am requesting a JD on property located at: Lahaina, Maui, Hawai'i
  (Street Address)
  TMK: (2)4-5-021:021 County: Maui State: Hawai'i
  Acreage of Parcel/Review Area for JD: 365.453 acres/6.91 acrea
  Section: N/A Township: N/A Range: N/A
  Latitude (decimal degrees): 20.900428 Longitude (decimal degrees): -156.677964
  (For linear projects, please include the center point of the proposed alignment.)
- Please attach a survey/plat map and vicinity map identifying location and review area for the JD.
- ☐ I currently own this property. ___ I plan to purchase this property.
  ☑ I am an agent/consultant acting on behalf of the requestor.
  ☐ Other (please explain): _____.
- Reason for request: (check as many as applicable)
  ☑ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all aquatic resources.
  ☑ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all jurisdictional aquatic resources under Corps authority.
  ☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps, and the JD would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.
  ☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps; this request is accompanied by my permit application and the JD is to be used in the permitting process.
  ☐ I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is included on the district Section 10 list and/or is subject to the ebb and flow of the tide.
  ☐ A Corps JD is required in order to obtain my local/state authorization.
  ☐ I intend to contest jurisdiction over a particular aquatic resource and request the Corps confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.
  ☐ I believe that the site may be comprised entirely of dry land.
  ☐ Other: _____
- Type of determination being requested:
  ☐ I am requesting an approved JD.
  ☐ I am requesting a preliminary JD.
  ☑ I am requesting a "no permit required" letter as I believe my proposed activity is not regulated.
  ☐ I am unclear as to which JD I would like to request and require additional information to inform my decision.

By signing below, you are indicating that you have the authority, or are acting as the duly authorized agent of a person or entity with such authority, to and do hereby grant Corps personnel right of entry to legally access the site if needed to perform the JD. Your signature shall be an affirmation that you possess the requisite property rights to request a JD on the subject property.

*Signature: Emily Y K Murai Date: 03/24/22

- Typed or printed name: Emily Murai
  Company name: Munekiyo Hiraga
  Address: 305 High Street, Suite 104
  Wailuku, Hawaii 96793
  Daytime phone no.: (808) 983-1233
  Email address: planning@munekiyohiraga.com

***Authorities:** Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Program of the U.S. Army Corps of Engineers; Final Rule for 33 CFR Parts 320-332.
Principal Purpose: The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced above.
Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USACE website.
Disclosure: Submission of requested information is voluntary; however, if information is not provided, the request for an AJD cannot be evaluated nor can an AJD be issued.

EXHIBIT B

Waters of the U.S. Assessment

Waters of the U.S. Assessment
Department of Hawaiian Home Lands
Villages of Leiali`i Phase 1-B
Wahikuli, Lāhaina, Maui

by:
Robert W. Hobdy
Kokomo, Maui
February 2022

for:
The Department of Hawaiian Home Lands

Waters of the U.S. Assessment
D.H.H.L. Villages of Leiali`i Phase 1-B

INTRODUCTION

The Villages of Leiali`i Phase 1-B project is located on the north edge of Lāhaina town in West Maui. It is adjacent to an existing residential community and the Lāhaina Civic Center Complex. One small unnamed stream channel that once passed through the southeast corner of this project is the subject of this Waters of the U.S. study, the purpose of which is to assess this entire aquatic stream resource to determine if it qualifies as a Jurisdictional Waters of the U.S. under the oversight of the U.S. Army Corps of Engineers (USACE).

SITE DESCRIPTION

This small unnamed stream lies between the watersheds of two larger streams that flow from the upper reaches of the western slopes of West Maui. The Hāhākea-Wahikuli stream to the north has intermittent flow while the larger Kahoma stream to the south has perennial flow. The subject unnamed stream with a total watershed of about 400 acres can be characterized as an ephemeral intermittent stream that only runs briefly following major rainfall events. Most of the land where this stream channel runs was formerly part of a large sugar cane plantation, but is now fallow. A network of plantation irrigation ditches spans this area, and one ditch crosses this stream at the 1,300-foot elevation and captures whatever modest flow is generated from the upper reaches of the watershed that extends up to 2,600 feet. The lower portion of the stream channel below the project area has been altered by development dating from over 50 years ago.

ASSESSMENT METHODOLOGY

The stream assessment was conducted following the USACE's Approved Jurisdictional Determination Form which derives its authority from the Rivers and Harbors Act (Section 10) and the Clean Water Act (Section 404). Assessment methodology guidelines include primarily evaluating stream flow frequency, volume and duration, and the presence of stream bed, banks and a visible Ordinary High Water Mark. Also evaluated were potential environmental effects and the ability of the stream to carry pollutants to the ocean. The evaluation of these characteristics then lead to a proposed determination of whether the aquatic resource qualifies as being jurisdictional under the USACE and subject to its oversight.

RESULTS

The following analysis of the unnamed stream conducted in early February 2022 found it to be an ephemeral aquatic resource that has no nexus with the ocean TNW. It is proposed to be determined as a Non-Jurisdictional aquatic resource. The Approved Jurisdictional Determination Form with accompanying maps and images is to be submitted by the applicant to USACE for their consideration and final determination.

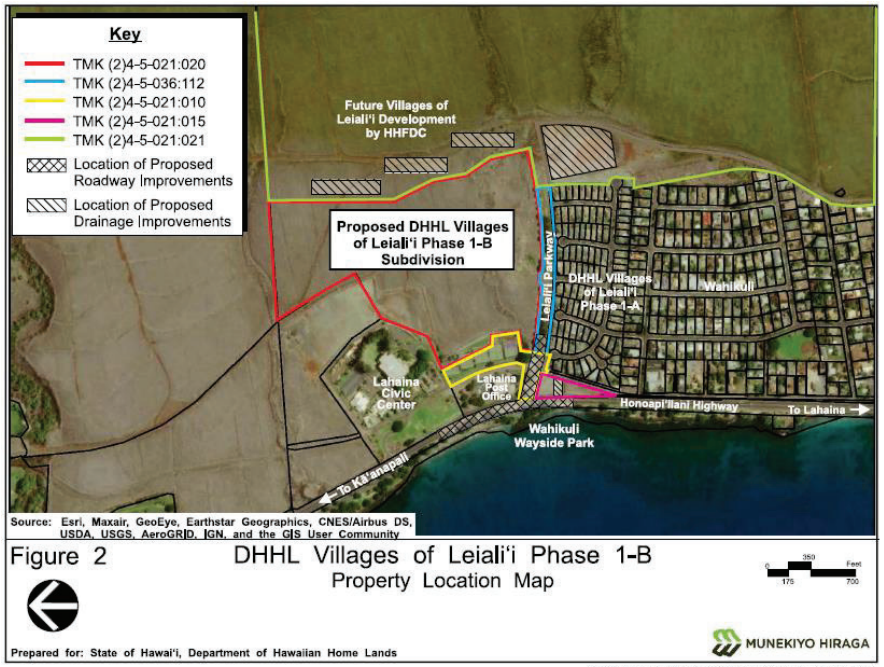


Figure 1. Project Map D.H.H.L.Villages of Leiali`i Phase 1-B

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION: UNNAMED STREAM-WAHIKULI, LAHAINA, MAUI
State: HAWAII County/parish/borough: MAUI City: LAHAINA
Center coordinates of site (lat/long in degree decimal format): Lat. 20.900° N, Long. 156.678° W.
Universal Transverse Mercator:
Name of nearest waterbody: PACIFIC OCEAN
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: PACIFIC OCEAN
Name of watershed or Hydrologic Unit Code (HUC):
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: linear feet: width (ft) and/or acres.
   Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Pick List**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **This unnamed stream, which has been shown as a Jurisdictional Aquatic Feature on the National Wetlands Inventory (R4SBC), that actually no longer physically qualifies as such because none of its waters presently flow into the Pacific Ocean TNW. Following is a description of this aquatic feature and a history of the changes to it that have occurred over more than a century.**

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

This unnamed stream was once approximately four miles in length, running from an elevation of 2,600 feet to the ocean, with a watershed of about 400 acres. Annual rainfall at the top averages about 50 inches but the stream passes down into a hot, dry lowland that averages only 12 inches per year with long summers. The stream only flows for short periods 2 - 3 times a year following major rainfall events and can be described as an ephemeral, intermittent aquatic feature.

In the early 1900s a sugar plantation cane haul road was developed laterally across this stream and its shallow depression at an elevation of 160 feet. No culvert was placed under the road to allow periodic stream flow to pass beneath. This created a shallow basin where any stream flow would accumulate and eventually percolate into the ground. Stream flow has been very modest and infrequent as this basin shows no sign of ponding or high-water marks and no signs of over-topping the basin. Furthermore, should the stream flow ever over-top the basin onto the road which slopes down to the south, the water would follow the road surface down to gently sloping open land away from the lower stream channel where it would spread out. This situation essentially dewaters the lower portion of the stream channel that formerly ran 0.4 miles further down to the ocean.

In 1970 a residential community was developed below the plantation road and above Honoapiilani Highway along the coast that included the lower portion of the unnamed stream channel. The project also involved the excavation of a large detention basin located above the subdivision and just below the plantation road (see Figure 3). In the process of site development for the subdivision, the shallow stream channel was filled in and leveled. Roads were laid out and house lots established. A system of underground storm drains was laid out following the roadways.

The detention basin above the subdivision was constructed to prevent flooding damage below. It included 2 underground over-flow drain pipes that connected to 2 storm drain pipe mainlines running down through the subdivision below, joining at the bottom in an open box culvert that runs under Honoapiilani Highway and to the ocean. The detention basin receives very little runoff due to the now dewatered unnamed stream at the plantation road above it. The water levels in the detention basin appear to have never exceeded a depth of 1 foot which is several feet below the overflow outlets. It seems that all the water that flows from the subdivision originates within the subdivision from ambient rainfall and domestic usage. Proceed to Section III. F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW: .

   Summarize rationale supporting determination: .

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) **General Area Conditions:**
   Watershed size: Pick List
   Drainage area: Pick List
   Average annual rainfall: inches
   Average annual snowfall: inches

   (ii) **Physical Characteristics:**
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through Pick List tributaries before entering TNW.

   Project waters are Pick List river miles from TNW.
   Project waters are Pick List river miles from RPW.
   Project waters are Pick List aerial (straight) miles from TNW.
   Project waters are Pick List aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain: .

   Identify flow route to TNW[5]: .
   Tributary stream order, if known: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):
☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:
(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is: **Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
☐ Discrete wetland hydrologic connection. Explain: .
☐ Ecological connection. Explain: .
☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:
Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):
☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)
All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

   Provide estimates for jurisdictional waters in the review area (check all that apply):
   - ☐ Tributary waters: linear feet width (ft).
   - ☐ Other non-wetland waters: acres.
     Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
   - ☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional waters within the review area (check all that apply):
   - ☐ Tributary waters: linear feet width (ft).
   - ☐ Other non-wetland waters: acres.
     Identify type(s) of waters: .

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
   - ☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
     - ☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .
     - ☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

   Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
   - ☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

   Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
   - ☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
   As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
   - ☐ Demonstrate that impoundment was created from "waters of the U.S.," or
   - ☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
   - ☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

- ☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
- ☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
- ☐ which are or could be used for industrial purposes by industries in interstate commerce.
- ☐ Interstate isolated waters. Explain: .
- ☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] **Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.***

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☒ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **The stream waters no longer flow to the ocean TNW.**
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☐ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☐ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: 1/24,000 Lahaina Quadrant.
☐ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Google Earth (3) July 8, 2016.
or ☒ Other (Name & Date): Detention Basin and Storm Drains, January 31, 2022.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

Figure 2. Current extent of the Watershed of the subject Unnamed Stream, Lahaina, Maui.

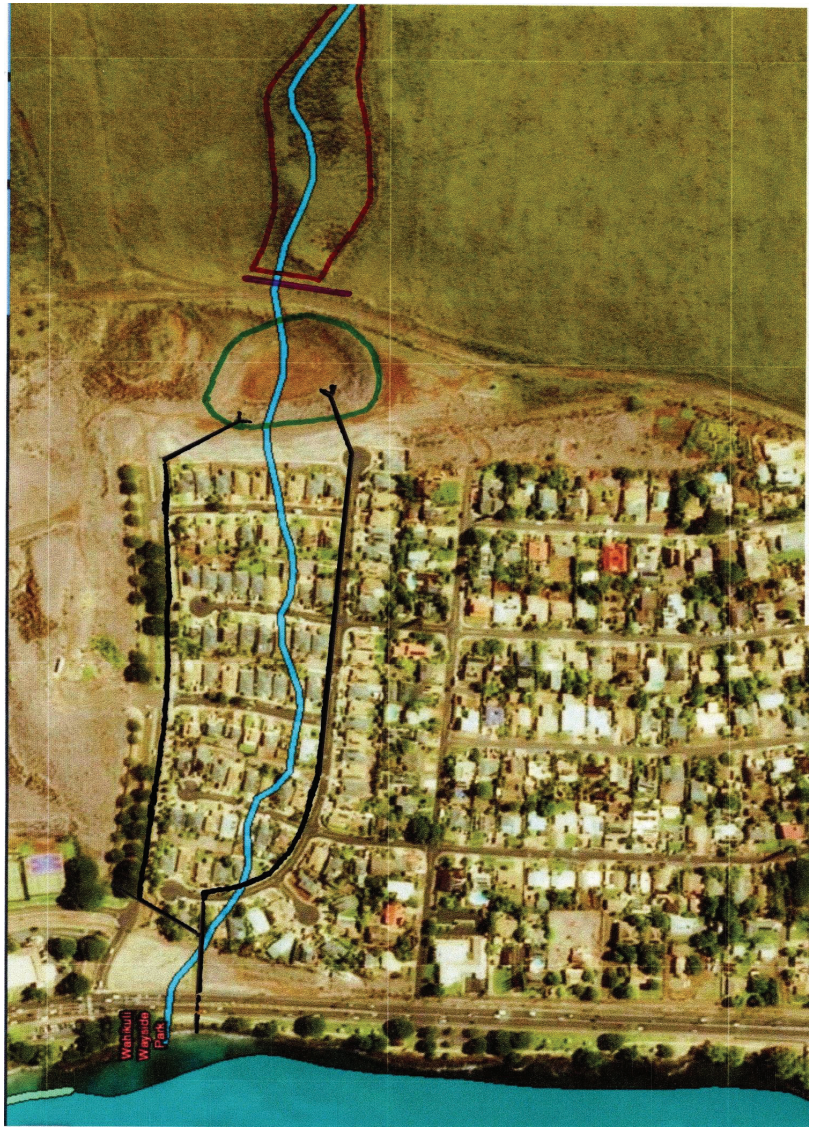

Figure 3.

Figure 2. Map Legend

original location of the Unnamed Stream as shown on the 1956 USGS Lahaina Map

dammed gully and raised berm resulting from the construction of the plantation road in the early 1900s

basin created by the construction of the plantation road

detention basin excavated above the 1970 Subdivision

storm drain main lines through the 1970 subdivision from the detention basin to the ocean.

Figure 4. The detention basin below the plantation road showing the lowest part that had accumulated only about 8 inches of water following a 6 inch Kona rain storm in December 2021.

Figure 5. one of the two detention basin overflow outlets that stand about 10 feet above the bottom.

Figure 6. The bottom of the storm drain surfaces below the subdivision and travels in an open culvert under Honoapiilani Highway to the ocean.

DETERMINATION LETTER FROM U.S. ARMY CORPS OF ENGINEERS DATED MAY 12, 2022

APPENDIX C-1

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

May 12, 2022

SUBJECT: No Permit Required, DA File No. POH-2022-00069

Brian Toda
Department of Hawaiian Homelands
91-5420 Kapolei Pkwy
Kapolei, HI 96707

Dear Mr. Toda:

The Honolulu District, U.S. Army Corps of Engineers (Corps), Regulatory Branch has received your request for a determination whether a Department of the Army (DA) permit is required for the Villages of Leiali'i subdivision project located in Lahaina, Island of Maui, Hawaii has been assigned DA file number POH-2022-00069. Please reference this number in all future correspondence with our office relating to this action.

We have reviewed your submittal pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344; "Section 404") and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403; "Section 10"). The determination provided in this letter pertains only to whether your proposed project is an activity we regulate; it does not address geographic jurisdiction.

While we have not made a determination of the jurisdictional status of the aquatic resource(s) on your property, based on the information you provided, we have determined that your proposed project would not involve an activity subject to the regulatory jurisdiction of the Corps and therefore, a DA permit is not required. This determination of no permit required addresses only the proposed work activities described in your submitted documentation and does not convey our determination of the jurisdictional status of the unnamed gulch.

While a DA permit is not required for your proposed project, you are responsible for obtaining all other applicable Federal, state, or local authorizations required by law. Be advised, a DA permit may be required if you alter the method, scope, or location of your proposed work. You should contact our office if you are considering modifying your project.

Thank you for your cooperation with the Honolulu District Regulatory Program. Should If you have any questions related to this determination, please contact me at 808-835-4307 or via e-mail at Michael.A.Maaninen@usace.army.mil. You are

encouraged to provide comments on your experience with the Honolulu District Regulatory Office by accessing our web-based customer survey form at https://regulatory.ops.usace.army.mil/customer-service-survey/. For additional information about our Regulatory Program, please visit our web site at http://www.poh.usace.army.mil/Missions/Regulatory.aspx.

Sincerely,

Michael Maaninen
Regulatory Specialist

FLORA AND FAUNA SURVEY

APPENDIX D

BIOLOGICAL RESOURCES SURVEY
DEPARTMENT OF HAWAIIAN HOME LANDS
VILLAGES OF LEIALI`I PHASE 1 – B SUBDIVISION AND OFFSITE IMPROVEMENTS
LĀHAINA, MAUI, HAWAII

by

Robert W. Hobdy
Environmental Consultant
Kokomo, Maui
July 2021

Prepared for:
State of Hawaii
Department of Hawaiian Home Lands

BIOLOGICAL RESOURCES SURVEY
DEPARTMENT OF HAWAIIAN HOME LANDS
VILLAGES OF LEI ALI`I PHASE 1 - B SUBDIVISION AND OFFSITE IMPROVEMENTS
LAHAINA, MAUI, HAWAII

INTRODUCTION

The Department of Hawaiian Home Lands Villages of Leiali`i Phase 1-B Subdivision and Offsite Improvements Project is located on the north edge of Lāhaina town, West Maui, TMK (2) 4-5-21:20 (see Figure 1). This biological assessment was initiated by the Department of Hawaiian Home Lands in compliance with environmental requirements of the planning process.

SITE DESCRIPTION

The project area is situated on 50.858 acres of undeveloped land along Leiali`i Parkway above the Lāhaina Civic Center. It lies on moderately sloping land between the elevation of 40 and 160 feet above sea level. The soil is characterized as Wahikuli Stony Silty Clay, 3 – 7 % slopes, which is a well-drained upland soil (Foote et al, 1972). Rainfall averages between 12 and 15 inches per year with most occurring during the winter months (Armstrong, 1983). The vegetation consists of dry land grasses and shrubs.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the Department of Hawaiian Home Lands Villages of Leiali`i Phase 1-B Subdivision and Offsite Improvements Project at Wahikuli, Lāhaina, Maui that was conducted in July 2021. The objectives of the survey were to:

1. Document what plant and animal 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.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used following routes that would ensure complete coverage of the project area. Notes were made on plant species distribution and abundance as well as on terrain and substrate.

DESCRIPTION OF THE VEGETATION

The vegetation in the project area was dominated by two species that were abundant: buffelgrass (*Cenchrus ciliaris*) and koa haole (*Leucaena leucocepahla*), which together made up more than 95% of the total biomass. A total of 26 plant species were recorded during the survey. Besides the two abundant species, five species were uncommon: Carolina lovegrass (*Eragrostis pectinacea*), koali kuahulu (*Merremia aegyptium*), `uhaloa (*Waltheria indica*), saltbush (*Atriplex suberecta*), and bracted fanpetals (*Sida ciliaris*). Another nineteen species were of rare occurrence here.

Just two common, indigenous native species were found: the koali kuahulu and the `uhaloa listed above as uncommon.

DISCUSSION AND RECOMMENDATIONS

The vegetation within this project is dominated by non-native plants that have taken over on these abandoned agricultural fields. A total of two native species were recorded during two visits to the project area. These native species are indigenous in Hawaii and also occur in other tropical areas around the Pacific. All are quite common in Hawaii.

None of the native plants found in the project are of any heightened environmental concern. No endangered or threatened plant species are known to occur on or around the project area, nor were there any species that are candidates for such status found. No special native plant habitats were observed.

The proposed development of the D.H.H.L. Villages of Leiali`i Phase1-B Subdivision and Offsite Improvements project area is not expected to result in any significant negative impacts to the botanical resources in this part of West Maui.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within two groups: Monocots and Dicots. Taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999).

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).

   Polynesian introduction = plants introduced to Hawai'i in the course of Polynesian migrations and prior to western contact.
   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
MONOCOTS			
POACEAE (Grass Family)			
Axonopus compressus (Sw.) P. Beauv.	broad-leaved carpetgrass	non-native	rare
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	non-native	rare
Cenchrus ciliaris L.	buffelgrass	non-native	abundant
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	uncommon
Megathyrsus maximus (Jacq.) Simon & Jacobs	guinea grass	non-native	rare
Tragus berteronianus Schult.	bur grass	non-native	rare
DICOTS			
AMARANTHACEAE (Amaranth Family)			
Atriplex suberecta Verd.	saltbush	non-native	uncommon
ASTERACEAE (Sunflower Family)			
Parthenium hysterophorus L.	Santa Maria	non-native	rare
Pluchea procumbens L.	coat buttons	non-native	rare
BORAGINACEAE (Borage Family)			
Heliotropium procumbens Mill.	four-spike heliotrope	non-native	rare
CACTACEAE (Cactus Family)			
Opuntia ficus-indica (L.) Mill.	panini	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Merremia aegyptia (L.) Urb.	koali kuahulu	indigenous	uncommon
EUPHORBIACEAE (Spurge Family)			
Ricinus communis L.	castor bean	non-native	rare
FABACEAE (Pea Family)			
Crotalaria pallida Aiton	smooth rattlepod	non-native	rare
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	rare
Indigofera spicata Forssk.	creeping indigo	non-native	rare
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	abundant
Macroptilium atropurpureum (DC.) Urb.	siratro	non-native	rare
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	rare
LAMIACEAE (Mint Family)			
Leonotis nepetifolia (L.) R. Br.	lion's ear	non-native	rare
MALVACEAE (Mallow Family)			
Sida ciliaris L.	bracted fanpetals	non-native	uncommon
Sida spinosa L.	prickly sida	non-native	rare
Waltheria indica L.	'uhaloa	indigenous	uncommon
NYCTAGINACEAE (Four-o'clock Family)			
Boerhavia coccinea Mill.	scarlet spiderling	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species, abundance, activity 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 (*Lasiurus cinereus semotus*), the Hawaiian petrel (*Pterodroma sandwichensis*) or the Newell's shearwater (*Puffinus newelli*) in the area.

RESULTS

MAMMALS

Mammals and their signs were scarce within the project area during two site visits. Taxonomy and nomenclature follow Tomich (1986).

Tracks of two non-native mammals were seen: domestic dogs (*Canis familiaris*) and domestic cats (*Felis catus*). Dogs accompany their owners on walks and cats wonder from nearby residences, mostly at night. Other mammals that are likely to occur here are mongoose (*Herpestes auropunctatus*), rats (*Rattus* spp.) and mice (*Mus domesticus*).

A special effort was made to look for the Endangered ʻōpeʻapeʻa or Hawaiian hoary bat by conducting an evening survey at two locations in the project area utilizing a bat detector (Batbox IIID) set to the frequency of 27,000 Hertz that these bats are known to emit when echo-locating for nocturnal flying insect prey. No bats were detected at these sampling sites.

BIRDS

Birdlife within the project area was sparse in both diversity of species and in total numbers. Taxonomy and nomenclature of the birds follow American Ornithological Society (2021).

Six species of non-native birds were recorded during the survey in this hot dry, environment. Just one species was common, the zebra dove (*Geopelia striata*). The African silverbill (*Lonchura cantans*) and the house finch (*Haemorhous mexicanus*) was uncommon and three other species were rare. No native birds were seen.

INSECTS

Insect species were also sparse in this hot, dry habitat. Nine species were recorded during two site visits. Taxonomy and nomenclature follow Nishida et al (1992). One species was common, the short-horned grasshopper (*Oedaleus abruptus*). Two species were uncommon: the blow fly (*Calliphora vomitoria*) and the dung fly (*Musca sorbens*). Six other species were rare.

One species, the globe skimmer (*Pantala flavescens*), is an indigenous, native dragonfly that is widespread throughout Hawaii as well in many other tropical countries worldwide. No other native insects were seen.

DISCUSSION AND RECOMMENDATIONS

The habitat in the proposed D.H.H.L. Villages of Leiali`i Phase 1-B Subdivision and Offsite Improvements Project area has been altered by over a century of agricultural activity and is now overwhelmingly dominated by non-native organisms. The project area is surrounded by similar habitat. Only a few highly adaptable native fauna species presently occur here.

The native globe skimmer dragonfly is indigenous and common in Hawaii and found in other places in the world. This species is not of any conservation concern.

The endemic and endangered nēnē goose (*Branta sandvicensis*) was not seen in the project area. It is known to frequent the margins of reservoirs and ditches where they feed and rest. There is none of this habitat in or around the project area. However, should they show up, they need space to be free from harassment or injury.

While not detected during the survey, the Endangered ʻōpeʻapeʻa or Hawaiian hoary bat was looked for at two different locations during an evening survey with the use of a bat detector (Batbox IIID) set to the frequency of 27,000 Hertz which these bats are known to emit when hunting for flying nocturnal insect prey. These wide-ranging bats are highly mobile as they follow spikes in insect prey but were not detected in the project area during the survey. If ʻōpeʻapeʻa show up the U.S. Fish and Wildlife Service should be consulted on how to proceed with project activities so that these bats will not be adversely affected.

Two native seabirds, the Endangered ʻuaʻu or Hawaiian dark-rumped petrel (*Pterodroma sandwichensis*) and the Threatened ʻaʻo or Newell's shearwater (*Puffinus newelli*), were also looked for during the evening surveys. These seabirds, which both nest high in the mountains between April and November, fly in from the ocean to their burrows during the evenings and then fly out to sea again at dawn each day to feed. In West Maui these seabirds when returning to their burrows call out to their mates which will return the calls. These calls are loud and can be heard at great distances. None of these calls were heard. Also, these seabirds are sometimes distracted by bright lights which can cause them to crash and be injured and sometimes killed by cats, dogs or mongoose. Young inexperienced birds, taking their first flights out to sea are particularly vulnerable. It is recommended that any significant outdoor lighting on structures at facilities be hooded to direct the light downward to minimize distractions and dangers to these birds.

With observance of the above recommendations, it is felt that the development of the D.H.H.L. Villages of Leiali`i Phase 1-B Subdivision and Offsite Improvements Project will not have any significant negative impacts on the fauna resources in this part of West Maui.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within three groups: Mammals, Birds and Insects. 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.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MAMMALS			
CANIDAE (Dog Family)			
Canis familiaris L.	domestic dog	non-native	rare
FELIDAE (Cat Family)			
Felis catus L.	domestic cat	non-native	rare
BIRDS			
COLUMBIDAE (Dove Family)			
Geopelia striata L.	zebra dove	non-native	common
Streptopelia chinensis Scopoli	spotted dove	non-native	rare
ESTRILDIDAE (Estrildid Finch Family)			
Lonchura cantans Gmelin	African silverbill	non-native	uncommon
FRINGILLIDAE (Cardueline Finch Family)			
Haemorhous mexicanus Muller	housefinch	non-native	uncommon
MIMIDAE (Mockingbird Family)			
Mimus polyglottus L.	northern mockingbird	non-native	rare
PASSERIDAE (Sparrow Family)			
Passer domesticus L.	house sparrow	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
INSECTS			
Order DIPTERA - flies			
CALLIPHORIDAE (Blowfly Family)			
Calliphora vomitoria L.	blowfly	non-native	uncommon
MUSCIDAE (Housefly Family)			
Musca sorbens Weidemann	dung fly	non-native	uncommon
Order LEPIDOPTERA - butterflies, moths			
CRAMBIDAE (Grass Moth Family)			
Spoladia recurvalis Fabricius	beet webworm moth	non-native	rare
LYCAENIDAE (Gossamer-winged Butterfly Family)			
Lampides boeticus L.	long-tailed blue butterfly	non-native	rare
NYMPHALIDAE (Brush-footed Butterfly Family)			
Danaus plexippus L.	monarch butterfly	non-native	rare
Order ODONATA - dragonflies, damselflies			
LIBELLULIDAE (Skimmer Dragonfly Family)			
Orthemis ferruginea Fabricius	roseate skimmer	non-native	rare
Pantala flavescens Fabricius	globe skimmer	indigenous	rare
Order ORTHOPTERA - grasshoppers, crickets			
ACRIDIDAE (Grasshopper Family)			
Oedaleus abruptus Thunberg	short-horned grasshopper	non-native	common
Trimerotropis pallidipennis Burmeister	pallid-winged grasshopper	non-native	rare

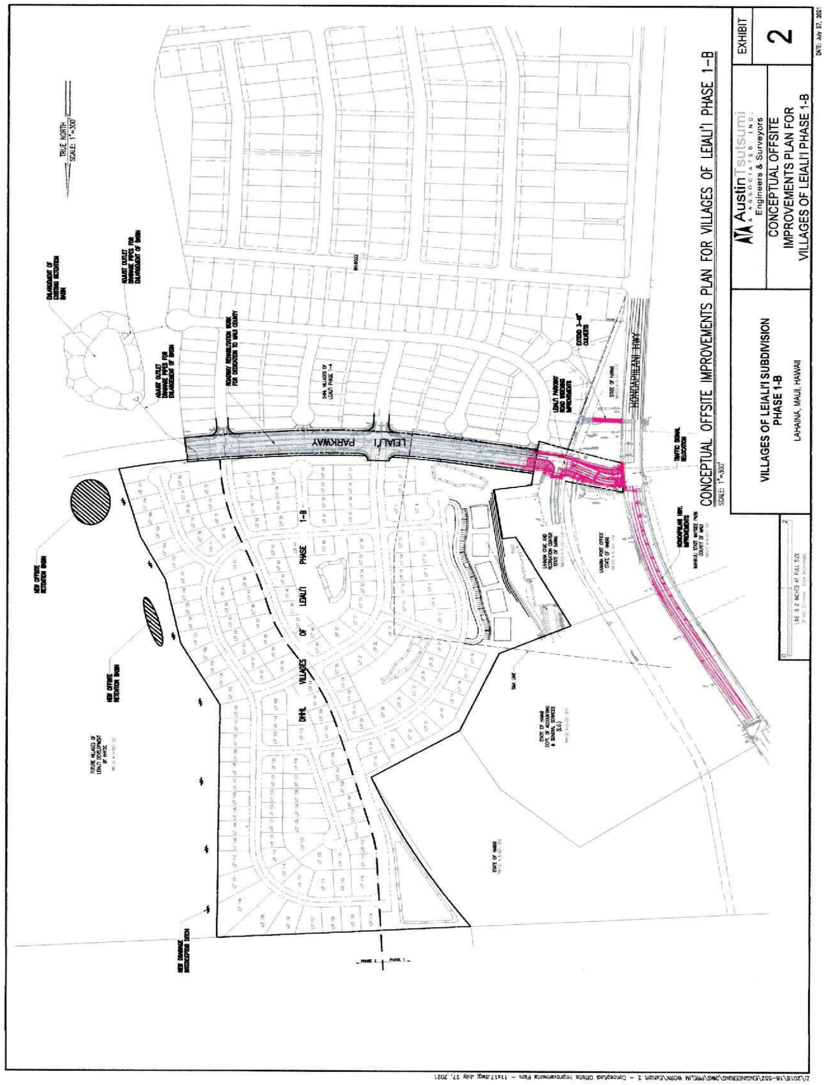

Figure 1. D.H.H.L. Villages of Leiali`i Phase 1-B Subdivision and Offsite Improvements, Lahaina, Maui.

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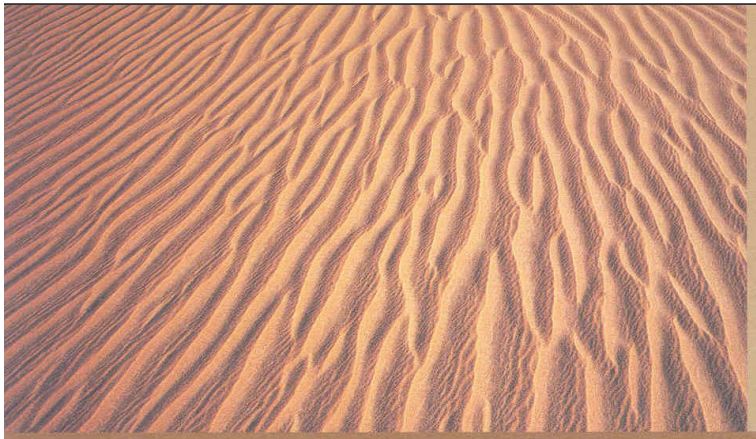
PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

APPENDIX E



Phase I Environmental Site Assessment

Project No. 2106-00227-PH1

Villages of Leialii 1B
TMK (2) 4-5-021: 020
Lahaina, Hawaii

prepared for

Munekiyo Hiraga

305 High Street, Suite 104

Wailuku, Hawaii

November 8, 2021

Prepared for:

Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, Hawaii

Phase I Environmental Site Assessment

Villages of Leialii 1B

Lahaina, Hawaii (no street address)

Tax Map Key (2) 4-5-021: 020

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ENPRO Project Number:	2106-00227-PH1
Date of Report:	November 8, 2021
On-Site Investigation:	September 23 and October 21, 2021

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PROJECT AT A GLANCE™

Assessment Component	Not Requested	Acceptable (†)	Routine Solution	Phase II ESA	Estimated Cost (‡)	Report Reference Section	
						Site	Adjoining Property
Historical Review				**1, 3**	**$90 to $110K**	**8.2**	
Regulatory Review		X					
Operations		X					
Hazardous Materials				**2**	**Included in 1**	**4.3, 7.2**	
Underground Storage Tanks		X					
Aboveground Storage Tanks		X					
Solid Waste		X					
Surface Areas				**2, 3**	**Included in 1**	**4.3, 7.2**	
Wells		X					
PCBs		X					
Asbestos	X						
Lead Based Paint	X						
Lead in Drinking Water	X						
Radon	X						
Mold	X						
Significant Data Gaps				**2, 3**	**Included in 1**	**4.3, 7.2**	

BOLD = Identified issues. Numbers reference Action Items listed on the following page.

(†) = Based on this preliminary study, it appears that further investigation in this area is not a priority concern for this site at the present time.

(‡) = Costs depicted are for investigation/program development activities. Remediation costs, if required, will be identified from investigation/program development activities.

Conditions noted in the Project at a Glance™ table represent the overall conditions of the Site. More specific details on assessment components may be included in the text of this report; therefore the Project at a Glance™ should not be used as a stand-alone document.

ACTION ITEMS

Based on our investigation, ENPRO Environmental (ENPRO) has concluded that there is sufficient risk to warrant additional investigation. ENPRO has identified the following action items and makes the following recommendations:

(1) Since the Site was used historically for agriculture, there is the potential that the soil is contaminated with petroleum, arsenic, and/or pesticides. Current State of Hawaii Department of Health (DOH) guidelines state that when property use changes from agricultural, soil sampling may be warranted to evaluate possible contamination.

ENPRO recommends conducting soil sampling at the Site.

(2) DOH documented a fueling station and visible soil contamination at the Site in 2005. Limited soil sampling later that year documented diesel and oil range hydrocarbons exceeding current environmental action levels in stockpiled soil at an unknown location on the Site (see Section 4.3 for additional information). The sampling does meet the current standard for soil sampling and the final disposition of the contaminated soil was not documented.

ENPRO recommends conducting soil sampling at the Site.

(3) Multiple structures were depicted on the southern portion of the Site in a 2000 aerial photograph. The structures and slabs have since been removed. The purpose of the structures was unknown and no soil sampling documentation at their location was available.

ENPRO recommends conducting soil sampling at the Site.

Further details regarding ENPRO's conclusions and recommendations may be found in Section 1.0 and Section 7.1 of this report.

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1.0 EXECUTIVE SUMMARY

ENPRO Environmental (ENPRO) was retained to conduct a Phase I Environmental Site Assessment (ESA) of the vacant parcel identified as TMK (2) 4-5-021: 020 in Lahaina, Hawaii (no street address) (the Site).

We have performed a Phase I ESA of the Site in conformance with the scope and limitations of ASTM E1527-13. Any exceptions to, or deletions from, this practice are described in Section 2.5 of this report.

This assessment has revealed no evidence of RECs in connection with the Site, except for the following:

- Former agricultural use. This finding is considered a REC because the Site is being redeveloped and agricultural land is known for petroleum, arsenic, and pesticide contamination. Refer to Sections 4.2 and 8.2 for additional information.
- Former fueling area with known contamination. This finding is considered a REC because previous sampling indicated diesel and oil range hydrocarbons exceeded the current environmental action levels and the final disposition of contaminated soil is unknown. Refer to Sections 4.3 and 7.3 for additional information.
- Previous slabs
- Data gap?

Recommendations for additional actions regarding the above conditions are listed in Section 8.1.

2.0 INTRODUCTION

2.1 PURPOSE OF THE PHASE I ENVIRONMENTAL SITE ASSESSMENT

The purpose of this ESA is to identify recognized environmental conditions. The term recognized environmental conditions means the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property:

(1) due to any release to the environment;

(2) under conditions indicative of a release to the environment; or

(3) under conditions that pose a material threat of a future release to the environment.

2.2 PHASE 1 ENVIRONMENTAL SITE ASSESSMENT PROCESS

The American Society for Testing and Materials (ASTM) is the recognized standards organization that has developed the Phase I ESA Standard E1527-13. All Appropriate Inquiries (AAI), which includes 40 CFR Part 312, §312.21 and §312.31, further defines the Phase I ESA process. The purpose of the ESA is to identify recognized environmental conditions (RECs) associated with a particular property.

ASTM E1527-13 defines three categories of RECs.

- A REC is defined as the presence or likely presence of any hazardous substance or petroleum product in, on, or at the Site:
  - Due to any release to the environment
  - Under conditions indicative of a release to the environment
  - Under conditions that pose a material threat of a future release to the environment
- Historical RECs (H-RECs) are defined as a past release of any hazardous substance or petroleum product that has occurred in connection with the Site and has been addressed to the satisfaction of the applicable regulatory authorities or meeting unrestricted use criteria established by a regulatory authority, without subjecting the Site to any required controls.
- Controlled RECs (C-RECs) are defined as a REC resulting from a past release that has been addressed to the satisfaction of the applicable regulatory authority, with

hazardous substances or petroleum products allowed to remain in place, subject to the implementation of required controls, such as Site use restrictions, activity and use limitations (AULs), institutional controls, or engineering controls.

Additionally, ASTM E1527-13 allows for the identification of *de minimis* conditions. A *de minimis* condition is defined as a condition that generally does not represent a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate government agencies. A condition determined to be *de minimis* is not a REC.

The scope of services in conducting this assessment included:

Records Review

- A review of:
  - environmental records
  - regulatory agency reports
  - permits
  - registrations
  - consultant's reports
- A review of historical uses of the Site by examining locally available:
  - aerial photographs
  - fire insurance maps
  - recorded land title records
  - USGS topographical maps
  - building department records
  - zoning/land use records
- A review of an environmental database search report of federal and state regulatory agency records.
- A review of regulatory agency files and records if the Site, or any of the adjoining properties, is identified on one or more of the standard environmental record sources in the database search.
- A review of readily available information describing the general geology and topography of the Site, local groundwater characteristics, sources of water, power and sewer, and proximity to ecologically sensitive receptors.

Site Reconnaissance

- A walkthrough inspection of the Site for visible evidence of RECs.
- A property line visual assessment of adjacent properties for evidence of potential offsite RECs that may affect the Site.

Interviews

Interviews with available key site personnel regarding current and previous activities on the Site, especially those involving the use of hazardous substances and petroleum products.

2.3 ENGAGEMENT

Munekiyo Hiraga (the Client) retained ENPRO to conduct a Phase I ESA of the Site.

This assessment was performed under the conditions of, and in accordance with ENPRO's Proposal Number 21E-0094-OGG dated May 10, 2021, the *ASTM E 1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* (ASTM E1527-13), and AAI which includes 40 CFR Part 312, §312.21 and §312.31. Any exceptions, additions to, or deletions from the ASTM E1527-13 or AAI practice, details of the work performed, sources of information, and findings are presented in the report.

2.4 SITE LOCATION AND LEGAL DESCRIPTION

The Site location and legal description are presented in Table 1.

Table 1
Location and Legal Description of the Site

Location Description	Site
Address	Villages of Leialii 1B, Lahaina, Hawaii (no street address)
TMK	(2) 4-5-021: 020
Latitude (North)	20.904288 - 20° 53' 15''
Longitude (West)	156.681281 - 156° 40' 53''
Elevation	116 feet above sea level
Distance and Direction to Surface Waters	Unnamed intermittent stream, approximately 340 feet south Pacific Ocean, approximately 485 feet west

2.5 LIMITING CONDITIONS

Access was provided to all known areas of the Site, except those obscured by vegetation.

No opinion regarding environmental conditions in areas that were not inspected can be formed.

As a matter of necessity, ENPRO relies largely on readily available sources of information such as the Client, public records, interviews, and contracted research firms for recognizing potential environmental liabilities at a property/facility. Requests for information resources are made to collect relevant data on current and past practices conducted at the property/facility. ENPRO may not receive all information requested or be able to confirm received information during the course of the environmental site assessment. Therefore, ENPRO shall not be held responsible for errors, omissions, or misrepresentations resulting from missing documentation or from inaccurate information provided by such sources.

2.6 DEVIATIONS, EXCEPTIONS, AND SIGNIFICANT ASSUMPTIONS

Deviations

This Phase 1 ESA did not include any deviations from the ASTM Standard Practice E1527-13.

Exceptions

This Phase 1 ESA did not include any exceptions from the ASTM Standard Practice E1527-13.

Significant Assumptions

ENPRO, in part, has relied on information supplied by the Client or the Client's agent(s), and assumes such information to be factual.

The commercial regulatory database search report, summarizing federal and state regulatory agency records, is provided by a contracted data research firm. The information provided is assumed to be correct unless otherwise noted.

Unless otherwise discovered during review, all other sources of information, whether verbal or written, are assumed to be factual.

2.7 SPECIAL TERMS AND CONDITIONS

This Phase 1 ESA did not include any special terms or conditions.

3.0 USER PROVIDED INFORMATION

A User questionnaire was completed by Mr. Bryan Esmeralda, consultant for the Site with Munekiyo Hiraga, on behalf of the Client. A copy of the completed User questionnaire is included in the appendix section of this report.

3.1 ENVIRONMENTAL LIENS AND ACTIVITY AND USE LIMITATIONS

Per ASTM, environmental liens and activity and use limitations (AULs), commonly found within recorded land title records, are to be provided to the environmental professional by the User.

This search for environmental liens and AULs is in addition to ENPRO's search of institutional and engineering controls discussed in Section 4.4, if discovered during the regulatory records review.

The User did not provide environmental liens or AULs information associated with the Site.

3.2 SPECIALIZED KNOWLEDGE

Mr. Esmeralda did not report any specialized knowledge of any RECs in connection with the Site.

3.3 COMMONLY KNOWN OR REASONABLY ASCERTAINABLE INFORMATION

The User reported that the Site was previously used for sugar cultivation.

3.4 VALUATION REDUCTION

Mr. Esmeralda revealed that the purchase price of the Site was significantly less than the purchase price of comparable properties.

3.5 OBVIOUS INDICATORS OF PRESENCE OR LIKELY PRESENCE OF CONTAMINATION AT THE SITE

Mr. Esmeralda stated that there were no obvious indicators that point to the presence or likely presence of contamination at the Site.

3.6 REASONS FOR PERFORMING PHASE I ENVIRONMENTAL SITE ASSESSMENT

The User stated that the purpose for conducting the Phase I ESA was to perform adequate due diligence before redeveloping the Site.

4.0 RECORDS REVIEW

4.1 PHYSICAL SETTING SOURCES

Topography

Review of the topographic map published by the United States Geological Survey (USGS) (2013) indicated the following significant information:

The Site elevation was approximately 115 feet above mean sea level.

The Site region was moderately sloping to the west.

The nearest body of water was an unnamed intermittent stream approximately 340 feet south of the Site. The Site is within 150 meters of a surface water body.

Soils

A review of the soil type of the area was performed. The soil survey of the island of Maui is published by the USDA Natural Resources Conservation Service in cooperation with the United States Department of Agriculture (USDA) Soil Conservation Service and University of Hawaii Agricultural Experiment Station. USDA soil survey data is available at http://websoilsurvey.nrcs.usda.gov/app/ and was accessed on September 30, 2021. The following information is pertinent to the Site:

The Site was situated on soil classified as Wahikuli stony silty clay and Wahikuli very stony silty clay.

Wahikuli stony and very stony silty clay consists of well-drained soils on uplands on the island of Maui. The soils developed in material weathered from basic igneous rock.

Geology/Hydrogeology

Groundwater beneath the Site occurs in one distinct aquifer within the Honokowai Aquifer System of the Lahaina Aquifer Sector. The aquifer is classified as a basal, unconfined, flank aquifer, occurring in horizontally extensive lavas. The groundwater status is reported as being currently in use for drinking water purposes. The salinity of the groundwater within this aquifer is described as fresh (<250 milligrams per liter Cl^-). The groundwater is further described as irreplaceable, with a high vulnerability to contamination (Mink and Lau, 1990).

A review of the State of Hawaii Department of Health (DOH) Safe Drinking Water Branch contamination maps identified no water wells in the vicinity of the Site.

The Site is located above the underground injection control line and there are two active drinking water wells within a half a mile of the Site.

The hydrogeologic gradient in the vicinity of the Site is anticipated to be slight with a general trend to the west direction. Groundwater levels may be influenced by leaking infrastructure and tidal fluctuations.

4.2 HISTORICAL USE REVIEW

The objective of consulting historical sources is to develop a history of the previous uses of the property, adjacent properties, and surrounding area to help identify the likelihood that past uses have resulted in RECs.

The following tables summarize relevant historical uses based on our review of the historical sources available for this assessment, as listed in Section 9.0.

Table 2
Historical Uses of the Site

Date	Observation/Use	Source
1923	No structures were depicted at the Site	Topographic map
1950	The Site appeared to be used for agricultural purposes.	Aerial photograph
2000	Several structures and a paved road were depicted at the southern portion of the Site.	Aerial photograph

The review of historical uses did not identify potential RECs, except for potential pesticide application beneath the former slabs on the southern portion of the Site. However, historical agricultural use indicates the potential presence of soil contaminants such as petroleum products, arsenic, and organochlorine pesticides and becomes a REC when the land use changes.

Table 3
Historical Uses of Adjacent and Surrounding Properties

Date	Observation/Use	Source
1923	The "Pioneer Mill" Railroad was depicted to the east of the Site and the surrounding areas were labeled as the "Lahaina District."	Topographic map
1956	The railroad was no longer depicted.	Topographic map
1983	A fire station was depicted to the west of the Site.	Topographic map

The review of historical uses identified railroad lines to the east of the Site between 1923, or earlier, and the early 1950s. The railroad was sufficiently distant from the Site and is not considered a REC.

4.3 PREVIOUS ENVIRONMENTAL REPORTS

ENPRO reviewed the following documents:

Request for Right of Entry, State of Hawaii Department of Health (DOH), March 2005

This document denied Goodfellow Bros, Inc. (Goodfellow) an extension to their Right of Entry due to the presence of "materials and debris, rock piles, several fuel tanks, waste barrels and ground contamination in and around the fuel tanks and barrels" that were observed during a March 2005 Site inspection.

The letter requests an assessment from an independent hazardous waste consultant to verify that the fuel tanks have been removed and contamination has been remediated. No map indicating the presence of the fuel tanks or contamination was included, and as such is considered a significant data gap.

Limited Environmental Soil Sampling Survey, Vuich Environmental Consultants, Inc. (Vuich), July 2005

Goodfellow removed the fueling area soils, gravel, and poly liner from the Site prior to Vuich's sampling event. Vuich collected four discrete soil samples and one composite sample as follows:

- Two discrete soil samples from 3 to 5 inches below ground surface (bgs), one from the former fuel area and one downgradient of the former fuel area

- Two discrete soil samples from 8 to 10 inches bgs, one from the former fuel area and one downgradient of the former fuel area
- One composite soil sample from a soil stockpile to the north of the former fueling area

Diesel was detected at concentrations less than the current, most conservative DOH Tier 1 Environmental Acton Levels (EALs) in in-situ soils from both the former fuel area and one downgradient of the former fuel area. Diesel and residual range organics (RRO) were detected at concentrations greater than the current, most conservative DOH EALs in the composite soil sample collected from the stockpiled soil.

While the report recommends no additional action, the sampling was not conducted in accordance with the current accepted methods, nor was final disposition of the contaminated soil stockpile documented. No map indicating the sampling locations was included, and as such is considered a significant data gap.

4.4 STANDARD ENVIRONMENTAL RECORD RESOURCES: FEDERAL, STATE AND LOCAL DATABASE SEARCH

The regulatory database search report prepared by EDR was reviewed to evaluate the Site and listed properties within ASTM recommended search distances.

The Site

The Site was not listed in the EDR regulatory database search report.

Adjacent and Surrounding Properties

The EDR regulatory database search report identified a total of four sites within the ASTM minimum search distances from the Site.

Most of the listed sites are not expected to present an environmental concern to the Site because, based upon ENPRO's review:

1. They only hold an operating permit (which does not imply a problem) or,
2. They were identified for past regulatory requirements that require no future action or,
3. They are too distant and/or hydrogeologically down gradient or cross gradient relative to the Site.

The EDR regulatory database search report identified four "orphan" sites within the ASTM minimum search distances from the Site. It is ENPRO's opinion that none of the orphan sites are close enough to the Site to constitute a REC expected to impact the Site.

4.5 VAPOR ENCROACHMENT SCREENING

The EDR Radius Map provided an initial search of all standard government record databases and EDR historical records within the ASTM E1527-13 recommended radii. ENPRO reviewed those sites related to former dry cleaners, gas stations and manufactured gas plants which met the criteria for vapor encroachment screening (VES) as provided by the ASTM E2600-10 *Standard Guide for Vapor Encroachment Screening of Property Involved in Real Estate Transactions* (ASTM E2600-10).

ENPRO reviewed the regulatory database search of those sites for recorded releases of contaminants of potential concern (COPCs) within the 1/3-mile and 1/10-mile approximate minimum distances defined in ASTM E2600-10 for vapor encroachment from COPC-contaminated sites. This measurement is based upon the distance from the known or suspect contaminated property to the Site boundary. ENPRO's review of EDR's database search for potential VECs takes into account the following factors:

- The land use of the Site
- Type of COPC(s)
- Location of known or suspect contaminated property is within the area of concern
- Characteristics of the soil
- Depth to groundwater
- Vapor conduits that may result in significant preferential pathways
- Cleanup status of contaminated property

Potential VECs evaluated included all RECs, including H-RECs and C-RECs, with identified releases of petroleum products or other potentially volatile contaminants of concern. As is provided by ASTM E2600-10, ENPRO also considered the predicted hydrogeological gradient around the Site when determining the potential for VECs to impact the site.

ENPRO did not identify any potential VECs within the recommended radii provided in ASTM E2600-10 with the potential to impact the Site.

4.6 ADDITIONAL ENVIRONMENTAL RECORD RESOURCES: STATE AND LOCAL AGENCIES

ENPRO reviewed files from the following agencies:

- DOH Solid and Hazardous Waste Branch (SHWB)
  - 1762 Honoapiilani Highway
- DOH Hazard Evaluation and Emergency Response (HEER) Office
- City and County of Maui Fire Department
- City and County of Maui Building, Planning and/or Zoning Departments

There were no records indicating possible evidence of RECs associated with the Site, adjacent properties, or surrounding properties.

No records specific to the Site were available.

5.0 SITE RECONNAISSANCE

Site reconnaissance was performed by Shea Momohara on September 23, 2021 and Kenton Beal on October 21, 2021. Site reconnaissance was conducted on foot and by Jeep. Access was provided to all known areas of the Site, except those obscured by vegetation.

No opinion is provided regarding environmental conditions in areas that were not inspected.

5.1 OBSERVED CURRENT AND HISTORICAL USES OF THE SITE

No buildings, structures, roads, or other improvements were observed at the Site at the time of this investigation.

Site Environmental Site Conditions

Table 4 summarizes the site inspection and findings of environmental conditions at the Site.

Table 4
Site Environmental Conditions

Item	Observation	Findings
Aboveground Storage Tanks (ASTs)	No ASTs or associated dispensers and piping were observed on the Site.	Not a REC
Underground Storage Tanks (USTs)	No USTs or associated dispensers and piping were observed on the Site.	Not a REC
Odors	No unusual odors were noted at the Site on the day of the site reconnaissance.	Not a REC
Pools of Liquid	Standing surface water, pools, catchment structures, and/or sumps containing liquids or oily sheen likely to be hazardous substances or petroleum products were not observed on the Site during the site reconnaissance.	Not a REC
Pits, Ponds, or Lagoons	No pits, ponds, stormwater catchment basins, retention structures, or lagoons were observed on the Site during the site reconnaissance.	Not a REC
Drums	No drums were observed on the Site during the Site reconnaissance.	Not a REC
Hazardous Substances or Petroleum Products	No containers identified as containing hazardous substances or petroleum products were observed at the Site during the site reconnaissance.	Not a REC

Table 4
Site Environmental Conditions

Item	Observation	Findings
Unidentified Substance Containers	No containers containing unidentified substances suspected of being hazardous substances or petroleum products were observed at the Site during the site reconnaissance.	Not a REC
Polychlorinated Biphenyls (PCBs)	No electrical or hydraulic equipment known or likely to contain PCBs was visually observed at the Site.	Not a REC
Surface Stains or Corrosion	No stains or corrosion indicative of hazardous substances or petroleum products were observed on the Site.	Not a REC
Drains, Sumps, or Other Discharge Features	No drains, sumps, or other discharge features were observed on the Site.	Not a REC
Stained Soil or Stressed Vegetation	Minor soil staining was observed at the Site east of the graded and bermed area.	De minimis
Solid Waste or Fill Dirt	Small quantities of inert materials were discarded (construction debris, concrete, etc.) throughout the Site.	Not a REC
Wastewater	No wastewater or other liquids, including stormwater that discharges into a drain, ditch, underground injection system, or stream on or near the Site, were observed during the site reconnaissance. Storm water runoff from the Site flows to the west via sheet flow and drainage channels. Some storm water is expected to percolate into exposed soil.	Not a REC
Wells	No dry wells, irrigation wells, injection wells, abandoned wells, or monitoring wells were observed on the Site during the site reconnaissance. However, a suspect piezometer was observed at the Site.	Not a REC
Septic Systems	No septic systems were observed during the Site reconnaissance.	Not a REC
Wetland Areas or Surface Waters	Areas that may be wetlands or nearby surface water bodies were not observed on or near the Site. There were not obvious signs of filling of wetlands.	Not a REC

There were no observed RECs on the Site.

5.2 OBSERVED USES OF ADJACENT AND SURROUNDING PROPERTIES

The area surrounding the Site consisted of residential, commercial, and undeveloped properties. Adjoining and surrounding properties were observed from the Site and from public access lands for signs of RECs and their potential to pose an environmental concern to the Site. These properties are listed in the table on the following page.

Table 5
Summary of Surrounding Property Use

Direction	Property	Use
North	Vacant Land	None
South	Residential Community	Residential
East	Vacant Land	None
West	Lahaina Fire Station Lahaina Comprehensive Health Center Lahaina Civic Center Tennis Courts	Fire Station Medical Facility Civic Center Recreation

RECs were not observed on adjoining or surrounding properties.

6.0 INTERVIEWS

Interviews with individuals having past or present knowledge of the Site and adjoining/adjacent properties, such as owners, key site managers, occupants, and neighbors are routinely conducted to obtain information indicating RECs in connection with the Site. The following individuals were interviewed:

Table 6
Key Site Interviews

Interviewee Name	Relationship to Site	Length of Time Familiar with Site	Date of Interview
Mr. Bryan Esmeralda	User	< 1 year	08/04/2021
Mr. Stewart Matsunaga	Owner	16 years	08/06/2021

6.1 OWNER

Mr. Stewart Matsunaga, acting administrator for the Site, completed a Site questionnaire supplied by ENPRO. A copy of the completed Site questionnaire is included in the appendix section of this report.

The Site

Mr. Matsunaga has been familiar with the Site for 16 years and reported the following relevant information regarding the Site:

- The Site had previously been used for sugar cane cultivation.
- There were irrigation control boxes and telecom boxes present at the Site.
- There was water-stressed vegetation at the Site

Adjoining and Adjacent Properties

Mr. Matsunaga reported no information regarding past or present contamination and/or activities on adjacent properties that may have resulted in contamination of the Site, except that those adjacent properties had previously been used for sugar cane production.

6.3 USER

Mr. Bryan Esmeralda, consultant for the Site with Munekiyo Hiraga, completed a Site questionnaire supplied by ENPRO. A copy of the completed Site questionnaire is included in the appendix section of this report.

The Site

Mr. Esmeralda has been familiar with the Site for less than one year and reported no information regarding past or present contamination and/or activities on the Site that may have resulted in contamination of the Site, except that the Site had been used for sugar cane production.

Adjoining and Adjacent Properties

Mr. Esmeralda reported no information regarding past or present contamination and/or activities on adjacent properties that may have resulted in contamination of the Site.

7.0 EVALUATION

This section documents the findings, opinions, and conclusions of the Phase I ESA. ASTM E1527-13 does not require the environmental professional to provide recommendations regarding identified environmental conditions at the Site. As a service to its clients, ENPRO provides recommendations to further evaluate and/or address environmental concerns in Section 8.1 of this report.

7.1 FINDINGS, OPINIONS, AND CONCLUSIONS

We have performed a Phase I ESA of the Site in conformance with the scope and limitations of ASTM E1527-13. Any exceptions to, or deletions from, this practice are described in Section 2.5 of this report.

This assessment has revealed no evidence of RECs in connection with the Site, except for the following:

- Former agricultural use. This finding is considered a REC because the Site is being redeveloped and agricultural land is known for petroleum, arsenic, and pesticide contamination. Refer to Sections 4.2 and 8.2 for additional information.
- Former fueling area with known contamination. This finding is considered a REC because previous sampling indicated diesel and oil range hydrocarbons exceeded the current environmental action levels and the final disposition of contaminated soil is unknown. Furthermore, the fueling area location was not documented. Refer to Sections 4.3 and 7.3 for additional information.
- Multiple structures were depicted on the southern portion of the Site in a 2000 aerial photograph. The structures and slabs have since been removed. The purpose of the structures was unknown and no soil sampling documentation at their location was available.

Recommendations for additional actions regarding the above conditions are listed in Section 8.1.

7.2 DATA GAPS

Data gaps are not uncommon in ESAs. A data gap by itself is not inherently significant. The significance is determined by other information and professional experience

as to whether the data gap raises reasonable concerns about activities that may present a REC. According to ASTM E1527-13 and AAI, the Phase I ESA report shall identify and comment on significant data gaps that affect the ability of the environmental professional to identify RECs and name the sources of information that were consulted to address the data gap.

The following significant data gaps were encountered:

- A known diesel and oil-contaminated stockpile was located at the Site adjacent to a former fueling area. Neither the fueling area location or final disposition of the contaminated soil are known.
- The purpose of structures observed at the southern side of the Site were unknown.

7.3 CERTIFICATIONS

ENPRO has completed a Phase I ESA in conformance with the scope and limitations of ASTM Practice E1527-13 of the Site. Any exceptions to, deletions from, this practice are described in Section 2.5 of this report. This assessment was performed at the request of the Client, using the methods and procedures consistent with good commercial and customary practices designed to conform to acceptable industry standards.

The information and opinions rendered in this report are intended for the Client for the purposes stated herein (see Section 2.2). This report is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose except as described below without the advance written consent of ENPRO. ENPRO shall not distribute nor publish this report without the consent of the Client except as required by law or court order. The information and opinions expressed in this report are given in response to a limited assignment and should be considered and implemented considering that assignment.

The Client may rely upon this report in evaluating a request for one or more extensions of credit to be secured directly or indirectly by the Site (including mortgage and mezzanine loans) and the acquisition of the direct or indirect interest in the Site as applicable.

In expressing the opinions stated in this report, ENPRO has exercised a degree of skill and care ordinarily exercised by a reasonable prudent environmental professional in the same community and in the same time frame given the same or similar facts and circumstances. Documentation and data provided by the Client, designated representatives of the Client or other interested third parties, or from the public domain, and referred to in the preparation of this assessment, have been used and referenced with the understanding that ENPRO assumes no responsibility or liability for their accuracy.

The independent conclusions represent our professional judgment based on information and data available to us during the course of this assignment. Factual information

regarding operations, conditions, and test data provided by the Client or their representatives has been assumed to be correct and complete. The conclusions presented are based on the data provided, observations, and conditions that existed on the date of the site visit.

If you have any questions regarding this report, please contact the ENPRO contact listed on the cover of this report at (808) 748-2114.

Researched by: Kimberly Rottas, Environmental Consultant

Surveyed by: Shea Momohara, Environmental Consultant

Kenton Beal, Executive Vice President

Written by: Kimberly Rottas, Environmental Consultant

I declare that to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in §312.10 of 40 CFR Part 312.

I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the property. I have developed and performed all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Reviewed by:

Kenton Beal
Executive Vice President, ENPRO Environmental

8.0 NON-SCOPE SERVICES

Recommendations are an additional service that may be useful in the User's analysis of the Site. Unless otherwise directed by the Client, it is ENPRO's standard practice to include recommendations for addressing all identified RECs at the Site.

ENPRO may also make recommendations regarding conditions identified at the Site which are not considered RECs, such as the proper storage of hazardous materials, the potential presence of asbestos containing materials, and the presence of ecological or cultural resources. Except where otherwise specified, there are no legal or regulatory requirements for the Client or the Site owner to follow the recommendations presented in this report.

8.1 RECOMMENDATIONS

Based on the RECs identified in this investigation, ENPRO recommends the following additional actions and/or investigations:

- Former agricultural use. Conduct Phase II soil sampling throughout the Site to determine if soil contaminants are present. If contaminants are identified, additional sampling may be required to delineate the extent of the contamination.

  Associated cost estimate for Phase II ESA……$90,000 to $110,000
- Former fueling area with known contamination. Conduct further research to identify the location of this area. Conduct Phase II soil sampling to assess if soil contaminants are present. If contaminants are identified, additional sampling may be required to delineate the extent of the contamination. Due to the nature of contaminants, this issue is addressed within the scope of work for the former agricultural use sampling (above).
- Former structures at south end of Site. Conduct further research to assess the function of these structures. This issue is addressed within the scope of work for the former agricultural use sampling (above).

8.2 ADDITIONAL ENVIRONMENTAL CONCERNS, NON-ASTM

The following environmental conditions were evaluated for the potential to impact the Site though they are not considered RECs as defined by ASTM.

Sensitive Ecological Areas

According to the EDR report, no areas were depicted as sensitive ecological areas or federal wetlands.

Former Agricultural Use

Based on a review of aerial photographs and interviews with persons knowledgeable of the Site, the Site was used as a historic sugar cane plantation (see Section 4.2). Since the Site was used for agriculture, there is the potential that the soil is contaminated with pesticides and/or dioxins. Current State of Hawaii Department of Health (DOH) guidelines state that when property use changes from agricultural, soil sampling may be warranted to evaluate possible contamination from pesticides, herbicides, and other agricultural chemicals.

The historical agricultural use of the Site and its region may be a cause for environmental concern because of pesticides and herbicides commonly used in agriculture. However, historical research has not identified the Site as an area of mixing or storage of chemicals.

According to Hawaii Administrative Rules (HAR) Chapter 128D Environmental Response Law, the use of agricultural chemicals does not constitute a release of hazardous substance. Section 128-D 1 of the HAR, excludes "any release resulting from the legal application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act."

However, the DOH HEER Office current guideline on the assessment of pesticides in former agricultural lands and related areas, May 2007, recommends that sites where pesticides may have been regularly applied in the past be tested for residual contamination prior to redevelopment.

A copy of the State of Hawaii Department of Health *Pesticides in Former Agricultural Lands and Related Areas Updates on Investigation and Assessment* and the HEER Office Technical Guidance Manual (TGM) Section 9.1 *Pesticide Contamination at Former Agricultural Facilities and Sites* are included in the appendix.

9.0 REFERENCES

Publications:

Names of Publication: Aquifer Identification and Classification for Maui: Groundwater Protection Strategy for Hawaii
Author of Publication: Mink, J.F. and L.S. Lau
Published by: Water Resources Research Center, University of Hawaii at Manoa, Honolulu, Hawaii
Date of Publication: 1990
Information Obtained: Groundwater data

Names of Publication: Groundwater Well Index
Author of Publication: State of Hawaii, Department of Natural Resources, Commission on Water Management
Date of Publication: January 2001
Information Obtained: Groundwater wells

Names of Publication: Ownership records and Tax Map Key maps
Author of Publication: County of Maui
Information Obtained: Ownership records

Names of Publication: Aerial Photograph
Published by: Environmental Data Resources, Inc.
Date of Publication: 1950, 1965, 1975, 1977, 2000
Information Obtained: Historical use

Names of Publication: Sanborn Fire Insurance Maps
Published by: Environmental Data Resources, Inc.
Information Obtained: Historical use

Names of Publication: Code of Federal Regulations, Title 40, Part 761, Rules for Controlling PCBs under the Toxic Substance Control Act,
Author of Publication: U.S. Environmental Protection Agency
Date of Publication: December 14, 1990
Information Obtained: PCB regulations

Names of Publication: Soil Survey for the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii
Author of Publication: Foote, Donald E. et al.
Published by: U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the University of Hawaii Agricultural Experiment Station.
Date of Publication: 1972
Information Obtained: Soil classification

Names of Publication: The EDR Radius Map Report
Author of Publication: Environmental Data Resources, Inc.
Date of Publication: July 2, 2021
Information Obtained: Regulatory database records

Names of Publication: Topographic Maps, Lahaina and Lanai North Quadrangles, Hawaii
Author of Publication: United States Geological Survey (USGS)
Date of Publication: 1923, 1956, 1961, 1983, 1992, 2013
Information Obtained: Historical use

Names of Publication: Request for Right of Entry
Author of Publication: DOH
Date of Publication: March 9, 2005
Information Obtained: Historical Site use

Names of Publication: Limited Environmental Soil Sampling Survey
Author of Publication: Vuich Environmental Consultants, Inc.
Date of Publication: July 5, 2005
Information Obtained: Historical Site use

Contacts:

Agency or Business: Munekiyo Hiraga
Representative: Mr. Bryan Esmeralda
Telephone Number: 808-983-1233
Date Received: August 4, 2021
Information Obtained: Historical and current Site use

Agency or Business: State of Hawaii Department of Hawaiian Home Lands
Representative: Mr. Stewart Matsunaga
Telephone Number: 808-620-9283
Date Received: August 6, 2021
Information Obtained: Historical and current Site use

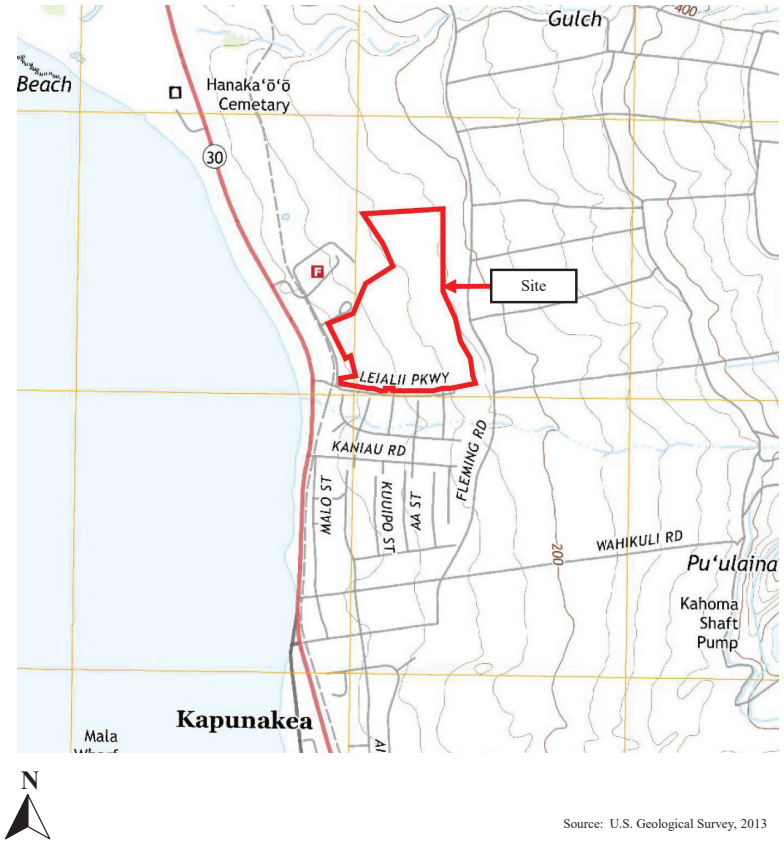
Agency or Business:	Solid and Hazardous Waste Branch (SHWB)
Location of Agency:	2827 Waimano Home Road, Suite 100, Pearl City
Telephone Number:	808-586-4226
Date Received:	July 29, 2021
Information Obtained:	Regulatory records

Agency or Business:	Hazard Evaluation and Emergency Response (HEER)
Location of Agency:	2385 Waimano Home Road, Suite 100, Pearl City
Telephone Number:	808-586-4249
Date Received:	July 6, 2021
Information Obtained:	Regulatory records

10.0 APPENDICES

Site Figures
Site Photographs
Historical Research
Regulatory Records Documentation
Records of Communication/Interview
References
Qualifications of Environmental Professionals

SITE FIGURES



Source: U.S. Geological Survey, 2013

Figure 1
TOPOGRAPHIC MAP

Scale: 1 inch = 2,000 feet

Project Number: 2106-00227-PH1
Villages of Leialii 1B

N

Source: Google Earth 2021

Figure 2
AERIAL PHOTOGRAPH

Scale: 1 inch = Approximately 1,000 feet

Project Number: 2106-00227-PH1
Villages of Leialii 1B

N

Source: Google Earth 2021

Figure 3
AERIAL PHOTOGRAPH

Scale: 1 inch = Approximately 500 feet

Project Number: 2106-00227-PH1
Villages of Leialii 1B

SITE PHOTOGRAPHS

Photo 1

Entrance at East end of Leialii Parkway – Facing East

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 2

Site Overview – Facing West from Eastern Property Boundary

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 3

Northern Site Boundary – Facing West

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 4

Graded and Bermed Area South of Site (Parking Lot)

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 5

Inert Debris South of Graded/Bermed Area

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 6

Stained Soil East of Graded and Bermed Area

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 7

Precast Infrastructure Discarded Near South End of Site

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 8

Lahaina Comprehensive Health Center – Adjacent Property to the Northwest

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 9

Residential Properties – Adjacent Properties to the South

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos: September 23 and October 21, 2021

Photo 10

Tennis Courts on Adjacent Property to the West

Project Number: 2106-00227-PH1

Villages of Leialii 1B

Date of Photos September 23 and October 21, 2021

HISTORICAL RESEARCH

Villages of Leialii 1B
Leialii Parkway
Lahaina, HI 96761

Inquiry Number: 6562357.4
July 02, 2021

EDR Historical Topo Map Report
with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topo Map Report

07/02/21

Site Name:	Client Name:
Villages of Leialii 1B	ENPRO, Env. Professionals
Leialii Parkway	151 Hekili Street Suite 210
Lahaina, HI 96761	Kailua, HI 96734
EDR Inquiry # 6562357.4	Contact: Kim Kim

EDR Topographic Map Library has been searched by EDR and maps covering the target property location as provided by ENPRO, Env. Professionals were identified for the years listed below. EDR's Historical Topo Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topo Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the late 1800s.

Search Results:		*Coordinates:*	
P.O.#	2106-00227-PH1	**Latitude:**	20.904288 20° 54' 15" North
Project:	Villages of Leialii 1B	**Longitude:**	-156.681281 -156° 40' 53" West
		UTM Zone:	Zone 4 North
		UTM X Meters:	741184.41
		UTM Y Meters:	2313296.97
		Elevation:	115.94' above sea level

Maps Provided:

2013
1992
1983
1961
1956
1923

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Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

2013 Source Sheets

Lahaina

7.5-minute, 24000

Lanai North OE E

7.5-minute, 24000

1992 Source Sheets

Lahaina

7.5-minute, 24000
Aerial Photo Revised 1992

1983 Source Sheets

LAHAINA

7.5-minute, 24000

1961 Source Sheets

MAUI

15-minute, 62500

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1956 Source Sheets

Lahaina

7.5-minute, 24000
Aerial Photo Revised 1950

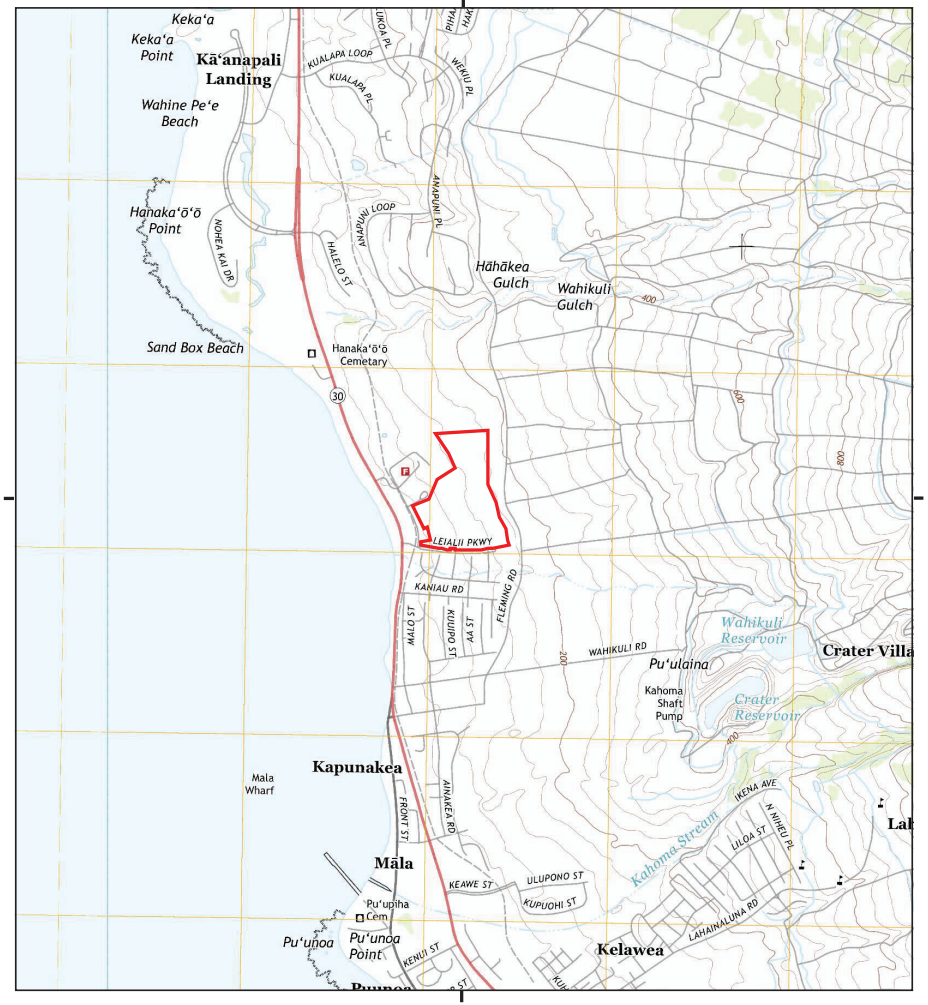
1923 Source Sheets

MALA

7.5-minute, 31680

Historical Topo Map

2013



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Lahaina, 2013, 7.5-minute
W, Lanai North OE E, 2013, 7.5-minute

SITE NAME: Villages of Leialii 1B
ADDRESS: Leialii Parkway
Lahaina, HI 96761
CLIENT: ENPRO, Env. Professionals

N

Historical Topo Map

1992

This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

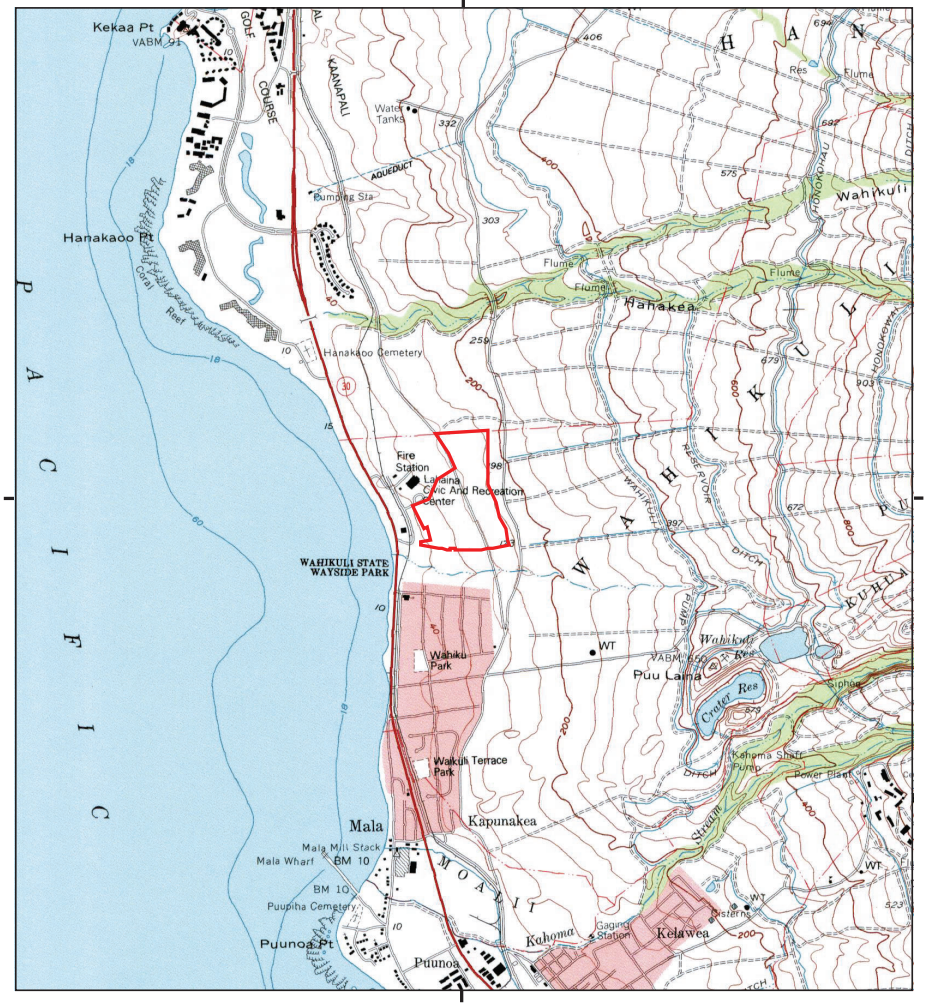
TP, Lahaina, 1992, 7.5-minute

SITE NAME: Villages of Leialii 1B
ADDRESS: Leialii Parkway
Lahaina, HI 96761
CLIENT: ENPRO, Env. Professionals

N

Historical Topo Map

1983



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NW N NE
W E
SW S SE

TP, LAHAINA, 1983, 7.5-minute

SITE NAME: Villages of Leialii 1B
ADDRESS: Leialii Parkway
Lahaina, HI 96761
CLIENT: ENPRO, Env. Professionals

N

Historical Topo Map

1961

This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

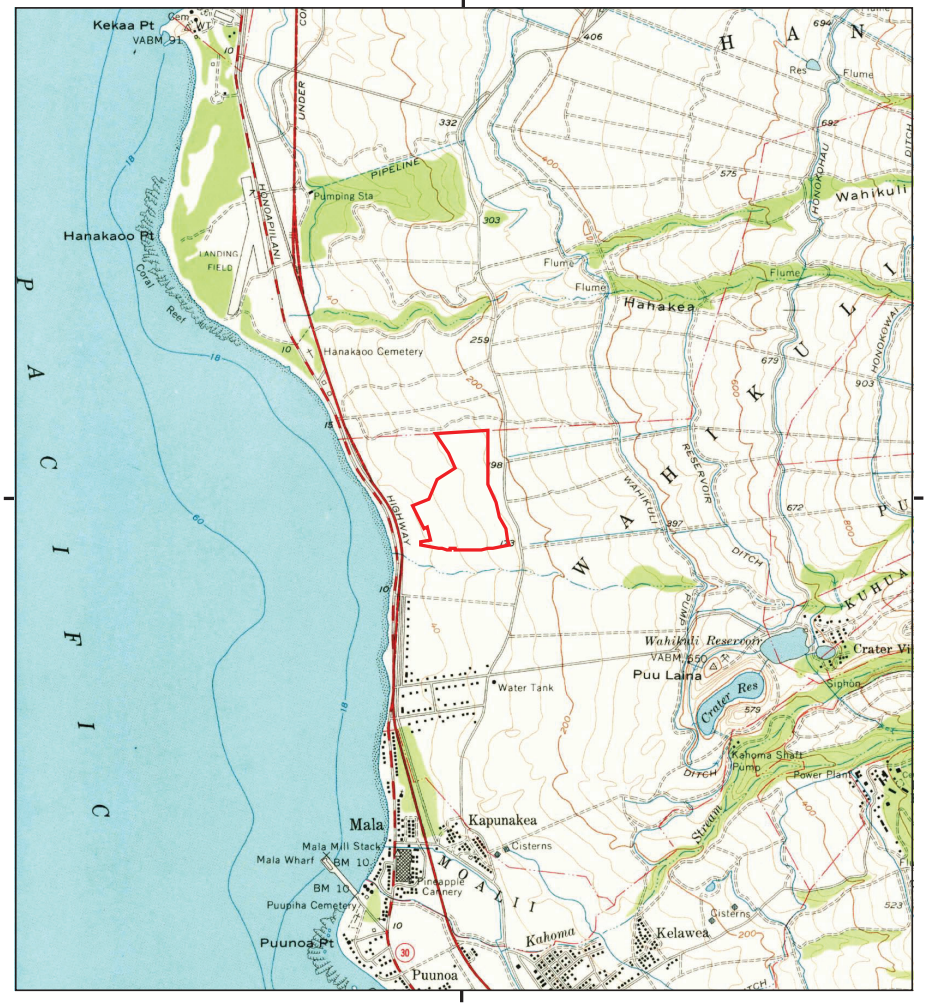
TP, MAUI, 1961, 15-minute

SITE NAME: Villages of Leialii 1B
ADDRESS: Leialii Parkway
Lahaina, HI 96761
CLIENT: ENPRO, Env. Professionals

N

Historical Topo Map

1956



This report includes information from the following map sheet(s).

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NW N NE
W E
SW S SE

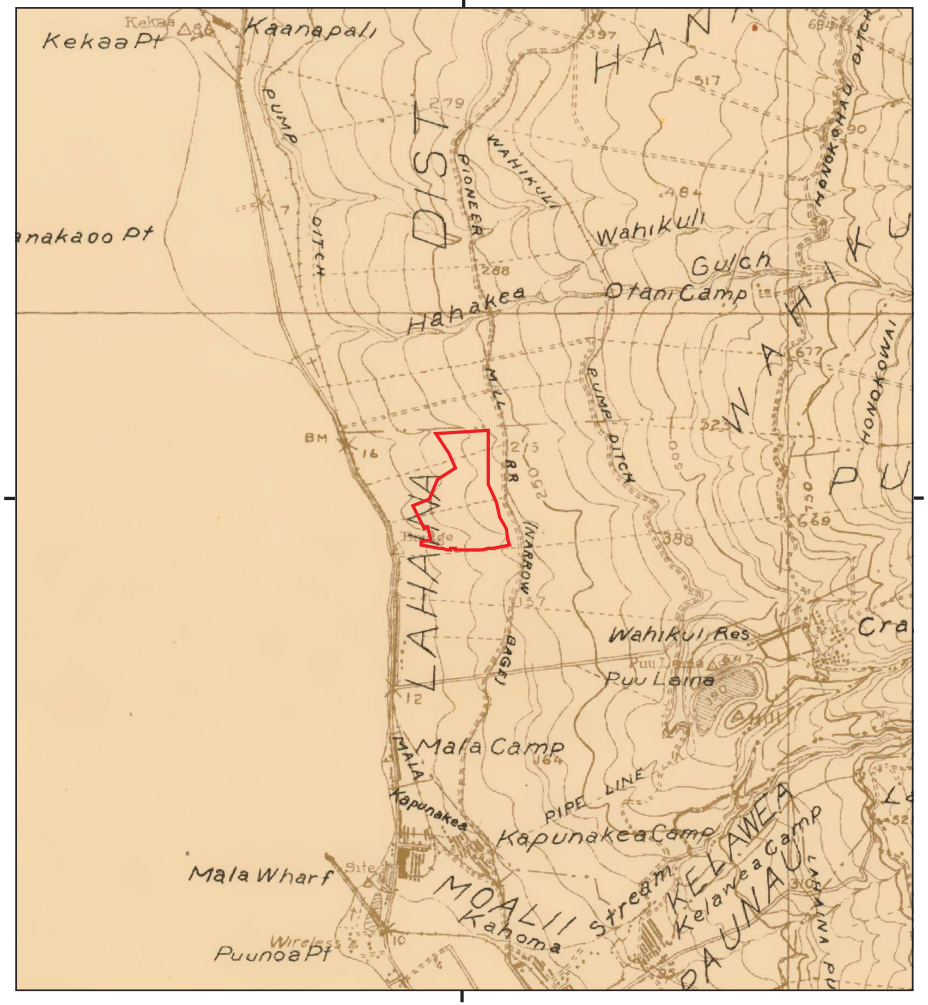
TP, Lahaina, 1956, 7.5-minute

SITE NAME: Villages of Leialii 1B
ADDRESS: Leialii Parkway
Lahaina, HI 96761
CLIENT: ENPRO, Env. Professionals

N

Historical Topo Map

1923



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, MALA, 1923, 7.5-minute

SITE NAME: Villages of Leialii 1B
ADDRESS: Leialii Parkway
Lahaina, HI 96761
CLIENT: ENPRO, Env. Professionals

N

Villages of Leialii 1B
Leialii Parkway
Lahaina, HI 96761

Inquiry Number: 6562357.3
July 02, 2021

Certified Sanborn® Map Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

07/02/21

Site Name:	Client Name:
Villages of Leialii 1B	ENPRO, Env. Professionals
Leialii Parkway	151 Hekili Street Suite 210
Lahaina, HI 96761	Kailua, HI 96734
EDR Inquiry # 6562357.3	Contact: Kim Kim

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Certified Sanborn Results:

Certification # 088A-4201-B2A8

PO # 2106-00227-PH1

Project Villages of Leialii 1B

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Sanborn® Library search results
Certification #: 088A-4201-B2A8

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- ✔ Library of Congress
- ✔ University Publications of America
- ✔ EDR Private Collection

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Villages of Leialii 1B

Leialii Parkway

Lahaina, HI 96761

Inquiry Number: 6562357.8

July 07, 2021

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

07/07/21

Site Name:	Client Name:
Villages of Leialii 1B	ENPRO, Env. Professionals
Leialii Parkway	151 Hekili Street Suite 210
Lahaina, HI 96761	Kailua, HI 96734
EDR Inquiry # 6562357.8	Contact: Kim Kim

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

Search Results:

Year	Scale	Details	Source
2000	1"=500'	Acquisition Date: December 19, 2000	USGS/DOQQ
1977	1"=500'	Flight Date: March 16, 1977	USGS
1975	1"=500'	Flight Date: July 22, 1975	USGS
1965	1"=500'	Flight Date: January 25, 1965	USGS
1950	1"=500'	Flight Date: September 28, 1950	USGS

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INQUIRY #: 6562357.8
YEAR: 2000
= 500'
N
EDR

INQUIRY #: 6562357.8
YEAR: 1977
= 500'
N
EDR

INQUIRY #: 6562357.8
YEAR: 1975
= 500'
N
EDR

INQUIRY #: 6562357.8
YEAR: 1965
= 500'
N
EDR
Subject boundary not shown because it exceeds image extent or image is not georeferenced.

Villages of Leialii 1B
Leialii Parkway
Lahaina, HI 96761

Inquiry Number: 6562357.5
July 08, 2021

The EDR-City Directory Image Report

EDR® Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

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EXECUTIVE SUMMARY

DESCRIPTION

Environmental Data Resources, Inc.'s (EDR) City Directory Report is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Report includes a search of available city directory data at 5 year intervals.

RECORD SOURCES

EDR's Digital Archive combines historical directory listings from sources such as Cole Information and Dun & Bradstreet. These standard sources of property information complement and enhance each other to provide a more comprehensive report.

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RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. A check mark indicates where information was identified in the source and provided in this report.

Year	*Target Street*	*Cross Street*	*Source*
2017	☐	☐	EDR Digital Archive
2014	☐	☐	EDR Digital Archive
2010	☐	☐	EDR Digital Archive
2005	☐	☐	EDR Digital Archive
2000	☐	☐	EDR Digital Archive
1995	☐	☐	EDR Digital Archive
1992	☐	☐	EDR Digital Archive

FINDINGS

TARGET PROPERTY STREET

Leialii Parkway
Lahaina, HI 96761

Year	CD Image	Source	
LEIALII PKWY			
2017	-	EDR Digital Archive	Street not listed in Source
2014	-	EDR Digital Archive	Street not listed in Source
2010	-	EDR Digital Archive	Street not listed in Source
2005	-	EDR Digital Archive	Street not listed in Source
2000	-	EDR Digital Archive	Street not listed in Source
1995	-	EDR Digital Archive	Street not listed in Source
1992	-	EDR Digital Archive	Street not listed in Source

FINDINGS

CROSS STREETS

Year	CD Image	Source	
AKOAKOA PL			
2017	-	EDR Digital Archive	Street not listed in Source
2014	-	EDR Digital Archive	Street not listed in Source
2010	-	EDR Digital Archive	Street not listed in Source
2005	-	EDR Digital Archive	Street not listed in Source
2000	-	EDR Digital Archive	Street not listed in Source
1995	-	EDR Digital Archive	Street not listed in Source
1992	-	EDR Digital Archive	Street not listed in Source

REGULATORY RECORDS DOCUMENTATION

Villages of Leialii 1B
Leialii Parkway
Lahaina, HI 96761

Inquiry Number: 6562357.2s
July 02, 2021

The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
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FORM-LBC-KKT

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E 2247-16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

LEIALII PARKWAY
LAHAINA, HI 96761

COORDINATES

Latitude (North):	20.9042880 - 20˚ 54' 15.43''
Longitude (West):	156.6812810 - 156˚ 40' 52.61''
Universal Tranverse Mercator:	Zone 4
UTM X (Meters):	741188.2
UTM Y (Meters):	2313160.5
Elevation:	120 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5941641 LAHAINA, HI
Version Date:	2013
West Map:	5945821 LANAI NORTH OE E, HI
Version Date:	2013

MAPPED SITES SUMMARY

Target Property Address:
LEIALII PARKWAY
LAHAINA, HI 96761

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
1	MAUI COUNTY LAHAINA	1762 HONOAPIILANI HW	UST, Financial Assurance	Lower	410, 0.078, WSW
2	COMMUNITY WORK DAY P	1870 HONOAPIILANI HI	SWRCY	Lower	1437, 0.272, WNW
3	LAHAINA SPS2 (HONOAP	2010 HONOAPIILANI HW	LUST, UST, Financial Assurance	Lower	2630, 0.498, NW
4	HYATT REGENCY MAUI	200 NOHEA KAI DR	SHWS, LUST, UST, AIRS, Financial Assurance	Lower	4345, 0.823, NW

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL..... National Priority List
Proposed NPL..... Proposed National Priority List Sites
NPL LIENS..... Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL..... National Priority List Deletions

Federal CERCLIS list

FEDERAL FACILITY..... Federal Facility Site Information listing
SEMS..... Superfund Enterprise Management System

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE..... Superfund Enterprise Management System Archive

Federal RCRA CORRACTS facilities list

CORRACTS..... Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF..... RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG..... RCRA - Large Quantity Generators
RCRA-SQG..... RCRA - Small Quantity Generators
RCRA-VSQG..... RCRA - Very Small Quantity Generators (Formerly Conditionally Exempt Small Quantity Generators)

Federal institutional controls / engineering controls registries

LUCIS..... Land Use Control Information System

US ENG CONTROLS..... Engineering Controls Sites List
US INST CONTROLS..... Institutional Controls Sites List

Federal ERNS list

ERNS..... Emergency Response Notification System

State and tribal landfill and/or solid waste disposal site lists

SWF/LF..... Permitted Landfills in the State of Hawaii

State and tribal leaking storage tank lists

INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

FEMA UST..... Underground Storage Tank Listing
INDIAN UST..... Underground Storage Tanks on Indian Land

State and tribal institutional control / engineering control registries

ENG CONTROLS..... Engineering Control Sites
INST CONTROL..... Sites with Institutional Controls

State and tribal voluntary cleanup sites

VCP..... Voluntary Response Program Sites
INDIAN VCP..... Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS..... Brownfields Sites

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS..... A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

INDIAN ODI..... Report on the Status of Open Dumps on Indian Lands
DEBRIS REGION 9..... Torres Martinez Reservation Illegal Dump Site Locations
ODI..... Open Dump Inventory
IHS OPEN DUMPS..... Open Dumps on Indian Land

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL..... Delisted National Clandestine Laboratory Register
CDL..... Clandestine Drug Lab Listing
US CDL..... National Clandestine Laboratory Register

Local Land Records

LIENS 2..... CERCLA Lien Information

Records of Emergency Release Reports

HMIRS..... Hazardous Materials Information Reporting System
SPILLS..... Release Notifications
SPILLS 90..... SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR..... RCRA - Non Generators / No Longer Regulated
FUDS..... Formerly Used Defense Sites
DOD..... Department of Defense Sites
SCRD DRYCLEANERS..... State Coalition for Remediation of Drycleaners Listing
US FIN ASSUR..... Financial Assurance Information
EPA WATCH LIST..... EPA WATCH LIST
2020 COR ACTION..... 2020 Corrective Action Program List
TSCA..... Toxic Substances Control Act
TRIS..... Toxic Chemical Release Inventory System
SSTS..... Section 7 Tracking Systems
ROD..... Records Of Decision
RMP..... Risk Management Plans
RAATS..... RCRA Administrative Action Tracking System
PRP..... Potentially Responsible Parties
PADS..... PCB Activity Database System
ICIS..... Integrated Compliance Information System
FTTS..... FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
MLTS..... Material Licensing Tracking System
COAL ASH DOE..... Steam-Electric Plant Operation Data
COAL ASH EPA..... Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER..... PCB Transformer Registration Database
RADINFO..... Radiation Information Database
HIST FTTS..... FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS..... Incident and Accident Data
CONSENT..... Superfund (CERCLA) Consent Decrees
INDIAN RESERV..... Indian Reservations
FUSRAP..... Formerly Utilized Sites Remedial Action Program
UMTRA..... Uranium Mill Tailings Sites
LEAD SMELTERS..... Lead Smelter Sites
US AIRS..... Aerometric Information Retrieval System Facility Subsystem
US MINES..... Mines Master Index File
ABANDONED MINES..... Abandoned Mines
FINDS..... Facility Index System/Facility Registry System
UXO..... Unexploded Ordnance Sites
DOCKET HWC..... Hazardous Waste Compliance Docket Listing
ECHO..... Enforcement & Compliance History Information
FUELS PROGRAM..... EPA Fuels Program Registered Listing
AIRS..... List of Permitted Facilities
DRYCLEANERS..... Permitted Drycleaner Facility Listing
Financial Assurance..... Financial Assurance Information Listing
LEAD..... LEAD
UIC..... Underground Injection Wells Listing
MINES MRDS..... Mineral Resources Data System

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP..... EDR Proprietary Manufactured Gas Plants

EDR Hist Auto..... EDR Exclusive Historical Auto Stations
EDR Hist Cleaner..... EDR Exclusive Historical Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS..... Recovered Government Archive State Hazardous Waste Facilities List
RGA LF..... Recovered Government Archive Solid Waste Facilities List
RGA LUST..... Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State- and tribal - equivalent CERCLIS

SHWS: The State Hazardous Waste Sites records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. The data come from the Department of Health.

A review of the SHWS list, as provided by EDR, and dated 08/17/2020 has revealed that there is 1 SHWS site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
HYATT REGENCY MAUI	***200 NOHEA KAI DR***	***NW 1/2 - 1 (0.823 mi.)***	***4***	***10***

State and tribal leaking storage tank lists

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Department of Health's Active Leaking Underground Storage Tank Log Listing.

A review of the LUST list, as provided by EDR, and dated 11/25/2020 has revealed that there is 1 LUST site within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
LAHAINA SPS2 (HONOAP	***2010 HONOAPIILANI HW***	***NW 1/4 - 1/2 (0.498 mi.)***	***3***	***9***

Release ID: 990122
Facility Id: 9-501748
Facility Status: Site Cleanup Completed (NFA)

State and tribal registered storage tank lists

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Health's Listing of Underground Storage Tanks.

A review of the UST list, as provided by EDR, and dated 11/30/2020 has revealed that there is 1 UST site within approximately 0.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
MAUI COUNTY LAHAINA Tank Status: Permanently Out of Use Facility Id: 9-502438 Date Closed: 05/15/1991	***1762 HONOAPIILANI HW***	***WSW 0 - 1/8 (0.078 mi.)***	***1***	***8***

ADDITIONAL ENVIRONMENTAL RECORDS

Local Lists of Landfill / Solid Waste Disposal Sites

SWRCY: A listing of recycling and drop-off facilities located in Hawaii.

A review of the SWRCY list, as provided by EDR, and dated 03/22/2021 has revealed that there is 1 SWRCY site within approximately 0.5 miles of the target property.

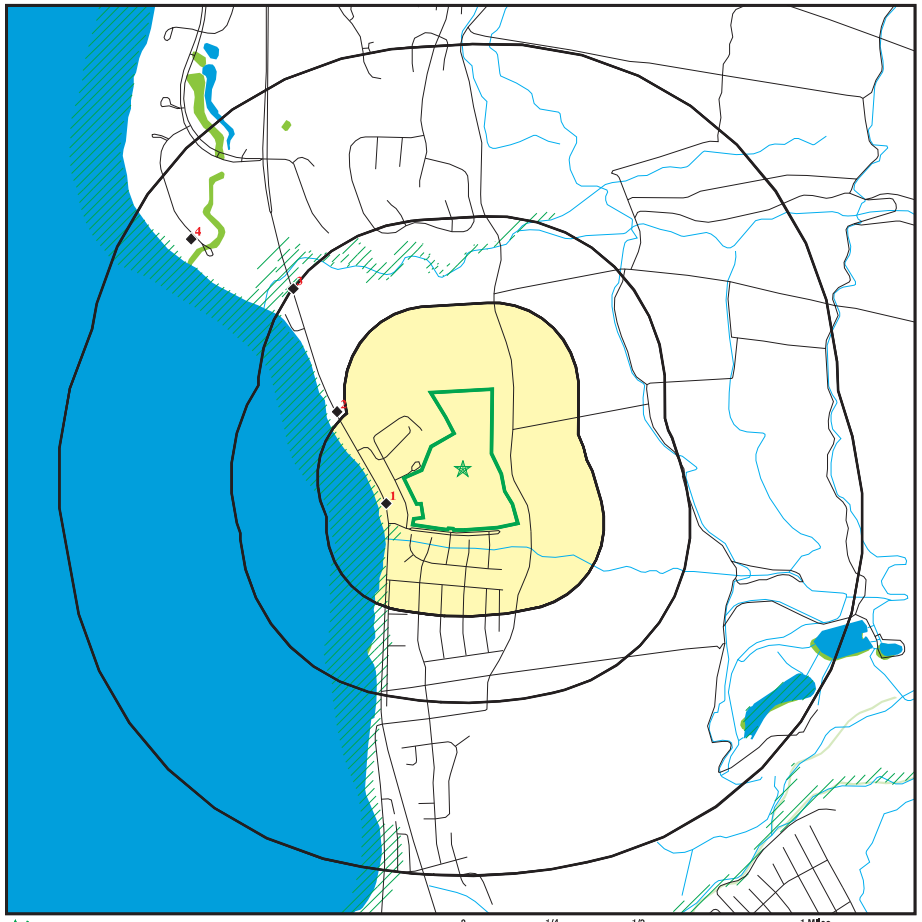
Lower Elevation	Address	Direction / Distance	Map ID	Page
COMMUNITY WORK DAY P	1870 HONOAPIILANI HI	WNW 1/4 - 1/2 (0.272 mi.)	2	8

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 4 records.

Site Name	Database(s)
TRAIN TURNAROUND TRANSFORMER SUBST	SHWS, SPILLS
KAANAPALI TRANSFORMER SITE	SHWS, SPILLS
OLOWALU COMPANY SUGAR MILL	SHWS
MECO PAD-MOUNT TRANSFORMER NO. 160	SHWS

OVERVIEW MAP - 6562357.2S



Target Property
Sites at elevations higher than or equal to the target property
Sites at elevations lower than the target property
Manufactured Gas Plants
National Priority List Sites
Dept. Defense Sites

0 1/4 1/2 1 Miles

Indian Reservations BIA
Special Flood Hazard Area (1%)
0.2% Annual Chance Flood Hazard
National Wetland Inventory
State Wetlands

N

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Villages of Leialii 1B ADDRESS: Leialii Parkway Lahaina HI 96761 LAT/LONG: 20.904288 / 156.681281	CLIENT: ENPRO, Env. Professionals CONTACT: Kim Kim INQUIRY #: 6562357.2s DATE: July 02, 2021 4:02 pm

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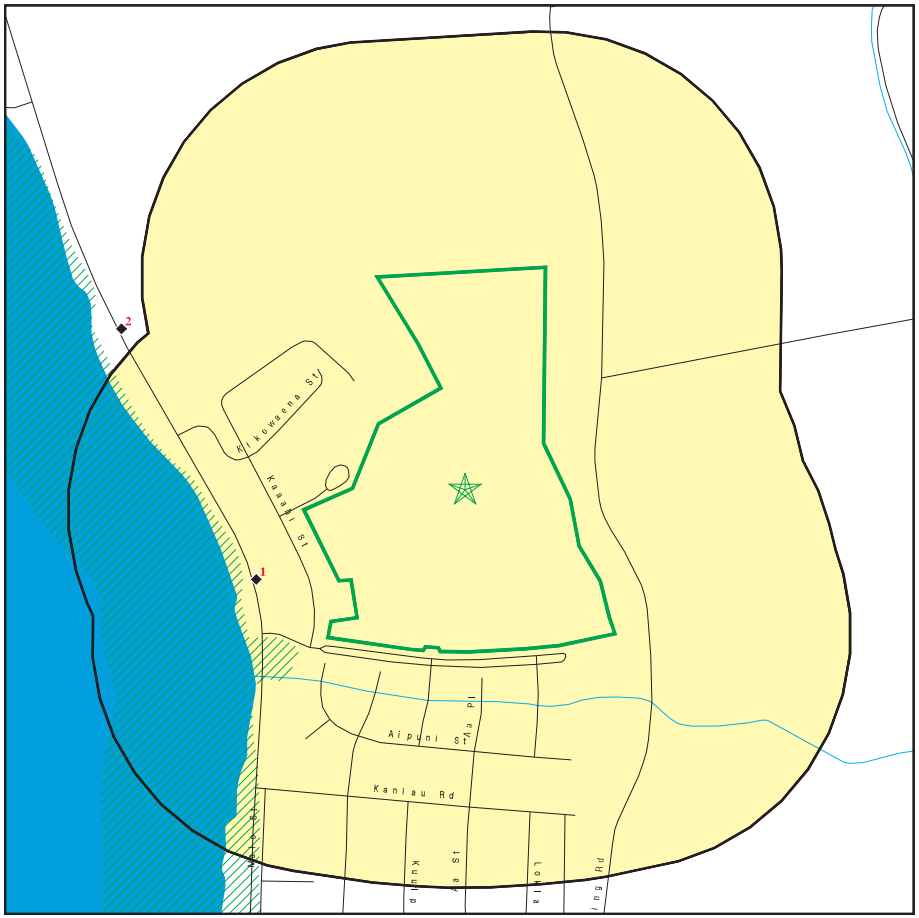
DETAIL MAP - 6562357.2S



Target Property
Sites at elevations higher than or equal to the target property
Sites at elevations lower than the target property
Manufactured Gas Plants
Sensitive Receptors
National Priority List Sites
Dept. Defense Sites

Indian Reservations BIA
Special Flood Hazard Area (1%)
0.2% Annual Chance Flood Hazard
National Wetland Inventory
State Wetlands

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-VSQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROLS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	0.001		0	NR	NR	NR	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	0	1	NR	1
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	1	NR	NR	1
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
UST	0.250		1	0	NR	NR	NR	1
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
ENG CONTROLS	0.500		0	0	0	NR	NR	0
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
SWRCY	0.500		0	0	1	NR	NR	1
INDIAN ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	0.001		0	NR	NR	NR	NR	0
CDL	0.001		0	NR	NR	NR	NR	0
US CDL	0.001		0	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	0.001		0	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	0.001		0	NR	NR	NR	NR	0
SPILLS	0.001		0	NR	NR	NR	NR	0
SPILLS 90	0.001		0	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	0.001		0	NR	NR	NR	NR	0
EPA WATCH LIST	0.001		0	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
TSCA	0.001		0	NR	NR	NR	NR	0
TRIS	0.001		0	NR	NR	NR	NR	0
SSTS	0.001		0	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	0.001		0	NR	NR	NR	NR	0
RAATS	0.001		0	NR	NR	NR	NR	0
PRP	0.001		0	NR	NR	NR	NR	0
PADS	0.001		0	NR	NR	NR	NR	0
ICIS	0.001		0	NR	NR	NR	NR	0
FTTS	0.001		0	NR	NR	NR	NR	0
MLTS	0.001		0	NR	NR	NR	NR	0
COAL ASH DOE	0.001		0	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	0.001		0	NR	NR	NR	NR	0
RADINFO	0.001		0	NR	NR	NR	NR	0
HIST FTTS	0.001		0	NR	NR	NR	NR	0
DOT OPS	0.001		0	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	0.001		0	NR	NR	NR	NR	0
US AIRS	0.001		0	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	0.001		0	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
DOCKET HWC	0.001		0	NR	NR	NR	NR	0
ECHO	0.001		0	NR	NR	NR	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
AIRS	0.001		0	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
Financial Assurance	0.001		0	NR	NR	NR	NR	0
LEAD	0.001		0	NR	NR	NR	NR	0
UIC	0.001		0	NR	NR	NR	NR	0
MINES MRDS	0.001		0	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA HWS	0.001		0	NR	NR	NR	NR	0
RGA LF	0.001		0	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
RGA LUST	0.001		0	NR	NR	NR	NR	0
- Totals --		0	1	0	2	1	0	4

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

1 WSW < 1/8 0.078 mi. 410 ft. — **MAUI COUNTY LAHAINA FIRE STATION**, **1762 HONOAPIILANI HWY**, **LAHAINA, HI 96761** — **UST**, **Financial Assurance** — **U001236835**, **N/A**

Relative: Lower
Actual: 13 ft.

UST:

Name:	MAUI COUNTY LAHAINA FIRE STATION
Address:	1762 HONOAPIILANI HWY
City,State,Zip:	LAHAINA, HI 96761
Facility ID:	9-502438
Owner:	COUNTY OF MAUI - FIRE DEPT
Owner Address:	200 S HIGH ST 3RD FLOOR
Owner City,St,Zip:	Lahaina, 96761 96761
Latitude:	Not reported
Longitude:	Not reported
Horizontal Reference Datum Name:	Not reported
Horizontal Collection Method Name:	Not reported
Tank ID:	R-1
Date Installed:	01/31/1972
Tank Status:	**Permanently Out of Use**
Date Closed:	05/15/1991
Tank Capacity:	5000
Substance:	Gasoline

HI Financial Assurance:

Name:	MAUI COUNTY LAHAINA FIRE STATION
Address:	1762 HONOAPIILANI HWY
City,State,Zip:	LAHAINA, HI 96761
Alt Facility ID:	9-502438
Tank Id:	R-1
Tank Status:	Permanently Out of Use
FRTYPE:	Risk Retention Group
Expiration Date:	Not reported

Name:	MAUI COUNTY LAHAINA FIRE STATION
Address:	1762 HONOAPIILANI HWY
City,State,Zip:	LAHAINA, HI 96761
Alt Facility ID:	9-502438
Tank Id:	R-1
Tank Status:	Permanently Out of Use
FRTYPE:	Trust Fund
Expiration Date:	Not reported

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2 WNW 1/4-1/2 0.272 mi. 1437 ft. — **COMMUNITY WORK DAY PROGRAM DBA MALAMA MAUI NUI**, **1870 HONOAPIILANI HIGHWAY**, **LAHAINA, HI** — **SWRCY** — **S126501013**, **N/A**

Relative: Lower
Actual: 19 ft.

SWRCY:

Permit Number:	RY-0049-20
Name:	COMMUNITY WORK DAY PROGRAM DBA MALAMA MAUI NUI
Address:	1870 HONOAPIILANI HIGHWAY
City,State,Zip:	LAHAINA, HI
Materials:	scrap metal (ferrous and non-ferrous), appliances (non-freon containing), electronics, tires, and lead acid batteries
Island:	Maui

COMMUNITY WORK DAY PROGRAM DBA MALAMA MAUI NUI (Continued) **S126501013**

TMK: (2) 4-5-021:016
Closure Date: Not reported
Type: permit by rule
Status: Not reported

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3 NW 1/4-1/2 0.498 mi. 2630 ft.

LAHAINA SPS2 (HONOAPIILANI) **LUST** **U003402933**
2010 HONOAPIILANI HWY / KAANAPALI HWY **UST** **N/A**
LAHAINA, HI 96761 **Financial Assurance**

Relative: Lower
Actual: 21 ft.

LUST:
Name: LAHAINA SPS2 (HONOAPIILANI)
Address: 2010 HONOAPIILANI HWY / KAANAPALI HWY
City,State,Zip: LAHAINA, HI 96761
Facility ID: 9-501748
Facility Status: Site Cleanup Completed (NFA)
Facility Status Date: 08/25/1999
Release ID: 990122
Project Officer: Jose Ruiz

UST:
Name: LAHAINA SPS2 (HONOAPIILANI)
Address: 2010 HONOAPIILANI HWY / KAANAPALI HWY
City,State,Zip: LAHAINA, HI 96761
Facility ID: 9-501748
Owner: COUNTY OF MAUI - PUBLIC WORKS & WASTE MANAGEMENT
Owner Address: 200 S HIGH ST
Owner City,St,Zip: Lahaina, 96761 96761
Latitude: 20.945875999999998
Longitude: -156.68653800000001
Horizontal Reference Datum Name: NAD83
Horizontal Collection Method Name: Address Matching

Tank ID: R-M-1
Date Installed: 05/05/1978
Tank Status: Permanently Out of Use
Date Closed: 09/30/1998
Tank Capacity: 250
Substance: Diesel

HI Financial Assurance:
Name: LAHAINA SPS2 (HONOAPIILANI)
Address: 2010 HONOAPIILANI HWY / KAANAPALI HWY
City,State,Zip: LAHAINA, HI 96761
Alt Facility ID: 9-501748
Tank Id: R-M-1
Tank Status: Permanently Out of Use
FRTYPE: Self Insured
Expiration Date: Not reported

4 NW 1/2-1 0.823 mi. 4345 ft.

HYATT REGENCY MAUI **SHWS** **1000847641**
200 NOHEA KAI DR **LUST** **N/A**
LAHAINA, HI 96761 **UST**
AIRS
Financial Assurance

Relative: Lower
Actual: 3 ft.

SHWS:
Name: HYATT REGENCY MAUI RESORT AND SPA
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761
Supplemental Location: Not reported
Island: Not reported
Environmental Interest: Not reported
HID Number: Not reported
Facility Registry Identifier: Not reported
Lead Agency: HEER Office
Program: State
Project Manager: Not reported
Hazard Priority: Not reported
Potential Hazards And Controls: Not reported
Island: Not reported
SDAR Environmental Interest Name: Not reported
HID Number: Not reported
Facility Registry Identifier: Not reported
Lead Agency: HEER Office
Potential Hazard And Controls: Not reported
Priority: Not reported
Assessment: Not reported
Response: Not reported
Nature of Contamination: Not reported
Nature of Residual Contamination: Not reported
Use Restrictions: Not reported
Engineering Control: Not reported
Description of Restrictions: Not reported
Institutional Control: Not reported
Within Designated Areawide Contamination: Not reported
Site Closure Type: Not reported
Document Date: Not reported
Document Number: Not reported
Document Subject: Not reported
Project Manager: Not reported
Contact Information: Not reported
Facility ID: 2011
Location Description: 200 Nohea Kai Dr
Is Public: True
Update On: 2019-11-23 00:00:00

LUST:
Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761
Facility ID: 9-501899
Facility Status: Site Cleanup Completed (NFA)
Facility Status Date: 11/30/1994
Release ID: 940101
Project Officer: Raymond Seid

UST:

HYATT REGENCY MAUI (Continued) **1000847641**

Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761
Facility ID: 9-501899
Owner: CCHH MAUI LLC
Owner Address: 200 Nohea Kai Dr.
Owner City,St,Zip: Lahaina, 96761 96761
Latitude: 20.912264
Longitude: -156.6908
Horizontal Reference Datum Name: NAD83
Horizontal Collection Method Name: Address Matching

Tank ID: 2
Date Installed: 02/01/1994
Tank Status: Currently In Use
Date Closed: Not reported
Tank Capacity: 12000
Substance: Diesel

Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761

Tank ID: 2
Date Installed: 02/01/1994
Tank Status: Currently In Use
Date Closed: Not reported
Tank Capacity: 12000
Substance: Diesel

Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761

Tank ID: R-1
Date Installed: 12/30/1979
Tank Status: Permanently Out of Use
Date Closed: 03/30/1994
Tank Capacity: 12000
Substance: Diesel

Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761

Tank ID: R-1
Date Installed: 12/30/1979
Tank Status: Permanently Out of Use
Date Closed: 03/30/1994
Tank Capacity: 12000
Substance: Diesel

AIRS:
Name: HYATT REGENCY
Address: 200 NOHEA KAI DRIVE
City,State,Zip: LAHAINA, HI
Facility Identifier: 0432-01-C

HYATT REGENCY MAUI (Continued) **1000847641**

Island: Maui
Mailing Address: 200 Nohea Kai Drive
Locale: Not reported
Mailing City: Lahaina
Contact Name: Gary Bulson
Mailing State: Hawaii
Mailing Zip: 96761
Contact Phone: Director of Engineering
Business Phone: Not reported
Issue Date: 10/31/2014
Expiration Date: 10/30/2019
Description: Two 300 HP York Shipley Boilers1.This permit encompasses the following equipment:Unit No.Description Model No. Serial No.B-1300 HP York-Shipley BoilerSPH-300-N/279-12551B-2300 HP York-Shipley BoilerSPHV-300-N/2-LP92-18871

HI Financial Assurance:
Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761
Alt Facility ID: 9-501899
Tank Id: 2
Tank Status: Currently In Use
FRTYPE: Insurance
Expiration Date: 05/25/2016

Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761
Alt Facility ID: 9-501899
Tank Id: R-1
Tank Status: Permanently Out of Use
FRTYPE: Insurance
Expiration Date: 05/25/2016

Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761
Alt Facility ID: 9-501899
Tank Id: 2
Tank Status: Currently In Use
FRTYPE: Insurance
Expiration Date: 05/25/2020

Name: HYATT REGENCY MAUI
Address: 200 NOHEA KAI DR
City,State,Zip: LAHAINA, HI 96761
Alt Facility ID: 9-501899
Tank Id: R-1
Tank Status: Permanently Out of Use
FRTYPE: Insurance
Expiration Date: 05/25/2020

Count: 4 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
LAHAINA	S109096070	TRAIN TURNAROUND TRANSFORMER SUBST	HONOAPIILANI HWY	96761	SHWS, SPILLS
LAHAINA	S109096079	KAANAPALI TRANSFORMER SITE	HONOAPIILANI HWY	96761	SHWS, SPILLS
LAHAINA	S111704826	OLOWALU COMPANY SUGAR MILL	11485 HONOAPIILANI HWY	96761	SHWS
LAHAINA	S111677610	MECO PAD-MOUNT TRANSFORMER NO. 160	KAANAPALI PKWY	96761	SHWS

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List
National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: EPA
Telephone: N/A
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites
A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: EPA
Telephone: N/A
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens
Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

Federal Delisted NPL site list

Delisted NPL: National Priority List Deletions
The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: EPA
Telephone: N/A
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Quarterly

Federal CERCLIS list

FEDERAL FACILITY: Federal Facility Site Information listing
A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 02/22/2021
Date Data Arrived at EDR: 03/30/2021
Date Made Active in Reports: 06/17/2021
Number of Days to Update: 79

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 06/23/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Varies

SEMS: Superfund Enterprise Management System
SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 07/26/2021
Data Release Frequency: Quarterly

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE: Superfund Enterprise Management System Archive

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 07/26/2021
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 57

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 57

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 57

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 57
Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

RCRA-VSQG: RCRA - Very Small Quantity Generators (Formerly Conditionally Exempt Small Quantity Generators)
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Very small quantity generators (VSQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 57
Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

Federal institutional controls / engineering controls registries

LUCIS: Land Use Control Information System
LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 02/09/2021
Date Data Arrived at EDR: 02/11/2021
Date Made Active in Reports: 03/22/2021
Number of Days to Update: 39
Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 05/05/2021
Next Scheduled EDR Contact: 08/23/2021
Data Release Frequency: Varies

US ENG CONTROLS: Engineering Controls Sites List
A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 02/22/2021
Date Data Arrived at EDR: 02/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 85
Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 05/21/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Varies

US INST CONTROLS: Institutional Controls Sites List
A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 02/22/2021
Date Data Arrived at EDR: 02/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 85
Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 05/21/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System
Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/24/2021
Date Made Active in Reports: 06/17/2021
Number of Days to Update: 85
Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 06/17/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

State- and tribal - equivalent CERCLIS

SHWS: Sites List
Facilities, sites or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated or may investigate under HRS 128D (includes CERCLIS sites).

Date of Government Version: 08/17/2020
Date Data Arrived at EDR: 09/09/2020
Date Made Active in Reports: 12/01/2020
Number of Days to Update: 83
Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 06/10/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Semi-Annually

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: Permitted Landfills in the State of Hawaii
Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 04/01/2021
Date Made Active in Reports: 06/22/2021
Number of Days to Update: 82
Source: Department of Health
Telephone: 808-586-4245
Last EDR Contact: 06/28/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Varies

State and tribal leaking storage tank lists

LUST: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 11/25/2020
Date Data Arrived at EDR: 12/09/2020
Date Made Active in Reports: 02/23/2021
Number of Days to Update: 76
Source: Department of Health
Telephone: 808-586-4228
Last EDR Contact: 05/28/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Semi-Annually

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 11/12/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 10/07/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 10/01/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 10/09/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 04/08/2020
Date Data Arrived at EDR: 05/20/2020
Date Made Active in Reports: 08/12/2020
Number of Days to Update: 84
Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 10/01/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 10/02/2020
Date Data Arrived at EDR: 12/18/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 84
Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 06/17/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 09/30/2020
Date Data Arrived at EDR: 12/22/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 80
Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

State and tribal registered storage tank lists

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/29/2021
Date Data Arrived at EDR: 02/17/2021
Date Made Active in Reports: 03/22/2021
Number of Days to Update: 33
Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 10/18/2021
Data Release Frequency: Varies

UST: Underground Storage Tank Database
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 11/30/2020
Date Data Arrived at EDR: 12/09/2020
Date Made Active in Reports: 02/23/2021
Number of Days to Update: 76
Source: Department of Health
Telephone: 808-586-4228
Last EDR Contact: 05/28/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Semi-Annually

INDIAN UST R7: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/30/2020
Date Data Arrived at EDR: 12/22/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 80
Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 04/08/2020
Date Data Arrived at EDR: 05/20/2020
Date Made Active in Reports: 08/12/2020
Number of Days to Update: 84
Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN UST R9: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 10/01/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 10/09/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 10/07/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 11/12/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 10/02/2020
Date Data Arrived at EDR: 12/18/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 84
Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 06/17/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 10/01/2020
Date Data Arrived at EDR: 12/16/2020
Date Made Active in Reports: 03/12/2021
Number of Days to Update: 86
Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 06/11/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

ENG CONTROLS: Engineering Control Sites
A listing of sites with engineering controls in place.

Date of Government Version: 04/17/2019
Date Data Arrived at EDR: 05/21/2019
Date Made Active in Reports: 05/30/2019
Number of Days to Update: 9
Source: Department of Health
Telephone: 404-586-4249
Last EDR Contact: 06/10/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Varies

INST CONTROL: Sites with Institutional Controls
Voluntary Remediation Program and Brownfields sites with institutional controls in place.

Date of Government Version: 04/17/2019
Date Data Arrived at EDR: 05/21/2019
Date Made Active in Reports: 05/30/2019
Number of Days to Update: 9
Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 06/10/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Varies

State and tribal voluntary cleanup sites

VCP: Voluntary Response Program Sites
Sites participating in the Voluntary Response Program. The purpose of the VRP is to streamline the cleanup process in a way that will encourage prospective developers, lenders, and purchasers to voluntarily cleanup properties.

Date of Government Version: 08/17/2020
Date Data Arrived at EDR: 09/09/2020
Date Made Active in Reports: 12/01/2020
Number of Days to Update: 83
Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 06/10/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Varies

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 07/27/2015
Date Data Arrived at EDR: 09/29/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 142
Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 06/15/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27
Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

State and tribal Brownfields sites

BROWNFIELDS: Brownfields Sites
With certain legal exclusions and additions, the term 'brownfield site' means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

Date of Government Version: 08/17/2020
Date Data Arrived at EDR: 09/09/2020
Date Made Active in Reports: 12/01/2020
Number of Days to Update: 83
Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 06/10/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites
Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 03/15/2021
Date Data Arrived at EDR: 03/16/2021
Date Made Active in Reports: 06/10/2021
Number of Days to Update: 86
Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 06/10/2021
Next Scheduled EDR Contact: 09/27/2021
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

SWRCY: SWRCY
A listing of recycling and drop-off facilities located in Hawaii.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 04/01/2021
Date Made Active in Reports: 06/23/2021
Number of Days to Update: 83

Source: Department of Health
Telephone: 808-586-4226
Last EDR Contact: 06/28/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 04/22/2021
Next Scheduled EDR Contact: 08/09/2021
Data Release Frequency: Varies

ODI: Open Dump Inventory
An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations
A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 04/14/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: No Update Planned

IHS OPEN DUMPS: Open Dumps on Indian Land
A listing of all open dumps located on Indian Land in the United States.

Date of Government Version: 04/01/2014
Date Data Arrived at EDR: 08/06/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 176

Source: Department of Health & Human Serivces, Indian Health Service
Telephone: 301-443-1452
Last EDR Contact: 04/29/2021
Next Scheduled EDR Contact: 08/09/2021
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations that have been removed from the DEAs National Clandestine Laboratory Register.

Date of Government Version: 12/07/2020
Date Data Arrived at EDR: 12/09/2020
Date Made Active in Reports: 03/02/2021
Number of Days to Update: 83

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 05/22/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: No Update Planned

CDL: Clandestine Drug Lab Listing
A listing of clandestine drug lab site locations.

Date of Government Version: 08/04/2010
Date Data Arrived at EDR: 09/10/2010
Date Made Active in Reports: 10/22/2010
Number of Days to Update: 42

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 05/19/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: No Update Planned

US CDL: Clandestine Drug Labs
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 12/07/2020
Date Data Arrived at EDR: 12/09/2020
Date Made Active in Reports: 03/02/2021
Number of Days to Update: 83

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 05/18/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Quarterly

Local Land Records

LIENS 2: CERCLA Lien Information
A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Semi-Annually

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/24/2021
Date Made Active in Reports: 06/17/2021
Number of Days to Update: 85

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 06/17/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

SPILLS: Release Notifications
Releases of hazardous substances to the environment reported to the Office of Hazard Evaluation and Emergency Response since 1988.

Date of Government Version: 03/25/2021
Date Data Arrived at EDR: 03/25/2021
Date Made Active in Reports: 06/15/2021
Number of Days to Update: 82

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 05/12/2021
Next Scheduled EDR Contact: 08/30/2021
Data Release Frequency: Varies

SPILLS 90: SPILLS90 data from FirstSearch
Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 03/10/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/11/2013
Number of Days to Update: 39

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/23/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 57

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

FUDS: Formerly Used Defense Sites
The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 02/11/2021
Date Data Arrived at EDR: 02/17/2021
Date Made Active in Reports: 04/05/2021
Number of Days to Update: 47

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 05/18/2021
Next Scheduled EDR Contact: 08/30/2021
Data Release Frequency: Varies

DOD: Department of Defense Sites
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 04/16/2021
Next Scheduled EDR Contact: 07/26/2021
Data Release Frequency: Semi-Annually

FEDLAND: Federal and Indian Lands
Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 04/02/2018
Date Data Arrived at EDR: 04/11/2018
Date Made Active in Reports: 11/06/2019
Number of Days to Update: 574

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 04/05/2021
Next Scheduled EDR Contact: 07/19/2021
Data Release Frequency: N/A

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 01/01/2017
Date Data Arrived at EDR: 02/03/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 63

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 05/18/2021
Next Scheduled EDR Contact: 08/23/2021
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information
All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 03/22/2021
Date Data Arrived at EDR: 03/23/2021
Date Made Active in Reports: 06/17/2021
Number of Days to Update: 86

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST
EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 04/30/2021
Next Scheduled EDR Contact: 08/16/2021
Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List
The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 09/30/2017
Date Data Arrived at EDR: 05/08/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 73

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 05/07/2021
Next Scheduled EDR Contact: 08/16/2021
Data Release Frequency: Varies

TSCA: Toxic Substances Control Act
Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 06/17/2020
Date Made Active in Reports: 09/10/2020
Number of Days to Update: 85

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 06/17/2021
Next Scheduled EDR Contact: 09/27/2021
Data Release Frequency: Every 4 Years

TRIS: Toxic Chemical Release Inventory System
Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2018
Date Data Arrived at EDR: 08/14/2020
Date Made Active in Reports: 11/04/2020
Number of Days to Update: 82

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 05/17/2021
Next Scheduled EDR Contact: 08/30/2021
Data Release Frequency: Annually

SSTS: Section 7 Tracking Systems
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 01/20/2021
Date Data Arrived at EDR: 01/21/2021
Date Made Active in Reports: 03/22/2021
Number of Days to Update: 60

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 04/20/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Annually

ROD: Records Of Decision
Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 09/13/2021
Data Release Frequency: Annually

RMP: Risk Management Plans
When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 01/22/2021
Date Data Arrived at EDR: 02/18/2021
Date Made Active in Reports: 05/11/2021
Number of Days to Update: 82

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 04/19/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Varies

RAATS: RCRA Administrative Action Tracking System
RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 12/30/2020
Date Data Arrived at EDR: 01/14/2021
Date Made Active in Reports: 03/05/2021
Number of Days to Update: 50

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 08/16/2021
Data Release Frequency: Quarterly

PADS: PCB Activity Database System
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 11/19/2020
Date Data Arrived at EDR: 01/08/2021
Date Made Active in Reports: 03/22/2021
Number of Days to Update: 73

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/09/2021
Next Scheduled EDR Contact: 07/19/2021
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System
The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 11/18/2016
Date Data Arrived at EDR: 11/23/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 79

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 10/18/2021
Data Release Frequency: Quarterly

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: No Update Planned

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: No Update Planned

MLTS: Material Licensing Tracking System
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 03/08/2021
Date Data Arrived at EDR: 03/11/2021
Date Made Active in Reports: 05/11/2021
Number of Days to Update: 61

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 04/16/2021
Next Scheduled EDR Contact: 08/02/2021
Data Release Frequency: Quarterly

COAL ASH DOE: Steam-Electric Plant Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2019
Date Data Arrived at EDR: 12/01/2020
Date Made Active in Reports: 02/09/2021
Number of Days to Update: 70

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 05/27/2021
Next Scheduled EDR Contact: 09/13/2021
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 01/12/2017
Date Data Arrived at EDR: 03/05/2019
Date Made Active in Reports: 11/11/2019
Number of Days to Update: 251

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 05/27/2021
Next Scheduled EDR Contact: 09/13/2021
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 09/13/2019
Date Data Arrived at EDR: 11/06/2019
Date Made Active in Reports: 02/10/2020
Number of Days to Update: 96

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 05/07/2021
Next Scheduled EDR Contact: 08/16/2021
Data Release Frequency: Varies

RADINFO: Radiation Information Database
The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 07/01/2019
Date Data Arrived at EDR: 07/01/2019
Date Made Active in Reports: 09/23/2019
Number of Days to Update: 84

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 06/22/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

DOT OPS: Incident and Accident Data
Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 01/02/2020
Date Data Arrived at EDR: 01/28/2020
Date Made Active in Reports: 04/17/2020
Number of Days to Update: 80

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 04/27/2021
Next Scheduled EDR Contact: 08/09/2021
Data Release Frequency: Quarterly

CONSENT: Superfund (CERCLA) Consent Decrees
Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/31/2020
Date Data Arrived at EDR: 01/13/2021
Date Made Active in Reports: 03/22/2021
Number of Days to Update: 68

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 04/05/2021
Next Scheduled EDR Contact: 07/19/2021
Data Release Frequency: Varies

BRS: Biennial Reporting System
The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 06/22/2020
Date Made Active in Reports: 11/20/2020
Number of Days to Update: 151

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 06/21/2021
Next Scheduled EDR Contact: 10/04/2021
Data Release Frequency: Biennially

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/14/2015
Date Made Active in Reports: 01/10/2017
Number of Days to Update: 546

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 04/06/2021
Next Scheduled EDR Contact: 07/19/2021
Data Release Frequency: Semi-Annually

FUSRAP: Formerly Utilized Sites Remedial Action Program
DOE established the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early U.S. Atomic Energy Commission (AEC) operations.

Date of Government Version: 08/08/2017
Date Data Arrived at EDR: 09/11/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 3

Source: Department of Energy
Telephone: 202-586-3559
Last EDR Contact: 04/28/2021
Next Scheduled EDR Contact: 08/16/2021
Data Release Frequency: Varies

UMTRA: Uranium Mill Tailings Sites
Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 08/30/2019
Date Data Arrived at EDR: 11/15/2019
Date Made Active in Reports: 01/28/2020
Number of Days to Update: 74

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 05/21/2021
Next Scheduled EDR Contact: 08/30/2021
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites
A listing of former lead smelter site locations.

Date of Government Version: 04/27/2021
Date Data Arrived at EDR: 05/03/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 16

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 06/29/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites
A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)
The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data
A listing of minor source facilities.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

MINES VIOLATIONS: MSHA Violation Assessment Data
Mines violation and assessment information. Department of Labor, Mine Safety & Health Administration.

Date of Government Version: 05/27/2021
Date Data Arrived at EDR: 05/27/2021
Date Made Active in Reports: 06/10/2021
Number of Days to Update: 14

Source: DOL, Mine Safety & Health Admi
Telephone: 202-693-9424
Last EDR Contact: 07/01/2021
Next Scheduled EDR Contact: 09/13/2021
Data Release Frequency: Quarterly

US MINES: Mines Master Index File
Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 02/01/2021
Date Data Arrived at EDR: 02/24/2021
Date Made Active in Reports: 05/19/2021
Number of Days to Update: 84

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 05/25/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Semi-Annually

US MINES 2: Ferrous and Nonferrous Metal Mines Database Listing
This map layer includes ferrous (ferrous metal mines are facilities that extract ferrous metals, such as iron ore or molybdenum) and nonferrous (Nonferrous metal mines are facilities that extract nonferrous metals, such as gold, silver, copper, zinc, and lead) metal mines in the United States.

Date of Government Version: 05/06/2020
Date Data Arrived at EDR: 05/27/2020
Date Made Active in Reports: 08/13/2020
Number of Days to Update: 78

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 05/27/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Varies

US MINES 3: Active Mines & Mineral Plants Database Listing
Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 05/27/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Varies

ABANDONED MINES: Abandoned Mines
An inventory of land and water impacted by past mining (primarily coal mining) is maintained by OSMRE to provide information needed to implement the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The inventory contains information on the location, type, and extent of AML impacts, as well as, information on the cost associated with the reclamation of those problems. The inventory is based upon field surveys by State, Tribal, and OSMRE program officials. It is dynamic to the extent that it is modified as new problems are identified and existing problems are reclaimed.

Date of Government Version: 03/23/2021
Date Data Arrived at EDR: 03/25/2021
Date Made Active in Reports: 06/17/2021
Number of Days to Update: 84

Source: Department of Interior
Telephone: 202-208-2609
Last EDR Contact: 06/14/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System
Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 02/03/2021
Date Data Arrived at EDR: 03/03/2021
Date Made Active in Reports: 04/05/2021
Number of Days to Update: 33

Source: EPA
Telephone: (415) 947-8000
Last EDR Contact: 05/18/2021
Next Scheduled EDR Contact: 09/13/2021
Data Release Frequency: Quarterly

UXO: Unexploded Ordnance Sites
A listing of unexploded ordnance site locations

Date of Government Version: 12/31/2018
Date Data Arrived at EDR: 07/02/2020
Date Made Active in Reports: 09/17/2020
Number of Days to Update: 77

Source: Department of Defense
Telephone: 703-704-1564
Last EDR Contact: 04/13/2021
Next Scheduled EDR Contact: 07/26/2021
Data Release Frequency: Varies

ECHO: Enforcement & Compliance History Information
ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide.

Date of Government Version: 04/04/2021
Date Data Arrived at EDR: 04/06/2021
Date Made Active in Reports: 06/25/2021
Number of Days to Update: 80
Source: Environmental Protection Agency
Telephone: 202-564-2280
Last EDR Contact: 07/01/2021
Next Scheduled EDR Contact: 10/18/2021
Data Release Frequency: Quarterly

DOCKET HWC: Hazardous Waste Compliance Docket Listing
A complete list of the Federal Agency Hazardous Waste Compliance Docket Facilities.

Date of Government Version: 11/03/2020
Date Data Arrived at EDR: 11/17/2020
Date Made Active in Reports: 02/09/2021
Number of Days to Update: 84
Source: Environmental Protection Agency
Telephone: 202-564-0527
Last EDR Contact: 05/21/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Varies

FUELS PROGRAM: EPA Fuels Program Registered Listing
This listing includes facilities that are registered under the Part 80 (Code of Federal Regulations) EPA Fuels Programs. All companies now are required to submit new and updated registrations.

Date of Government Version: 02/17/2021
Date Data Arrived at EDR: 02/17/2021
Date Made Active in Reports: 03/22/2021
Number of Days to Update: 33
Source: EPA
Telephone: 800-385-6164
Last EDR Contact: 05/14/2021
Next Scheduled EDR Contact: 08/30/2021
Data Release Frequency: Quarterly

AIRS: List of Permitted Facilities
A listing of permitted facilities in the state.

Date of Government Version: 03/31/2021
Date Data Arrived at EDR: 04/01/2021
Date Made Active in Reports: 06/22/2021
Number of Days to Update: 82
Source: Department of Health
Telephone: 808-586-4200
Last EDR Contact: 06/22/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Varies

DRYCLEANERS: Permitted Drycleaner Facility Listing
A listing of permitted drycleaner facilities in the state.

Date of Government Version: 03/31/2021
Date Data Arrived at EDR: 04/01/2021
Date Made Active in Reports: 06/22/2021
Number of Days to Update: 82
Source: Department of Health
Telephone: 808-586-4200
Last EDR Contact: 06/22/2021
Next Scheduled EDR Contact: 10/11/2021
Data Release Frequency: Varies

Financial Assurance: Financial Assurance Information Listing
A listing of financial assurance information for underground storage tank facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 12/03/2020
Date Data Arrived at EDR: 12/29/2020
Date Made Active in Reports: 03/16/2021
Number of Days to Update: 77
Source: Department of Health
Telephone: 808-586-4226
Last EDR Contact: 06/02/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Varies

LEAD: Lead Inspection Listing
Lead inspections

Date of Government Version: 03/15/2021
Date Data Arrived at EDR: 04/07/2021
Date Made Active in Reports: 06/29/2021
Number of Days to Update: 83
Source: Department of Health
Telephone: 808-586-5800
Last EDR Contact: 06/15/2021
Next Scheduled EDR Contact: 09/20/2021
Data Release Frequency: Varies

UIC: Underground Injection Wells Listing
A listing of underground injection well locations.

Date of Government Version: 02/07/2013
Date Data Arrived at EDR: 02/12/2013
Date Made Active in Reports: 04/09/2013
Number of Days to Update: 56
Source: Department of Health
Telephone: 808-586-4258
Last EDR Contact: 05/19/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Varies

PCS ENF: Enforcement data
No description is available for this data

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 02/05/2015
Date Made Active in Reports: 03/06/2015
Number of Days to Update: 29
Source: EPA
Telephone: 202-564-2497
Last EDR Contact: 06/30/2021
Next Scheduled EDR Contact: 10/18/2021
Data Release Frequency: Varies

PCS: Permit Compliance System
PCS is a computerized management information system that contains data on National Pollutant Discharge Elimination System (NPDES) permit holding facilities. PCS tracks the permit, compliance, and enforcement status of NPDES facilities.

Date of Government Version: 07/14/2011
Date Data Arrived at EDR: 08/05/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 55
Source: EPA, Office of Water
Telephone: 202-564-2496
Last EDR Contact: 06/30/2021
Next Scheduled EDR Contact: 10/18/2021
Data Release Frequency: Semi-Annually

PCS INACTIVE: Listing of Inactive PCS Permits
An inactive permit is a facility that has shut down or is no longer discharging.

Date of Government Version: 11/05/2014
Date Data Arrived at EDR: 01/06/2015
Date Made Active in Reports: 05/06/2015
Number of Days to Update: 120
Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 06/30/2021
Next Scheduled EDR Contact: 10/18/2021
Data Release Frequency: Semi-Annually

MINES MRDS: Mineral Resources Data System
Mineral Resources Data System

Date of Government Version: 04/06/2018
Date Data Arrived at EDR: 10/21/2019
Date Made Active in Reports: 10/24/2019
Number of Days to Update: 3
Source: USGS
Telephone: 703-648-6533
Last EDR Contact: 05/27/2021
Next Scheduled EDR Contact: 09/06/2021
Data Release Frequency: Varies

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR Hist Auto: EDR Exclusive Historical Auto Stations
EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR Hist Cleaner: EDR Exclusive Historical Cleaners
EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS: Recovered Government Archive State Hazardous Waste Facilities List
The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/08/2014
Number of Days to Update: 191

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LF: Recovered Government Archive Solid Waste Facilities List
The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/17/2014
Number of Days to Update: 200

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank
The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/03/2014
Number of Days to Update: 186

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Oil/Gas Pipelines
Source: Endeavor Business Media
Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by Endeavor Business Media. This information is provided on a best effort basis and Endeavor Business Media does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of Endeavor Business Media.

Electric Power Transmission Line Data
Source: Endeavor Business Media
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Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory
Source: Office of Planning
Telephone: 808-587-2895

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

STREET AND ADDRESS INFORMATION

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GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

VILLAGES OF LEIALII 1B
LEIALII PARKWAY
LAHAINA, HI 96761

TARGET PROPERTY COORDINATES

Latitude (North):	20.904288 - 20˚ 54' 15.44''
Longitude (West):	156.681281 - 156˚ 40' 52.61''
Universal Tranverse Mercator:	Zone 4
UTM X (Meters):	741188.2
UTM Y (Meters):	2313160.5
Elevation:	120 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	5941641 LAHAINA, HI
Version Date:	2013
West Map:	5945821 LANAI NORTH OE E, HI
Version Date:	2013

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

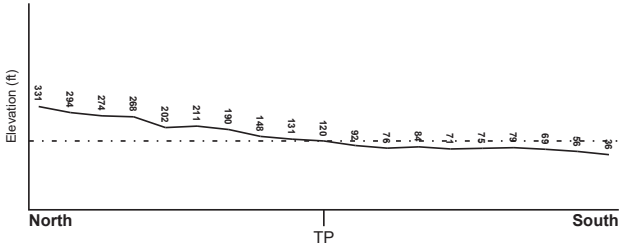
TOPOGRAPHIC INFORMATION

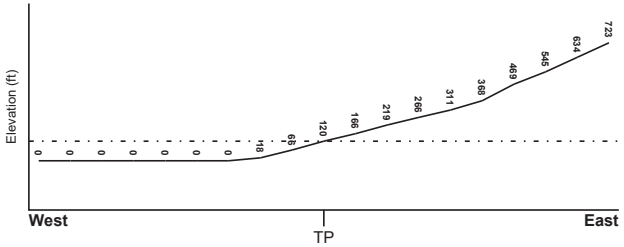
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General WSW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 120 ft.

0 1/2 1 Miles

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Flood Plain Panel at Target Property	FEMA Source Type
1500030353F	FEMA FIRM Flood data

Additional Panels in search area:	FEMA Source Type
1500030354E	FEMA FIRM Flood data
1500030362F	FEMA FIRM Flood data
1500030361F	FEMA FIRM Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
NOT AVAILABLE	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

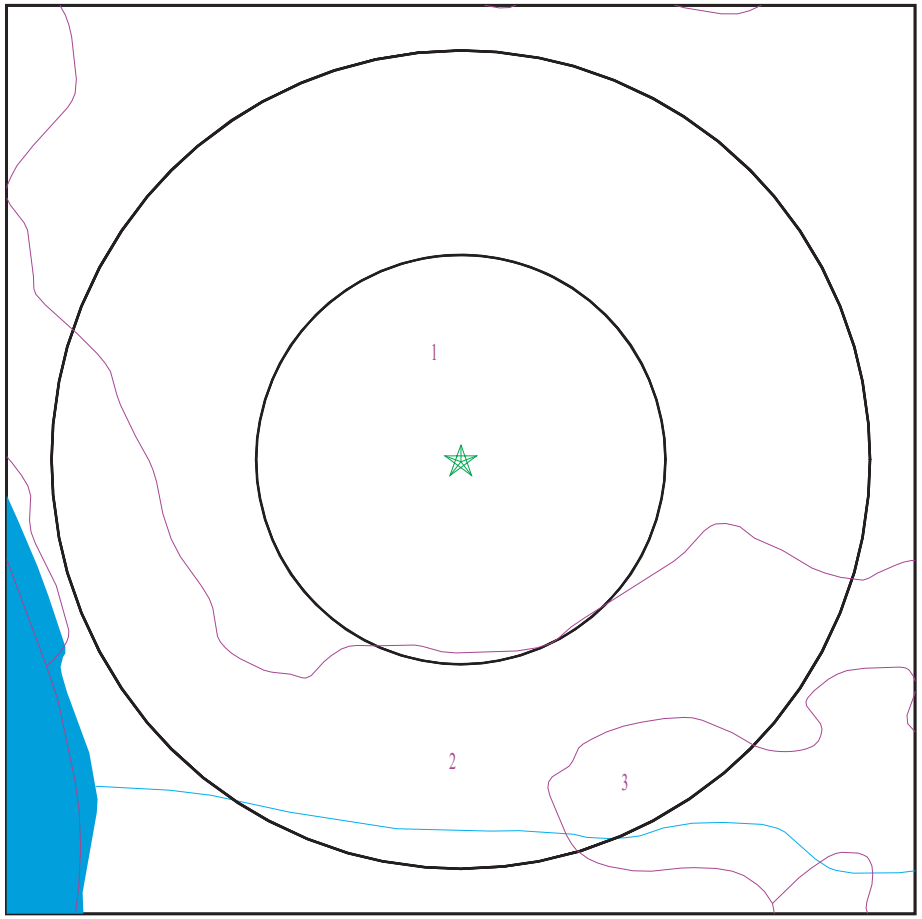
GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT		GEOLOGIC AGE IDENTIFICATION	
Era:	-	Category:	-
System:	-		
Series:	-		
Code:	N/A *(decoded above as Era, System & Series)*		

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 6562357.2s



★ Target Property
SSURGO Soil
Water

SITE NAME:	Villages of Leialii 1B	CLIENT:	ENPRO, Env. Professionals
ADDRESS:	Leialii Parkway Lahaina HI 96761	CONTACT:	Kim Kim
		INQUIRY #:	6562357.2s
LAT/LONG:	20.904288 / 156.681281	DATE:	July 02, 2021 4:03 pm

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GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Wahikuli

Soil Surface Texture: stony silty clay

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 81 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	14 inches	stony silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:
2	14 inches	31 inches	gravelly silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:
3	31 inches	42 inches	bedrock	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Map ID: 2

Soil Component Name: Wahikuli

Soil Surface Texture: very stony silty clay

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 81 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	14 inches	very stony silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:
2	14 inches	31 inches	gravelly silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:
3	31 inches	42 inches	bedrock	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:

Soil Map ID: 3

Soil Component Name: Wahikuli

Soil Surface Texture: stony silty clay

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 81 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	14 inches	stony silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:
2	14 inches	31 inches	gravelly silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:
3	31 inches	42 inches	bedrock	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	Not reported	Max: 0.42 Min: 0.02	Max: Min:

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

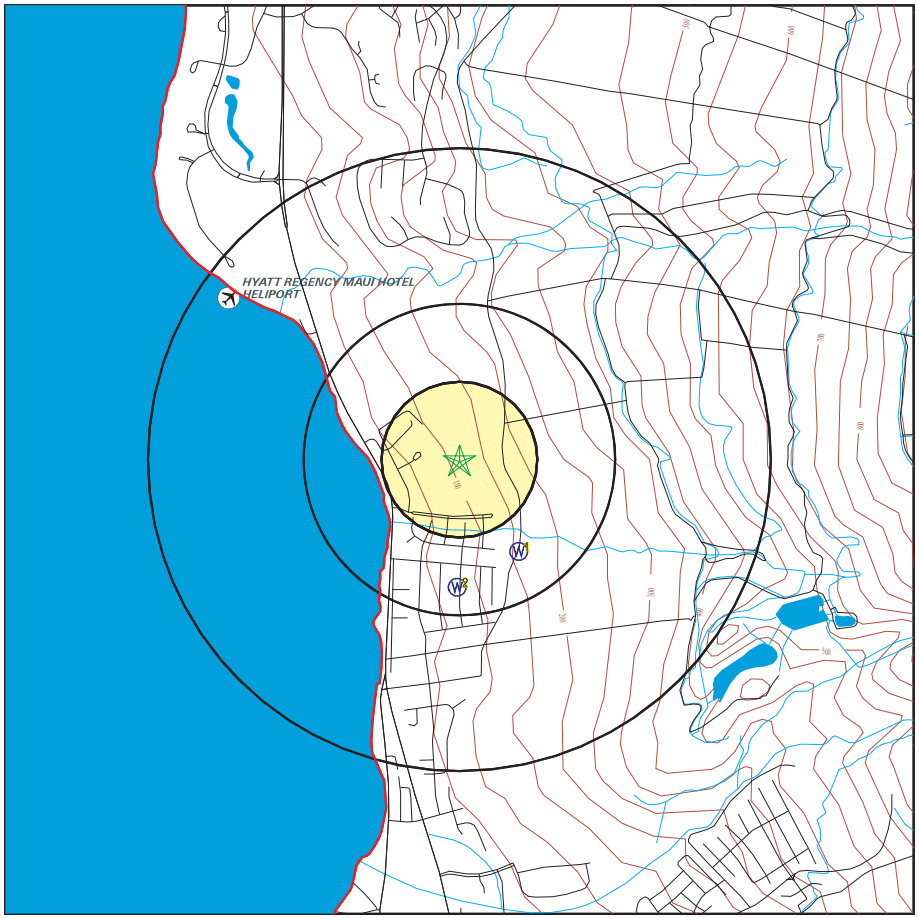
MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	HI1200000003728	1/4 - 1/2 Mile SSE
2	HI1200000003729	1/4 - 1/2 Mile South

PHYSICAL SETTING SOURCE MAP - 6562357.2s



0 1/4 1/2 1 Miles

- County Boundary
- Major Roads
- Contour Lines
- Airports
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- GI Indeterminate Groundwater Flow at Location
- GV Groundwater Flow Varies at Location

SITE NAME: Villages of Leialii 1B ADDRESS: Leialii Parkway Lahaina HI 96761 LAT/LONG: 20.904288 / 156.681281	CLIENT: ENPRO, Env. Professionals CONTACT: Kim Kim INQUIRY #: 6562357.2s DATE: July 02, 2021 4:03 pm

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID Direction Distance Elevation	Database	EDR ID Number
1 **SSE** **1/4 - 1/2 Mile** **Higher**	**HI WELLS**	**HI1200000003728**

Well #:	6-5440-001	Pump Rate (g/m):	0
Well Owner:	State of Hawaii Hawaii Housing Finance & Development Corporation, HHFDC		
Land Owner:	Not Reported	Well Use:	Landscape/ Water Features
Well Name:	Wahikuli Irr	Original Well Name:	Not Reported
Driller:	Roscoe Moss Hawaii Inc		
Well Construction Type:	Percussion	Casing Diameter (in):	10
Ground Elevation (ft):	148	Well Depth (ft):	162
Solid Casing Depth:	144	Perforated Casing Depth:	162
Major Well Use:	Landscape/ Water Features		
Initial Water Level (ft):	1.44	Water Level After Drilling:	0
Water Level After Install:	0	Chloride Content (mg/L):	240
Date Tested:	15-NOV-93	Test Pump Rate (g/m):	250
Test Drawdown Rate(ft):	1.2	Test Chloride Content (MG/L):	0
Test Water Temp:	0	Temp Unit:	Not Reported
Max Chloride Level:	Not Reported	Minimum Chloride Level:	Not Reported
Year Installed:	0	Draft Year:	Not Reported
Hole Bottom Elevation:	-14	Solid Casing Bottom Elevation:	4
Perforated Casing Bottom Elevation:	-14	Pump Capacity (MM gal/day):	0
Pump Intake Depth:	0	Latest Head:	Not Reported
Latest WCR1 Report:	08-DEC-93	Latest WCR2 Report:	Not Reported
Transmissivity:	0	Min to Pump 5 Volumes:	0

2 **South** **1/4 - 1/2 Mile** **Lower**	**HI WELLS**	**HI1200000003729**

Well #:	6-5441-002	Pump Rate (g/m):	0
Well Owner:	County of Maui, Department of Parks and Recreation, Central Maui, MDPR		
Land Owner:	Not Reported	Well Use:	Landscape/ Water Features
Well Name:	Lahaina Civic Center		
Original Well Name:	Not Reported	Driller:	Roscoe Moss Hawaii Inc
Well Construction Type:	Percussion	Casing Diameter (in):	8
Ground Elevation (ft):	0	Well Depth (ft):	97
Solid Casing Depth:	77	Perforated Casing Depth:	97
Major Well Use:	Landscape/ Water Features		
Initial Water Level (ft):	0	Water Level After Drilling:	0
Water Level After Install:	0	Chloride Content (mg/L):	540
Date Tested:	30-AUG-93	Test Pump Rate (g/m):	255
Test Drawdown Rate(ft):	0	Test Chloride Content (MG/L):	540
Test Water Temp:	0	Temp Unit:	Not Reported
Max Chloride Level:	Not Reported	Minimum Chloride Level:	Not Reported
Year Installed:	0	Draft Year:	Not Reported
Hole Bottom Elevation:	0	Solid Casing Bottom Elevation:	0
Perforated Casing Bottom Elevation:	0	Pump Capacity (MM gal/day):	0
Pump Intake Depth:	0	Latest Head:	Not Reported
Latest WCR1 Report:	10-SEP-93	Latest WCR2 Report:	Not Reported
Transmissivity:	0	Min to Pump 5 Volumes:	0

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

Federal EPA Radon Zone for MAUI County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for Zip Code: 96761

Number of sites tested: 10

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.030 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	Not Reported	Not Reported	Not Reported	Not Reported

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

HYDROLOGIC INFORMATION

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory
Source: Office of Planning
Telephone: 808-587-2895

HYDROGEOLOGIC INFORMATION

AQUIFLOW[R] Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Service, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Well Index Database
Source: Commission on Water Resource Management
Telephone: 808-587-0214
CWRM maintains a Well Index Database to track specific information pertaining to the construction and installation of production wells in Hawaii.

OTHER STATE DATABASE INFORMATION

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STREET AND ADDRESS INFORMATION

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RECORDS OF COMMUNICATION/INTERVIEW

Phase I Environmental Site Assessment Site Questionnaire

Persons with significant knowledge of the subject property – such as past and present owners and occupants – should provide the following information. Please fill in this form to the best of your ability and attach supporting documentation, if available. Without these answers, our report would have to note that the Phase I ESA is incomplete, and applicable Landowner Liability Protections could be at risk. **Return the completed questionnaire as soon as possible.**

Completed by:		
	Name:	Bryan Esmeralda
	Company:	State of HI, Dept of Hawaiian Home Lands
	Title:	Senior Associate
	Phone Number:	808-983-1233
	Time Familiar with Site:	
	Relationship to Site:	Consultant

PROJECT NO.: 2106-00227-PH1

PROJECT NAME/ADDRESS: Villages of Leialii 1B

GENERAL SITE USEAGE

1. What is the current use of the property? vacant/unused
2. Are hazardous materials or petroleum products currently present at the property? ○ Yes ○ No ● Unknown

   If yes, what type and where are they located? _____
3. What is the past use of the property? agriculture (sugar)
4. Were hazardous materials or petroleum products previously present at the property? ○ Yes ○ No ● Unknown

   If yes, what type and where were they located? _____
5. What are the current uses of the adjacent properties? vacant/residential/civic center
6. What were the past uses of the adjacent properties? agriculture (sugar)
7. What are the current uses of the surrounding area? vacant
8. What were the past uses of the surrounding area? agriculture (sugar)

EXTERIOR AREAS

9. Are there pits, ponds, or lagoons on or near the property? ◉ Yes ○ No ○ Unknown

10. Are there any rivers or creeks that run through the property? ○ Yes ◉ No ○ Unknown

11. Are there or have there ever been any above-ground storage tanks? ○ Yes ○ No ◉ Unknown

If yes, please complete the table below (status = active, out-of-use, removed, etc.):

Contents	Capacity	Location	Status	Known Leak?	Closure Report?
				☐	☐
				☐	☐
				☐	☐
				☐	☐

12. Are there any underground storage tanks on the property? ○ Yes ◉ No ○ Unknown

If yes, please complete the table below (status = active, out-of-use, removed, etc.):

Contents	Capacity	Location	Status	Known Leak?	Closure Report?
				☐	☐
				☐	☐
				☐	☐
				☐	☐

13. Are there any pipes of unidentified use on the property exterior? ○ Yes ○ No ◉ Unknown

If yes, where? _____

14. Are there any 55-gallon drums on the property exterior? ○ Yes ○ No ◉ Unknown

If yes, please describe number, contents, and location: _____

15. Are there any unidentified substance containers on the property exterior? ○ Yes ○ No ◉ Unknown

If yes, please describe their size and location: _____

16. Is there any electrical or hydraulic equipment on the property exterior? ◉ Yes ○ No ○ Unknown

If so, does the equipment contain PCBs?

Please describe the number, type, and location of the equipment: irrigation control boxes, telecom boxes

17. Are there any areas of stained soil or pavement on the property? ○ Yes ○ No ◉ Unknown

If so, where? _____

18. Is there any evidence of stressed vegetation on the property? ◉ Yes ○ No ○ Unknown

If so, where? water stress

19. Is there any solid waste on the property? ○ Yes ○ No ◉ Unknown

If so, where? _____

20. Are there any wells on the property? ○ Yes ◉ No ○ Unknown

If so, please describe the number, type, location, and purpose: _____

21. Are there any septic systems on the property? ○ Yes ◉ No ○ Unknown

INTERIOR AREAS

22. Are there interior heating/cooling systems? ○ Yes ◉ No ○ Unknown

23. Is there evidence of stains or corrosion on floors/walls/ceilings? ○ Yes ◉ No ○ Unknown

If so, in which rooms? _____

24. Are there any sump pumps on the property? ○ Yes ◉ No ○ Unknown

25. Are there any pipes of unidentified use on the property interior? ○ Yes ○ No ◉ Unknown

If so, where? _____

26. Are there any 55-gallon drums on the property interior? ○ Yes ○ No ◉ Unknown

If yes, please describe number, contents, and location: _____

27. Are there any unidentified substance containers on the property interior? ○ Yes ○ No ◉ Unknown

If yes, please describe their size and location: _____

28. Is there any electrical or hydraulic equipment on the property interior? ○ Yes ○ No ◉ Unknown

If so, does the equipment contain PCBs? ○ Yes ○ No ○ Unknown

Please describe the number, type, and location of the equipment: _____

PROPERTY DOCUMENTATION

29. Do you know of any past or present environmental documents or inspections? ◉ Yes ○ No ○ Unknown

30. Do you know of any hazardous waste permits? ○ Yes ○ No ◉ Unknown

31. Do you know of any wastewater permits? ○ Yes ○ No ● Unknown

32. Do you know of any underground injection permits? ○ Yes ○ No ● Unknown

33. Do you know of any stormwater pollution prevention plans? ○ Yes ○ No ● Unknown

34. Please indicate all supporting documentation provided along with this questionnaire.

a) Environmental document(s)/inspection(s)	● Attached	○ Not Provided	○ Not Applicable
b) Hazardous waste permit(s)	○ Attached	○ Not Provided	○ Not Applicable
c) Wastewater permit(s)	○ Attached	○ Not Provided	○ Not Applicable
d) Underground injection permit(s)	○ Attached	○ Not Provided	○ Not Applicable
e) Stormwater pollution prevention plan(s)	○ Attached	○ Not Provided	○ Not Applicable
f) Underground storage tank documentation	○ Attached	○ Not Provided	○ Not Applicable
g) Above-ground storage tank documentation	○ Attached	○ Not Provided	○ Not Applicable
h) Floor plan	○ Attached	○ Not Provided	○ Not Applicable
i) Site map	● Attached	○ Not Provided	○ Not Applicable
j) As-built drawings	○ Attached	○ Not Provided	○ Not Applicable

k) Other _____

35. Is there anything else we should know?

Property acquired in 2005 from HHFDC.

Respondent Affirmation. Respondent represents that to the best of their knowledge the above statements and facts are true and correct and no material facts have been suppressed or misstated.

Signature Bryan K. Esmeralda Date 8/4/2021

Answers to this questionnaire have been orally communicated to a representative of ENPRO Environmental, and was completed by:

Name Signature Date

Phase I Environmental Site Assessment User Questionnaire

The person who will use the Phase I ESA should provide the following information. Please fill in this form to the best of your ability, explaining any Yes answers to 1b), 2, 3, 4, 5, and/or 6 on a separate sheet of paper and attaching supporting documentation. Without these answers, our report would have to note that the Phase I ESA is incomplete, and your Landowner Liability Protections could be at risk. **Provide the completed questionnaire before we conduct the site visit.**

Completed by:	
Name:	Stewart Matsunaga
Company:	Munekiyo Hiraga
Title:	Acting Administrator, Land Development Division
Phone Number:	808-620-9283
Time Familiar with Site:	land acquired 2005 from HHFDC
Relationship to Site:	land owner

PROJECT NO.: 2106-00227-PH1

PROJECT NAME/ADDRESS: Villages of Leialii 1B

1. **Environmental Cleanup Liens.** ASTM requires the User to check for environmental liens that may be filed or recorded against the subject property. Such liens might be found in the "exceptions to coverage" section of the property's title insurance commitment or policy. Please attach all documentation pertaining to environmental cleanup leans.

   a) Have you checked for these environmental cleanup liens? ○ Yes ● No

   b) Are you aware of any such liens against the subject property? ○ Yes ● No

2. **Activity and Use Limitations (AULs).** These include engineering controls (e.g. caps) and land use restrictions or institutional controls (e.g. deed restrictions, covenants) that may be in place at the subject property or filed under federal, tribal, state, or local law. The title commitment or policy might list AULs. Please attach all documentation pertaining to environmental cleanup leans.

   Are you aware of any possible AULs involving the subject site? ○ Yes ● No

3. **Specialized Knowledge.** This involves personal knowledge or experience related to the subject property or nearby properties. For example, any chemicals, oil, degreasers, gasoline, or other hazardous substances commonly used at the subject property or adjacent properties. Include information on above-ground and/or underground storage tanks, cess pools, etc.

   Do you have any specialized knowledge that might indicate the past or present use of such substances on the subject or nearby properties? ○ Yes ● No

4. **Fair Market Value.** A purchase price significantly below fair market value may indicate an environmental problem. Please note that this question does not require an appraisal of the property. If the price is significantly below market value, the User should consider whether it might be because contamination may be present at the subject property.

   Is the purchase price significantly below fair market value? ● Yes ○ No

5. **Common Knowledge. Please use a separate sheet if necessary.**

a) Describe past uses of the property:

agriculture (sugar)

b) Describe any specific chemicals that are present or were once present at the property:

unknown

c) Describe any other information such as spills, cleanups, or previous environmental investigations that may help us identify possible contamination**:**

unknown

6. **Obvious Indicators.** This includes any spills, stains, releases, cleanups, etc. on or near the subject property.

Do you know of any obvious indicators of possible contamination on or near the site? ○ Yes ● No

7. **Purpose of Phase I.** Please indicate your purpose for conducting a Phase I Environmental Site Assessment as the subject property.

☐ Sale/purchase ☐ Return of lease ■ Redevelopment ☐ Other _____

8. **Plans.** This includes general maps, as-build drawings, etc. Please attach all available plans for the subject property.

Can you supply a floor plan diagram and list of tenants for the structures at the property? ○ Yes ○ No

9. **Attachments.** Please indicate all documentation provided along with this questionnaire.

a) Ownership records	● Attached	○ Not Provided	○ Not Applicable
b) Environmental liens	○ Attached	○ Not Provided	○ Not Applicable
c) AULs	○ Attached	○ Not Provided	○ Not Applicable
d) Explanation of specialized knowledge	○ Attached	○ Not Provided	○ Not Applicable
e) Explanation of reduced fair market value	○ Attached	○ Not Provided	○ Not Applicable
f) Additional information regarding common knowledge	○ Attached	○ Not Provided	○ Not Applicable
g) Explanation of obvious indicators of contamination	○ Attached	○ Not Provided	○ Not Applicable
h) Previous environmental reports	● Attached	○ Not Provided	○ Not Applicable
i) Floor plan	○ Attached	○ Not Provided	○ Not Applicable
j) Site map	● Attached	○ Not Provided	○ Not Applicable
k) As-built drawings	○ Attached	○ Not Provided	○ Not Applicable
l) Other			

Respondent Affirmation. Respondent represents that to the best of their knowledge the above statements and facts are true and correct and no material facts have been suppressed or misstated.

Signature Bryan K. Esmeralda Date 8/4/2021

Answers to this questionnaire have been orally communicated to a representative of ENPRO Environmental, andwas completed by:

Name _____ Signature _____ Date _____

REFERENCES

LINDA LINGLE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF HEALTH
919 Ala Moana Boulevard, Room 206
HONOLULU, HAWAII 96814

In reply, please refer to:
File: EHA/HEER Office
07-251 RB

May 11, 2007

TO: Interested Parties

FROM: Keith E. Kawaoka, D.Env., Program Manager
Hazard Evaluation and Emergency Response Office

SUBJECT: **Pesticides in Former Agricultural Lands and Related Areas – Updates on Investigation and Assessment (arsenic, technical chlordane, and dioxin test methodologies and action levels and field sampling strategies)**

Attached for you information is a technical report that presents guidance on the assessment of pesticides in former agricultural lands and related areas. This report serves as an addendum to the Hazard Evaluation and Emergency Response (HEER) Office document, *Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater* (May 2005).

If you have any question, place call Dr. Roger Brewer of my office at 1-808-586-4238, or contact him by email at roger.brewer@doh.hawaii.gov.

Attachment

Pesticides in Former Agricultural Lands and Related Areas
Updates on Investigation and Assessment

This technical report presents updated guidance on the investigation and assessment of residual pesticides in soils. The guidance focuses on the redevelopment of former agricultural land but is also applicable to golf courses, nurseries, military housing complexes and similar, large-scale projects involving soils that may have been treated with pesticides. Updates are provided for arsenic, chlordane and dioxin test methodologies and action levels. A basic review of multi-increment sampling strategies is also presented.

This technical report serves as an addendum to the Hawai‘i Department of Health (HDOH), Hazard Evaluation and Emergency Response (HEER) document *Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater* (May 2005 and updates) and other related technical reports noted below. Information presented in these technical memoranda will be incorporated into the upcoming revision of the HEER office *Technical Guidance Manual.* Comment and suggestions are welcome. Please contact Dr. Roger Brewer of HDOH at 1-808-586-4328 or roger.brewer@doh.hawaii.gov for further information.

Pesticides of Potential Concern

"Pesticides" is a general term that includes any type of chemical mixture specifically formulated to kill "pests." Pesticides commonly used in Hawai‘i include herbicides, fungicides and insecticides, the latter including termiticides and nematocides. HDOH recommends that sites where pesticides may have been regularly applied in the past be tested for residual contamination prior to redevelopment. The guidance is especially pertinent to large tracts of former agricultural land, golf courses, nurseries and military housing complexes that are being demolished and redeveloped with new homes.

In the case of former agricultural lands, contamination is likely to be heaviest in former pesticide mixing and staging areas, seed dipping areas and storage areas, although heavy contamination could occur in association with bagasse piles, settling ponds, former plantation camp areas, etc. Residual contamination in former fields has not been well documented, although HDOH is continuing to collect data for these areas. Conditions can vary dramatically from site to site.

Types of pesticides commonly used in Hawai'i include:

Pesticide Group & Related Contaminants	Standard USEPA Laboratory Method
Organochlorine pesticides	8081A
Organophosphorus pesticides	8041A
Chlorinated herbicides	8151A
Carbamates	8321A
Pentachlorophenol	8270
Fumigants	8260
Dioxins/furans	8280/8290
Heavy metals (primarily arsenic, lead & mercury)	various

The above list is not intended to be comprehensive, nor is it intended to represent a required list of target analytes that must be tested for in areas where pesticides were used in the past. Specific pesticides of concern should be based on a review of the historical use of the site with a focus on pesticides that may be persistent in soil above HDOH Environmental Action Levels (EALs, HDOH 2005 and updates). Soil and groundwater action levels for the majority of commonly used pesticides in Hawai‘i are included in this document. Contact the HEER office for pesticides not listed in the EAL document.

Fumigants are not likely to be persistent in shallow soils more than one year after use due to a propensity to volatilize into the atmosphere and degrade or be carried downward in leachate. Organochlorine pesticides are known to be very persistent in soils in Hawai‘i, as are arsenic and lead. Organophosphorus pesticides, chlorinated herbicides, carbamates and pentachlorophenol are more susceptible to biological and chemical breakdown over time and are more likely to be persistent in heavily contaminated, pesticide mixing areas than in fields. As of the date of the technical report, however, HDOH has not compiled adequate data to rule out the potential presence of these pesticides in former field areas above levels of concern. As discussed below, significant levels of dioxins and furans may also remain in soils even though the parent pesticide has degraded below levels of concern.

Summaries of historical pesticide use on agricultural lands are available from the Hawai‘i Department of Agriculture and other sources (e.g., Hanson 1959, 1962; HDOA 1969, 1977, 1989). The Clean Water Branch of HDOH provides a brief summary of pesticides in their NPDES guidance (HDOH 2004). A selection of pesticide-related documents can be downloaded from the HDOH EAL web page (refer to HDOH 2005).

A detailed review of pesticide use in Hawai‘i and a compilation of persistent contaminants that could accumulate in soil above levels of concern will be included in the upcoming revision to the HEER office Technical Guidance Manual (anticipated Fall 2007). Additional pesticides will be added to the current list of chemicals in the EAL lookup tables as needed.

Arsenic

HDOH recommends that the name of the soil series and a summary of the soil type be noted for samples tested for bioaccessible arsenic, including mention of the total iron and aluminum oxide content (NCRS 2007). HDOH also recommends that the fine-grained (<250µm) fraction of the soil sample that is to be tested for bioaccessible arsenic also be tested for total arsenic.

Guidance on the collection and interpretation of bioaccessible arsenic data is presented in the HDOH 2006 technical report *Soil Action Levels and Categories for Bioaccessible Arsenic* (HDOH 2006a). HDOH recommends that bioaccessible arsenic test be carried out when the total arsenic concentration in the soil exceeds 20 mg/kg (assumed upper limit for background arsenic in soil). Bioaccessible arsenic tests are used to estimate the fraction of total arsenic that could be stripped or “desorbed” from the soil following ingestion and thus made available for uptake. Arsenic that remains sorbed to the soil sample is considered to be unavailable for uptake and essentially “non-toxic.” The concentration of bioaccessible arsenic in a soil sample is calculated by dividing the mass of arsenic that moves into the batch test solution by the mass of the sample. Although not required as part of the bioaccessibility test, HDOH recommends that the concentration of total arsenic also be determined for the sample. This will help confirm the results of the test and provide insight on the range of arsenic bioaccessibility in the fine-grained fraction of contaminated soil.

The HEER Office has not developed generic bioaccessible factors for arsenic in soils in Hawai‘i and currently recommends testing on a site-by-site basis. The use of bioaccessible arsenic tests has not been formally adopted by USEPA as a substitute for bioavailable arsenic testing (i.e. in-vivo or animal testing). In lieu of formal guidance, USEPA has recommended that HDOH provide additional information to demonstrate a preponderance of evidence that the arsenic is indeed tightly bound to the soil and has very limited availability for uptake in humans. These lines of evidence include:

- *In vivo* studies that indicate very low arsenic bioavailability in soils from heavily impacted areas in Kea‘au (Exponent 2005, Roberts et al., 2006);
- The correlation of *in vivo* study results with bioaccessible arsenic data collected at the same site (e.g., Cutler 2006);
- Correlation of decreasing arsenic bioavailability with increasing iron oxide concentration (Roberts et al., 2006);
- Average iron oxide concentration in soils used for agriculture in Hawai‘i of 10-30%, well above typical soils on the US mainland (NRCS 2007);
- A lack of arsenic in groundwater underlying current and former sugar cane areas, indicating strong binding to soil and minimal leaching potential (HDOH 2006b);
- Laboratory testing at UH Manoa that demonstrated tropical soils (Andisols and Oxisols) with high levels of oxide and hydroxide mineral species have a natural ability to sequester arsenic, even over a wide pH range, making the arsenic less available to the soil solution - and therefore also estimated to be less bioaccessible through human ingestion and digestion (Cutler et al., 2006);
- Soil uptake factors for vegetables and fruits grown in arsenic-contaminated soils in the Kea‘au area are >2 orders of magnitude less than uptake factors published in scientific literature, supporting a conclusion that the arsenic is much more tightly bound to the soils than might otherwise be expected (HDOH, internal data);
- Laboratory batch test data that indicate arsenic sorption coefficients in soil greater than 500 (HDOH, internal data); and
- Use of a conservative, maximum-acceptable target risk to establish upper-bound action levels for bioaccessible arsenic in soil (HDOH 2006a).

HDOH recommends that a brief summary of the soil series associated with the subject site and sample point locations be provided with bioaccessible arsenic data (NRCVS 2007). The relationship between soil mineral characteristics and bioaccessibility is very complex and dependent on more than the metal oxide content of the soil. For example, the arsenic binding capacity of soils developed on coralline, coastal sediments is significantly less than soils developed over basalt, although these soils are rarely used for agriculture. Additional research is currently under way by the University of Hawai‘i as well as other groups.

Technical Chlordane and Other Organochlorine Pesticides

HDOH recommends that soils potentially treated with termiticides be tested for *technical chlordane* rather than individual chlordane isomers and related compounds generally found in technical chlordane. The concentration of chlordane isomers, heptachlor and heptachlor epoxide do not need to be reported. Laboratories should be directed to test for technical chlordane using USEPA Method 8081A or an equivalent method (USEPA 1996). This must be specifically requested prior

to submittal of the samples and noted on the Chain of Custody form. Laboratories should also be instructed to report any additional organochlorine pesticides that are not typically found in technical chlordane (e.g., DDT, dieldrin, endrin, etc.).

Technical chlordane is a mixture of chlordane (50-75%) and over 100 related compounds, including heptachlor and heptachlor epoxide (ATSDR 1994). Toxicity factors published by the USEPA are based on studies of technical chlordane, not individual chlordane isomers (USEPA 1997). These toxicity factors collectively take into account the full suite of compounds present in technical chlordane and are used to generate the USEPA Region IX Preliminary Remediation Goals (USEPA 2004) and HDOH Environmental Action Levels (HDOH 2005) for direct-exposure concerns. Since the quantification of technical chlordane includes chlordane, heptachlor and heptachlor epoxide, these individual compounds do not need to be reported in the analysis or evaluated separately in an Environmental Hazard ("risk") Assessment unless otherwise directed by HDOH. Doing so will cause the health risk posed by these compounds to be double counted, since it will already be included in the assessment of technical chlordane.

Tier 1 Environmental Action Levels (EALs) for technical chlordane are presented in the HDOH document *Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater* (HDOH 2005). Tier 1, direct-exposure action levels technical chlordane were generated using a target excess cancer risk of 10^{-6} and a noncancer hazard quotient of 1.0 (refer to Appendix 1, Tables I-1 through I-3). However, use of a target, cumulative risk of 10^{-5} is generally acceptable for evaluation of multiple contaminants under a Tier 2 or Tier 3 assessment. Since technical chlordane is actually a mixture of numerous chemicals, it is more appropriate to screen site data using Tier 2 direct-exposure action levels based on a cumulative target cancer risk of 10^{-5}. Correlative action levels for residential and commercial/industrial exposure are 16 gm/kg and 65 mg/kg, respectively. After taking into account action levels for leaching concerns, the following action levels are generated:

Tier 2 Action Levels for soil with technical chlordane only

Exposure Scenario	Direct Exposure (mg/kg)	[1]Leaching (mg/kg)	[2]Final Tier 2 Action Level (mg/kg)
Residential	16	15	15
Commercial/Industrial	65	15	15

1. HDOH EAL guidance document, Appendix 1, Table E-1.
2. Lowest of direct-exposure and leaching soil action level

These action levels will replace the Tier 1 action levels for technical chlordane currently presented in the HDOH EAL document (HDOH 2005). On a site-specific basis, HDOH may require calculation of cumulative cancer and noncancer health risks if contaminants not related to technical chlordane are identified in the soil above HDOH Tier 1 action levels for direct-exposure concerns. This may be necessary to assure that a cumulative cancer risk of 10^{-5} and a noncancer Hazard Index of 1.0 are not significantly exceeded. Leaching concerns posed by the additional contaminants must also be evaluated.

Refer to the HDOH technical report *Use of laboratory batch tests to evaluate potential leaching of contaminants from soil* for guidance on the site-specific evaluation of potential leaching concerns

and the development of alternative action levels (HDOH 2007). Technical chlordane has a very low mobility in soil and the soil leaching action level is considered to be highly conservative. If the batch tests indicate that the technical chlordane does not pose a threat to groundwater then the direct-exposure action levels (or estimated cumulative health risks) can be used to guide final remedial actions.

Soil that meets the Tier 2, commercial/industrial direct-exposure action level for technical chlordane (i.e., up to 65 mg/kg) can be used as interim (daily) cover in landfills, provided that the soil passes a TCLP leaching test and given the concurrence of the landfill operator. A maximum concentration of 65 mg/kg technical chlordane is recommended, unless otherwise approved by HDOH. Soil used for longer-term, intermediate cover must meet more stringent action levels (e.g., residential). Contact the HDOH Solid and Hazardous Waste Branch for additional information regarding the use or disposal of soil at landfills.

Dioxin

HDOH concurs with the use of bioassay kits to help reduce the time and expense related to investigation of dioxin concentrations in soil. Dioxins are included in Table 1 as potential contaminants of concern due to their presence in pesticides (NTP 2005), especially pentachlorophenol (PCP), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4,5-trichlorophenoxypropionic acid (2,4,5-TP or Silvex). These chemicals were used as herbicides on agricultural lands in Hawai'i. Dioxins can also be created when organic material is burned in the presence of chlorine, including the burning of sugar cane fields where organochlorine pesticides and other chlorine containing media are present.

Quantification of dioxins in soil is for use in human health risk assessments is carried out using GC/MS laboratory methods (USEPA Methods 8280 and 8290). Risk to human health is estimated in terms of toxicity equivalents of individual dioxin and furan congeners or "TEQ dioxins" (WHO 2005). Soil action levels for TEQ dioxins are discussed in the HDOH technical report *Proposed dioxin action levels for East Kapolei Brownfield Site* (HDOH 2006c).

Laboratory GC/MS tests can be expensive and time consuming, with analytical costs typically ranging between $750 and $1,000 per sample. Bioassay methods offer a cheaper and faster approach to screen for dioxins in soils. Bioassay methods currently available include CALUX (Dennison et al. 1999, USEPA 2005a) and Cape Technology's DF1 kit (USEPA 2005b). Bioassay data are reported directly in terms of TEQ units. In order to evaluate the accuracy and precision of bioassay kits for soils in Hawai'i, HDOH collected 25 soil samples from a former sugar cane field in west O'ahu and tested the samples for TEQ dioxins using both High Resolution GC/MS and CALUX. A summary of the results of the study is presented in Figure 1. As can be noted in the figure, CALUX consistently over predicted TEQ dioxin concentrations in the soil in comparison to the GC/MS analysis. While the correlation of the CALUX test with the GC/MS data is somewhat low, the conservative nature of the CALUX test supports its use as screening tool to estimate maximum levels of TEQ dioxins in soil.

For sites where a bioassay method is used for dioxin analysis, HDOH recommends that dioxin levels be confirmed on 10% of the samples using GC/MS (or two samples, whichever is greater). The GC/MS analyses should be conducted on samples with the highest-reported, bioassay TEQ dioxins results. Additional analysis of samples using GC/MS methods may be necessary for sites where CALUX tests indicate TEQ dioxins in soil over the HDOH upper action level of 390 ng/kg.

Refer to the HDOH technical report *Proposed dioxin action levels for East Kapolei Brownfield Site* for additional guidance on soil action levels (HDOH 2006c).

Multi-Increment and Decision Unit Investigation Strategies

HDOH strongly encourages the use of *multi-increment* and *decision unit* strategies (Ramsey and Hewitt 2005) to enhance sample representativeness in the investigation of contaminated soil. Multi-increment samples significantly increase the accuracy of representative contaminant concentrations, in comparison to traditional, discrete samples (Jenkins et al. 2005). Establishing decision units early in the investigation helps integrate the field investigation with an assessment of potential environmental concerns, referred to as an "Environmental Hazard ("risk") Assessment" (HDOH 2005).

Detailed guidance on multi-increment and decision-unit investigation strategies will be included in the upcoming revision to the HEER Office Technical Guidance Manual (anticipated late 2007). In the interim, a brief summary of these approaches is provided below. Example work plans and site investigation reports can be reviewed at the HEER office and will be posted to the HDOH EAL web page (refer to HDOH 2005). Reviewers of these reports should be aware that the projects were carried out during ongoing refinement of approaches for the investigation of large areas and the sampling strategies presented may not be directly transferable to new sites without modification and consultation with HDOH.

Multi-Increment Samples

Multi-increment samples improve the reliability of sample data by reducing the variability of the data as compared to conventional discrete sampling strategies. Thirty to fifty small *increments* of soil (typically 10 to 50 grams per increment) are collected from each specific *decision unit* of interest (see below). The increments are collected in a stratified-random manner (e.g., by walking up and down adjacent rows) and physically combined into one sample. The combined sample is analyzed to obtain a representative contaminant concentration for the entire decision unit. Multi-increment sampling data typically have low variability and high reproducibility, which results in a high level of confidence for decision-making. Three multi-increment samples, referred to as field replicate samples or *triplicates*, should be collected in 10% of the decision units being tested (minimum one set of triplicate samples per site). Data for the samples can be statistically compared in order to evaluate the precision of the field sampling methodology.

Multi-increment samples generally weigh between 500 and 2,000 grams. The laboratory dries the sample, sieves it to <2mm particle size (can also be done in the field) and collects a subsample for analysis. To obtain a representative sub-sample, the field sample must be processed so that the entire "population" of soil particles is accessible for collection. Sub-sampling can be accomplished with a sectoral splitter or by collecting a multi-increment sample using the same approach as used to collect the field sample but with smaller tools and increment masses (USEPA 2003). A larger mass than typically called for in the published USEPA laboratory method is recommended for in order to reduce lab fundamental error due to the range of particle sizes being tested (e.g. 10 gram versus 1 gram sample for total arsenic analyses, based on a maximum particle size of 2 mm). [Note that a mass of 1 gram is considered acceptable for samples that have been sieved to <250µm, as is required for bioaccessible arsenic analysis.]

Multi-increment samples can be collected for both nonvolatile and volatile contaminant analyses. Sample collection for volatile contaminants requires that increments be placed in an extraction

solution in the field (ADEC 2007). Issues related to field extraction solutions, methanol transportation in the field, appropriate sample containers, elevated laboratory method reporting limits, etc., still need to be worked out, however, and this approach has not yet been widely used in Hawai'i. Additional guidance will be provided in the upcoming revision of the HEER office *Technical Guidance Manual* (anticipated late 2007). Consultants who would like to use the approach in the meantime should provide sampling and analysis work plans to the HEER office for review and ensure close coordination with the receiving laboratory.

Decision Units

Multi-increment samples should be collected in carefully selected *decision units*. A decision unit is an area where a decision is to be made regarding the extent and magnitude of contaminants with respect to the environmental concerns posed by the contaminants. (Strictly speaking, a decision unit is really a volume rather than area of soil, since the thickness of the decision unit is often a key factor.) These concerns include direct exposure to the soil, intrusion of vapors into overlying buildings, leaching and contamination of groundwater, toxicity to terrestrial flora and fauna and gross contamination (odors, explosive hazards, etc.; HDOH 2005). A decision unit can be an identified spill area or "hot spot," a residential yard, a playground or schoolyard, a garden, a commercial/industrial property or other specific area of interest. The size and shape of a decision unit is primarily controlled by the environmental concerns posed by the contaminants present and the intended use of the site.

An investigation of individual spill areas is generally necessary to assess leaching, vapor intrusion and gross contamination concerns at sites contaminated with highly mobile or volatile contaminants. This can include releases from pipelines or tanks or heavily contaminated portions of pesticide mixing areas in former agricultural lands. Each spill area represents a single decision unit. Discrete samples, or more preferably multi-increment samples collected over small areas, can be useful for delineation of spill area boundaries. The spill areas themselves should be sampled using multi-increment samples when feasible, however. Non-volatile contaminants in spill areas can be readily sampled using multi-increment sampling methods. Volatile contaminants could also be investigated with multi-increment sampling in these areas, although guidance on field methods has yet to be worked out in detail (see above).

Decision units that encompass an entire residential or commercial lot are appropriate for assessment of direct-exposure concerns. This is typically the driving environmental concern for the investigation of former agricultural field areas. Each residential lot represents a separate decision unit. Testing every lot may not be feasible or necessary for projects over 10 to 25 acres in size, depending on the size of the individual lots (default is 5,000 ft^2). For moderate-size sites, it may be feasible to combine multiple lots into larger "composite" decision units (typically up to five lots) and collect a single multi-increment sample from within each unit. The maximum concentration of a contaminant in any given lot is equal to the concentration reported for the composited decision unit times the number of lots included (i.e., assumes all of the contamination is on one lot). The variance of contaminant concentrations between composited decision units may also be useful to estimate worst-case contaminant concentrations on individual lots.

For very large redevelopment projects (e.g., >100 acres), testing each individual lot and even combining lots into larger decision units may not be practical. As an alternative, HDOH recommends that multi-increment samples be collected from a statistically defendable number of 5,000ft^2 decision units randomly located across the site. Each decision unit represents a

hypothetical, residential lot. The data from these decision units can be statistically evaluated to predict maximum contaminant concentrations on any given lot within the site. Although not every lots is tested, this approach ensures that data are at least available for nearby, presumably comparable lots.

A minimum of 59 decision unit is required to obtain the HDOH-desired, 95% confidence level that residual levels of pesticides on untested lots do not exceed the maximum concentration identified on the lots tested (USEPA 1989). Past crop types, topography, soil type, planned future use and related factors should be considered in the selection of decision unit locations in order to ensure that a representative sampling of the site is carried out. Areas suspected of potentially higher levels of contamination should be investigated separately and not included in the 59 decision units selected to characterize the primary field area (e.g., former pesticide mixing areas, storage areas, plantation camps, rail lines, etc.) This approach has been used at several large-scale redevelopment sites in Hawai‘i and will be discussed in the upcoming revision of the HEER office Technical Guidance Manual.

Initial Screening of Agricultural Lands

It is often desirable to carry out a screening level investigation of former agricultural land prior to committing funds for a full-scale, detailed investigation, as described above. Although not adequate for HDOH to make final regulatory determinations, this step provides important information that can be used to prepare a more detailed work plan. Defensible methods to screen large areas of land are still being developed. A combined multi-increment/decision unit approach is preferred over the collection of a limited number of discrete or composite samples based on the total acreage of the site. Two example approaches are described below.

A relatively quick and sensible approach is to divide the site into neighborhood-size decision units rather decision units based on the size of hypothetical, individual lots. An area of ten acres is a reasonable starting point for a “neighborhood.” A minimum of 15 decision units per site is preferable. This helps to ensure coverage of large-scale heterogeneities across the site and, if needed, is usually adequate for use in basic statistical analyses. The size and shape of individual decision units can vary and should be determined with respect to soil type, topography, past crop use, proposed redevelopment, etc., as discussed above. A multi-increment sample should be collected from each decision unit, with triplicates collected in ten-percent of the decision units (minimum two). Each sample should be tested for the full suite of pesticides that may have been used at the site in the past, including related contaminants like arsenic and dioxins. Again, areas suspected of higher levels of contamination should be investigated separately.

An alternative approach for sites where access is an issue is to collect multi-increment samples in 18 (vs 59), 5,000ft^2 decision units randomly located across the site, each representing a hypothetical, residential lot. This allows an estimation of maximum contaminant levels on any given lot to a 60% confidence level (USEPA 1989). The samples should be tested as described above. The collection of multi-increment samples in specified decision units is preferred to the collection of randomly located, discrete samples in large field areas.

As is often the case, developing the most appropriate investigation for a given site involves a balance of short-term time versus long-term uncertainty and liability. A neighborhood-based, screening level investigation is recommended where feasible. Testing entire neighborhoods will provide some level of comfort to future residents whose lots were not tested during the full-scale

investigation. Perhaps most importantly, however, this approach requires a thorough walkthrough of the entire site. This will assist in the identification of areas suspected of elevated contamination, including previously unknown dumping sites, waste pits, former plantation camp areas, storage areas, etc. When walking and testing the entire site is not feasible, testing a limited number of lot-size decision units is recommended. One advantage of this approach is that the decision unit data can potentially be included in the full-scale investigation of the property (e.g., 18 of the 59 total decision units), saving on follow up investigation time costs.

Sample data from the screening level investigation should be used to initially assess residual pesticide levels in the fields and to prepare a more focused list of target pesticides of concern for the detailed investigation. Pesticides that are not detected during the initial screening investigation can generally be eliminated, although this should be discussed with HDOH. Eliminating specific pesticides from the list of target contaminants will require approval if the site is being formally overseen by HDOH.

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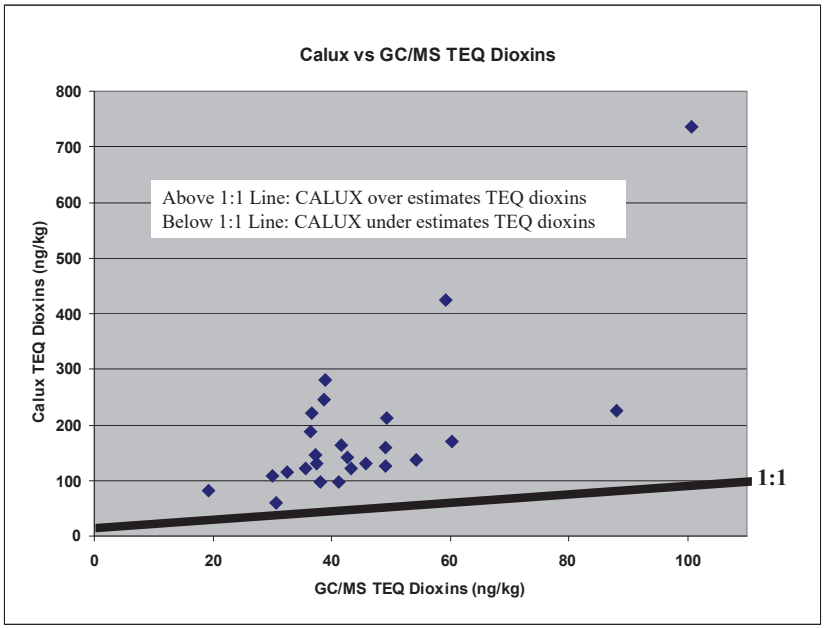

Figure 1. Results of East Kapolei study conducted on 25 samples of soil from a former sugar cane field. CALUX consistently over estimated TEQ dioxins in comparison to High Resolution GC/MS data for split samples.

QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

Kimberly Kim
Environmental Professional

CAREER HISTORY

Experienced in conducting ASTM Standard Phase I and Phase II Environmental Site Assessments and site assessment work addressing PCBs, petroleum-related contaminants, pesticides, asbestos, metals, underground storage tanks (USTs), and non-point source contaminants and review of federal, state and county databases and regulatory files.

Experienced in developing Environmental Hazard Evaluations (EHEs), Environmental Hazard Management Plans (EHMPs).

Experienced in fugitive gas emission monitoring.

Experienced in collecting multi-incremental soil samples.

Experienced in conducting hazardous materials surveys and environmental site assessments for asbestos containing building materials, and lead containing paint.

Experienced in conducting surveys for moisture intrusion, visible suspect mold and indoor air quality investigations.

Experienced in conducting post remediation verification (PRV) for mold and moisture intrusion remediation and hygienic indoor surfaces.

Experienced in the planning and execution of ground penetrating radar (GPR) surveys.

Research experience includes fieldwork and writing sduring the investigation of Surtseyan eruption dynamics, impacts of jetting during littoral explosions, mass transport on the Martian surface, GPR studies of pyroclastic runout, and disaster preparedness in the Hawaiian islands.

EDUCATION

B.S. Geology and Geophysics – 2011 University of Hawaii at Manoa. Emphasis in volcanology and Hawaiian geology.

PUBLICATIONS

Bergonio J, Rottas KM, Schorghofer N (2013) *Properties of Martian slope streak populations*, Icarus 225:194-199.

Rottas KM, Houghton BF (2012) *Structure, stratigraphy, and eruption dynamics of a young tuff ring: Hanauma Bay, Oahu, Hawaii*, Bull Volcanol 74:1683-1697.

SPECIALIZED TRAINING

30 Hour OSHA Construction; October 2016

40 Hour EM 385-1-1; October 2016

GHS and OSHA Hazardous Communication; October 2016

Lead Renovator; September 2016

40 Hour HAZWOPER; July 2016

Lead Paint Regulations; March 2016

Gas Free Instrumentation, 2016

Volcanic Crisis Awareness, Coastal Community Resilience; 2012

Tsunami Awareness; 2011

Disaster Management; 2010

Kimberly Kim
Environmental Professional

CERTIFICATIONS & LISCENCES

Hawaii State Certified Lead Risk Assessor, Certification No. PB-0842

AHERA Asbestos Building Inspector, Project Monitor, and Project Designer, Certification No. HIASB-4124

ACAC Council-Certified Fire and Smoke Damage Technician, Certification No. 1712016

ACAC Council-Certified Indoor Environmental Consultant, Certification No. 1801016

Associate Safety Professional, Certification No. ASP-29724

Registered Professional Geologist, Certification No. 70607

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Shea Momohara

Environmental Professional

CAREER HISTORY

Experienced in conducting ASTM Standard Phase I and Phase II Environmental Site Assessments (ESA)'s and site assessment work addressing PCBs, petroleum-related contaminants, pesticides, asbestos, metals, underground storage tanks/aboveground storage tanks (USTs/ASTs), volatile organic compounds (VOCs), and non-point source contaminants and review of federal and state and county databases and regulatory files.

Experienced in writing and interpreting sampling and analysis plans (SAPs), environmental hazard evaluation/environmental hazard management plans (EHE/EHMPs), specifications, submittals, and floor plans for large scale and long duration projects.

Experienced in field work and sampling for constituents in accordance with SAPS, EHE/EHMPs, specifications, submittals, and demolition floor plans.

Experienced in soil, water, air, and hazardous materials sampling and laboratory analysis interpretation.

Experienced in working closely with the State of Hawaii Department of Health (HDOH) with writing EHE/EHMPs for soil and water testing.

Experienced in conducting clearance, personal, and area air monitoring for asbestos, lead, and other particulates and lead dust wipe sample collection, in compliance with Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA) and HDOH regulations.

Experienced in project monitoring for removal and disturbance of hazardous materials and implementing containment engineering controls in compliance with EPA, OSHA, and HDOH regulations.

Experienced in conducting hazardous materials surveys and environmental site assessments for asbestos containing building materials and lead containing/lead-based paint.

Experience in oversight of remediation, abatement, renovation, and demolition projects.

Experienced in conducting sampling, laboratory analysis interpretation, and report writing for consultation projects including LEED testing, radon, combustion by-products, particulates, etc.

Experienced in conducting fire assessments for fire-related hazardous constituents, including sampling, laboratory analysis interpretation, and report writing.

Experienced in conducting fungal inspection surveys for moisture intrusion, visible suspect mold and indoor air quality investigations.

Experienced in conducting post remediation verification (PRV) for mold and moisture intrusion remediation and hygienic indoor surfaces.

Experienced in environmental research and report preparation.

Experienced in ecological fieldwork.

Experienced in water restoration technician training.

EDUCATION

B.A. Biology – 2015 University of Hawaii at Manoa.

Shea Momohara

Environmental Professional

SPECIALIZED TRAINING

AHERA Asbestos Building Inspector Certification, No. HIASB-4288

AHERA Asbestos Building Project Monitor, Certification No. HIASB-4288

ACAC Council-Certified Residential Indoor Environmentalist (CRIE), Certification No. 1801011

Lead Renovators Initial Certified, Certificate Verification No. R-I-8861-3-17-00051

Lead Inspector Certification

Lead Risk Assessor Certification

IICRC Water Restoration Technician (WRT)

CPR/AED for Pro Rescuers; Responding to Emergencies; First Aid Certified, Certification ID: GVS5E5 (Exp. 2022)

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Kenton Beal
Executive Vice President

CAREER HISTORY

More than twenty-five years of professional environmental project development and management. Strong emphasis on risk evaluation, risk ranking and environmental hazard assessment. Experienced in portfolio-wide environmental management and prioritizing resource allocation to address environmental liabilities in a cost effective manner. Has developed thousands of project budgets for planning and implementation purposes. Performed numerous RCRA hazardous waste characterization investigations, Phase I and II environmental investigations, remediation of soil and groundwater and environmental management of large construction projects. Projects have included urban renewal, remediation management at petroleum refineries, best management practices, storm water management, solid waste management, construction-related permitting, indoor air quality evaluations, closure of RCRA Treatment Storage and Disposal (TSD) facilities, remediation management for fungal contamination, evaluation of environmental issues related to lease disputes and commercial property transactions. Has performed and managed thousands of mold and moisture investigations ranging from single-family residential properties to high-rise commercial and resort properties.

PROFESSIONAL AFFILIATIONS

Registered Environmental Assessor (California)
Past President, Hawaii Chapter of the Institute of Hazardous Materials Managers
Registered Geologist (California)
Certified Professional Geologist (American Institute of Professional Geologists)
American Indoor Air Quality Council (Board of Directors, Hawaii Chapter)
Certified Indoor Environmentalist (Indoor Air Quality Association)
Certified in Mold Loss Prevention (Indoor Air Quality Association)
American Industrial Hygiene Association

EDUCATION

MBA, Hawaii Pacific University, 2001
M.S., Geology and Geophysics, University of Hawaii, 1987
B.A., Geology, University of California at Santa Barbara, 1984

GEOGRAPHIC EXPERIENCE

Successfully completed projects throughout the major Hawaiian Islands, Guam, Saipan, CNMI, Puerto Rico, Japan, and throughout the United States

ENVIRONMENTAL INVESTIGATION/ REMEDIATION EXPERIENCE

Projects have included wood treatment facilities, petroleum refineries, underground storage tank (UST) sites, agricultural facilities, urban renewal projects, petroleum bulk storage terminals impacted with free floating petroleum hydrocarbons, dry cleaners, and a variety of commercial/industrial facilities. Received No Further Action status at multiple sites from the State of Hawaii Department of Health. Successful experience with investigation and remediation projects for real property transfers and redevelopment. Design of corrective measures for indoor air quality complaints. Mold and moisture training, prevention and response planning.

Kenton Beal
Executive Vice President

SPECIALIZED TRAINING

Mold Loss Prevention, Indoor Air Quality Association
Groundwater Flow through Porous and Fractured Media, University of Wisconsin-Madison
Corrective Action for Containing and Controlling Ground Water Contamination, National Water Well Association
Basic Ground Water Modeling, National Water Well Association
Project Management, University of Hawaii
Clean Air Act Amendment 112 ®, U.S. EPA
Management & Supervision of Hazardous Waste Operations, Unitek Environmental Consultants
AHERA Asbestos Management Planner
AHERA Asbestos Inspector
HVAC and the Indoor Environment, American Indoor Air Quality Council
IICRC S520 Mold Remediation Guideline, American Indoor Air Quality Council
Case Studies in Environmental Mold, American Industrial Hygiene Association
Health Effects of Mold, American Indoor Air Quality Council
40-hour Hazwoper Training and Refreshers, Various
Understanding Environmental Sampling and Data Analysis
Managing Uncertainty with Systematic Planning

PROFESSIONAL PRESENTATIONS

Building Operator Certification, Indoor Environmental Quality, University of Hawaii
Environmental Game Changers, Honolulu, Hawaii
Indoor Air Quality in Commercial Buildings, American Society of Heating and Refrigeration Engineers
Environmental Solutions for Real Estate Transactions, Honolulu Board of Realtors
Storm Water Monitoring, Law Seminars International, Honolulu
Mold Remediation Boot Camp, Las Vegas
Mold University™, Honolulu and Houston
Indoor Air Quality for Property Managers, San Francisco, Honolulu, Las Vegas, Los Angeles
Mold Report™, San Francisco, Honolulu, Las Vegas, Los Angeles
Mold Awareness, International Executive Housekeepers Association
Advanced Conference on Real Estate, Law Seminars International
Hot Topics in the Mold Industry, American Indoor Air Quality Council, Hawaii
Mold Investigation Training, Pensacola, Fort Lauderdale, Orlando, Tampa, Florida
Environmental Investigation for Emergency Services, Burbank and Long Beach California
Multi-Family Residential Development, Lohrman Education Services, Honolulu
Environmental Law Seminar A to Z, NBI, Inc., Honolulu
Real Estate Development From Beginning to End, Lorman Educations Services, Honolulu

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ENPRO

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT

APPENDIX E-1

May 5, 2022

Mrs. Adrienne Wong
Austin, Tsunami & Associates, Inc.
1871 Wili Pa Loop, Suite A
Wailuku, Hawaii

RE: Phase II Environmental Site Assessment
Villages of Leiali'i 1B
Lahaina, Hawaii
ENPRO Project Number: 2202-00041-PH2

Dear Mrs. Wong,

ENPRO Environmental (ENPRO) has prepared this letter to document Multi Increment® (MI) soil sampling activities performed at the above-referenced address (the Site) between March 16, and April 1, 2022. The Site location is illustrated in Figure 1. Figure 2 presents an aerial photo of the Site with brief descriptions of surrounding land use.

The objective of this investigation was to evaluate the presence of chemicals of potential concern (COPCs) that may have resulted from historical use at the Site.

BACKGROUND

In September and October of 2021, ENPRO Environmental (ENPRO) conducted a Phase I Environmental Site Assessment (Phase I ESA) of the subject property as described in the *Phase I Environmental Site Assessment, Villages of Leiali'i 1B, Lahaina, Hawaii* report dated November 8, 2021.

The Phase I ESA identified the Phase I Investigation identified the following Recognized Environmental Conditions:

- Based on historical use of the Site for agricultural activities, there is a potential that soil is contaminated with petroleum, arsenic, and pesticides. Current State of Hawaii Department of Health (DOH) guidelines state that when property use changes from agricultural to residential, soil sampling may be warranted to evaluate possible contamination. ENPRO recommended conducting soil sampling at the Site.
- DOH documented a fueling station and visible soil contamination at the Site in 2005. Limited soil sampling later that year documented diesel and oil range hydrocarbons exceeding current environmental action levels in stockpiled soil at

an unknown location on the Site (see Section 4.3 of the Phase I report for additional information). The sampling technique did not meet current guidelines for soil sampling. The final disposition of the contaminated soil was not documented. The location of the sampling was poorly documented.

- Multiple structures were depicted on the southern portion of the Site in a 2000 soil were collected using a stainless-steel sampling spoon and placed into a re-sealable plastic Ziploc® bag, comprising a bulk sample of approximately 1,500 grams.

MI samples were labelled with a unique sample number, recorded on a chain-of-custody form, placed into an insulated sample chest with ice, and shipped overnight via FedEx to OnSite Environmental, Inc. (OnSite) in Redmond, Washington for TPH, organochlorine pesticides and total arsenic analysis.

ENPRO collected replicate soil samples, as described in the DOH TGM, from DU7, DU8, DU30, DU31, DU50 using the same sampling methodology as described above.

LABORATORY ANALYSES AND INTERPRETATION OF REPLICATE RESULTS

OnSite Environmental Inc. (OnSite) analyzed soil samples for:

- Organochlorine pesticides (EPA Method 8081A)
- Total arsenic (EPA Method 3051m/7061Am)
- TPH (EPA Method 5015M)

To evaluate variance in field sample collection, standard deviations from the replicates were calculated and used to obtain relative standard deviations (RSDs) for each set of replicate samples. Statistical data are presented in Tables 1, 2, and 3.

Table 1

Surface Soil Replicate Calculations, DUs 7A and 8A

Analyte/Calculation	DU7A			DU8A		
	MI7AI (mg/kg)	MI7AII (mg/kg)	MI7AIII (mg/kg)	MI8AI (mg/kg)	MI8AI (mg/kg)	MI8AI (mg/kg)
RRO	< 57	< 57	< 57	< 57	< 57	< 57
Mean	< 57			< 57		
Standard Deviation	0			0		
RSD	0.0%			0.0%		
gamma-Chlordane	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Mean	< 0.011			< 0.011		
Standard Deviation	0			0		
RSD	0.0%			0.0%		

Table 2
Surface Soil Replicate Calculations, DUs 30A and 31A

Analyte/Calculation	DU30A			DU31A		
	MI30AI (mg/kg)	MI30AII (mg/kg)	MI30AIII (mg/kg)	MI31AI (mg/kg)	MI31AII (mg/kg)	MI31AIII (mg/kg)
RRO	< 57	< 56	< 57	< 56	< 57	< 57
Mean	< 57			< 57		
Standard Deviation	0.5			0.5		
RSD	0.8%			0.8%		
gamma-Chlordane	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Mean	< 0.011			< 0.011		
Standard Deviation	0			0		
RSD	0.0%			0.0%		

Table 3
Surface Soil Replicate Calculations, DU 50A

Analyte/Calculation	DU50A		
	MI50AI (mg/kg)	MI50AII (mg/kg)	MI50AIII (mg/kg)
RRO	71	78	65
Mean	71		
Standard Deviation	5		
RSD	7.4%		
gamma-Chlordane	< 0.012	< 0.013	< 0.011
Mean	< 0.012		
Standard Deviation	0.001		
RSD	6.8%		

The replicate RSDs for samples 7a, 8a, 30a, 31a, and 50a were less than 35%. As such, this data is considered acceptable for final decision making and can be compared directly to the applicable EALs for the replicate samples analyzed and all the DUs they represent.

Laboratory Results

Prior to analysis, OnSite prepared and sub-sampled the MI soil samples in accordance with the DOH TGM. The results of the soil sample analyses are presented in Table 4 on the following page. For simplicity, only the analytes detected are included in the table on the following pages.

Table 4
Laboratory Results for Detected Analytes and Corresponding EALs

DU	RRO (mg/kg)	Gamma-Chlordane (mg/kg)
DU1A	< 54	< 0.011
DU2A	< 54	< 0.011
DU3A	< 55	< 0.011
DU4A	< 55	< 0.011
DU5A	< 56	< 0.011
DU6A	< 55	< 0.011
DU7A*	< 57	< 0.011
DU8A*	< 57	< 0.011
DU9A	< 56	< 0.011
DU10A	< 58	< 0.011
DU11A	110	< 0.010
DU12A	65	< 0.011
DU13A	< 57	< 0.011
DU14A	< 57	< 0.011
DU15A	180	< 0.011
DU16A	**700**	< 0.010
DU16B	< 58	NA
DU17A	< 56	< 0.011
DU18A	< 57	< 0.011
DU19A	< 68	< 0.014
DU20A	< 55	< 0.011
DU21A	< 55	< 0.011
DU22A	< 70	< 0.014
DU23A	< 57	< 0.011
DU24A	< 56	< 0.011

Conservative = unrestricted land use for sites within 150 meters of a surface water body and where groundwater is a current or potential drinking water source (EAL Surfer, Fall 2017)

Site-specific = unrestricted land use for sites within 150 meters of a surface water body and where groundwater is a current or potential drinking water source (DOH, Fall 2017)

EAL = environmental action level

mg/kg = milligrams per kilogram

NA = not analyzed due to non-detects in overlying layer

* = replicate sample average

[1] = value listed is for chlordane (technical)

Table 4 *Continued*

Laboratory Results for Detected Analytes and Corresponding EALs

DU	RRO (mg/kg)	Gamma-Chlordane (mg/kg)
DU25A	< 56	< 0.011
DU26A	62	< 0.011
DU27A	< 55	< 0.011
DU28A	< 56	< 0.011
DU29A	< 67	< 0.013
DU30A*	< 57	< 0.011
DU31A*	< 57	< 0.011
DU32A	< 56	< 0.011
DU33A	< 57	< 0.011
DU34A	< 57	< 0.011
DU35A	< 56	< 0.011
DU36A	< 59	< 0.012
DU37A	< 60	< 0.012
DU38A	< 55	< 0.011
DU39A	< 55	< 0.011
DU40A	71	0.012
DU41A	< 57	< 0.011
DU42A	110	< 0.011
DU43A	< 57	< 0.011
DU44A	< 54	< 0.011
DU45A	< 59	< 0.012
DU46A	< 56	< 0.011
DU47A	140	< 0.011
DU48A	< 56	< 0.011
DU49A	< 69	< 0.014
DU50A*	71	< 0.012
DU51A	380	< 0.012
Conservative EAL	500	17[1]
Site-specific EAL	500	17[1]

Conservative = unrestricted land use for sites within 150 meters of a surface water body and where groundwater is a current or potential drinking water source (EAL Surfer, Fall 2017)

Site-specific = unrestricted land use for sites within 150 meters of a surface water body and where groundwater is a current or potential drinking water source (DOH, Fall 2017)

EAL = environmental action level

mg/kg = milligrams per kilogram

NA = not analyzed due to non-detects in overlying layer

* = replicate sample average

[1] = value listed is for chlordane (technical)

Conclusions and Recommendations

The results of laboratory analyses indicated Site soils collected from shallow interval (0 to 6 inches bgs) of DU16 are impacted by TPH RRO at a concentration greater than the applicable EAL. Based on this result, the sample from the deeper interval (6 to 12 inches bgs) was analyzed. TPH RRO was not detected at a concentration greater than the laboratory's practical quantitation limit in the sample from the deeper interval.

Based on the results of this investigation, ENPRO recommends:

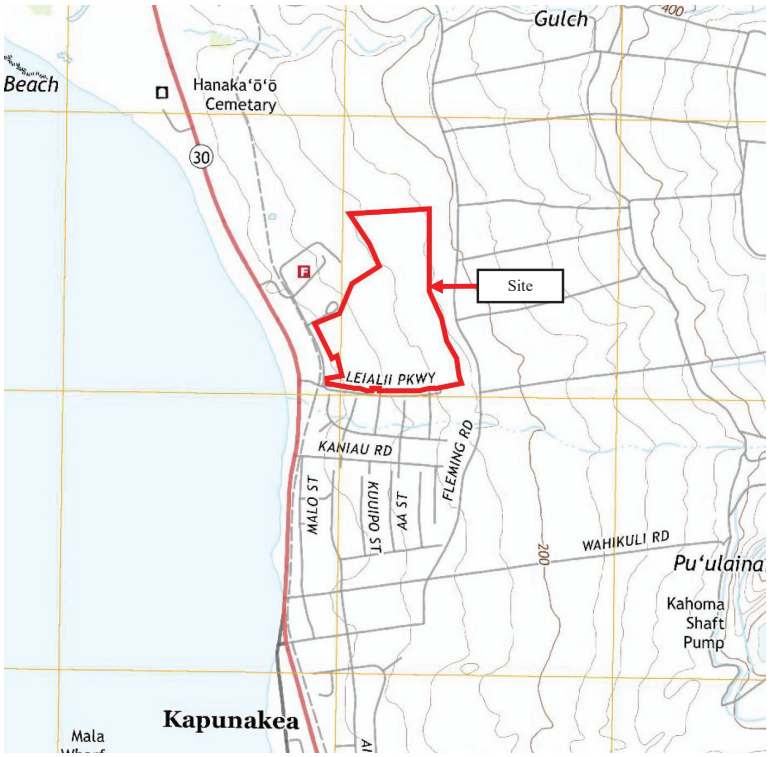
- Notify DOH of the findings of this investigation
- Remove impacted soils from the shallow interval of DU16, dispose of them at an acceptable landfill, conduct confirmation sampling to demonstrate that RRO no longer remains at this DU at concentrations greater than the EALs, and work with DOH to obtain a no further action (NFA) determination, OR
- Work with DOH to develop an environmental hazard evaluation and environmental hazard management plan to manage impacted soils on-site and obtain an NFA determination with institutional controls

We appreciate the opportunity to be of service to you on this project. If you have any questions regarding this project, please contact me at 748-2112.

Sincerely,

Kenton Beal, RG
Executive Vice President

Enclosures: Figures
Photographs
Laboratory Report



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Source: U.S. Geological Survey, 2013

Figure 1
TOPOGRAPHIC MAP and SITE LOCATION

Scale: 1 inch = 2,000 feet

Project Number: 2202-00041-PH2
Villages of Leiali'i 1B

N

Source: Google Earth 2021

Figure 2
DECISION UNITS
(Surrounding Land Use Noted)

Scale: 1 inch = Approximately 500 feet

Project Number: 2202-00041-PH2
Villages of Leiali'i 1B

Photo 1

Villages of Leiali'I 1B – Leiali'i Parkway East Gate- Facing East

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 2

Site Overview – Excavator Assisting with Sampling Activities

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 3

Samples Packed on Ice in Insulated Sample Chests in the Field

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 4

Samples Packed for Shipment to the Laboratory

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 5

Soil Sample MI4A (typical)

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 6

Site Overview – Facing West

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 7

Adjacent Property, Facing South

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 8

Site Overview – Facing Northwest

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 9

DU41 Boulders Partially Obstructing Access

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 10

DUs 11 15, 16 – Facing East

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 11

DUs 15, 16 Showing Shallow Excavations for Sampling – Facing West

Project Number: 2202-00041-PH2

Villages of Leialii 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 12

DU16 – Asphalt Layer, Suspected Source of Elevated RRO

Project Number: 2202-00041-PH2

Villages of Leiali'i 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

Photo 13

MI Soil Sample MI16A (typical)

Project Number: 2202-00041-PH2

Villages of Leialii 1B, Lahaina

Dates of Photos: March 16 – April 1, 2022

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

April 5, 2022

Kim Kim
EnPro Environmental
151 Hekili Street, Suite 210
Kailua, HI 96734

Re: Analytical Data for Project 2202-00041-PH2
Laboratory Reference No. 2203-279

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on March 24, 2022.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

Case Narrative

Samples were collected on March 17 and 18, 2022 and received by the laboratory March 24, 2022. Samples were shipped in a cooler packed with blue ice and arrived at a temperature of <6°C. They were maintained at the laboratory at a temperature of 2°C to 6°C. A copy of the cooler receipt form has been included with this report.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

All samples were processed in the laboratory following the multi-increment sampling procedures as outlined in the HEER-TGM. Additional notes will be addressed in appropriate sections as warranted.

Total Arsenic EPA 6010D Analysis

The Matrix Spike/ Matrix Spike Duplicate recoveries for Arsenic are outside control limits due to matrix effects. The samples were re-extracted and re-analyzed with similar results. The Spike Blank recovery was 95 %.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI51A**					
Laboratory ID:	03-279-01					
Diesel Range Organics	**ND**	31	EPA 8015M	3-29-22	4-1-22	
Residual Range Organics	**380**	62	EPA 8015M	3-29-22	4-1-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*88*	*50-150*				
Client ID:	**MI50AI**					
Laboratory ID:	03-279-03					
Diesel Range Organics	**ND**	32	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**71**	65	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*81*	*50-150*				
Client ID:	**MI50AII**					
Laboratory ID:	03-279-04					
Diesel Range Organics	**ND**	27	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**78**	54	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*90*	*50-150*				
Client ID:	**MI50AIII**					
Laboratory ID:	03-279-05					
Diesel Range Organics	**ND**	30	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**65**	59	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*71*	*50-150*				
Client ID:	**MI49A**					
Laboratory ID:	03-279-07					
Diesel Range Organics	**ND**	34	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	69	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*76*	*50-150*				
Client ID:	**MI48A**					
Laboratory ID:	03-279-09					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	56	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*79*	*50-150*				

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI47A**					
Laboratory ID:	03-279-11					
Diesel Range Organics	**ND**	28	EPA 8015M	3-30-22	3-31-22	
Residual Range Organics	**140**	56	EPA 8015M	3-30-22	3-31-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*90*	*50-150*				
Client ID:	**MI46A**					
Laboratory ID:	03-279-13					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	56	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*84*	*50-150*				

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0329S1					
Diesel Range Organics	**ND**	25	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	50	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*89*	*50-150*				
Laboratory ID:	MB0330S1					
Diesel Range Organics	**ND**	25	EPA 8015M	3-30-22	3-30-22	
Residual Range Organics	**ND**	50	EPA 8015M	3-30-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*92*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	03-280-01										
	ORIG	DUP									
Diesel Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Residual Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						*83*	*79*	*50-150*			
Laboratory ID:	SB0330S1										
	ORIG	DUP									
Diesel Range Organics	**98.7**	**89.3**	NA	NA		NA		NA	10	NA	
Surrogate:											
o-Terphenyl						*109*	*103*	*50-150*			

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI51A**					
Laboratory ID:	03-279-01					
alpha-BHC	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	12	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	12	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	6.2	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	12	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	12	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	62	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*84*	*30-110*				
DCB	*91*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI50AI**					
Laboratory ID:	03-279-03					
alpha-BHC	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	13	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	13	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	6.5	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	13	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	13	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	13	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	65	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*78*	*30-110*				
DCB	*87*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

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Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI50AII**					
Laboratory ID:	03-279-04					
alpha-BHC	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	5.4	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	54	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*86*	*30-110*				
DCB	*95*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI50AIII**					
Laboratory ID:	03-279-05					
alpha-BHC	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	12	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	12	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	5.9	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	12	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	12	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	12	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	59	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*68*	*30-110*				
DCB	*72*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI49A**					
Laboratory ID:	03-279-07					
alpha-BHC	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	14	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	14	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	6.8	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	14	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	14	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	14	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	68	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*89*	*30-110*				
DCB	*95*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI48A**					
Laboratory ID:	03-279-09					
alpha-BHC	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	56	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*84*	*30-110*				
DCB	*99*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI47A**					
Laboratory ID:	03-279-11					
alpha-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	56	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*87*	*30-110*				
DCB	*83*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI46A**					
Laboratory ID:	03-279-13					
alpha-BHC	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	5.6	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	56	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*86*	*30-110*				
DCB	*98*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0329S1					
alpha-BHC	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
gamma-BHC (Lindane)	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
beta-BHC	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
delta-BHC	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Heptachlor	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Aldrin	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Heptachlor Epoxide	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
gamma-Chlordane	**ND**	10	EPA 8081B	3-29-22	3-29-22	
alpha-Chlordane	**ND**	10	EPA 8081B	3-29-22	3-29-22	
4,4'-DDE	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endosulfan I	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Dieldrin	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endrin	**ND**	10	EPA 8081B	3-29-22	3-29-22	
4,4'-DDD	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endosulfan II	**ND**	10	EPA 8081B	3-29-22	3-29-22	
4,4'-DDT	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endrin Aldehyde	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Methoxychlor	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endosulfan Sulfate	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endrin Ketone	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Toxaphene	**ND**	50	EPA 8081B	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*88*	*30-110*				
DCB	*108*	*40-117*				

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Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS											
Laboratory ID:	SB0329S1										
	SB	SBD	SB	SBD		SB	SBD				
alpha-BHC	**85.7**	**85.3**	100	100	N/A	**86**	**85**	65-115	0	15	
gamma-BHC (Lindane)	**82.9**	**82.9**	100	100	N/A	**83**	**83**	69-116	0	15	
beta-BHC	**96.5**	**92.8**	100	100	N/A	**96**	**93**	63-116	4	15	
delta-BHC	**87.0**	**86.5**	100	100	N/A	**87**	**87**	66-116	1	15	
Heptachlor	**81.3**	**81.7**	100	100	N/A	**81**	**82**	63-119	0	15	
Aldrin	**83.2**	**82.9**	100	100	N/A	**83**	**83**	60-116	0	15	
Heptachlor Epoxide	**78.5**	**78.0**	100	100	N/A	**78**	**78**	65-116	1	15	
gamma-Chlordane	**80.5**	**80.7**	100	100	N/A	**81**	**81**	64-116	0	15	
alpha-Chlordane	**82.1**	**82.1**	100	100	N/A	**82**	**82**	62-119	0	15	
4,4'-DDE	**84.7**	**84.2**	100	100	N/A	**85**	**84**	69-120	1	15	
Endosulfan I	**86.6**	**86.3**	100	100	N/A	**87**	**86**	60-121	0	15	
Dieldrin	**83.3**	**83.0**	100	100	N/A	**83**	**83**	64-115	0	15	
Endrin	**99.0**	**98.8**	100	100	N/A	**99**	**99**	62-118	0	15	
4,4'-DDD	**88.3**	**88.9**	100	100	N/A	**88**	**89**	64-124	1	15	
Endosulfan II	**85.2**	**85.0**	100	100	N/A	**85**	**85**	64-115	0	15	
4,4'-DDT	**102**	**101**	100	100	N/A	**102**	**101**	57-130	1	15	
Endrin Aldehyde	**92.9**	**93.8**	100	100	N/A	**93**	**94**	57-114	1	15	
Methoxychlor	**95.7**	**95.0**	100	100	N/A	**96**	**95**	49-129	1	15	
Endosulfan Sulfate	**83.8**	**83.4**	100	100	N/A	**84**	**83**	61-115	0	15	
Endrin Ketone	**83.2**	**83.1**	100	100	N/A	**83**	**83**	64-116	0	15	
Surrogate:											
TCMX						*91*	*91*	*30-110*			
DCB						*92*	*95*	*40-117*			

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI51A**					
Laboratory ID:	03-279-01					
Arsenic	**ND**	12	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI50AI**					
Laboratory ID:	03-279-03					
Arsenic	**ND**	13	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI50AII**					
Laboratory ID:	03-279-04					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI50AIII**					
Laboratory ID:	03-279-05					
Arsenic	**ND**	12	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI49A**					
Laboratory ID:	03-279-07					
Arsenic	**ND**	14	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI48A**					
Laboratory ID:	03-279-09					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI47A**					
Laboratory ID:	03-279-11					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI46A**					
Laboratory ID:	03-279-13					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0331SM2					
Arsenic	**ND**	10	EPA 6010D	3-31-22	3-31-22	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	03-280-01										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	03-280-01										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**65.8**	**58.9**	100	100	ND	**66**	**59**	75-125	11	20	V

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-279
Project: 2202-00041-PH2

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
MI51A	03-279-01	**20**	3-29-22
MI50AI	03-279-03	**23**	3-29-22
MI50AII	03-279-04	**8**	3-29-22
MI50AIII	03-279-05	**16**	3-29-22
MI49A	03-279-07	**27**	3-29-22
MI48A	03-279-09	**10**	3-29-22
MI47A	03-279-11	**10**	3-30-22
MI46A	03-279-13	**10**	3-29-22

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OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260D, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Leialii 1B
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ ____ (other)

Laboratory Number: 03-279

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx ☐ Acid / SG Cleanup	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total arsenic			% Moisture
1	MI51A	3/17/22	0900	soil	1				✓							✓							✓			X
2	MI51B	3/17/22	0900	soil	1																					
3	MI50AI	3/17/22	0900	soil	1				✓							✓							✓			X
4	MI50AII	3/17/22	0900	soil	1				✓							✓							✓			X
5	MI50AIII	3/17/22	0900	soil	1				✓							✓							✓			X
6	MI50B	3/17/22	0900	soil	1																					
7	MI49A	3/17/22	0900	soil	1				✓							✓							✓			X
8	MI49B	3/17/22	0900	soil	1																					
9	MI48A	3/18/22	0900	soil	1				✓							✓							✓			X
10	MI48B	3/18/22	0900	soil	1																					

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO Environmental	3/20/22	1500
Received	[signature]	ENPRO Environmental	3/20/22	1500
Relinquished	[signature]	ENPRO Environmental	3/22/22	1100
Received	N/A	FedEx	3/22/22	1100
Relinquished	N/A	FedEx		
Received	[signature]	OSE	3/24/22	1030
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:
HI Samples; MI Prep
invoice to kcale@enproenvironmental.com

report to kkim@enproenvironmental.com

HOLD "B" samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Leialii 1B
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ ____ (other)

Laboratory Number: 03-279

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx ☐ Acid / SG Cleanup	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total arsenic			% Moisture
11	MI47A	3/18/22	0900	soil	1				✓							✓							✓			X
12	MI47B	3/18/22	0900	soil	1																					
13	MI46A	3/18/22	0900	soil	1				✓							✓							✓			X
14	MI46B	3/18/22	0900	soil	1																					

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO Environmental	3/20/22	1500
Received	[signature]	ENPRO Environmental	3/20/22	1500
Relinquished	[signature]	ENPRO Environmental	3/22/22	1100
Received	N/A	FedEx	3/22/22	1100
Relinquished	N/A	FedEx		
Received	[signature]	OSE	3/24/22	1030
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:
HI Samples; MI Prep
invoice to kcale@enproenvironmental.com

report to kkim@enproenvironmental.com

HOLD "B" samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Sample/Cooler Receipt and Acceptance Checklist

Client: ENP

Client Project Name/Number: 2202-00041-PH2

OnSite Project Number: 03-279

Initiated by: MN

Date Initiated: 3/24/22

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	No	N/A	1 2 3 4	
1.2 Were the custody seals intact?	Yes	No	N/A	1 2 3 4	
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	N/A	1 2 3 4	
1.4 Were the samples delivered on ice or blue ice?	Yes	No	N/A	1 2 3 4	
1.5 Were samples received between 0-6 degrees Celsius?	Yes	No	N/A	Temperature: 4	
1.6 Have shipping bills (if any) been attached to the back of this form?	Yes	N/A			
1.7 How were the samples delivered?	Client	Courier	UPS/FedEx	OSE Pickup	Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	Yes	No	1 2 3 4
2.2 Was the COC legible and written in permanent ink?	Yes	No	1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	Yes	No	1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	Yes	No	1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	Yes	No	1 2 3 4
2.6 Were any of the samples submitted omitted from the COC?	Yes	No	1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	No		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	No		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	Yes	No		1 2 3 4
3.4 Have the samples been correctly preserved?	Yes	No	N/A	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	Yes	No	N/A	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	Yes	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	No		1 2 3 4
3.8 Was method 5035A used?	Yes	No	N/A	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		N/A	1 2 3 4

Explain any discrepancies:

1 - Discuss issue in Case Narrative
2 - Process Sample As-is
3 - Client contacted to discuss problem
4 - Sample cannot be analyzed or client does not wish to proceed

//SERVER\OSE\Administration\forms\cooler_checklist.xls

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

April 5, 2022

Kim Kim
EnPro Environmental
151 Hekili Street, Suite 210
Kailua, HI 96734

Re: Analytical Data for Project 2202-00041-PH2
Laboratory Reference No. 2203-280

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on March 24, 2022.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

Case Narrative

Samples were collected on March 21, 22, and 23, 2022 and received by the laboratory March 24, 2022. Samples were shipped in a cooler packed with blue ice and arrived at a temperature of <6°C. They were maintained at the laboratory at a temperature of 2°C to 6°C. A copy of the cooler receipt form has been included with this report.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

All samples were processed in the laboratory following the multi-increment sampling procedures as outlined in the HEER-TGM. Additional notes will be addressed in appropriate sections as warranted.

Total Arsenic EPA 6010D Analysis

The Matrix Spike/ Matrix Spike Duplicate recoveries for Arsenic are outside control limits due to matrix effects. The samples were re-extracted and re-analyzed with similar results. The Spike Blank recovery was 95 %.

Organochlorine Pesticides by EPA 8081B Analysis

The surrogate recovery for TCMX in the samples MI33A and MI20A were above the quality control limits of 30-110%. Because the samples were non-detect and the recovery showed high bias, no further action was performed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI44A**					
Laboratory ID:	03-280-01					
Diesel Range Organics	**ND**	27	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	54	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*83*	*50-150*				
Client ID:	**MI39A**					
Laboratory ID:	03-280-03					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	55	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*86*	*50-150*				
Client ID:	**MI38A**					
Laboratory ID:	03-280-05					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	55	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*71*	*50-150*				
Client ID:	**MI32A**					
Laboratory ID:	03-280-07					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	56	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*96*	*50-150*				
Client ID:	**MI33A**					
Laboratory ID:	03-280-09					
Diesel Range Organics	**ND**	29	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	57	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*86*	*50-150*				
Client ID:	**MI26A**					
Laboratory ID:	03-280-11					
Diesel Range Organics	**ND**	28	EPA 8015M	3-30-22	3-31-22	
Residual Range Organics	**62**	56	EPA 8015M	3-30-22	3-31-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*105*	*50-150*				

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI20A**					
Laboratory ID:	03-280-13					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	55	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*96*	*50-150*				
Client ID:	**MI21A**					
Laboratory ID:	03-280-15					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	55	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*97*	*50-150*				
Client ID:	**MI27A**					
Laboratory ID:	03-280-17					
Diesel Range Organics	**ND**	27	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	55	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*92*	*50-150*				
Client ID:	**MI34A**					
Laboratory ID:	03-280-19					
Diesel Range Organics	**ND**	29	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	57	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*89*	*50-150*				
Client ID:	**MI28A**					
Laboratory ID:	03-280-21					
Diesel Range Organics	**ND**	28	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	56	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0329S1					
Diesel Range Organics	**ND**	25	EPA 8015M	3-29-22	3-29-22	
Residual Range Organics	**ND**	50	EPA 8015M	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*89*	*50-150*				
Laboratory ID:	MB0330S1					
Diesel Range Organics	**ND**	25	EPA 8015M	3-30-22	3-30-22	
Residual Range Organics	**ND**	50	EPA 8015M	3-30-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*92*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	03-280-01										
	ORIG	DUP									
Diesel Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Residual Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						*83*	*79*	*50-150*			
Laboratory ID:	SB0330S1										
	ORIG	DUP									
Diesel Range Organics	**98.7**	**89.3**	NA	NA		NA		NA	10	NA	
Surrogate:											
o-Terphenyl						*109*	*103*	*50-150*			

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI44A**					
Laboratory ID:	03-280-01					
alpha-BHC	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.4	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	54	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*89*	*30-110*				
DCB	*83*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI39A**					
Laboratory ID:	03-280-03					
alpha-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
beta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
delta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Heptachlor	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Aldrin	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-29-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan I	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Toxaphene	**ND**	55	EPA 8081B	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*88*	*30-110*				
DCB	*104*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI38A**					
Laboratory ID:	03-280-05					
alpha-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
beta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
delta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Heptachlor	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Aldrin	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-29-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan I	**ND**	5.5	EPA 8081B	3-29-22	3-29-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Toxaphene	**ND**	55	EPA 8081B	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*74*	*30-110*				
DCB	*85*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI32A**					
Laboratory ID:	03-280-07					
alpha-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
beta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
delta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
Heptachlor	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
Aldrin	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-29-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan I	**ND**	5.6	EPA 8081B	3-29-22	3-29-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-29-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-29-22	
Toxaphene	**ND**	56	EPA 8081B	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*85*	*30-110*				
DCB	*97*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI33A**					
Laboratory ID:	03-280-09					
alpha-BHC	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	57	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*115*	*30-110*				Q
DCB	*116*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI26A**					
Laboratory ID:	03-280-11					
alpha-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	56	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*78*	*30-110*				
DCB	*78*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI20A**					
Laboratory ID:	03-280-13					
alpha-BHC	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
beta-BHC	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
delta-BHC	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
Heptachlor	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
Aldrin	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan I	**ND**	5.5	EPA 8081B	3-29-22	4-4-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	4-4-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	4-4-22	
Toxaphene	**ND**	55	EPA 8081B	3-29-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*113*	*30-110*				Q
DCB	*117*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI21A**					
Laboratory ID:	03-280-15					
alpha-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	55	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*89*	*30-110*				
DCB	*83*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI27A**					
Laboratory ID:	03-280-17					
alpha-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.5	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	55	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*92*	*30-110*				
DCB	*88*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI34A**					
Laboratory ID:	03-280-19					
alpha-BHC	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.7	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	57	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*85*	*30-110*				
DCB	*80*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI28A**					
Laboratory ID:	03-280-21					
alpha-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
beta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
delta-BHC	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Heptachlor	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Aldrin	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
gamma-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
alpha-Chlordane	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDE	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan I	**ND**	5.6	EPA 8081B	3-29-22	3-30-22	
Dieldrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDD	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan II	**ND**	11	EPA 8081B	3-29-22	3-30-22	
4,4'-DDT	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Methoxychlor	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Endrin Ketone	**ND**	11	EPA 8081B	3-29-22	3-30-22	
Toxaphene	**ND**	56	EPA 8081B	3-29-22	3-30-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*92*	*30-110*				
DCB	*84*	*40-117*				

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0329S1					
alpha-BHC	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
gamma-BHC (Lindane)	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
beta-BHC	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
delta-BHC	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Heptachlor	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Aldrin	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Heptachlor Epoxide	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
gamma-Chlordane	**ND**	10	EPA 8081B	3-29-22	3-29-22	
alpha-Chlordane	**ND**	10	EPA 8081B	3-29-22	3-29-22	
4,4'-DDE	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endosulfan I	**ND**	5.0	EPA 8081B	3-29-22	3-29-22	
Dieldrin	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endrin	**ND**	10	EPA 8081B	3-29-22	3-29-22	
4,4'-DDD	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endosulfan II	**ND**	10	EPA 8081B	3-29-22	3-29-22	
4,4'-DDT	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endrin Aldehyde	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Methoxychlor	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endosulfan Sulfate	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Endrin Ketone	**ND**	10	EPA 8081B	3-29-22	3-29-22	
Toxaphene	**ND**	50	EPA 8081B	3-29-22	3-29-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*88*	*30-110*				
DCB	*108*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS											
Laboratory ID:	SB0329S1										
	SB	SBD	SB	SBD		SB	SBD				
alpha-BHC	**85.7**	**85.3**	100	100	N/A	**86**	**85**	65-115	0	15	
gamma-BHC (Lindane)	**82.9**	**82.9**	100	100	N/A	**83**	**83**	69-116	0	15	
beta-BHC	**96.5**	**92.8**	100	100	N/A	**96**	**93**	63-116	4	15	
delta-BHC	**87.0**	**86.5**	100	100	N/A	**87**	**87**	66-116	1	15	
Heptachlor	**81.3**	**81.7**	100	100	N/A	**81**	**82**	63-119	0	15	
Aldrin	**83.2**	**82.9**	100	100	N/A	**83**	**83**	60-116	0	15	
Heptachlor Epoxide	**78.5**	**78.0**	100	100	N/A	**78**	**78**	65-116	1	15	
gamma-Chlordane	**80.5**	**80.7**	100	100	N/A	**81**	**81**	64-116	0	15	
alpha-Chlordane	**82.1**	**82.1**	100	100	N/A	**82**	**82**	62-119	0	15	
4,4'-DDE	**84.7**	**84.2**	100	100	N/A	**85**	**84**	69-120	1	15	
Endosulfan I	**86.6**	**86.3**	100	100	N/A	**87**	**86**	60-121	0	15	
Dieldrin	**83.3**	**83.0**	100	100	N/A	**83**	**83**	64-115	0	15	
Endrin	**99.0**	**98.8**	100	100	N/A	**99**	**99**	62-118	0	15	
4,4'-DDD	**88.3**	**88.9**	100	100	N/A	**88**	**89**	64-124	1	15	
Endosulfan II	**85.2**	**85.0**	100	100	N/A	**85**	**85**	64-115	0	15	
4,4'-DDT	**102**	**101**	100	100	N/A	**102**	**101**	57-130	1	15	
Endrin Aldehyde	**92.9**	**93.8**	100	100	N/A	**93**	**94**	57-114	1	15	
Methoxychlor	**95.7**	**95.0**	100	100	N/A	**96**	**95**	49-129	1	15	
Endosulfan Sulfate	**83.8**	**83.4**	100	100	N/A	**84**	**83**	61-115	0	15	
Endrin Ketone	**83.2**	**83.1**	100	100	N/A	**83**	**83**	64-116	0	15	
Surrogate:											
TCMX						*91*	*91*	*30-110*			
DCB						*92*	*95*	*40-117*			

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

TOTAL ARSENIC EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI44A**					
Laboratory ID:	03-280-01					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI39A**					
Laboratory ID:	03-280-03					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI38A**					
Laboratory ID:	03-280-05					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI32A**					
Laboratory ID:	03-280-07					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI33A**					
Laboratory ID:	03-280-09					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI26A**					
Laboratory ID:	03-280-11					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI20A**					
Laboratory ID:	03-280-13					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI21A**					
Laboratory ID:	03-280-15					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI27A**					
Laboratory ID:	03-280-17					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI34A**					
Laboratory ID:	03-280-19					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	
Client ID:	**MI28A**					
Laboratory ID:	03-280-21					
Arsenic	**ND**	11	EPA 6010D	3-31-22	3-31-22	

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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0331SM2					
Arsenic	**ND**	10	EPA 6010D	3-31-22	3-31-22	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	03-280-01										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	03-280-01										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**65.8**	**58.9**	100	100	ND	**66**	**59**	75-125	11	20	V

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 5, 2022
Samples Submitted: March 24, 2022
Laboratory Reference: 2203-280
Project: 2202-00041-PH2

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
MI44A	03-280-01	**7**	3-29-22
MI39A	03-280-03	**9**	3-29-22
MI38A	03-280-05	**9**	3-29-22
MI32A	03-280-07	**11**	3-29-22
MI33A	03-280-09	**12**	3-29-22
MI26A	03-280-11	**11**	3-30-22
MI20A	03-280-13	**10**	3-29-22
MI21A	03-280-15	**9**	3-29-22
MI27A	03-280-17	**9**	3-29-22
MI34A	03-280-19	**12**	3-29-22
MI28A	03-280-21	**11**	3-29-22

This report pertains to the samples analyzed in accordance with the chain of custody,
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OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260D, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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Chain of Custody

Page 1 of 2 3

Laboratory Number: 03-280

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Leial;; ~~PH2~~ 1B
Project Manager: Kim Kim
Sampled by:

Turnaround Request (in working days) (Check One): Same Day; 1 Day; 2 Days; 3 Days; ✓ Standard (7 Days); (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx (_) Acid / SG Clean-up	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			Sample Disposal
1	MI44A	3-21-22	0900	Soil	1			✓							✓							✓			X
2	MI44B		0900																						
3	MI39A		1100					✓							✓							✓			X
4	MI39B		1100																						
5	MI38A		1400					✓							✓							✓			X
6	MI38B		1400																						
7	MI 32A	3-22-22	0900	Soil				✓							✓							✓			X
8	MI 32B		0900																						
9	MI 33A		1400					✓							✓							✓			X
10	MI 33B		1400																						

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	3-23-22	10:30
Received	[signature]	Jay Olsen	3-23-22	10:30
Relinquished	[signature]	Jay Olsen	3-23-22	11:30
Received	FedEx	FedEx	3-23-22	11:30
Relinquished				
Received	Nicholle Bohlin	OSE	3/24/22	1030
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions: HI samples MI Prep
invoice to kcale@enproenvironmental.com
Hold "B" samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

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Chain of Custody

Page 2 of 2 3

Laboratory Number: 03-280

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Leial;; 1B
Project Manager: Kim Kim
Sampled by:

Turnaround Request (in working days) (Check One): Same Day; 1 Day; 2 Days; 3 Days; ✓ Standard (7 Days); (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx (_) Acid / SG Clean-up	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			Sample Disposal
11	MI 26A	3-22-22	1000	Soil	1			✓							✓							✓			X
12	MI 26B		1000																						
13	MI 20A		1100					✓							✓							✓			X
14	MI 20B		1100																						
15	MI 21A		1230					✓							✓							✓			X
16	MI 21B		1230																						
17	MI 27A		1300					✓							✓							✓			X
18	MI 27B		1300																						
19	MI 34A	3-23-22	0830	Soil				✓							✓							✓			X
20	MI 34B		0830																						

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	3-23-22	1030
Received	[signature]	Jay Olsen	3-23-22	10:30
Relinquished	[signature]	Jay Olsen	3-23-22	11:30
Received	FedEx	FedEx	3-23-22	11:30
Relinquished				
Received	Nicholle Bohlin	OSE	3/24/22	1030
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions: HI samples; MI Prep
invoice to kcale@enproenvironmental.com
Hold "B" samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

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Chain of Custody

Page 3 of 3

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah, LLC
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): Same Day; 1 Day; 2 Days; 3 Days; ✓ Standard (7 Days); (other)

Laboratory Number: 03-280

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	NWTPH-Dx (L, Acid/SG Clean-up)	Volatiles 8260C	Halogenated volatiles 8260C	CID EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low level PAHs)	HPAs (NWTPH-Dx/SIM low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HPA (24 hr greater NEA)	Total Arsenic			Initials
21	MI 28A	3-23-22	10:10	Soil	1				✓							✓							✓			X
22	MI 28B	↓	↓	↓	↓																					

last

	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished	[signature]	ENPRO	3-23-22	1030	HI samples, MI Prep
Received	[signature]	Jay Olson	3-23-22	10:30	Invoice to Kcale@enproenvironmental.com
Relinquished	[signature]	Jay Olson	3-23-22	11:30	
Received	FedEx	FedEx	3-23-22	11:30	Hold "B" samples pending "A" Results
Relinquished					
Received	Nicholle [signature]	OSE	3/24/22	1030	Data Package: Standard ☐ Level III ☐ Level IV ☐
Reviewed/Date		Reviewed/Date			Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Sample/Cooler Receipt and Acceptance Checklist

Client: ENP

Client Project Name/Number: 2202-00041-PH2

OnSite Project Number: 03-280

Initiated by: [initials]

Date Initiated: 3/24/22

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	(No)	N/A	1 2 3 4
1.2 Were the custody seals intact?	Yes	No	(N/A)	1 2 3 4
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	(N/A)	1 2 3 4
1.4 Were the samples delivered on ice or blue ice?	(Yes)	No	N/A	1 2 3 4
1.5 Were samples received between 0-6 degrees Celsius?	(Yes)	No	N/A	Temperature: 6.6
1.6 Have shipping bills (if any) been attached to the back of this form?	(Yes)	N/A		
1.7 How were the samples delivered?	Client	Courier	(UPS/FedEx)	OSE Pickup / Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	(Yes)	No	1 2 3 4
2.2 Was the COC legible and written in permanent ink?	(Yes)	No	1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	(Yes)	No	1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	(Yes)	No	1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	(Yes)	No	1 2 3 4
2.6 Were any of the samples listed on the COC omitted from the COC?	Yes	(No)	1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	(No)		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	(No)		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	(Yes)	No		1 2 3 4
3.4 Have the samples been correctly preserved?	Yes	No	(N/A)	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	Yes	No	(N/A)	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	(Yes)	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	(No)		1 2 3 4
3.8 Was method 5035A used?	Yes	No	(N/A)	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		(N/A)	1 2 3 4

Explain any discrepancies:

1 - Discuss issue in Case Narrative
2 - Process Sample As-is
3 - Client contacted to discuss problem
4 - Sample cannot be analyzed or client does not wish to proceed

//SERVER\OSE\Administration\forms\cooler_checklist.xls

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

April 8, 2022

Kim Kim
EnPro Environmental
151 Hekili Street, Suite 210
Kailua, HI 96734

Re: Analytical Data for Project 2202-00041-PH2
Laboratory Reference No. 2203-311

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on March 29, 2022.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

Case Narrative

Samples were collected on March 23, 24 and 25, 2022 and received by the laboratory March 29, 2022. Samples were shipped in a cooler packed with blue ice and arrived at a temperature of <6°C. They were maintained at the laboratory at a temperature of 2°C to 6°C. A copy of the cooler receipt form has been included with this report.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

All samples were processed in the laboratory following the multi-increment sampling procedures as outlined in the HEER-TGM. Additional notes will be addressed in appropriate sections as warranted.

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI22A**					
Laboratory ID:	03-311-01					
Diesel Range Organics	**ND**	35	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	70	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*75*	*50-150*				
Client ID:	**MI35A**					
Laboratory ID:	03-311-03					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*91*	*50-150*				
Client ID:	**MI29A**					
Laboratory ID:	03-311-05					
Diesel Range Organics	**ND**	33	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	67	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*77*	*50-150*				
Client ID:	**MI23A**					
Laboratory ID:	03-311-07					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*99*	*50-150*				
Client ID:	**MI12A**					
Laboratory ID:	03-311-09					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**65**	55	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*102*	*50-150*				
Client ID:	**MI17A**					
Laboratory ID:	03-311-11					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI11A**					
Laboratory ID:	03-311-13					
Diesel Range Organics	**ND**	26	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**110**	52	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*93*	*50-150*				
Client ID:	**MI18A**					
Laboratory ID:	03-311-15					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*94*	*50-150*				
Client ID:	**MI15A**					
Laboratory ID:	03-311-17					
Diesel Range Organics	**ND**	27	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**180**	53	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*93*	*50-150*				
Client ID:	**MI16A**					
Laboratory ID:	03-311-19					
Diesel Range Organics	**ND**	130	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**700**	260	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*83*	*50-150*				
Client ID:	**MI13A**					
Laboratory ID:	03-311-21					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*94*	*50-150*				
Client ID:	**MI8AI**					
Laboratory ID:	03-311-23					
Diesel Range Organics	**ND**	29	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*86*	*50-150*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI8AII**					
Laboratory ID:	03-311-24					
Diesel Range Organics	**ND**	29	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*84*	*50-150*				
Client ID:	**MI8AIII**					
Laboratory ID:	03-311-25					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*98*	*50-150*				
Client ID:	**MI9A**					
Laboratory ID:	03-311-27					
Diesel Range Organics	**ND**	28	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*98*	*50-150*				

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Date of Report: April 8, 2022
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Laboratory Reference: 2203-311
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0404S1					
Diesel Range Organics	**ND**	25	EPA 8015M	4-4-22	4-4-22	
Residual Range Organics	**ND**	50	EPA 8015M	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*86*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	03-311-01										
	ORIG	DUP									
Diesel Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Residual Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						*75*	*82*	*50-150*			
Laboratory ID:	SB0404S1										
	ORIG	DUP									
Diesel Range Organics	**93.2**	**93.1**	NA	NA		NA		NA	0	NA	
Surrogate:											
o-Terphenyl						*100*	*98*	*50-150*			

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI22A**					
Laboratory ID:	03-311-01					
alpha-BHC	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
gamma-BHC (Lindane)	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
beta-BHC	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
delta-BHC	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
Heptachlor	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
Aldrin	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
Heptachlor Epoxide	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
gamma-Chlordane	**ND**	14	EPA 8081B	4-4-22	4-6-22	
alpha-Chlordane	**ND**	14	EPA 8081B	4-4-22	4-6-22	
4,4'-DDE	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Endosulfan I	**ND**	7.0	EPA 8081B	4-4-22	4-6-22	
Dieldrin	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Endrin	**ND**	14	EPA 8081B	4-4-22	4-6-22	
4,4'-DDD	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Endosulfan II	**ND**	14	EPA 8081B	4-4-22	4-6-22	
4,4'-DDT	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Endrin Aldehyde	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Methoxychlor	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Endosulfan Sulfate	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Endrin Ketone	**ND**	14	EPA 8081B	4-4-22	4-6-22	
Toxaphene	**ND**	70	EPA 8081B	4-4-22	4-6-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*118*	*30-110*				
DCB	*107*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI35A**					
Laboratory ID:	03-311-03					
alpha-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
Aldrin	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-6-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-6-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-4-22	4-6-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-6-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-6-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-6-22	
Toxaphene	**ND**	56	EPA 8081B	4-4-22	4-6-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*80*	*30-110*				
DCB	*95*	*40-117*				

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Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI29A**					
Laboratory ID:	03-311-05					
alpha-BHC	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
gamma-BHC (Lindane)	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
beta-BHC	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
delta-BHC	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
Heptachlor	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
Aldrin	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
Heptachlor Epoxide	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
gamma-Chlordane	**ND**	13	EPA 8081B	4-4-22	4-6-22	
alpha-Chlordane	**ND**	13	EPA 8081B	4-4-22	4-6-22	
4,4'-DDE	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Endosulfan I	**ND**	6.7	EPA 8081B	4-4-22	4-6-22	
Dieldrin	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Endrin	**ND**	13	EPA 8081B	4-4-22	4-6-22	
4,4'-DDD	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Endosulfan II	**ND**	13	EPA 8081B	4-4-22	4-6-22	
4,4'-DDT	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Endrin Aldehyde	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Methoxychlor	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Endosulfan Sulfate	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Endrin Ketone	**ND**	13	EPA 8081B	4-4-22	4-6-22	
Toxaphene	**ND**	67	EPA 8081B	4-4-22	4-6-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*81*	*30-110*				
DCB	*95*	*40-117*				

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Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI23A**					
Laboratory ID:	03-311-07					
alpha-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	57	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*75*	*30-110*				
DCB	*93*	*40-117*				

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Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI12A**					
Laboratory ID:	03-311-09					
alpha-BHC	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.5	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	55	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*74*	*30-110*				
DCB	*88*	*40-117*				

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Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI17A**					
Laboratory ID:	03-311-11					
alpha-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	56	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*75*	*30-110*				
DCB	*88*	*40-117*				

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Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI11A**					
Laboratory ID:	03-311-13					
alpha-BHC	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	10	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	10	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.2	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	10	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	10	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	10	EPA 8081B	4-4-22	4-7-22	Y1
Endrin Aldehyde	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	10	EPA 8081B	4-4-22	4-7-22	Y1
Endosulfan Sulfate	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	52	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*81*	*30-110*				
DCB	*90*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI18A**					
Laboratory ID:	03-311-15					
alpha-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	57	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*81*	*30-110*				
DCB	*94*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI15A**					
Laboratory ID:	03-311-17					
alpha-BHC	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.3	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	Y1
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	Y1
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	53	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*77*	*30-110*				
DCB	*84*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI16A**					
Laboratory ID:	03-311-19					
alpha-BHC	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	10	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	10	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.1	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	10	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	10	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	10	EPA 8081B	4-4-22	4-7-22	Y1
Endrin Aldehyde	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	10	EPA 8081B	4-4-22	4-7-22	Y1
Endosulfan Sulfate	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	10	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	51	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*51*	*30-110*				
DCB	*75*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI13A**					
Laboratory ID:	03-311-21					
alpha-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	57	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*83*	*30-110*				
DCB	*97*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI8AI**					
Laboratory ID:	03-311-23					
alpha-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	57	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*74*	*30-110*				
DCB	*87*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI8AII**					
Laboratory ID:	03-311-24					
alpha-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	57	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*81*	*30-110*				
DCB	*94*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI8AIII**					
Laboratory ID:	03-311-25					
alpha-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	57	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*78*	*30-110*				
DCB	*96*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI9A**					
Laboratory ID:	03-311-27					
alpha-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Aldrin	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-4-22	4-7-22	
Dieldrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan II	**ND**	11	EPA 8081B	4-4-22	4-7-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Methoxychlor	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-4-22	4-7-22	
Toxaphene	**ND**	56	EPA 8081B	4-4-22	4-7-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*88*	*30-110*				
DCB	*103*	*40-117*				

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0404S1					
alpha-BHC	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
gamma-BHC (Lindane)	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
beta-BHC	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
delta-BHC	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
Heptachlor	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
Aldrin	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
Heptachlor Epoxide	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
gamma-Chlordane	**ND**	10	EPA 8081B	4-4-22	4-4-22	
alpha-Chlordane	**ND**	10	EPA 8081B	4-4-22	4-4-22	
4,4'-DDE	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Endosulfan I	**ND**	5.0	EPA 8081B	4-4-22	4-4-22	
Dieldrin	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Endrin	**ND**	10	EPA 8081B	4-4-22	4-4-22	
4,4'-DDD	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Endosulfan II	**ND**	10	EPA 8081B	4-4-22	4-4-22	
4,4'-DDT	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Endrin Aldehyde	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Methoxychlor	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Endosulfan Sulfate	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Endrin Ketone	**ND**	10	EPA 8081B	4-4-22	4-4-22	
Toxaphene	**ND**	50	EPA 8081B	4-4-22	4-4-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*81*	*30-110*				
DCB	*100*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
MATRIX SPIKES											
Laboratory ID:	03-311-03										
	MS	MSD	MS	MSD		MS	MSD				
alpha-BHC	**93.3**	**96.0**	100	100	ND	**93**	**96**	36-123	3	21	
gamma-BHC (Lindane)	**95.2**	**97.7**	100	100	ND	**95**	**98**	38-121	3	21	
beta-BHC	**88.5**	**90.6**	100	100	ND	**89**	**91**	31-125	2	21	
delta-BHC	**85.9**	**88.3**	100	100	ND	**86**	**88**	37-118	3	23	
Heptachlor	**80.4**	**82.2**	100	100	ND	**80**	**82**	37-123	2	24	
Aldrin	**90.3**	**91.6**	100	100	ND	**90**	**92**	45-118	1	22	
Heptachlor Epoxide	**87.6**	**89.2**	100	100	ND	**88**	**89**	46-114	2	22	
gamma-Chlordane	**87.6**	**89.0**	100	100	ND	**88**	**89**	41-120	2	23	
alpha-Chlordane	**83.0**	**85.0**	100	100	ND	**83**	**85**	43-118	2	23	
4,4'-DDE	**89.8**	**91.9**	100	100	ND	**90**	**92**	34-139	2	22	
Endosulfan I	**94.5**	**96.6**	100	100	ND	**94**	**97**	43-124	2	25	
Dieldrin	**94.3**	**96.3**	100	100	ND	**94**	**96**	40-128	2	23	
Endrin	**96.5**	**97.9**	100	100	ND	**96**	**98**	44-120	1	28	
4,4'-DDD	**93.5**	**94.8**	100	100	ND	**93**	**95**	42-131	1	21	
Endosulfan II	**92.8**	**94.5**	100	100	ND	**93**	**95**	47-112	2	22	
4,4'-DDT	**61.0**	**61.2**	100	100	ND	**61**	**61**	29-141	0	32	
Endrin Aldehyde	**85.2**	**87.1**	100	100	ND	**85**	**87**	41-114	2	22	
Methoxychlor	**86.3**	**88.4**	100	100	ND	**86**	**88**	31-139	2	23	
Endosulfan Sulfate	**88.2**	**89.2**	100	100	ND	**88**	**89**	48-112	1	21	
Endrin Ketone	**89.1**	**90.8**	100	100	ND	**89**	**91**	46-117	2	22	
Surrogate:											
TCMX						*78*	*81*	*30-110*			
DCB						*90*	*93*	*40-117*			

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

TOTAL ARSENIC EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI22A**					
Laboratory ID:	03-311-01					
Arsenic	**ND**	14	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI35A**					
Laboratory ID:	03-311-03					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI29A**					
Laboratory ID:	03-311-05					
Arsenic	**ND**	13	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI23A**					
Laboratory ID:	03-311-07					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI12A**					
Laboratory ID:	03-311-09					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI17A**					
Laboratory ID:	03-311-11					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI11A**					
Laboratory ID:	03-311-13					
Arsenic	**ND**	10	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI18A**					
Laboratory ID:	03-311-15					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI15A**					
Laboratory ID:	03-311-17					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI16A**					
Laboratory ID:	03-311-19					
Arsenic	**ND**	10	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI13A**					
Laboratory ID:	03-311-21					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI8AI**					
Laboratory ID:	03-311-23					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI8AII**					
Laboratory ID:	03-311-24					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI8AIII**					
Laboratory ID:	03-311-25					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	
Client ID:	**MI9A**					
Laboratory ID:	03-311-27					
Arsenic	**ND**	11	EPA 6010D	4-4-22	4-5-22	

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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0404SM2					
Arsenic	**ND**	10	EPA 6010D	4-4-22	4-5-22	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	04-014-01										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	04-014-01										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**96.8**	**98.7**	100	100	ND	**97**	**99**	75-125	2	20	

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 8, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311
Project: 2202-00041-PH2

% MOISTURE
MULTI-INCREMENT SAMPLING

Client ID	Lab ID	% Moisture	Date Analyzed
MI22A	03-311-01	**29**	4-4-22
MI35A	03-311-03	**10**	4-4-22
MI29A	03-311-05	**25**	4-4-22
MI23A	03-311-07	**12**	4-4-22
MI12A	03-311-09	**10**	4-4-22
MI17A	03-311-11	**10**	4-4-22
MI11A	03-311-13	**3**	4-4-22
MI18A	03-311-15	**12**	4-4-22
MI15A	03-311-17	**6**	4-4-22
MI16A	03-311-19	**2**	4-4-22
MI13A	03-311-21	**12**	4-4-22
MI8AI	03-311-23	**12**	4-4-22
MI8AII	03-311-24	**12**	4-4-22
MI8AIII	03-311-25	**12**	4-4-22
MI9A	03-311-27	**11**	4-4-22

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260D, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
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Chain of Custody

Page 1 of 3

Laboratory Number: 03-311

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah IB
Project Manager: Kim Kim
Sampled by: A. Barro & Liam Sullivan

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	HCID	TPH-Dx/DTEX	TPH-Gx	Acid / SG Cleanup	Volatiles 8260C	Halocarbon Volatiles 8260C	EDB EPA 8011 (Water Only)	Semivolatiles 8270D/SIM (with isotope dilution)	VOCs 8270D/SIM (low level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total NRCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			No. Metals
1	MI 22 A	3-23-22	1000	Soil	1				✓							✓							✓				✓
2	MI 22 B		1000																								
3	MI 35 A		1200						✓							✓							✓				✓
4	MI 35 B		1200																								
5	MI 29 A		1300						✓							✓							✓				✓
6	MI 29 B		1300																								
7	MI 23 A		1400						✓							✓							✓				✓
8	MI 23 B		1400																								
9	MI 12 A	3-24-22	0800						✓							✓							✓				✓
10	MI 12 B		0800																								

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	3-25-22	1400
Received	Michelle Bohlin	OSE	3/29/22	0930
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions: HI samples MI prep
Invoice to Kcale@enproenvironmental.com
Hold "B" pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

OnSite Environmental Inc.
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Chain of Custody

Page 2 of 3

Laboratory Number: 03-311

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah B
Project Manager: Kim Kim
Sampled by: A. Barro & Liam Sullivan

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	HCID	TPH-Dx/DTEX	TPH-Gx	Acid / SG Cleanup	Volatiles 8260C	Halocarbon Volatiles 8260C	EDB EPA 8011 (Water Only)	Semivolatiles 8270D/SIM (with isotope dilution)	VOCs 8270D/SIM (low level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total NRCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			No. Metals
11	MI 17 A	3-24-22	0900	Soil	1				✓							✓							✓				✓
12	MI 17 B		0900																								
13	MI 11 A		1000						✓							✓							✓				✓
14	MI 11 B		1000																								
15	MI 18 A		1200						✓							✓							✓				✓
16	MI 18 B																										
17	MI 15 A								✓							✓							✓				✓
18	MI 15 B																										
19	MI 16 A		~~1300~~ 1400						✓							✓							✓				✓
20	MI 16 B																										

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	3-25-22	1400
Received	Michelle Bohlin	OSE	3/29/22	0930
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions: HI samples MI prep
Invoice to Kcale@enproenvironmental.com
Hold "B" samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

OnSite Environmental Inc.
Analytical Laboratory Testing Services
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Chain of Custody

Page 3 of 3

Laboratory Number: 03-311

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah B
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): Same Day; 1 Day; 2 Days; 3 Days; ✓ Standard (7 Days); (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	HNTPH-HCID	HNTPH-Gas/BTEX	HNTPH-Gas	NWTPH-Dx (_) Acid / Silica Cleanup	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Water Only)	Semivolatiles 8270D/SIM (with Low Level PAHs)	HPAs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			Hold
21	MI3A	3-25-22	800	Soil	1				✓							✓							✓			✓
22	MI3B	↓	↓	↓																						
23	MI8AI		1000						✓							✓							✓			✓
24	MI8AII		↓						✓							✓							✓			✓
25	MI8AIII								✓							✓							✓			✓
~~26~~	~~MI8A~~																									
26	MI8B		↓																							
27	MI9A		1200						✓							✓							✓			✓
28	MI9B	↓	↓	↓																						

last

	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished	[signature]	ENPRO	3-25-22	1400	HI Samples MI prep
Received	Michelle [signature]	OSE	3/29/22	0930	Invoice to Kcale@enproenvironmental.com
Relinquished					Hold "B" Samples pending "A" Results
Received					
Relinquished					
Received					Data Package: Standard ☐ Level III ☐ Level IV ☐
Reviewed/Date		Reviewed/Date			Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Sample/Cooler Receipt and Acceptance Checklist

Client: ENP

Client Project Name/Number: 2202-00041-PH2

Initiated by: NB

OnSite Project Number: 03-311

Date Initiated: 3/29/22

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	No	N/A	1 2 3 4	
1.2 Were the custody seals intact?	Yes	No	N/A	1 2 3 4	
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	N/A	1 2 3 4	
1.4 Were the samples delivered on ice or blue ice?	Yes	No	N/A	1 2 3 4	
1.5 Were samples received between 0-6 degrees Celsius?	Yes	No	N/A	Temperature: 3.4	
1.6 Have shipping bills (if any) been attached to the back of this form?	Yes	N/A			
1.7 How were the samples delivered?	Client	Courier	UPS/FedEx	OSE Pickup	Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	Yes	No	1 2 3 4
2.2 Was the COC legible and written in permanent ink?	Yes	No	1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	Yes	No	1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	Yes	No	1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	Yes	No	1 2 3 4
2.6 Were any of the samples submitted omitted from the COC?	Yes	No	1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	No		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	No		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	Yes	No		1 2 3 4
3.4 Have the samples been correctly preserved?	Yes	No	N/A	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	Yes	No	N/A	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	Yes	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	No		1 2 3 4
3.8 Was method 5035A used?	Yes	No	N/A	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		N/A	1 2 3 4

Explain any discrepancies:

1 - Discuss issue in Case Narrative
2 - Process Sample As-is
3 - Client contacted to discuss problem
4 - Sample cannot be analyzed or client does not wish to proceed

//SERVER\OSE\Administration\forms\cooler_checklist.xls

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

April 12, 2022

Kim Kim
EnPro Environmental
151 Hekili Street, Suite 210
Kailua, HI 96734

Re: Analytical Data for Project 2202-00041-PH2
Laboratory Reference No. 2203-311B

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on March 29, 2022.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 12, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311B
Project: 2202-00041-PH2

Case Narrative

Samples were collected on March 23, 24 and 25, 2022 and received by the laboratory March 29, 2022. Samples were shipped in a cooler packed with blue ice and arrived at a temperature of <6°C. They were maintained at the laboratory at a temperature of 2°C to 6°C. A copy of the cooler receipt form has been included with this report.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

All samples were processed in the laboratory following the multi-increment sampling procedures as outlined in the HEER-TGM. Additional notes will be addressed in appropriate sections as warranted.

NWTPH-Dx Analysis

Per client request, sample MI16B was extracted and analyzed outside of hold time.

Any other QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.

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Date of Report: April 12, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311B
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI16B**					
Laboratory ID:	03-311-20					
Diesel Range Organics	**ND**	29	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	58	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*83*	*50-150*				

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 12, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311B
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0411S1					
Diesel Range Organics	**ND**	25	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	50	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*106*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE										
Laboratory ID:	SB0411S1									
	ORIG	DUP								
Diesel Range Organics	**90.6**	**90.3**	NA	NA		NA	NA	0	NA	
Surrogate:										
o-Terphenyl						*93*	*90*	*50-150*		

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 12, 2022
Samples Submitted: March 29, 2022
Laboratory Reference: 2203-311B
Project: 2202-00041-PH2

% MOISTURE
MULTI-INCREMENT SAMPLING

Client ID	Lab ID	% Moisture	Date Analyzed
MI16B	03-311-20	**13**	4-11-22

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260D, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Page 1 of 3

Laboratory Number: 03-311

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah IB
Project Manager: Kim Kim
Sampled by: A. Barro & Liam Sullivan

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx (_ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Water Only)	Semivolatiles 8270D/SIM (with low level PAHs)	PAHs 8270D/SIM (low level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			Sulfur Modifier
1	MI 22 A	3-23-22	1000	Soil	1				✓						✓							✓			✓
2	MI 22 B		1000																						
3	MI 35 A		1200						✓						✓							✓			✓
4	MI 35 B		1200																						
5	MI 29 A		1300						✓						✓							✓			✓
6	MI 29 B		1300																						
7	MI 23 A		1400						✓						✓							✓			✓
8	MI 23 B		1400																						
9	MI 12 A	3-24-22	0800						✓						✓							✓			✓
10	MI 12 B		0800																						

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	3-25-22	1400
Received	Nicholle Bottin	OSE	3/29/22	0930
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:
MI samples MI prep
Invoice to Kcale@epproenvironmental.com
Hold "B" pending "A" results
⊗ Added 4/8/22 - DB (3 day TAT)

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

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Chain of Custody

Page 2 of 3

Laboratory Number: 03-311

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah B
Project Manager: Kim Kim
Sampled by: Anthony Barro & Liam Sullivan

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx (_ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Water Only)	Semivolatiles 8270D/SIM (with low level PAHs)	PAHs 8270D/SIM (low level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			Sulfur Modifier
11	MI 17 A	3-24-22	0900	Soil	1			✓							✓							✓			✓
12	MI 17 B		0900																						
13	MI 11 A		1000					✓							✓							✓			✓
14	MI 11 B		1000																						
15	MI 18 A		1200					✓							✓							✓			✓
16	MI 18 B																								
17	MI 15 A							✓							✓							✓			✓
18	MI 15 B																								
19	MI 16 A		~~1200~~ 1400					✓							✓							✓			✓
20	MI 16 B							⊗																	⊗

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	3-25-22	1400
Received	Nicholle Bottin	OSE	3/29/22	0930
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:
MI samples MI prep
Invoice to Kcale@epproenvironmental.com
Hold "B" samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Chain of Custody

OnSite Environmental Inc.
Analytical Laboratory Testing Services
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Page 3 of 3

Laboratory Number: 03-311

Company: ENPRO ENVIRONMENTAL
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah B
Project Manager: Kim Kim
Sampled by: Anthony Bocco

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ Standard (7 Days) ☐ _____ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Bottle	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	NWTPH-Dx ☐ Acid / SG Clean-up	Volatiles 8260C	Halogenated Volatiles 8260C	EDB (Gx, 8011 (Water Only))	Semivolatiles 8270D/SIM	Semivolatiles 8270D/SIM Alkylated	PAHs 8270D/SIM Alkylated	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	Total Air Sulfur	Total Air Sulfur	Comments/Special Instructions
21	MI13A	3-25-22	800	Soil	1																				
22	MI13B	↑	↑		↑				✓																
23	MI8AI		1000																						
24	MI8AII								✓																
25	MI8AIII								✓																
~~26~~	~~MI8A~~																								
26	MI8B		1200						✓																
27	MI9A																								
28	MI9B	↓	↓		↓																				
		last																							

Relinquished	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished	[signature]	ENPRO	3-25-22	1400	HI Samples MI PREP
Received	[signature]	OSE	3/29/22	0930	Invoice to Kim Kim@enproenvironmental.com
Relinquished					Hold "B" Samples pending "A" results
Received					
Relinquished					Data Package: Standard ☐ Level III ☐ Level IV ☐
Received					
Reviewed/Date					Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Sample/Cooler Receipt and Acceptance Checklist

Client: ENP

Client Project Name/Number: 2202-00041-PH2

OnSite Project Number: 03-311

Initiated by: NB

Date Initiated: 3/29/22

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	No	N/A	1 2 3 4	
1.2 Were the custody seals intact?	Yes	No	N/A	1 2 3 4	
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	N/A	1 2 3 4	
1.4 Were the samples delivered on ice or blue ice?	Yes	No	N/A	1 2 3 4	
1.5 Were samples received between 0-6 degrees Celsius?	Yes	No	N/A	Temperature:	3.4
1.6 Have shipping bills (if any) been attached to the back of this form?	Yes	N/A			
1.7 How were the samples delivered?	Client	Courier	UPS/FedEx	OSE Pickup	Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	Yes	No	1 2 3 4
2.2 Was the COC legible and written in permanent ink?	Yes	No	1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	Yes	No	1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	Yes	No	1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	Yes	No	1 2 3 4
2.6 Were any of the samples submitted omitted from the COC?	Yes	No	1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	No		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	No		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	Yes	No		1 2 3 4
3.4 Have the samples been correctly preserved?	Yes	No	N/A	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	Yes	No	N/A	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	Yes	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	No		1 2 3 4
3.8 Was method 5035A used?	Yes	No	N/A	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		N/A	1 2 3 4

Explain any discrepancies:

1 - Discuss issue in Case Narrative
2 - Process Sample As-is
3 - Client contacted to discuss problem
4 - Sample cannot be analyzed or client does not wish to proceed

//SERVER\OSE\Administration\forms\cooler_checklist.xls

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

April 13, 2022

Kim Kim
EnPro Environmental
151 Hekili Street, Suite 210
Kailua, HI 96734

Re: Analytical Data for Project 2202-00041-PH2
Laboratory Reference No. 2204-002

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on April 1, 2022.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

Case Narrative

Samples were collected on March 28 and 29, 2022 and received by the laboratory April 1, 2022. Samples were shipped in a cooler packed with blue ice and arrived at a temperature of <6°C. They were maintained at the laboratory at a temperature of 2°C to 6°C. A copy of the cooler receipt form has been included with this report.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

All samples were processed in the laboratory following the multi-increment sampling procedures as outlined in the HEER-TGM. Additional notes will be addressed in appropriate sections as warranted.

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI1A**					
Laboratory ID:	04-002-01					
Diesel Range Organics	**ND**	27	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	54	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*88*	*50-150*				
Client ID:	**MI2A**					
Laboratory ID:	04-002-03					
Diesel Range Organics	**ND**	27	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	54	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*95*	*50-150*				
Client ID:	**MI3A**					
Laboratory ID:	04-002-05					
Diesel Range Organics	**ND**	27	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	55	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*97*	*50-150*				
Client ID:	**MI4A**					
Laboratory ID:	04-002-07					
Diesel Range Organics	**ND**	28	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	55	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*88*	*50-150*				
Client ID:	**MI5A**					
Laboratory ID:	04-002-09					
Diesel Range Organics	**ND**	28	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*98*	*50-150*				
Client ID:	**MI6A**					
Laboratory ID:	04-002-11					
Diesel Range Organics	**ND**	28	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	55	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*97*	*50-150*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI7AI**					
Laboratory ID:	04-002-13					
Diesel Range Organics	**ND**	29	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*98*	*50-150*				
Client ID:	**MI7AII**					
Laboratory ID:	04-002-14					
Diesel Range Organics	**ND**	28	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*99*	*50-150*				
Client ID:	**MI7AIII**					
Laboratory ID:	04-002-15					
Diesel Range Organics	**ND**	29	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*90*	*50-150*				
Client ID:	**MI10A**					
Laboratory ID:	04-002-17					
Diesel Range Organics	**ND**	29	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	58	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*98*	*50-150*				

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0411S1					
Diesel Range Organics	**ND**	25	EPA 8015M	4-11-22	4-11-22	
Residual Range Organics	**ND**	50	EPA 8015M	4-11-22	4-11-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*106*	*50-150*				

Analyte	Result		Spike Level	Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE										
Laboratory ID:	SB0411S1									
	ORIG	DUP								
Diesel Range Organics	**90.6**	**90.3**	NA	NA	NA		NA	0	NA	
Surrogate:										
o-Terphenyl					*93*	*90*	*50-150*			

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE
PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI1A**					
Laboratory ID:	04-002-01					
alpha-BHC	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	54	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*82*	*30-110*				
DCB	*95*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody,
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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI2A**					
Laboratory ID:	04-002-03					
alpha-BHC	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.4	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	54	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*71*	*30-110*				
DCB	*72*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI3A**					
Laboratory ID:	04-002-05					
alpha-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	55	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*74*	*30-110*				
DCB	*69*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI4A**					
Laboratory ID:	04-002-07					
alpha-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	55	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*77*	*30-110*				
DCB	*72*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI5A**					
Laboratory ID:	04-002-09					
alpha-BHC	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	56	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*81*	*30-110*				
DCB	*76*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI6A**					
Laboratory ID:	04-002-11					
alpha-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.5	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	55	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*76*	*30-110*				
DCB	*70*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI7AI**					
Laboratory ID:	04-002-13					
alpha-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	57	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*76*	*30-110*				
DCB	*69*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI7AII**					
Laboratory ID:	04-002-14					
alpha-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	57	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*77*	*30-110*				
DCB	*71*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI7AIII**					
Laboratory ID:	04-002-15					
alpha-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	57	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*79*	*30-110*				
DCB	*70*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI10A**					
Laboratory ID:	04-002-17					
alpha-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	11	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	57	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*77*	*30-110*				
DCB	*69*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0411S1					
alpha-BHC	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
beta-BHC	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
delta-BHC	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
Heptachlor	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
Aldrin	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
Heptachlor Epoxide	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
gamma-Chlordane	**ND**	10	EPA 8081B	4-11-22	4-12-22	
alpha-Chlordane	**ND**	10	EPA 8081B	4-11-22	4-12-22	
4,4'-DDE	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Endosulfan I	**ND**	5.0	EPA 8081B	4-11-22	4-12-22	
Dieldrin	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Endrin	**ND**	10	EPA 8081B	4-11-22	4-12-22	
4,4'-DDD	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Endosulfan II	**ND**	10	EPA 8081B	4-11-22	4-12-22	
4,4'-DDT	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Endrin Aldehyde	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Methoxychlor	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Endosulfan Sulfate	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Endrin Ketone	**ND**	10	EPA 8081B	4-11-22	4-12-22	
Toxaphene	**ND**	50	EPA 8081B	4-11-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*74*	*30-110*				
DCB	*72*	*40-117*				

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
MATRIX SPIKES											
Laboratory ID:	04-002-03										
	MS	MSD	MS	MSD		MS	MSD				
alpha-BHC	**89.5**	**93.4**	100	100	ND	**89**	**93**	36-123	4	21	
gamma-BHC (Lindane)	**86.9**	**91.2**	100	100	ND	**87**	**91**	38-121	5	21	
beta-BHC	**82.6**	**85.6**	100	100	ND	**83**	**86**	31-125	4	21	
delta-BHC	**80.0**	**82.7**	100	100	ND	**80**	**83**	37-118	3	23	
Heptachlor	**85.6**	**89.1**	100	100	ND	**86**	**89**	37-123	4	24	
Aldrin	**87.0**	**90.1**	100	100	ND	**87**	**90**	45-118	4	22	
Heptachlor Epoxide	**85.7**	**87.8**	100	100	ND	**86**	**88**	46-114	2	22	
gamma-Chlordane	**80.2**	**82.8**	100	100	ND	**80**	**83**	41-120	3	23	
alpha-Chlordane	**79.7**	**81.9**	100	100	ND	**80**	**82**	43-118	3	23	
4,4'-DDE	**89.0**	**91.7**	100	100	ND	**89**	**92**	34-139	3	22	
Endosulfan I	**86.5**	**89.8**	100	100	ND	**87**	**90**	43-124	4	25	
Dieldrin	**87.0**	**89.2**	100	100	ND	**87**	**89**	40-128	2	23	
Endrin	**86.9**	**89.8**	100	100	ND	**87**	**90**	44-120	3	28	
4,4'-DDD	**95.4**	**98.3**	100	100	ND	**95**	**98**	42-131	3	21	
Endosulfan II	**81.9**	**84.8**	100	100	ND	**82**	**85**	47-112	3	22	
4,4'-DDT	**86.1**	**89.1**	100	100	ND	**86**	**89**	29-141	3	32	
Endrin Aldehyde	**78.5**	**81.2**	100	100	ND	**78**	**81**	41-114	3	22	
Methoxychlor	**102**	**110**	100	100	ND	**102**	**110**	31-139	8	23	
Endosulfan Sulfate	**78.5**	**82.4**	100	100	ND	**78**	**82**	48-112	5	21	
Endrin Ketone	**78.5**	**81.5**	100	100	ND	**78**	**81**	46-117	4	22	
Surrogate:											
TCMX						*75*	*78*	*30-110*			
DCB						*71*	*70*	*40-117*			

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

TOTAL ARSENIC EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI1A**					
Laboratory ID:	04-002-01					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI2A**					
Laboratory ID:	04-002-03					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI3A**					
Laboratory ID:	04-002-05					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI4A**					
Laboratory ID:	04-002-07					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI5A**					
Laboratory ID:	04-002-09					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI6A**					
Laboratory ID:	04-002-11					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI7AI**					
Laboratory ID:	04-002-13					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI7AII**					
Laboratory ID:	04-002-14					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI7AIII**					
Laboratory ID:	04-002-15					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	
Client ID:	**MI10A**					
Laboratory ID:	04-002-17					
Arsenic	**ND**	11	EPA 6010D	4-5-22	4-5-22	

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0405SM1					
Arsenic	**ND**	10	EPA 6010D	4-5-22	4-5-22	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	04-021-01										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	04-021-01										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**95.7**	**94.7**	100	100	ND	**96**	**95**	75-125	1	20	

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Date of Report: April 13, 2022
Samples Submitted: April 1, 2022
Laboratory Reference: 2204-002
Project: 2202-00041-PH2

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
MI1A	04-002-01	**7**	4-5-22
MI2A	04-002-03	**7**	4-5-22
MI3A	04-002-05	**8**	4-5-22
MI4A	04-002-07	**10**	4-5-22
MI5A	04-002-09	**10**	4-5-22
MI6A	04-002-11	**10**	4-5-22
MI7AI	04-002-13	**13**	4-5-22
MI7AII	04-002-14	**12**	4-5-22
MI7AIII	04-002-15	**13**	4-5-22
MI10A	04-002-17	**13**	4-5-22

This report pertains to the samples analyzed in accordance with the chain of custody,
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OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260D, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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Chain of Custody

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah, LLB
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ _____ (other)

Laboratory Number: 04-002

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			% Moisture
11	MI6A	3-28-22		Soil	1				✓							✓							✓			✓
12	MI6B	↓		↓																						
13	MI7AI	3-29-22	830						✓							✓							✓			✓
14	MI7AII		830						✓							✓							✓			
15	MI7AIII		830						✓							✓							✓			
16	MI7B		830																							
17	MI10A		1100						✓							✓							✓			✓
18	MI10B	↓	1100	↓																						
	last																									

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO		
Received	[signature]	OSE	4/1/22	1030
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions: HI Samples, MI Prep
Invoice to Kcale@enproenvironmental.com
Hold "B" Sampling pending "A" Results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Chain of Custody

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah, LLB
Project Manager: Kim Kim
Sampled by: A Barro

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ _____ (other)

Laboratory Number: 04-002

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			% Moisture
1	MI1A	3-28-22	1200	Soil	1				✓							✓							✓			✓
2	MI1B		1200																							
3	MI2A		1330						✓							✓							✓			✓
4	MI2B		1330																							
5	MI3A		1430						✓							✓							✓			✓
6	~~MI3B~~ MI3B		1430																							
7	MI4A		1530						✓							✓							✓			✓
8	MI4B		1530																							
9	MI5A		1000						✓							✓							✓			✓
10	MI5B		1000																							

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO		
Received	[signature]	OSE	4/1/22	1030
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions: HI Samples MI Prep
Invoice to Kcale@enproenvironmental.com
Hold "B" pending "A" Results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Sample/Cooler Receipt and Acceptance Checklist

Client: EnP

Client Project Name/Number: 2202-00041-PH2

OnSite Project Number: 04-002

Initiated by: [illegible]

Date Initiated: 4/1/22

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	No	N/A	1 2 3 4	
1.2 Were the custody seals intact?	Yes	No	N/A	1 2 3 4	
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	N/A	1 2 3 4	
1.4 Were the samples delivered on ice or blue ice?	Yes	No	N/A	1 2 3 4	
1.5 Were samples received between 0-6 degrees Celsius?	Yes	No	N/A	Temperature: 5	
1.6 Have shipping bills (if any) been attached to the back of this form?	Yes	N/A			
1.7 How were the samples delivered?	Client	Courier	UPS/FedEx	OSE Pickup	Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	Yes	No		1 2 3 4
2.2 Was the COC legible and written in permanent ink?	Yes	No		1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	Yes	No		1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	Yes	No		1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	Yes	No		1 2 3 4
2.6 Were any of the samples submitted omitted from the COC?	Yes	No		1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	No		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	No		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	Yes	No		1 2 3 4
3.4 Have the samples been correctly preserved?	Yes	No	N/A	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	Yes	No	N/A	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	Yes	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	No		1 2 3 4
3.8 Was method 5035A used?	Yes	No	N/A	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		N/A	1 2 3 4

Explain any discrepancies:

1 - Discuss issue in Case Narrative

2 - Process Sample As-is

3 - Client contacted to discuss problem

4 - Sample cannot be analyzed or client does not wish to proceed

//SERVER\OSE\Administration\forms\cooler_checklist.xls

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

April 14, 2022

Kim Kim
EnPro Environmental
151 Hekili Street, Suite 210
Kailua, HI 96734

Re: Analytical Data for Project 2202-00041-PH2
Laboratory Reference No. 2204-033

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on April 5, 2022.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

Case Narrative

Samples were collected on March 29, 30 and 31, 2022 and received by the laboratory April 5, 2022. Samples were shipped in a cooler packed with blue ice and arrived at a temperature of <6°C. They were maintained at the laboratory at a temperature of 2°C to 6°C. A copy of the cooler receipt form has been included with this report.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

All samples were processed in the laboratory following the multi-increment sampling procedures as outlined in the HEER-TGM. Additional notes will be addressed in appropriate sections as warranted.

Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI14A**					
Laboratory ID:	04-033-01					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*93*	*50-150*				
Client ID:	**MI19A**					
Laboratory ID:	04-033-03					
Diesel Range Organics	**ND**	34	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	68	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*82*	*50-150*				
Client ID:	**MI24A**					
Laboratory ID:	04-033-05					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*82*	*50-150*				
Client ID:	**MI25A**					
Laboratory ID:	04-033-07					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*94*	*50-150*				
Client ID:	**MI36A**					
Laboratory ID:	04-033-09					
Diesel Range Organics	**ND**	29	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	59	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*97*	*50-150*				
Client ID:	**MI37A**					
Laboratory ID:	04-033-11					
Diesel Range Organics	**ND**	30	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	60	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI30AI**					
Laboratory ID:	04-033-13					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*73*	*50-150*				
Client ID:	**MI30AII**					
Laboratory ID:	04-033-14					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*76*	*50-150*				
Client ID:	**MI30AIII**					
Laboratory ID:	04-033-15					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*68*	*50-150*				
Client ID:	**MI31AI**					
Laboratory ID:	04-033-17					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	56	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*76*	*50-150*				
Client ID:	**MI31AII**					
Laboratory ID:	04-033-18					
Diesel Range Organics	**ND**	29	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*79*	*50-150*				
Client ID:	**MI31AIII**					
Laboratory ID:	04-033-19					
Diesel Range Organics	**ND**	29	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI41A**					
Laboratory ID:	04-033-21					
Diesel Range Organics	**ND**	29	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*89*	*50-150*				
Client ID:	**MI40A**					
Laboratory ID:	04-033-23					
Diesel Range Organics	**ND**	28	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**71**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*79*	*50-150*				
Client ID:	**MI43A**					
Laboratory ID:	04-033-25					
Diesel Range Organics	**ND**	29	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				
Client ID:	**MI42A**					
Laboratory ID:	04-033-27					
Diesel Range Organics	**ND**	29	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**110**	57	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*83*	*50-150*				
Client ID:	**MI45A**					
Laboratory ID:	04-033-29					
Diesel Range Organics	**ND**	30	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	59	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*88*	*50-150*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

DIESEL AND HEAVY OIL RANGE ORGANICS
EPA 8015M
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0412S1					
Diesel Range Organics	**ND**	25	EPA 8015M	4-12-22	4-12-22	
Residual Range Organics	**ND**	50	EPA 8015M	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*84*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	04-033-01										
	ORIG	DUP									
Diesel Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Residual Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						*93*	*82*	*50-150*			
Laboratory ID:	SB0412S1										
	ORIG	DUP									
Diesel Range Organics	**97.1**	**93.1**	NA	NA		NA		NA	4	NA	
Surrogate:											
o-Terphenyl						*97*	*98*	*50-150*			

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Project: 2202-00041-PH2

ORGANOCHLORINE
PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI14A**					
Laboratory ID:	04-033-01					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*85*	*30-110*				
DCB	*85*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI19A**					
Laboratory ID:	04-033-03					
alpha-BHC	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	14	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	14	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	6.8	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	14	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	14	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	14	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	68	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*77*	*30-110*				
DCB	*80*	*40-117*				

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Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI24A**					
Laboratory ID:	04-033-05					
alpha-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	56	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*87*	*30-110*				
DCB	*85*	*40-117*				

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Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI25A**					
Laboratory ID:	04-033-07					
alpha-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	56	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*79*	*30-110*				
DCB	*81*	*40-117*				

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Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI36A**					
Laboratory ID:	04-033-09					
alpha-BHC	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	12	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	12	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.8	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	12	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	12	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	58	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*81*	*30-110*				
DCB	*79*	*40-117*				

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Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI37A**					
Laboratory ID:	04-033-11					
alpha-BHC	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	12	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	12	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	6.0	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	12	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	12	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	12	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	60	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*68*	*30-110*				
DCB	*64*	*40-117*				

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Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI30AI**					
Laboratory ID:	04-033-13					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*66*	*30-110*				
DCB	*76*	*40-117*				

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Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI30AII**					
Laboratory ID:	04-033-14					
alpha-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	56	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*67*	*30-110*				
DCB	*70*	*40-117*				

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Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI30AIII**					
Laboratory ID:	04-033-15					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*76*	*30-110*				
DCB	*80*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI31AI**					
Laboratory ID:	04-033-17					
alpha-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.6	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	56	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*74*	*30-110*				
DCB	*83*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI31AII**					
Laboratory ID:	04-033-18					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*73*	*30-110*				
DCB	*82*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI31AIII**					
Laboratory ID:	04-033-19					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*77*	*30-110*				
DCB	*84*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI41A**					
Laboratory ID:	04-033-21					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*82*	*30-110*				
DCB	*91*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI40A**					
Laboratory ID:	04-033-23					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**12**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*67*	*30-110*				
DCB	*75*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI43A**					
Laboratory ID:	04-033-25					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-13-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-13-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-13-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-13-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*69*	*30-110*				
DCB	*77*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI42A**					
Laboratory ID:	04-033-27					
alpha-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
gamma-BHC (Lindane)	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
beta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
delta-BHC	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
Heptachlor	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
Aldrin	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
Heptachlor Epoxide	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
gamma-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-14-22	
alpha-Chlordane	**ND**	11	EPA 8081B	4-12-22	4-14-22	
4,4'-DDE	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Endosulfan I	**ND**	5.7	EPA 8081B	4-12-22	4-14-22	
Dieldrin	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Endrin	**ND**	11	EPA 8081B	4-12-22	4-14-22	
4,4'-DDD	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Endosulfan II	**ND**	11	EPA 8081B	4-12-22	4-14-22	
4,4'-DDT	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Endrin Aldehyde	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Methoxychlor	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Endosulfan Sulfate	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Endrin Ketone	**ND**	11	EPA 8081B	4-12-22	4-14-22	
Toxaphene	**ND**	57	EPA 8081B	4-12-22	4-14-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*107*	*30-110*				
DCB	*114*	*40-117*				

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI45A**					
Laboratory ID:	04-033-29					
alpha-BHC	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
gamma-BHC (Lindane)	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
beta-BHC	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
delta-BHC	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
Heptachlor	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
Aldrin	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
Heptachlor Epoxide	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
gamma-Chlordane	**ND**	12	EPA 8081B	4-12-22	4-14-22	
alpha-Chlordane	**ND**	12	EPA 8081B	4-12-22	4-14-22	
4,4'-DDE	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Endosulfan I	**ND**	5.9	EPA 8081B	4-12-22	4-14-22	
Dieldrin	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Endrin	**ND**	12	EPA 8081B	4-12-22	4-14-22	
4,4'-DDD	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Endosulfan II	**ND**	12	EPA 8081B	4-12-22	4-14-22	
4,4'-DDT	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Endrin Aldehyde	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Methoxychlor	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Endosulfan Sulfate	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Endrin Ketone	**ND**	12	EPA 8081B	4-12-22	4-14-22	
Toxaphene	**ND**	59	EPA 8081B	4-12-22	4-14-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*103*	*30-110*				
DCB	*111*	*40-117*				

OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

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Date of Report: April 14, 2022
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Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0412S1					
alpha-BHC	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
gamma-BHC (Lindane)	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
beta-BHC	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
delta-BHC	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
Heptachlor	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
Aldrin	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
Heptachlor Epoxide	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
gamma-Chlordane	**ND**	10	EPA 8081B	4-12-22	4-12-22	
alpha-Chlordane	**ND**	10	EPA 8081B	4-12-22	4-12-22	
4,4'-DDE	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Endosulfan I	**ND**	5.0	EPA 8081B	4-12-22	4-12-22	
Dieldrin	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Endrin	**ND**	10	EPA 8081B	4-12-22	4-12-22	
4,4'-DDD	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Endosulfan II	**ND**	10	EPA 8081B	4-12-22	4-12-22	
4,4'-DDT	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Endrin Aldehyde	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Methoxychlor	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Endosulfan Sulfate	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Endrin Ketone	**ND**	10	EPA 8081B	4-12-22	4-12-22	
Toxaphene	**ND**	50	EPA 8081B	4-12-22	4-12-22	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*74*	*30-110*				
DCB	*84*	*40-117*				

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Soil
Units: ug/Kg (ppb)

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS											
Laboratory ID:	SB0412S1										
	SB	SBD	SB	SBD		SB	SBD				
alpha-BHC	**88.9**	**99.3**	100	100	N/A	**89**	**99**	65-115	11	15	
gamma-BHC (Lindane)	**87.1**	**97.5**	100	100	N/A	**87**	**98**	69-116	11	15	
beta-BHC	**83.1**	**92.7**	100	100	N/A	**83**	**93**	63-116	11	15	
delta-BHC	**84.7**	**90.2**	100	100	N/A	**85**	**90**	66-116	6	15	
Heptachlor	**85.1**	**93.5**	100	100	N/A	**85**	**94**	63-119	9	15	
Aldrin	**88.8**	**97.4**	100	100	N/A	**89**	**97**	60-116	9	15	
Heptachlor Epoxide	**87.3**	**94.8**	100	100	N/A	**87**	**95**	65-116	8	15	
gamma-Chlordane	**82.6**	**92.1**	100	100	N/A	**83**	**92**	64-116	11	15	
alpha-Chlordane	**82.1**	**89.9**	100	100	N/A	**82**	**90**	62-119	9	15	
4,4'-DDE	**93.0**	**98.1**	100	100	N/A	**93**	**98**	69-120	5	15	
Endosulfan I	**87.8**	**97.9**	100	100	N/A	**88**	**98**	60-121	11	15	
Dieldrin	**88.0**	**97.1**	100	100	N/A	**88**	**97**	64-115	10	15	
Endrin	**84.7**	**90.4**	100	100	N/A	**85**	**90**	62-118	7	15	
4,4'-DDD	**93.1**	**101**	100	100	N/A	**93**	**101**	64-124	8	15	
Endosulfan II	**82.6**	**91.1**	100	100	N/A	**83**	**91**	64-115	10	15	
4,4'-DDT	**86.8**	**91.2**	100	100	N/A	**87**	**91**	57-130	5	15	
Endrin Aldehyde	**92.6**	**101**	100	100	N/A	**93**	**101**	57-114	9	15	
Methoxychlor	**95.9**	**98.3**	100	100	N/A	**96**	**98**	49-129	2	15	
Endosulfan Sulfate	**80.4**	**87.6**	100	100	N/A	**80**	**88**	61-115	9	15	
Endrin Ketone	**81.5**	**91.1**	100	100	N/A	**82**	**91**	64-116	11	15	
Surrogate:											
TCMX						*84*	*86*	*30-110*			
DCB						*100*	*105*	*40-117*			

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI14A**					
Laboratory ID:	04-033-01					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI19A**					
Laboratory ID:	04-033-03					
Arsenic	**ND**	14	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI24A**					
Laboratory ID:	04-033-05					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI25A**					
Laboratory ID:	04-033-07					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI36A**					
Laboratory ID:	04-033-09					
Arsenic	**ND**	12	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI37A**					
Laboratory ID:	04-033-11					
Arsenic	**ND**	12	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI30AI**					
Laboratory ID:	04-033-13					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI30AII**					
Laboratory ID:	04-033-14					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	

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Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI30AIII**					
Laboratory ID:	04-033-15					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI31AI**					
Laboratory ID:	04-033-17					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI31AII**					
Laboratory ID:	04-033-18					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI31AIII**					
Laboratory ID:	04-033-19					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI41A**					
Laboratory ID:	04-033-21					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI40A**					
Laboratory ID:	04-033-23					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI43A**					
Laboratory ID:	04-033-25					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	
Client ID:	**MI42A**					
Laboratory ID:	04-033-27					
Arsenic	**ND**	11	EPA 6010D	4-11-22	4-11-22	

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Laboratory Reference: 2204-033
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MI45A**					
Laboratory ID:	04-033-29					
Arsenic	**ND**	12	EPA 6010D	4-11-22	4-11-22	

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

TOTAL ARSENIC
EPA 6010D
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0411SM2					
Arsenic	**ND**	10	EPA 6010D	4-11-22	4-11-22	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	04-060-02										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	04-060-02										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**90.5**	**89.8**	100	100	ND	**91**	**90**	75-125	1	20	

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Date of Report: April 14, 2022
Samples Submitted: April 5, 2022
Laboratory Reference: 2204-033
Project: 2202-00041-PH2

% MOISTURE
MULTI-INCREMENT SAMPLING

Client ID	Lab ID	% Moisture	Date Analyzed
MI14A	04-033-01	**12**	4-11-22
MI19A	04-033-03	**27**	4-11-22
MI24A	04-033-05	**11**	4-11-22
MI25A	04-033-07	**11**	4-11-22
MI36A	04-033-09	**15**	4-11-22
MI37A	04-033-11	**16**	4-11-22
MI30AI	04-033-13	**12**	4-11-22
MI30AII	04-033-14	**11**	4-11-22
MI30AIII	04-033-15	**12**	4-11-22
MI31AI	04-033-17	**11**	4-11-22
MI31AII	04-033-18	**12**	4-11-22
MI31AIII	04-033-19	**12**	4-11-22
MI41A	04-033-21	**12**	4-11-22
MI40A	04-033-23	**12**	4-11-22
MI43A	04-033-25	**12**	4-11-22
MI42A	04-033-27	**13**	4-11-22
MI45A	04-033-29	**15**	4-11-22

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OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260D, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Page 1 of 3

Laboratory Number: 04-033

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah, IB
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ _____ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			% Moisture
1	MI 14A	3-29-22	1130	Soil	1				✓							✓							✓			✓
2	MI 14B	↓	↓	↓	↓																					
3	MI 19A		1400						✓							✓							✓			✓
4	MI 19B		↓																							
5	MI 24A	3-30-22	0830						✓							✓							✓			✓
6	MI 24B	↓	↓																							
7	MI 25A	3-29-22	1330						✓							✓							✓			✓
8	MI 25B	↓	↓																							
9	MI 36A	3-30-22	1300						✓							✓							✓			✓
10	MI 36B	↓	↓																							

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	4-1-22	1400
Received	[signature]	OSE	4/5/22	1100
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:
HI samples, MI prep
Invoice to Kcale@enproenvironmental.com
report to KKim@enproenvironmental.com
Hold "B" ~~Results~~ samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

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Chain of Custody

Page 2 of 3

Laboratory Number: 04-033

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah, IB
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ _____ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			% Moisture
11	MI 37A	3-30-22	1030	Soil	1				✓							✓							✓			✓
12	MI 37B		↓																							
13	MI 30 A I		0830						✓							✓							✓			✓
14	MI 30 A II		↓						✓							✓							✓			
15	MI 30 A III								✓							✓							✓			
16	MI 30 B		~~0830~~ 1000																							
17	MI 31 A I		1030						✓							✓							✓			✓
18	MI 31 A II		↓						✓							✓							✓			
19	MI 31 A III								✓							✓							✓			
20	MI 31 B	↓	1030	↓	↓																					

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	4-1-22	1400
Received	[signature]	OSE	4/5/22	1100
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:
HI samples, MI prep
Invoice to Kcale@enproenvironmental.com
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Hold "B" samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

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Chain of Custody

Page 3 of 3

Laboratory Number: 04-033

Company: ENPRO Environmental
Project Number: 2202-00041-PH2
Project Name: Villages of Issaquah, IB
Project Manager: Kim Kim
Sampled by: Anthony Barro

Turnaround Request (in working days) (Check One): ☐ Same Day ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Standard (7 Days) ☐ _____ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx ☐ Acid / SG Clean-up	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Total Arsenic			% Moisture
21	MI 41A	3-31-22	1200	Soil	1				✓							✓							✓			✓
22	MI 41B		↓																							
23	MI 40A		1300						✓							✓							✓			✓
24	MI 40B		↓																							
25	MI 43A		0600						✓							✓							✓			✓
26	MI 43B		↓																							
27	MI 42A		1000						✓							✓							✓			✓
28	MI 42B		↓																							
29	MI 45A		1400						✓							✓							✓			✓
30	MI 45B	↓	↓	↓	↓																					

	Signature	Company	Date	Time
Relinquished	[signature]	ENPRO	4-1-22	1400
Received	[signature]	OSE	4/5/22	1100
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:
HI samples, MI Prep
invoice to Kcale@enproenvironmental.com
report to KKim@enproenvironmental.com
Hold "B" Samples pending "A" results

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Sample/Cooler Receipt and Acceptance Checklist

Client: EMP
Client Project Name/Number: 2202-00041-PH2
OnSite Project Number: 04-033
Initiated by: [initials]
Date Initiated: 4/5/22

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	No	N/A	1 2 3 4	
1.2 Were the custody seals intact?	Yes	No	N/A	1 2 3 4	
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	N/A	1 2 3 4	
1.4 Were the samples delivered on ice or blue ice?	Yes	No	N/A	1 2 3 4	
1.5 Were samples received between 0-6 degrees Celsius?	Yes	No	N/A	Temperature: 5.5	
1.6 Have shipping bills (if any) been attached to the back of this form?	Yes	N/A			
1.7 How were the samples delivered?	Client	Courier	UPS/FedEx	OSE Pickup	Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	Yes	No	1 2 3 4
2.2 Was the COC legible and written in permanent ink?	Yes	No	1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	Yes	No	1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	Yes	No	1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	Yes	No	1 2 3 4
2.6 Were any of the samples submitted omitted from the COC?	Yes	No	1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	No		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	No		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	Yes	No		1 2 3 4
3.4 Have the samples been correctly preserved?	Yes	No	N/A	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	Yes	No	N/A	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	Yes	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	No		1 2 3 4
3.8 Was method 5035A used?	Yes	No	N/A	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		N/A	1 2 3 4

Explain any discrepancies:

1 - Discuss issue in Case Narrative
2 - Process Sample As-is
3 - Client contacted to discuss problem
4 - Sample cannot be analyzed or client does not wish to proceed

//SERVER\OSE\Administration\forms\cooler_checklist.xls

FINAL ARCHAEOLOGICAL INVENTORY SURVEY

APPENDIX

F

Final

Archaeological Inventory Survey for the Villages of Leialiʻi, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupuaʻa, Lāhainā District, Maui Island, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapiʻilani Highway Right-of-Way

Prepared for
Department of Hawaiian Home Lands

Prepared by
Jonas K. Madeus, B.A.,
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(Job Code: WAHIKULI 5)

September 2022

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Management Summary

Reference	Archaeological Inventory Survey for the Villages of Leialiʻi, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupuaʻa, Lāhainā District, Maui Island, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapiʻilani Highway Right-of-Way (Madeus et al. 2022)
Date	September 2022
Project Number	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: WAHIKULI 5
Investigation Permit Number	CSH completed the archaeological inventory survey (AIS) fieldwork under archaeological fieldwork permit number 21-10 (for 2021) and 22-02 (for 2022), issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-13-282.
Agencies	SHPD, Department of Hawaiian Home Lands (DHHL), Hawaii Department of Transportation (HDOT), and County Department of Parks and Recreation
Land Jurisdiction	State of Hawaiʻi, DHHL
Project Proponent	DHHL
Project Funding	State of Hawaiʻi, DHHL
Project Location	The project area is located along Leialiʻi Parkway in Lāhainā across from and extending directly east of the existing Villages of Leialiʻi Phase 1-A Subdivision in Lāhainā, Wahikuli Ahupuaʻa, Lāhainā District, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112. The project area is bounded by the Lāhainā Civic Center multipurpose sports and recreation facility to the northwest, by the Leialiʻi Phase 1-A Subdivision to the south, and Wahikuli Wayside Park to the west. The eastern side of the project area is agricultural land. The project area is depicted on a portion of the 1992 Lahaina USGS 7.5-minute topographic quadrangle.
Project Description	The project will involve the construction of approximately 250 new units on 51 acres (20.639 hectares) for the development of a Leialiʻi Phase 1-B Subdivision across from the existing Leialiʻi Phase 1-A Subdivision. The project will include off-site improvements to surrounding utilities including drainage improvements, improvements to Leialiʻi Parkway, and improvements at the intersection of Leialiʻi Parkway and Honoapiʻilani Highway.
Project Acreage	The project area is 83.3 acres (33.7 hectares).
Historic Preservation Regulatory Context	CSH conducted an archaeological literature review and field inspection (LRFI) in October 2021 to provide a synopsis of past land use and a summary of previous archaeological studies conducted in the project area (Yucha et al. 2022). This information was used in preparation of a

	field inspection to locate previously documented historic properties in the region and to predict the types of historic properties that may present in the project area. The field inspection documented three surface features, two roads and a railroad track, as potential historic properties within the project area. Due to the significant findings, the SHPD requested the study be converted into an AIS to meet the requirements of HAR §13-276 (Appendix A). This AIS investigation fulfills the requirements of HAR §13-13-276 and was conducted to identify, document, and assess significance of any historic properties. This document is intended to support the proposed project's historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-8 and HAR §13-13-275. It is also intended to support any project-related historic preservation consultation with stakeholders, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups.
Fieldwork Effort	Fieldwork was accomplished on 4 October 2021 by CSH archaeologists Jay Rapoza, B.A., and Jonas Madeus B.A., and project manager, Trevor Yucha, B.S., under the general supervision of principal investigators Josephine Yucha, M.S., and Hallett H. Hammatt Ph.D. This work required approximately 6 person-days to complete.
Historic Properties Identified and Historic Property Significance	CSH documented three new historic properties within the project area: State Inventory of Historic Places (SIHP) # 50-50-03-08886 is an asphalt-paved road and former plantation railroad corridor. It is assessed as significant pursuant to HAR §13-13-275-6, Criterion "d" (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and workmanship, and has provided information regarding historic land use of the project area. SIHP # 50-50-03-08887 is a portion of the existing Lāhainā, Kāʻanapali & Pacific (LK&P) railroad that was established as a tourist attraction in 1969. It is assessed as significant pursuant to HAR §13-13-275-6, Criterion "d" (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, setting, materials, and workmanship, and has provided information regarding historic land use of the project area. SIHP # 50-50-03-08888 is an asphalt-paved road that was used for historic commercial agricultural operations and formerly labeled as "Main Industrial Road". It is assessed as significant pursuant to HAR §13-13-275-6, Criterion "d" (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and

	workmanship, and has provided information regarding historic land use of the project area.
Effect Recommendation	Three significant historic properties, SIHP #s 50-50-03-08886, -08887, and -08888, have been identified within the current project area. These historic properties will be impacted by project-related ground disturbance. In accordance with HAR §13-13-275-7, the effect recommendation for this project is "effect, with proposed mitigation commitments."
Mitigation Recommendations	As described in HAR §13-13-279-3, "archaeological monitoring may be an identification, mitigation, or post-mitigation contingency measure. Monitoring shall entail the archaeological observation of, and possible intervention with, on-going activities which may adversely affect historic properties." SIHP # -08886, an asphalt paved road and former railroad corridor, SIHP # -08887, a portion of an operational tourist railroad, and SIHP # -08888, an asphalt paved industrial road, have provided information important to research on historic land use of the project area. Archaeological monitoring is recommended for project-related ground disturbance within the boundaries of these three historic properties in order to provide an opportunity to gather additional data on the subsurface structure of the historic properties. The provisions and objectives of archaeological monitoring will be addressed within an archaeological monitoring plan that will be prepared for the review and acceptance of the SHPD prior to any project-related ground disturbance.

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Section 1 Introduction

1.1 Project Background

At the request of Munekiyo Hiraga, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this archaeological inventory survey (AIS) report for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way (ROW). The project area encompasses 83.3 acres (33.7 hectares) and is located along Leiali‘i Parkway in Lāhainā across from and extending directly east of the existing Villages of Leiali‘i Phase 1-A Subdivision. The project area is bounded by the Lāhainā Civic Center multipurpose sports and recreation facility to the northwest, by the Leiali‘i Phase 1-A Subdivision to the south, and Wahikuli Wayside Park to the west. The eastern side of the project area is agricultural land. The project area is depicted on a portion of the 2017 Lahaina U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), tax map plats (Figure 2 and Figure 3), and a 2019 aerial photograph (Figure 4).

The project will be constructed on land owned by the State of Hawai‘i. The project area includes a total of 83.3 acres (33.7 hectares). The project will involve the construction of approximately 250 new units on 51 acres (20.6 hectares) for the development of a Leiali‘i Phase 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include off-site improvements to surrounding utilities including drainage improvements, improvements to Leiali‘i Parkway, and improvements at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway.

1.2 Historic Preservation Regulatory Context

In October 2021, CSH conducted an archaeological literature review and field inspection (LRFI) for the current project to provide a synopsis of past land use and a summary of previous archaeological studies conducted in the project area (Yucha et al. 2022). This information was used in preparation of a field inspection to locate previously documented historic properties in the region and to predict the types of historic properties that may present in the project area. The field inspection documented three surface features, two roads and a railroad track, as potential historic properties within the project area. Due to the significant findings, the SHPD requested the study be converted into an AIS to meet the requirements of Hawai‘i Administrative Rules (HAR) §13-276 (Appendix A).

This AIS investigation fulfills the requirements of HAR §13-13-276 and was conducted to identify, document, and assess significance of any historic properties. This document is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-8 and HAR §13-13-275. It is also intended to support any project-related historic preservation consultation with stakeholders, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups.

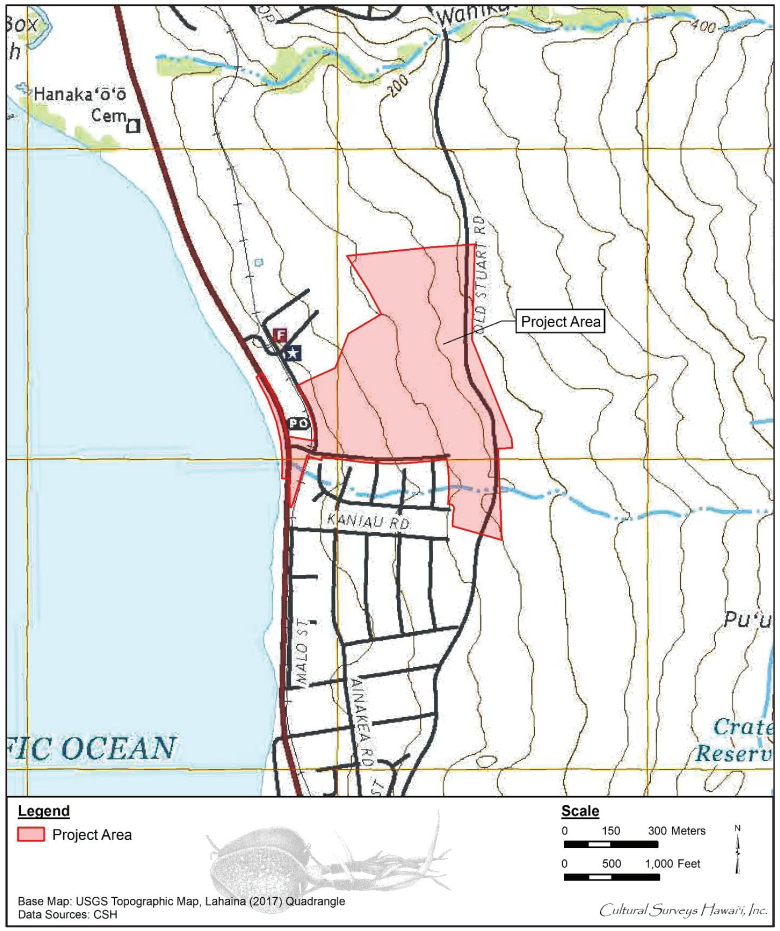

Figure 1. Portion of the 2017 Lahaina USGS 7.5-minute topographic quadrangle showing the location of the project area

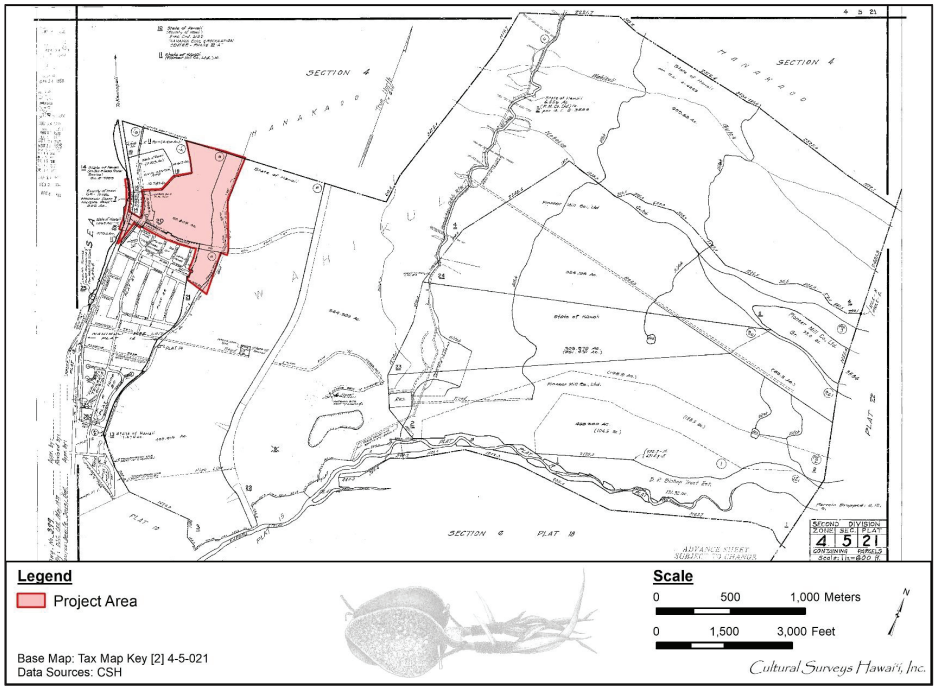

Figure 2. Tax Map Key (TMK) [2] 4-5-021 showing the project area (Hawaii TMK Service 2014)

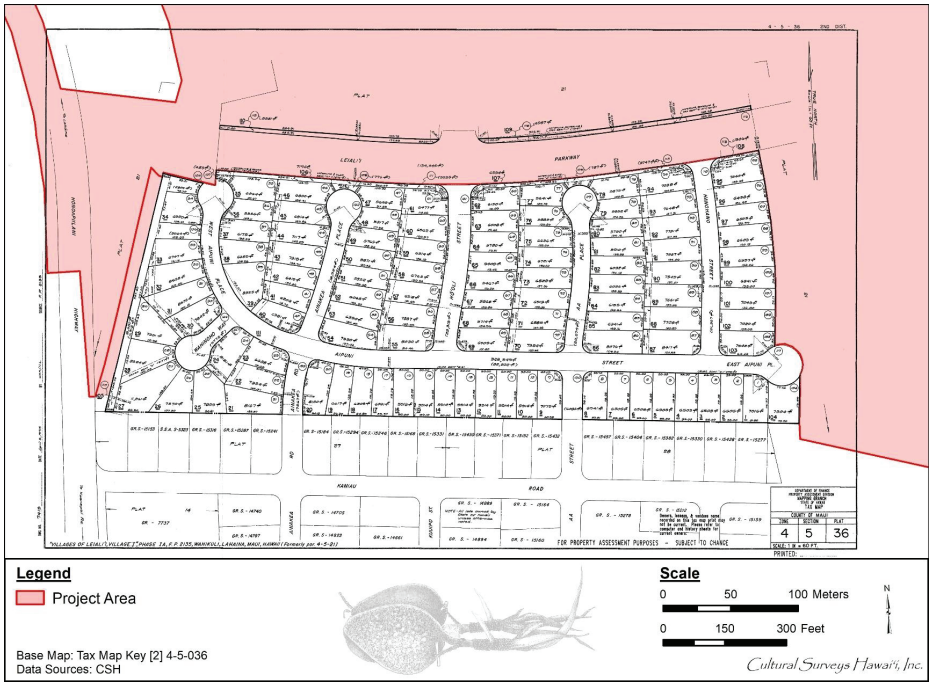

Figure 3. TMK: [2] 4-5-036 showing the project area (Hawaii TMK Service 2014)

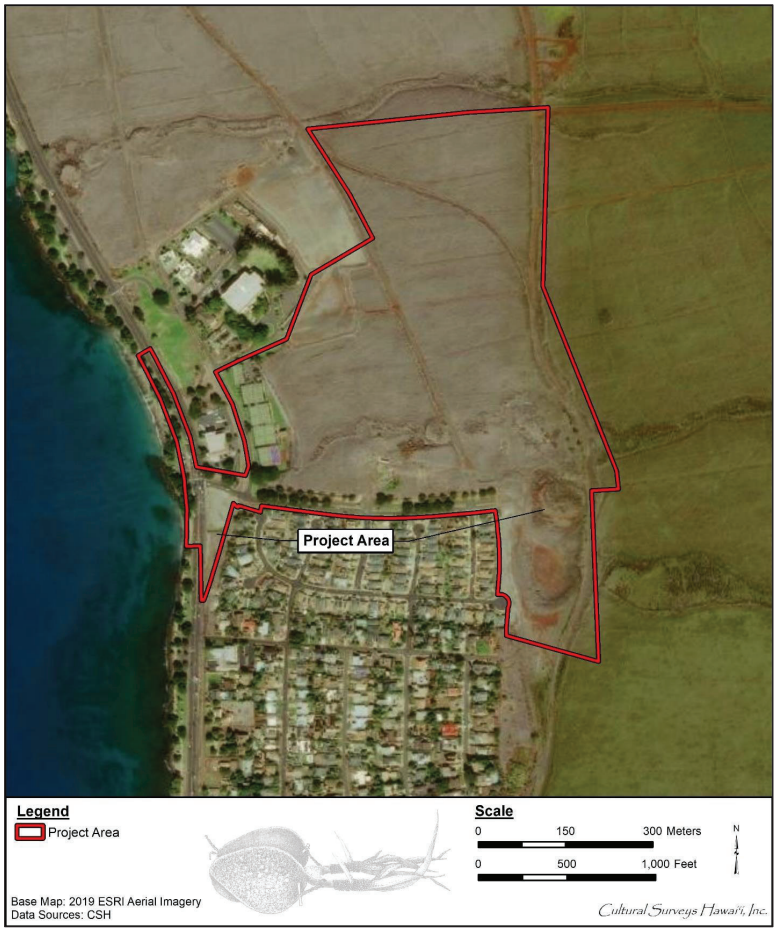

Figure 4. 2019 aerial image of the project area (Esri 2019)

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is on the western slope of the West Maui Mountains, north of Honokōhau Ditch. The westernmost edge of the project area encompasses a portion of the Honoapi‘ilani Highway ROW, which follows the edge of the ocean shoreline. The lands of the current project area slope from an elevation of 65.5 m (215 ft) above mean sea level (AMSL) in the east to 6.1 m (20 ft) in the west.

In 2014, the average monthly air temperature for the project area was between 21.70°C (71.05°F) in January and February and 25.70°C (78.26°F) in August with an average annual air temperature of 23.74°C (74.72°F) (Giambelluca et al. 2014). Due to the rain “shadow” caused by the West Maui Mountains, the vicinity of the project area received a mean annual rainfall of 424.4 mm (16.71 inches) between 1978 and 2007, according to the University of Hawai‘i 2011 *Rainfall Atlas of Hawaii* (Giambelluca et al. 2013; Giambelluca et al. 1986:47). The mean monthly rainfall varied between 9.6 mm (0.38 inches) in September to 78.1 mm (3.07 inches) in December.

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), natural soils within the project area primarily consist of Wahikuli stony silty clay, 3 to 7 percent slopes (WcB) over the majority of the northern half, with Wahikuli stony silty clay, 7 to 15 percent slopes (WcC) in the southern portion, Rock land (rRK) near a small portion of the southeastern corner, and areas of Wahikuli very stony silty clay, 3 to 7 percent slopes (Wdb), and Beaches (BS) around Honoapi‘ilani Highway in the west (Figure 5).

Wahikuli Series soils are described as follows:

> This series consists of well-drained soils on uplands on the island of Maui. These soils developed in material weathered form basic igneous rock. They have been influenced to some extent by volcanic ash from local cinder cones. They are gently to moderately sloping. Elevations range from nearly sea level to 600 feet. The annual rainfall amounts to 12 to 20 inches; most of it occurs in winter. The mean annual soil temperature is 75° F. Wahikuli soils are geographically associated with Lahaina and Molokai soils.
>
> These soils are used mostly for sugarcane. A small acreage is used for homesites. The natural vegetation consists of bermudagrass, feather fingergrass, kiawe, and uhaloa (Foote et al. 1972:125)

The Wahikuli silty clay, 3 to 7 percent slopes (WdB) soil provides a representative profile of the soil series and is described as follows:

> In a representative profile the surface layer is dark reddish-brown silty clay about 15 inches thick. The subsoil, about 17 inches thick, is dark reddish-brown silty clay that has subangular blocky structure. The substratum is hard basic igneous rock. The soil is mildly alkaline in the surface layer and subsoil. Permeability is moderate. Runoff is slow, and the erosion hazard is slight. The available water

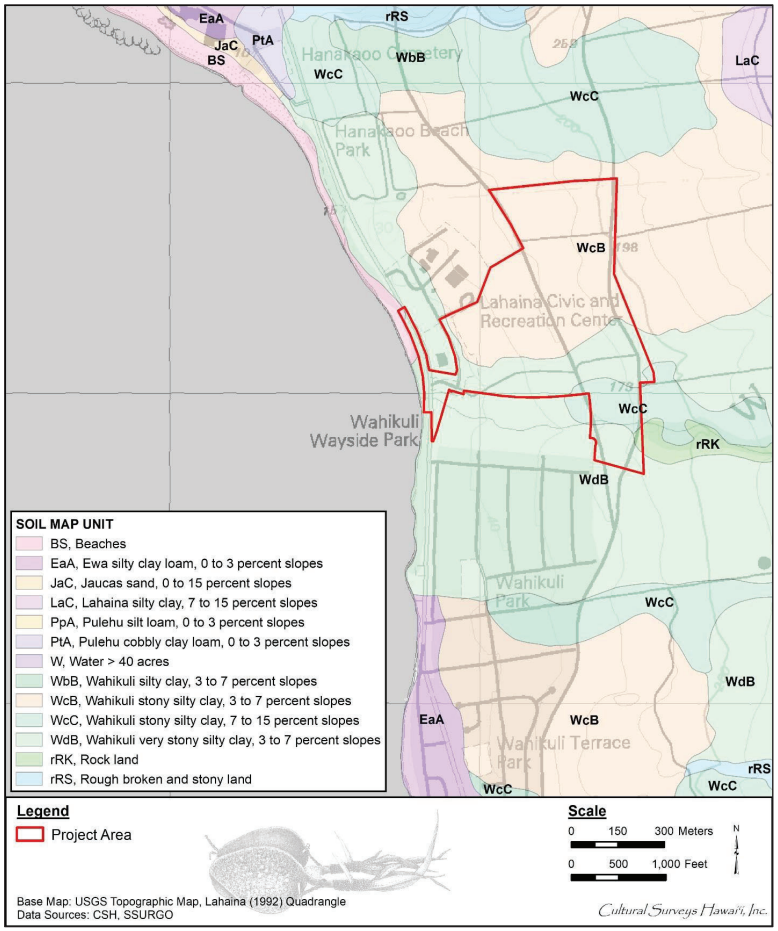

Figure 5. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (U.S. Department of Agriculture Soils Survey Geographic Database [SSURGO] 2001)

capacity is about 1.4 inches per foot in the surface layer and 1.5 inches per foot in the subsoil. In places roots penetrate to bedrock. (Foote et al. 1972:125)

Characteristics of the specific Wahikuli soil types indicated within the project area are described as follows:

Wahikuli stony silty clay, 3 to 7 percent slopes (WcB).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that there are enough stones on the surface to hinder cultivation.

This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IIe if irrigated, IVs if nonirrigated; sugarcane group 1; pasture group 3)

Wahikuli stony silty clay, 7 to 15 percent slopes (WcC).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that there are enough stones on the surface to hinder cultivation. Runoff is slow to medium, and the erosion hazard is slight to moderate. Included in mapping were small, nonstony areas and some moderately steep areas.

This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IIIe if irrigated, IVe if nonirrigated; sugarcane group 1; pasture group 3)

Wahikuli very stony silty clay, 3 to 7 percent slopes (Wdb).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that as much as 3 percent of the surface is covered by stones. Included in mapping were small areas where stones cover 3 to 15 percent of the surface.

This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IVs if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3) (Foote et al. 1972:126)

Rock land (rRK) is described as follows:

Rock land (rRK) is made up of areas where exposed rock covers 25 to 90 percent of the surface. It occurs on all five islands. The rock outcrops and very shallow soils are the main characteristics. The rock outcrops are mainly basalt and andesite. This land type is nearly level to very steep. Elevations range from nearly sea level to more than 6,000 feet. The annual rainfall amounts to 15 to 60 inches.

Rock land is used for pasture, wildlife habitat, and water supply. The natural vegetation at the lower elevations consists mainly of kiawe, klu, piligrass, Japanese tea, and koa haole. Lantana, guava, Natal redtop, and molassesgrass are dominant at the higher elevations. This land type is also used for urban development. In many areas, especially on the island of Oahu, the soil material associated with the rock outcrops is very sticky and very plastic. It also has high shrink-well potential. Buildings on the steep slopes are susceptible to sliding when the soil is saturated. Foundations and retaining walls are susceptible to cracking. (Foote et al. 1972:119)

Beaches (BS) are described as follows:

> Beaches (BS) occur as sandy, gravelly, or cobbly areas on all the islands in the survey area. They are washed and rewashed by ocean waves. The beaches consist mainly of light-colored sands derived from coral and seashells. A few of the beaches, however, are dark colored because their sands are from basalt and andesite.
>
> Beaches have no value for farming. Where accessible and free of cobblestones and stones, they are highly suitable for recreational uses and resort development. (Capability classification VIIIw, nonirrigated) (Foote et al. 1972:28)

The vegetation of the project area consists mostly of modern plantings in and around the nearby subdivision, including ground cover species such as Bermuda grass (*Cynodon dactylon*), beach morning glory (*Ipomoea pes-caprae*), *naupaka* (*Scaevola taccada*) and *hau* (*Hibiscus tiliaceus*) in the beachside areas; plantings of exotic species such as bird-of-paradise (*Strelitzia reginae*), sword ferns (*Nephrolepis* sp.) fan palms (*Washingtonia* sp.) and torch ginger (*Phaeomeria magnifica*) in shaded areas; bougainvillea (*Bougainvillea spectabilis*), wedelia (*Sphagneticola trilobata*), and plumeria (*Plumeria rubra*) coconut trees (*Cocos nucifera*), autograph trees (*Clusia rosea*) and monkeypod (*Samanea saman*). Hedges were mostly of flowering hibiscus (*Hibiscus kokio kokio*), mock-orange (*Murraya paniculata*) and flowering rose (*Rosa* sp.).

1.3.2 Built Environment

The project area is located on lands within the *ahupua‘a* of Wahikuli at a portion of Kā‘anapali Beach that has been developed into the Villages of Leiali‘i, Phase 1-A Subdivision and its associated amenities. A majority of the project area at the time of this LRFI consisted of fallow cane fields. The lands surrounding the project area have been previously impacted and modified by the cultivation of sugarcane. The Kā‘anapali Landing, the primary harbor for sugar and pineapple shipments out of West Maui prior to World War II, was also the location of a large plantation village. Cultivated fields of sugarcane in Kā‘anapali once extended from the mountains to the beach areas of Wahikuli, Kā‘anapali and Honokōwai. Fields of cane were taken out of cultivation in the late 1950s to allow for development of the Kā‘anapali Resorts to the north of the project area. Adjacent to the project area are a number of municipal buildings, including the Lāhainā Civic Center, Lāhainā District Court, and the Lāhainā Fire Station.

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this study under archaeological fieldwork permit number 22-02, issued by the SHPD pursuant to HAR §13-13-282. A field inspection for the LRFI was accomplished on 4 October 2021 by CSH archaeologists Jay Rapoza, B.A., and Jonas Madeus B.A., and project manager, Trevor Yucha, B.S., under the general supervision of principal investigators Josephine Yucha, M.S., and Hallett H. Hammatt Ph.D. This work required approximately 6 person-days to complete. In general, fieldwork included 100% pedestrian inspection of the project area and documentation of all features of historic or archaeological significance.

In addition to the pedestrian survey and documentation conducted by CSH, this AIS report includes the results of geotechnical excavations conducted by Geolabs, Inc. CSH did not observe the geotechnical excavations conducted in the project area, but the geotechnical report was reviewed and analyzed in order to characterize the stratigraphy and depth of soils within the project area.

2.1.1 Pedestrian Survey

A 100%-coverage pedestrian inspection of the project area was accomplished through systematic sweeps spaced approximately 5 m apart. The purpose of the survey was to document and determine the types and locations of potential historic properties (any building, structure, object, district, area, or site, including heiau and underwater site, which is over 50 years old) within the project area.

Documentation included descriptions and photographs of any potential findings as well as descriptions of the natural and built environment observed throughout the project area. Descriptions and photographs were recorded using Apple Ipads equipped with standard digital form software and with digital cameras.

2.1.2 GPS Data Collection

CSH archaeologists used a hand-held Garmin GPS unit (accuracy +/- 3 m) uploaded with a shapefile of the project area boundaries to complete the pedestrian survey. All points of interest were then recorded with a Trimble Geo 7X mapping grade GPS unit with a TSCI Datalogger and real-time differential correction. This unit provides sub-meter horizontal accuracy in the field. GPS field data was postprocessed, yielding horizontal accuracy between 0.5 and 0.3 m. GPS location information was converted into GIS shape files using GPS Pathfinder Office Software, Version 5.9, and graphically displayed using ArcGIS Desktop 10.6.1.9270.

2.2 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop Museum

Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina (2000) database.

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area.

2.3 Disposition of Materials

No cultural materials or sediment samples were collected by CSH during the investigation. All data generated during the AIS are stored at the CSH Maui offices in Wailuku.

Section 3 Background Research

The division of Maui’s lands into political districts occurred during the rule of Kaka‘alaneo, under the direction of his *kahuna*, Kalaiha‘ōhi‘a (Beckwith 1970:383). This division resulted in 12 districts or *moku* during traditional times: Kula, Honua‘ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko‘olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Kā‘anapali, and Lāhainā. The current project area is located on the western side of Mauna Kahalawai, or the West Maui Mountains as they are commonly called today, in the *moku* of Lāhainā

The workings of traditional Hawaiian land tenure are often reflective of the socio-political intricacies of particular places that were favored among the *ali‘i* (ruling class), and the area surrounding the *kalana* of Lāhainā is illustrative of that fact. The *moku o loko*, or *moku* as it is most commonly called, literally means “to cut across, divide, separate” (Lucas 1995:77). When used as a term of traditional land tenure, a *moku* is akin to a political district, an overall land division that can contain smaller divisions of land such as ‘*okana*, *kalana*, *ahupua‘a*, *‘ili*, and *mo‘o*. Lāhainā Moku, consists of multiple *ahupua‘a* that extend from Ukumehame at the southern end to Hanakaō‘ō along the northern end.

The term *kalana* literally translates to mean a thing loosened or released—“to loosen” (*kala*) with the nominal suffix of “*na*” added at the end (Handy et al. 1991:47). In reference to land tenure, *kalana* is a term that is sometimes interchanged or synonymous with the term *‘okana*, which is a sub-division of land that is smaller than a *moku* (Alexander 1890; Lucas 1995:47). On Maui Island, Alexander (1890) observed that there are five *‘okana* or sub-districts within Hāna Moku, while Lāhainā was termed a *kalana*. Handy et al. (1991:47) speculate that the land divisions designated as *kalana* were politically released from the *‘okana* or even *moku* that they had been a part of during the original division of the islands. These land divisions were then given as separate domains to *ali‘i* of first rank, remaining as autonomous heritages. Curtis Lyons, a surveyor during the Māhele, specifically states that the *kalana* of Lāhainā belonged to no *moku* (Handy et al. 1991:47). While the formal boundaries of the *kalana* of Lāhainā within Lāhainā Moku have never been surveyed, it is possible that the area comprising the *kalana* encompassed the fertile strip of lands along the coastline, stretching from Puamana to Māla, and inner reaches of the stream valleys, from Kaua‘ula to Wahikuli.

The geographic arrangement of the typical *ahupua‘a* within the traditional Hawaiian land tenure system is commonly thought of as a “pie-shaped” unit of land that extends from the coastline to the mountains. In this sense, the tenants of an *ahupua‘a* may be permitted access to resources to carry out subsistence practices that would include marine resources and fishing rights in the coastal area and rights to arable lands for crop cultivation, as well as water and timber rights in the planting zones and valuable bird catching privileges at the higher elevations (Handy et al. 1991:48). As indicated by Maly and Maly (2007:82), however, the distribution and geographic boundaries of the *ahupua‘a* of Lāhainā are somewhat unique in the Hawaiian Islands.

Within their cultural landscape study, Maly and Maly (2007:8) note that many of the *ahupua‘a* of the Lāhainā area are small and often configured as detached parcels, or *lele*, that do not run in the typical *mauka* (towards the mountians) to *makai* (towards the ocean) “pie-shaped” manner. One section of an *ahupua‘a* may be situated near the coastline, another section bearing the same *ahupua‘a* name may be within the upper reaches of the stream valleys, while still another section

might be found within the mid-elevation areas—all of which are separated by intervening *ahupua‘a* bearing different names.

3.1 Mythological and Traditional Accounts

Lāhainā has been known by three other names in traditional accounts. The oldest name was said to have been Na-hono-a-Pi‘ilani, the lands of Pi‘ilani as it was surrounded by other islands (G.H. Hanakauluna in Sterling 1998:37). Lele has been acknowledged as the ancient name of Lāhainā (Sterling 1998:34, 37) in the story of Kamalalawalu and Halemano in their flight from the O‘ahu Chief Aikanaka in the *Legend of Halemano* and in the *Legend of Pupukea* as home to Maui Chief Kamalalawalu (referred to frequently as Kama) who was a contemporary of Kakuhihewa on O‘ahu (Fornander 1919:238, 436). A third name for Lāhainā is mentioned in the story *Relating to Kekaa* (Fornander 1919:540-544) where Keka‘a is noted as the capital of Maui when Kaka‘alaneo was reigning over West Maui.

3.1.1 The Naming of Lāhainā and Chief Kaka‘alaneo

There is speculation that the name of Keka‘a for Lāhainā predates that of Lele, as the story predates the introduction of breadfruit, the primary food source that is referred to when speaking of the area as Lele (Fornander 1919:540; H.L. Sheldon in Sterling 1998:35).

Kaka‘alaneo was King of Maui and “has always been famed in Hawaiian traditions as the first king of that island who gave his attention to agriculture...” (Nakuina 1904:55). He was famous for planting the *ulu* (breadfruit tree) groves in Lāhainā.

> …and the place became famous in story and song as the “Malu ulu o Lele.” “The shady breadfruit grove of Lele.” As the place is situated at the base of and leeward of the Lihau range of mountains, where very little rain falls, and is more or less shut off from the cooling influence of the prevailing trade winds, one who is kamaaina can fully appreciate the cool, grateful memories evoked by the mere mention of the “Malu ulu o Lele”…
>
> In the days of Kakaalaneo, breadfruit trees were a very valuable possession, and to plant one was a meritorious act, worthy of commendation by one’s superior. To plant a grove even if only a small one, was an act worthy of the gods, entitling the planter to the grateful remembrance of posterity, whose duty it was to compose and sing songs of praise in his or her honor. It was the same if the grove was a cocoanut one; and conversely, to cut and destroy one tree, either breadfruit or cocoanut, merited death. To destroy many was a declaration of war… (Nakuina 1904:55-56)

Kaka‘alaneo was also the father of the mischievous Kaululā‘au who cut down breadfruit trees throughout Lahaina and was eventually exiled to Lāna‘i. Kaululā‘au subsequently out-witted the spirits of that island, making it habitable for humans. In regard to Kaka‘alaeno:

> Legends gather about the name of the ruling chief of Maui, Kakaalaneo (Kukaalaneo, Kaalaneo), who lived in present Lahaina district on the hill Keka‘a, owned fishponds in Hana district on the opposite end of the island, planted a famous breadfruit grove, and took to wife the Molokai chiefess whom Eleio found for him and who brought him the first feather cape seen on Maui, by whom he had the mischievous son

> Kaululaau who killed off the spirits on Lanai. In his day the old name of Lele became attached to Lahaina. (Beckwith 1970:384)

3.1.2 Chief Hua

Pukui et al. (1974:127) translate the literal meaning of Lāhainā as “cruel sun” and note that the area is said to have been named for droughts. Mrs. Pia Cockett, cited in Sterling (1998:16), translates the name of the town Lāhainā: “Not Lahaina, it was Lāhainā. Because there was a man, a baldheaded man who went in the sun and his head became sore. That’s why they call it Lāhainā [hainā = cruelty; lā = day, sun].”

According to Sterling (1998:16), Pukui relates that the literal translation of “cruel sun” refers to the drought during the time of Chief Hua, “when the sun was so cruel to the people that it caused everything to wither and dry.” Hua was a chief of Lāhainā who had forsaken his *kahuna*, or priest, Luaho‘omoe, which caused the drought throughout the Hawaiian Islands:

> There lived here in Lahaina a chief named Hua, … he desired to get some *ua‘u* squabs to eat; then he sent some men up to the mountains above Oloalu [Olowalu] to get some squabs to satisfy his desire. He did not wish for birds from the beach. When the birds were obtained, they were to be taken to the priest for him to ascertain where the birds came from; if he should give out the same information as the men had given to the chief as to the source of the birds, then he would be safe; if he should give a contrary answer, he would be killed. The name of this priest was Luahoomoe, and he also had children. When the men went up, they could not find any mountain birds at all, so they decided to get some shore birds. When they caught some, they daubed the feathers red with dirt so that the chief would think the birds came from the mountain. When they returned and handed the birds to the chief, he was exceedingly glad because he thought the birds came from the mountain. The chief told the men to take them to the priest for his inspection. The priest perceived, however, that the birds came from the seashore… Then the chief said to the priest: “You shall not live, for you have guessed wrongly. I can very well see that these are mountain birds.” Then and there an imu was prepared in which to bake the priest.
>
> Before he was placed in the imu, however he said to his children: “You two wait until the imu is lighted, and when the smoke ascends, should it break for the Oloalu mountains, that indicates the path; move along; and where the smoke becomes stationary, that indicates where you are to reside … Then the priest was cast into the oven and the opening closed up tightly. The smoke arose and darkened the sky; … after the priest had been in the imu for two days, he reappeared and sat by the edge of the imu unknown to any one; the chief thinking all the time that he was dead; but it was not so.
>
> When the smoke ascended and leaned towards the Oloalu mountains, the two sons went off in that direction; the cloud pointed towards Hanaula, and there it stood still, so the two sons ascended to the place and resided there.

> Then the whole of Maui became dry; no rain, not even a cloud in the sky, and people died from lack of water. The smoke that hung over Hanaula became a cloud, and rain fell there.
>
> Hua, the chief, lived on, and because of the lack of water and food he sailed for Hawaii, the home of his elder brother; but because Hawaii also suffered from lack of water and food he came back and lived at Wailuku. Wailuku also did not have any water, and that caused the chief to be crazed, so he leaned against the edge of the precipice and died, and that was the origin of the saying “The bones of Hua rattle in the sun.” (Fornander 1919:514, 516)

Fornander (1919:516) notes that “The bones of Hua rattle in the sun” refers to the chief “whose wickedness won him the detestation of his people, who therefore let his body lie where he fell that his bones bleached in the sun and rattled in the wind.” Pukui (1983) relates that the ancient proverb (or *‘olelo no‘eau*) regarding Chief Hua warns others to not talk too much of one’s king and is a reminder that trouble will follow those who destroy the innocent.

Hua, the island chief who reigned over Maui prior to the tenth century, is credited with constructing the first *heiau* (sacred temple) on the island beginning in Lāhainā. Of the six *heiau* that are documented in Lāhainā, Hua was responsible for the construction of at least two, while his descendent namesake, Hua-nui-kalalailai, built the third *heiau* only two generations later.

3.1.3 Hina and the Demigod Māui

The region of Lāhainā is also known for the goddess Hina, mother of the demigod Māui:

> A version of the Maui stories is met with representing him as the son of Hina-lauae and Hina, residing above Lahainaluna, Maui, which relate his venturing forth on mischievous pranks before birth. Reference is made to his snaring the sun that Hina might have time to dry her kapas. It says, further, that while absent on this duty Hina bore another son, an owl, which he did not treat with contempt. Setting out one day pole-fishing, Maui was seized and carried away to Moalii, some distance westerly from Lahainaluna, to be placed on the altar the following day as a sacrifice by the king. Hina saw in a vision what was being done so she and the owl followed along, Hina staying at a rock by the wayside. The owl flew on to where Maui was guarded and saw that he was tied with cords. The guards were awake, so the owl waited till near dawn, but they would not sleep.
>
> Maui then spoke: “O thou Aina, retard and prolong the night.” The night being prolonged, the guards fell asleep, whereupon the owl entered and struck at Maui’s bonds till they fell off. They then set off to where Hina was waiting, by which time it was daylight. Hiding Maui under the stone, Hina sat outside of him and spread out her sleeping garment and looked for fleas as the searching party came up. To their inquiry for the man which was to be sacrificed by the chief, she said that she had not seen him, having just now arisen, and by the warmth of the sun was looking for fleas. At their departure the owl led Maui forth, and Hina followed till they reached home. Thus was Maui saved. (Thrum 1923:200-201)

Mo‘olelo (stories) of the formation of Pu‘u Keka‘a, a prominent landmark at the coast north of the current project area, as well as other natural features that surround this *pu‘u* are linked to the deeds of the demi-god Māui and punishment for his naysayers following his great feats of lifting the sky and lassoing the sun. With regard to the creation of the rocky promontory that is Keka‘a, Westervelt (1910) recalls the following story:

> A man who had been watching the process of lifting the sky ridiculed Maui for attempting such a difficult task. When the clouds rested on the tops of the mountains, Maui turned to punish his critic. The man had fled to the other side of the island. Maui rapidly pursued and finally caught him on the sea coast, not many miles north of the town now known as Lahaina. After a brief struggle the man was changed, according to the story, into a great black rock, which can be seen by any traveler who desires to localize the legends of Hawaii. (Westervelt 1910:32)

Fornander (1919:538) tells the story of a man, Moemoe, who insulted the demi-god, Māui by saying “You can not [*sic*] catch the sun for you are a low down farmer,” for which Māui replied “When I conquer my enemy and satisfy my desire I shall kill you.” After successfully lassoing the sun, Māui went to find Moemoe in order to follow through with his threat and the following account is given:

> On his return he called at Moemoe’s place. It was absent. Maui traced it to Kawaiaopilopilo. This place is between Kekaa and James’ canefield; Moemoe saw him, and it went on in an irregular manner, now towards the mountain and now towards the sea. Maui became greatly angered, so he flew right on and caught the other above Kekaha; he killed it; it turned, however, into a rock. That rock is still lying along there makai of the new road. Its length is nearly seven feet. While Maui was off on his journey his mother became pregnant with and bore another child, an owl. (Fornander 1919:538)

Keka‘a was also a resting place for Wahine-o-Manua, a woman guided by *pūeo* (owl), who fled from an abusive situation:

> Halulukoakoa (Walker Site 11 at Wahikuli), a coral structure, is famed traditionally as having given shelter to Wahine-o-Manua, a very beautiful young woman who fled from her husband in consequence of constant ill treatment. Regardless of the rigid kapu of the heiaus against women being allowed within its sacred walls, she hid herself therein and watched those searching for her. On their departure she ventured forth and on reaching the road an owl god appeared to her as guardian and guide, and by the clapping of its wings led the pursued girl through the brush till she reached the large stone mauka of Kekaa, Kaanapali, where it left her and she lay down and slept till morn, when she arose and departed. The stone is known as Pohaku o Wahine o Manua. (Thrum 1905:45)

Along with the creation of Pu‘u Keka‘a and the natural features nearby, this *pu‘u* is also known in the *mo‘olelo ‘aina* as a *leina a ka uhane* or leaping of place for the souls. In the traditions of Maui Island, the soul has three abiding places: the volcano, in the water, and on dry plains like the plains of Kamaomao and Keka‘a (Fornander 1919:570-576). Mr. Ahue (in Hill et al. 2007) further explained that one of the ceremonial uses of Pu‘u Keka‘a is more spiritual than physical. The tall

cliffs of Pu‘u Keka‘a serve as a spiritual portal, the leaping place for the souls of the departed to return to the afterlife. It is said that when a person dies, his spirit journeys to Keka‘a (Fornander 1919:542) and from this *leina a ka ‘uhane* one is oriented directly west, towards the setting of the sun and the Hawaiian afterlife.

3.1.4 He Mo‘o, the Apotheosis of Kalā‘aiheana, and the Veneration of Kihawahine

Kala‘aiheana was the sister to the chiefly brothers of Kiha-a-pi‘ilani and Lono-a-pi‘ilani (Fornander 1919:176) and sister Pi‘ikea, all who were born of Pi‘ilani and La‘ieloheikawai. Thus, Kala‘aiheana was a product of a *pi‘o*, or high ranking marriage (Stagner 1986:113, 114) and double *mo‘o* (lizard, also refers to a genealogy/succession or indigenous royal family) lineage (Klieger 1998:7, 9), a fact that would play significantly upon her death. Kihawahine Mokuhinia Kalama‘ula Kala‘aiheana was her full given name and upon her death was transformed into a *mo‘o* (lizard) and referred to as only Kihawahine Mokuhinia Kalama‘ula (Klieger 1998:9). In this way, Beckwith (1970:126) identifies Moku‘ula, more specifically, Loko o Mokuhinia, as the place where Kihawahine Mokuhinia, the *mo‘o* goddess, resided. This *loko,* or pond, was a part of a larger complex of ponds called Kalua o Kiha, literally “The Pit of Kiha” or dwelling place of Kiha, the *mo‘o* goddess.

Loko o Mokuhinia is located near the coast south of the current project area. The lands that immediately surrounded Loko o Mokuhinia were traditionally reserved for the *ali‘i* (royalty) and those in service to the *ali‘i* (Klieger 1998:64-65). According to Klieger (1998:69), the neighborhood extending out from the royal residence of Moku‘ula and surrounding *loko* resembled concentric layers or bands, and where a person lived within these circles depended on ones rank and/or position in government. From Moku‘ula and the King’s residence as the center or *piko*, the subsequent rings were as follows: Kalua o Kiha for the government and court; Kalua‘ehu for the *ali‘i* and extended family; and Lāhainā for the traders and Lāhainā *maka‘ainana* (commoners) (Klieger 1998:70).

The worship of the *mo‘o* occurred at a *heiau*, located at the summit of Pa‘upa‘u, that was specifically constructed and dedicated to the worship of Kihawahine. According to Fornander (1919:520-523), this mountain rises immediately behind the village of Lahaina, and is named for a child whose parents wearied of carrying him down and up the mountain in order to bathe him. At the summit of Pa‘upa‘u is Kamohomoho Heiau which was named for the noted Lāhainā Chief Kamohomoho. He was the first “to build a heiau for the worship of the god called Moo. This lizard excelled in strength; it had a stumped tail; that is the way the tails of the lizards of the present time appear, because of Moo, the great and strong” (Fornander 1920:397).

The supernatural powers of Kihawahine were great, as she was one of Kamehameha the Great’s ancestral gods (*‘aumakua*) (Fornander 1920:397). Claimed by Kamehameha, through his marriage to Keōpuolani, and during his campaign to unite the island chain under a single sovereign (Fornander 1920:397), the image of Kihawahine was set as a dominant image in a *heiau* that was dressed “in deep saffron, yellow or light yellow on a patterned *tapa* cloth.” (Beckwith 1970:125-126). “In her name [Kamehameha] carried his conquest over the islands” and “Ulumaheihei Hoapili, who later became an active friend of the missionaries [in Lāhainā] and a leader in establishing the Christian church, was her keeper (*kahu*)” (Beckwith 1970:126).

3.1.5 The Origins of Pu‘ulaina, ‘Eke, and Lihau

Pu‘ulaina is a hill located within Wahikuli Ahupua‘a. Fornander (1919:532-534) recounts the following regarding the birth of Pu‘ulaina:

> …some say it was begotten by two mountains, Eeke (the summit crater of the West Maui Mountains) and Lihau (the mountain top back of Olowalu). Eeke was the husband and Lihau was the wife. They were real persons, but it will be shown later the reason for their being changed to mountains. After they had lived as man and wife, a child was born to them, a son, the subject of this story which we are considering. But after some time Eeke became entangled, for he saw a beautiful woman, Puuwaiohina from Kauaula, and they committed adultery. Because of this, Lihau thought to choke the child to death, so that the two of them could go and do mischief; this caused them to quarrel. Eeke took the child to his mother, Maunahoomaha, and left him with her. After that their god, Hinaikauluau, placed a restriction over them; they were not to live together, nor were they to have any intercourse with others; but ten days after this order, Eeke again committed adultery with Puuwaiohina above referred to, who was a younger sister to Lihau. Because of this their god punished them by making Eeke a mountain and Puuwaiohina a mountain ridge; that is the ridge prominent at Kauaula. There is, it seems, a hole below the highest point of this ridge. When sound issues from this hole, that is the time the kanaula wind blows a fierce gale.
>
> After that, Lihau was possessed with love for their child, so she asked Maunahoomaha for permission to meet her son, that was agreeable to her mother-in-law, and when she met her child she was glad. When she realized what a handsome man her favorite son had grown to be, she gave him for husband to Molokini, one of the noted beauties of that time, because she was the wife intended for him.
>
> …. However, arriving on Maui, this was one of Pele’s [the fire goddess] cruel deeds: one of her younger sisters saw how handsome Puulaina was, so she asked Molokini to let her have him for husband. The other refused, for she was greatly in love with her own husband; so she [Molokini] was changed into a little island, and she has remained so to this day.
>
> When Lihau heard of this, she grieved for her daughter-in-law, so she went to consult Pele on the matter. But Pele replied gruffly: “If that is the case, then I say to you that you will die; also your son.” Lihau was there and then changed into a hill where Pele resided for some time; the son also died. But the one whose was the desire, earnestly entreated and begged that her husband be spared. But the red-bleary-eyed [Makole-ulaula, an epithet applied to Pele] did not wish it that way. That was how the son became a hill and has remained such until this day. (Fornander 1919:532-534)

Nicholson (1881:40) relates the following Pu‘ulaina story regarding Pele as she made her way through the Hawaiian Archipelago:

> On Pele’s first arrival at Hawaii Nei, she dwelt on the island of Kauai. Thence she went to Kalaupapa (Molokai), and lived in the crater of Kahua-Ko at that place. Subsequently she departed for Puulaina, near Lahainaluna (on the Island of Maui), and excavated that crater.

Fornander (1919:536) recounts an alternative story regarding the naming of Pu‘ulaina following the creation of that hill by Pele:

> This was the reason for so naming it (Pu‘ulaina): At that time a chief was living on the other side of the hill, and because he was tired of seeing it standing there obstructing his view, and preventing him from seeing the breadfruit grove of Lahaina, he ordered his men to go and construct a ti-leaf house on its top; and the hill was called Puulai. And because it was sightly to those viewing it from Lahaina it was called Puulaina. (Fornander 1919:536)

Fornander (1919:536) further notes that the chief who had constructed the *ti* leaf house atop Pu‘ulaina also constructed a larger *heiau* on the far, *makai*, side of the hill—a place where people frequently died and were buried on the side of the hill. It is said that because there was such a great number of dead buried there and because the dirt slid down when the graves were being dug, this side of the hill was named Puuheehee (sliding hill). Jeanne Booth Johnson in Sterling (1998:43) recalls the presence of remnants (three rock mounds) of an old *heiau* atop Pu‘ulaina that was reportedly dedicated to Pele; this *heiau* is possibly the same as that mentioned in the story related by Fornander (1919:536).

Pu‘ulaina was also a central feature in a conversation recorded in *Ka Nupepa Kuokoa,* (1862) where the deceptive words of a *kahuna* encouraged people to go and gather at this place called Pu‘ulaina, with the thought of finding gold and money.

3.1.6 The Stories of Halulukoakoa Heiau

Thomas Maunapau, as recounted by Walker (1931), wrote a series of newspaper articles about his visit to Lāhainā, including an article about a legend associated with a Halulukoakoa Heiau (Walker Site 11) at the southeast corner of the coconut grove at Māla Region of Wahikuli Ahupua‘a:

> At one time a temple was located there known as Halulukoakoa. The story goes that a Hawaiian youth Kaili was seized by warriors of a West Maui chieftain at Kahakuloa.
>
> Kaili was taken in a canoe around the western end of the island for the sacrifice at the temple. His sister Nailima saw the capture and skirted the cliffs of the island, keeping her eyes on the canoes which were in the open sea. She arrived at Lahaina and learned her brother had been taken to the temple. She withdrew to the outskirts of the settlement, sat down upon a stone and commenced to cry.
>
> Pueo the owl-god appeared suddenly and learned the cause of her grief. He told her to prey [*sic*] to all the gods for her brother’s deliverance while he went to the sacrifice. Here the owl-god unbound the victim from the sacrificial stone and bade him walk backwards from the tmple [*sic*]. At first the youth did not understand, but the owl-god circled and beat his wings. Finally conveying his meaning to the youth.

> After walking backwards for several miles under the owl-god’s guidance, he found the sister.
>
> He immediately heard warriors approaching and hid under the stone upon which Nailima was sitting. When the warriors arrived they asked if a man had been seen passing that way, saying they were searching for Kaili. The sister said she had seen no one. The warriors then fell upon the footprints of Kaili and followed them, little knowing they would lead them back to the temple. (Walker 1931:115)

Thomas Thrum in Sterling (1998:43) accounts a story related to Halulukoakoa Heiau as a shelter, or place of refuge:

> Halulukoakoa, a coral structure, is famed traditionally as having given shelter to Wahine-o-Manua, a very beautiful young woman who fled from her husband in consequence of constant ill treatment. Regardless of the rigid kapu of the heiaus against women being allowed within its sacred walls, she hid herself therein and watched those searching for her. On their departure she ventured forth and on reaching the road an owl god appeared to her as guardian and guide, and by the clapping of its wings led the pursued girl through the brush till she reached the large stone mauka of Kekaa, Kaanapali, where it left her and she lay down and slept till morn, when she arose and departed. The stone is known as Pohaku o Wahine o Manua. (Sterling 1998:43)

3.1.7 Politics and Warfare

According to Handy et al. (1991:492), Lāhainā was a favored place for the high chiefs of Maui to reside as the entire *moku* could boast of a mild climate year round, plentiful marine and terrestrial resources, close proximity to Lana‘i and Moloka‘i, and easy communication with other population centers of West Maui as well as settlements along the western, southwestern and southern shores of Haleakalā. Flanked by excellent fishing grounds, Lāhainā was the primary seat of the *ali‘i* (chiefs) of West Maui (Handy et al. 1991) and later was the center of government for the Kingdom of Hawai‘i.

During battles fought between Kamehameha-nui of Maui and Alapa‘i of Hawai‘i, the Hawai‘i Island warriors attacked the food resources of Lāhainā by drying the streams of Kaua‘ula, Kanahā, and Kahoma and laying waste to the *lo‘i* (pondfield). This action by Alapa‘i effectively cut off food and freshwater resources from the Maui forces and country people (Kamakau 1961:74). During the wars of unification, Kamehameha landed and occupied the Lāhainā District from Launiupoko to Mala and all the parts of the lands that had been given over to food patches and cane fields were overrun by men from Hawai‘i Island (Kamakau 1961:171). Kamehameha resided at Lāhainā for one year to equip his fleet with food and other provisions supplied by the lands of Maui, Moloka‘i, Lāna‘i, and Kaho‘olawe (Kamakau 1961:188).

3.1.8 Native Hawaiian Agriculture

Lāhainā, like most centers of pre-Contact Hawaiian populations, was surrounded by irrigated *lo‘i* and *kula* (dryland fields) of the food and plant products essential to traditional Hawaiian life. At least two notable *‘auwai* (irrigation channels) that span multiple *ahupua‘a* between Kaua‘ula and Kahoma are described in native lore. Roughly datable by the chiefs associated with them, the

earliest in the Lahainaluna vicinity is known as ‘Auwaiawao, reportedly named for the Chiefess Wao, sister of Kaululā‘au, who ruled a portion of Maui ca. 1390. Portions of this *‘auwai* were subsequently incorporated into the construction of the Lahainaluna Ditch. The second ‘*auwai*, known as ‘Auwai o Pi‘ilani, is associated with Pi‘ilani, who ruled Maui and the neighboring islands ca. 1450. The ‘Auwai o Pi‘ilani has its headwaters in the Kaua‘ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna (Maly and Maly 2007:4).

According to Fornander (1919:540, 542), descriptions of the establishment of cultivated areas surrounding Lāhainā offer insight into the variety of agricultural goods in the region:

> …Kekaa was the capital of Maui when Kaalaneo [Kakaalaneo] was reigning over West Maui. It is said that there were many people there. Many houses were constructed and the people cultivated a great deal of potatoes, bananas, sugarcane, and other things of a like nature. From what I have been told that country from above Kekaa to Hahakea and Wahikuli, that country now covered with cactus in a northwesterly direction from Lahainaluna, was all cultivated; Kekaa became a city populated by a great many; this chief (Kaalaneo) also planted the breadfruit and kukui trees down at Lahaina. (Fornander 1919:540, 542)

Accounts from 1793, collected by Handy (1940:105) illustrate the extensiveness of pre-Contact cultivation near Lāhainā between Paunau and Pana‘ewa Aupua‘a. Archibald Menzies was the acting surgeon and naturalist onboard the *H.M.S Discovery* and traveled to the Hawaiian Islands between the years 1792-1794. Captained by George Vancouver, the *H.M.S Discovery* and Menzies made three visits to Hawai‘i (Menzies 1920). Menzies kept a journal, which included references to two previous trips to Hawai‘i in 1786 and 1787, although no further notes are known of from those earlier trips. Menzies’ journals provide highly detailed descriptions of Lāhainā and its deliberately designed agricultural arrangement. The following passages described some of what he saw on these trips.

> [Lahaina, 1793] Here our conductors importuned us to dine … after which we continued our journey, and soon entered the verge of the woods where we observed rugged banks of a large rivulet that came out of the chasm cultivated and watered with great neatness and industry. Even the shelving cliffs of rock were planted with esculent roots, banked in and watered by aqueducts from the rivulet with as much art as if their level had been taken by the most ingenious engineer. We could not indeed but admire the laudable ingenuity of these people in cultivating their soil with so much economy. The indefatigable labor in making these little fields in so rugged a situation, the care and industry with which they were transplanted, watered and kept in order, surpassed anything of the kind we had ever seen before. It showed in a conspicuous manner the ingenuity of the inhabitants in modifying their husbandry to different situations of soil and exposure, and it was with no small degree of pleasure we here beheld their labor rewarded with productive crops.
>
> March 17. On the forenoon of the 17th, I accompanied Captain Vancouver and a party of officers, with the two Niihau women, to see the village of Lahaina, which we found scattered along shore on a low tract of land that was neatly divided into little fields and laid out in the highest state of cultivation and improvement by being

> planted in the most regular manner with the different esculent roots and useful vegetables of the country, and watered at pleasure by aqueducts that ran here and there along the banks of intersecting fields, and in this manner branching through the greatest part of the plantation.
>
> These little fields were transplanted in a variety of forms, some in rows, in squares, in clumps and others at random; some according to their nature were kept covered with water, while others were with equal care kept dry by gathering earth around them in little hills. (Handy 1940:105)

Outside the fields and gardens of Lāhainā, the lands were dry and desolate, and observations note the rather abrupt shift in vegetation and cultivation, as well as the apparent severity of the landscape along the alluvial plains with a rise in elevation. Jacques Arago, a French author and artist in service to Captain Vancouver’s company of officers. While working as a draftsman aboard the ships *Uranie* and *Physicienne* under the command of Captain Louis Freycinet during a French scientific expedition of the Pacific in the years 1817–1820, he noted the following about the Lāhainā area:

> The space cultivated by the natives of Lahaina is about three leagues in length, and one in its greatest breadth. Beyond this, all is dry and barren; everything recalls the image of desolation. Nevertheless, the soil and its resources are the same; whence therefore this apparently culpable neglect? It is a natural consequence of the mode of reasoning adopted by these people; they have all that is necessary at hand, what advantage would there be in seeking superfluities from afar? ... Superfluities are thrown away on these people. Twenty acres of land will not produce them a better dinner than their square of taro. (Arago 1823:120)

In an unpublished manuscript about life in Lāhainā in 1897, Arthur Waal, former *luna* (foreman, boss) (Figure 6) for Pioneer Mill Sugar Company (PiMCO) and postmaster for the Lāhainā post office, makes the following observation about the population and subsistence practices of native Hawaiians in Lāhainā:

> Lahaina has a mixed population. Many natives had their own kuleanas, up in the valleys where they grew taro, sweet potatoes, vegetables and bananas. Most all of them had chickens and pigs.
>
> I saw the last remaining grass huts in Lahaina, one was near the Kilipaki Village camp on the beach out Kaanapali way, and the other one in Kahumana gulch occupied by a very old Hawaiian with a thick, heavy white beard and hair. This Hawaiian, George Kukaia, was a wonderfully health specimen of the old type Hawaiian. Nearby was his taro patch and fruit bearing trees. (Waal 1897:5, 6-6A)

3.1.9 Fishing in Lāhainā

The inland ponds, or *loko*, of Aimakalepo, Unahiole, and ‘Alamihi near the mouth of Kahoma, and the famed royal fishpond of Mokuhinia at Waine‘e likely provided a reliable fish resource that was supplemented by off-shore communal or family fishing. Following the island-wide survey conducted by (Walker 1931:299), he relates that J.K. Napaepae, a native of Lāhainā, noted that

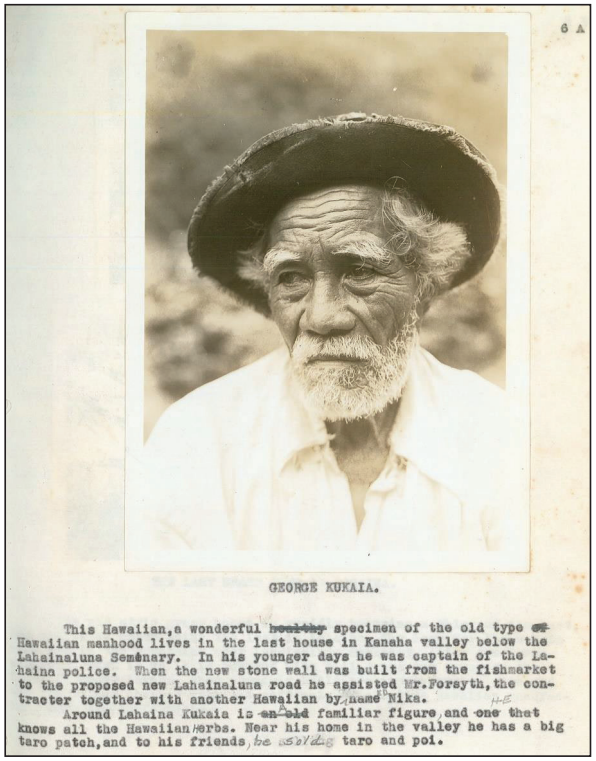

Figure 6. Photograph of George Kukaia and excerpt from Waal (1897:6)

there used to be a pond at Māla named Alanuhi that was primarily for mullet, but “now filled with rubbish and crossed by the road leading out to Mala wharf.”

Kahā‘ulelio (2006:9) notes a particular fishing ground, Kapuali‘ili‘i, that extended from Keawaiki (present-day Lāhainā Harbor) to ‘Uha‘ilio Point, less than one mile along the Lāhainā shore. Fishing often involved a cooperative effort of *lau* (leaf) fishing, a method using a drag line made of *ti* leaves. In this manner of fishing, smaller fish and *kakakī* (a type of *kala* or unicornfish) were the primary catches. Other types of fish and marine resources often sought in the waters off of Lāhainā include *mahimahi, aku, iheihei, puhiki‘i, he‘e, weke, akule*, and many others (Kahā‘ulelio 2006).

3.2 Historical Background

3.2.1 Early Historic Period

In the heyday of whaling [between 1820–1860], it was estimated that over 50 whalers were sometimes at anchor off Lāhainā at any one time (Alexander 1899:259). By the year 1844, Lāhainā recorded 326 whaling vessels at port with the number the following year increasing by over 50 vessels to 379 (Thrum 1912:8-9). According to Ashdown (1963), it is during the whaling era that Pu‘u Keka‘a became known as “Black Rock” (cited in The Maui Historical Society 1971), the commonly known name for the rocky promontory north of the current project area:

> During the years after the discovery of the Hawaiian Islands in 1778, foreigners taught some Hawaiians to fear “ghosts” and the “unknown.” At Pu‘u Keka‘a, whalers set up kettles in which to try-out whale oil. They could not pronounce the proper name so they called the sacred hill as “Black Rock” and said it was “haunted by evil spirits.” (Ashdown 1947:48)

> During the time King Kahekili ruled Maui [about AD 1690]. It was told he had visited Kā‘anapali, and to his dismay and anger, there was no feast waiting for him and his company as “the sacred taro patches had been neglected, the sacred fish-pond of Loko-i‘a Kapu-kapu at the mouth of the Honokowai river practically empty of fish, and his people in a state of terror”. Kahekili ascended Pu‘u Keka‘a to pray in company with his priests, and there he learned the causes of misery in the area. People had many illnesses, which the local doctors could not understand or cure, and they also had learned to drink liquor. Drunkenness, disease and idleness had afflicted too many in the village of Keka‘a and in all Lahaina. By order of the king, strong men were sent to destroy stills, to burn filthy, squalid homes, and to renew the village. Others were ordered to renew the taro patches and fishpond, the sweet-potato-hills, and then begin life anew. (Ashdown 1947:49)

With the unification of the Hawaiian Islands in 1791 under a single sovereign, followed by the arrival of the first Protestant missionaries in Lāhainā in 1823; changes such as Western-styled commerce and Christianization of the Native Hawaiian people began to sweep across Lāhainā (Alexander 1899:194). The town and surrounding landings played a prominent role in the early economy of the Kingdom. As early as 1862, the lands surrounding Lāhainā were cultivated in commercial sugar (Gilmore 1931:198-203), while the sandalwood trade of the 1810s, the whale trade of the 1830s, the Irish potato trade of the 1840s and the establishment of the protestant

Lahaina Mission Station in the 1820s and the Lahainaluna Seminary in the 1830s drew people to the waterfront areas, which ultimately resulted in a population rise (Kuykendall 1968:234). This trend made Lāhainā one of the primary economic, religious, and educational centers for the early Hawaiian Kingdom (Kamakau 1992:304).

The Protestant missionary William Ellis, who visited Lāhainā during the 1820s, described the landscape that had entranced both the Hawaiians themselves and the nineteenth century newcomers:

> The appearance of Lāhainā from the anchorage is singularly romantic and beautiful. A fine sandy beach stretches along the margin of the sea, lined for a considerable distance with houses and adorned with shady clumps of kou-trees, or waving groves of cocoa-nuts… The level land of the whole district, for about three miles, is one continued garden, laid out in beds of taro, potatoes, yams, sugar-cane, or cloth-plants. The lowly cottage of the farmer is seen peeping through the leaves of the luxuriant plantain and banana tree, and in every direction white columns of smoke ascend, curling up among the wide-spreading branches of the bread-fruit tree. The sloping hills immediately behind, and the lofty mountains in the interior, clothed with verdure to their very summits, intersected by deep and dark ravines, frequently enlivened by waterfalls, or divided by winding valleys, terminate the delightful prospect. (Ellis 1969:76-77)

Missionary, C.S. Stewart, in his journal from his residence in Hawai‘i between 1823 and 1825, describes Lāhainā and its cultivation and irrigation systems. Stewart described Lāhainā as appearing to be in neglect although in his description there is ample evidence of traditional cultivation:

> The bread-fruit trees stand as thickly as those of an irregularly planted orchard, and beneath them are taro patches and fishponds, twenty or thirty yards square, filled with stagnant water, and interspersed with clumps of tapa tree, groves of the banana, rows of the sugar-cane, and bunches of the potatoe and melon. All these flourish exuberantly from the richness of the soil alone, with but little attention or labor from the hand of man.
>
> It scarce ever rains, not oftener than half a dozen times during the year; and the land is watered entirely by conducting the streams which rush from the mountains, by artificial courses on every plantation. Each farmer has a right, established by custom, to the water every fifth day. The pathways, which are very narrow, are usually along the sides of these water trenches.
>
> The number of inhabitants is about two thousand five hundred. Their houses are generally not more than…eight or ten feet long, six or eight broad, and from four to six high: having one small hole for a door, which cannot be entered but by creeping, and is the only opening for the admission of light and air. They make little use of these dwellings, except to protect their food and clothing, and to sleep, in during wet and cool weather; and most generally eat, sleep, and live in the open air, under the shade of a kou, or bread-fruit tree. (Stewart 1839)

In August 1826, the Reverend William Richards writes from Lāhainā:

> At the close of my last letter, we were living on the sea beach, a spot rendered unpleasant, not only by the roaring of the surf, which dashed within a few feet of our doors, but also, by the numerous houses recently erected on every side … Our houses, too, had become so bad, that they were a very indifferent shelter from the storm, and we were daily expecting that the wind would take them entirely away.
>
> Ka‘ahumanu soon wrote to me, that she had ordered the governor of Lahaina to make over to me, a small piece of taro and potato ground, and also a garden and building spot. Two large well built native houses were standing in the yard, to which we immediately removed, and in which we now live. Directly in front of us, are several taro gardens and fish ponds, surrounded with cocoa nuts [*sic*], *hala*, and *kou* trees, in the midst of which stands the brick house erected by Tamehameha, and called by Vancouver, “the royal palace.”
>
> Back of our houses, and inclosed [*sic*] in the same yard, is about an acre of excellent land, designed for a garden. It contains three breadfruit trees, and on its borders, are a few cocoa nuts. It is now covered with bananas, plantains and sugar cane, interspersed with melons, cucumbers, beans, cabbage and yams.
>
> On the 26th of October, the schools of Lahaina were all publickly [sic] examined. There were present, nineteen schools containing *nine hundred and twenty two* [italics theirs] scholars. The school of Nahienaena, in a particular manner, distinguished itself for its improvement. (Richards 1827)

The Reverends Richards writes in the *Missionary Herald*, October 1830, to discuss religious matters at the missionary station of Lāhainā:

> The state of things at Lahaina, on the island of Maui, continues to be encouraging … Public worship on the Sabbath was established on the 18th of February, 1825. Then, ten persons were present – now more than as many hundreds… In every considerable village from one end of the island to the other, the people have erected a house for the worship of God. At Olualu, [Olowalu] a village eight miles distant from Lahaina, we have preached during the season, nearly thirty sermons to a congregation of five to six hundred. This and a single Sabbath at Kanepale, [Kā‘anapali] a village equally distant from Lahaina in another direction, is all that we have been able to do for the people on this side of the island. (Richards and Green 1831)

Census figures provided by Protestant missionaries throughout the Hawaiian Islands beginning in 1831 provide the earliest documentation of the size of the Native Hawaiian population after the first decades of Western contact. During the first census of Maui Island in 1831-1832, a population of 8,415 was recorded for the Lāhainā District; which comprised 24% of the entire island population of 35,062 (Schmitt 1977:11-12). By the time of the next census in 1835-1836, the Lāhainā population had dropped to 5,234 comprising 22% of the Maui Island population of 24,199 (Schmitt 1977:11-12).

Lāhainā, being a center of pre-Contact and post-Contact economic activity, saw many missionaries moving into Lāhainā Town and beyond to acquire lands for the construction of churches and schools. South of the current project area, the western end of Pana‘ewa Ahupua‘a was selected as the location for the Lahainaluna School. The Reverend Lorrin Andrews established a school for men at Lahainaluna in 1831. Protestant missionaries endeavoring to instruct Native Hawaiians in Christianity had convinced the chiefs and royalty of Lāhainā that a school was needed to educate and provide a supply of native teachers for the people of Maui (Lahaina Restoration Foundation 2008). The governor of Maui, Hoapili, and his wife granted lands "*mai ka wai i ka wai*," (all between the two streams) to the missionaries on the lower slopes of Pu‘u Pa‘upa‘u. The construction of school buildings in the native style was undertaken by the students themselves. Missionaries Lorrin Andrews and Jonathan Green "shouldered their axes and headed a progression of future students up the mountain for timber. Academic work began September 5, 1831, with twenty-five young men" (Alexander 1953:69). Lahainaluna was "the first high school in the islands" and "reported an enrollment of 34 students in 1835 and offered courses in algebra, geometry, trigonometry, and surveying, all taught in Hawaiian" (Schmitt 1977:xx).

Following the initial construction of the school, food supplies from the hillside potato plots were often found wanting to provide for the teachers and resident students. In 1835 missionaries pushed for additional favorable lands to be allocated to the school, which The King then tasked Ulu-maheihei to acquire what lands he deemed suitable for the school (Kamakau 1961:355). In addition to taro lands by the stream of Kanahā and within the lands of Makaili‘i and Kukuikapa, Ulu-maheihei also allocated to the school:

> …two cattle pastures: the plain of Ku‘ia to Kaua‘ula turning upward as far as Kahili, and the plain of Pana‘ewa between Kanaha and Kahoma where is the plain of Pahalona … and when the chiefs complained and said that these were their lands given by Kamehameha, and that all their taro land had been taken away and nothing left but a few breadfruit trees, Ulu-maheihei answered, "It is a fine thing; do not get excited about the land. Give your land to those who are seeking knowledge. This is the thing which will establish the government of your chiefs … Knowledge is fundamental to living as a chief." When Elizabeth Kina‘u visited Lahainaluna in 1837 she gave more land extending to the creek of Wao. (Kamakau 1961:355)

A theological department was established in 1843, headed by Reverend Sheldon Dibble, but the early death of Rev. Dibble in 1845 ended all systematic theological instruction on Maui until Reverend W. D. Alexander began teaching theology at Wailuku in 1865.

David Malo, although 38, entered the school with the first class of students. With Rev. Sheldon Dibble, Malo helped to translate portions of the Bible, which were then printed and bound by Lahainaluna students. Malo wrote an account of Kamehameha I, entitled *Hawaiian Antiquities*, but the original manuscript was lost. The account, published by its translator Nathaniel B. Emerson in 1903, and published by the Bishop Museum in 1951, is considered one of the foremost ethnological works in the Hawaiian language. It was Malo who said, "*O keia ke kukui pio ole i Ka Makani o Kauaula*," or "This is the torch which the Winds of Kaua‘ula cannot extinguish," meaning the educational impact of Lahainaluna High School was permanent and unaffected, even by the most famous storm winds of the region. The first newspaper published serving the Pacific

Ocean was the *Ka Lama Hawaii* (The Torch of Hawaii) issued at Lahainaluna in 1834 (Alexander 1894).

By 1837, Charles Burnham had finished building a two-story house of stone walls, wood rafters and a thatched roof for the school. A printing press was installed in this first stone building of the new Lahainaluna Seminary, which was operated by students who set type and printed lesson books in their native language (Hale Pa‘i o Lahainaluna 2008). In 1838, student Samuel P. Kalama engraved the first *ahupua‘a* map of the Hawaiian Islands at Lahainaluna. The map was a groundbreaking achievement at the time (Moffat and Fitzpatrick 2004) and was hand-tinted with colors to call attention to larger land districts. In 1841, a Royal Historical Society was formed at Lahainaluna. At age 26, Lahainaluna student Samuel M. Kamakau was selected as one of the officers, along with Kamehameha III (president), William Richards (vice president) and Sheldon Dibble (secretary). Kamakau (1961) authored *Ruling Chiefs of Hawaii*, which remains the best compilation of the generations of Hawaiian chiefs before Kamehameha I.

In 1842, the Reverend John S. Emerson began construction of the Lahainaluna Ditch, a waterway modeled after a native *‘āuwai*, which had carried water between the Kanahā and Kaua‘ula streams (Maly and Maly 2007). Rev. Emerson remained at the Seminary until the completion of the waterway in 1846. In 1843, the Lahainaluna press published "The Laws and the Resolutions Passed at the Annual Council of the Hawaiian Nobles and Representatives Convened According to the Constitution," the first printed record of actions supporting the new constitution. A missionary instructor at the Seminary, Sheldon Dibble, published the first history of the Sandwich Islands at Lahainaluna that same year (Anderson 1864).

Accounts by Reverend William Richards in 1845 (Lahaina Restoration Foundation 2008), and Mr. Chester S. Lyman in 1846 (Maly and Maly 2007) referred to the ongoing construction of the Lahainaluna Ditch. The lands of Lahainaluna, first administered by missionaries of the Protestant church, were transferred from the American Board of Commissioners for Foreign Missions (ABCFM) to the Hawaiian Government in 1849 and would remain under government control thereafter (The Maui News 1926).

In 1836, following the death of Kamehameha III's sister, Harrieta Keōpūolani Nāhi‘ena‘ena, from illness following labor and childbirth, the king arranged to transport her remains from O‘ahu to "…have her laid away on Maui, the land where her mother, Harriet Ke-opu-o-lani had been laid away, 'in the calm of Hauola'" (Kamakau 1961:341). After being escorted to Lāhainā by a number of smaller schooners carrying a very large retinue of attendant *ali‘i* and entourage of Nāhi‘ena‘ena, a road was prepared for the funeral procession that would travel a loop through the busy port town:

> The body remained on the ship while a roadway was prepared by cutting down breadfruit trees and *kou* trees of Molakia and covering the way with sand, then a layer of grass, and finally mats spread all along the path. (This roadway) began at the horse gate at Pana‘ewa… (Kamakau 1961:341)

This event held a special significance at a time when the Kingdom of Hawaii was experiencing a shift in the power of the Monarchy during the reign of Kamehameha III. According to Kamakau (1961:342):

> On the day of funeral many high chiefs gathered, such as the king and queen, Kina‘u, Ke-ka-ulu-ohi, Kuini Liliha, Ke-kau-‘onohi, Ke-ano, and many others who were the last of their race to be entitled to the great royal *kahili* from which have branched off the *kahili* of today with their variegated feathers. (Kamakau 1961:342)

3.2.2 The Māhele and the Kuleana Act

The most significant change in land-use patterns and land allocation came with the Māhele and the privatization of land in Hawai‘i. The 1839 establishment by Kamehameha III (Kauikeaouli) of a Bill of Rights for the people of Hawai‘i, followed by a formal constitution in 1840, hastened the shift of the Hawaiian economy from that of a subsistence-based economy to that of a market-based economy. The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—which introduced the concept of ownership of private property into Hawaiian society. During the Māhele, all of the lands in the Kingdom of Hawai‘i were divided between *mō‘i* (king), *ali‘i* (royalty), *konohiki* (overseer of an *ahupua‘a*), and *maka‘āinana* (tenants of the land), and passed into the Western land tenure model of private ownership. On 8 March 1848, Kauikeaouli further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners, and in 1850 the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995:41-51).

The *maka‘āinana* were offered fee-simple titles for their house lots and lands which they cultivated for themselves. *Kuleana* awards for individual parcels within the *ahupua‘a* were subsequently granted through a land commission. These awards were first presented to Native Hawaiian tenants followed by the naturalized foreigners (non-Hawaiians born in the islands) or long-term resident foreigners who could prove occupancy on the parcels before 1845.

Land Commission Awards (LCAs) were granted by ministers representing the Kingdom of Hawaii’s Department of the Interior. Native testimony to establish title to real property was recorded by Native Register – wherein claimants would provide traditional proof of ownership – and in like manner foreign testimony by Foreign Register – wherein boundary survey evidence would support traditional claims.

A small area in the northern portion of the project area was once part of Land Grant 7715M, an LCA that encompassed the entire *ahupua‘a* of Hanakao‘o. LCA 7715M was awarded to Lot Kapuaiwa (King Kamehameha V), and after his death on 11 December 1872, was transferred to Ruth Keelikolani, his half-sister and heir (Figure 7 and Figure 8). Eventually this property became part of Lahaina Sugar Company—later to be absorbed into the Pioneer Mill Company (PiMCo).

3.2.3 Mid-Nineteenth to Early Twentieth Centuries

The whaling industry in the Pacific Ocean reached its peak in 1859. Prices for whale oil collapsed five years later. Since the 1840s, the Hawaiian economy had been dependent primarily on supplying whale ships during their long layovers in the islands. With the dwindling number of ships arriving during the 1860s, the population of Lāhainā Town and neighboring West Maui *ahupua‘a* dependent on the prosperity of Lāhainā migrated to other parts of Maui and to other islands (Schmitt 1977). In 1853, 4,833 persons were recorded as living in the Lāhainā District.

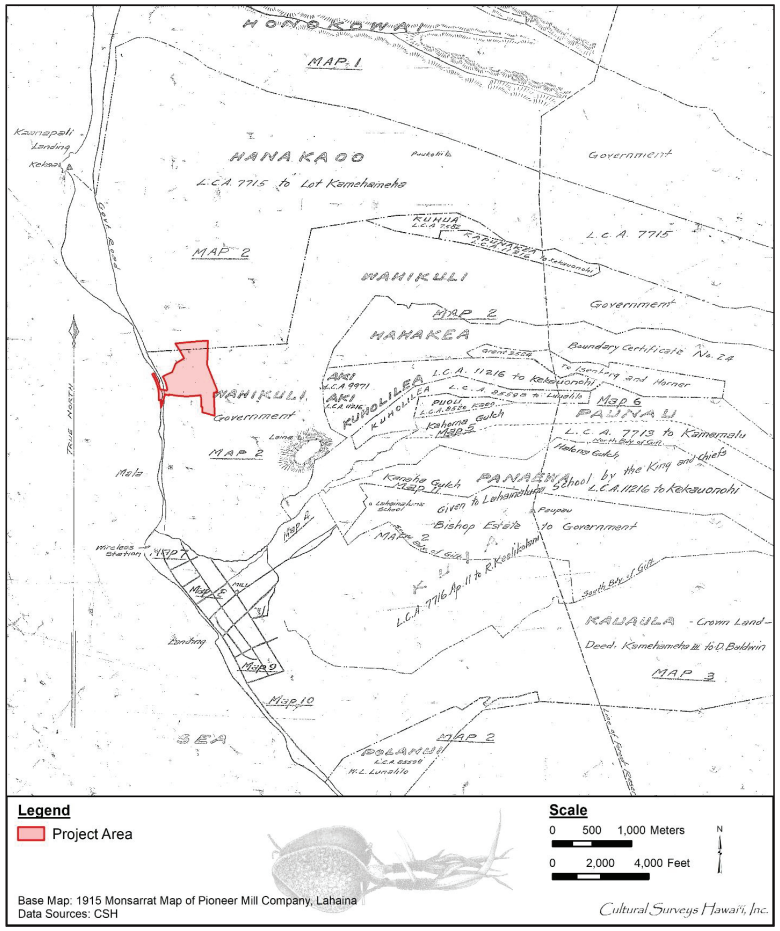

Figure 7. Monsarrat (1915) map showing project area in relation to LCA 7715

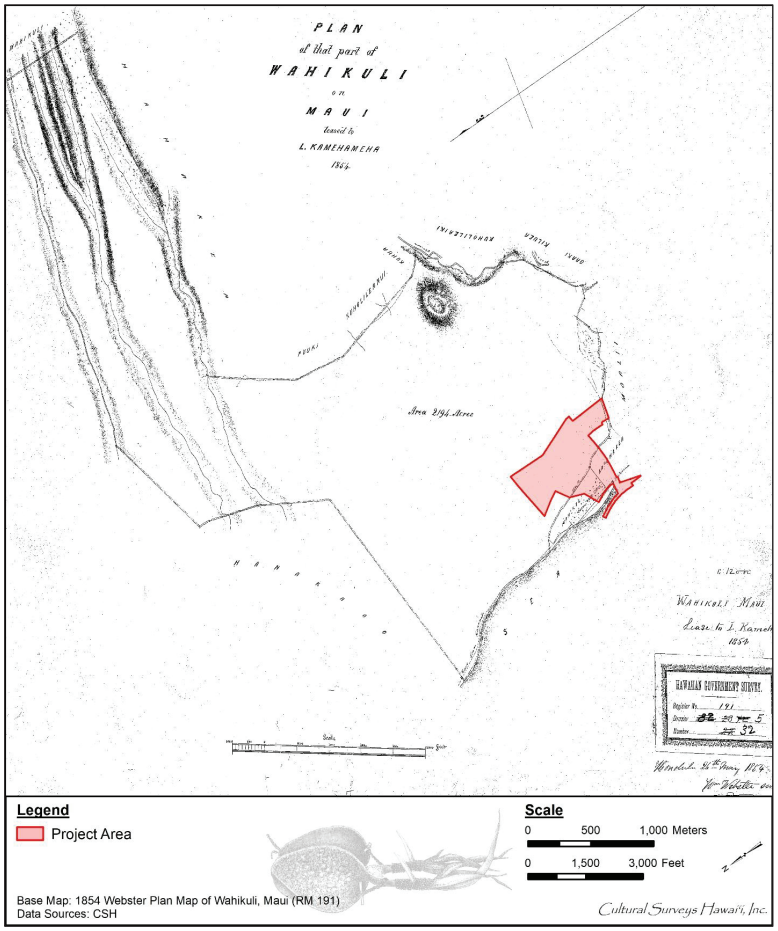

Figure 8. Webster (1854) map of Wahikuli showing the project area

In 1878, the total district population had dropped to 2,448, and by 1896, the population was 2,398 (Schmitt 1977:12-13). A Dodge (1880) map depicts the location of Lahainaluna School (Figure 9). The school and major development in the vicinity are also shown on a Dodge (1885) Hawaiian Government Survey Map of Maui (Figure 10).

3.2.3.1 Development of Sugar as a Commercial Crop

Kō (sugarcane) originally is believed to have been brought to the Hawaiian Islands during the initial Polynesian settlement of the island chain. Early Hawaiians cultivated several varieties of *kō*, each with different cultural associations. *Kō* was also considered to be therapeutic and was a primary ingredient of many native compounds (Handy et al. 1991:183-189).

As the Hawaiian economy shifted following the enactment of the Māhele, *kō* would soon become important as a major cash crop. From 1840 to 1850, a cane field and a rude mill, consisting of three whaling ship try-pots on adobe and stonework with wooden rollers and iron bands, was owned and operated by David Malo in Lāhainā for the production of molasses that was sold primarily for home consumption (Rolph 1917:168-169). As foreign entrepreneurs looked to expand their exportable crops and increase their profits, sugar became the answer, and by 1849 Judge A. W. Parsons was operating a commercial mill in Lāhainā (Jensen 1989). A milestone for the sugar industry of Hawai‘i occurred in either 1854 or 1855 when Captain Pardon Edwards brought a variety of sugar cane from the Marquesas to Lāhainā. Originally intended for transport to Charles Titcomb of Hanalei on Kaua‘i Island, several stalks of the Marquesan cane were given to Consul Chase and F. A. Oudinot of Lāhainā to plant in their gardens (Kew Royal Gardens 1894:419). It was quickly recognized that this variety of cane outperformed the Cuban varieties of sugarcane that were being grown in the Hawaiian Archipelago at that time, as the cane that was introduced by Captain Edwards produced cane with a very sweet quality and a remarkably fast-growing time (Kew Royal Gardens 1894:418-419). This newly introduced cane came to be known as Lāhainā Cane and, to the exclusion of others, was the premier type of sugarcane grown in Hawai‘i (Stubbs 1900:59, 66).

With the introduction of improved technology and the first steam-driven mill, the next 20 years saw an explosion in the sugarcane industry in Hawai‘i with over 22 plantations or mills operating on the island of Maui by 1884 (Wilcox 1996:2-5). Two of the 22 plantations in operation toward the end of the nineteenth century, West Maui Sugar Company and Pioneer Mill Company, led the sugar industry in the Lāhainā District.

3.2.3.2 West Maui Sugar Company

In 1864, Lot Kamehameha (King Kamehameha V) ventured into the sugar industry with two established sugar entrepreneurs, F.W. Hutchison, of the Lahaina Sugar Company, and James Makee, of the Rose Ranch sugar plantation in Ulupalakua, to form the West Maui Sugar Company. To start, the King leased the crown lands in Olowalu and Ukumehame to the West Maui Sugar Company (Olowalu 2008). An additional tract of 2,194 acres of crown land in Wahikuli was also leased by Lot Kamehameha in 1854, nine years prior to his coronation as king; it is unclear, however, if these lands were included in the lands that were under cultivation by West Maui Sugar Company. Overall, sugar production was fair for the fledgling company. Lacking a mill, however, the company sent its crop to PiMCo for processing (Olowalu 2008).

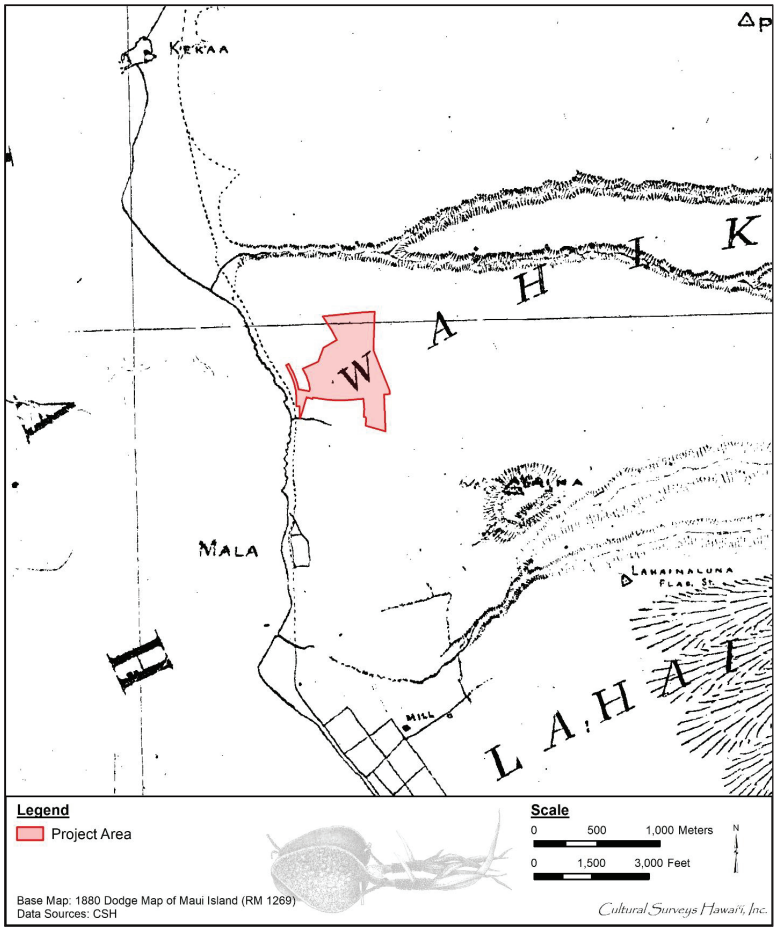

Figure 9. Dodge (1880) map of Wahikuli showing the project area and Lahainaluna School to the southeast

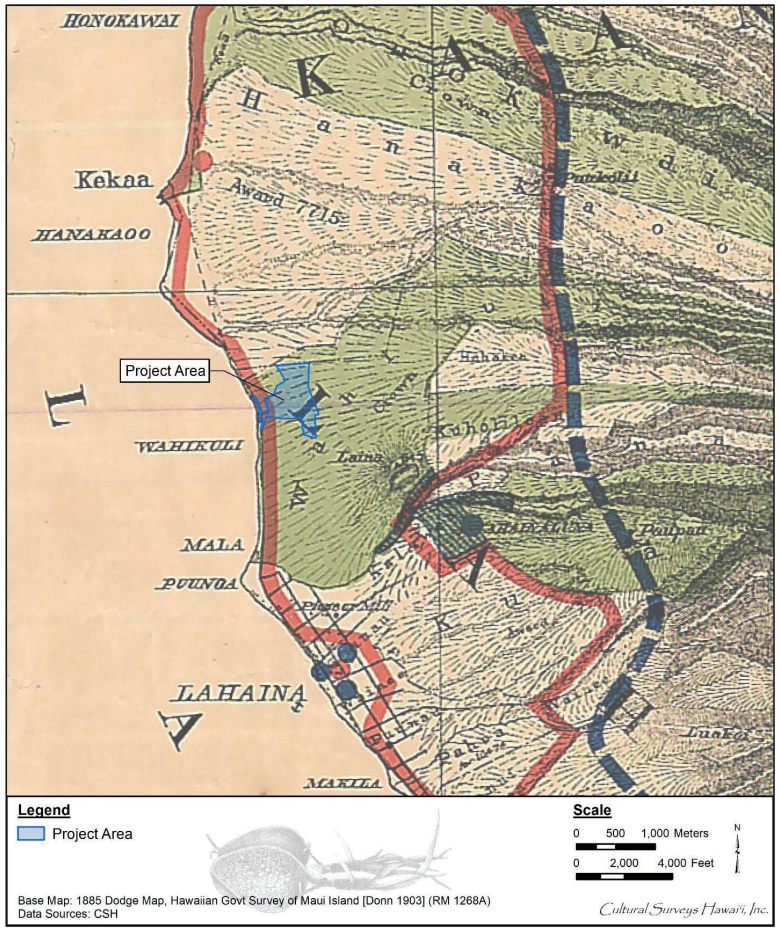

Figure 10. Portion of Dodge (1885) Hawaiian Government Survey Map of Maui showing the project area and Lahainaluna School to the southeast; Crown Lands shown in green

In the late 1860s, Z.S. Spalding became a partner in the West Maui Sugar Company and, taking over as manager, had West Maui Sugar Company acquire the Lahaina Sugar Company mill to end its reliance on the PiMCo mill for processing. The company was formed under the premise that the high prices of sugar set during the American Civil War would continue. However, Louisiana's sugar beet industry recovered in the mid-1860s, causing American sugar prices to fall. King Kamehameha V blamed the company's financial woes on Spalding, who years before had been a spy for the U.S. government concerning the U.S. interest in annexing the islands. Finally, after the King threatened to withhold his land leases (Wilcox 1996:127), Z.S. Spalding was dismissed and James Makee's son, Parker Makee, filled in as manager (Olowalu 2008). Following the death of King Kamehameha V in 1872, the land leases under his name were transferred to the West Maui Sugar Company and two years later the associates of the company sold its assets to James Campbell and Henry Turton of the PiMCo (Wilcox 1996:127).

3.2.3.3 Pioneer Mill Company

In 1862, a fire swept through the original three school buildings and two dwelling houses of the Lahainaluna Seminary. Repairs were swift, with Lot Kamehameha (Kamehameha V) personally supervising construction efforts to replace the lost buildings and restore the school. By this time, descendants of the early missionaries to the "Sandwich Islands" were returning from schools in the U.S. as ordained ministers, or finding positions as engineers, teachers, or doctors in the Hawaiian Islands. Many missionaries who labored during the "Great Awakening" between 1837 and 1842 were "sustaining pastoral relations" and retiring from active missionary service. Samuel T. Alexander had been sent from his family home at Lahainaluna to study at Oahu College (Punahou School), and at Williams College in Massachusetts. S.T. Alexander returned to Lahainaluna in 1862 as a teacher and is credited with improving sugarcane and banana yields there with his students. By 1863, S.T. Alexander was named manager of the Waihee Sugar Plantation (Dean 1950).

As the Hawaiian population of West Maui declined during the nineteenth century, missionaries and entrepreneurs moved into the district, reshaping the landscape for Western enterprises and pursuits. Reverend Dwight Baldwin (1798-1886) had arrived in the Hawaiian Islands in 1831 and was stationed at Lāhainā between 1835 and 1870. In the early 1850s, Rev. Baldwin was granted 2,675 acres of land in northwest Maui. This land holding became the basis for enterprises expanding over areas of West Maui undertaken by his son, Henry Perrine Baldwin, during the nineteenth century (Dean 1950).

Henry Perrine Baldwin excelled at studies at Oahu College. While working for his brother's sugar plantation in Lāhainā to raise money for an anticipated medical school education, he was hired away by S.T. Alexander to be head *luna* at the Waihee Plantation. In 1869, both S.T. Alexander and H.P. Baldwin resigned and established the Haiku Plantation. In 1876, they started a project to bring East Maui water to the dry leeward isthmus of Central Maui. It was modeled after a successful irrigation project undertaken on Kaua‘i in 1866 and demonstrated a process which would be repeated many times throughout the Hawaiian Islands (Wilcox 1996). The system by which mountain water was brought to the PiMCo fields in Lāhainā from Honokōhau was modeled on the same principle.

The Pioneer Mill Company was established as a partnership in 1863 between James Campbell, Henry Turton, and Benjamin Pittman. A plantation village, the Kā‘anapali Village, and a production facility was established at Pu‘u Keka‘a along with a shipping port at Kā‘anapali Landing. In order to increase the amount of land under cultivation and the crop yields, the new plantation worked out long-term land leases along with the appurtenant water rights from regional small landowners (Simpich 1974). The growing of sugarcane along the west coast of Maui required the development of sources for mountain water. Using gravity flow water from mountain streams, PiMCo produced 500 tons of sugar in 1866 (Dorrance and Morgan 2000). With the acquisition of lands and water rights that were controlled by the West Maui Sugar Association in 1874 (Waal 1897), PiMCo was able to significantly expand its land holdings and crop yields. In 1872, production had reached 1,000 tons annually, and by the turn of the century, production had cleared over 10,000 tons of sugar a year (Thrum 1900:41).

In 1877, Harry Turton bought out his partners and was the sole owner of the Pioneer Mill Company; by 1879, almost 4,500 acres of land were under contract to the company (The Maui News 1926). In 1885, H. Hackfield & Company, later American Factors (AmFac/JMB), the sugar agency representing the Pioneer Mill Company, purchased the controlling shares in the company and negotiated additional leases to acquire large tracts of land in Kaua‘ula. These lands were controlled by the Bernice Pauahi Bishop Estate and included water sources essential to the expansion of the plantation.

By 1890, PiMCo holdings had grown to 10,000 acres of regional watershed, cultivatable land, and transportation right-of-ways (personal communication, Lahaina Restoration Foundation, 2008). With increasing acreage under cultivation resulting in higher crop yields, PiMCo was one of the first to put in a rail system for hauling cane from the fields to the mill (Conde and Best 1973:252). In the early days of PiMCo, the sugar grown along the coast of Lāhainā was wholly dependent on the flow of mountain water. The development of additional water sources and pumping water to areas not previously irrigated became the means of expanding and maintaining sugar cultivation along the alluvial plains of Lāhainā. Minimal development is shown within the current project area on a Monsarrat (1915) map of Pioneer Mill Co. (see Figure 7). A Wall (1913) map describes the land withing he project area as "covered with many large boulders" and requiring "hand cultivation" (Figure 11). A 1929 map shows development around Lāhainā town to the south and near Keka‘a Point to the north (Figure 12). A 1933 Maui Island USGS topographic quadrangle depicts a railway line near the coast and a large unimproved road along the eastern boundary of the current project area (Figure 13).

3.2.3.3.1 Drilling for Well Water

Between 1860 and 1881, aside from limited diversions of the various streams issuing from the valleys in back of Lāhainā, Olowalu, and Ukumehame, no large-scale development for irrigation water had been attempted by PiMCo or any of the other sugar enterprises of West Maui. The McCandless Brothers, an engineering enterprise from Honolulu, were hired in 1883 to drill the first well for PiMCo at Kā‘anapali. While ample water was found, Turton considered the drilling a failure as he was hoping for an artesian source at Kā‘anapali that did not require the more costly expenditure of pumping (McCandless 1936).

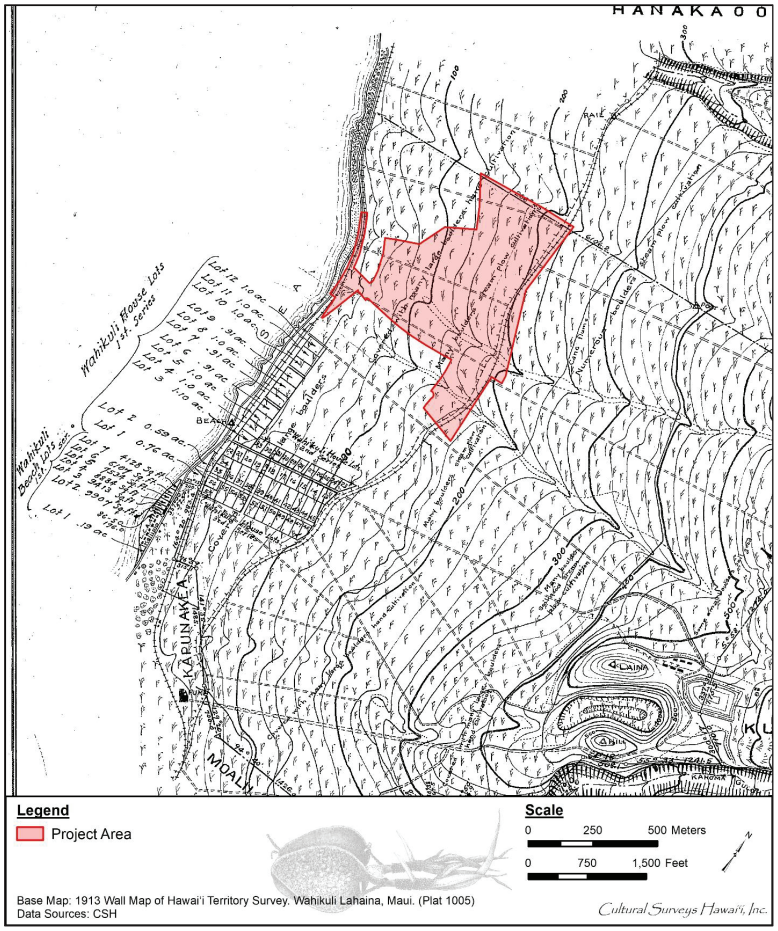

Figure 11. Wall (1913) map showing the land of the project area as “covered with many large boulders hand cultivation”

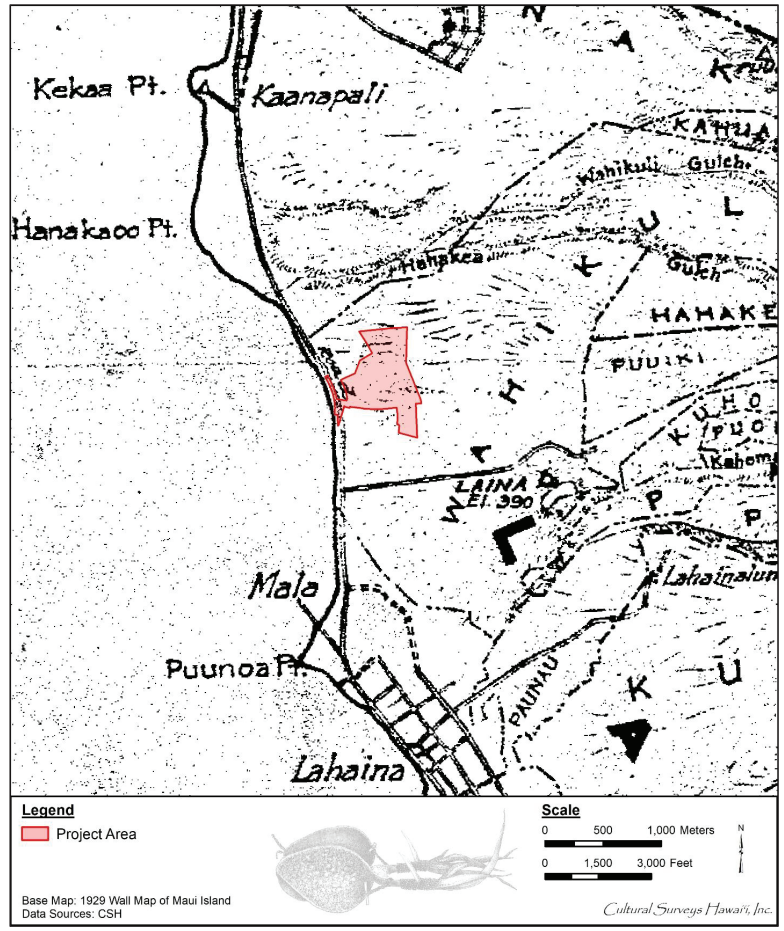

Figure 12. Wall (1929) map showing the gulches and development near the project area

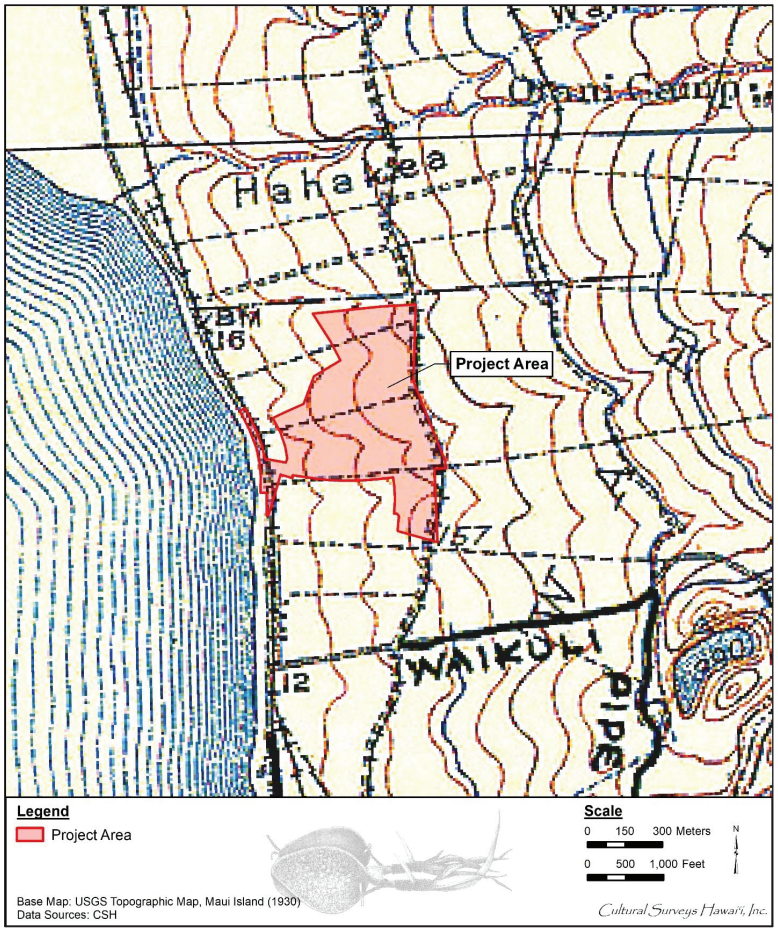

Figure 13. Portion of the 1930 Maui Island USGS topographic quadrangle showing the project area and surrounding railway lines, unimproved roads, and the Waikuli Pipe (U.S. Geological Survey 1930)

In 1896, PiMCo hired the McCandless Brothers again to resume drilling near their first drilling location. This resulted in the development of nine wells at Kā‘anapali, as well as a system of pumps that would make this location a success as a source of water. The successful installation of wells at Kā‘anapali, Wahikuli, Māla, and Waine‘e in 1897 effectively doubled the production of sugar at PiMCo (Gilmore 1931; Stearns and MacDonald 1942). The Wahikuli Pump Ditch, among others, are depicted on an undated map by PiMCo (Figure 14). Note the map also shows the locations of two plantation camps, Kelawea Camp and Wahikuli Camp. A 1953 PiMCo map shows the extensive pump system that was established surrounding the project area (Figure 15).

An additional 14 wells were developed in 1900, with 12 more in 1921, for a grand total of 36 wells at the Kā‘anapali turbo-electric pumping stations. With this successful development, the McCandless Brothers continued to drill 26 more wells in the vicinity of Lāhainā. The Lāhainā wells were sunk 100 to 300 feet deep, into formations representing a mixture of, “clay, gravel, and boulders, down to the basalt bedrock” (McCandless 1936).

“Maui-type well” is a name applied throughout Hawai‘i to a particularly successful type of well, a vertical mine-like shaft to the basal water table, with one or more horizontal infiltration tunnels skimming off the fresh water from the underlying salt water (Stearns and MacDonald 1942:126). The substantial increase in the volume of irrigation water from Maui-type wells provided the Pioneer Mill Company (Table 1) with the ability to further expand its cultivated acreage; between 1895 and 1905, the number of acres harvested increased from 525 to 3,000 (Gilmore 1936).

3.2.3.3.2 Tunneling for Perched Water

In 1898, PiMCo installed a simple galvanized iron flume in the Honokōwai Stream, but the mechanism by which arid coastal lands could receive mountain waters was perfected in 1904 on Maui’s western coastline with the building of the Honokōhau Ditch. The Honokōhau Ditch consisted of tunnels and flumes 14 miles long, and it delivered 20 million gallons per day (mgd) to the PiMCo fields. In a similar manner, each of the other ditch systems was developed to provide large-scale water resources to fields along the Kahoma, Kanahā, Kaua‘ula, Launiupoko, Olowalu, and Ukumehame Stream Valleys (Wilcox 1996:134). To fully develop each stream valley, a series of tunnels were driven high into the water-bearing valley walls by company engineers (Table 2).

According to Stearns and MacDonald (1942) the dike complexes and dike swarms at the headlands of each stream valley were found to contain abundant water. The West Maui dike swarms not only stored water from areas of high rainfall in the mountains, but dispersed water in all directions. The dikes were found to crop out at the head of every major valley and supply practically all the perennial streams (Stearns and MacDonald 1942:165).

The successful drilling of Tunnel 16 in 1901 at Kaua‘ula produced a steady flow of 4,325,000 gallons in a 24-hour period as reported in 1903 (Barkhausen 1903), however by 1904 the flow at Tunnel 16 dropped to 2,000,000 gallons per day, as reported in the table above (Stearns and MacDonald 1942:213). Tunnel 16 was considered relatively short and its cost, at $3,813.53, was one-third the cost of continuing work on the Kahoma flume. The year-end plantation report for 1904 reported that a similar drilling project at Tunnel 18 at Kahoma produced a steady flow of over 1.5 million gallons a day. Developing water resources by drilling tunnels into lava formations at high elevations to intercept large flows of water carried by lava tubes was a program successfully undertaken at nine other Pioneer Mill Company locations (Wadsworth 1936).

Figure 14. Undated Pioneer Mill Co. map showing ditch systems and camps (Pioneer Mill Company n.d.)

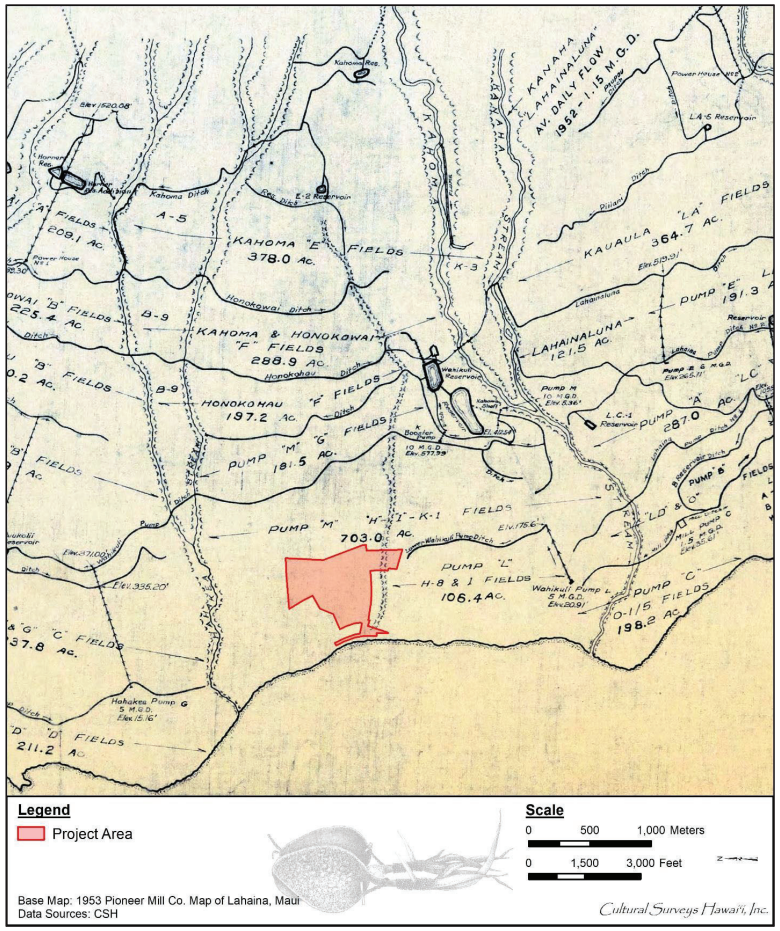

Figure 15. Pioneer Mill Company (1953) showing the pumps and cane fields around the project area

Table 1. Maui-type Wells on Pioneer Mill Co. Lands (adapted from Stearns and MacDonald (1942)

USGS No.	Plant. No.	Name	Date	Elev. (ft)	Depth (ft)	Capacity m.g.d.	Aquifer
2	F	Honokowai	1921	65	65	5.00	Wailuku basalt
3	D, H	Kaanapali	1897	27	25	15.00	Wailuku basalt
4	G	Hāhākea	1923	14	12	5.00	Wailuku basalt
5	M	Kahoma	1933	322	323	10.00	Wailuku basalt
6	L	Wahikuli	1897	26	27	5.00	Wailuku basalt
7	C	Pioneer Mill	1897	34	39	10.00	Wailuku basalt
8, 9	B, A, E	Wainee	1897	30	31	13.90	Wailuku basalt
10	N	Olowalu	1933	165	300	5.25	Wailuku basalt
11	O	Olowalu	1905	20	20	3.00	Wailuku basalt
12	P	Ukumehame	1934	79	143	4.75	Wailuku basalt

Table 2. Tunnels Driven for Perched Ground Water by the Pioneer Mill Company (Stearns and MacDonald 1942:213)

No.	Valley	Elev. (ft)	Yield (gallon/ day)	Length (ft)	Geologic Structure/Perching Formation
13	Olowalu	1,710	100,000	3,000	Vent breccias of Wailuku caldera complex cut by dikes
14	Olowalu	775	Dry		Dike swarm in Wailuku basalt
15	Launiupoko	1,425	100,000	1,320	Tunnel cuts through 20 dikes in Wailuku basalt
16	Kauaula	2,920	2,000,000	656	Tunnel cuts through 194 dikes
17	Kahoma	1,923	Dry	2,500	Tunnel cuts through 19 dikes
18	Kahoma	1,984	1,900,000	3,080	Tunnel cuts through 47 dikes
19	Kahoma	2,350	10,000	739	Tunnel cuts through 16 dikes
20a	Honokōwai	1,700	2,000,000	1,250	Tunnel cuts through 18 dikes
20b	Honokōwai	1,600	500,000	1,050	Tunnel cuts through 7 dikes

Further work by the plantation in 1910 to increase sources for fresh water resulted in the replacement of the Kahoma flume with a tunnel 5,300 feet long, resulting in better capture of storm runoff water (Weizheimer 1911). Between 1908 and 1912, PiMCo consistently shipped over 25,000 tons of sugar annually out of Kā‘anapali Landing at Pu‘u Keka‘a, a production increase of over 150 percent following the improved supply of irrigation water made available in the early 1900s (Thrum 1912).

3.2.3.3.3 The Honokohau Ditch Project

Additional sources of water were required for the successful expansion of acreage under cultivation. To this end, a large-scale ditch project was proposed that would put the Pioneer Mill Company on par with sugar operations in Maui’s central isthmus. The largest water sources on the Lāhainā side of the island were the Honokōhau and Honolua streams, on lands owned by H.P. Baldwin and the Honolua Ranch Company. The construction of the Honokōhau Ditch began in 1902. The ditch started at an elevation of 700 ft AMSL with intakes at Honokōhau, Kaluanui, and Honolua streams. The ditch and flumes ran along soft hillsides where landslides frequently choked the ditch and damaged the flumes, but teams of workers kept the waterways clear. Work was completed in May 1904 with capacity averaging 25 mgd (Wilcox 1996).

The Honokōhau Ditch supplied water to nine reservoirs with a combined storage capacity of 70 million gallons. Not having to pump water to field elevations at 700 ft AMSL represented an immediate savings. As a result, more than 1,000 new acres were placed in irrigation, offsetting nearly $30,000 in permanent improvement costs (Barkhausen 1905).

3.2.4 Contemporary Land Use

At the beginning of the twentieth century, most of the field jobs were performed by contract gangs. Each type of contract gang was paid at a different rate, which was sometimes dependent on the difficulty of the terrain. Gangs were organized for planting, harvesting, cutting, packing, laying flumes, laying portable railroad track, and other similar field jobs (Eckart 1911). Preparation of the fields was accomplished by either a tractor/steam plow where the fields are virtually rock free (approximately 60% of the fields under cultivation in 1934) or via hand preparation with handpicks and shovels in rocky areas that would not be suitable for plowing (approximately 40% of the fields under cultivation in 1934) (Gilmore 1936:199-200).

With the availability of ample water, one method by which sugarcane was transported to the main railroad lines of the Pioneer Mill railway was fluming. PiMCo operated flumes averaging about 3,500 ft long, which required 75,000 to 175,000 gallons of water per hour to flume sugarcane downslope. A full flume gang consisted of 68 men, of whom 24 were assigned to *hāpai kō*, carry the harvested sugarcane to a spot where the cane would be handled by the chute workers. The remaining members of the flume gang typically was comprised of eight men assigned to the chute, six flume carpenters for repairing field breaks and leaks, six overseers, and 24 flume workers to clear jams and unload the sugarcane into railroad cars (Carter 1934).

By 1910, PiMCo employed over 1,600 workers and cultivated over 8,000 acres of sugarcane. By 1920, the lands under cultivation stretched from Ukumehame to Honokōwai. Through the years, the company changed hands and the new owners kept on the leading edge of industrialization, implementing changes such as increasing the number of rollers in the mill until

it reached its peak production of 34,980 tons in 1924. In 1931, the company acquired the Olowalu Sugar Company, further increasing its holdings.

Beginning in 1912, a two-year project to completely rebuild the Honokōhau Ditch was undertaken by David T. Fleming, manager of the Honolua Ranch. The new ditch was able to collect and deliver 25 million gallons of water per day—all of which was sold to PiMCo (Wilcox 1996). The much-needed water saved the harvest of 1914, when the crops were about to be abandoned due to a drought (Weizheimer 1914).

By 1930, PiMCo’s power and irrigation water pumping system required a new source for the Kahoma region. A concrete-lined well shaft was constructed to a diameter of 12 ft and sunk 325 ft underground (Watts 1939). A steam plow engine was modified to provide power for an elevator designed to lower workers into the well. The resulting Maui-type well was able to pump fresh water at a rate of 10 mgd.

In the rocky fields that would not allow for plowing, sugar cultivation was accomplished in the following manner:

> In these fields the rocks are cleared away and built into a series of stone walls from 5 to 6 feet apart and often 3 feet high. These stone walls form the banks of the cane row; and between these walls the ground is softened up with a pick and the seed then planted. (Gilmore 1936:200)

Gilmore (1936:200) noted that though extremely difficult and time consuming to plant, the soil of these rocky areas were very fertile and yielded between 90 to 100 tons of sugarcane per acre, presumably making it worth the time and manpower to continue cultivation in these labor intensive areas.

By 1940, acreage harvested had peaked at 5,237, including 550 acres from the purchase of the Olowalu Plantation in 1931 (Berg 1954). After World War II, improvements in heavy equipment and mechanized farming brought on more efficient field clearing and planting methods, and from 1947 to 1950, PiMCo started a rock removal program to increase overall sugar production (Pioneer Mill Company 1951). The program used heavy equipment to bulldoze rocks from the fields, which were stacked into large piles that still dot the landscape today. At this time, many of the terraced fields described above were either abandoned in hard to access areas with a higher degree of slope relief or cleared via this new machinery. While the railroad had provided an efficient means of transporting sugar prior to the 1950s, by 1952 it was no longer economically feasible to keep the railway operating. In response to the increasing expenses of maintenance and operation, the rail system was replaced with the more efficient cane haul trucks and a feeder conveyer and crane system for loading (Nishimoto et al. 2003:101-102).

PiMCo thrived throughout major dips in the American economy; however, all ventures are susceptible to market change, and PiMCo was no exception. Faced with foreign competition that had lower land and labor costs, the company closed in 1999 (Kubota 1999). Today, fallow fields, the smokestack, and a six-mile segment of the track are all that remain of the Pioneer Mill Company. In 1970, the Kaanapali & Pacific Railroad used the six-mile segment of track to create a tourist Sugar Cane Train ride *mauka* of Lāhainā Town. Although the sugarcane industry has

disappeared from this area of Maui, the impact of the industry has left a lasting imprint on the landscape of West Maui.

With the primary emphasis on tourism and the promotion of Lāhainā and Kā‘anapali as a destination resort and vacation area, along with economic pressure from low sugar prices, AmFac was forced to phase out regional sugar cultivation and milling operations. The last sugar harvest for Pioneer Mill occurred in 1999, and the mill closed in 2003, thereby ending the chapter on the “Sugar Era” of West Maui (Kubota 2004).

A series of aerial images and maps depicts the region of the project area between 1949 and 1992 (Figure 16 through Figure 21). Overall, the project area has consisted of agricultural cane fields with very little development in the immediate region. Meanwhile, the coastal area to the south increasingly became populated with residential and commercial activities. The Lāhainā Civic Center is shown adjacent to the project area in a 1978 aerial image (see Figure 19).

In the years immediately following statehood in 1959, the Kā‘anapali area north of Lāhainā was master-planned as a resort destination. AmFac developed the cane lands located in Kā‘anapali into the Royal Kaanapali Golf Course and the first hotel along the coastline, the Sheraton Maui Hotel, opened on Kā‘anapali Beach in 1963. Following the development of the Kā‘anapali Beach Hotel and the Whalers Shopping Village in 1970, the Maui Surf Hotel opened in 1971 at what is known today as the Westin Maui Resort & Spa’s Ocean Tower (Fischer 2013).

Recently, as part of the DHHL general and regional plans for Honokowai and Wahikuli, the Villages of Leiali‘i Phase 1-A subdivision were completed. This subdivision consists of 104 house lots averaging 6,500 sq ft and associated amenities including roadways, water, sewer, fire protection, drainage improvements and landscaping. The first beneficiaries of this project began occupying homes in 2007, and all homes in the subdivision were occupied by December 2007.

Figure 16. 1949 orthophotoquad of Wahikuli showing the project area (School of Ocean and Earth Science Technology [SOEST] 1949)

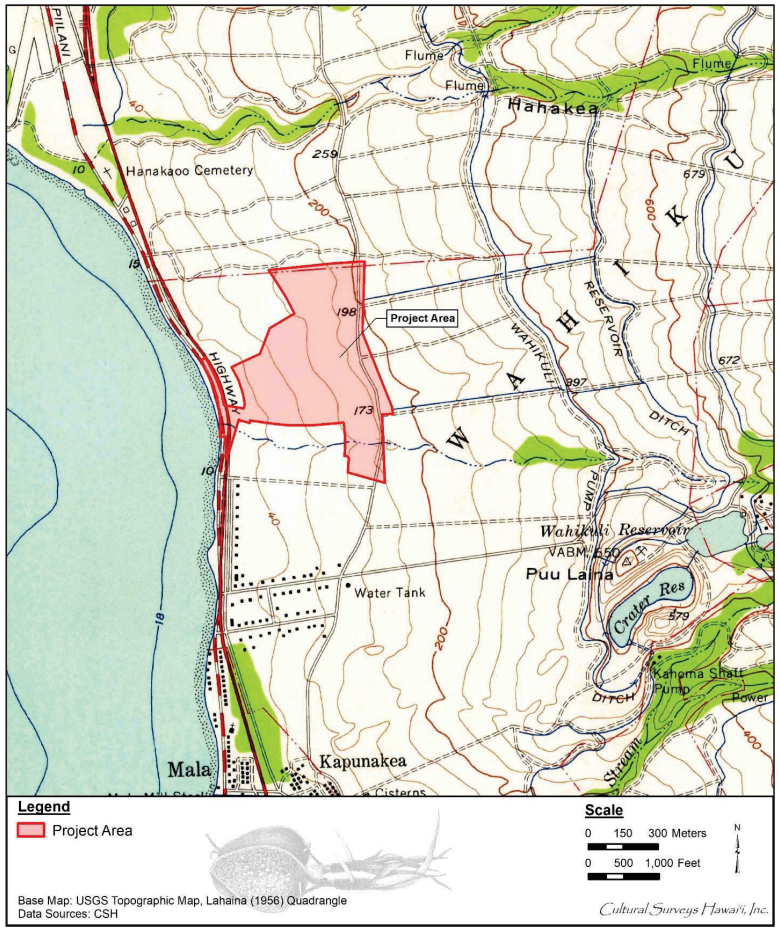

Figure 17. Portion of the 1956 Lahaina USGS 7.5-minute topographic quadrangle showing the project area (U.S. Geological Survey 1956)

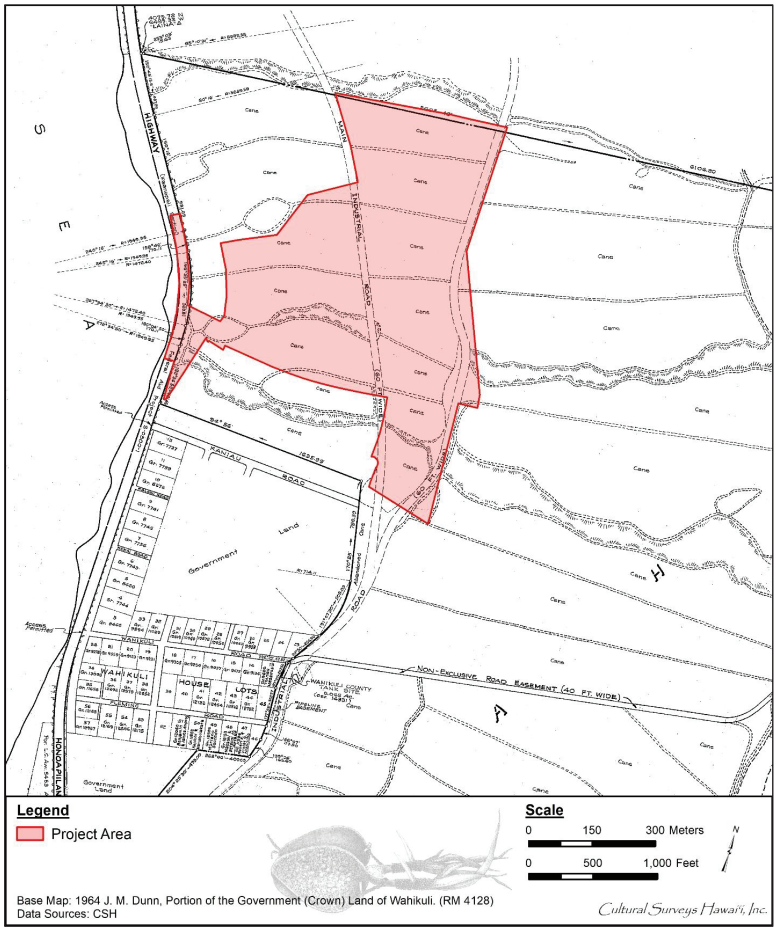

Figure 18. Dunn (1964) Portion of the Government (Crown) Land of Wahikuli map (RM 4128) showing the project area and development to the south; the road within the project area is labeled “Industrial Road (60 ft. Wide)”

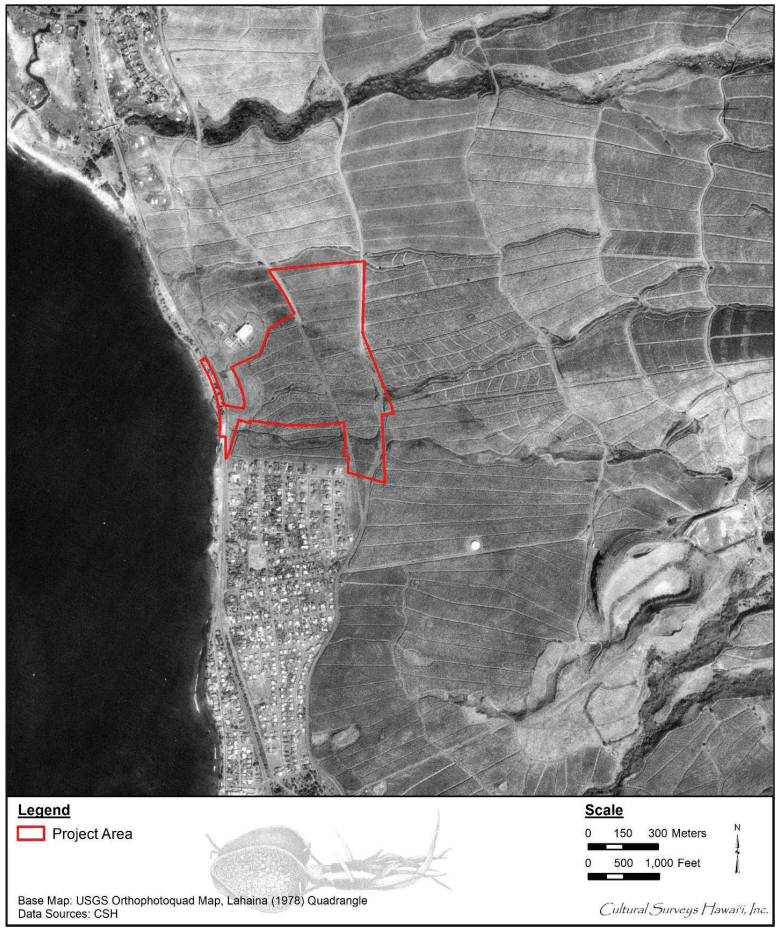

Figure 19. Portion of the 1978 Lahaina USGS orthophotoquad showing the project area and immediate vicinity (U.S. Geological Survey 1978)

Figure 20. 1987 orthophotoquad of Wahikuli showing the project area (School of Ocean and Earth Science Technology [SOEST] 1987)

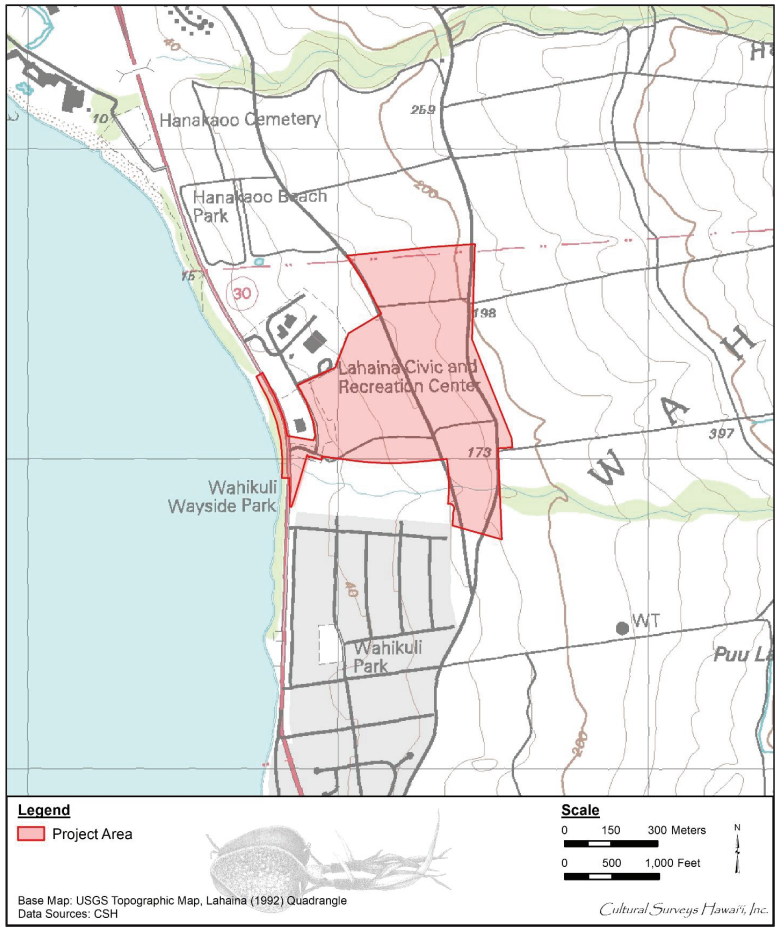

Figure 21. Portion of the 1992 Lahaina USGS 7.5-minute topographic quadrangle showing the location of the project area (U.S. Geological Survey 1992)

3.3 Previous Archaeological Research

Between 1931 and 1976, only sporadic archaeological studies were undertaken in the area. Following the passage of the National Historic Preservation Act in 1966 and HRS Chapter 6E, which established the Historic Preservation Program in 1976, archaeological studies occurred as a condition of development on a more frequent basis. In this vein, the lands surrounding the current project area have been subject to a variety of studies including archaeological reconnaissance investigations, field inspections, AIS investigations, archaeological monitoring, and burial treatment programs (Figure 22 and Table 3). Historic properties in the vicinity of the current project area have been identified along the stream valleys to the north and south and primarily include pre- and post-Contact agricultural complexes and burial sites, and pre-Contact habitation areas and fishponds (Figure 23).

3.3.1 Walker (1931)

The earliest archaeological studies on the island of Maui were a part of island-wide surveys conducted in the early 1900s (Stokes 1917; Walker 1931). These studies tended to focus on the generation of descriptive lists of large-scale architecture or traditional ceremonial *heiau* sites. Walker (1931) described Site 11, Halulukoakoa Heiau (SIHP # 50-50-03-00011) as follows:

> Name: Halulukoakoa
> Location: S.E. corner of cocoanut grove at Mala, just north of Kapunakea Camp. It lies in the ahupuaa of Wahikuli according to Thrum.
> Description: A large heiau for human sacrifice of which but few fragments of walls remain. There is some coral to be found in their construction, but most of the stone has been removed for rock ballast on the railroad. The site has been further cleared and levelled to make a playground, and what remains has been used for a dump of debris of every kind, and the whole is heavily overgrown with kiawe bushes.
> Remarks: Informant J. Kahahana is said to know of some legends connected with this heiau.

3.3.2 Connolly (1974)

In August 1974, the Bernice P. Bishop Museum conducted a Phase I archaeological survey for a proposed flood-control project for an approximate 1.5-mile long section of Kahoma Stream (Connolly 1974), from the mouth near Mala Wharf *mauka* toward the area northwest of Lahainaluna High School. The entire survey recorded two terrace systems, Kahoma System and Kaia System, and a large burial area. The burial area, designated as Bishop Site Ma-D5-8/SIHP # 50-50-03-00226, is on the southern side of the mouth of Kahoma Stream and contains at least 25 burials, marked by a cement tomb, a headstone, and 23 low stone platforms. SIHP # -00226 is not in the vicinity of the current project area. Preservation of the burial area was recommended.

The Kahoma Stream Terrace System, Bishop Site D5-7/SIHP # -01775, is a complex of terraces and features within the Kahoma Stream bed. The features include “36 terraces with stone-reinforced retaining walls (probably historic), seven cement structures (historic), and four free-standing walls, and two ditches [water-diversion channels]” (Connolly 1974:6). The structures were remnants of the Yamashiro Dairy. No further work at the terrace complex was recommended.

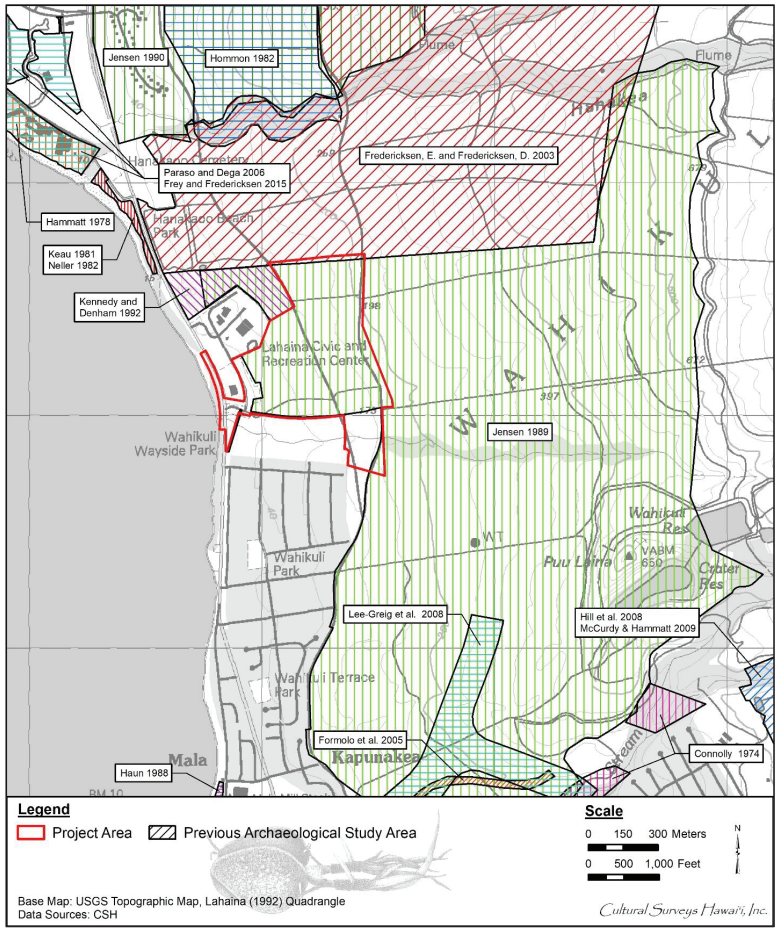

Figure 22. Previous archaeological studies within the vicinity of the project area (U.S. Geological Survey 1992)

Table 3. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results (SIHP # 50-50-03-#####)
Connolly (1974)	Archaeological survey	Kahoma and Kanahā streams confluence	Identified SIHP # -01775, Kahoma Stream Terrace System; SIHP # -01776, Haia Terrace System at the stream confluence; and SIHP # -00226, burial area near the stream mouth (beyond the vicinity of the current project area)
Hammatt (1978)	Reconnaissance survey	Hyatt Regency Maui Resort Hotel; TMK: [2] 4-4-006:031	No historic properties identified
Keau (1981)	Reconnaissance survey	Hāhākea Beach Park; TMK: [2] 4-4-06:33	No historic properties identified
Neller (1982)	Reconnaissance survey	Hāhākea Beach Park; TMK: [2] 4-4-06:33	Notes a previously identified historic property, SIHP # -01204, grinding stone
Hommon (1982)	Reconnaissance survey	North Beach Mauka and South Beach Mauka; TMKs: [2] 4-4-002:002 and [2] 4-4-006:001 and 014 pors.	Identified 10 historic properties: SIHP #s -02001 through -02003 within the gulch at North Beach Mauka and SIHP #s -02004 through -02010 in the South Beach Mauka gulch; the features included over 23 terraces, three probable road and trail segments, three walls, and one possible ceremonial feature (upright stone and alignment)
Haun (1988)	Reconnaissance survey with subsurface testing	Lahaina Cannery; TMKs: 04-05-05-9 through 11; TMK: 04-05-11:3	Identified a buried pre-Contact cultural layer and pondfield sediments (beyond the vicinity of the current project area)
Jensen (1989)	AIS	Lahaina Master Plan development area; Hāhākea Gulch, Kahoma Stream, Crater Reservoir	Identified 11 new historic properties: SIHP #s -02478 through -02485 and -02488, agricultural features (terraces and walled enclosures), SIHP # -02486, large formal cairn/marker and 13 mounds interpreted as probable graves/grave markers; and SIHP #

Reference	Type of Study	Location	Results (SIHP # 50-50-03-#####)
			-02487, historic agricultural access road; assessed components of a previously identified historic property, SIHP # -01203, Kahoma Complex; SIHP #s -02478 and -02480 are beyond the vicinity of the current project area
Jensen (1990)	AIS	South Beach Mauka Development	Confirmed SIHP #s -02004 through -02010 and newly identified two agricultural complexes, SIHP #s -02489 (agricultural terraces, footpath, possible habitation features, and possible burial) (beyond the vicinity of the current project area) and -02490 (walled terraces, enclosure, and agricultural terra remnants); both possibly of pre-Contact origin; project area subsequently revised to exclude the new sites
Kennedy and Denham (1992)	AIS	Proposed baseball complex adjacent to the Lahaina Civic/Recreation Center; TMK: [2] 4-5-021:003	No historic properties identified
Fredericksen and Fredericksen (2003)	AIS	Kā‘anapali and Honokowai	Recorded 81 newly identified historic properties, SIHP #s -05241 through -05321, consisting of pre-Contact to post-Contact agricultural sites, habitation areas, petroglyph panel sites, plantation era sites, and possible ceremonial areas, shrines, burial features, also further documented SIHP # -02893, Puukolii Cemetery
Formolo et al. 2005	AIS	Keawe Street roadway extension; TMK: [2] 4-5-021:003, 022 pors.	No historic properties identified

Reference	Type of Study	Location	Results (SIHP # 50-50-03-#####)
Paraso and Dega (2006)	AIS	Hyatt Regency Maui Resort; TMKs: [2] 4-4-013:004, 005, 008	No historic properties identified; observed a potential cultural layer located outside of the development footprint (no SIHP # assigned)
Lee-Greig et al. (2008)	AIS	17.5-acre area for a realignment section (Phase 1A) of Honoapi‘ilani Hwy	Identified SIHP #s -06492 and -06596, two push piles remnant of agricultural field improvement activity; project prompted by inadvertent discovery of SIHP # -06277, a system of over 400 historic agricultural terraces
Hill et al. (2008)	AIS	Lahainaluna High School, TMK: [2] 4-6-018:005, 007, and 0012	Identified six historic properties: SIHP #s -06494 and -06498 are irrigation ditches; SIHP #s -06495, -06497, and -06499 are retaining walls; and SIHP # -06496 is a terrace wall; also documented the Hale Pa‘i o Lahainaluna (SIHP # -01596)
McCurdy and Hammatt (2009)	Archaeological monitoring	Lahainaluna High School, TMK: [2] 4-6-018:005, 007, and 0012	Identified SIHP # -06608, subsurface remnant of a historic garage; and SIHP # -06609, subsurface remnant of a historic foundation/cellar
Frey and Fredericksen (2015)	Archaeological monitoring	Maui Hyatt Vacation Club Timeshare; TMK: [2] 4-4-013:088 Lot 66A	Identified SIHP # -07720, 11 finds of human remains reinterred within a burial preserve area

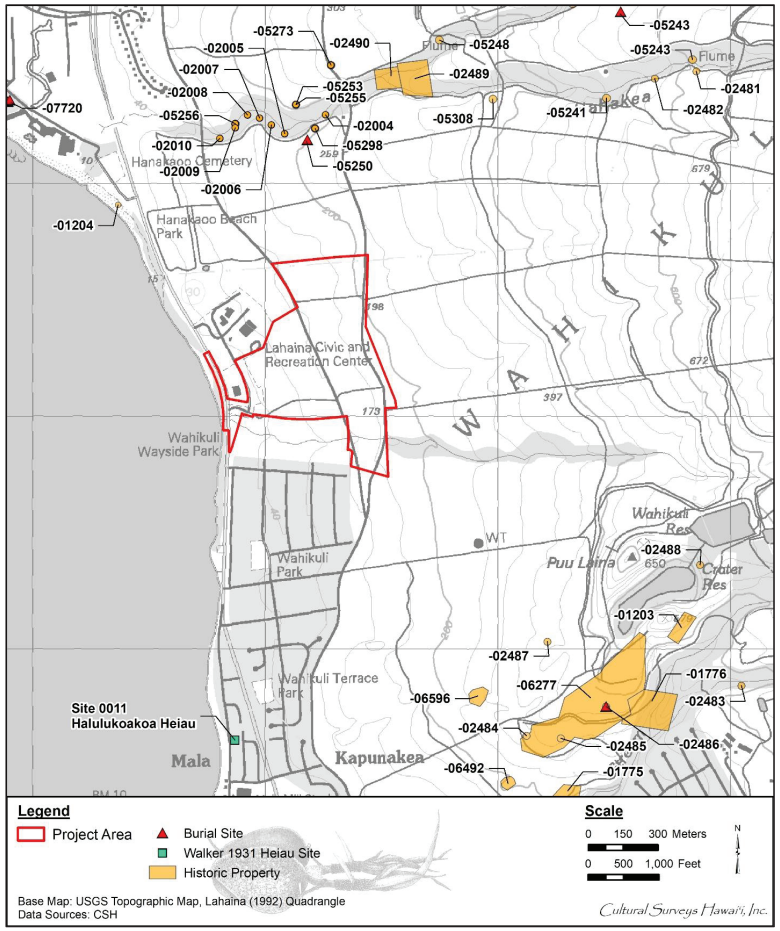

Figure 23. Previously identified historic properties within the vicinity of the project area (U.S. Geological Survey 1992)

The Haia Terrace System, Bishop Site D5-9/SIHP # -01776, is at the confluence of the Kanahā and Kahoma streams, which was technically outside of the survey area but it was recorded briefly “should the boundaries of the flood-control project be expanded” and in case there existed a relationship between the two terrace systems (Connolly 1974:ii, 9). The complex contained a house site with a probable pre-Contact foundation, but the site was not mapped extensively. Mr. Jonah Haia had lived on the site above the confluence ca. 1880. Additional research on the terrace system was recommended prior to any impacts.

3.3.3 Hammatt (1978)

On 13 March 1978, Archaeological Research Center Hawaii, Inc., (ARCH) conducted a reconnaissance survey for the Hyatt Regency Maui Resort Hotel (Hammatt 1978) (TMK: [2] 4-4-006:031). The study involved a general inspection of the hotel construction site, examination of a single backhoe trench across a beach berm, and examination of a sewer line trench and pumping site excavation on the *mauka* side of the construction site. A majority of the construction site hadbeen previously altered and graded. The beach berm and sewer excavations showed “reworked lenses of charcoal from recent burning” (Hammatt 1978:2). No historic properties were identified during the study.

3.3.4 Keau (1981); Neller (1982)

On 6 July 1981, Charles Keau of the Maui County Parks Department conducted an archaeological reconnaissance survey of a 3.7-acre parcel along the northern coast of Lāhainā, at Hāhākea Beach Park (Keau 1981). Findings include a possible habitation site, a coral abrader, scattered midden, a possible wall, and a historic drainage culvert. The following year, the parcel was reassessed by Charles Keau and Earl Neller, and a single test pit was excavated within the habitation feature (Neller 1982). The test pit revealed that the habitation site was likely natural, comprised of exposed beach colluvium. A majority of the beach parcel was determined to have undergone extensive land modification resulting from wave action, erosion, road construction, rock crushing, grave digging, camping, and canoe landing (Neller 1982). Neller (1982) mentions a nearby Chinese cemetery at the southern end of the beach site, the Hanakao‘o (Hāhākea) grinding stones (SIHP # 50-50-03-01204), and the ruins of an historic rock crusher site. Neller (1982) noted that the Grinding Stone Site (SIHP # -01204) previously had been recorded in 1973-74 by the SHPD, and it was used for finishing pre-form adze blanks. Preservation of SIHP # -01204 was recommended along with archaeological monitoring during construction activities in the vicinity of the historic rock crusher site.

3.3.5 Hommon (1982)

On 22 June and 9 August 1982, Science Management, Inc. (SMI) conducted an archaeological reconnaissance survey of the North Beach *mauka* (TMK: [2] 4-4-002:002) and South Beach *mauka* (TMKs: [2] 4-4-006:001 and 014 pors.) areas (Hommon 1982). The study areas are within the Ka‘anapali Master Plan project. Ten historic properties were identified during the survey. SIHP #s 50-50-03-02001 through -02003 (terraces/walls) are in the northern gulch and SIHP #s -02004 through -02006 (terraces), -02008 (probable road), -02009 (terrace complex), and -02010 (wall) are in the southern gulch. The documentation consisted of completing a field form, taking a photograph, and placing a tag with a temporary number. The historic properties contained “more

than 30 features, including more than 23 terraces, as well as 3 probable fragments of roads or broad trails, 3 walls and a possible religious site [an upright stone at SIHP # -02001]” (Hommon 1982:19). An intensive archaeological survey was recommended prior to any ground disturbance in the two gulches containing historic properties.

3.3.6 Haun (1988)

From 21 through 23 January 1988, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted a subsurface archaeological reconnaissance survey for the Lahaina Cannery *makai* and *mauka* parcels (TMKs: [2] 4-5-005:009, 010, 011 and [2] 4-5-011:003) totaling approximately 4 acres and located south of the current project area (Haun 1988). The survey included the excavation of 19 backhoe trenches. Trench 7 was in the *makai* parcel and contained a prehistoric cultural deposit that included sparse midden, volcanic glass flakes, and charcoal and ash lenses suggestive of habitation-related activities (Haun 1988:14). A second site was identified throughout the entire *mauka* parcel and consisted of buried pondfield sediments. Background research indicated that two fishponds had been in the area in the mid-1800s and the area also had been used to grow taro. Historic property designations were not assigned during the study and the deposits have subsequently been designated as SIHP # -02693.

3.3.7 Jensen (1989)

In August and September 1989, PHRI, conducted an AIS for the approximate 1,200-acre Lahaina Master Planned Project Site (Jensen 1989), which includes the current project area. Eleven new historic properties were identified as follows:

SIHP # 50-50-03-02478, agricultural terrace near Hāhākea Gulch;
SIHP # -02479, two agricultural terraces near Hāhākea Gulch;
SIHP # -02480, two contiguous walled enclosures near Hāhākea Gulch;
SIHP # -02481, two agricultural terraces near Hāhākea Gulch;
SIHP # -02482, agricultural terrace near Hāhākea Gulch;
SIHP # -02483, walled enclosure and eight segments of agricultural terraces on the south branch of Kahoma Stream;
SIHP # -02484, walled enclosure or L-shaped wall near the western end of the existing agricultural airstrip above Kahoma Stream Gulch;
SIHP # -02485, walled enclosure near the existing agricultural airstrip above Kahoma Stream Gulch;
SIHP # -02486, large formal cairn/marker and 13 mounds interpreted as probable graves/grave markers approximately 200 m southwest of Puu Laina;
SIHP # -02487, an approximate 270-meter-long historic agricultural access road west of Crater Reservoir; and
SIHP # -02488, walled enclosure east of Crater Reservoir.

In addition, the study reassessed components of a previously identified historic property, SIHP # -01203, Kahoma Complex, near the proposed Honoapi‘ilani Alternate C Road Alignment Corridor. SIHP # -01203 was initially assessed by Chiniago, Inc. (Barrera 1988). SIHP # -01203 includes agricultural terraces (Features A, C, and D), raised and faced habitation terrace (Feature B), and a small habitation cave (Feature E) located on the southern side of the north Kahoma

Stream branch. Features on the opposite side of the floodplain include agricultural terraces (Features F and H) and terracing with a possible habitation area associated (Feature G). Of the 12 historic properties, no further documentation was recommended for SIHP # -02487, historic agricultural access road. No historic properties were identified within the current project area.

3.3.8 Jensen (1990)

Between August and September 1989, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an AIS for the South Beach Mauka Development Site (TMK: [2] 4-4-006:001) (Jensen 1990). The study documented the seven sites, SIHP #s -02004 through -2010, previously identified by Hommon (1982) and two newly identified agricultural complexes, SIHP #s -02489 and -02490. The nine sites contained a total of 49 component features, including “agricultural terraces, small habitation terraces, walled enclosures, walls, a possible grave, a single footpath, and agricultural access roads” (Jensen 1990:14). All the sites were within the Hāhākea Gulch. The functions of the sites tentatively included “temporary habitation, possible habitation, possible burial, transportation, and prehistoric and contemporary agriculture” (Jensen 1990:14).

The two newly identified sites provided “limited evidence of temporary prehistoric habitation in conjunction with extensive agricultural activities involving both sides of the gulch” (Jensen 1990:22). Subsequently, the extent of the project area was changed by the client to exclude the two new site areas. Eight of the sites were considered significant solely for information content, while Site T-1 (SIHP # -02489), containing a possible burial, was considered significant for information content and potential cultural value. Vegetation clearing and further data collection were recommended at each historic property in order to determine preservation options.

3.3.9 Kennedy and Denham (1992)

On 21 February 1992, Archaeological Consultants of Hawaii, Inc. (ACH) conducted an AIS of 19.3 acres for a proposed baseball complex adjacent to the Lahaina Civic/Recreation Center (TMK: [2] 4-5-021:003) (Kennedy and Denham 1992). The study included pedestrian inspections of three survey areas: a former sugarcane field, an area along a low gulch on the northern boundary of the project area, and an in-use sugarcane field along Honoapi‘ilani Highway. A possible agricultural clearing mound was encountered. No historic properties were identified.

3.3.10 Fredericksen and Fredericksen (2003)

Between 2001 and 2002, Xamanek Researches conducted an AIS for the Ka‘anapali 2020 Project (TMKs: [2] 4-4-002, -004, -005, and -006) (Fredericksen and Fredericksen 2003). The project is a planned community development area consisting of 4,325 acres of land in Ka‘anapali and Honokowai. The survey was conducted within approximately 2,700 acres of the development area. Testing included 53 test units and 44 backhoe trenches. During the survey, 81 newly identified historic properties were recorded (SIHP #s -05241 through -05321). The features were largely interpreted as likely pre-Contact to post-Contact era. In addition, further documentation was provided for the Puukolii Cemetery (SIHP # -02893). The historic properties were summarized as follows:

> …single and multiple component dry land agricultural sites, and one large, wet valley agricultural site in Honokowai Gulch. These agricultural sites are composed

> primarily of terraces. Other identified site types included temporary and more permanent habitation areas, several petroglyph panel sites, possible ceremonial areas and shrines, possible burial features, and plantation era sites. (Fredericksen and Fredericksen 2003:Abstract)

Preservation was recommended for a majority of the historic properties, and archaeological monitoring was recommended within the proposed development areas.

3.3.11 Formolo et al. 2005

On 10 February 2005, Archaeological Services Hawaii, LLC (ASH) conducted an AIS of a 1200-ft-long corridor for a proposed Keawe Street roadway extension project (TMK: [2] 4-5-021:003, 022 pors.) (Formolo et al. 2005). The survey included the excavation of eight backhoe trenches approximately 2.5 to 3.0 m long and 0.7 m wide. Bedrock was encountered at shallow depths in the *mauka* portion of the project area. No cultural historic properties were identified. Due to the negative findings, the AIS study was deemed an archaeological assessment.

3.3.12 Paraso and Dega 2006

In January 2006, SCS conducted an AIS at the Hyatt Regency Maui Resort, located south of the current project area (TMKs: [2] 4-4-013:004, 005, 008). The investigation included 11 backhoe trenches distributed among three parcels of the property. The two *mauka* parcels contained both disturbed and intact deposits primarily of cinder and/or loam-based materials (Paraso and Dega 2006). A potential cultural layer was encountered at the northern end of the coastline parcel (Parcel 008), as determined based on the dark color of the sediment and known findings of human burials in the adjacent Maui Marriott Ocean Club property to the north. However, no cultural materials were encountered, and the potential cultural layer was observed in one trench outside of the proposed building footprint. The layer was not assigned a site number. No historic properties were encountered, and the study was deemed an archaeological assessment.

3.3.13 Lee-Greig et al. (2008)

In June and July 2008, CSH conducted an AIS for the realignment of a section of the Honoapi‘ilani Highway, Phase IA for the Lāhainā Bypass Project (Lee-Greig et al. 2008). In May 2007, over 400 agricultural terraces and associated irrigation channels were identified during a pre-construction walk through at the northern end of the Phase IA right-of-way. As the historic preservation review process had been completed, and Phase IA was to commence construction, the find was recorded as an inadvertent discovery, SIHP # 50-50-03-06277. an early historic agricultural complex of terraces and irrigation ditches. This complex was described as a “short watercourse field” by Mr. Humio Okimoto, a steam locomotive engineer for PiMCo. He explained that such fields were planted and harvested by hand and could not be tilled and harvested mechanically. Subsequently, an alternative realignment of the Phase IA section was proposed.

Fieldwork included a pedestrian survey of the approximate 17.5-acre area, 26 backhoe trenches throughout former cane fields, backhoe excavations within two agricultural push-piles, and geophysical testing (GPR) and mechanical exploration at the base of the northern embankment of Kahoma Gulch. The two push piles were designated as historic properties, SIHP #s -06492 and -06596, remnants of agricultural field improvement activity.

3.3.14 Hill et al. (2008); McCurdy and Hammatt (2009)

In June 2008, CSH conducted an AIS for the Lahainaluna High School cesspool conversion project (TMK: [2] 4-6-018:005, 007, 012) (Hill et al. 2008). A surface survey documented six newly identified post-Contact historic properties (SIHP #s 50-50-03-06494 through -06499), which defined six areas of concern/potential impact areas. SIHP #s -06494 and -06498 are irrigation ditches; SIHP #s -06495, -06497, and -06499 are retaining walls; and SIHP # -06496 is a terrace wall. The survey also documented the Hale Pa‘i o Lahainaluna (SIHP # -01596), which was constructed in 1937 and previously recorded by Ralston Nagata in 1966 and placed on the National Register of Historic Places in 1976.

Between May and September 2008, CSH conducted archaeological monitoring for the Lahainaluna High School cesspool conversion project (TMK: [2] 4-6-018:005, 007, 012) (McCurdy and Hammatt 2009). Two historic properties were identified, in addition to an assemblage of 220 artifacts. SIHP # -06608 is subsurface remnant of a historic garage. SIHP # -06609 is a subsurface remnant of a historic foundation/cellar. The results of monitoring describe the efforts that were taken to ensure no adverse effects to the previously identified historic properties and the potential impact areas.

3.3.15 Frey and Fredericksen (2015)

From April 2013 through December 2014, Xamanek Researches, LLC conducted archaeological monitoring for the Maui Hyatt Vacation Club Timeshare Project (TMK: [2] 4-4-013:088 Lot 66A) (Frey and Fredericksen 2015). The project area is along the coast, west of Honoapi‘ilani Highway and north of the current project area. During monitoring of building footings, a total of 11 burial finds were identified, which included six *in situ* burials within natural sand, four separate finds of isolated elements, and one previously disturbed human burial. The burials were designated as SIHP # 50-50-03-07720 and reinterred within a burial preserve area established in the northwestern corner of the Maui Hyatt Timeshare property. The human remains were wrapped in *lauhala* (*pandanus*; *Pandanus odoratissimus*) and placed in a concrete vault (4 ft wide, 6 ft long, and 3 ft deep), which was backfilled with clean sand. The closed vault was covered with topsoil in an area landscaped with native vegetation contained within a railing barrier.

Section 4 Results of Fieldwork

4.1 Pedestrian Inspection Results

On 4 October 2021, a 100%-coverage pedestrian inspection of the project area was accomplished through systematic sweeps spaced approximately 5 m apart. In general, surface visibility was fair as nearly the entire surface of the project area was overgrown with dry grasses and pockets of *koa haole* (*Leucaena leucocephala*).

CSH documented three new historic properties on the surface of the project area during the pedestrian inspection. These include SIHP # 50-50-03-08886, an asphalt-paved road and former plantation railroad corridor, SIHP # 50-50-03-08887, a portion of the existing Lāhainā, Kā‘anapali & Pacific (LK&P) railroad that was established as a tourist attraction in 1969, and SIHP # 50-50-03-08888, an asphalt-paved road that was used for historic commercial agricultural operations and formerly labeled as “Main Industrial Road”. A detailed description of each historic properties is provided in Section 5 (Historic Property Descriptions).

4.2 Geotechnical Boring Results

In September 2021, Geolabs, Inc. conducted a geotechnical survey within the project area. CSH did not observe the geotechnical excavations conducted in the project area, but has reviewed and analyzed the geotechnical report in order to characterize the stratigraphy and depth of soils within the project area.

Sixteen drilling locations were distributed throughout the *makai* half of the project area, west of SIHP # -08888. The test bore locations were designated as B-1 through B-12 and L-1 through L-4. The bores terminated between 2.13 and 8.53 m below surface (mbs) (between 7.00 and 28.00 ft). Geolabs collected five bulk samples, Bulk-1 through Bulk-5, from Test Bores B-1, B-3, B-7, B-11, and B-12 respectively. Overall, the stratigraphy within the project area appeared relatively uniform and consisted of an agricultural plow zone within alluvial sediment overlying relatively shallow basalt bedrock.

4.2.1 Test Bore 1 (B-1) & BULK-1

Test Bore 1 (B-1) is located near the northwest boundary of the project area in TMK: [2] 4-5-020. The boring terminated at 26.0 ft (7.92 mbs). Sample 1 was collected between 0.15 and 0.61 mbs and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 2 was collected between 0.61 and 1.82 mbs and consisted of grayish brown sandy clay with weathered basalt gravel. Samples 1 and 2 were interpreted by CSH as being representative of the agricultural plow zone. Samples 3–5 contained layers of natural basalt and bedrock.

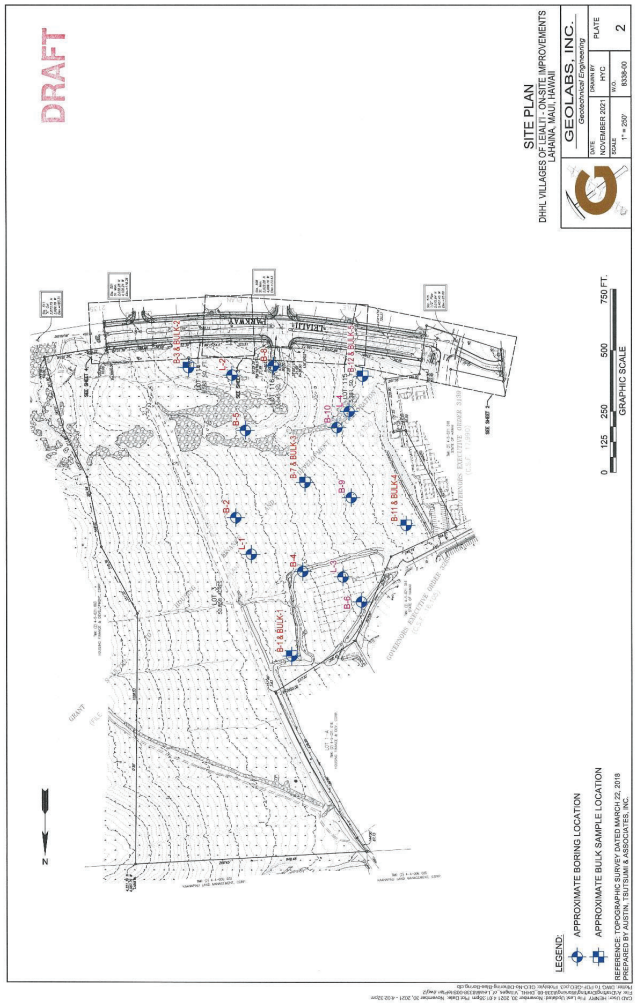

Figure 24. Geolabs, Inc. Draft Site Plan showing the approximate locations of borings and bulk samples

GEOLABS, INC.
Geotechnical Engineering

DHHL VILLAGES OF LEIALI'I - ON-SITE IMPROVEMENTS
LAHAINA, MAUI, HAWAII

DRAFT

Log of Boring 1

Approximate Ground Surface Elevation (feet): 113 *

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	16	71			8			CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), medium stiff to hard, dry (alluvium)
LL=43 PI=17	15				45			CL	Grayish brown **SANDY CLAY** with traces of weathered basalt gravel, hard, dry (residual soil)
	19	68			40/6" +10/0" Ref.		5		
UC= 5010 psi			62	23					Gray vugular **BASALT**, severely to moderately fractured, slightly to moderately weathered, medium hard to hard (basalt formation)
UC= 10350 psi			72	23			10		
									Gray and brown vesicular **BASALT**, moderately to closely fractured, moderately to highly weathered, very soft to soft (basalt formation)
			72	13			15		
	14				13		20		
			67	0					
					5/0"		25		Gray vugular **BASALT**, severely fractured, slightly weathered, medium hard (basalt formation)
							30		Boring terminated at 26 feet
							35		

* Elevations estimated from Topographic Survey dated March 22, 2018 prepared by Austin, Tsutsumi & Associates, Inc.

Date Started:	September 20, 2021	Water Level:	Not Encountered
Date Completed:	September 21, 2021		
Logged By:	Nick Mcclean	Drill Rig:	CME-45C TRUCK *(Energy Transfer Ratio = 78%)*
Total Depth:	26 feet	Drilling Method:	4" Solid-Stem Auger & PQ Coring
Work Order:	8338-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 1

BORING_LOG 8338-00.GPJ GEOLABS.GDT 12/29/21

Figure 25. Geolabs, Inc. log of B-1

4.2.2 Test Bore 2 (B-2)

Test Bore 2 (B-2) is located in the central portion of the project area in TMK: [2] 4-5-020. The boring terminated at 27.0 ft (8.22 mbs). Sample 1 was collected between 0.15 and 0.61 mbs and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 2 was collected between 0.61 and 0.92 mbs and consisted of mottled tannish gray sandy clay. Samples 1 and 2 were interpreted by CSH as being representative of the agricultural plow zone. Samples 3–6 contained layers of natural basalt and bedrock.

4.2.3 Test Bore 3 (B-3) & BULK-2

Test Bore 3 (B-3) is located in the southern portion of the project area, near Leiali‘i Parkway, in TMK: [2] 4-5-020. The boring terminated at 26.5 ft (8.08 mbs). Sample 1 was collected between 0.15 and 0.61 mbs and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 1 was interpreted by CSH as being representative of the agricultural plow zone. Samples 2–6 contained layers of natural basalt, basaltic silty gravel, and bedrock.

4.2.4 Test Bore 4 (B-4)

Test Bore 4 (B-4) is located in the central portion of the project area in TMK: [2] 4-5-020. The boring terminated at 26.0 ft (7.92 mbs). Sample 1 was collected between 0.15 and 0.30 mbs and consisted of reddish-brown sandy clay (alluvium). Sample 1 was interpreted by CSH as being representative of the agricultural plow zone. Samples 2–5 contained layers of natural basalt rocks or bedrock.

4.2.5 Test Bore 5 (B-5)

Test Bore 5 (B-5) is located in the southern portion of the project area in TMK: [2] 4-5-020. The boring terminated at 27.5 ft (8.38 mbs). Sample 1 was collected between 0.15 and 0.61 mbs and consisted of reddish-brown sandy clay alluvium. Sample 1 was interpreted by CSH as being representative of the agricultural plow zone. Samples 2–7 contained layers of natural basaltic silty sand, basaltic sandy gravel and basalt

4.2.6 Test Bore 6 (B-6)

Test Bore 6 (B-6) is located in the northwestern portion of the project area in TMK: [2] 4-5-020. The boring terminated at 25.0 ft (7.62 mbs). Sample 1 was collected between 0.15 and 0.46 mbs and consisted of reddish-brown sandy clay with some basalt cobbles and boulders (alluvium). Sample 2 was collected between 0.46 and 0.76 mbs and consisted of grayish brown with multi-color mottling sandy clay, with weathered basalt gravels. Sample 1 and 2 were interpreted by CSH as being representative of the agricultural plow zone. Samples 3 and 4 contained layers of natural basalt rocks or bedrock.

4.2.7 Test Bore 7 (B-7) & BULK-3

Test Bore 7 (B-7) is located in the central portion of the project area in TMK: [2] 4-5-020. The boring terminated at 25.5 ft (7.77 mbs). Sample 1 was collected between 0.15 and 0.76 mbs and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 1 was interpreted by CSH as being representative of agricultural plow zone. Samples 2–6 contained layers of natural basalt, basaltic sandy gravel, and bedrock.

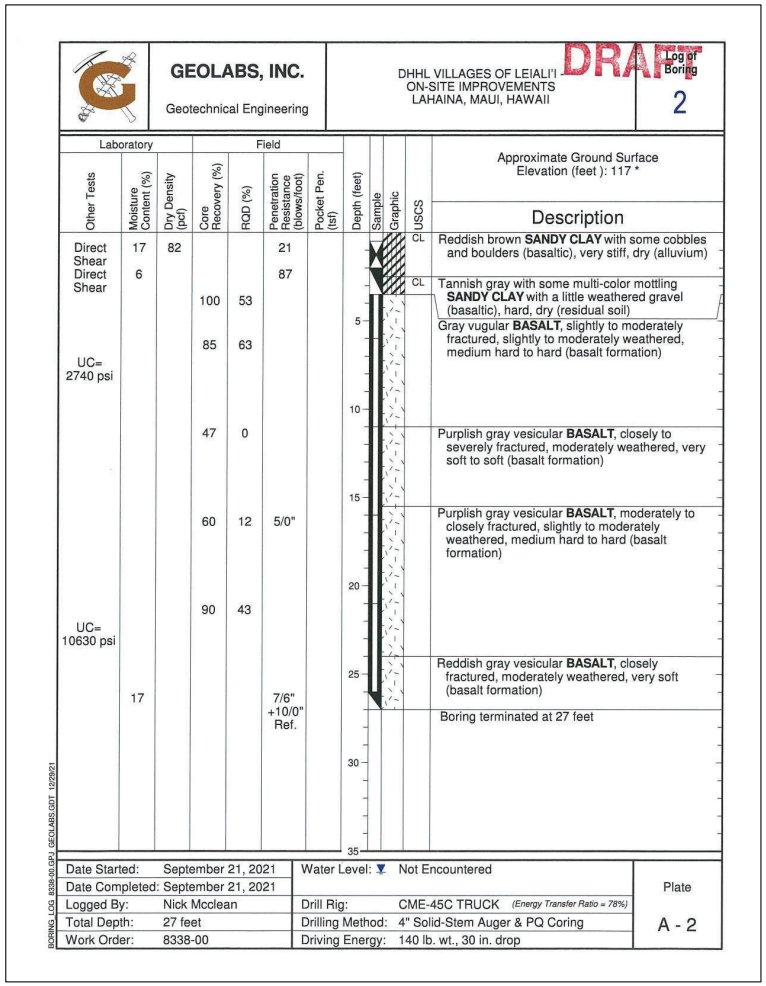

Figure 26. Geolabs, Inc. log of B-2

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Log of Boring 3

Approximate Ground Surface Elevation (feet): 113 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	15	89			52			CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), hard, dry (alluvium)
			93	22					Gray vugular **BASALT**, moderately to closely fractured, slightly to moderately weathered, medium hard to hard (basalt formation)
			97	0			5		Gray **BASALT**, closely fractured, slightly weathered, hard to very hard (basalt formation)
UC= 10260 psi UC= 2580 psi UC= 12140 psi			42	23			10		
	13		88	23	17/6" +10/0" Ref.		15	GM	Reddish gray **SILTY GRAVEL (BASALTIC)**, very dense, dry (clinker)
			82	50			20		Brownish gray vesicular **BASALT**, moderately fractured, slightly to moderately weathered, soft to medium hard (basalt formation)
					8/0"		25		Reddish gray vesicular **BASALT**, moderately fractured, moderately weathered, very soft to soft (basalt formation)
							30		Boring terminated at 26.5 feet
							35		

Date Started:	September 28, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 28, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	26.5 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 3
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

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Figure 27. Geolabs, Inc. log of B-3

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Log of Boring 4

Approximate Ground Surface Elevation (feet): 103 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	12	85	92	40	5/0"			CL	Reddish brown **SANDY CLAY**, hard, dry (alluvium)
UC= 5120 psi									Gray vugular **BASALT**, slightly fractured, slightly weathered, hard (basalt formation)
UC= 9010 psi			65	23			5		Purplish gray vesicular **BASALT**, moderately to closely fractured, slightly to moderately weathered, very soft to soft (basalt formation)
UC= 7330 psi			95	17			10		Gray vugular **BASALT**, moderately fractured, slightly weathered, hard (basalt formation)
			70	15			15		Purplish gray vesicular **BASALT**, moderately fractured, slightly to moderately weathered, medium hard (basalt formation)
			58	20			20		
							25		Boring terminated at 26 feet
							30		
							35		

Date Started:	September 22, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 22, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	26 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 4
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

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Figure 28. Geolabs, Inc. log of B-4

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Log of Boring 5

Approximate Ground Surface Elevation (feet): 96 *

Laboratory: Other Tests	Moisture Content (%)	Dry Density (pcf)	Field: Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
Sieve - #200 = 40.6%	14	83			46	1.0		CL	Reddish brown **SANDY CLAY**, hard, dry (alluvium)
	8				35/6" +10/0" Ref.			SM	Pinkish gray **SILTY SAND (BASALTIC)** with some gravel, medium dense to very dense, dry (weathered basalt)
			56	0					Gray vugular **BASALT**, closely fractured, moderately to highly weathered, medium hard (basalt formation)
			23	0	10/0" Ref.		5	GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dry (clinker)
			97	38	10/0" Ref.		10		Gray dense **BASALT**, slightly fractured, slightly weathered, hard to very hard (basalt formation)
UC= 17200 psi									
			93	55			15		
			47	13			20		Reddish gray vesicular **BASALT**, moderately fractured, moderately weathered, soft (basalt formation)
								GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, medium dense to dense, dry (clinker)
	20				30		25		
									Boring terminated at 27.5 feet
							30		
							35		

Date Started:	September 27, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 27, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	27.5 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 5
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

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Figure 29. Geolabs, Inc. log of B-5

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Log of Boring 6

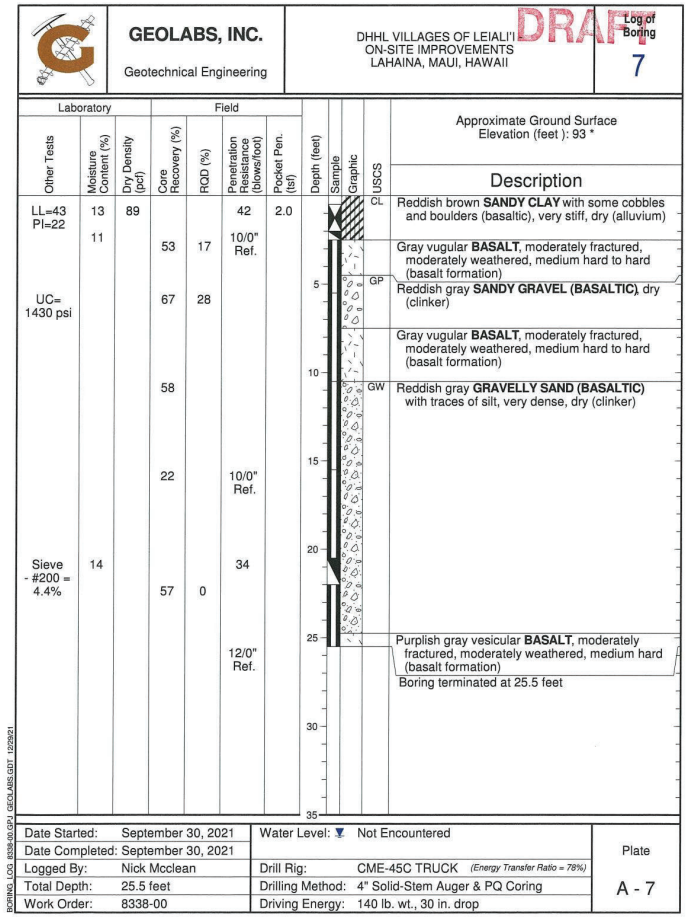
Approximate Ground Surface Elevation (feet): 87 *

Laboratory: Other Tests	Moisture Content (%)	Dry Density (pcf)	Field: Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
Direct Shear	17	87			72	1.5		CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), very stiff, dry (alluvium)
	10				10/0" Ref.			CL	Grayish brown with multi-color mottling **SANDY CLAY** with traces of weathered basalt gravel, hard, dry (residual soil)
			73	33					Gray vugular **BASALT**, moderately to closely fractured, moderately weathered, medium hard (basalt formation)
UC= 4310 psi							5		
			60	15					
UC= 5120 psi									
			37	17			10		
UC= 5190 psi	11				10/0" Ref.		15		grades to soft locally
			96	26					
			92	47			20		
									Reddish gray vesicular **BASALT**, slightly fractured, slightly weathered, very soft (basalt formation)
							25		Boring terminated at 25 feet
							30		
							35		

Date Started:	September 20, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 20, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	25 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 6
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG_8338-00.GPJ GEOLABS.GDT 12/29/21

Figure 30. Geolabs, Inc. log of B-6



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Log of Boring 7

Approximate Ground Surface Elevation (feet): 93 *

Other Tests (Laboratory)	Moisture Content (%) (Laboratory)	Dry Density (pcf) (Laboratory)	Core Recovery (%) (Field)	RQD (%) (Field)	Penetration Resistance (blows/foot) (Field)	Pocket Pen. (tsf) (Field)	Depth (feet)	USCS	Description
LL=43 PI=22	13	89			42	2.0		CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), very stiff, dry (alluvium)
	11		53	17	10/0" Ref.				Gray vugular **BASALT**, moderately fractured, moderately weathered, medium hard to hard (basalt formation)
UC= 1430 psi			67	28			5	GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dry (clinker)
									Gray vugular **BASALT**, moderately fractured, moderately weathered, medium hard to hard (basalt formation)
			58				10	GW	Reddish gray **GRAVELLY SAND (BASALTIC)** with traces of silt, very dense, dry (clinker)
			22		10/0" Ref.		15		
Sieve - #200 = 4.4%	14		57	0	34		20		
					12/0" Ref.		25		Purplish gray vesicular **BASALT**, moderately fractured, moderately weathered, medium hard (basalt formation)
									Boring terminated at 25.5 feet
							30		
							35		

Date Started:	September 30, 2021	Water Level:	Not Encountered
Date Completed:	September 30, 2021		
Logged By:	Nick Mcclean	Drill Rig:	CME-45C TRUCK (Energy Transfer Ratio = 78%)
Total Depth:	25.5 feet	Drilling Method:	4" Solid-Stem Auger & PQ Coring
Work Order:	8338-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 7

BORING_LOG_8338-00.GPJ GEOLABS.GDT 12/29/21

Figure 31. Geolabs, Inc. log of B-7

4.2.8 Test Bore 8 (B-8)

Test Bore 8 (B-8) is located in the southern portion of the project area, near Leiali‘i Parkway, in TMK: [2] 4-5-020. The boring terminated at 26.0 ft (7.92 mbs). Sample 1 was collected between 0 and 0.31 mbs and consisted of reddish-brown sandy clay alluvium. Sample 1 was interpreted by CSH as being representative of the agricultural plow zone. Samples 2–7 contained layers of natural basaltic sandy gravel and bedrock.

4.2.9 Test Bore 9 (B-9)

Test Bore 9 (B-9) is located in the western half of the project area in TMK: [2] 4-5-020. The boring terminated at 25.5 ft (7.77 mbs). Sample 1 was collected between 0.15 and 0.61 mbs and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 1 was interpreted by CSH as being representative of the agricultural plow zone. Samples 2–5 contained layers of natural basalt, basaltic sandy gravel and bedrock.

4.2.10 Test Bore 10 (B-10)

Test Bore 10 (B-10) is located in the southwestern portion of the project area in TMK: [2] 4-5-020. The boring terminated at 26.0 ft (7.92 mbs). Sample 1 was collected between 0.15 and 0.72 mbs and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 1 was interpreted by CSH as being representative of the agricultural plow zone. Samples 2–4 contained layers of natural basalt or bedrock.

4.2.11 Test Bore 11 (B-11) & BULK-4

Test Bore 11 (B-11) is located in the western portion of the project area in TMK: [2] 4-5-020. The boring terminated at 26.5 ft (8.08 mbs). Sample 1 was collected between 0.15 and 1.67 mbs and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 1 was interpreted by CSH as being representative of the agricultural plow zone. Samples 2–10 contained layers of natural basalt, basaltic sandy gravel, and bedrock.

4.2.12 Test Bore 12 (B-12) & BULK-5

Test Bore 12 (B-12) is located near the southwestern corner of the project area, near Leiali‘i Parkway, in TMK: [2] 4-5-020. The boring terminated at 28.0 ft (8.53 m). Sample 1 was collected between 0.15 and 0.61 m and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 2 was collected between 0.61 and 0.91 m and consisted of grayish brown sandy clay with weathered gravel. Samples 1 and 2 were interpreted by CSH as being representative of the agricultural plow zone. Samples 3–6 contained layers of natural basalt rocks or bedrock.

4.2.13 L-1

Test L-1 is located in the central portion of the project area in TMK: [2] 4-5-020. The boring terminated at 8.0 ft (2.44 m). Sample 1 was collected between 0.15 and 0.31 m and consisted of reddish-brown sandy clay alluvium. Sample 1 were interpreted by CSH as being representative of the agricultural plow zone. Sample 2 contained of natural basalt and bedrock.

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Log of Boring 8

Approximate Ground Surface Elevation (feet): 88 *

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
			60	27	10/0" Ref.			CL	Reddish brown **SANDY CLAY**, hard, dry (alluvium)
									Gray vesicular **BASALT**, moderately to severely fractured, moderately weathered, medium hard (basalt formation)
								GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dry (clinker)
UC= 5880 psi			95	12			5		Gray vugular **BASALT**, moderately to closely fractured, moderately weathered, hard (basalt formation)
									Gray dense **BASALT**, moderately to severely fractured, moderately weathered, hard (basalt formation)
UC= 14100 psi			58	45			10		
							15		Reddish gray vesicular **BASALT**, moderately fractured, slightly weathered, soft (basalt formation)
			63	0					
			97	55			20		
							25		Gray vugular **BASALT**, massive to slightly fractured, slightly weathered, hard (basalt formation)
									Boring terminated at 26 feet
							30		
							35		

Date Started:	September 28, 2021	Water Level:	Not Encountered
Date Completed:	September 28, 2021		
Logged By:	Nick Mcclean	Drill Rig:	CME-45C TRUCK (Energy Transfer Ratio = 78%)
Total Depth:	26 feet	Drilling Method:	4" Solid-Stem Auger & PQ Coring
Work Order:	8338-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 8

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Figure 32. Geolabs, Inc. log of B-8

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Log of Boring 9

Approximate Ground Surface Elevation (feet): 78 *

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
Direct Shear	19	72			36	0.3		CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), very stiff, dry (alluvium)
			29	0					Gray vugular **BASALT**, moderately fractured, slightly to moderately weathered, medium hard (basalt formation)
							5	GP-GM	Reddish gray **SANDY GRAVEL (BASALTIC)** with a little silt, dense to very dense, dry (clinker)
Sieve - #200 = 5.0%	14				31				
			38						
	10		54	23	10/0" Ref.		10		
									Gray vesicular **BASALT**, slightly to moderately fractured, slightly weathered, hard (basalt formation)
			80	20			15		
UC= 4600 psi									
			63	27			20		
					10/0" Ref.		25	GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dense to very dense, dry (clinker)
									Boring terminated at 25.5 feet
							30		
							35		

Date Started:	September 30, 2021	Water Level:	Not Encountered
Date Completed:	September 30, 2021		
Logged By:	Nick Mcclean	Drill Rig:	CME-45C TRUCK (Energy Transfer Ratio = 78%)
Total Depth:	25.5 feet	Drilling Method:	4" Solid-Stem Auger & PQ Coring
Work Order:	8338-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 9

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Figure 33. Geolabs, Inc. log of B-9

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Log of Boring 10

Approximate Ground Surface Elevation (feet): 72 *

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
LL=39 PI=18	14	82			30	0.3		CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), very stiff, dry (alluvium)
			71	0					Gray vugular **BASALT**, closely to severely fractured, moderately to highly weathered, medium hard (basalt formation)
			50	0	10/0" Ref.		5		
			40	13	10/0" Ref.		10		
	27				73		15		Reddish gray vesicular **BASALT**, moderately to severely fractured, slightly to moderately weathered, very soft to soft (basalt formation)
			81	0					
			83	50			20		Gray vugular **BASALT**, massive to moderately fractured, slightly weathered, hard (basalt formation)
							25		Boring terminated at 26 feet
							30		
							35		

Date Started:	September 29, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 29, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	26 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 10
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

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Figure 34. Geolabs, Inc. log of B-10

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Log of Boring 11

Approximate Ground Surface Elevation (feet): 63 *

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	15	84			21	0.3		CH	Reddish brown **SILTY CLAY** with some cobbles and boulders (basaltic), stiff to hard, dry (alluvium)
LL=60 PI=31	19				39				
	19	80	50	0	10/0" Ref.		5		Reddish gray vesicular **BASALT**, moderately to closely fractured, moderately weathered, soft (basalt formation)
UC= 12030 psi			78	33					Gray vugular **BASALT**, slightly fractured, slightly weathered, hard (basalt formation)
							10	GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dry (clinker)
UC= 7480 psi			87	31					Gray **BASALT**, slightly fractured, slightly weathered, hard (basalt formation)
							15		Reddish gray vesicular **BASALT**, slightly fractured, slightly to moderately weathered, soft (basalt formation)
			80	38					
							20	GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dry (clinker)
									Gray vesicular **BASALT**, slightly fractured, slightly weathered, hard (basalt formation)
			60	13					Gray vugular **BASALT**, slightly fractured, slightly weathered, hard (basalt formation)
							25		Reddish gray vesicular **BASALT**, closely to severely fractured, moderately weathered, very soft to soft (basalt formation)
									Boring terminated at 26.5 feet
							30		
							35		

Date Started:	September 29, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 29, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	26.5 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 11
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

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Figure 35. Geolabs, Inc. log of B-11

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Log of Boring 12

Approximate Ground Surface Elevation (feet): 57 *

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
Direct Shear LL=41 PI=21	15	90			62	2.5		CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), hard, dry (alluvium)
	9				36/6" +10/0" Ref.			CL	Grayish brown **SANDY CLAY** with a little weathered basalt gravel, hard, dry (residual soil)
			90	0					Gray vugular **BASALT**, moderately to closely fractured, moderately weathered, medium hard (basalt formation)
			95	95			5		Gray **BASALT**, slightly fractured to massive, unweathered to slightly weathered, hard to very hard (basalt formation)
UC= 18850 psi							10		
UC= 15400 psi			75	28					
			82	23			15		Reddish gray vesicular **BASALT**, moderately to severely fractured, moderately weathered, very soft to soft (basalt formation)
			43	0			20		
							25		Tannish brown vesicular **BASALT**, severely fractured, highly to extremely weathered, very soft (basalt formation)
	65				28				
							30		Boring terminated at 28 feet
							35		

Date Started:	September 24, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 27, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	28 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 12
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

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Figure 36. Geolabs, Inc. log of B-12

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Log of Boring L-1

Approximate Ground Surface Elevation (feet): 117 *

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	14	93						CL	Reddish brown **SANDY CLAY**, hard, dry (alluvium)
			78	11	5/0"				Gray vugular **BASALT**, closely fractured, moderately weathered, medium hard to hard (basalt formation)
			97	0	5/0"		5		
									Boring terminated at 8 feet
							10		
							15		
							20		
							25		
							30		
							35		

Date Started:	September 22, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 22, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	8 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 13
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG_8338-00.GPJ GEOLABS.GDT 12/29/21

Figure 37. Geolabs, Inc. log of L-1

4.2.14 L-2

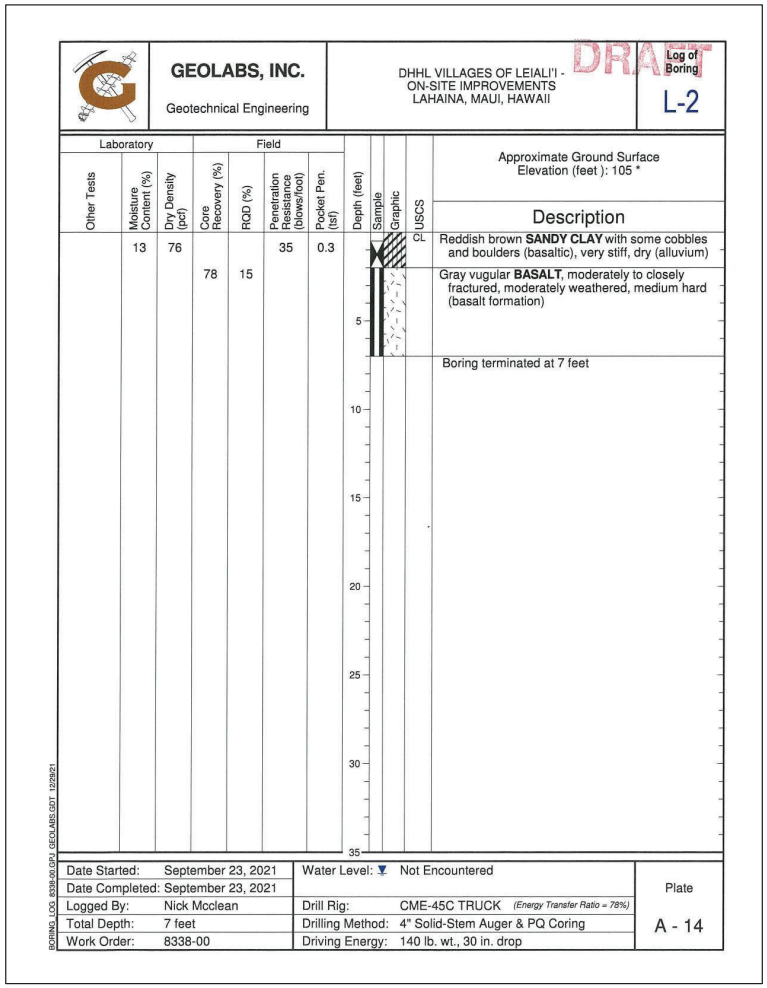
Test L-2 is located in the southern portion of the project area, near Leiali‘i Parkway, in TMK: [2] 4-5-020. The boring terminated at 7.0 ft (2.13 m). Sample 1 was collected between 0.15 and 0.61 m and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 1 were interpreted by CSH as being representative of the agricultural plow zone. Sample 2 contained natural basalt and bedrock.

4.2.15 L-3

Test L-3 is located in the northwestern portion of the project area, in TMK: [2] 4-5-020. The boring terminated at 7.0 ft (2.13 m). Sample 1 was collected between 0.15 and 0.61 m and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 2 was collected between 0.61 and 0.76 m and consisted of tannish brown sandy clay with a little weathered basalt gravel. Samples 1 and 2 were interpreted by CSH as being representative of the agricultural plow zone. Samples 3 and 4 contained layers of natural basalt and bedrock.

4.2.16 L-4

Test L-4 is located in the southwestern portion of the project area in TMK: [2] 4-5-020. The boring terminated at 7.0 ft (2.13 m). Sample 1 was collected between 0.15 and 0.61 m and consisted of reddish-brown sandy clay alluvium with some basalt cobbles and boulders. Sample 1 were interpreted by CSH as being representative of the agricultural plow zone. Samples 2 and 3 contained layers of natural basalt and bedrock.



GEOLABS, INC.
Geotechnical Engineering

DHHL VILLAGES OF LEIALI'I - ON-SITE IMPROVEMENTS
LAHAINA, MAUI, HAWAII

DRAFT

Log of Boring
L-2

Approximate Ground Surface Elevation (feet): 105 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Description
	13	76			35	0.3				CL	Reddish brown **SANDY CLAY** with some cobbles and boulders (basaltic), very stiff, dry (alluvium)
			78	15			5				Gray vugular **BASALT**, moderately to closely fractured, moderately weathered, medium hard (basalt formation)
											Boring terminated at 7 feet
							10				
							15				
							20				
							25				
							30				
							35				

Date Started:	September 23, 2021	Water Level: Not Encountered	Plate
Date Completed:	September 23, 2021		
Logged By:	Nick Mcclean	Drill Rig: CME-45C TRUCK *(Energy Transfer Ratio = 78%)*	
Total Depth:	7 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	A - 14
Work Order:	8338-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING_LOG 8338-00.GPJ GEOLABS.GDT 12/29/21

Figure 38. Geolabs, Inc. log of L-2

GEOLABS, INC.
Geotechnical Engineering

DHHL VILLAGES OF LEIALI'I - ON-SITE IMPROVEMENTS
LAHAINA, MAUI, HAWAII

DRAFT

Log of Boring 8

Approximate Ground Surface Elevation (feet): 88 *

Laboratory: Other Tests	Laboratory: Moisture Content (%)	Laboratory: Dry Density (pcf)	Field: Core Recovery (%)	Field: RQD (%)	Field: Penetration Resistance (blows/foot)	Field: Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Description
										CL	Reddish brown **SANDY CLAY**, hard, dry (alluvium)
			60	27	10/0" Ref.						Gray vesicular **BASALT**, moderately to severely fractured, moderately weathered, medium hard (basalt formation)
										GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dry (clinker)
UC= 5880 psi			95	12			5				Gray vugular **BASALT**, moderately to closely fractured, moderately weathered, hard (basalt formation)
							10				Gray dense **BASALT**, moderately to severely fractured, moderately weathered, hard (basalt formation)
UC= 14100 psi			58	45							
			63	0			15				Reddish gray vesicular **BASALT**, moderately fractured, slightly weathered, soft (basalt formation)
			97	55			20				
							25				Gray vugular **BASALT**, massive to slightly fractured, slightly weathered, hard (basalt formation)
											Boring terminated at 26 feet
							30				
							35				

Date Started:	September 28, 2021	Water Level:	Not Encountered
Date Completed:	September 28, 2021		
Logged By:	Nick Mcclean	Drill Rig:	CME-45C TRUCK *(Energy Transfer Ratio = 78%)*
Total Depth:	26 feet	Drilling Method:	4" Solid-Stem Auger & PQ Coring
Work Order:	8338-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 8

BORING LOG 8338-00.GPJ GEOLABS.GDT 12/29/21

Figure 39. Geolabs, Inc. log of L-3

GEOLABS, INC.
Geotechnical Engineering

DHHL VILLAGES OF LEIALI'I - ON-SITE IMPROVEMENTS
LAHAINA, MAUI, HAWAII

DRAFT

Log of Boring 8

Approximate Ground Surface Elevation (feet): 88 *

Laboratory: Other Tests	Laboratory: Moisture Content (%)	Laboratory: Dry Density (pcf)	Field: Core Recovery (%)	Field: RQD (%)	Field: Penetration Resistance (blows/foot)	Field: Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Description
										CL	Reddish brown **SANDY CLAY**, hard, dry (alluvium)
			60	27	10/0" Ref.						Gray vesicular **BASALT**, moderately to severely fractured, moderately weathered, medium hard (basalt formation)
										GP	Reddish gray **SANDY GRAVEL (BASALTIC)**, dry (clinker)
UC= 5880 psi			95	12			5				Gray vugular **BASALT**, moderately to closely fractured, moderately weathered, hard (basalt formation)
							10				Gray dense **BASALT**, moderately to severely fractured, moderately weathered, hard (basalt formation)
UC= 14100 psi			58	45							
			63	0			15				Reddish gray vesicular **BASALT**, moderately fractured, slightly weathered, soft (basalt formation)
			97	55			20				
							25				Gray vugular **BASALT**, massive to slightly fractured, slightly weathered, hard (basalt formation)
											Boring terminated at 26 feet
							30				
							35				

Date Started:	September 28, 2021	Water Level:	Not Encountered
Date Completed:	September 28, 2021		
Logged By:	Nick Mcclean	Drill Rig:	CME-45C TRUCK *(Energy Transfer Ratio = 78%)*
Total Depth:	26 feet	Drilling Method:	4" Solid-Stem Auger & PQ Coring
Work Order:	8338-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 8

BORING LOG 8338-00.GPJ GEOLABS.GDT 12/29/21

Figure 40. Geolabs, Inc. log of L-4

Section 5 Historic Property Descriptions

Three historic properties (SIHP #s 50-50-03-08886, -08887, and -08888) were newly identified during this AIS on the surface of the project area (Table 4, Figure 41, and Figure 42). These historic properties include two roads (one previously used as a railroad corridor) and a historic through modern railroad that functioned as part of a broader transportation circulation network throughout Wahikuli Ahupua‘a.

A review of background research and historic maps indicates that the earliest documented transportation through Wahikuli Ahupua‘a was isolated to a coastal trail in the 1800s (see Figure 9), which was improved into a coastal road in the early 1900s (see Figure 12), and eventually developed into the modern alignment of Honoapi‘ilani Highway. Smaller *mauka* to *makai* trails likely connected to the coastal trail. No evidence of pre-Contact or historic coastal transportation were identified within the current project area.

By 1913, a railroad corridor (SIHP # -08886) was constructed within the project area to transport sugarcane through the Pioneer Mill commercial agricultural field system to the mill for processing (see Figure 14). Rail transportation continued as the primary means of hauling sugarcane until being overtaken by the advent of tournahaulers and road transportation circa 1950. By 1956, the railroad in the project area had been removed and replaced by an industrial road (also SIHP # -08886) (see Figure 17). A second industrial road (SIHP # -08888) was added by 1964, likely to provide further field access and create a loop for tournahauler and commercial traffic through the field system (see Figure 18).

In an effort to resurrect and memorialize the nostalgia of railroad transportation through the region, A.W. McKelvy created the LK&P railroad (SIHP # -08887) in 1969 as a tourist attraction that was designed to mimic a historic “narrow-gauge” plantation railroad. Steam locomotives and passenger cars were also built to resemble trains from the 1880s and to carry passengers on a six-mile journey beginning at the railroad station at Kelawea (close to the former site of the original Pioneer Mill Company sugar mill) and ending within the current project area near the Honoapi‘ilani Highway and Kaniau Road intersection. It ran daily passenger service from Lāhainā to Pu‘ukoli‘i for over 30 years (Sugar Cane Train Maui 2014). This track was still in use as a tourist attraction for the “Sugar Cane Train” through the 2019 holiday season.

Table 4. Historic properties identified within the current project area

SIHP #	Formal Type	Function	Temporal Association
50-50-03-08886	Road; Former Railroad Corridor	Transportation	Post-Contact (plantation)
50-50-03-08887	Railroad	Transportation	Post-Contact (1969-present)
50-50-03-08888	Road	Transportation	Post-Contact (plantation)

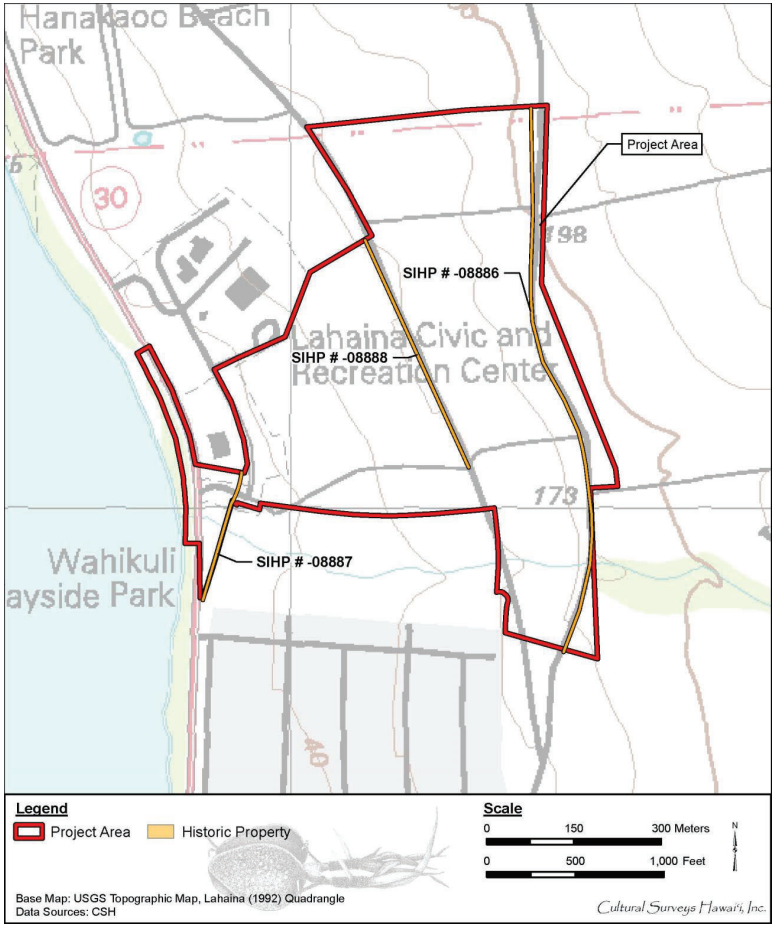


Figure 41. Portion of the 1992 Lahaina USGS 7.5-minute topographic quadrangle showing the historic property locations within the project area (U.S. Geological Survey 1992)

Figure 42. 2019 aerial image of the project area showing the historic property locations (Esri 2019)

5.1 SIHP # 50-50-03-08886

FORMAL TYPE:	Road
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	Post-Contact (plantation)
TEST EXCAVATIONS:	None
TAX MAP KEY:	[2] 4-5-021
LAND JURISDICTION:	DHHL
PREVIOUS DOCUMENTATION:	None

SIHP # 50-50-03-08886 is an asphalt-paved road (Figure 43 and Figure 44) that traverses the entire length, north to south, along the eastern side of the project area. SIHP # -08886 is approximately 900 m long within the project area and continues beyond the northern and southern boundaries. The road is approximately 11.5 m wide. The road does not appear to be in use for public vehicular traffic but is in usable condition. No other improvements (curbing, culverts, etc.) were observed along the road within the project area.

A review of historic maps indicates that the SIHP # -08886 was previously used as a plantation railroad corridor. The earliest depiction of the railroad corridor is on the 1913 Wall map of Wahikuli (see Figure 11). The railroad corridor is also depicted on the 1930 U.S. Geological Survey topographic quadrangle (see Figure 13). It is unclear in the 1949 aerial image of the project area if the railroad remains intact or if the track has been removed to allow for vehicular road access (see Figure 16). However, by 1956, the railroad has been removed and replaced by the current road, as depicted in the 1956 Lahaina USGS topographic quadrangle showing the project area (see Figure 17). The road later appears in a 1964 registered map of Wahikuli labeled as a “Main Industrial Road (60 ft. wide)” (see Figure 18). Based on available information, SIHP # -08886 is more than 50 years old and therefore is considered a historic property.

While no improvements or contributing features were observed along the portion of SIHP # -08886 within the project area, data was collected on the origin and location of the transportation corridor, its connection to the broader system of transportation of commercial sugarcane throughout the region, the design of the transportation system that provided access between commercial agricultural fields and the mill, and the changes that occurred over the historic era in Wahikuli Ahupua‘a from railroad transportation to road transportation. If excavation or ground disturbance is anticipated within the historic property, then there is a potential to gather additional data on subsurface remnants of the former railroad corridor or any previous land use that may have been obscured by subsequent development.

SIHP # -08886 is assessed as significant pursuant to HAR §13-13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and workmanship, and has provided information regarding historic land use of the project area.

Figure 43. General view of SIHP # -08886, cane haul road, view to north

Figure 44. General view of SIHP # -08886, cane haul road, showing the unimproved condition of the paving, view to east

5.2 **SIHP # 50-50-03-08887**

FORMAL TYPE:	Railroad
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	Post-Contact (1969-present)
TEST EXCAVATIONS:	None
TAX MAP KEY:	[2] 4-5-021
LAND JURISDICTION:	DHHL
PREVIOUS DOCUMENTATION:	None

SIHP # 50-50-03-08887 is defined as the southernmost portion of the existing Lāhainā, Kā‘anapali & Pacific (LK&P) railroad that is located along the western (*makai*) edge of the current project area. Within the project area, it is approximately 182.0 m long and 2.0 m wide. The railroad consists of two metal rails directly overlying the ground surface, which was a common design for the plantation railways, rather than being fastened to wooden sleeper beams over gravel ballast.

The LK&P railroad was created in 1969 by A.W. McKelvy and the Makai Corporation as a tourist attraction that was designed to mimic a historic “narrow-gauge” plantation railroad. Steam locomotives and passenger cars were also built to resemble trains from the 1880s and to carry passengers on a six-mile journey beginning at the railroad station at Kelawea (close to the former site of the original Pioneer Mill Company sugar mill) and ending within the current project area near the Honoapi‘ilani Highway and Kaniau Road intersection. It ran daily passenger service from Lāhainā to Pu‘ukoli‘i for over 30 years (Sugar Cane Train Maui 2014). This track was still in use as a tourist attraction for the “Sugar Cane Train” through the 2019 holiday season.

The portion of the LK&P railroad that is located within the current project area does not follow the historic alignment of the former Pioneer Mill Company railroad, which was located within the current right-of-way of Honoapi‘ilani Highway. Based on available information, SIHP # -08887 is more than 50 years old and therefore is considered a historic property.

Documentation of SIHP # -08887 as part of the current AIS has confirmed the age and origin of the railroad as a tourist attraction in 1969, the location of the railroad within the current project area, the design and materials used to construct the railroad, and how the railroad serves as a modern-day model of the extensive plantation railroad network that once extended throughout the region. If excavation or ground disturbance is anticipated within the historic property, then there is a potential to gather additional data on the subsurface structure and components of the railroad or any previous land use that may have been obscured by its development.

SIHP # -08887 is assessed as significant pursuant to HAR §13-13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, setting, materials, and workmanship, and has provided information regarding historic land use of the project area.

Figure 45. General view of SIHP # -08887, plantation railway, view to south

Figure 46. Close-up of SIHP # -08887, plantation railway, view to southeast

5.3 SIHP # 50-50-03-08888

FORMAL TYPE:	Road
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	Post-Contact (plantation)
TEST EXCAVATIONS:	None
TAX MAP KEY:	[2] 4-5-021
LAND JURISDICTION:	DHHL
PREVIOUS DOCUMENTATION:	None

SIHP # 50-50-03-08888 is an asphalt-paved road that traverses northwest to southeast in the central portion of the project area (Figure 47 and Figure 48). SIHP # -08888 is approximately 412.5 m long and 7.0 m wide within the project area. The northern portion of SIHP # -08888 continues beyond the northern boundary of the project area, while the opposite end stops short of the southern boundary. The road does not appear to be in use for public vehicular traffic but is in usable condition. No other improvements (curbing, culverts, etc.) were observed along the road within the project area.

The road corridor is not depicted on the 1956 Lahaina USGS topographic quadrangle (see Figure 17), but it later appears on a 1964 registered map of Wahikuli (see Figure 18) labeled as a “Main Industrial Road (60 ft. wide).” Based on available information, SIHP # -08888 is more than 50 years old and therefore is considered a historic property.

While no improvements or contributing features were observed along the portion of SIHP # -08888 within the project area, data was collected on the origin and location of the transportation corridor, its connection to the broader system of transportation of commercial sugarcane throughout the region, the design of the transportation system that provided access between commercial agricultural fields and the mill, and the changes that occurred over the historic era in Wahikuli Ahupua‘a from railroad transportation to road transportation. If excavation or ground disturbance is anticipated within the historic property, then there is a potential to gather additional data on the subsurface structure and components of the historic road or any previous land use that may have been obscured by subsequent development.

SIHP # -08888 is assessed as significant pursuant to HAR §13-13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and workmanship, and has provided information regarding historic land use of the project area.

Figure 47. General view of SIHP # -08888, cane haul road, view to south

Figure 48. General view of SIHP # -08888, cane haul road, view to north

Section 6 Significance Assessments

Historic property significance is evaluated and assessed based on the five State of Hawai‘i historic property significance criteria. To be considered significant, a historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and/or association and meet one or more of the following broad cultural/historic significance criteria in accordance with HAR §13-13-275-6:

a. Be associated with events that have made an important contribution to the broad patterns of our history;

b. Be associated with the lives of persons important in our past;

c. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;

d. Have yielded, or is likely to yield, information important for research on prehistory or history; or

e. Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

Three new historic properties were identified within the current project area. Table 5 lists the historic properties along with their significance/eligibility assessments and mitigation recommendations. These significance recommendations are included in this AIS for the review and concurrence of the SHPD.

SIHP # 50-50-03-08886 is an asphalt-paved road and former plantation railroad corridor. It is assessed as significant pursuant to HAR §13-13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and workmanship, and has provided information regarding historic land use of the project area.

SIHP # 50-50-03-08887 is a portion of the existing Lāhainā, Kā‘anapali & Pacific (LK&P) railroad that was established as a tourist attraction in 1969. It is assessed as significant pursuant to HAR §13-13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, setting, materials, and workmanship, and has provided information regarding historic land use of the project area.

SIHP # 50-50-03-08888 is an asphalt-paved road that was used for historic commercial agricultural operations and formerly labeled as “Main Industrial Road”. It is assessed as significant pursuant to HAR §13-13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and workmanship, and has provided information regarding historic land use of the project area.

Table 5. Archaeological Historic Property Integrity, Significance, and Mitigation Recommendations

SIHP #	Test Excavation	Formal Type/ Description	Integrity						Significance	Mitigation Recommendation
			Location	Design	Setting	Materials	Workmanship	Feeling	Association	
50-50-03-08886	None	Road; Former Railroad Corridor	Y	Y	N	Y	Y	N	N	d	Archaeological monitoring
50-50-03-08887	None	Railroad	Y	Y	Y	Y	Y	N	N	d	Archaeological monitoring
50-50-03-08888	None	Road	Y	Y	N	Y	Y	N	N	d	Archaeological monitoring

Section 7 Project Effect and Mitigation Recommendations

7.1 Project Effect

Three significant historic properties, SIHP #s 50-50-03-08886, -08887, and -08888, have been identified within the current project area. These historic properties will be impacted by project-related ground disturbance. In accordance with HAR §13-13-275-7, the effect recommendation for this project is "effect, with proposed mitigation commitments."

7.2 Mitigation Recommendations

7.2.1 Archaeological Monitoring

As described in HAR §13-13-279-3, "archaeological monitoring may be an identification, mitigation, or post-mitigation contingency measure. Monitoring shall entail the archaeological observation of, and possible intervention with, on-going activities which may adversely affect historic properties."

SIHP # -08886, an asphalt paved road and former railroad corridor, SIHP # -08887, a portion of an operational tourist railroad, and SIHP # -08888, an asphalt paved industrial road, have provided information important to research on historic land use of the project area. Archaeological monitoring is recommended for project-related ground disturbance within the boundaries of these three historic properties in order to provide an opportunity to gather additional data on the subsurface structure of the historic properties. The provisions and objectives of archaeological monitoring will be addressed within an archaeological monitoring plan that will be prepared for the review and acceptance of the SHPD prior to any project-related ground disturbance.

Section 8 Summary and Interpretation

At the request of Munekiyo Hiraga, CSH has prepared this AIS for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui Island, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway ROW. CSH previously conducted an LRFI that included a 100% pedestrian inspection of the project area, GPS data collection, written/photographic documentation, and background research that focused on documentation of previous land use and previous archaeological studies. The current AIS designates the surface features initially documented during the LRFI as historic properties SIHP #s 50-50-03-08886, -08887, -08888. The current AIS also includes an assessment of the Geolabs, Inc. logs of soil test bores collected in September 2021. CSH was not present during the geotechnical boring or collection of samples.

The fertile and resource-rich lower coastal plain of Lāhainā was home to high ranking *ali‘i* prior to Western contact, and it was the seat of government for the Kingdom of Hawai‘i following the unification of seven of the eight major Hawaiian Islands in 1791. The abundant resources and *ali‘i* residential compounds show a rather large pre-Contact and post-Contact population along the lower reaches of the *kalana* of Lāhainā. Just as important as the coastal resources, the well-watered stream valleys also provided a continuous water source for successful agricultural pursuits from the headwaters to the seaward mouth of the streams. Such large gulches are present to the north and south of the current project area.

The traditional settlement pattern would include both temporary and permanent habitation and intensive agricultural cultivation along the slopes, within the stream valleys, and along the coastal plain. The archaeological features likely to identify in these types of land would have included habitation terraces, enclosures and platforms, cultural material deposits, fishpond remnants, ceremonial structure and fishing shrines, agricultural terraces, agricultural mounds and traditional water control features (Connolly 1974; Hammatt 1978; Jensen 1989). Surface indications of the above activities have likely been destroyed or modified during the major land clearing and cultivation activities of the sugar industry, subsurface deposits associated with pre-Contact subsistence practices as well as temporary habitation may occur within the area.

Sugar operations in the Lāhainā region evolved from small farms within LCAs and grants, and eventually culminated in the Pioneer Mill Company which included some 10,000 acres. Following the liquidation of PiMCo, some former sugarcane lands were developed but most acreage today remains fallow. Historic-era properties associated with sugarcane cultivation may be anticipated within the project area. And include remnant irrigation canals and other features associated with industrial water development in the area (e.g., water gates, pump remnant, etc.) as well as push-piles that have since crossed the 50-year historic determination threshold.

According to a series of historic maps and aerial images, coastal settlement zones initially developed south of the project area and later to the north, both around the mouths of the gulches. LCAs. In addition, findings from previous archaeological studies have occurred along those gulches and primarily include pre- and post-Contact agricultural complexes and burial sites, and pre-Contact habitation areas and fishponds. In 1989, PHRI conducted a pedestrian survey within

the current project area as part of an AIS, and no historic properties were documented on the surface (Jensen 1989). Their study did not include subsurface testing within the project area.

CSH documented three new historic properties within the project area. These include SIHP # 50-50-03-08886, an asphalt-paved road and former plantation railroad corridor, SIHP # 50-50-03-08887, a portion of the existing LK&P railroad that was established as a tourist attraction in 1969, and SIHP # 50-50-03-08888, an asphalt-paved road that was used for historic commercial agricultural operations and formerly labeled as “Main Industrial Road”. These findings support the historic documentation of the project area as commercial agricultural fields. These fields were part of a larger plantation system that required transportation by railroad, and later by vehicular road, of resources and laborers through Wahikuli Ahupua‘a and the surrounding region.

A review of background research and historic maps indicates that the earliest documented transportation through Wahikuli Ahupua‘a was isolated to a coastal trail in the 1800s, which was improved into a coastal road in the early 1900s, and eventually developed into the modern alignment of Honoapi‘ilani Highway. Smaller *mauka* to *makai* trails likely connected to the coastal trail. No evidence of pre-Contact or historic coastal transportation were identified within the current project area.

By 1913, a railroad corridor (SIHP # -08886) was constructed within the project area to transport sugarcane through the Pioneer Mill commercial agricultural field system to the mill for processing. Rail transportation continued as the primary means of hauling sugarcane until being overtaken by the advent of tournahaulers and road transportation circa 1950. By 1956, the railroad in the project area had been removed and replaced by an industrial road (also SIHP # -08886). A second industrial road (SIHP # -08888) was added by 1964, likely to provide further field access and create a loop for tournahauler and commercial traffic through the field system.

In an effort to resurrect and memorialize the nostalgia of railroad transportation through the region, A.W. McKelvy created the LK&P railroad (SIHP # -08887) in 1969 as a tourist attraction that was designed to mimic a historic “narrow-gauge” plantation railroad. Steam locomotives and passenger cars were also built to resemble trains from the 1880s and to carry passengers on a six-mile journey beginning at the railroad station at Kelawea (close to the former site of the original Pioneer Mill Company sugar mill) and ending within the current project area near the Honoapi‘ilani Highway and Kaniau Road intersection. It ran daily passenger service from Lāhainā to Pu‘ukoli‘i for over 30 years (Sugar Cane Train Maui 2014). This track was still in use as a tourist attraction for the “Sugar Cane Train” through the 2019 holiday season

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2022 *Archaeological Literature Review and Field Inspection for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui Island, TMKs: [2] 4-5-021: 010 por., 015 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way* Submitted to Cultural Surveys Hawai'i, Wailuku, Hawai'i.

Appendix A SHPD Correspondence

DAVID Y. IGE
GOVERNOR OF
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STATE OF HAWAII
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CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

February 24, 2022

IN REPLY REFER TO:
Project No.: 2022PR00139
Doc. No.: 2202AM21
Archaeology

William Ailā, Jr., Chariman
State of Hawaii
Department of Hawaiian Home Lands (DHHL)
P.O. Box 1879
Honolulu, HI 96805
c/o brian.toda@hawaii.gov

Dear William Ailā, Jr.:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
State of Hawaii DHHL
Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project
Archaeological Literature Review and Field Inspection Report
Wahikuli Ahupua‘a, Lāhainā District, Island of Maui
TMK: (2) 4-5-021:010 por., 015 por., 020, and 021 por.; and (2) 4-5-036:109, 110, and 112
(Honoapi‘ilani Highway ROW)

This letter provides the State Historic Preservation Division's (SHPD's) review of the State of Hawaii DHHL's Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project. SHPD received the submission on February 7, 2022, which included an HRS 6E Submittal Form, locator maps, a letter from DHHL requesting our review of the project, and an archaeological literature review and field inspection (LRFI) report titled, *Archaeological Literature Review and Field Inspection for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui Island, TMKs: (2) 4-5-021:010 por., 015 por., 020, and 021 por.; (2) 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way* (Yucha et al., January 2022).

DHHL proposes the construction of a new subdivision and associated infrastructure improvements within 83.3-acre project area on the subject property. The project will involve the construction of approximately 250 new units on 51 acres for the development of a Leiali‘i Phase 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include drainage improvements, improvements to Leiali‘i Parkway, and improvements at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway. Aerial photographs show the project area is currently undeveloped and previously impacted by agricultural activities associated with the Pioneer Mill.

Cultural Surveys Hawai‘i, Inc. (CSH) produced the subject LRFI report in support of the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project. The report (Yucha et al. 2022) includes summaries of previous archaeological investigations and historic land use in the area, and the results of the archaeological field inspection conducted for the current project. The LRFI documents portions of two roads (CSH 1 and 7) and a narrow-gauge railroad track (CSH 5) within the project area that are all believed to be more than 50 years old and thus considered to be potential historic properties.

Based on presence of historic properties within the current project area, SHPD requests the LRFI report be converted into an archaeological inventory survey (AIS) report meeting the requirements of HAR §13-276-5 and be submitted to SHPD for review and acceptance prior to initiation of project related work. However, prior to this, **SHPD requests** the project proponent and archaeological firm consult with our office regarding whether or not AIS subsurface testing is needed and, if so, to agree on an appropriate AIS testing strategy.

William Ailā, Jr.
02/24/2022
Page 2

SHPD shall notify the DHHL when the archaeological inventory survey report and any required mitigation plans are accepted, and the project initiation process may proceed.

Please contact Andrew McCallister, Maui Archaeologist IV, at andrew.mccallister@hawaii.gov for matters regarding archaeological resources or this letter.

Aloha, Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Noelani Hessler, CSH, nhessler@culturalsurveys.com
Trevor Yucha, CSH, tyucha@culturalsurveys.com
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Stewart Matsunaga, DHHL, stewart.t.matsunaga@hawaii.gov

FINAL ARCHAEOLOGICAL MONITORING PLAN

APPENDIX F-1

Final

Archaeological Monitoring Plan for the Villages of Leiali‘i, Village 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui Island, TMKs: [2] 4-5-021:010 por., 014 por., 015 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way

Prepared for
Department of Hawaiian Home Lands

Prepared by
Josephine M. Yucha, M.S.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
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(Job Code: WAHIKULI 6)

February 2023

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Management Summary

Reference	Archaeological Monitoring Plan for the Villages of Leiali‘i, Village 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui Island, TMKs: [2] 4-5-021:010 por., 014 por., 015 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way (Yucha and Hammatt 2022)
Date	February 2023
Project Number	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: WAHIKULI 6 HICRIS Project No.: 2022PR00139
Investigation Permit Number	CSH will likely complete the archaeological monitoring fieldwork under archaeological fieldwork permit number 22-02, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) §13-282.
Agencies	SHPD, Department of Hawaiian Home Lands (DHHL), Hawaii Department of Transportation (HDOT), and County Department of Parks and Recreation
Land Jurisdiction	State of Hawai‘i, DHHL
Project Funding	State of Hawai‘i, DHHL
Project Location	The project area is located along Leiali‘i Parkway in Lāhainā across from and extending directly east of the existing Villages of Leiali‘i Phase 1-A Subdivision in Lāhainā, Wahikuli Ahupua‘a, Lāhainā District, TMKs: [2] 4-5-021:010 por., 014 por., 015 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112. The project area is bounded by the Lāhainā Civic Center multipurpose sports and recreation facility to the northwest, by the Leiali‘i Phase 1-A Subdivision to the south, and Wahikuli Wayside Park to the west. The eastern side of the project area is agricultural land. The project area is depicted on a portion of the 2017 Lahaina USGS 7.5-minute topographic quadrangle.
Project Description and Related Ground Disturbance	The project will involve the construction of approximately 250 new units on 51 acres (20.639 hectares) for the development of a Leiali‘i Village 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include off-site improvements to surrounding utilities including drainage improvements, improvements to Leiali‘i Parkway, and improvements at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway. Project-related ground disturbance will include grading, trenching for underground utilities and building footings, landscaping, and drainage improvements.
Project Acreage	The project area is 83.3 acres (33.7 hectares).

Historic Preservation Regulatory Context	CSH conducted an archaeological literature review and field inspection (LRFI) in October 2021 to provide a synopsis of past land use and a summary of previous archaeological studies conducted in the project area (Yucha et al. 2022). This information was used in preparation of a field inspection to locate previously documented historic properties in the region and to predict the types of historic properties that may present in the project area. The field inspection documented three surface features, two roads and a railroad track, as potential historic properties within the project area. Due to the significant findings of the LRFI, the SHPD requested the study be converted into an archaeological inventory survey (AIS) to meet the requirements of HAR §13-276-5 (Project No. 2022PR00139, Doc. No. 2202AM21) (Appendix A). The AIS included a 100% pedestrian inspection and a review of the geotechnical report of 16 drilling locations distributed throughout the *makai* half of the project area in order to characterize the stratigraphy and depth of soils within the project area. The two roads and railroad track noted during the LRFI were identified as historic properties (SIHP #s 50-50-03-08886, -08887, and -08888) during the AIS. CSH submitted a draft AIS report to the SHPD on 24 June 2022, and minor revisions were requested. A revised AIS report was submitted to the SHPD on 30 September 2022. The SHPD reviewed and accepted the final AIS report (Madeus et al. 2022) on 5 October 2022 (Project No. 2022PR00139, Doc. No. 2210IK01) (see Appendix A). This archaeological monitoring plan (AMP) is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-8 and HAR §13-275. It is also intended to support any project-related historic preservation consultation with stakeholders, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. In consultation with the SHPD, this document fulfills the requirements of HAR §13-279-4.
Historic Properties Identified and Historic Property Significance	CSH documented three historic properties within the project area during the AIS: State Inventory of Historic Places (SIHP) # 50-50-03-08886 is an asphalt-paved road and former plantation railroad corridor. It is assessed as significant pursuant to HAR §13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and workmanship, and has provided information regarding historic land use of the project area. SIHP # 50-50-03-08887 is a portion of the existing Lāhainā, Kāʻanapali & Pacific (LK&P) railroad that was established as a tourist attraction in

	1969. It is assessed as significant pursuant to HAR §13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, setting, materials, and workmanship, and has provided information regarding historic land use of the project area. SIHP # 50-50-03-08888 is an asphalt-paved road that was used for historic commercial agricultural operations and formerly labeled as “Main Industrial Road”. It is assessed as significant pursuant to HAR §13-275-6, Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). The historic property retains the integrity of location, design, materials, and workmanship, and has provided information regarding historic land use of the project area.
Monitoring Recommendations	In accordance with HAR §13-279-3, archaeological monitoring may be an identification, mitigation, or post-mitigation contingency measure. Monitoring shall entail the archaeological observation of, and possible intervention with, on-going activities which may adversely affect historic properties. For the current project, archaeological monitoring will be conducted as a mitigation measure in order to mitigate the project’s effect on three historic properties located within the project area. On-site archaeological monitoring will be conducted for any project-related ground disturbance that occurs within the boundaries of the three historic properties (SIHP # -08886, 08887, and 08888). The objective of archaeological monitoring will be to identify and document any subsurface components of these historic properties. Additionally, since the three historic properties are linear alignments that extend roughly north-south through the upper (SIHP # -08886), middle (SIHP # -0888) and lower (SIHP # -08887) portions of the project area, archaeological monitoring documentation of these corridors will provide representative data on stratigraphy for the project area. One archaeological monitor will be assigned to each piece of ground-disturbing equipment in operation within the historic property boundaries. Any departure from this will occur only after consultation with and written concurrence from the SHPD.

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Section 1 Introduction

1.1 Project Background

At the request of the State of Hawai‘i Department of Hawaiian Homelands (DHHL), Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this archaeological monitoring plan (AMP) for the Villages of Leiali‘i, Village 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui, TMKs: [2] 4-5-021:010 por., 014 por., 015 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way (ROW). The project area encompasses 83.3 acres (33.7 hectares) and is located along Leiali‘i Parkway in Lāhainā across from and extending directly east of the existing Villages of Leiali‘i Phase 1-A Subdivision. The project area is bounded by the Lāhainā Civic Center multipurpose sports and recreation facility to the northwest, by the Leiali‘i Phase 1-A Subdivision to the south, and Wahikuli Wayside Park to the west. The eastern side of the project area is agricultural land. The project area is depicted on a portion of the 2017 Lahaina U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), tax map plats (Figure 2 and Figure 3), and a 2019 aerial photograph (Figure 4).

The project will be constructed on land owned by the State of Hawai‘i. The project area includes a total of 83.3 acres (33.7 hectares). The project will involve the construction of approximately 250 new units on 51 acres (20.6 hectares) for the development of a Leiali‘i Village 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include off-site improvements to surrounding utilities including drainage improvements, improvements to Leiali‘i Parkway, and improvements at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway. Project-related ground disturbance will include grading, trenching for underground utilities and building footings, landscaping, and drainage improvements.

1.2 Historic Preservation Regulatory Context

CSH conducted an archaeological literature review and field inspection (LRFI) in October 2021 to provide a synopsis of past land use and a summary of previous archaeological studies conducted in the project area (Yucha et al. 2022). This information was used in preparation of a field inspection to locate previously documented historic properties in the region and to predict the types of historic properties that may present in the project area. The field inspection documented three surface features, two roads and a railroad track, as potential historic properties within the project area.

Due to the significant findings of the LRFI, the Hawai‘i State Historic Preservation Division (SHPD) requested the study be converted into an archaeological inventory survey (AIS) to meet the requirements of HAR §13-276-5 (Project No. 2022PR00139, Doc. No. 2202AM21) (Appendix A). The AIS included a 100% pedestrian inspection and a review of the geotechnical report of 16 drilling locations distributed throughout the western *makai* (seaward) half of the project area in order to characterize the stratigraphy and depth of soils within the project area. The two roads and railroad track noted during the LRFI were identified as historic properties (SIHP #s 50-50-03-08886, -08887, and -08888) during the AIS.

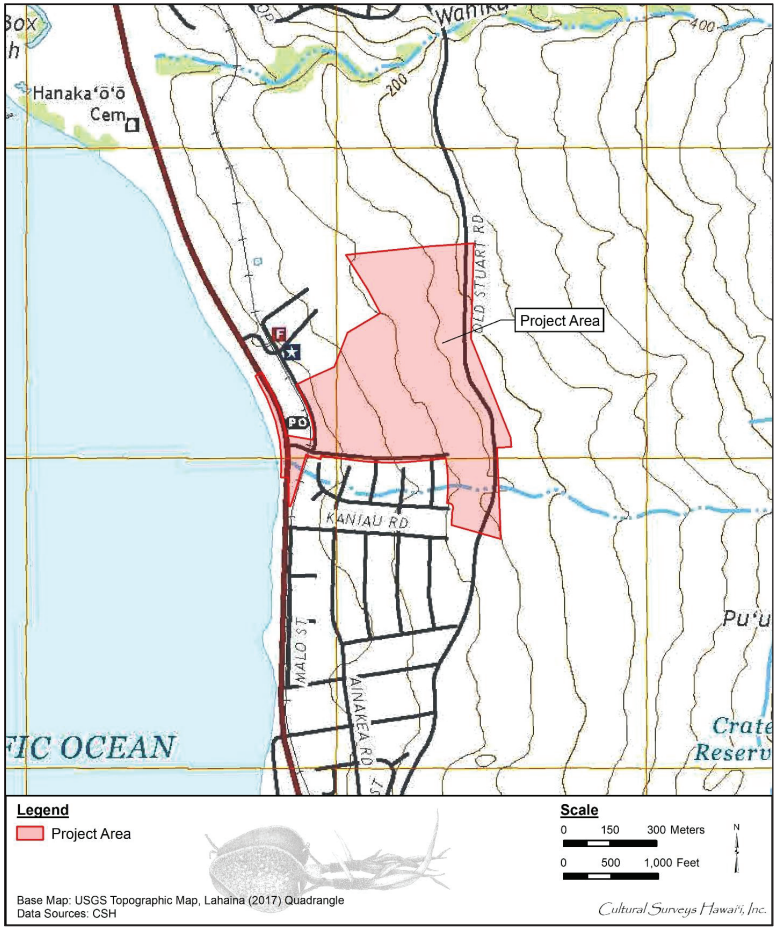

Figure 1. Portion of the 2017 Lahaina USGS 7.5-minute topographic quadrangle showing the location of the project area (U.S. Geological Survey 2017)

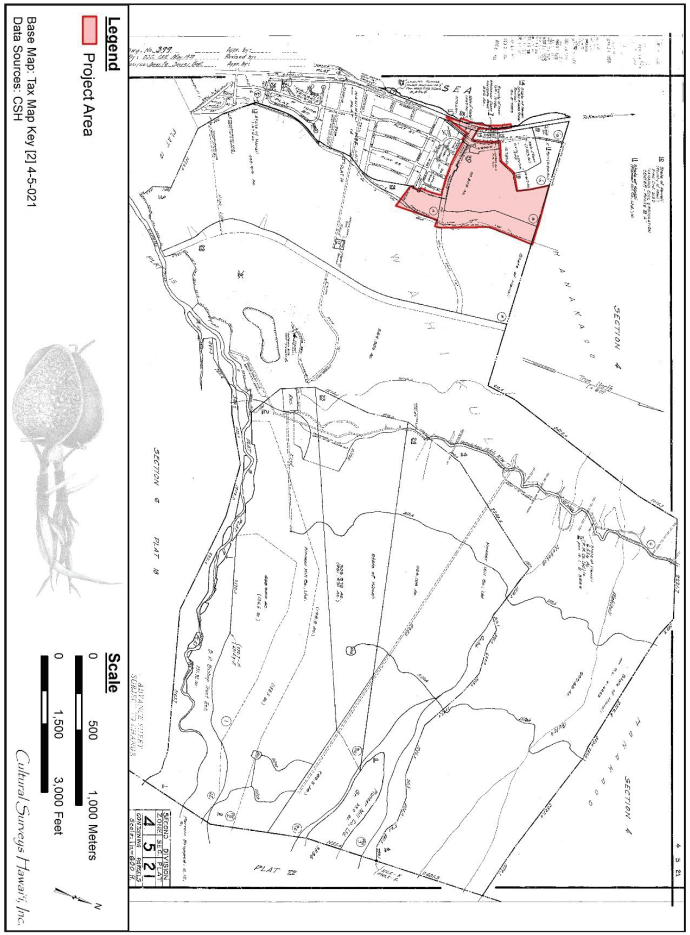

Figure 2. Tax Map Key (TMK) [2] 4-5-021 showing the project area (Hawaii TMK Service 2014)

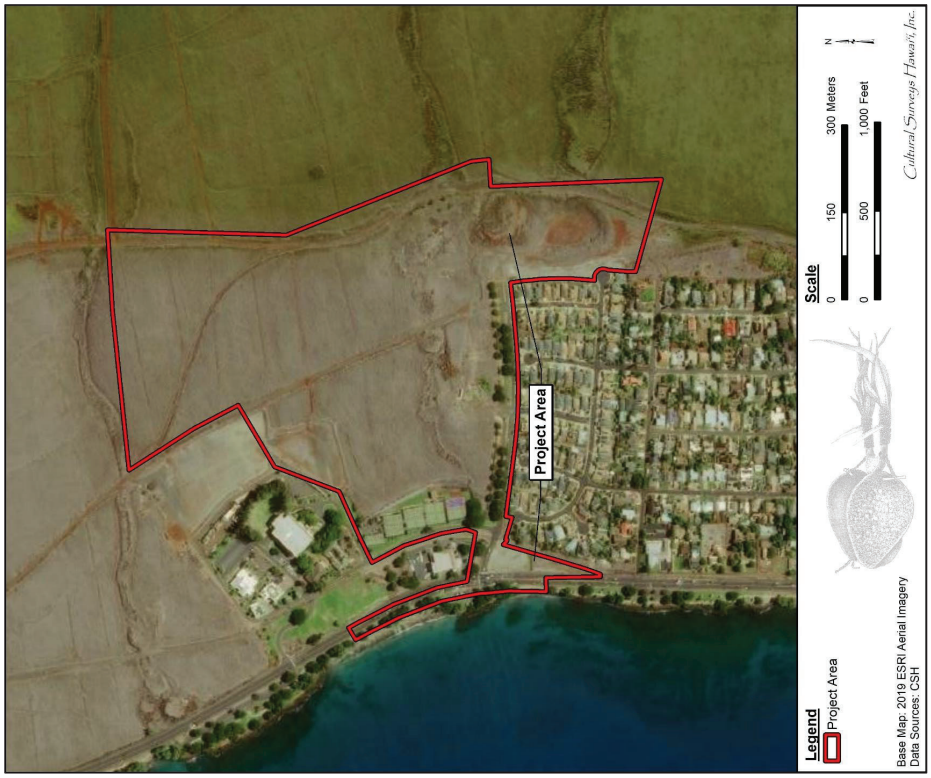

Figure 4. 2019 aerial image of the project area (Esri 2019)

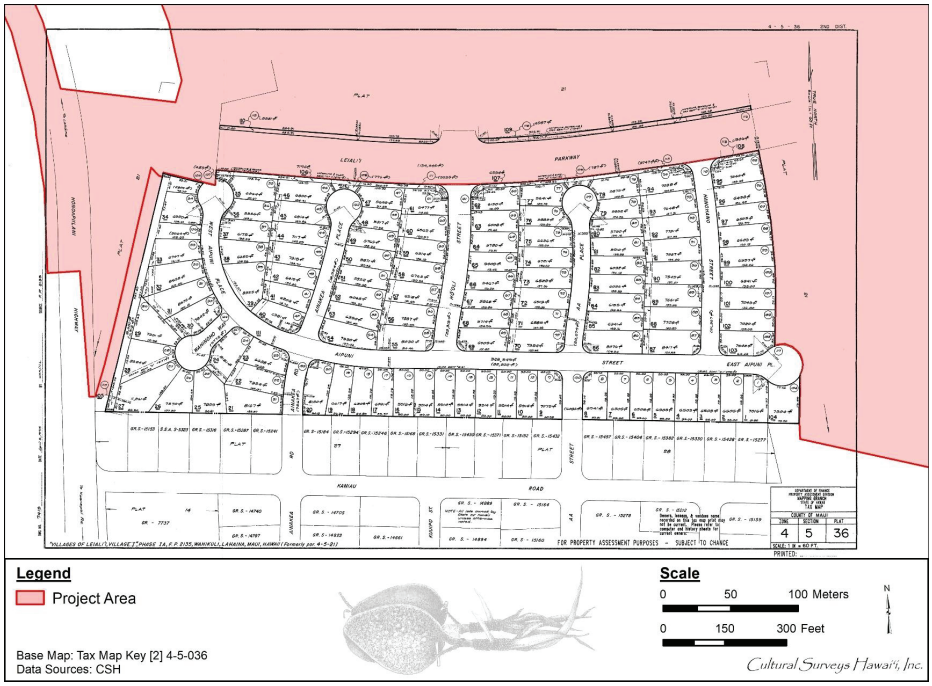

Figure 3. TMK: [2] 4-5-036 showing the project area (Hawaii TMK Service 2014)

CSH submitted a draft AIS report to the SHPD on 24 June 2022, and minor revisions were requested. A revised AIS report was submitted to the SHPD on 30 September 2022. The SHPD reviewed and accepted the final AIS report (Madeus et al. 2022) on 5 October 2022 (Project No. 2022PR00139, Doc. No. 2210IK01) (see Appendix A).

This archaeological monitoring plan (AMP) is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-8 and Hawai‘i Administrative Rules (HAR) §13-275. It is also intended to support any project-related historic preservation consultation with stakeholders, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. In consultation with the SHPD, this document fulfills the requirements of HAR §13-279-4.

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is on the western slope of the West Maui Mountains, north of Honokōhau Ditch. The westernmost edge of the project area encompasses a portion of the Honoapi‘ilani Highway ROW, which follows the edge of the ocean shoreline. The lands of the current project area slope from an elevation of 65.5 m (215 ft) above mean sea level (AMSL) in the east to 6.1 m (20 ft) in the west.

In 2014, the average monthly air temperature for the project area was between 21.70°C (71.05°F) in January and February and 25.70°C (78.26°F) in August with an average annual air temperature of 23.74°C (74.72°F) (Giambelluca et al. 2014). Due to the rain “shadow” caused by the West Maui Mountains, the vicinity of the project area received a mean annual rainfall of 424.4 mm (16.71 inches) between 1978 and 2007, according to the University of Hawai‘i 2011 *Rainfall Atlas of Hawaii* (Giambelluca et al. 2013; Giambelluca et al. 1986:47). The mean monthly rainfall varied between 9.6 mm (0.38 inches) in September to 78.1 mm (3.07 inches) in December.

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), natural soils within the project area primarily consist of Wahikuli stony silty clay, 3 to 7 percent slopes (WcB) over the majority of the northern half, with Wahikuli stony silty clay, 7 to 15 percent slopes (WcC) in the southern portion, Rock land (rRK) near a small portion of the southeastern corner, and areas of Wahikuli very stony silty clay, 3 to 7 percent slopes (Wdb), and Beaches (BS) around Honoapi‘ilani Highway in the west (Figure 5).

Wahikuli Series soils are described as follows:

> This series consists of well-drained soils on uplands on the island of Maui. These soils developed in material weathered form basic igneous rock. They have been influenced to some extent by volcanic ash from local cinder cones. They are gently to moderately sloping. Elevations range from nearly sea level to 600 feet. The annual rainfall amounts to 12 to 20 inches; most of it occurs in winter. The mean annual soil temperature is 75° F. Wahikuli soils are geographically associated with Lahaina and Molokai soils.

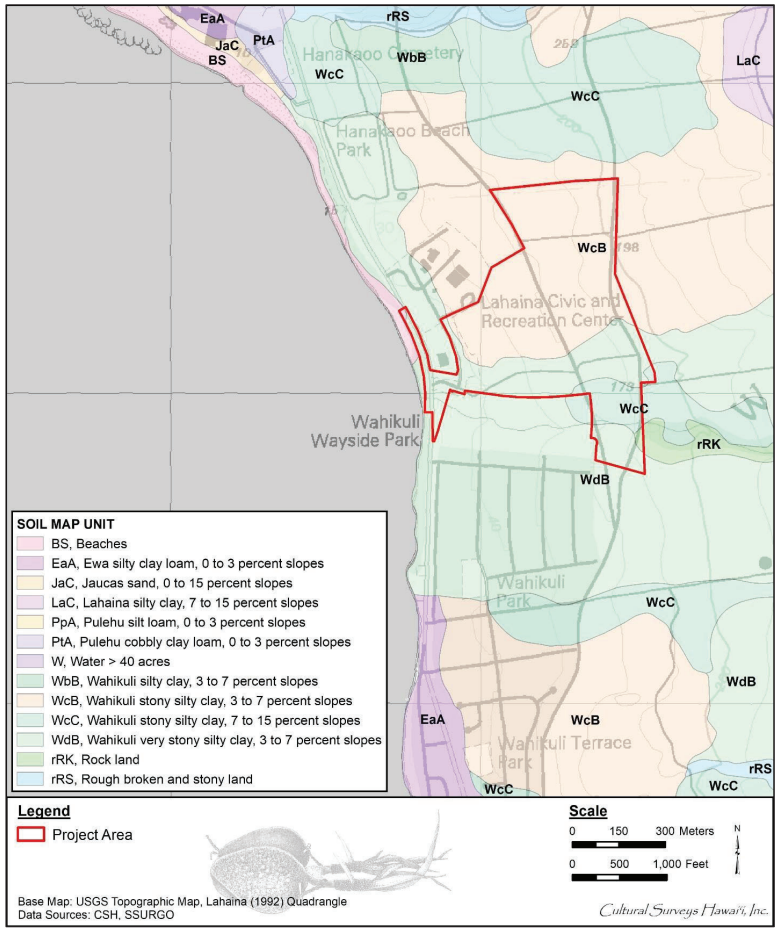

Figure 5. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (U.S. Department of Agriculture Soils Survey Geographic Database [SSURGO] 2001)

> These soils are used mostly for sugarcane. A small acreage is used for homesites. The natural vegetation consists of bermudagrass, feather fingergrass, kiawe, and uhaloa (Foote et al. 1972:125)

The Wahikuli silty clay, 3 to 7 percent slopes (WdB) soil provides a representative profile of the soil series and is described as follows:

> In a representative profile the surface layer is dark reddish-brown silty clay about 15 inches thick. The subsoil, about 17 inches thick, is dark reddish-brown silty clay that has subangular blocky structure. The substratum is hard basic igneous rock. The soil is mildly alkaline in the surface layer and subsoil. Permeability is moderate. Runoff is slow, and the erosion hazard is slight. The available water capacity is about 1.4 inches per foot in the surface layer and 1.5 inches per foot in the subsoil. In places roots penetrate to bedrock. (Foote et al. 1972:125)

Characteristics of the specific Wahikuli soil types indicated within the project area are described as follows:

> **Wahikuli stony silty clay, 3 to 7 percent slopes** (WcB).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that there are enough stones on the surface to hinder cultivation.
>
> This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IIe if irrigated, IVs if nonirrigated; sugarcane group 1; pasture group 3)
>
> **Wahikuli stony silty clay, 7 to 15 percent slopes** (WcC).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that there are enough stones on the surface to hinder cultivation. Runoff is slow to medium, and the erosion hazard is slight to moderate. Included in mapping were small, nonstony areas and some moderately steep areas.
>
> This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IIIe if irrigated, IVe if nonirrigated; sugarcane group 1; pasture group 3)
>
> **Wahikuli very stony silty clay, 3 to 7 percent slopes** (Wdb).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that as much as 3 percent of the surface is covered by stones. Included in mapping were small areas where stones cover 3 to 15 percent of the surface.
>
> This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IVs if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3) (Foote et al. 1972:126)

Rock land (rRK) is described as follows:

> Rock land (rRK) is made up of areas where exposed rock covers 25 to 90 percent of the surface. It occurs on all five islands. The rock outcrops and very shallow soils are the main characteristics. The rock outcrops are mainly basalt and andesite. This

> land type is nearly level to very steep. Elevations range from nearly sea level to more than 6,000 feet. The annual rainfall amounts to 15 to 60 inches.
>
> Rock land is used for pasture, wildlife habitat, and water supply. The natural vegetation at the lower elevations consists mainly of kiawe, klu, piligrass, Japanese tea, and koa haole. Lantana, guava, Natal redtop, and molassesgrass are dominant at the higher elevations. This land type is also used for urban development. In many areas, especially on the island of Oahu, the soil material associated with the rock outcrops is very sticky and very plastic. It also has high shrink-well potential. Buildings on the steep slopes are susceptible to sliding when the soil is saturated. Foundations and retaining walls are susceptible to cracking. (Foote et al. 1972:119)

Beaches (BS) are described as follows:

> Beaches (BS) occur as sandy, gravelly, or cobbly areas on all the islands in the survey area. They are washed and rewashed by ocean waves. The beaches consist mainly of light-colored sands derived from coral and seashells. A few of the beaches, however, are dark colored because their sands are from basalt and andesite.
>
> Beaches have no value for farming. Where accessible and free of cobblestones and stones, they are highly suitable for recreational uses and resort development. (Capability classification VIIIw, nonirrigated) (Foote et al. 1972:28)

The vegetation of the project area consists mostly of modern plantings in and around the nearby subdivision, including ground cover species such as Bermuda grass (*Cynodon dactylon*), beach morning glory (*Ipomoea pes-caprae*), *naupaka* (*Scaevola taccada*) and *hau* (*Hibiscus tiliaceus*) in the beachside areas; plantings of exotic species such as bird-of-paradise (*Strelitzia reginae*), sword ferns (*Nephrolepis* sp.) fan palms (*Washingtonia* sp.) and torch ginger (*Phaeomeria magnifica*) in shaded areas; bougainvillea (*Bougainvillea spectabilis*), wedelia (*Sphagneticola trilobata*), and plumeria (*Plumeria rubra*) coconut trees (*Cocos nucifera*), autograph trees (*Clusia rosea*) and monkeypod (*Samanea saman*). Hedges were mostly of flowering hibiscus (*Hibiscus kokio kokio*), mock-orange (*Murraya paniculata*) and flowering rose (*Rosa* sp.).

1.3.2 Built Environment

The project area is located on lands within the *ahupua‘a* of Wahikuli at a portion of Kā‘anapali Beach that has been developed into the Villages of Leiali‘i, Phase 1-A Subdivision and its associated amenities. A majority of the project area at the time of this report consists of fallow cane fields. The lands surrounding the project area have been previously impacted and modified by the cultivation of sugarcane. The Kā‘anapali Landing, the primary harbor for sugar and pineapple shipments out of West Maui prior to World War II, was also the location of a large plantation village. Cultivated fields of sugarcane in Kā‘anapali once extended from the mountains to the beach areas of Wahikuli, Kā‘anapali and Honokōwai. Fields of cane were taken out of cultivation in the late 1950s to allow for development of the Kā‘anapali Resorts to the north of the project area. Adjacent to the project area are a number of municipal buildings, including the Lāhainā Civic Center, Lāhainā District Court, and the Lāhainā Fire Station.

Section 2 Background Research

The division of Maui’s lands into political districts occurred during the rule of Kaka‘alaneo, under the direction of his *kahuna*, Kalaiha‘ōhi‘a (Beckwith 1970:383). This division resulted in 12 districts or *moku* during traditional times: Kula, Honua‘ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko‘olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Kā‘anapali, and Lāhainā. The current project area is located on the western side of Mauna Kahalawai, or the West Maui Mountains as they are commonly called today, in the *moku* of Lāhainā

The workings of traditional Hawaiian land tenure are often reflective of the socio-political intricacies of particular places that were favored among the *ali‘i* (ruling class), and the area surrounding the *kalana* of Lāhainā is illustrative of that fact. The *moku o loko*, or *moku* as it is most commonly called, literally means “to cut across, divide, separate” (Lucas 1995:77). When used as a term of traditional land tenure, a *moku* is akin to a political district, an overall land division that can contain smaller divisions of land such as ‘*okana*, *kalana*, *ahupua‘a*, *‘ili*, and *mo‘o*. Lāhainā Moku, consists of multiple *ahupua‘a* that extend from Ukumehame at the southern end to Hanakaō‘ō along the northern end.

The term *kalana* literally translates to mean a thing loosened or released—“to loosen” (*kala*) with the nominal suffix of “*na*” added at the end (Handy et al. 1991:47). In reference to land tenure, *kalana* is a term that is sometimes interchanged or synonymous with the term *‘okana*, which is a sub-division of land that is smaller than a *moku* (Alexander 1890; Lucas 1995:47). On Maui Island, Alexander (1890) observed that there are five *‘okana* or sub-districts within Hāna Moku, while Lāhainā was termed a *kalana*. Handy et al. (1991:47) speculate that the land divisions designated as *kalana* were politically released from the *‘okana* or even *moku* that they had been a part of during the original division of the islands. These land divisions were then given as separate domains to *ali‘i* of first rank, remaining as autonomous heritages. Curtis Lyons, a surveyor during the Māhele, specifically states that the *kalana* of Lāhainā belonged to no *moku* (Handy et al. 1991:47). While the formal boundaries of the *kalana* of Lāhainā within Lāhainā Moku have never been surveyed, it is possible that the area comprising the *kalana* encompassed the fertile strip of lands along the coastline, stretching from Puamana to Māla, and inner reaches of the stream valleys, from Kaua‘ula to Wahikuli.

The geographic arrangement of the typical *ahupua‘a* within the traditional Hawaiian land tenure system is commonly thought of as a “pie-shaped” unit of land that extends from the coastline to the mountains. In this sense, the tenants of an *ahupua‘a* may be permitted access to resources to carry out subsistence practices that would include marine resources and fishing rights in the coastal area and rights to arable lands for crop cultivation, as well as water and timber rights in the planting zones and valuable bird catching privileges at the higher elevations (Handy et al. 1991:48). As indicated by Maly and Maly (2007:82), however, the distribution and geographic boundaries of the *ahupua‘a* of Lāhainā are somewhat unique in the Hawaiian Islands.

Within their cultural landscape study, Maly and Maly (2007:8) note that many of the *ahupua‘a* of the Lāhainā area are small and often configured as detached parcels, or *lele*, that do not run in the typical *mauka* (towards the mountians) to *makai* (towards the ocean) “pie-shaped” manner. One section of an *ahupua‘a* may be situated near the coastline, another section bearing the same *ahupua‘a* name may be within the upper reaches of the stream valleys, while still another section

might be found within the mid-elevation areas—all of which are separated by intervening *ahupua‘a* bearing different names.

2.1 Mythological and Traditional Accounts

Lāhainā has been known by three other names in traditional accounts. The oldest name was said to have been Na-hono-a-Pi‘ilani, the lands of Pi‘ilani as it was surrounded by other islands (G.H. Hanakauluna in Sterling 1998:37). Lele has been acknowledged as the ancient name of Lāhainā (Sterling 1998:34, 37) in the story of Kamalalawalu and Halemano in their flight from the O‘ahu Chief Aikanaka in the *Legend of Halemano* and in the *Legend of Pupukea* as home to Maui Chief Kamalalawalu (referred to frequently as Kama) who was a contemporary of Kakuhihewa on O‘ahu (Fornander 1919:238, 436). A third name for Lāhainā is mentioned in the story *Relating to Kekaa* (Fornander 1919:540-544) where Keka‘a is noted as the capital of Maui when Kaka‘alaneo was reigning over West Maui.

2.1.1 The Naming of Lāhainā and Chief Kaka‘alaneo

There is speculation that the name of Keka‘a for Lāhainā predates that of Lele, as the story predates the introduction of breadfruit, the primary food source that is referred to when speaking of the area as Lele (Fornander 1919:540; H.L. Sheldon in Sterling 1998:35).

Kaka‘alaneo was King of Maui and “has always been famed in Hawaiian traditions as the first king of that island who gave his attention to agriculture...” (Nakuina 1904:55). He was famous for planting the *ulu* (breadfruit tree) groves in Lāhainā.

> …and the place became famous in story and song as the “Malu ulu o Lele.” “The shady breadfruit grove of Lele.” As the place is situated at the base of and leeward of the Lihau range of mountains, where very little rain falls, and is more or less shut off from the cooling influence of the prevailing trade winds, one who is kamaaina can fully appreciate the cool, grateful memories evoked by the mere mention of the “Malu ulu o Lele”…
>
> In the days of Kakaalaneo, breadfruit trees were a very valuable possession, and to plant one was a meritorious act, worthy of commendation by one’s superior. To plant a grove even if only a small one, was an act worthy of the gods, entitling the planter to the grateful remembrance of posterity, whose duty it was to compose and sing songs of praise in his or her honor. It was the same if the grove was a cocoanut one; and conversely, to cut and destroy one tree, either breadfruit or cocoanut, merited death. To destroy many was a declaration of war… (Nakuina 1904:55-56)

Kaka‘alaneo was also the father of the mischievous Kaululā‘au who cut down breadfruit trees throughout Lahaina and was eventually exiled to Lāna‘i. Kaululā‘au subsequently out-witted the spirits of that island, making it habitable for humans. In regard to Kaka‘alaeno:

> Legends gather about the name of the ruling chief of Maui, Kakaalaneo (Kukaalaneo, Kaalaneo), who lived in present Lahaina district on the hill Keka‘a, owned fishponds in Hana district on the opposite end of the island, planted a famous breadfruit grove, and took to wife the Molokai chiefess whom Eleio found for him and who brought him the first feather cape seen on Maui, by whom he had the mischievous son

> Kaululaau who killed off the spirits on Lanai. In his day the old name of Lele became attached to Lahaina. (Beckwith 1970:384)

2.1.2 Chief Hua

Pukui et al. (1974:127) translate the literal meaning of Lāhainā as “cruel sun” and note that the area is said to have been named for droughts. Mrs. Pia Cockett, cited in Sterling (1998:16), translates the name of the town Lāhainā: “Not Lahaina, it was Lāhainā. Because there was a man, a baldheaded man who went in the sun and his head became sore. That’s why they call it Lāhainā [hainā = cruelty; lā = day, sun].”

According to Sterling (1998:16), Pukui relates that the literal translation of “cruel sun” refers to the drought during the time of Chief Hua, “when the sun was so cruel to the people that it caused everything to wither and dry.” Hua was a chief of Lāhainā who had forsaken his *kahuna*, or priest, Luaho‘omoe, which caused the drought throughout the Hawaiian Islands:

> There lived here in Lahaina a chief named Hua, … he desired to get some *ua‘u* squabs to eat; then he sent some men up to the mountains above Oloalu [Olowalu] to get some squabs to satisfy his desire. He did not wish for birds from the beach. When the birds were obtained, they were to be taken to the priest for him to ascertain where the birds came from; if he should give out the same information as the men had given to the chief as to the source of the birds, then he would be safe; if he should give a contrary answer, he would be killed. The name of this priest was Luahoomoe, and he also had children. When the men went up, they could not find any mountain birds at all, so they decided to get some shore birds. When they caught some, they daubed the feathers red with dirt so that the chief would think the birds came from the mountain. When they returned and handed the birds to the chief, he was exceedingly glad because he thought the birds came from the mountain. The chief told the men to take them to the priest for his inspection. The priest perceived, however, that the birds came from the seashore… Then the chief said to the priest: “You shall not live, for you have guessed wrongly. I can very well see that these are mountain birds.” Then and there an imu was prepared in which to bake the priest.
>
> Before he was placed in the imu, however he said to his children: “You two wait until the imu is lighted, and when the smoke ascends, should it break for the Oloalu mountains, that indicates the path; move along; and where the smoke becomes stationary, that indicates where you are to reside … Then the priest was cast into the oven and the opening closed up tightly. The smoke arose and darkened the sky; … after the priest had been in the imu for two days, he reappeared and sat by the edge of the imu unknown to any one; the chief thinking all the time that he was dead; but it was not so.
>
> When the smoke ascended and leaned towards the Oloalu mountains, the two sons went off in that direction; the cloud pointed towards Hanaula, and there it stood still, so the two sons ascended to the place and resided there.

> Then the whole of Maui became dry; no rain, not even a cloud in the sky, and people died from lack of water. The smoke that hung over Hanaula became a cloud, and rain fell there.
>
> Hua, the chief, lived on, and because of the lack of water and food he sailed for Hawaii, the home of his elder brother; but because Hawaii also suffered from lack of water and food he came back and lived at Wailuku. Wailuku also did not have any water, and that caused the chief to be crazed, so he leaned against the edge of the precipice and died, and that was the origin of the saying “The bones of Hua rattle in the sun.” (Fornander 1919:514, 516)

Fornander (1919:516) notes that “The bones of Hua rattle in the sun” refers to the chief “whose wickedness won him the detestation of his people, who therefore let his body lie where he fell that his bones bleached in the sun and rattled in the wind.” Pukui (1983) relates that the ancient proverb (or *‘olelo no‘eau*) regarding Chief Hua warns others to not talk too much of one’s king and is a reminder that trouble will follow those who destroy the innocent.

Hua, the island chief who reigned over Maui prior to the tenth century, is credited with constructing the first *heiau* (sacred temple) on the island beginning in Lāhainā. Of the six *heiau* that are documented in Lāhainā, Hua was responsible for the construction of at least two, while his descendent namesake, Hua-nui-kalalailai, built the third *heiau* only two generations later.

2.1.3 Hina and the Demigod Māui

The region of Lāhainā is also known for the goddess Hina, mother of the demigod Māui:

> A version of the Maui stories is met with representing him as the son of Hina-lauae and Hina, residing above Lahainaluna, Maui, which relate his venturing forth on mischievous pranks before birth. Reference is made to his snaring the sun that Hina might have time to dry her kapas. It says, further, that while absent on this duty Hina bore another son, an owl, which he did not treat with contempt. Setting out one day pole-fishing, Maui was seized and carried away to Moalii, some distance westerly from Lahainaluna, to be placed on the altar the following day as a sacrifice by the king. Hina saw in a vision what was being done so she and the owl followed along, Hina staying at a rock by the wayside. The owl flew on to where Maui was guarded and saw that he was tied with cords. The guards were awake, so the owl waited till near dawn, but they would not sleep.
>
> Maui then spoke: “O thou Aina, retard and prolong the night.” The night being prolonged, the guards fell asleep, whereupon the owl entered and struck at Maui’s bonds till they fell off. They then set off to where Hina was waiting, by which time it was daylight. Hiding Maui under the stone, Hina sat outside of him and spread out her sleeping garment and looked for fleas as the searching party came up. To their inquiry for the man which was to be sacrificed by the chief, she said that she had not seen him, having just now arisen, and by the warmth of the sun was looking for fleas. At their departure the owl led Maui forth, and Hina followed till they reached home. Thus was Maui saved. (Thrum 1923:200-201)

Mo‘olelo (stories) of the formation of Pu‘u Keka‘a, a prominent landmark at the coast north of the current project area, as well as other natural features that surround this *pu‘u* are linked to the deeds of the demi-god Māui and punishment for his naysayers following his great feats of lifting the sky and lassoing the sun. With regard to the creation of the rocky promontory that is Keka‘a, Westervelt (1910) recalls the following story:

> A man who had been watching the process of lifting the sky ridiculed Maui for attempting such a difficult task. When the clouds rested on the tops of the mountains, Maui turned to punish his critic. The man had fled to the other side of the island. Maui rapidly pursued and finally caught him on the sea coast, not many miles north of the town now known as Lahaina. After a brief struggle the man was changed, according to the story, into a great black rock, which can be seen by any traveler who desires to localize the legends of Hawaii. (Westervelt 1910:32)

Fornander (1919:538) tells the story of a man, Moemoe, who insulted the demi-god, Māui by saying “You can not [*sic*] catch the sun for you are a low down farmer,” for which Māui replied “When I conquer my enemy and satisfy my desire I shall kill you.” After successfully lassoing the sun, Māui went to find Moemoe in order to follow through with his threat and the following account is given:

> On his return he called at Moemoe’s place. It was absent. Maui traced it to Kawaiaopilopilo. This place is between Kekaa and James’ canefield; Moemoe saw him, and it went on in an irregular manner, now towards the mountain and now towards the sea. Maui became greatly angered, so he flew right on and caught the other above Kekaha; he killed it; it turned, however, into a rock. That rock is still lying along there makai of the new road. Its length is nearly seven feet. While Maui was off on his journey his mother became pregnant with and bore another child, an owl. (Fornander 1919:538)

Keka‘a was also a resting place for Wahine-o-Manua, a woman guided by *pūeo* (owl), who fled from an abusive situation:

> Halulukoakoa (Walker Site 11 at Wahikuli), a coral structure, is famed traditionally as having given shelter to Wahine-o-Manua, a very beautiful young woman who fled from her husband in consequence of constant ill treatment. Regardless of the rigid kapu of the heiaus against women being allowed within its sacred walls, she hid herself therein and watched those searching for her. On their departure she ventured forth and on reaching the road an owl god appeared to her as guardian and guide, and by the clapping of its wings led the pursued girl through the brush till she reached the large stone mauka of Kekaa, Kaanapali, where it left her and she lay down and slept till morn, when she arose and departed. The stone is known as Pohaku o Wahine o Manua. (Thrum 1905:45)

Along with the creation of Pu‘u Keka‘a and the natural features nearby, this *pu‘u* is also known in the *mo‘olelo ‘aina* as a *leina a ka uhane* or leaping of place for the souls. In the traditions of Maui Island, the soul has three abiding places: the volcano, in the water, and on dry plains like the plains of Kamaomao and Keka‘a (Fornander 1919:570-576). Mr. Ahue (in Hill et al. 2007) further explained that one of the ceremonial uses of Pu‘u Keka‘a is more spiritual than physical. The tall

cliffs of Pu‘u Keka‘a serve as a spiritual portal, the leaping place for the souls of the departed to return to the afterlife. It is said that when a person dies, his spirit journeys to Keka‘a (Fornander 1919:542) and from this *leina a ka ‘uhane* one is oriented directly west, towards the setting of the sun and the Hawaiian afterlife.

2.1.4 He Mo‘o, the Apotheosis of Kalā‘aiheana, and the Veneration of Kihawahine

Kala‘aiheana was the sister to the chiefly brothers of Kiha-a-pi‘ilani and Lono-a-pi‘ilani (Fornander 1919:176) and sister Pi‘ikea, all who were born of Pi‘ilani and La‘ieloheikawai. Thus, Kala‘aiheana was a product of a *pi‘o*, or high ranking marriage (Stagner 1986:113, 114) and double *mo‘o* (lizard, also refers to a genealogy/succession or indigenous royal family) lineage (Klieger 1998:7, 9), a fact that would play significantly upon her death. Kihawahine Mokuhinia Kalama‘ula Kala‘aiheana was her full given name and upon her death was transformed into a *mo‘o* (lizard) and referred to as only Kihawahine Mokuhinia Kalama‘ula (Klieger 1998:9). In this way, Beckwith (1970:126) identifies Moku‘ula, more specifically, Loko o Mokuhinia, as the place where Kihawahine Mokuhinia, the *mo‘o* goddess, resided. This *loko,* or pond, was a part of a larger complex of ponds called Kalua o Kiha, literally “The Pit of Kiha” or dwelling place of Kiha, the *mo‘o* goddess.

Loko o Mokuhinia is located near the coast south of the current project area. The lands that immediately surrounded Loko o Mokuhinia were traditionally reserved for the *ali‘i* (royalty) and those in service to the *ali‘i* (Klieger 1998:64-65). According to Klieger (1998:69), the neighborhood extending out from the royal residence of Moku‘ula and surrounding *loko* resembled concentric layers or bands, and where a person lived within these circles depended on ones rank and/or position in government. From Moku‘ula and the King’s residence as the center or *piko*, the subsequent rings were as follows: Kalua o Kiha for the government and court; Kalua‘ehu for the *ali‘i* and extended family; and Lāhainā for the traders and Lāhainā *maka‘ainana* (commoners) (Klieger 1998:70).

The worship of the *mo‘o* occurred at a *heiau*, located at the summit of Pa‘upa‘u, that was specifically constructed and dedicated to the worship of Kihawahine. According to Fornander (1919:520-523), this mountain rises immediately behind the village of Lahaina, and is named for a child whose parents wearied of carrying him down and up the mountain in order to bathe him. At the summit of Pa‘upa‘u is Kamohomoho Heiau which was named for the noted Lāhainā Chief Kamohomoho. He was the first “to build a heiau for the worship of the god called Moo. This lizard excelled in strength; it had a stumped tail; that is the way the tails of the lizards of the present time appear, because of Moo, the great and strong” (Fornander 1920:397).

The supernatural powers of Kihawahine were great, as she was one of Kamehameha the Great’s ancestral gods (*‘aumakua*) (Fornander 1920:397). Claimed by Kamehameha, through his marriage to Keōpuolani, and during his campaign to unite the island chain under a single sovereign (Fornander 1920:397), the image of Kihawahine was set as a dominant image in a *heiau* that was dressed “in deep saffron, yellow or light yellow on a patterned *tapa* cloth.” (Beckwith 1970:125-126). “In her name [Kamehameha] carried his conquest over the islands” and “Ulumaheihei Hoapili, who later became an active friend of the missionaries [in Lāhainā] and a leader in establishing the Christian church, was her keeper (*kahu*)” (Beckwith 1970:126).

2.1.5 The Origins of Pu‘ulaina, ‘Eke, and Lihau

Pu‘ulaina is a hill located within Wahikuli Ahupua‘a. Fornander (1919:532-534) recounts the following regarding the birth of Pu‘ulaina:

> …some say it was begotten by two mountains, Eeke (the summit crater of the West Maui Mountains) and Lihau (the mountain top back of Olowalu). Eeke was the husband and Lihau was the wife. They were real persons, but it will be shown later the reason for their being changed to mountains. After they had lived as man and wife, a child was born to them, a son, the subject of this story which we are considering. But after some time Eeke became entangled, for he saw a beautiful woman, Puuwaiohina from Kauaula, and they committed adultery. Because of this, Lihau thought to choke the child to death, so that the two of them could go and do mischief; this caused them to quarrel. Eeke took the child to his mother, Maunahoomaha, and left him with her. After that their god, Hinaikauluau, placed a restriction over them; they were not to live together, nor were they to have any intercourse with others; but ten days after this order, Eeke again committed adultery with Puuwaiohina above referred to, who was a younger sister to Lihau. Because of this their god punished them by making Eeke a mountain and Puuwaiohina a mountain ridge; that is the ridge prominent at Kauaula. There is, it seems, a hole below the highest point of this ridge. When sound issues from this hole, that is the time the kanaula wind blows a fierce gale.
>
> After that, Lihau was possessed with love for their child, so she asked Maunahoomaha for permission to meet her son, that was agreeable to her mother-in-law, and when she met her child she was glad. When she realized what a handsome man her favorite son had grown to be, she gave him for husband to Molokini, one of the noted beauties of that time, because she was the wife intended for him.
>
> …. However, arriving on Maui, this was one of Pele’s [the fire goddess] cruel deeds: one of her younger sisters saw how handsome Puulaina was, so she asked Molokini to let her have him for husband. The other refused, for she was greatly in love with her own husband; so she [Molokini] was changed into a little island, and she has remained so to this day.
>
> When Lihau heard of this, she grieved for her daughter-in-law, so she went to consult Pele on the matter. But Pele replied gruffly: “If that is the case, then I say to you that you will die; also your son.” Lihau was there and then changed into a hill where Pele resided for some time; the son also died. But the one whose was the desire, earnestly entreated and begged that her husband be spared. But the red-bleary-eyed [Makole-ulaula, an epithet applied to Pele] did not wish it that way. That was how the son became a hill and has remained such until this day. (Fornander 1919:532-534)

Nicholson (1881:40) relates the following Pu‘ulaina story regarding Pele as she made her way through the Hawaiian Archipelago:

> On Pele’s first arrival at Hawaii Nei, she dwelt on the island of Kauai. Thence she went to Kalaupapa (Molokai), and lived in the crater of Kahua-Ko at that place. Subsequently she departed for Puulaina, near Lahainaluna (on the Island of Maui), and excavated that crater.

Fornander (1919:536) recounts an alternative story regarding the naming of Pu‘ulaina following the creation of that hill by Pele:

> This was the reason for so naming it (Pu‘ulaina): At that time a chief was living on the other side of the hill, and because he was tired of seeing it standing there obstructing his view, and preventing him from seeing the breadfruit grove of Lahaina, he ordered his men to go and construct a ti-leaf house on its top; and the hill was called Puulai. And because it was sightly to those viewing it from Lahaina it was called Puulaina. (Fornander 1919:536)

Fornander (1919:536) further notes that the chief who had constructed the *ti* leaf house atop Pu‘ulaina also constructed a larger *heiau* on the far, *makai*, side of the hill—a place where people frequently died and were buried on the side of the hill. It is said that because there was such a great number of dead buried there and because the dirt slid down when the graves were being dug, this side of the hill was named Puuheehee (sliding hill). Jeanne Booth Johnson in Sterling (1998:43) recalls the presence of remnants (three rock mounds) of an old *heiau* atop Pu‘ulaina that was reportedly dedicated to Pele; this *heiau* is possibly the same as that mentioned in the story related by Fornander (1919:536).

Pu‘ulaina was also a central feature in a conversation recorded in *Ka Nupepa Kuokoa,* (1862) where the deceptive words of a *kahuna* encouraged people to go and gather at this place called Pu‘ulaina, with the thought of finding gold and money.

2.1.6 The Stories of Halulukoakoa Heiau

Thomas Maunapau, as recounted by Walker (1931), wrote a series of newspaper articles about his visit to Lāhainā, including an article about a legend associated with a Halulukoakoa Heiau (Walker Site 11) at the southeast corner of the coconut grove at Māla Region of Wahikuli Ahupua‘a:

> At one time a temple was located there known as Halulukoakoa. The story goes that a Hawaiian youth Kaili was seized by warriors of a West Maui chieftain at Kahakuloa.
>
> Kaili was taken in a canoe around the western end of the island for the sacrifice at the temple. His sister Nailima saw the capture and skirted the cliffs of the island, keeping her eyes on the canoes which were in the open sea. She arrived at Lahaina and learned her brother had been taken to the temple. She withdrew to the outskirts of the settlement, sat down upon a stone and commenced to cry.
>
> Pueo the owl-god appeared suddenly and learned the cause of her grief. He told her to prey [*sic*] to all the gods for her brother’s deliverance while he went to the sacrifice. Here the owl-god unbound the victim from the sacrificial stone and bade him walk backwards from the tmple [*sic*]. At first the youth did not understand, but the owl-god circled and beat his wings. Finally conveying his meaning to the youth.

> After walking backwards for several miles under the owl-god’s guidance, he found the sister.
>
> He immediately heard warriors approaching and hid under the stone upon which Nailima was sitting. When the warriors arrived they asked if a man had been seen passing that way, saying they were searching for Kaili. The sister said she had seen no one. The warriors then fell upon the footprints of Kaili and followed them, little knowing they would lead them back to the temple. (Walker 1931:115)

Thomas Thrum in Sterling (1998:43) accounts a story related to Halulukoakoa Heiau as a shelter, or place of refuge:

> Halulukoakoa, a coral structure, is famed traditionally as having given shelter to Wahine-o-Manua, a very beautiful young woman who fled from her husband in consequence of constant ill treatment. Regardless of the rigid kapu of the heiaus against women being allowed within its sacred walls, she hid herself therein and watched those searching for her. On their departure she ventured forth and on reaching the road an owl god appeared to her as guardian and guide, and by the clapping of its wings led the pursued girl through the brush till she reached the large stone mauka of Kekaa, Kaanapali, where it left her and she lay down and slept till morn, when she arose and departed. The stone is known as Pohaku o Wahine o Manua. (Sterling 1998:43)

2.1.7 Politics and Warfare

According to Handy et al. (1991:492), Lāhainā was a favored place for the high chiefs of Maui to reside as the entire *moku* could boast of a mild climate year round, plentiful marine and terrestrial resources, close proximity to Lana‘i and Moloka‘i, and easy communication with other population centers of West Maui as well as settlements along the western, southwestern and southern shores of Haleakalā. Flanked by excellent fishing grounds, Lāhainā was the primary seat of the *ali‘i* (chiefs) of West Maui (Handy et al. 1991) and later was the center of government for the Kingdom of Hawai‘i.

During battles fought between Kamehameha-nui of Maui and Alapa‘i of Hawai‘i, the Hawai‘i Island warriors attacked the food resources of Lāhainā by drying the streams of Kaua‘ula, Kanahā, and Kahoma and laying waste to the *lo‘i* (pondfield). This action by Alapa‘i effectively cut off food and freshwater resources from the Maui forces and country people (Kamakau 1961:74). During the wars of unification, Kamehameha landed and occupied the Lāhainā District from Launiupoko to Mala and all the parts of the lands that had been given over to food patches and cane fields were overrun by men from Hawai‘i Island (Kamakau 1961:171). Kamehameha resided at Lāhainā for one year to equip his fleet with food and other provisions supplied by the lands of Maui, Moloka‘i, Lāna‘i, and Kaho‘olawe (Kamakau 1961:188).

2.1.8 Native Hawaiian Agriculture

Lāhainā, like most centers of pre-Contact Hawaiian populations, was surrounded by irrigated *lo‘i* and *kula* (dryland fields) of the food and plant products essential to traditional Hawaiian life. At least two notable *‘auwai* (irrigation channels) that span multiple *ahupua‘a* between Kaua‘ula and Kahoma are described in native lore. Roughly datable by the chiefs associated with them, the

earliest in the Lahainaluna vicinity is known as ‘Auwaiawao, reportedly named for the Chiefess Wao, sister of Kaululā‘au, who ruled a portion of Maui ca. 1390. Portions of this *‘auwai* were subsequently incorporated into the construction of the Lahainaluna Ditch. The second ‘*auwai*, known as ‘Auwai o Pi‘ilani, is associated with Pi‘ilani, who ruled Maui and the neighboring islands ca. 1450. The ‘Auwai o Pi‘ilani has its headwaters in the Kaua‘ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna (Maly and Maly 2007:4).

According to Fornander (1919:540, 542), descriptions of the establishment of cultivated areas surrounding Lāhainā offer insight into the variety of agricultural goods in the region:

> …Kekaa was the capital of Maui when Kaalaneo [Kakaalaneo] was reigning over West Maui. It is said that there were many people there. Many houses were constructed and the people cultivated a great deal of potatoes, bananas, sugarcane, and other things of a like nature. From what I have been told that country from above Kekaa to Hahakea and Wahikuli, that country now covered with cactus in a northwesterly direction from Lahainaluna, was all cultivated; Kekaa became a city populated by a great many; this chief (Kaalaneo) also planted the breadfruit and kukui trees down at Lahaina. (Fornander 1919:540, 542)

Accounts from 1793, collected by Handy (1940:105) illustrate the extensiveness of pre-Contact cultivation near Lāhainā between Paunau and Pana‘ewa Aupua‘a. Archibald Menzies was the acting surgeon and naturalist onboard the *H.M.S Discovery* and traveled to the Hawaiian Islands between the years 1792-1794. Captained by George Vancouver, the *H.M.S Discovery* and Menzies made three visits to Hawai‘i (Menzies 1920). Menzies kept a journal, which included references to two previous trips to Hawai‘i in 1786 and 1787, although no further notes are known of from those earlier trips. Menzies’ journals provide highly detailed descriptions of Lāhainā and its deliberately designed agricultural arrangement. The following passages described some of what he saw on these trips.

> [Lahaina, 1793] Here our conductors importuned us to dine … after which we continued our journey, and soon entered the verge of the woods where we observed rugged banks of a large rivulet that came out of the chasm cultivated and watered with great neatness and industry. Even the shelving cliffs of rock were planted with esculent roots, banked in and watered by aqueducts from the rivulet with as much art as if their level had been taken by the most ingenious engineer. We could not indeed but admire the laudable ingenuity of these people in cultivating their soil with so much economy. The indefatigable labor in making these little fields in so rugged a situation, the care and industry with which they were transplanted, watered and kept in order, surpassed anything of the kind we had ever seen before. It showed in a conspicuous manner the ingenuity of the inhabitants in modifying their husbandry to different situations of soil and exposure, and it was with no small degree of pleasure we here beheld their labor rewarded with productive crops.
>
> March 17. On the forenoon of the 17th, I accompanied Captain Vancouver and a party of officers, with the two Niihau women, to see the village of Lahaina, which we found scattered along shore on a low tract of land that was neatly divided into little fields and laid out in the highest state of cultivation and improvement by being

> planted in the most regular manner with the different esculent roots and useful vegetables of the country, and watered at pleasure by aqueducts that ran here and there along the banks of intersecting fields, and in this manner branching through the greatest part of the plantation.
>
> These little fields were transplanted in a variety of forms, some in rows, in squares, in clumps and others at random; some according to their nature were kept covered with water, while others were with equal care kept dry by gathering earth around them in little hills. (Handy 1940:105)

Outside the fields and gardens of Lāhainā, the lands were dry and desolate, and observations note the rather abrupt shift in vegetation and cultivation, as well as the apparent severity of the landscape along the alluvial plains with a rise in elevation. Jacques Arago, a French author and artist in service to Captain Vancouver's company of officers. While working as a draftsman aboard the ships *Uranie* and *Physicienne* under the command of Captain Louis Freycinet during a French scientific expedition of the Pacific in the years 1817–1820, he noted the following about the Lāhainā area:

> The space cultivated by the natives of Lahaina is about three leagues in length, and one in its greatest breadth. Beyond this, all is dry and barren; everything recalls the image of desolation. Nevertheless, the soil and its resources are the same; whence therefore this apparently culpable neglect? It is a natural consequence of the mode of reasoning adopted by these people; they have all that is necessary at hand, what advantage would there be in seeking superfluities from afar? ... Superfluities are thrown away on these people. Twenty acres of land will not produce them a better dinner than their square of taro. (Arago 1823:120)

In an unpublished manuscript about life in Lāhainā in 1897, Arthur Waal, former *luna* (foreman, boss) (Figure 6) for Pioneer Mill Sugar Company (PiMCO) and postmaster for the Lāhainā post office, makes the following observation about the population and subsistence practices of native Hawaiians in Lāhainā:

> Lahaina has a mixed population. Many natives had their own kuleanas, up in the valleys where they grew taro, sweet potatoes, vegetables and bananas. Most all of them had chickens and pigs.
>
> I saw the last remaining grass huts in Lahaina, one was near the Kilipaki Village camp on the beach out Kaanapali way, and the other one in Kahumana gulch occupied by a very old Hawaiian with a thick, heavy white beard and hair. This Hawaiian, George Kukaia, was a wonderfully health specimen of the old type Hawaiian. Nearby was his taro patch and fruit bearing trees. (Waal 1897:5, 6-6A)

2.1.9 Fishing in Lāhainā

The inland ponds, or *loko*, of Aimakalepo, Unahiole, and ‘Alamihi near the mouth of Kahoma, and the famed royal fishpond of Mokuhinia at Waine‘e likely provided a reliable fish resource that was supplemented by off-shore communal or family fishing. Following the island-wide survey conducted by (Walker 1931:299), he relates that J.K. Napaepae, a native of Lāhainā, noted that

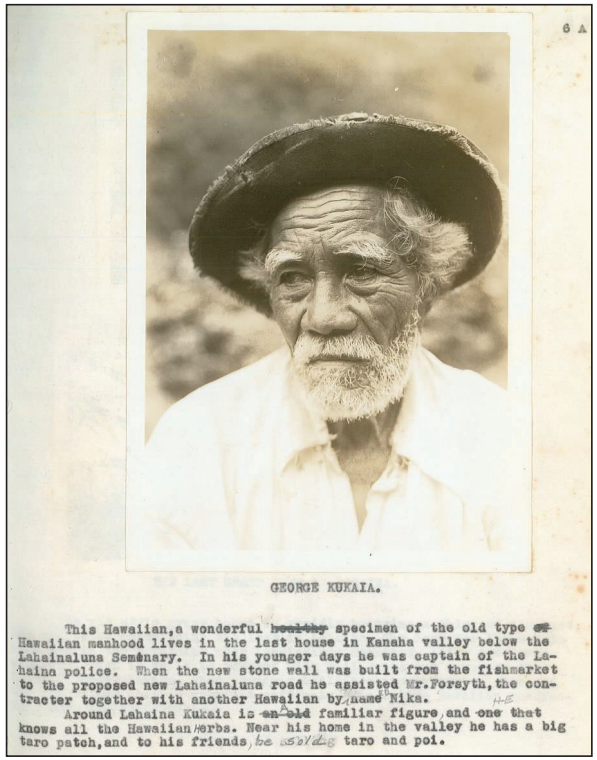

Figure 6. Photograph of George Kukaia and excerpt from Waal (1897:6)

there used to be a pond at Māla named Alanuhi that was primarily for mullet, but “now filled with rubbish and crossed by the road leading out to Mala wharf.”

Kahā‘ulelio (2006:9) notes a particular fishing ground, Kapuali‘ili‘i, that extended from Keawaiki (present-day Lāhainā Harbor) to ‘Uha‘ilio Point, less than one mile along the Lāhainā shore. Fishing often involved a cooperative effort of *lau* (leaf) fishing, a method using a drag line made of *ti* leaves. In this manner of fishing, smaller fish and *kakakī* (a type of *kala* or unicornfish) were the primary catches. Other types of fish and marine resources often sought in the waters off of Lāhainā include *mahimahi, aku, iheihei, puhiki‘i, he‘e, weke, akule*, and many others (Kahā‘ulelio 2006).

2.2 Historical Background

2.2.1 Early Historic Period

In the heyday of whaling [between 1820–1860], it was estimated that over 50 whalers were sometimes at anchor off Lāhainā at any one time (Alexander 1899:259). By the year 1844, Lāhainā recorded 326 whaling vessels at port with the number the following year increasing by over 50 vessels to 379 (Thrum 1912:8-9). According to Ashdown (1963), it is during the whaling era that Pu‘u Keka‘a became known as “Black Rock” (cited in The Maui Historical Society 1971), the commonly known name for the rocky promontory north of the current project area:

> During the years after the discovery of the Hawaiian Islands in 1778, foreigners taught some Hawaiians to fear “ghosts” and the “unknown.” At Pu‘u Keka‘a, whalers set up kettles in which to try-out whale oil. They could not pronounce the proper name so they called the sacred hill as “Black Rock” and said it was “haunted by evil spirits.” (Ashdown 1947:48)

> During the time King Kahekili ruled Maui [about AD 1690]. It was told he had visited Kā‘anapali, and to his dismay and anger, there was no feast waiting for him and his company as “the sacred taro patches had been neglected, the sacred fish-pond of Loko-i‘a Kapu-kapu at the mouth of the Honokowai river practically empty of fish, and his people in a state of terror”. Kahekili ascended Pu‘u Keka‘a to pray in company with his priests, and there he learned the causes of misery in the area. People had many illnesses, which the local doctors could not understand or cure, and they also had learned to drink liquor. Drunkenness, disease and idleness had afflicted too many in the village of Keka‘a and in all Lahaina. By order of the king, strong men were sent to destroy stills, to burn filthy, squalid homes, and to renew the village. Others were ordered to renew the taro patches and fishpond, the sweet-potato-hills, and then begin life anew. (Ashdown 1947:49)

With the unification of the Hawaiian Islands in 1791 under a single sovereign, followed by the arrival of the first Protestant missionaries in Lāhainā in 1823; changes such as Western-styled commerce and Christianization of the Native Hawaiian people began to sweep across Lāhainā (Alexander 1899:194). The town and surrounding landings played a prominent role in the early economy of the Kingdom. As early as 1862, the lands surrounding Lāhainā were cultivated in commercial sugar (Gilmore 1931:198-203), while the sandalwood trade of the 1810s, the whale trade of the 1830s, the Irish potato trade of the 1840s and the establishment of the protestant

Lahaina Mission Station in the 1820s and the Lahainaluna Seminary in the 1830s drew people to the waterfront areas, which ultimately resulted in a population rise (Kuykendall 1968:234). This trend made Lāhainā one of the primary economic, religious, and educational centers for the early Hawaiian Kingdom (Kamakau 1992:304).

The Protestant missionary William Ellis, who visited Lāhainā during the 1820s, described the landscape that had entranced both the Hawaiians themselves and the nineteenth century newcomers:

> The appearance of Lāhainā from the anchorage is singularly romantic and beautiful. A fine sandy beach stretches along the margin of the sea, lined for a considerable distance with houses and adorned with shady clumps of kou-trees, or waving groves of cocoa-nuts… The level land of the whole district, for about three miles, is one continued garden, laid out in beds of taro, potatoes, yams, sugar-cane, or cloth-plants. The lowly cottage of the farmer is seen peeping through the leaves of the luxuriant plantain and banana tree, and in every direction white columns of smoke ascend, curling up among the wide-spreading branches of the bread-fruit tree. The sloping hills immediately behind, and the lofty mountains in the interior, clothed with verdure to their very summits, intersected by deep and dark ravines, frequently enlivened by waterfalls, or divided by winding valleys, terminate the delightful prospect. (Ellis 1969:76-77)

Missionary, C.S. Stewart, in his journal from his residence in Hawai‘i between 1823 and 1825, describes Lāhainā and its cultivation and irrigation systems. Stewart described Lāhainā as appearing to be in neglect although in his description there is ample evidence of traditional cultivation:

> The bread-fruit trees stand as thickly as those of an irregularly planted orchard, and beneath them are taro patches and fishponds, twenty or thirty yards square, filled with stagnant water, and interspersed with clumps of tapa tree, groves of the banana, rows of the sugar-cane, and bunches of the potatoe and melon. All these flourish exuberantly from the richness of the soil alone, with but little attention or labor from the hand of man.
>
> It scarce ever rains, not oftener than half a dozen times during the year; and the land is watered entirely by conducting the streams which rush from the mountains, by artificial courses on every plantation. Each farmer has a right, established by custom, to the water every fifth day. The pathways, which are very narrow, are usually along the sides of these water trenches.
>
> The number of inhabitants is about two thousand five hundred. Their houses are generally not more than…eight or ten feet long, six or eight broad, and from four to six high: having one small hole for a door, which cannot be entered but by creeping, and is the only opening for the admission of light and air. They make little use of these dwellings, except to protect their food and clothing, and to sleep, in during wet and cool weather; and most generally eat, sleep, and live in the open air, under the shade of a kou, or bread-fruit tree. (Stewart 1839)

In August 1826, the Reverend William Richards writes from Lāhainā:

> At the close of my last letter, we were living on the sea beach, a spot rendered unpleasant, not only by the roaring of the surf, which dashed within a few feet of our doors, but also, by the numerous houses recently erected on every side … Our houses, too, had become so bad, that they were a very indifferent shelter from the storm, and we were daily expecting that the wind would take them entirely away.
>
> Ka‘ahumanu soon wrote to me, that she had ordered the governor of Lahaina to make over to me, a small piece of taro and potato ground, and also a garden and building spot. Two large well built native houses were standing in the yard, to which we immediately removed, and in which we now live. Directly in front of us, are several taro gardens and fish ponds, surrounded with cocoa nuts [*sic*], *hala*, and *kou* trees, in the midst of which stands the brick house erected by Tamehameha, and called by Vancouver, “the royal palace.”
>
> Back of our houses, and inclosed [*sic*] in the same yard, is about an acre of excellent land, designed for a garden. It contains three breadfruit trees, and on its borders, are a few cocoa nuts. It is now covered with bananas, plantains and sugar cane, interspersed with melons, cucumbers, beans, cabbage and yams.
>
> On the 26th of October, the schools of Lahaina were all publickly [sic] examined. There were present, nineteen schools containing *nine hundred and twenty two* [italics theirs] scholars. The school of Nahienaena, in a particular manner, distinguished itself for its improvement. (Richards 1827)

The Reverends Richards writes in the *Missionary Herald*, October 1830, to discuss religious matters at the missionary station of Lāhainā:

> The state of things at Lahaina, on the island of Maui, continues to be encouraging … Public worship on the Sabbath was established on the 18th of February, 1825. Then, ten persons were present – now more than as many hundreds… In every considerable village from one end of the island to the other, the people have erected a house for the worship of God. At Olualu, [Olowalu] a village eight miles distant from Lahaina, we have preached during the season, nearly thirty sermons to a congregation of five to six hundred. This and a single Sabbath at Kanepale, [Kā‘anapali] a village equally distant from Lahaina in another direction, is all that we have been able to do for the people on this side of the island. (Richards and Green 1831)

Census figures provided by Protestant missionaries throughout the Hawaiian Islands beginning in 1831 provide the earliest documentation of the size of the Native Hawaiian population after the first decades of Western contact. During the first census of Maui Island in 1831-1832, a population of 8,415 was recorded for the Lāhainā District; which comprised 24% of the entire island population of 35,062 (Schmitt 1977:11-12). By the time of the next census in 1835-1836, the Lāhainā population had dropped to 5,234 comprising 22% of the Maui Island population of 24,199 (Schmitt 1977:11-12).

Lāhainā, being a center of pre-Contact and post-Contact economic activity, saw many missionaries moving into Lāhainā Town and beyond to acquire lands for the construction of churches and schools. South of the current project area, the western end of Pana‘ewa Ahupua‘a was selected as the location for the Lahainaluna School. The Reverend Lorrin Andrews established a school for men at Lahainaluna in 1831. Protestant missionaries endeavoring to instruct Native Hawaiians in Christianity had convinced the chiefs and royalty of Lāhainā that a school was needed to educate and provide a supply of native teachers for the people of Maui (Lahaina Restoration Foundation 2008). The governor of Maui, Hoapili, and his wife granted lands “*mai ka wai i ka wai*,” (all between the two streams) to the missionaries on the lower slopes of Pu‘u Pa‘upa‘u. The construction of school buildings in the native style was undertaken by the students themselves. Missionaries Lorrin Andrews and Jonathan Green “shouldered their axes and headed a progression of future students up the mountain for timber. Academic work began September 5, 1831, with twenty-five young men” (Alexander 1953:69). Lahainaluna was “the first high school in the islands” and “reported an enrollment of 34 students in 1835 and offered courses in algebra, geometry, trigonometry, and surveying, all taught in Hawaiian” (Schmitt 1977:xx).

Following the initial construction of the school, food supplies from the hillside potato plots were often found wanting to provide for the teachers and resident students. In 1835 missionaries pushed for additional favorable lands to be allocated to the school, which The King then tasked Ulu-maheihei to acquire what lands he deemed suitable for the school (Kamakau 1961:355). In addition to taro lands by the stream of Kanahā and within the lands of Makaili‘i and Kukuikapa, Ulu-maheihei also allocated to the school:

> …two cattle pastures: the plain of Ku‘ia to Kaua‘ula turning upward as far as Kahili, and the plain of Pana‘ewa between Kanaha and Kahoma where is the plain of Pahalona … and when the chiefs complained and said that these were their lands given by Kamehameha, and that all their taro land had been taken away and nothing left but a few breadfruit trees, Ulu-maheihei answered, “It is a fine thing; do not get excited about the land. Give your land to those who are seeking knowledge. This is the thing which will establish the government of your chiefs … Knowledge is fundamental to living as a chief.” When Elizabeth Kina‘u visited Lahainaluna in 1837 she gave more land extending to the creek of Wao. (Kamakau 1961:355)

A theological department was established in 1843, headed by Reverend Sheldon Dibble, but the early death of Rev. Dibble in 1845 ended all systematic theological instruction on Maui until Reverend W. D. Alexander began teaching theology at Wailuku in 1865.

David Malo, although 38, entered the school with the first class of students. With Rev. Sheldon Dibble, Malo helped to translate portions of the Bible, which were then printed and bound by Lahainaluna students. Malo wrote an account of Kamehameha I, entitled *Hawaiian Antiquities*, but the original manuscript was lost. The account, published by its translator Nathaniel B. Emerson in 1903, and published by the Bishop Museum in 1951, is considered one of the foremost ethnological works in the Hawaiian language. It was Malo who said, “*O keia ke kukui pio ole i Ka Makani o Kauaula*,” or “This is the torch which the Winds of Kaua‘ula cannot extinguish,” meaning the educational impact of Lahainaluna High School was permanent and unaffected, even by the most famous storm winds of the region. The first newspaper published serving the Pacific

Ocean was the *Ka Lama Hawaii* (The Torch of Hawaii) issued at Lahainaluna in 1834 (Alexander 1894).

By 1837, Charles Burnham had finished building a two-story house of stone walls, wood rafters and a thatched roof for the school. A printing press was installed in this first stone building of the new Lahainaluna Seminary, which was operated by students who set type and printed lesson books in their native language (Hale Pa‘i o Lahainaluna 2008). In 1838, student Samuel P. Kalama engraved the first *ahupua‘a* map of the Hawaiian Islands at Lahainaluna. The map was a groundbreaking achievement at the time (Moffat and Fitzpatrick 2004) and was hand-tinted with colors to call attention to larger land districts. In 1841, a Royal Historical Society was formed at Lahainaluna. At age 26, Lahainaluna student Samuel M. Kamakau was selected as one of the officers, along with Kamehameha III (president), William Richards (vice president) and Sheldon Dibble (secretary). Kamakau (1961) authored *Ruling Chiefs of Hawaii*, which remains the best compilation of the generations of Hawaiian chiefs before Kamehameha I.

In 1842, the Reverend John S. Emerson began construction of the Lahainaluna Ditch, a waterway modeled after a native *‘āuwai*, which had carried water between the Kanahā and Kaua‘ula streams (Maly and Maly 2007). Rev. Emerson remained at the Seminary until the completion of the waterway in 1846. In 1843, the Lahainaluna press published “The Laws and the Resolutions Passed at the Annual Council of the Hawaiian Nobles and Representatives Convened According to the Constitution,” the first printed record of actions supporting the new constitution. A missionary instructor at the Seminary, Sheldon Dibble, published the first history of the Sandwich Islands at Lahainaluna that same year (Anderson 1864).

Accounts by Reverend William Richards in 1845 (Lahaina Restoration Foundation 2008), and Mr. Chester S. Lyman in 1846 (Maly and Maly 2007) referred to the ongoing construction of the Lahainaluna Ditch. The lands of Lahainaluna, first administered by missionaries of the Protestant church, were transferred from the American Board of Commissioners for Foreign Missions (ABCFM) to the Hawaiian Government in 1849 and would remain under government control thereafter (The Maui News 1926).

In 1836, following the death of Kamehameha III’s sister, Harrieta Keōpūolani Nāhi‘ena‘ena, from illness following labor and childbirth, the king arranged to transport her remains from O‘ahu to “…have her laid away on Maui, the land where her mother, Harriet Ke-opu-o-lani had been laid away, ‘in the calm of Hauola’” (Kamakau 1961:341). After being escorted to Lāhainā by a number of smaller schooners carrying a very large retinue of attendant *ali‘i* and entourage of Nāhi‘ena‘ena, a road was prepared for the funeral procession that would travel a loop through the busy port town:

> The body remained on the ship while a roadway was prepared by cutting down breadfruit trees and *kou* trees of Molakia and covering the way with sand, then a layer of grass, and finally mats spread all along the path. (This roadway) began at the horse gate at Pana‘ewa… (Kamakau 1961:341)

This event held a special significance at a time when the Kingdom of Hawaii was experiencing a shift in the power of the Monarchy during the reign of Kamehameha III. According to Kamakau (1961:342):

> On the day of funeral many high chiefs gathered, such as the king and queen, Kina‘u, Ke-ka-ulu-ohi, Kuini Liliha, Ke-kau-‘onohi, Ke-ano, and many others who were the last of their race to be entitled to the great royal *kahili* from which have branched off the *kahili* of today with their variegated feathers. (Kamakau 1961:342)

2.2.2 The Māhele and the Kuleana Act

The most significant change in land-use patterns and land allocation came with the Māhele and the privatization of land in Hawai‘i. The 1839 establishment by Kamehameha III (Kauikeaouli) of a Bill of Rights for the people of Hawai‘i, followed by a formal constitution in 1840, hastened the shift of the Hawaiian economy from that of a subsistence-based economy to that of a market-based economy. The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—which introduced the concept of ownership of private property into Hawaiian society. During the Māhele, all of the lands in the Kingdom of Hawai‘i were divided between *mō‘i* (king), *ali‘i* (royalty), *konohiki* (overseer of an *ahupua‘a*), and *maka‘āinana* (tenants of the land), and passed into the Western land tenure model of private ownership. On 8 March 1848, Kauikeaouli further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners, and in 1850 the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995:41-51).

The *maka‘āinana* were offered fee-simple titles for their house lots and lands which they cultivated for themselves. *Kuleana* awards for individual parcels within the *ahupua‘a* were subsequently granted through a land commission. These awards were first presented to Native Hawaiian tenants followed by the naturalized foreigners (non-Hawaiians born in the islands) or long-term resident foreigners who could prove occupancy on the parcels before 1845.

Land Commission Awards (LCAs) were granted by ministers representing the Kingdom of Hawaii’s Department of the Interior. Native testimony to establish title to real property was recorded by Native Register – wherein claimants would provide traditional proof of ownership – and in like manner foreign testimony by Foreign Register – wherein boundary survey evidence would support traditional claims.

A small area in the northern portion of the project area was once part of Land Grant 7715M, an LCA that encompassed the entire *ahupua‘a* of Hanakao‘o. LCA 7715M was awarded to Lot Kapuaiwa (King Kamehameha V), and after his death on 11 December 1872, was transferred to Ruth Keelikolani, his half-sister and heir (Figure 7 and Figure 8). Eventually this property became part of Lahaina Sugar Company—later to be absorbed into the Pioneer Mill Company (PiMCo).

2.2.3 Mid-Nineteenth to Early Twentieth Centuries

The whaling industry in the Pacific Ocean reached its peak in 1859. Prices for whale oil collapsed five years later. Since the 1840s, the Hawaiian economy had been dependent primarily on supplying whale ships during their long layovers in the islands. With the dwindling number of ships arriving during the 1860s, the population of Lāhainā Town and neighboring West Maui *ahupua‘a* dependent on the prosperity of Lāhainā migrated to other parts of Maui and to other islands (Schmitt 1977). In 1853, 4,833 persons were recorded as living in the Lāhainā District.

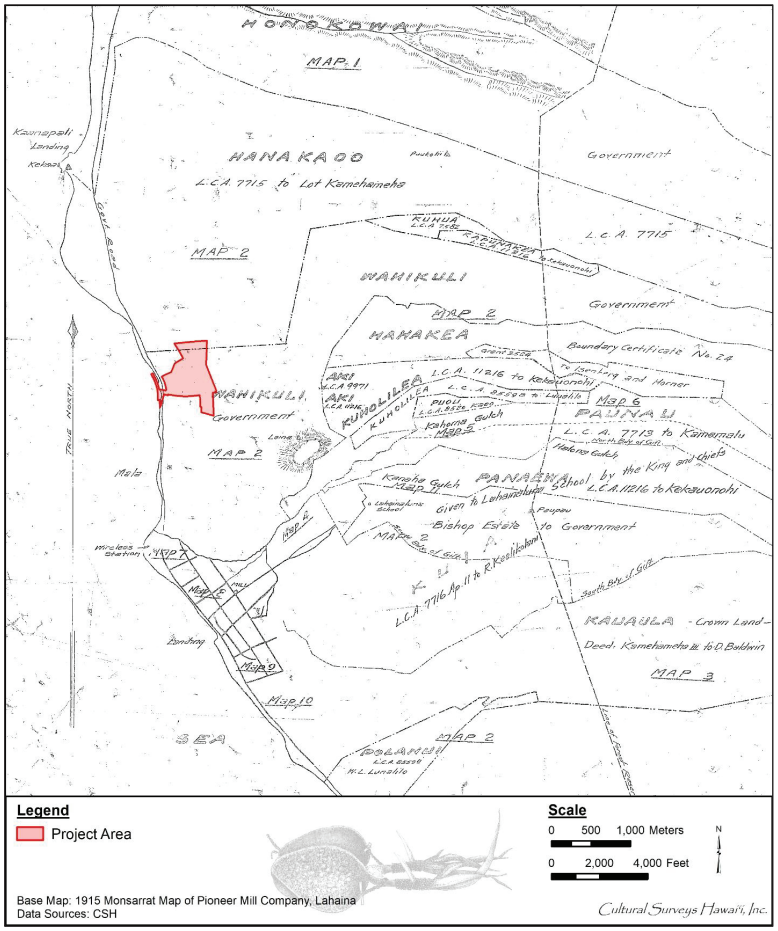

Figure 7. Monsarrat (1915) map showing project area in relation to LCA 7715

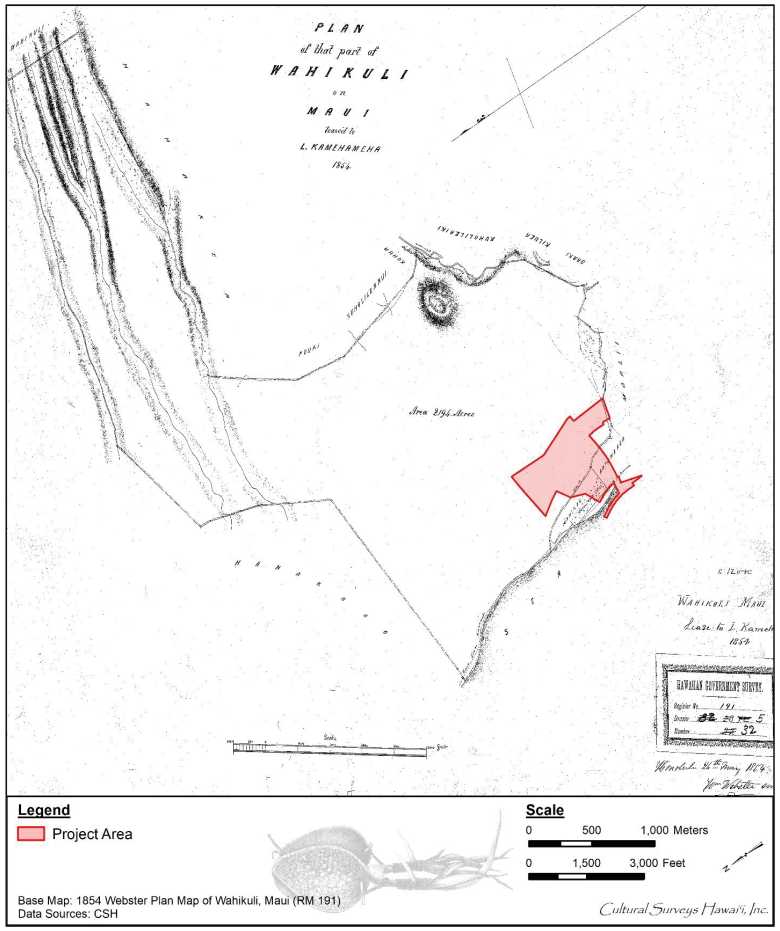

Figure 8. Webster (1854) map of Wahikuli showing the project area

In 1878, the total district population had dropped to 2,448, and by 1896, the population was 2,398 (Schmitt 1977:12-13). A Dodge (1880) map depicts the location of Lahainaluna School (Figure 9). The school and major development in the vicinity are also shown on a Dodge (1885) Hawaiian Government Survey Map of Maui (Figure 10).

2.2.3.1 Development of Sugar as a Commercial Crop

Kō (sugarcane) originally is believed to have been brought to the Hawaiian Islands during the initial Polynesian settlement of the island chain. Early Hawaiians cultivated several varieties of *kō*, each with different cultural associations. *Kō* was also considered to be therapeutic and was a primary ingredient of many native compounds (Handy et al. 1991:183-189).

As the Hawaiian economy shifted following the enactment of the Māhele, *kō* would soon become important as a major cash crop. From 1840 to 1850, a cane field and a rude mill, consisting of three whaling ship try-pots on adobe and stonework with wooden rollers and iron bands, was owned and operated by David Malo in Lāhainā for the production of molasses that was sold primarily for home consumption (Rolph 1917:168-169). As foreign entrepreneurs looked to expand their exportable crops and increase their profits, sugar became the answer, and by 1849 Judge A. W. Parsons was operating a commercial mill in Lāhainā (Jensen 1989). A milestone for the sugar industry of Hawai‘i occurred in either 1854 or 1855 when Captain Pardon Edwards brought a variety of sugar cane from the Marquesas to Lāhainā. Originally intended for transport to Charles Titcomb of Hanalei on Kaua‘i Island, several stalks of the Marquesan cane were given to Consul Chase and F. A. Oudinot of Lāhainā to plant in their gardens (Kew Royal Gardens 1894:419). It was quickly recognized that this variety of cane outperformed the Cuban varieties of sugarcane that were being grown in the Hawaiian Archipelago at that time, as the cane that was introduced by Captain Edwards produced cane with a very sweet quality and a remarkably fast-growing time (Kew Royal Gardens 1894:418-419). This newly introduced cane came to be known as Lāhainā Cane and, to the exclusion of others, was the premier type of sugarcane grown in Hawai‘i (Stubbs 1900:59, 66).

With the introduction of improved technology and the first steam-driven mill, the next 20 years saw an explosion in the sugarcane industry in Hawai‘i with over 22 plantations or mills operating on the island of Maui by 1884 (Wilcox 1996:2-5). Two of the 22 plantations in operation toward the end of the nineteenth century, West Maui Sugar Company and Pioneer Mill Company, led the sugar industry in the Lāhainā District.

2.2.3.2 West Maui Sugar Company

In 1864, Lot Kamehameha (King Kamehameha V) ventured into the sugar industry with two established sugar entrepreneurs, F.W. Hutchison, of the Lahaina Sugar Company, and James Makee, of the Rose Ranch sugar plantation in Ulupalakua, to form the West Maui Sugar Company. To start, the King leased the crown lands in Olowalu and Ukumehame to the West Maui Sugar Company (Olowalu 2008). An additional tract of 2,194 acres of crown land in Wahikuli was also leased by Lot Kamehameha in 1854, nine years prior to his coronation as king; it is unclear, however, if these lands were included in the lands that were under cultivation by West Maui Sugar Company. Overall, sugar production was fair for the fledgling company. Lacking a mill, however, the company sent its crop to PiMCo for processing (Olowalu 2008).

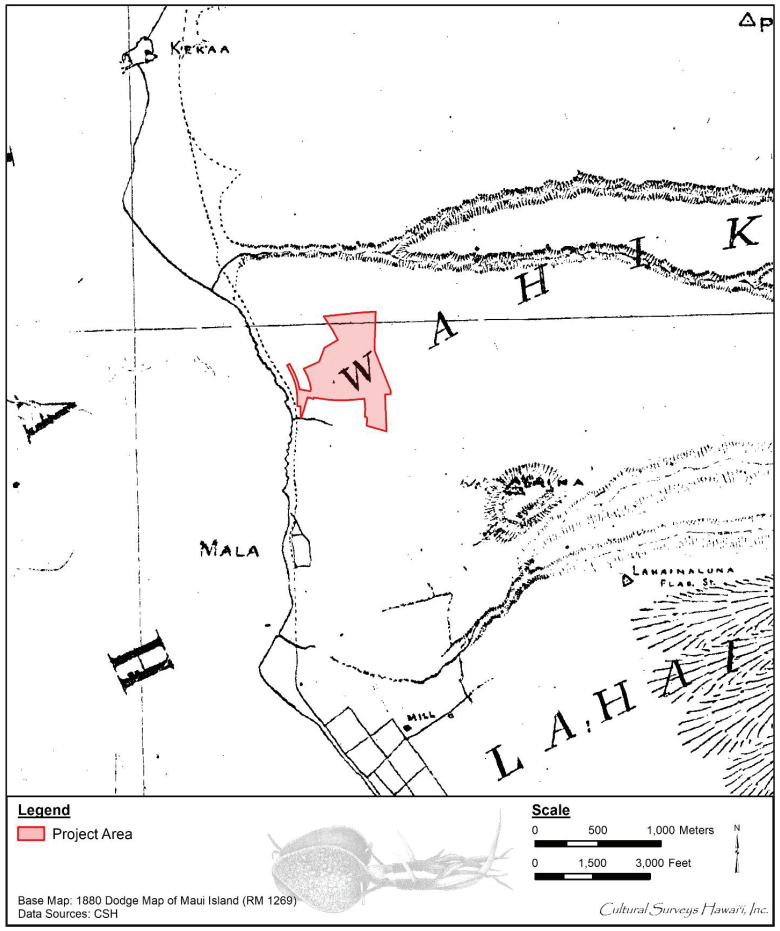

Figure 9. Dodge (1880) map of Wahikuli showing the project area and Lahainaluna School to the southeast

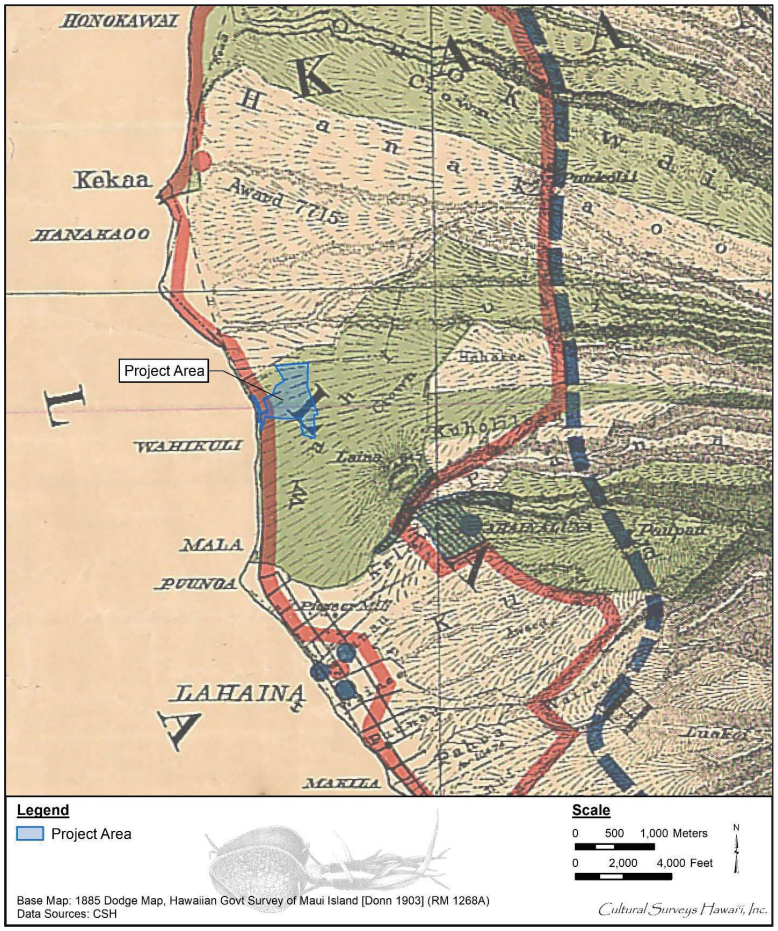

Figure 10. Portion of Dodge (1885) Hawaiian Government Survey Map of Maui showing the project area and Lahainaluna School to the southeast; Crown Lands shown in green

In the late 1860s, Z.S. Spalding became a partner in the West Maui Sugar Company and, taking over as manager, had West Maui Sugar Company acquire the Lahaina Sugar Company mill to end its reliance on the PiMCo mill for processing. The company was formed under the premise that the high prices of sugar set during the American Civil War would continue. However, Louisiana's sugar beet industry recovered in the mid-1860s, causing American sugar prices to fall. King Kamehameha V blamed the company's financial woes on Spalding, who years before had been a spy for the U.S. government concerning the U.S. interest in annexing the islands. Finally, after the King threatened to withhold his land leases (Wilcox 1996:127), Z.S. Spalding was dismissed and James Makee's son, Parker Makee, filled in as manager (Olowalu 2008). Following the death of King Kamehameha V in 1872, the land leases under his name were transferred to the West Maui Sugar Company and two years later the associates of the company sold its assets to James Campbell and Henry Turton of the PiMCo (Wilcox 1996:127).

2.2.3.3 Pioneer Mill Company

In 1862, a fire swept through the original three school buildings and two dwelling houses of the Lahainaluna Seminary. Repairs were swift, with Lot Kamehameha (Kamehameha V) personally supervising construction efforts to replace the lost buildings and restore the school. By this time, descendants of the early missionaries to the "Sandwich Islands" were returning from schools in the U.S. as ordained ministers, or finding positions as engineers, teachers, or doctors in the Hawaiian Islands. Many missionaries who labored during the "Great Awakening" between 1837 and 1842 were "sustaining pastoral relations" and retiring from active missionary service. Samuel T. Alexander had been sent from his family home at Lahainaluna to study at Oahu College (Punahou School), and at Williams College in Massachusetts. S.T. Alexander returned to Lahainaluna in 1862 as a teacher and is credited with improving sugarcane and banana yields there with his students. By 1863, S.T. Alexander was named manager of the Waihee Sugar Plantation (Dean 1950).

As the Hawaiian population of West Maui declined during the nineteenth century, missionaries and entrepreneurs moved into the district, reshaping the landscape for Western enterprises and pursuits. Reverend Dwight Baldwin (1798-1886) had arrived in the Hawaiian Islands in 1831 and was stationed at Lāhainā between 1835 and 1870. In the early 1850s, Rev. Baldwin was granted 2,675 acres of land in northwest Maui. This land holding became the basis for enterprises expanding over areas of West Maui undertaken by his son, Henry Perrine Baldwin, during the nineteenth century (Dean 1950).

Henry Perrine Baldwin excelled at studies at Oahu College. While working for his brother's sugar plantation in Lāhainā to raise money for an anticipated medical school education, he was hired away by S.T. Alexander to be head *luna* at the Waihee Plantation. In 1869, both S.T. Alexander and H.P. Baldwin resigned and established the Haiku Plantation. In 1876, they started a project to bring East Maui water to the dry leeward isthmus of Central Maui. It was modeled after a successful irrigation project undertaken on Kaua‘i in 1866 and demonstrated a process which would be repeated many times throughout the Hawaiian Islands (Wilcox 1996). The system by which mountain water was brought to the PiMCo fields in Lāhainā from Honokōhau was modeled on the same principle.

The Pioneer Mill Company was established as a partnership in 1863 between James Campbell, Henry Turton, and Benjamin Pittman. A plantation village, the Kā‘anapali Village, and a production facility was established at Pu‘u Keka‘a along with a shipping port at Kā‘anapali Landing. In order to increase the amount of land under cultivation and the crop yields, the new plantation worked out long-term land leases along with the appurtenant water rights from regional small landowners (Simpich 1974). The growing of sugarcane along the west coast of Maui required the development of sources for mountain water. Using gravity flow water from mountain streams, PiMCo produced 500 tons of sugar in 1866 (Dorrance and Morgan 2000). With the acquisition of lands and water rights that were controlled by the West Maui Sugar Association in 1874 (Waal 1897), PiMCo was able to significantly expand its land holdings and crop yields. In 1872, production had reached 1,000 tons annually, and by the turn of the century, production had cleared over 10,000 tons of sugar a year (Thrum 1900:41).

In 1877, Harry Turton bought out his partners and was the sole owner of the Pioneer Mill Company; by 1879, almost 4,500 acres of land were under contract to the company (The Maui News 1926). In 1885, H. Hackfield & Company, later American Factors (AmFac/JMB), the sugar agency representing the Pioneer Mill Company, purchased the controlling shares in the company and negotiated additional leases to acquire large tracts of land in Kaua‘ula. These lands were controlled by the Bernice Pauahi Bishop Estate and included water sources essential to the expansion of the plantation.

By 1890, PiMCo holdings had grown to 10,000 acres of regional watershed, cultivatable land, and transportation right-of-ways (personal communication, Lahaina Restoration Foundation, 2008). With increasing acreage under cultivation resulting in higher crop yields, PiMCo was one of the first to put in a rail system for hauling cane from the fields to the mill (Conde and Best 1973:252). In the early days of PiMCo, the sugar grown along the coast of Lāhainā was wholly dependent on the flow of mountain water. The development of additional water sources and pumping water to areas not previously irrigated became the means of expanding and maintaining sugar cultivation along the alluvial plains of Lāhainā. Minimal development is shown within the current project area on a Monsarrat (1915) map of Pioneer Mill Co. (see Figure 7). A Wall (1913) map describes the land withing he project area as “covered with many large boulders” and requiring “hand cultivation” (Figure 11). A 1929 map shows development around Lāhainā town to the south and near Keka‘a Point to the north (Figure 12). A 1933 Maui Island USGS topographic quadrangle depicts a railway line near the coast and a large unimproved road along the eastern boundary of the current project area (Figure 13).

2.2.3.3.1 Drilling for Well Water

Between 1860 and 1881, aside from limited diversions of the various streams issuing from the valleys in back of Lāhainā, Olowalu, and Ukumehame, no large-scale development for irrigation water had been attempted by PiMCo or any of the other sugar enterprises of West Maui. The McCandless Brothers, an engineering enterprise from Honolulu, were hired in 1883 to drill the first well for PiMCo at Kā‘anapali. While ample water was found, Turton considered the drilling a failure as he was hoping for an artesian source at Kā‘anapali that did not require the more costly expenditure of pumping (McCandless 1936).

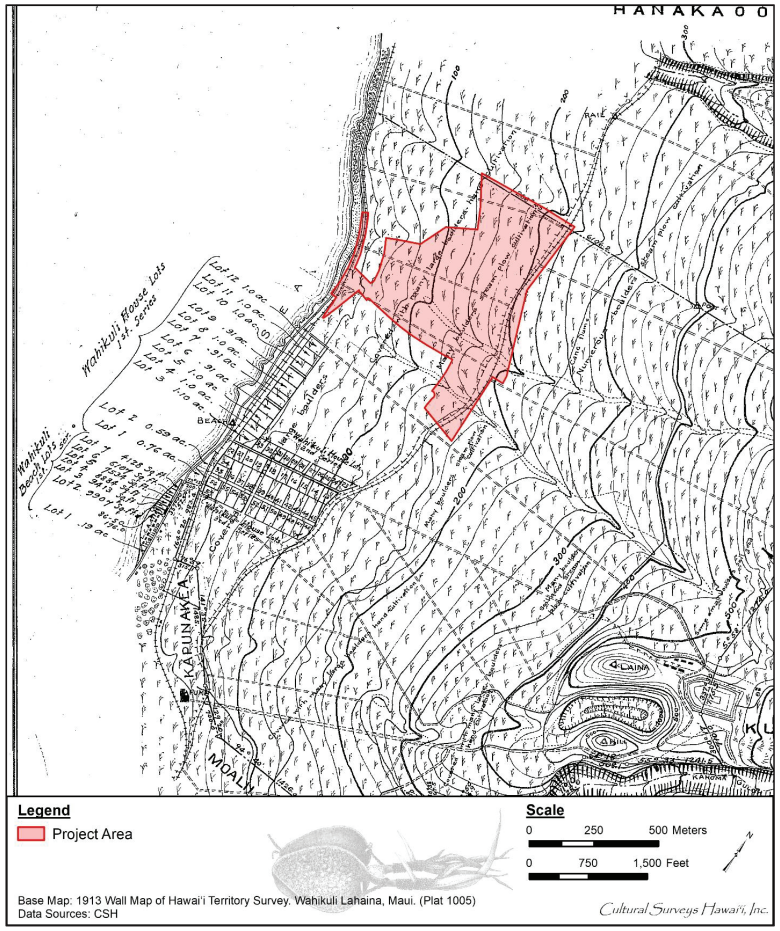

Figure 11. Wall (1913) map showing the land of the project area as “covered with many large boulders hand cultivation”

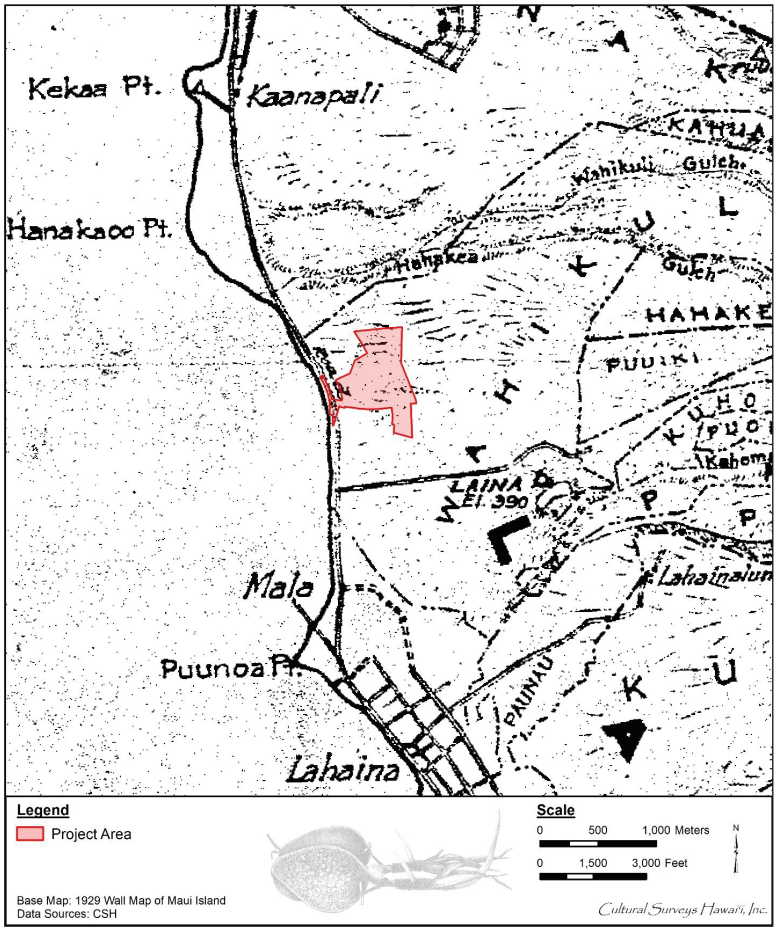

Figure 12. Wall (1929) map showing the gulches and development near the project area

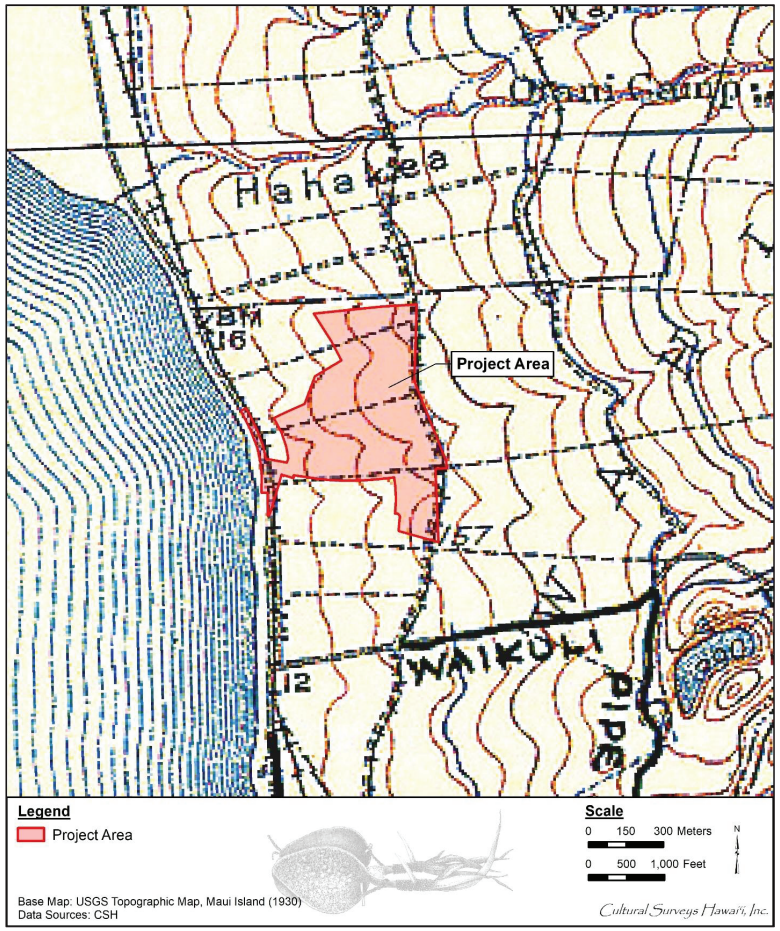

Figure 13. Portion of the 1930 Maui Island USGS topographic quadrangle showing the project area and surrounding railway lines, unimproved roads, and the Waikuli Pipe (U.S. Geological Survey 1930)

In 1896, PiMCo hired the McCandless Brothers again to resume drilling near their first drilling location. This resulted in the development of nine wells at Kā‘anapali, as well as a system of pumps that would make this location a success as a source of water. The successful installation of wells at Kā‘anapali, Wahikuli, Māla, and Waine‘e in 1897 effectively doubled the production of sugar at PiMCo (Gilmore 1931; Stearns and MacDonald 1942). The Wahikuli Pump Ditch, among others, are depicted on an undated map by PiMCo (Figure 14). Note the map also shows the locations of two plantation camps, Kelawea Camp and Wahikuli Camp. A 1953 PiMCo map shows the extensive pump system that was established surrounding the project area (Figure 15).

An additional 14 wells were developed in 1900, with 12 more in 1921, for a grand total of 36 wells at the Kā‘anapali turbo-electric pumping stations. With this successful development, the McCandless Brothers continued to drill 26 more wells in the vicinity of Lāhainā. The Lāhainā wells were sunk 100 to 300 feet deep, into formations representing a mixture of, “clay, gravel, and boulders, down to the basalt bedrock” (McCandless 1936).

“Maui-type well” is a name applied throughout Hawai‘i to a particularly successful type of well, a vertical mine-like shaft to the basal water table, with one or more horizontal infiltration tunnels skimming off the fresh water from the underlying salt water (Stearns and MacDonald 1942:126). The substantial increase in the volume of irrigation water from Maui-type wells provided the Pioneer Mill Company (Table 1) with the ability to further expand its cultivated acreage; between 1895 and 1905, the number of acres harvested increased from 525 to 3,000 (Gilmore 1936).

2.2.3.3.2 Tunneling for Perched Water

In 1898, PiMCo installed a simple galvanized iron flume in the Honokōwai Stream, but the mechanism by which arid coastal lands could receive mountain waters was perfected in 1904 on Maui’s western coastline with the building of the Honokōhau Ditch. The Honokōhau Ditch consisted of tunnels and flumes 14 miles long, and it delivered 20 million gallons per day (mgd) to the PiMCo fields. In a similar manner, each of the other ditch systems was developed to provide large-scale water resources to fields along the Kahoma, Kanahā, Kaua‘ula, Launiupoko, Olowalu, and Ukumehame Stream Valleys (Wilcox 1996:134). To fully develop each stream valley, a series of tunnels were driven high into the water-bearing valley walls by company engineers (Table 2).

According to Stearns and MacDonald (1942) the dike complexes and dike swarms at the headlands of each stream valley were found to contain abundant water. The West Maui dike swarms not only stored water from areas of high rainfall in the mountains, but dispersed water in all directions. The dikes were found to crop out at the head of every major valley and supply practically all the perennial streams (Stearns and MacDonald 1942:165).

The successful drilling of Tunnel 16 in 1901 at Kaua‘ula produced a steady flow of 4,325,000 gallons in a 24-hour period as reported in 1903 (Barkhausen 1903), however by 1904 the flow at Tunnel 16 dropped to 2,000,000 gallons per day, as reported in the table above (Stearns and MacDonald 1942:213). Tunnel 16 was considered relatively short and its cost, at $3,813.53, was one-third the cost of continuing work on the Kahoma flume. The year-end plantation report for 1904 reported that a similar drilling project at Tunnel 18 at Kahoma produced a steady flow of over 1.5 million gallons a day. Developing water resources by drilling tunnels into lava formations at high elevations to intercept large flows of water carried by lava tubes was a program successfully undertaken at nine other Pioneer Mill Company locations (Wadsworth 1936).

Figure 14. Undated Pioneer Mill Co. map showing ditch systems and camps (Pioneer Mill Company n.d.)

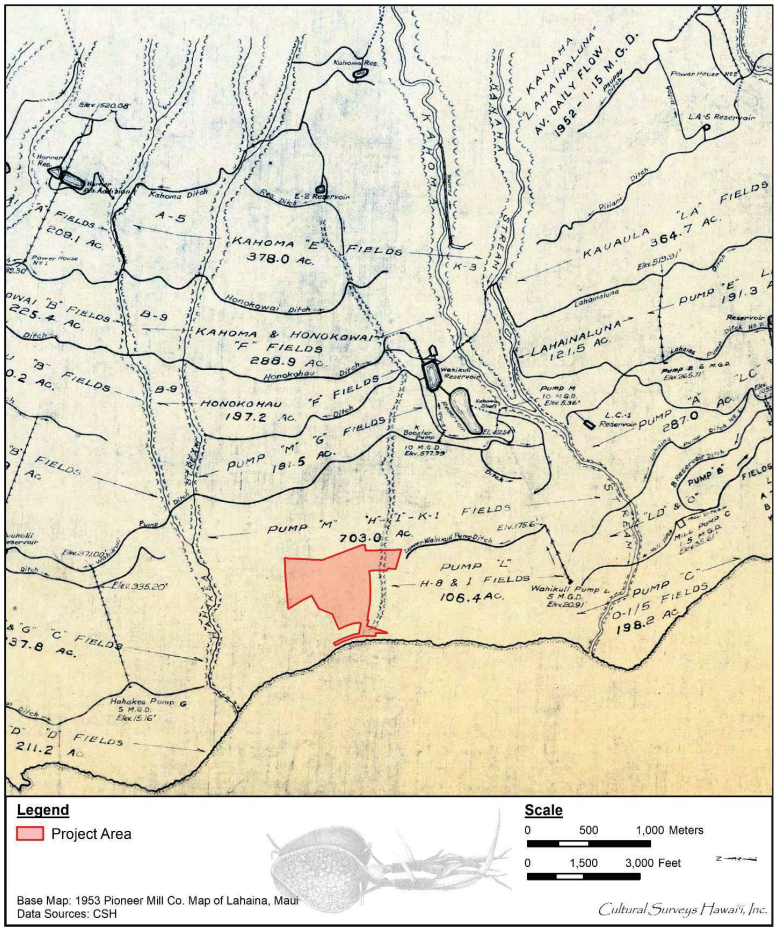

Figure 15. Pioneer Mill Company (1953) showing the pumps and cane fields around the project area

Table 1. Maui-type Wells on Pioneer Mill Co. Lands (adapted from Stearns and MacDonald (1942)

USGS No.	Plant. No.	Name	Date	Elev. (ft)	Depth (ft)	Capacity m.g.d.	Aquifer
2	F	Honokowai	1921	65	65	5.00	Wailuku basalt
3	D, H	Kaanapali	1897	27	25	15.00	Wailuku basalt
4	G	Hāhākea	1923	14	12	5.00	Wailuku basalt
5	M	Kahoma	1933	322	323	10.00	Wailuku basalt
6	L	Wahikuli	1897	26	27	5.00	Wailuku basalt
7	C	Pioneer Mill	1897	34	39	10.00	Wailuku basalt
8, 9	B, A, E	Wainee	1897	30	31	13.90	Wailuku basalt
10	N	Olowalu	1933	165	300	5.25	Wailuku basalt
11	O	Olowalu	1905	20	20	3.00	Wailuku basalt
12	P	Ukumehame	1934	79	143	4.75	Wailuku basalt

Table 2. Tunnels Driven for Perched Ground Water by the Pioneer Mill Company (Stearns and MacDonald 1942:213)

No.	Valley	Elev. (ft)	Yield (gallon/ day)	Length (ft)	Geologic Structure/Perching Formation
13	Olowalu	1,710	100,000	3,000	Vent breccias of Wailuku caldera complex cut by dikes
14	Olowalu	775	Dry		Dike swarm in Wailuku basalt
15	Launiupoko	1,425	100,000	1,320	Tunnel cuts through 20 dikes in Wailuku basalt
16	Kauaula	2,920	2,000,000	656	Tunnel cuts through 194 dikes
17	Kahoma	1,923	Dry	2,500	Tunnel cuts through 19 dikes
18	Kahoma	1,984	1,900,000	3,080	Tunnel cuts through 47 dikes
19	Kahoma	2,350	10,000	739	Tunnel cuts through 16 dikes
20a	Honokōwai	1,700	2,000,000	1,250	Tunnel cuts through 18 dikes
20b	Honokōwai	1,600	500,000	1,050	Tunnel cuts through 7 dikes

Further work by the plantation in 1910 to increase sources for fresh water resulted in the replacement of the Kahoma flume with a tunnel 5,300 ft long, resulting in better capture of storm runoff water (Weizheimer 1911). Between 1908 and 1912, PiMCo consistently shipped over 25,000 tons of sugar annually out of Kā‘anapali Landing at Pu‘u Keka‘a, a production increase of over 150 percent following the improved supply of irrigation water made available in the early 1900s (Thrum 1912).

2.2.3.3.3 The Honokohau Ditch Project

Additional sources of water were required for the successful expansion of acreage under cultivation. To this end, a large-scale ditch project was proposed that would put the Pioneer Mill Company on par with sugar operations in Maui’s central isthmus. The largest water sources on the Lāhainā side of the island were the Honokōhau and Honolua streams, on lands owned by H.P. Baldwin and the Honolua Ranch Company. The construction of the Honokōhau Ditch began in 1902. The ditch started at an elevation of 700 ft AMSL with intakes at Honokōhau, Kaluanui, and Honolua streams. The ditch and flumes ran along soft hillsides where landslides frequently choked the ditch and damaged the flumes, but teams of workers kept the waterways clear. Work was completed in May 1904 with capacity averaging 25 mgd (Wilcox 1996).

The Honokōhau Ditch supplied water to nine reservoirs with a combined storage capacity of 70 million gallons. Not having to pump water to field elevations at 700 ft AMSL represented an immediate savings. As a result, more than 1,000 new acres were placed in irrigation, offsetting nearly $30,000 in permanent improvement costs (Barkhausen 1905).

2.2.4 Contemporary Land Use

At the beginning of the twentieth century, most of the field jobs were performed by contract gangs. Each type of contract gang was paid at a different rate, which was sometimes dependent on the difficulty of the terrain. Gangs were organized for planting, harvesting, cutting, packing, laying flumes, laying portable railroad track, and other similar field jobs (Eckart 1911). Preparation of the fields was accomplished by either a tractor/steam plow where the fields are virtually rock free (approximately 60% of the fields under cultivation in 1934) or via hand preparation with handpicks and shovels in rocky areas that would not be suitable for plowing (approximately 40% of the fields under cultivation in 1934) (Gilmore 1936:199-200).

With the availability of ample water, one method by which sugarcane was transported to the main railroad lines of the Pioneer Mill railway was fluming. PiMCo operated flumes averaging about 3,500 ft long, which required 75,000 to 175,000 gallons of water per hour to flume sugarcane downslope. A full flume gang consisted of 68 men, of whom 24 were assigned to *hāpai kō*, carry the harvested sugarcane to a spot where the cane would be handled by the chute workers. The remaining members of the flume gang typically was comprised of eight men assigned to the chute, six flume carpenters for repairing field breaks and leaks, six overseers, and 24 flume workers to clear jams and unload the sugarcane into railroad cars (Carter 1934).

By 1910, PiMCo employed over 1,600 workers and cultivated over 8,000 acres of sugarcane. By 1920, the lands under cultivation stretched from Ukumehame to Honokōwai. Through the years, the company changed hands and the new owners kept on the leading edge of industrialization, implementing changes such as increasing the number of rollers in the mill until

it reached its peak production of 34,980 tons in 1924. In 1931, the company acquired the Olowalu Sugar Company, further increasing its holdings.

Beginning in 1912, a two-year project to completely rebuild the Honokōhau Ditch was undertaken by David T. Fleming, manager of the Honolua Ranch. The new ditch was able to collect and deliver 25 million gallons of water per day—all of which was sold to PiMCo (Wilcox 1996). The much-needed water saved the harvest of 1914, when the crops were about to be abandoned due to a drought (Weizheimer 1914).

By 1930, PiMCo’s power and irrigation water pumping system required a new source for the Kahoma region. A concrete-lined well shaft was constructed to a diameter of 12 ft and sunk 325 ft underground (Watts 1939). A steam plow engine was modified to provide power for an elevator designed to lower workers into the well. The resulting Maui-type well was able to pump fresh water at a rate of 10 mgd.

In the rocky fields that would not allow for plowing, sugar cultivation was accomplished in the following manner:

> In these fields the rocks are cleared away and built into a series of stone walls from 5 to 6 feet apart and often 3 feet high. These stone walls form the banks of the cane row; and between these walls the ground is softened up with a pick and the seed then planted. (Gilmore 1936:200)

Gilmore (1936:200) noted that though extremely difficult and time consuming to plant, the soil of these rocky areas were very fertile and yielded between 90 to 100 tons of sugarcane per acre, presumably making it worth the time and manpower to continue cultivation in these labor intensive areas.

By 1940, acreage harvested had peaked at 5,237, including 550 acres from the purchase of the Olowalu Plantation in 1931 (Berg 1954). After World War II, improvements in heavy equipment and mechanized farming brought on more efficient field clearing and planting methods, and from 1947 to 1950, PiMCo started a rock removal program to increase overall sugar production (Pioneer Mill Company 1951). The program used heavy equipment to bulldoze rocks from the fields, which were stacked into large piles that still dot the landscape today. At this time, many of the terraced fields described above were either abandoned in hard to access areas with a higher degree of slope relief or cleared via this new machinery. While the railroad had provided an efficient means of transporting sugar prior to the 1950s, by 1952 it was no longer economically feasible to keep the railway operating. In response to the increasing expenses of maintenance and operation, the rail system was replaced with the more efficient cane haul trucks and a feeder conveyer and crane system for loading (Nishimoto et al. 2003:101-102).

PiMCo thrived throughout major dips in the American economy; however, all ventures are susceptible to market change, and PiMCo was no exception. Faced with foreign competition that had lower land and labor costs, the company closed in 1999 (Kubota 1999). Today, fallow fields, the smokestack, and a six-mile segment of the track are all that remain of the Pioneer Mill Company. In 1970, the Kaanapali & Pacific Railroad used the six-mile segment of track to create a tourist Sugar Cane Train ride *mauka* of Lāhainā Town. Although the sugarcane industry has

disappeared from this area of Maui, the impact of the industry has left a lasting imprint on the landscape of West Maui.

With the primary emphasis on tourism and the promotion of Lāhainā and Kā‘anapali as a destination resort and vacation area, along with economic pressure from low sugar prices, AmFac was forced to phase out regional sugar cultivation and milling operations. The last sugar harvest for Pioneer Mill occurred in 1999, and the mill closed in 2003, thereby ending the chapter on the “Sugar Era” of West Maui (Kubota 2004).

A series of aerial images and maps depicts the region of the project area between 1949 and 1992 (Figure 16 through Figure 21). Overall, the project area has consisted of agricultural cane fields with very little development in the immediate region. Meanwhile, the coastal area to the south increasingly became populated with residential and commercial activities. The Lāhainā Civic Center is shown adjacent to the project area in a 1978 aerial image (see Figure 19).

In the years immediately following statehood in 1959, the Kā‘anapali area north of Lāhainā was master-planned as a resort destination. AmFac developed the cane lands located in Kā‘anapali into the Royal Kaanapali Golf Course and the first hotel along the coastline, the Sheraton Maui Hotel, opened on Kā‘anapali Beach in 1963. Following the development of the Kā‘anapali Beach Hotel and the Whalers Shopping Village in 1970, the Maui Surf Hotel opened in 1971 at what is known today as the Westin Maui Resort & Spa’s Ocean Tower (Fischer 2013).

Recently, as part of the DHHL general and regional plans for Honokowai and Wahikuli, the Villages of Leiali‘i Phase 1-A subdivision were completed. This subdivision consists of 104 house lots averaging 6,500 sq ft and associated amenities including roadways, water, sewer, fire protection, drainage improvements and landscaping. The first beneficiaries of this project began occupying homes in 2007, and all homes in the subdivision were occupied by December 2007.

Figure 16. 1949 orthophotoquad of Wahikuli showing the project area (School of Ocean and Earth Science Technology [SOEST] 1949)

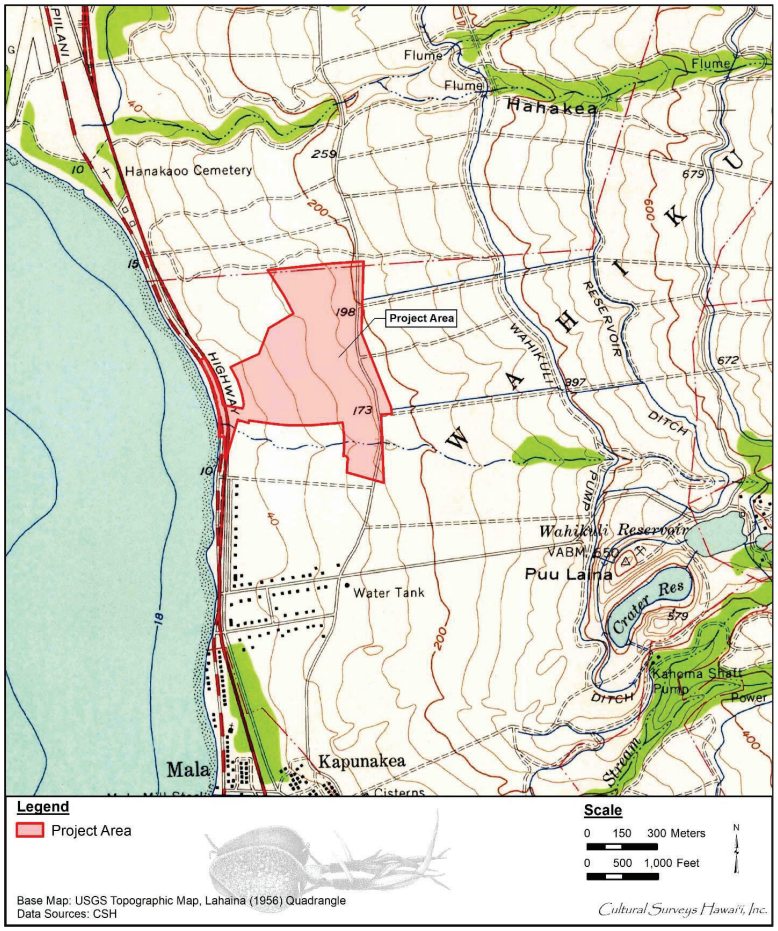

Figure 17. Portion of the 1956 Lahaina USGS 7.5-minute topographic quadrangle showing the project area (U.S. Geological Survey 1956)

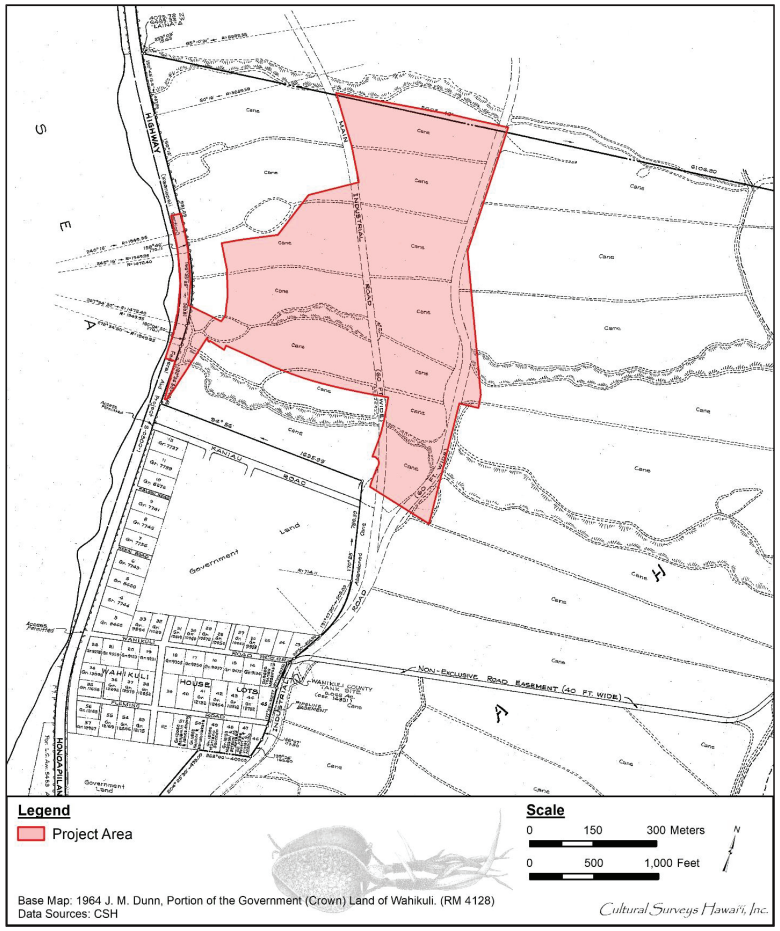

Figure 18. Dunn (1964) Portion of the Government (Crown) Land of Wahikuli map (RM 4128) showing the project area and development to the south; the road within the project area is labeled "Industrial Road (60 ft. Wide)"

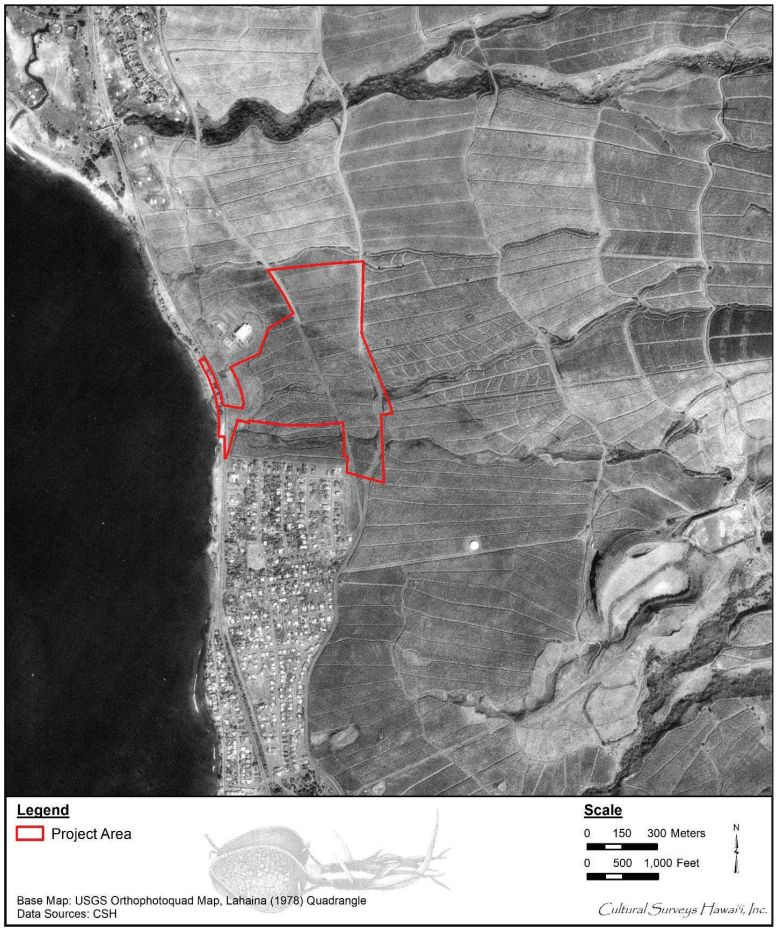

Figure 19. Portion of the 1978 Lahaina USGS orthophotoquad showing the project area and immediate vicinity (U.S. Geological Survey 1978)

Figure 20. 1987 orthophotoquad of Wahikuli showing the project area (School of Ocean and Earth Science Technology [SOEST] 1987)

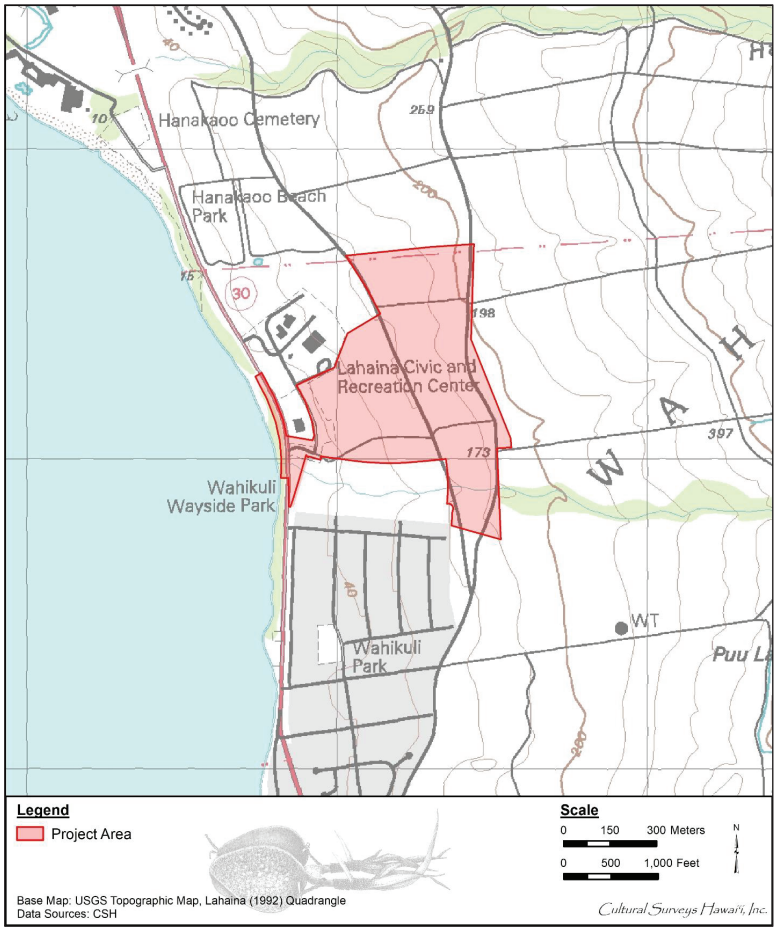

Figure 21. Portion of the 1992 Lahaina USGS 7.5-minute topographic quadrangle showing the location of the project area (U.S. Geological Survey 1992)

2.3 Previous Archaeological Research

Between 1931 and 1976, only sporadic archaeological studies were undertaken in the area. Following the passage of the National Historic Preservation Act in 1966 and HRS Chapter 6E, which established the Historic Preservation Program in 1976, archaeological studies occurred as a condition of development on a more frequent basis. In this vein, the lands surrounding the current project area have been subject to a variety of studies including archaeological reconnaissance investigations, field inspections, AIS investigations (termed "archaeological surveys" pre-2002, before HAR §13-276-5), archaeological monitoring, and burial treatment programs (Figure 22 and Table 3). Historic properties in the vicinity of the current project area have been identified along the stream valleys to the north and south and primarily include pre- and post-Contact agricultural complexes and burial sites, and pre-Contact habitation areas and fishponds (Figure 23). The AIS for the current project also identified three historic properties consisting of two roads (SIHP #s 50-50-03-08886 and -08888) and a railroad track (SIHP # 50-50-03-08887) within the project area.

2.3.1 Walker (1931)

The earliest archaeological studies on the island of Maui were a part of island-wide surveys conducted in the early 1900s (Stokes 1917; Walker 1931). These studies tended to focus on the generation of descriptive lists of large-scale architecture or traditional ceremonial *heiau* sites. Walker (1931) described Site 11, Halulukoakoa Heiau (SIHP # 50-50-03-00011) as follows:

> Name: Halulukoakoa
> Location: S.E. corner of cocoanut grove at Mala, just north of Kapunakea Camp. It lies in the ahupuaa of Wahikuli according to Thrum.
> Description: A large heiau for human sacrifice of which but few fragments of walls remain. There is some coral to be found in their construction, but most of the stone has been removed for rock ballast on the railroad. The site has been further cleared and levelled to make a playground, and what remains has been used for a dump of debris of every kind, and the whole is heavily overgrown with kiawe bushes.
> Remarks: Informant J. Kahahana is said to know of some legends connected with this heiau.

2.3.2 Connolly (1974)

In August 1974, the Bernice P. Bishop Museum conducted a Phase I archaeological survey for a proposed flood-control project for an approximate 1.5-mile long section of Kahoma Stream (Connolly 1974), from the mouth near Mala Wharf *mauka* toward the area northwest of Lahainaluna High School. The entire survey recorded two terrace systems, Kahoma System and Kaia System, and a large burial area. The burial area, designated as Bishop Site Ma-D5-8/SIHP # 50-50-03-00226, is on the southern side of the mouth of Kahoma Stream and contains at least 25 burials, marked by a cement tomb, a headstone, and 23 low stone platforms. SIHP # -00226 is not in the vicinity of the current project area. Preservation of the burial area was recommended.

The Kahoma Stream Terrace System, Bishop Site D5-7/SIHP # -01775, is a complex of terraces and features within the Kahoma Stream bed. The features include "36 terraces with stone-

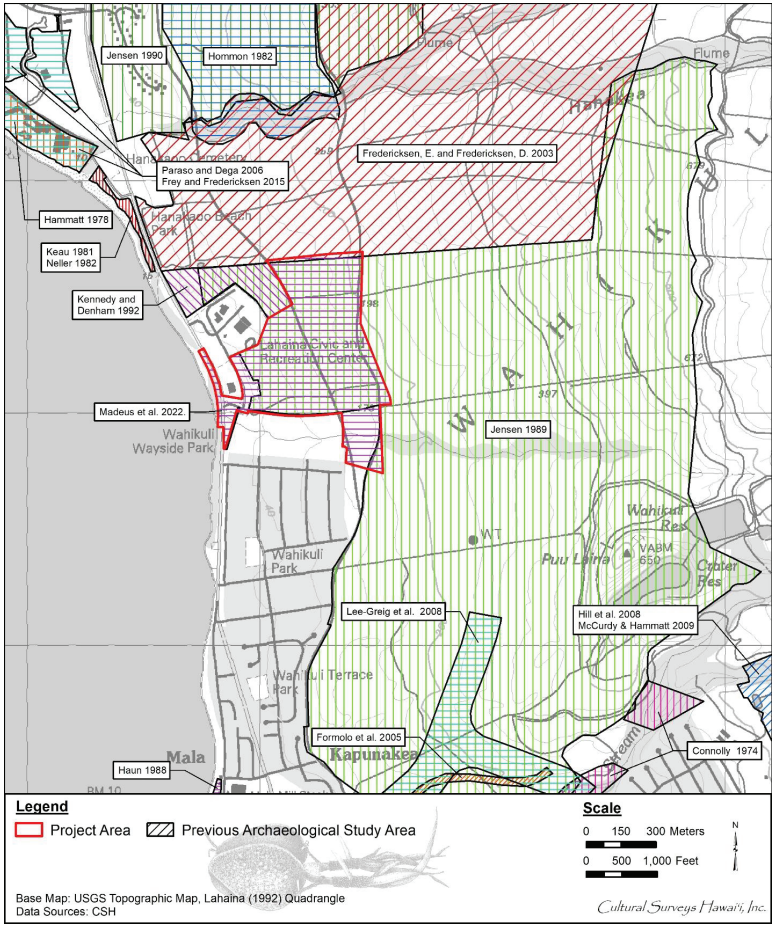

Figure 22. Previous archaeological studies within the vicinity of the project area (U.S. Geological Survey 1992)

Table 3. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results (SIHP # 50-50-03-#####)
Connolly (1974)	Archaeological survey	Kahoma and Kanahā streams confluence	Identified SIHP # -01775, Kahoma Stream Terrace System; SIHP # -01776, Haia Terrace System at the stream confluence; and SIHP # -00226, burial area near the stream mouth (beyond the vicinity of the current project area)
Hammatt (1978)	Reconnaissance survey	Hyatt Regency Maui Resort Hotel; TMK: [2] 4-4-006:031	No historic properties identified
Keau (1981)	Reconnaissance survey	Hāhākea Beach Park; TMK: [2] 4-4-06:33	No historic properties identified
Neller (1982)	Reconnaissance survey	Hāhākea Beach Park; TMK: [2] 4-4-06:33	Notes a previously identified historic property, SIHP # -01204, grinding stone
Hommon (1982)	Reconnaissance survey	North Beach Mauka and South Beach Mauka; TMKs: [2] 4-4-002:002 and [2] 4-4-006:001 and 014 pors.	Identified 10 historic properties: SIHP #s -02001 through -02003 within the gulch at North Beach Mauka and SIHP #s -02004 through -02010 in the South Beach Mauka gulch; the features included over 23 terraces, three probable road and trail segments, three walls, and one possible ceremonial feature (upright stone and alignment)
Haun (1988)	Reconnaissance survey with subsurface testing	Lahaina Cannery; TMKs: 04-05-05-9 through 11; TMK: 04-05-11:3	Identified a buried pre-Contact cultural layer and pondfield sediments (beyond the vicinity of the current project area)
Jensen (1989)	Archaeological survey	Lahaina Master Plan development area; Hāhākea Gulch, Kahoma Stream, Crater Reservoir	Identified 11 new historic properties: SIHP #s -02478 through -02485 and -02488, agricultural features (terraces and walled enclosures), SIHP # -02486, large formal cairn/marker and 13 mounds interpreted as probable graves/grave markers; and SIHP #

Reference	Type of Study	Location	Results (SIHP # 50-50-03-#####)
			-02487, historic agricultural access road; assessed components of a previously identified historic property, SIHP # -01203, Kahoma Complex; SIHP #s -02478 and -02480 are beyond the vicinity of the current project area
Jensen (1990)	Archaeological survey	South Beach Mauka Development	Confirmed SIHP #s -02004 through -02010 and newly identified two agricultural complexes, SIHP #s -02489 (agricultural terraces, footpath, possible habitation features, and possible burial) (beyond the vicinity of the current project area) and -02490 (walled terraces, enclosure, and agricultural terra remnants); both possibly of pre-Contact origin; project area subsequently revised to exclude the new sites
Kennedy and Denham (1992)	Archaeological survey	Proposed baseball complex adjacent to the Lahaina Civic/Recreation Center; TMK: [2] 4-5-021:003	No historic properties identified
Fredericksen and Fredericksen (2003)	AIS	Kā‘anapali and Honokowai	Recorded 81 newly identified historic properties, SIHP #s -05241 through -05321, consisting of pre-Contact to post-Contact agricultural sites, habitation areas, petroglyph panel sites, plantation era sites, and possible ceremonial areas, shrines, burial features, also further documented SIHP # -02893, Puukolii Cemetery
Formolo et al. (2005)	AIS	Keawe Street roadway extension; TMK: [2] 4-5-021:003, 022 pors.	No historic properties identified

Reference	Type of Study	Location	Results (SIHP # 50-50-03-#####)
Paraso and Dega (2006)	AIS	Hyatt Regency Maui Resort; TMKs: [2] 4-4-013:004, 005, 008	No historic properties identified; observed a potential cultural layer located outside of the development footprint (no SIHP # assigned)
Lee-Greig et al. (2008)	AIS	17.5-acre area for a realignment section (Phase 1A) of Honoapi‘ilani Hwy	Identified SIHP #s -06492 and -06596, two push piles remnant of agricultural field improvement activity; project prompted by inadvertent discovery of SIHP # -06277, a system of over 400 historic agricultural terraces
Hill et al. (2008)	AIS	Lahainaluna High School, TMK: [2] 4-6-018:005, 007, and 0012	Identified six historic properties: SIHP #s -06494 and -06498 are irrigation ditches; SIHP #s -06495, -06497, and -06499 are retaining walls; and SIHP # -06496 is a terrace wall; also documented the Hale Pa‘i o Lahainaluna (SIHP # -01596)
McCurdy and Hammatt (2009)	Archaeological monitoring	Lahainaluna High School, TMK: [2] 4-6-018:005, 007, and 0012	Identified SIHP # -06608, subsurface remnant of a historic garage; and SIHP # -06609, subsurface remnant of a historic foundation/cellar
Frey and Fredericksen (2015)	Archaeological monitoring	Maui Hyatt Vacation Club Timeshare; TMK: [2] 4-4-013:088 Lot 66A	Identified SIHP # -07720, 11 finds of human remains reinterred within a burial preserve area
Madeus et al. (2022)	AIS	Current Project, Villages of Leiali‘i, Phase 1-B Subdivision; TMKs: [2] 4-5-021:010 por., 014 por., 015 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway ROW	Identified SIHP #s -08886 and -08888, two paved roads, and SIHP # -08887, a railroad track

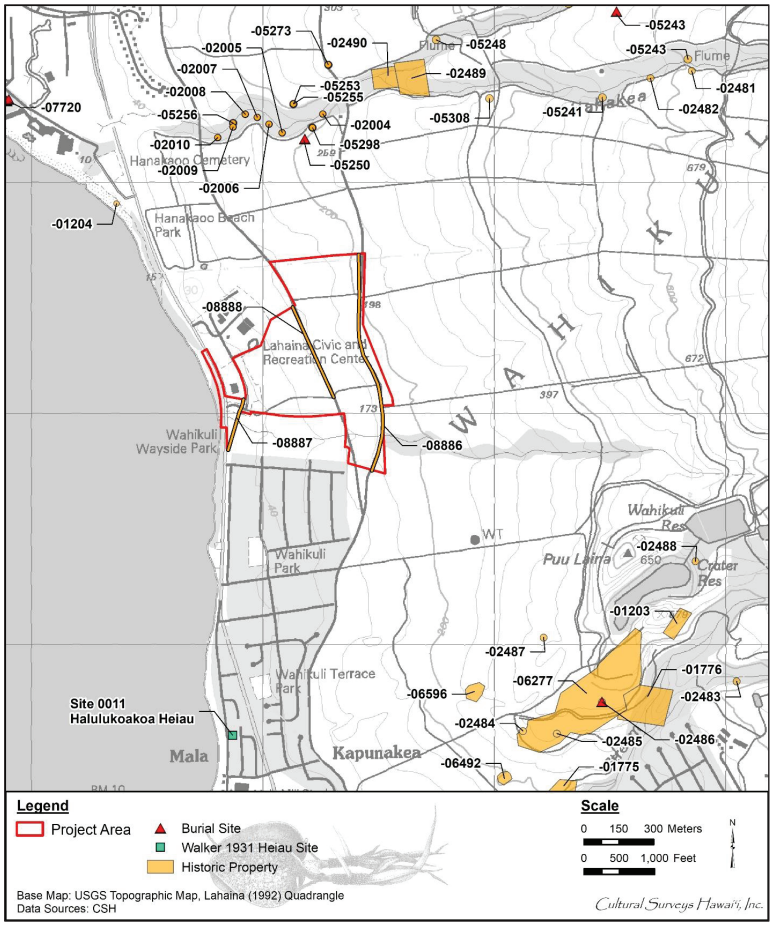

Figure 23. Previously identified historic properties within the vicinity of the project area (U.S. Geological Survey 1992)

reinforced retaining walls (probably historic), seven cement structures (historic), and four free-standing walls, and two ditches [water-diversion channels]" (Connolly 1974:6). The structures were remnants of the Yamashiro Dairy. No further work at the terrace complex was recommended.

The Haia Terrace System, Bishop Site D5-9/SIHP # -01776, is at the confluence of the Kanahā and Kahoma streams, which was technically outside of the survey area but it was recorded briefly "should the boundaries of the flood-control project be expanded" and in case there existed a relationship between the two terrace systems (Connolly 1974:ii, 9). The complex contained a house site with a probable pre-Contact foundation, but the site was not mapped extensively. Mr. Jonah Haia had lived on the site above the confluence ca. 1880. Additional research on the terrace system was recommended prior to any impacts.

2.3.3 Hammatt (1978)

On 13 March 1978, Archaeological Research Center Hawaii, Inc., (ARCH) conducted a reconnaissance survey for the Hyatt Regency Maui Resort Hotel (Hammatt 1978) (TMK: [2] 4-4-006:031). The study involved a general inspection of the hotel construction site, examination of a single backhoe trench across a beach berm, and examination of a sewer line trench and pumping site excavation on the *mauka* side of the construction site. A majority of the construction site hadbeen previously altered and graded. The beach berm and sewer excavations showed "reworked lenses of charcoal from recent burning" (Hammatt 1978:2). No historic properties were identified during the study.

2.3.4 Keau (1981); Neller (1982)

On 6 July 1981, Charles Keau of the Maui County Parks Department conducted an archaeological reconnaissance survey of a 3.7-acre parcel along the northern coast of Lāhainā, at Hāhākea Beach Park (Keau 1981). Findings include a possible habitation site, a coral abrader, scattered midden, a possible wall, and a historic drainage culvert. The following year, the parcel was reassessed by Charles Keau and Earl Neller, and a single test pit was excavated within the habitation feature (Neller 1982). The test pit revealed that the habitation site was likely natural, comprised of exposed beach colluvium. A majority of the beach parcel was determined to have undergone extensive land modification resulting from wave action, erosion, road construction, rock crushing, grave digging, camping, and canoe landing (Neller 1982). Neller (1982) mentions a nearby Chinese cemetery at the southern end of the beach site, the Hanakao‘o (Hāhākea) grinding stones (SIHP # 50-50-03-01204), and the ruins of an historic rock crusher site. Neller (1982) noted that the Grinding Stone Site (SIHP # -01204) previously had been recorded in 1973-74 by the SHPD, and it was used for finishing pre-form adze blanks. Preservation of SIHP # -01204 was recommended along with archaeological monitoring during construction activities in the vicinity of the historic rock crusher site.

2.3.5 Hommon (1982)

On 22 June and 9 August 1982, Science Management, Inc. (SMI) conducted an archaeological reconnaissance survey of the North Beach *mauka* (TMK: [2] 4-4-002:002) and South Beach *mauka* (TMKs: [2] 4-4-006:001 and 014 pors.) areas (Hommon 1982). The study areas are within the Ka‘anapali Master Plan project. Ten historic properties were identified during the survey. SIHP #s

50-50-03-02001 through -02003 (terraces/walls) are in the northern gulch and SIHP #s -02004 through -02006 (terraces), -02008 (probable road), -02009 (terrace complex), and -02010 (wall) are in the southern gulch. The documentation consisted of completing a field form, taking a photograph, and placing a tag with a temporary number. The historic properties contained “more than 30 features, including more than 23 terraces, as well as 3 probable fragments of roads or broad trails, 3 walls and a possible religious site [an upright stone at SIHP # -02001]” (Hommon 1982:19). An intensive archaeological survey was recommended prior to any ground disturbance in the two gulches containing historic properties.

2.3.6 Haun (1988)

From 21 through 23 January 1988, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted a subsurface archaeological reconnaissance survey for the Lahaina Cannery *makai* and *mauka* parcels (TMKs: [2] 4-5-005:009, 010, 011 and [2] 4-5-011:003) totaling approximately 4 acres and located south of the current project area (Haun 1988). The survey included the excavation of 19 backhoe trenches. Trench 7 was in the *makai* parcel and contained a prehistoric cultural deposit that included sparse midden, volcanic glass flakes, and charcoal and ash lenses suggestive of habitation-related activities (Haun 1988:14). A second site was identified throughout the entire *mauka* parcel and consisted of buried pondfield sediments. Background research indicated that two fishponds had been in the area in the mid-1800s and the area also had been used to grow taro. Historic property designations were not assigned during the study and the deposits have subsequently been designated as SIHP # -02693.

2.3.7 Jensen (1989)

In August and September 1989, PHRI, conducted an archaeological survey for the approximate 1,200-acre Lahaina Master Planned Project Site (Jensen 1989), which includes the current project area. Eleven new historic properties were identified as follows:

SIHP # 50-50-03-02478, agricultural terrace near Hāhākea Gulch;
SIHP # -02479, two agricultural terraces near Hāhākea Gulch;
SIHP # -02480, two contiguous walled enclosures near Hāhākea Gulch;
SIHP # -02481, two agricultural terraces near Hāhākea Gulch;
SIHP # -02482, agricultural terrace near Hāhākea Gulch;
SIHP # -02483, walled enclosure and eight segments of agricultural terraces on the south branch of Kahoma Stream;
SIHP # -02484, walled enclosure or L-shaped wall near the western end of the existing agricultural airstrip above Kahoma Stream Gulch;
SIHP # -02485, walled enclosure near the existing agricultural airstrip above Kahoma Stream Gulch;
SIHP # -02486, large formal cairn/marker and 13 mounds interpreted as probable graves/grave markers approximately 200 m southwest of Puu Laina;
SIHP # -02487, an approximate 270-meter-long historic agricultural access road west of Crater Reservoir; and
SIHP # -02488, walled enclosure east of Crater Reservoir.

In addition, the study reassessed components of a previously identified historic property, SIHP # -01203, Kahoma Complex, near the proposed Honoapi‘ilani Alternate C Road Alignment Corridor. SIHP # -01203 was initially assessed by Chiniago, Inc. (Barrera 1988). SIHP # -01203 includes agricultural terraces (Features A, C, and D), raised and faced habitation terrace (Feature B), and a small habitation cave (Feature E) located on the southern side of the north Kahoma Stream branch. Features on the opposite side of the floodplain include agricultural terraces (Features F and H) and terracing with a possible habitation area associated (Feature G). Of the 12 historic properties, no further documentation was recommended for SIHP # -02487, historic agricultural access road. No historic properties were identified within the current project area.

2.3.8 Jensen (1990)

Between August and September 1989, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological survey for the South Beach Mauka Development Site (TMK: [2] 4-4-006:001) (Jensen 1990). The study documented the seven sites, SIHP #s -02004 through -2010, previously identified by Hommon (1982) and two newly identified agricultural complexes, SIHP #s -02489 and -02490. The nine sites contained a total of 49 component features, including “agricultural terraces, small habitation terraces, walled enclosures, walls, a possible grave, a single footpath, and agricultural access roads” (Jensen 1990:14). All the sites were within the Hāhākea Gulch. The functions of the sites tentatively included “temporary habitation, possible habitation, possible burial, transportation, and prehistoric and contemporary agriculture” (Jensen 1990:14).

The two newly identified sites provided “limited evidence of temporary prehistoric habitation in conjunction with extensive agricultural activities involving both sides of the gulch” (Jensen 1990:22). Subsequently, the extent of the project area was changed by the client to exclude the two new site areas. Eight of the sites were considered significant solely for information content, while Site T-1 (SIHP # -02489), containing a possible burial, was considered significant for information content and potential cultural value. Vegetation clearing and further data collection were recommended at each historic property in order to determine preservation options.

2.3.9 Kennedy and Denham (1992)

On 21 February 1992, Archaeological Consultants of Hawaii, Inc. (ACH) conducted an archaeological survey of 19.3 acres for a proposed baseball complex adjacent to the Lahaina Civic/Recreation Center (TMK: [2] 4-5-021:003) (Kennedy and Denham 1992). The study included pedestrian inspections of three survey areas: a former sugarcane field, an area along a low gulch on the northern boundary of the project area, and an in-use sugarcane field along Honoapi‘ilani Highway. A possible agricultural clearing mound was encountered. No historic properties were identified.

2.3.10 Fredericksen and Fredericksen (2003)

Between 2001 and 2002, Xamanek Researches conducted an AIS for the Ka‘anapali 2020 Project (TMKs: [2] 4-4-002, -004, -005, and -006) (Fredericksen and Fredericksen 2003). The project is a planned community development area consisting of 4,325 acres of land in Ka‘anapali and Honokowai. The survey was conducted within approximately 2,700 acres of the development area. Testing included 53 test units and 44 backhoe trenches. During the survey, 81 newly

identified historic properties were recorded (SIHP #s -05241 through -05321). The features were largely interpreted as likely pre-Contact to post-Contact era. In addition, further documentation was provided for the Puukolii Cemetery (SIHP # -02893). The historic properties were summarized as follows:

> …single and multiple component dry land agricultural sites, and one large, wet valley agricultural site in Honokowai Gulch. These agricultural sites are composed primarily of terraces. Other identified site types included temporary and more permanent habitation areas, several petroglyph panel sites, possible ceremonial areas and shrines, possible burial features, and plantation era sites. (Fredericksen and Fredericksen 2003:Abstract)

Preservation was recommended for a majority of the historic properties, and archaeological monitoring was recommended within the proposed development areas.

2.3.11 Formolo et al. (2005)

On 10 February 2005, Archaeological Services Hawaii, LLC (ASH) conducted an AIS of a 1200-ft-long corridor for a proposed Keawe Street roadway extension project (TMK: [2] 4-5-021:003, 022 pors.) (Formolo et al. 2005). The survey included the excavation of eight backhoe trenches approximately 2.5 to 3.0 m long and 0.7 m wide. Bedrock was encountered at shallow depths in the *mauka* portion of the project area. No cultural historic properties were identified. Due to the negative findings, the AIS study was deemed an archaeological assessment.

2.3.12 Paraso and Dega (2006)

In January 2006, SCS conducted an AIS at the Hyatt Regency Maui Resort, located south of the current project area (TMKs: [2] 4-4-013:004, 005, 008). The investigation included 11 backhoe trenches distributed among three parcels of the property. The two *mauka* parcels contained both disturbed and intact deposits primarily of cinder and/or loam-based materials (Paraso and Dega 2006). A potential cultural layer was encountered at the northern end of the coastline parcel (Parcel 008), as determined based on the dark color of the sediment and known findings of human burials in the adjacent Maui Marriott Ocean Club property to the north. However, no cultural materials were encountered, and the potential cultural layer was observed in one trench outside of the proposed building footprint. The layer was not assigned a site number. No historic properties were encountered, and the study was deemed an archaeological assessment.

2.3.13 Lee-Greig et al. (2008)

In June and July 2008, CSH conducted an AIS for the realignment of a section of the Honoapi‘ilani Highway, Phase IA for the Lāhainā Bypass Project (Lee-Greig et al. 2008). In May 2007, over 400 agricultural terraces and associated irrigation channels were identified during a pre-construction walk through at the northern end of the Phase IA right-of-way. As the historic preservation review process had been completed, and Phase IA was to commence construction, the find was recorded as an inadvertent discovery, SIHP # 50-50-03-06277. an early historic agricultural complex of terraces and irrigation ditches. This complex was described as a “short watercourse field” by Mr. Humio Okimoto, a steam locomotive engineer for PiMCo. He explained

that such fields were planted and harvested by hand and could not be tilled and harvested mechanically. Subsequently, an alternative realignment of the Phase IA section was proposed.

Fieldwork included a pedestrian survey of the approximate 17.5-acre area, 26 backhoe trenches throughout former cane fields, backhoe excavations within two agricultural push-piles, and geophysical testing (GPR) and mechanical exploration at the base of the northern embankment of Kahoma Gulch. The two push piles were designated as historic properties, SIHP #s -06492 and -06596, remnants of agricultural field improvement activity.

2.3.14 Hill et al. (2008); McCurdy and Hammatt (2009)

In June 2008, CSH conducted an AIS for the Lahainaluna High School cesspool conversion project (TMK: [2] 4-6-018:005, 007, 012) (Hill et al. 2008). A surface survey documented six newly identified post-Contact historic properties (SIHP #s 50-50-03-06494 through -06499), which defined six areas of concern/potential impact areas. SIHP #s -06494 and -06498 are irrigation ditches; SIHP #s -06495, -06497, and -06499 are retaining walls; and SIHP # -06496 is a terrace wall. The survey also documented the Hale Pa‘i o Lahainaluna (SIHP # -01596), which was constructed in 1937 and previously recorded by Ralston Nagata in 1966 and placed on the National Register of Historic Places in 1976.

Between May and September 2008, CSH conducted archaeological monitoring for the Lahainaluna High School cesspool conversion project (TMK: [2] 4-6-018:005, 007, 012) (McCurdy and Hammatt 2009). Two historic properties were identified, in addition to an assemblage of 220 artifacts. SIHP # -06608 is subsurface remnant of a historic garage. SIHP # -06609 is a subsurface remnant of a historic foundation/cellar. The results of monitoring describe the efforts that were taken to ensure no adverse effects to the previously identified historic properties and the potential impact areas.

2.3.15 Frey and Fredericksen (2015)

From April 2013 through December 2014, Xamanek Researches, LLC conducted archaeological monitoring for the Maui Hyatt Vacation Club Timeshare Project (TMK: [2] 4-4-013:088 Lot 66A) (Frey and Fredericksen 2015). The project area is along the coast, west of Honoapi‘ilani Highway and north of the current project area. During monitoring of building footings, a total of 11 burial finds were identified, which included six *in situ* burials within natural sand, four separate finds of isolated elements, and one previously disturbed human burial. The burials were designated as SIHP # 50-50-03-07720 and reinterred within a burial preserve area established in the northwestern corner of the Maui Hyatt Timeshare property. The human remains were wrapped in *lauhala* (*pandanus*; *Pandanus odoratissimus*) and placed in a concrete vault (4 ft wide, 6 ft long, and 3 ft deep), which was backfilled with clean sand. The closed vault was covered with topsoil in an area landscaped with native vegetation contained within a railing barrier.

2.3.16 AIS for the Current Project (Madeus et al. 2022)

In October 2021, CSH conducted an AIS for the current Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project (Madeus et al. 2022). The AIS entailed a 100%-coverage pedestrian inspection, and three historic properties were newly identified on the surface of the project area. These include SIHP # 50-50-03-08886, an asphalt-paved road and former

plantation railroad corridor, SIHP # 50-50-03-08887, a portion of the existing Lāhainā, Kā‘anapali & Pacific (LK&P) railroad that was established as a tourist attraction in 1969, and SIHP # 50-50-03-08888, an asphalt-paved road that was used for historic commercial agricultural operations and formerly labeled as “Main Industrial Road” (Figure 24 through Figure 27). The three historic properties were assessed as significant pursuant to HAR §13-284-6, Criterion “d” (has yielded, or is likely to yield, information important for research on prehistory or history). SIHP #s -08886, -08887, and -08888 retain the integrity of location, design, materials, and workmanship, and have provided information regarding historic land use of the project area. SIHP # -08887 also retains the integrity of setting. Archaeological monitoring was recommended for project-related ground disturbance within the boundaries of these three historic properties.

In September 2021, Geolabs, Inc. had conducted a geotechnical survey within the project area, which was included within the AIS findings. CSH provided an assessment of the geotechnical report in order to characterize the stratigraphy and depth of soils within the project area. Sixteen drilling locations were distributed throughout the *makai* half of the project area with depths between 2.13 and 8.53 m below surface (mbs) (between 7.00 and 28.00 ft). Overall, the stratigraphy within the project area appeared relatively uniform and consisted of an agricultural plow zone within alluvial sediment overlying relatively shallow basalt bedrock.

Figure 24. Esri (2019) aerial image of the project area showing the historic property locations (Madeus et al. 2022:87)

Figure 25. General view of SIHP # -08886, cane haul road, view to north (Madeus et al. 2022:89)

Figure 26. General view of SIHP # -08887, plantation railway, view to south (Madeus et al. 2022:91)

Figure 27. General view of SIHP # -08888, cane haul road, view to north (Madeus et al. 2022:93)

Section 3 Archaeological Monitoring Provisions

Under Hawai‘i State historic preservation legislation, “Archaeological monitoring may be an identification, mitigation, or post-mitigation contingency measure. Monitoring shall entail the archaeological observation of, and possible intervention with, on-going activities, which may adversely affect historic properties” (HAR §13-279-3).

Hawai‘i State historic preservation legislation governing archaeological monitoring programs requires that each monitoring plan discuss eight specific items (HAR §13-279-4). The monitoring provisions below address these eight requirements in terms of archaeological monitoring for the current project.

1) Anticipated Historic Properties:

An AIS of the project area has identified three surface historic properties (SIHP # 50-50-03-08886, an asphalt-paved road and former plantation railroad corridor, SIHP # -08887, a portion of the existing LK&P railroad, and SIHP # -08888, an asphalt-paved road that was used for historic commercial agricultural operations). The two paved roads are related to the use of the property for commercial sugarcane cultivation, while the railroad was created as a tourist attraction that mimics the design of a plantation railroad. Project-related ground disturbance has the potential to expose additional historic properties related to commercial sugarcane cultivation.

Studies in the vicinity of the current project area also have identified pre-Contact agricultural and habitation complexes primarily within gulch areas. Remnant buried cultural deposits related to these activities could be encountered below the agricultural plow zone.

2) Locations of Historic Properties:

The locations of the three historic properties identified during the project’s AIS and in the surrounding vicinity are depicted in Figure 23 and Figure 28. Each of the three historic properties extend approximately north-to-south across the lengths of the project area. SIHP # -08886 is approximately 900 m long near the eastern length of the project area, SIHP # -08888 is approximately 412.5 m long in the central portion of the project area, and SIHP # -08887 is approximately 182.0 m long along the western (*makai*) edge of the current project area.

3) Fieldwork:

For the current project, archaeological monitoring will be conducted as a mitigation measure in order to mitigate the project’s effect on three historic properties located within the project area (see Figure 28). On-site archaeological monitoring will be conducted for any project-related ground disturbance that occurs within the boundaries of the three historic properties (SIHP # -08886, 08887, and 08888). The objective of archaeological monitoring will be to identify and document any subsurface components of these historic properties. Additionally, since the three historic properties are linear alignments that extend roughly north-south through the upper (SIHP # -08886), middle (SIHP # -0888) and lower (SIHP # -08887) portions of the project area, archaeological monitoring documentation of these corridors will provide representative data on stratigraphy for the project area. One archaeological

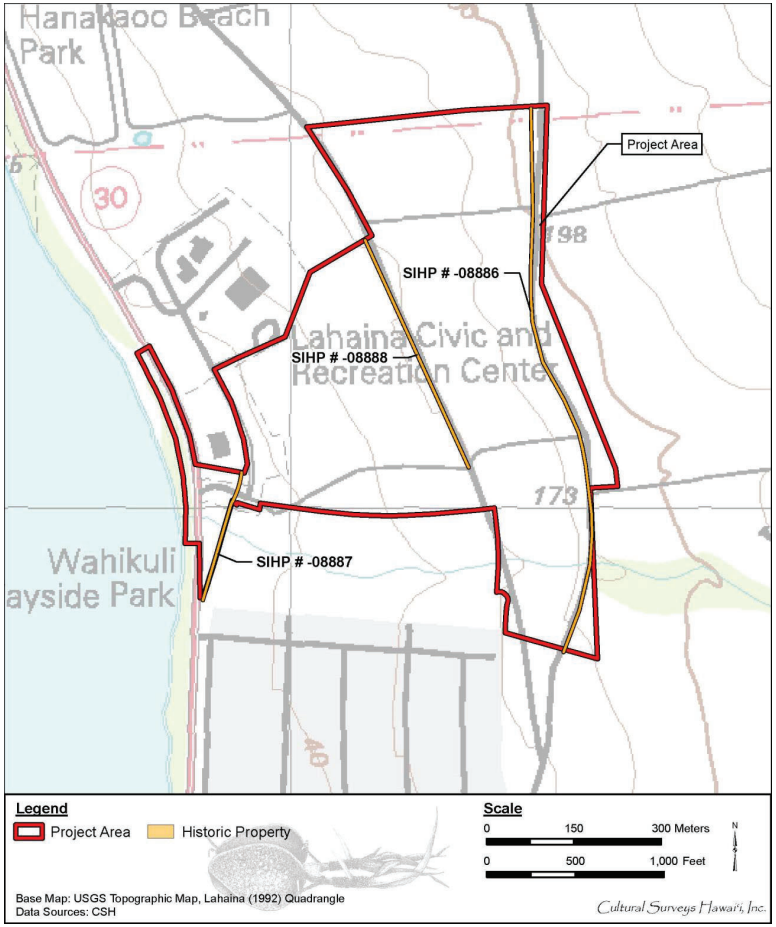

Figure 28. Portion of the 1992 Lahaina USGS 7.5-minute topographic quadrangle showing the location of the three historic properties where on-site archaeological monitoring of project-related ground disturbance will occur

monitor will be assigned to each piece of ground-disturbing equipment in operation within the historic property boundaries. Any departure from this will occur only after consultation with and written concurrence from the SHPD.

The monitoring fieldwork will likely encompass the documentation of subsurface archaeological deposits (e.g., trash pits, structural remnants) and will employ current standard archaeological recording techniques. This will include drawing and recording 2.0-meter or longer sections of the stratigraphy of excavation profiles where cultural features or artifacts are exposed as well as 2.0-meter or longer representative profiles. These exposures will be photographed, located on project area maps using sub-meter accurate GPS location, and sampled. Photographs and representative profiles of excavations will be taken even if no historically significant sites are documented. As appropriate, sampling will include the collection of representative artifacts, bulk sediment samples, and/or the on-site screening of measured volumes of feature fill to determine feature contents.

In the event of significant finds, the SHPD will be notified. If human remains are identified, construction activity in the vicinity will be stopped and no exploratory work of any kind will be conducted unless specifically requested by the SHPD. All human skeletal remains that are encountered during excavation will be handled in compliance with HAR §13-300 and HRS §6E-43.

4) Archaeologist’s Role:

The monitoring archaeologist will have the authority to stop work immediately in the area of any findings so that documentation can proceed and appropriate treatment can be determined. In addition, the archaeologist will have the authority to slow and/or suspend construction activities in order to ensure that the necessary archaeological sampling and recording can take place.

5) Coordination Meeting:

Before work commences on the project, the archaeologist shall hold or attend a coordination meeting to orient the construction crew to the requirements of the archaeological monitoring program. At this meeting, the monitor will emphasize his or her authority to temporarily halt construction and state that all finds (including objects such as bottles) are the property of the landowner and may not be removed from the construction site. At this time, it will be made which excavations or areas require on-site monitoring.

6) Laboratory Work:

Laboratory work will be conducted in accordance with HAR §13-279-5(6). Laboratory analysis of non-burial related finds will be tabulated and standard artifact and midden recording will be conducted as follows. Artifacts will be documented as to provenience, measurements, weight, type of material, and presumed function. Photographs of representative artifacts will be taken for inclusion in the archaeological monitoring report. Bone and shell midden materials will be sorted down to species, when possible, and then tabulated by provenience.

As appropriate, collected charcoal material obtained within intact cultural deposits will be analyzed for species identification. Charcoal samples ideal for dating analyses will be sent

to Beta Analytic, Inc. for radiocarbon dating. If appropriate, artifacts may be sent to the University of Hawai‘i-Hilo Geoarchaeology Lab for Energy-Dispersive X-ray Fluorescence (EDXRF) analysis in order to identify and possibly geographically locate the source material. All analyzed samples, provenience information, and results will be presented in table form within the archaeological monitoring report.

7) Report Preparation:

Within 30 days of completion of the archaeological monitoring fieldwork, a brief archaeological monitoring letter report of findings as specified in §13-282-3(f)(1) will be submitted for SHPD’s review and acceptance.

The report will be prepared within 60 days of the end of archaeological monitoring fieldwork and will contain sections on monitoring methods, archaeological results, stratigraphy, and results of laboratory analyses, and it will present a synthesis of these results. The report will address the requirements of a monitoring report (pursuant to HAR §13-279-5). Photographs of excavations will be included in the monitoring report even if no historically significant sites are documented. Should burial treatment be completed as part of the monitoring effort, a summary of this treatment will be included in the monitoring report. Should burials and/or human remains be identified, CSH will provide all appropriate additional written documentation (e.g., letters, memos, reports) that may be requested by the SHPD.

8) Archiving Materials:

All burial materials will be addressed in accordance with SHPD directives. Materials not associated with burials will be temporarily stored at the CSH Maui office until an appropriate curation facility is selected, in consultation with the landowner and the SHPD. All data generated will be stored at the CSH offices.

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Appendix A SHPD Correspondence

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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FORESTRY AND WILDLIFE
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD., STE 555
KAPOLEI, HI 96707

February 24, 2022

IN REPLY REFER TO:
Project No.: 2022PR00139
Doc. No.: 2202AM21
Archaeology

William Ailā, Jr., Chariman
State of Hawaii
Department of Hawaiian Home Lands (DHHL)
P.O. Box 1879
Honolulu, HI 96805
c/o brian.toda@hawaii.gov

Dear William Ailā, Jr.:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
State of Hawaii DHHL
Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project
Archaeological Literature Review and Field Inspection Report
Wahikuli Ahupua‘a, Lāhainā District, Island of Maui
TMK: (2) 4-5-021:010 por., 015 por., 020, and 021 por.; and (2) 4-5-036:109, 110, and 112
(Honoapi‘ilani Highway ROW)

This letter provides the State Historic Preservation Division's (SHPD's) review of the State of Hawaii DHHL's Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project. SHPD received the submission on February 7, 2022, which included an HRS 6E Submittal Form, locator maps, a letter from DHHL requesting our review of the project, and an archaeological literature review and field inspection (LRFI) report titled, *Archaeological Literature Review and Field Inspection for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui Island, TMKs: (2) 4-5-021:010 por., 015 por., 020, and 021 por.; (2) 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way* (Yucha et al., January 2022).

DHHL proposes the construction of a new subdivision and associated infrastructure improvements within 83.3-acre project area on the subject property. The project will involve the construction of approximately 250 new units on 51 acres for the development of a Leiali‘i Phase 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include drainage improvements, improvements to Leiali‘i Parkway, and improvements at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway. Aerial photographs show the project area is currently undeveloped and previously impacted by agricultural activities associated with the Pioneer Mill.

Cultural Surveys Hawai‘i, Inc. (CSH) produced the subject LRFI report in support of the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project. The report (Yucha et al. 2022) includes summaries of previous archaeological investigations and historic land use in the area, and the results of the archaeological field inspection conducted for the current project. The LRFI documents portions of two roads (CSH 1 and 7) and a narrow-gauge railroad track (CSH 5) within the project area that are all believed to be more than 50 years old and thus considered to be potential historic properties.

Based on presence of historic properties within the current project area, SHPD requests the LRFI report be converted into an archaeological inventory survey (AIS) report meeting the requirements of HAR §13-276-5 and be submitted to SHPD for review and acceptance prior to initiation of project related work. However, prior to this, **SHPD requests** the project proponent and archaeological firm consult with our office regarding whether or not AIS subsurface testing is needed and, if so, to agree on an appropriate AIS testing strategy.

William Ailā, Jr.
02/24/2022
Page 2

SHPD shall notify the DHHL when the archaeological inventory survey report and any required mitigation plans are accepted, and the project initiation process may proceed.

Please contact Andrew McCallister, Maui Archaeologist IV, at andrew.mccallister@hawaii.gov for matters regarding archaeological resources or this letter.

Aloha, Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Noelani Hessler, CSH, nhessler@culturalsurveys.com
Trevor Yucha, CSH, tyucha@culturalsurveys.com
Julie Cachola, DHHL, julie-ann.cachola@hawaii.gov
Malia Cox, DHHL, malia.m.cox@hawaii.gov
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
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601 KAMOKILA BLVD., STE 555
KAPOLEI, HI 96707

October 5, 2022

IN REPLY REFER TO:
Project No.: 2022PR00139
Doc. No.: 2210IK01
Archaeology

William Ailā, Jr., Chairman
State of Hawaii
Department of Hawaiian Home Lands (DHHL)
P.O. Box 1879
Honolulu, HI 96805
c/o brian.toda@hawaii.gov

Dear William Ailā, Jr.:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
State of Hawaii DHHL
Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project
Archaeological Inventory Survey
Wahikuli Ahupua‘a, Lāhainā District, Island of Maui
TMK: (2) 4-5-021:010 por., 015 por., 020, and 021 por.; and (2) 4-5-036:109, 110, and 112
(Honoapi‘ilani Highway ROW)

This letter provides the State Historic Preservation Division’s (SHPD’s) review of the State of Hawaii DHHL’s Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project and a draft archaeological inventory survey (AIS) report titled, *Draft Archaeological Inventory Survey for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui Island TMKs [2] 4-5-021:010 por., 014 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi‘ilani Highway Right-of-Way* (Madeus et al., September 2022). SHPD previously reviewed the subject project and a literature review and field inspection (LRFI) report (Yucha et at., January 2022). In a letter dated February 24, 2022 (Project No. 2022PR00139, Doc. No. 2202AM21), SHPD requested that the LRFI report be converted into an AIS report due to the presence of historic properties within the project area. SHPD received the draft AIS report on June 24, 2022 (Submission No. 2022PR00139.003) and requested minor revisions. Subsequently, on September 30, 2022, SHPD received the revised AIS report, a DHHL letter, and a Cultural Surveys Hawaii, Inc. (CSH) cover letter (Submission No. 2022PR00139.004).

DHHL proposes the construction of a new subdivision and associated infrastructure improvements within 83.3-acre project area on the subject property. The project will involve the construction of approximately 250 new units on 51 acres for the development of a Leiali‘i Phase 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include drainage improvements, as well as improvements to Leiali‘i Parkway and at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway. Aerial photographs show the project area is currently undeveloped and previously impacted by agricultural activities associated with the Pioneer Mill.

CSH produced the subject AIS report (Madeus et al., September 2022) in support of the project. The report includes summaries of the scope of work, historic land use in the area, previous archaeological investigations, and the results of the AIS survey for the current project. The AIS identified three historic properties, including SIHP Site #50-50-03-08886 (an asphalt paved road and former railroad corridor), SIHP Site #50-50-03-08887 (portion of the Lāhainā Kā‘anapali & Pacific (LK&P) railroad tourist attraction), and SIHP Site #50-50-03-08888 (an asphalt paved industrial road). Madeus et al. (September 2022) assessed the two road segments associated with historic commercial agricultural operations to contain integrity of location, design, materials, and workmanship. The LK&P

William Ailā, Jr.
10/05/2022
Page 2

railroad was assessed to contain integrity of location, design, setting, materials, and workmanship. All three historic properties were determined significant under Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). Lastly, Madeus et al. (September 2022) made a project effect determination recommendation of “Effect, with proposed mitigation commitments” with mitigation in the form of archaeological monitoring (data recovery) within the boundaries of the historic properties to gather additional data on the subsurface structure of the historic properties.

The AIS report meets the minimum requirements of HAR §13-275-6. **It is accepted**. Please send two hard copies of the document, clearly marked FINAL, along with a copy of this acceptance letter and text-searchable PDF version of the report to the Kapolei SHPD office, attention SHPD Library. Also, submit a text-searchable PDF copy of the final AIS report to HICRIS Project 2022PR00139 using the Project Supplement option on the HICRIS website and submit a digital copy to lehua.k.soares@hawaii.gov.

SHPD agrees with the significance assessments for SIHP Sites #50-50-03-08886, 50-50-03-08887, and 50-50-03-08888 and **SHPD concurs** with DHHL’s project effect determination of **“Effect, with proposed mitigation commitments”** with mitigation in the form of archaeological monitoring.

SHPD looks forward to receiving for review and acceptance an archaeological monitoring plan meeting the requirements of HAR §13-277. Please submit the archaeological monitoring plan and associated submittal review fee to HICRIS Project No. 2022PR00193.

SHPD shall notify the DHHL when the archaeological monitoring plan is accepted, and the project initiation process may proceed.

Please contact ‘Iolani Kauhane, Maui Archaeologist III, at iolani.kauhane@hawaii.gov for matters regarding archaeological resources or this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

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STATE HISTORIC PRESERVATION DIVISION ARCHAEOLOGICAL MONITORING PLAN ACCEPTANCE LETTER

APPENDIX

F-2

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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII | KA MOKU'ĀINA 'O HAWAI'I
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STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

February 10, 2023

IN REPLY REFER TO:
Project No.: 2022PR00139
Doc. No.: 2302IK07
Archaeology

Ikaika Anderson, Acting Director
State of Hawaii
Department of Hawaiian Home Lands (DHHL)
P.O. Box 1879
Honolulu, HI 96805
c/o Andrew Choy
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Dear Ikaika Anderson:

SUBJECT: **Chapter 6E-8 Historic Preservation Review**
State of Hawaii Department of Hawaiian Home Lands
Villages of Leiali'i, Phase 1-B Subdivision
Archaeological Monitoring Plan
Wahikuli Ahupua'a, Lāhainā District, Island of Maui
TMK: (2) 4-5-021:010 por., 015 por., 020, and 021 por.; and (2) 4-5-036:109, 110, and 112
(Honoapi'ilani Highway ROW)

This letter provides the State Historic Preservation Division's (SHPD's) review of the revised draft archaeological monitoring plan (AMP) titled, *Archaeological Monitoring Plan for the Villages of Leiali'i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua'a, Lāhainā District, Maui Island, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; [2] 4-5-036:109, 110, and 112; and Honoapi'ilani Highway Right-of-Way* (Yucha and Hammatt, February 2023). SHPD previously accepted an archaeological inventory survey (AIS) report for the subject project and concurred with DHHL's project effect determination of "Effect, with proposed mitigation commitments" with mitigation in the form of archaeological monitoring (October 5, 2022; Project No. 2022PR00139, Doc. No. 2210IK01). SHPD received the draft AMP on November 9, 2022 (Submission No.006) and requested minor revisions. Subsequently, SHPD received the current revised AMP on February 7, 2023 and a Cultural Surveys Hawai'i, Inc. (CSH; archaeological consultant) cover letter.

The DHHL proposes the construction of a new subdivision and associated infrastructure improvements within a 83.3-acre project area on the subject property. The project will involve the construction of approximately 250 new units on 51 acres for the development of a Leiali'i Phase 1-B Subdivision across from the existing Leiali'i Phase 1-A Subdivision. The project will include improvements to surrounding utilities including improvements to drainage, the Leiali'i Parkway, and at the intersection of Leiali'i Parkway and Honoapi'ilani Highway. Aerial photographs show the project area is currently undeveloped and previously impacted by agricultural activities associated with the Pioneer Mill.

CSH produced the subject AMP (Yucha and Hammatt, February 2023) in support of the proposed project. Archaeological monitoring will be conducted for any project related ground disturbances that cocurs within the boundaries of Site 50-50-03-08886 (an asphalt paved road and former railroad corridor), Site 50-50-03-08887 (portion

of the Lāhainā Kā'anapali & Pacific [LK&P] railroad tourist attraction), and Site 50-50-03-08888 (an asphalt paved industrial road) The AMP includes a scope of work, a historical background section, a summary of previous archaeological investigations, and the following archaeological monitoring stipulations:

- On-site monitoring will be conducted for all ground-disturbing activities. One monitor is required for each piece of ground-altering machinery during this project;
- A coordination meeting will be conducted between the construction team and the monitoring archaeologist prior to the initiation of any construction activities so that the team is aware of the need for archaeological monitoring, the archaeological provisions detailed in this plan, and the responsibility of the construction team to ensure that no ground disturbing work is conducted without an archaeological monitor present;
- The archaeological monitor has the authority to temporarily halt all activity in the area in the event of a potential historic property being identified or to record archaeological information for cultural deposits or features;
- If non-burial historic properties are identified, documentation shall include, as appropriate, recording stratigraphy using USDA soil descriptions, GPS point collection (with sub-meter accuracy), recordation of feature contents through excavation or sampling of features, screening of features, representative scaled profile drawings, photo documentation using a scale and north arrow, and appropriate laboratory analysis of collected samples and artifacts. Additionally, photographs and profiles of excavations will be collected from across the project area, even if no significant historic properties are encountered. The profiles will measure a minimum of 2 m across, and their locations will be provided on a project site map and USGS map; Former A-horizons will be sampled for archaeological materials. Photographs and written descriptions will be recorded for all cultural materials.
- If a large infilled pit feature, trash, or historic artifacts concentration deposit is identified, SHPD will be consulted regarding appropriate documentation. That documentation will, at a minimum, include photographs with North arrow and scale and a collection of a representative sample through the excavation of a controlled column sampling strategy (50 cm across by 25 cm deep by 10 cm thick samples);
- If human remains are identified, work will cease in the vicinity, the find shall be secured, and provisions outlined within the Hawaii Revised Statutes (HRS) §6E-43 and HAR §13-300-40, and any SHPD directives shall be followed. Work will resume in the area of the inadvertent find only following receipt of SHPD's written approval and directives. SIHP Site number will be requested for any burial find, and if SHPD makes a determination of burial relocation, SIHP Site number request and GPS data will be completed for the location of the burial re-interment; and
- Collected materials not associated with burials will be temporarily stored at the archaeological firm's office/laboratory until an appropriate curation facility is selected, in consultation with the landowner and the SHPD.

The revised AMP (Yucha and Hammatt, February 2023) meets the minimum requirements of HAR §13-279-4. **It is accepted**. Please send two hard copies of the document, clearly marked FINAL, along with a copy of this letter and a text-searchable PDF version of the AMP to the Kapolei SHPD office, attention SHPD Library. Also, submit a text-searchable PDF copy of the final AMP to HICRIS Project No. 2022PR00139 using the Project Supplement option and send a PDF copy of the AMP to lehua.k.soares@hawaii.gov.

SHPD hereby notifies the DHHL that the archaeological monitoring plan has been accepted and the project may continue.

SHPD requests written notification via email and HICRIS at the start of archaeological monitoring. Within 30 days of completion of archaeological monitoring fieldwork, SHPD looks forward to receiving for review and acceptance a brief archaeological monitoring letter report of findings as specified in HAR §13-282-3(f)(1). Subsequently, SHPD looks forward to receipt of an archaeological monitoring report meeting the requirements of HAR §13-279-5 for review and acceptance.

Please submit the monitoring report and submittal review fee and all other project documents and correspondence to HICRIS Project No. 2022PR00139 using the Project Supplement option.

Please contact ‘Iolani Kauhane, Historic Preservation Archaeologist III, at Iolani.Kauhane@hawaii.gov for any questions regarding this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
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CULTURAL IMPACT ASSESSMENT

APPENDIX G

FINAL
Cultural Impact Assessment for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; 4-5-036:109, 110, and 112 por.; and Honoapi‘ilani Highway Right-of-Way

Prepared for
Munekiyo Hiraga

Prepared by
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Cultural Surveys Hawai‘i, Inc.
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(Job Code: WAHIKULI 4)

March 2023

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Management Summary

Reference	Cultural Impact Assessment for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; 4-5-036:109, 110, and 112 por.; and Honoapi‘ilani Highway Right-of-Way (Tanaka and Hammatt 2023)
Date	March 2023
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: WAHIKULI 4
Agencies	State Office of Planning and Sustainable Development (OPSD), Environmental Review Program (ERP)
Land Jurisdiction	State/County; DHHL
Project Location	The project area is located along Leiali‘i Parkway in Lāhainā across from and extending directly east of the existing Villages of Leiali‘i Phase 1-A Subdivision in Lāhainā, Wahikuli Ahupua‘a, Lāhainā District, TMKs: [2] 4-5-021:010, 014 por., 020, 021 por., and 4-5-036:109, 110, and 112 por.. The project area also includes a triangular plot of land between the western side of the Phase 1-A Subdivision and *mauka* (toward the mountains) side of Honoapi‘ilani Highway, and improvements within the Honoapi‘ilani Highway Right-of-Way (ROW) at the intersection with Leiali‘i Parkway and extending north along the highway toward Turtle Rock by the Post Office. The project area is bounded by the Lāhainā Civic Center multipurpose sports and recreation facility to the northwest, by the Leiali‘i Phase 1-A Subdivision to the south, and Wahikuli Wayside Park to the west. The eastern side of the project area is agricultural land. The project area is depicted on a portion of the 1992 Lahaina USGS 7.5-minute topographic quadrangle.
Project Description	The project will involve the construction of a maximum of 250 new units on 51 acres (20.639 hectares) for the development of a Leiali‘i Phase 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include off-site improvements to surrounding utilities including construction of a retention basin, road widenings, and improvements at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway.
Project Acreage	83.3 acres (33.7 hectares)
Document Purpose and Regulatory Context	This cultural impact assessment (CIA) supports compliance for the Leiali‘i Phase 1-B Subdivision with: • The mandate set forth by the Hawai‘i State Constitution (Articles IX and XII), courts, Hawai‘i Revised Statutes (HRS), and Hawai‘i Administrative Rules (HAR) and other Hawai‘i State laws requiring government agencies to promote and

	preserve cultural beliefs, practices. and resources of Native Hawaiians and other ethnic groups; • the State of Hawai‘i’s environmental review process under HRS §343, which requires consideration of the proposed project’s potential effects on cultural practices and cultural features in order to “promote responsible decision making” (HRS §343); • and the State of Hawai‘s historic preservation review process under HAR §13-275-6 and §13-284-6, which requires the identification and mitigation of adverse effects proposed by a potential project in order to “promote the use and conservation of historic properties for the education of the citizens of Hawai‘i” (HAR §13-275-6). This CIA contains information gathered from archival research and consultation, compiled in order to “analyze the impact of a proposed action on cultural practices and features associated with the project area” (Office of Environmental Quality Control 1997). Cultural practices and cultural features may include traditional cultural properties (TCPs), designated significant historic properties under State of Hawai‘i significance Criterion e, pursuant to HAR §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6).
Results of Background Research	Background research for the proposed project yielded the following information: 1. Lāhainā Moku, located on the south facing flank of Mauna ‘Eke, or the West Maui Mountains as it is commonly called today, consists of multiple *ahupua‘a* (traditional land division usually extending from the mountains to the sea) that extend from Ukumehame at the southern end to Hanakaō‘ō along the northern end. 2. Pukui et al. (1974:127) translate the literal meaning of Lāhainā as “cruel sun” and note the area is said to have been named for droughts. According to Sterling (1998:16), Pukui relates that the literal translation of “cruel sun” refers to the drought during the time of Chief Hua, “when the sun was so cruel to the people that it caused everything to wither and dry.” Mrs. Pia Cockett, cited in Sterling (1998:16), translates the name of the town Lāhainā: “Not Lahaina, it was Lāhainā. Because there was a man, a

	baldheaded man who went in the sun and his head became sore. That’s why they call it Lāhainā [hainā = cruelty; lā = day, sun].” 3. There are several rains within Lāhainā Moku. These rains include the Hāli‘ipili, Kanikanilehua, Kaua‘ula, Pa‘ūpili, and ‘Ula rain. Other rains associated with Lāhainā include the *kiawe*, Maka‘ūpili, *‘ohu*, Papawai, ‘Ūkiukiu, and ‘Ulalena rains. 4. In the *mo‘olelo* (story) of Māui, he wrangles the rays of the sun (Moemoe) and forces it to travel slowly through the sky. The purpose was to allow his mother and others enough time to complete their daily tasks. Māui broke one of Moemoe’s rays, which immediately turned to stone once it hit the ground. This stone can be seen *makai* (toward the sea) of the current Sheraton Maui Resort and Spa. 5. Kaka‘alaneo was an early ruler of Maui who directed his attention to agriculture and the domestic industry (Nakuina 1904:53). Kaka‘alaneo was famous for planting the highly valued breadfruit grove of Lāhainā known throughout the Hawaiian Islands as Malu Ulu o Lele (“the shady breadfruit grove of Lele [Lahaina]”). During the reign of Kaka‘alaneo, Handy (1940:106) relates that the cultivation of bananas, sugarcane, potatoes and more spanned from Keka‘a (Black Rock) to Hāhākea and to Wahikuli. 6. Handy et al. (1991:492) note that the main taro lands of Lāhainā were watered by two large streams, the Kahoma Stream and Kanahā Stream (a tributary to the Kahoma Stream), which run far back into the valleys. Early descriptions indicate that both dry-land (*kula*) and pond-field (*lo‘i*) methods of cultivation were equally employed in the Lāhainā area (Handy et al. 1991:492–493). 7. The inland ponds, or *loko*, of Aimakalepo, Unahiole, and ‘Alamihi near the mouth of Kahoma, and the famed royal fishpond of Mokuhinia at Waine‘e likely provided a reliable fish resource that was supplemented by off-shore communal or family fishing. J.K. Napaepae, a native of Lāhainā, noted that there used to be a pond at Māla named Alanuhi that was primarily for mullet, but “now filled with rubbish and crossed by the road leading out to Mala wharf” (Walker 1931:299). 8. Lāhainā was a favored place for the high chiefs of Maui to reside as the entire *moku* (district) could boast of a mild climate year round, plentiful marine and terrestrial resources, close proximity to Lana‘i and Moloka‘i, and easy communication with other population centers of West Maui as well as settlements along the western, southwestern and southern shores of Haleakalā (Handy et al. 1991:492). Flanked by excellent fishing grounds, Lāhainā was the primary seat of the *ali‘i* (royalty) of

	West Maui (Handy et al. 1991) and later was the center of government for the Kingdom of Hawai‘i. 9. As early as 1862, the lands surrounding Lāhainā were cultivated in commercial sugar (Gilmore 1931:198–203), while the sandalwood trade of the 1810s, the whale trade of the 1830s, the Irish potato trade of the 1840s, the establishment of the protestant Lahaina Mission Station in the 1820s, and the Lahainaluna Seminary in the 1830s drew people to the waterfront areas, which ultimately resulted in a population rise (Kuykendall 1968:234). This trend made Lāhainā one of the primary economic, religious, and educational centers for the early Hawaiian Kingdom (Kamakau 1992:304). 10. South of the current project area, the western end of Pana‘ewa Ahupua‘a was selected as the location for the Lahainaluna School. The Reverend Lorrin Andrews established a school for men at Lahainaluna in 1831. Protestant missionaries endeavoring to instruct Native Hawaiians in Christianity had convinced the chiefs and royalty of Lāhainā that a school was needed to educate and provide a supply of native teachers for the people of Maui (Lahaina Restoration Foundation 2008). 11. In 1864, Lot Kamehameha (King Kamehameha V) ventured into the sugar industry with two established sugar entrepreneurs, F.W. Hutchison, of the Lahaina Sugar Company, and James Makee, of the Rose Ranch sugar plantation in Ulupalakua, to form the West Maui Sugar Company. To start, the King leased the crown lands in Olowalu and Ukumehame to the West Maui Sugar Company (Olowalu 2008). An additional tract of 2,194 acres of crown land in Wahikuli was also leased by Lot Kamehameha in 1854, nine years prior to his coronation as king; it is unclear, however, if these lands were included in the lands under cultivation by West Maui Sugar Company. 12. The Pioneer Mill Company (PiMCo) was established as a partnership in 1863 between James Campbell, Henry Turton, and Benjamin Pittman. A plantation village, the Kā‘anapali Village, and a production facility was established at Pu‘u Keka‘a along with a shipping port at Kā‘anapali Landing. 13. The McCandless Brothers, an engineering enterprise from Honolulu, were hired in 1883 to drill the first well for PiMCo at Kā‘anapali. The successful installation of wells at Kā‘anapali, Wahikuli, Māla, and Waine‘e in 1897 effectively doubled the production of sugar at PiMCo (Gilmore 1931; Stearns and MacDonald 1942). 14. The Honokōhau Ditch consisted of tunnels and flumes 14 miles long, and it delivered 20 million gallons per day (mgd) to the PiMCo fields. The construction of the Honokōhau Ditch began

	in 1902. The ditch started at an elevation of 700 feet (ft) AMSL with intakes at Honokōhau, Kaluanui, and Honolua streams. The ditch and flumes ran along soft hillsides where landslides frequently choked the ditch and damaged the flumes, but teams of workers kept the waterways clear. Work was completed in May 1904 with capacity averaging 25 mgd (Wilcox 1996). 15. In the years immediately following statehood in 1959, the Kā‘anapali area north of Lāhainā was master-planned as a resort destination. American Factors (AmFac) developed the cane lands located in Kā‘anapali into the Royal Kaanapali Golf Course and the first hotel along the coastline, the Sheraton Maui Hotel, opened on Kā‘anapali Beach in 1963. Following the development of the Kā‘anapali Beach Hotel and the Whalers Shopping Village in 1970, the Maui Surf Hotel opened in 1971 at what is known today as the Westin Maui Resort & Spa’s Ocean Tower (Fischer 2013).
Results of Community Consultation	CSH attempted to contact Hawaiian organizations, agencies, and community members as well as cultural and lineal descendants in order to identify individuals with cultural expertise and/or knowledge of the project area and vicinity. Community outreach letters were sent to 38 individuals or groups; five responded, one provided written testimony, and zero of these *kama‘āina* (native-born) and/or *kūpuna* (elder/of the grandparent’s generation) met with CSH for more in-depth interview. 1. Edwin “Ekolu” Lindsey III
Identification of Cultural Practices	Consultation identified the following cultural, historical, and natural resources where cultural practices (including traditional and customary Native Hawaiian rights) are being exercised in Wahikuli Ahupua‘a: 1. Marine resources 2. Freshwater resources Based on the results of community consultation and background research conducted as part of this CIA, CSH has identified the following cultural practices within Wahikuli Ahupua‘a: 1. Agricultural practices 2. Plant gathering 3. Fishing 4. *Limu* gathering 5. Burial practices Zero ongoing cultural practices were identified within the project area during community consultation. The project area is also located in the general vicinity of ongoing cultural practices such as marine resources and water resources.

Identification of Impacts to Cultural Practices	While no impacts were identified within the project area, four potential impacts to ongoing cultural practices were identified along the shoreline of Wahikuli Ahupua'a outside of the project area during community consultation for this CIA. These impacts include: 1. Impacts to ocean and marine resources from sedimentation from construction activities 2. Impacts to ocean and marine resources from sewage 3. Impacts to beach access from increased density and traffic 4. Impacts to freshwater resources
Mitigation Possibilities Identified During Background Research and Consultation	The results of community consultation, underscored by background research conducted for this CIA, inform the following mitigation possibilities promoting and preserving cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups: 1. Edwin “Ekolu” Lindsey III expressed concern that sedimentation from construction activities could impact the ocean and marine resources. He also mentioned that sewage may potentially have “negative impacts to the ocean and resources.” He asked, “Do we have the capacity?” 2. Mr. Lindsey stated that the proposed project will result in “increased density” and “increased traffic,” and stated that he is worried about the impact the increase in traffic will have on “all the kids and beach access.” 3. Mr. Lindsey also expressed his concern regarding “water resources” (drinking water). He asked, “Is there enough?” pointing out that, “We are struggling to have stream flow, let alone more drinking water.” 4. Mr. Lindsey stated that “Mitigation projects will be necessary” to address the potential impacts that the increase in population density and traffic will have on beach access. 5. CSH recommends feasible mitigation to address potential impacts to shoreline sedimentation during construction include the of Best Management Practices (BMPs). Potential BMPs to employ during the construction process include the use of silt fencing, storm drain inlet protection, vegetative buffers, and dust control. 6. CSH recommends feasible mitigation to address potential impacts from sewage run-off to include confirmation that the project will comply with all such rules and standards that govern the treatment of sewage. 7. CSH recommends that, as part of the environmental review process, that any potential effect to the availability of freshwater resources (drinking water) by the proposed project be reviewed and if appropriate, mitigated.

	8. CSH recommends that, as part of the project’s environmental review process, that any potential effect of increased traffic and population density on beach access imposed by the proposed project be reviewed and, if appropriate, mitigated. 9. Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that *iwi kūpuna* (ancestral remains) are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended. 10. In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance.

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Section 1 Introduction

1.1 Project Description

At the request of Munekiyo Hiraga, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this cultural impact assessment (CIA) for the Villages of Leiali‘i, Phase 1-B Subdivision and Related Improvements Project, Wahikuli Ahupua‘a, Lāhainā District, Maui, TMKs: [2] 4-5-021:010 por., 014 por., 020, and 021 por.; 4-5-036:109, 110, and 112 por.; and Honoapi‘ilani Highway Right-of-Way (ROW). The project area encompasses 83.3 acres (33.7 hectares) and is located along Leiali‘i Parkway in Lāhainā across from and extending directly east of the existing Villages of Leiali‘i Phase 1-A Subdivision. The project area also includes improvements within the Honoapi‘ilani Highway ROW at the intersection with Leiali‘i Parkway and extending north along the highway toward Turtle Rock by the Post Office. The project area is bounded by the Lāhainā Civic Center multipurpose sports and recreation facility to the northwest, by the Leiali‘i Phase 1-A Subdivision to the south, and Wahikuli Wayside Park to the west. The eastern side of the project area is agricultural land. The project area is depicted on a portion of the 1992 Lahaina U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), tax map plats (Figure 2 and Figure 3), and a 2019 aerial photograph (Figure 4).

The project will involve the construction of up to 250 new units on 51 acres (20.639 hectares) for the development of a Leiali‘i Phase 1-B Subdivision across from the existing Leiali‘i Phase 1-A Subdivision. The project will include off-site improvements to surrounding utilities including construction of a retention basin, road widenings, and improvements at the intersection of Leiali‘i Parkway and Honoapi‘ilani Highway.

1.2 Regulatory Context

This CIA supports compliance for the Leiali‘i Phase 1-B Subdivision Project with:

- The mandate set forth by the Hawai‘i State Constitution (Articles IX and XII), courts, Hawai‘i Revised Statutes (HRS), and Hawai‘i Administrative Rules (HAR) and other Hawai‘i State laws requiring government agencies to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups;
- the State of Hawai‘i’s environmental review process under HRS §343, which requires consideration of the proposed project’s potential effects on cultural practices and cultural features in order to “promote responsible decision making” (HRS §343);
- and the State of Hawai‘s historic preservation review process under HAR §13-275-6 and §13-284-6, which requires the identification and mitigation of adverse effects proposed by a potential project in order to “promote the use and conservation of historic properties for the education of the citizens of Hawai‘i” (HAR §13-275-6).

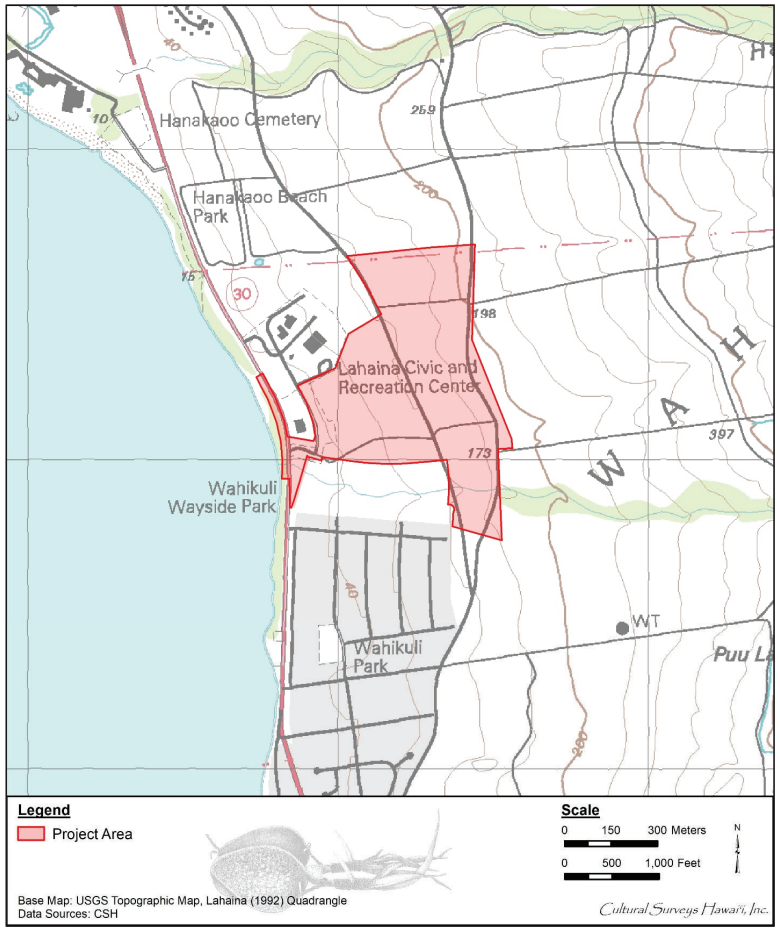


Figure 1. Portion of the 1992 Lahaina USGS 7.5-minute topographic quadrangle showing the location of the project area

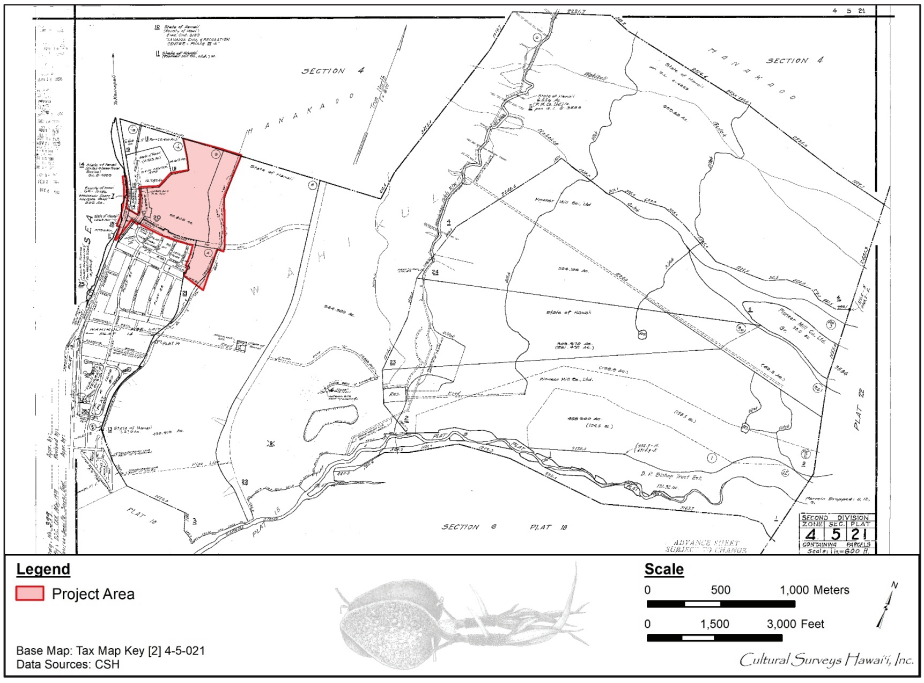


Figure 2. Tax Map Key (TMK) [2] 4-5-021 showing the project area (Hawaii TMK Service 2014)

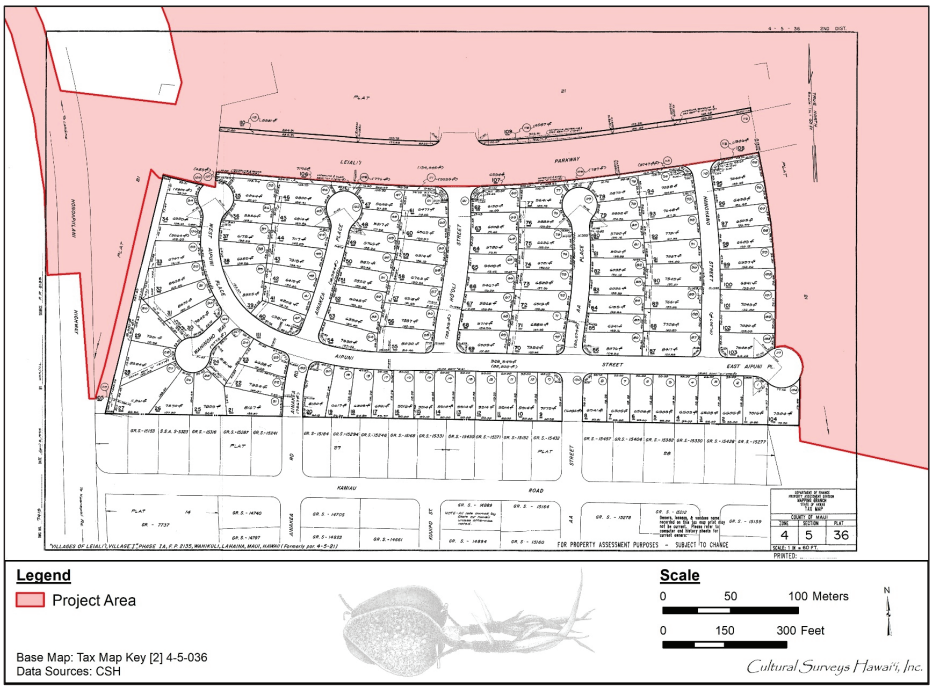


Figure 3. TMK: [2] 4-5-036 showing the project area (Hawaii TMK Service 2014)

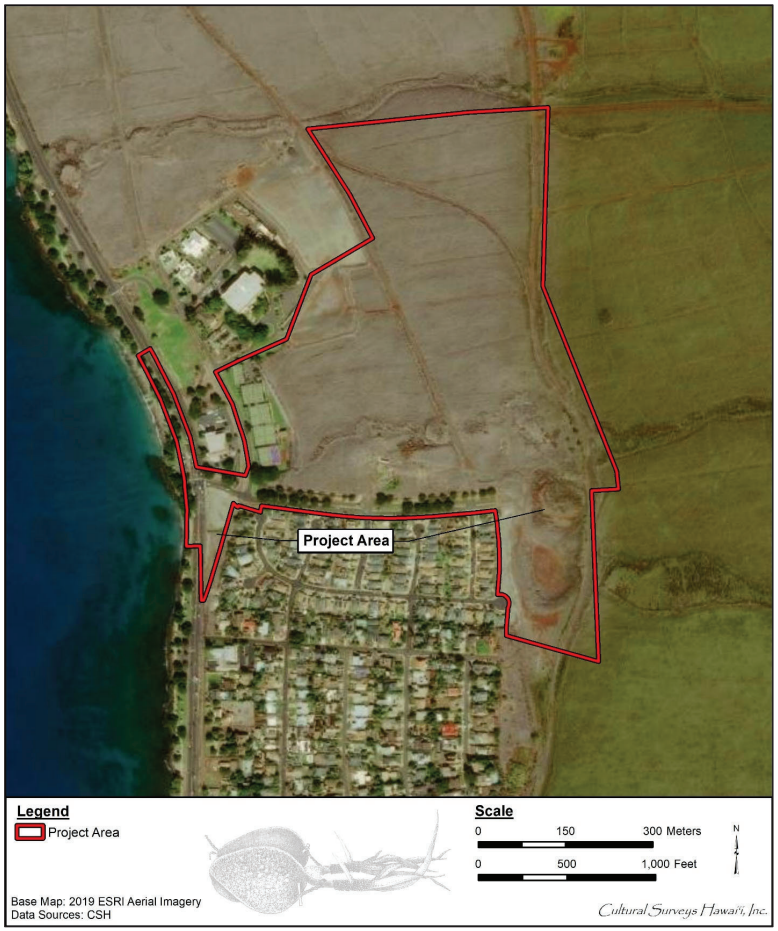


Figure 4. 2019 aerial image of the project area (ESRI 2019)

1.3 Document Purpose

This CIA contains information gathered from archival research and consultation, compiled in order to “analyze the impact of a proposed action on cultural practices and features associated with the project area” (Office of Environmental Quality Control 1997). Cultural practices and cultural features may include traditional cultural properties (TCPs), designated significant historic properties under State of Hawai‘i significance Criterion e, pursuant to HAR §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6).

1.4 Scope of Work

The scope of work for this cultural component includes the following:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.5 Natural Environment

The project area is on the western slope of the West Maui Mountains, north of Honokohau Ditch. The westernmost edge of the project area encompasses a portion of the Honoapi‘ilani Highway ROW, which follows the edge of the ocean shoreline. The lands of the current project area slope from an elevation of 65.5 m (215 feet [ft]) above mean sea level (AMSL) in the east to 6.1 m (20 ft) in the west.

In 2014, the average monthly air temperature for the project area was between 21.70°C (71.05°F) in January and February and 25.70°C (78.26°F) in August with an average annual air temperature of 23.74°C (74.72°F) (Giambelluca et al. 2014). Due to the rain “shadow” caused by the West Maui Mountains, the vicinity of the project area received a mean annual rainfall of 424.4 mm (16.71 inches) between 1978 and 2007, according to the University of Hawai‘i 2011 *Rainfall Atlas of Hawaii* (Giambelluca et al. 2013; Giambelluca et al. 1986:47). The mean monthly rainfall varied between 9.6 mm (0.38 inches) in September to 78.1 mm (3.07 inches) in December.

The vegetation of the project area consists mostly of modern plantings in and around the nearby subdivision, including ground cover species such as Bermuda grass (*Cynodon dactylon*), beach morning glory (*Ipomoea pes-caprae*), *naupaka* (*Scaevola taccada*), and *hau* (*Hibiscus tiliaceus*) in the beachside areas; plantings of exotic species such as bird-of-paradise (*Strelitzia reginae*), sword ferns (*Nephrolepis* sp.), fan palms (*Washingtonia* sp.), and torch ginger (*Phaeomeria magnifica*) in shaded areas; bougainvillea (*Bougainvillea spectabilis*), wedelia (*Sphagneticola trilobata*), and plumeria (*Plumeria rubra*), coconut trees (*Cocos nucifera*), autograph trees (*Clusia rosea*), and monkeypod (*Samanea saman*). Hedges were mostly of flowering hibiscus (*Hibiscus kokio kokio*), mock-orange (*Murraya paniculata*), and flowering rose (*Rosa* sp.).

1.5.1 ***Ka Lepo*** **(Soil)**

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), natural soils within the project area primarily consist of Wahikuli stony silty clay, 3 to 7% slopes (WcB) over the majority of the northern half, with Wahikuli stony silty clay, 7 to 15% slopes (WcC) in the southern portion, Rock land (rRK) near a small portion of the southeastern corner, and areas of Wahikuli very stony silty clay, 3 to 7% slopes (Wdb), and Beaches (BS) around Honoapi‘ilani Highway in the west (Figure 5).

Wahikuli Series soils are described as follows:

> This series consists of well-drained soils on uplands on the island of Maui. These soils developed in material weathered form basic igneous rock. They have been influenced to some extent by volcanic ash from local cinder cones. They are gently to moderately sloping. Elevations range from nearly sea level to 600 feet. The annual rainfall amounts to 12 to 20 inches; most of it occurs in winter. The mean annual soil temperature is 75° F. Wahikuli soils are geographically associated with Lahaina and Molokai soils.
>
> These soils are used mostly for sugarcane. A small acreage is used for homesites. The natural vegetation consists of bermudagrass, feather fingergrass, kiawe, and uhaloa [Foote et al. 1972:125]

The Wahikuli silty clay, 3 to 7% slopes (WdB) soil provides a representative profile of the soil series and is described as follows:

> In a representative profile the surface layer is dark reddish-brown silty clay about 15 inches thick. The subsoil, about 17 inches thick, is dark reddish-brown silty clay that has subangular blocky structure. The substratum is hard basic igneous rock. The soil is mildly alkaline in the surface layer and subsoil. Permeability is moderate. Runoff is slow, and the erosion hazard is slight. The available water capacity is about 1.4 inches per foot in the surface layer and 1.5 inches per foot in the subsoil. In places roots penetrate to bedrock. [Foote et al. 1972:125]

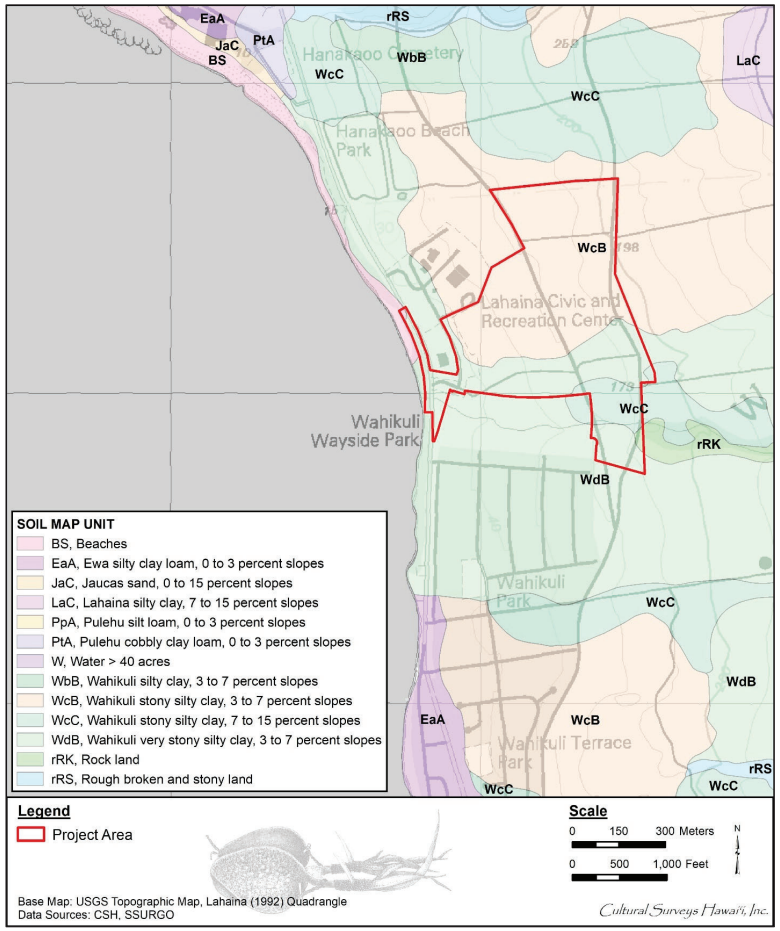


Figure 5. Overlay of *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (USDA SSURGO 2001)

Characteristics of the specific Wahikuli soil types indicated within the project area are described as follows:

> **Wahikuli stony silty clay, 3 to 7 percent slopes** (WcB).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that there are enough stones on the surface to hinder cultivation.
>
> This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IIe if irrigated, IVs if nonirrigated; sugarcane group 1; pasture group 3)
>
> **Wahikuli stony silty clay, 7 to 15 percent slopes** (WcC).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that there are enough stones on the surface to hinder cultivation. Runoff is slow to medium, and the erosion hazard is slight to moderate. Included in mapping were small, nonstony areas and some moderately steep areas.
>
> This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IIIe if irrigated, IVe if nonirrigated; sugarcane group 1; pasture group 3)
>
> **Wahikuli very stony silty clay, 3 to 7 percent slopes** (Wdb).—This soil is similar to Wahikuli silty clay, 3 to 7 percent slopes, except that as much as 3 percent of the surface is covered by stones. Included in mapping were small areas where stones cover 3 to 15 percent of the surface.
>
> This soil is used mostly for sugarcane. A small acreage is used for homesites. (Capability classification IVs if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3) [Foote et al. 1972:126]

Rock land (rRK) is described as follows:

> Rock land (rRK) is made up of areas where exposed rock covers 25 to 90 percent of the surface. It occurs on all five islands. The rock outcrops and very shallow soils are the main characteristics. The rock outcrops are mainly basalt and andesite. This land type is nearly level to very steep. Elevations range from nearly sea level to more than 6,000 feet. The annual rainfall amounts to 15 to 60 inches.
>
> Rock land is used for pasture, wildlife habitat, and water supply. The natural vegetation at the lower elevations consists mainly of kiawe, klu, piligrass, Japanese tea, and koa haole. Lantana, guava, Natal redtop, and molassesgrass are dominant at the higher elevations. This land type is also used for urban development. In many areas, especially on the island of Oahu, the soil material associated with the rock outcrops is very sticky and very plastic. It also has high shrink-well potential. Buildings on the steep slopes are susceptible to sliding when the soil is saturated. Foundations and retaining walls are susceptible to cracking. [Foote et al. 1972:119]

Beaches (BS) are described as follows:

> Beaches (BS) occur as sandy, gravelly, or cobbly areas on all the islands in the survey area. They are washed and rewashed by ocean waves. The beaches consist

> mainly of light-colored sands derived from coral and seashells. A few of the beaches, however, are dark colored because their sands are from basalt and andesite.
>
> Beaches have no value for farming. Where accessible and free of cobblestones and stones, they are highly suitable for recreational uses and resort development. (Capability classification VIIIw, nonirrigated). [Foote et al. 1972:28]

1.5.2 *Nā Ua* (Rains)

Precipitation is a major component of the water cycle and is responsible for depositing *wai* (fresh water) on local flora. Pre-Contact *kānaka* (Native Hawaiians) recognized two distinct annual seasons. The first, known as *kau* (period of time, especially summer), lasts typically from May to October and is a season marked by a high-sun period corresponding to warmer temperatures and steady trade winds. The second season, *ho‘oilo* (winter, rainy season) continues through the end of the year from November to April and is a much cooler period when trade winds are less frequent, and widespread storms and rainfall become more common (Giambelluca et al. 1986:17).

Each small geographic area on Maui had a Hawaiian name for its own rain. According to Akana and Gonzalez:

> Rain names are a precious legacy from our kūpuna who were keen observers of the world around them and who had a nuanced understanding of the forces of nature. They knew that one place could have several types of rain, each distinct from the other. They knew when a particular rain would fall, its color, its duration, its intensity, its path, its sound, its scent, and its effect on the land and their lives […] Rain names are a treasure of cultural, historical, and environmental information. [Akana and Gonzalez 2015:xx]

It was a customary and necessary tradition to grant a name for each type of rain. Rains were named to show their action toward plants or the supposed effects on people or their possessions (Pukui and Elbert 1986:361). The following section presents these rains as they were mentioned in historical texts compiled by Akana and Gonzalez (2015).

There are several rains within Lāhainā Moku. These rains include the Hāli‘ipili, Kanikanilehua, Kaua‘ula, Pa‘ūpili, and ‘Ula rain. Other rains associated with Lāhainā include the *kiawe*, Maka‘ūpili, *‘ohu*, Papawai, ‘Ūkiukiu, and ‘Ulalena rains.

According to Akana and Gonzalez (2015:33), the name “Hali‘i pili” translates to “to spread over pili grass.” Hāli‘ipili is also “a generally descriptive term; its various usages are determined by the context” (Akana and Gonzalez 2015:33). Hāli‘ipili is also defined in Lorrin Andrews’ *A Dictionary of the Hawaiian Language*:

> 2. To spread over a region, as a shower, like the spreading of a mat.
>
> Hāli‘ipili i ke kula o Lele (*The shower extends over the plain of Lāhainā*).
>
> Source: Andrews 145·[Akana and Gonzalez 2015:34]

The Hāli‘ipili rain is also mentioned in a *mele ‘uhane* (lament) which was composed for Moenahele (Akana and Gonzalez 2015:34).

3. Ku‘u kaikamahine mai nā kai ‘ewalu
Mai ka ua he‘e koko ‘ula i ka moana
Mai ka ua Hāli‘ipili o Lele

My beloved daughter from the eight seas
From the fleeting rainbow rain over the ocean
From the Hāli‘ipili rain of Lele

From a mele ‘uhane, or lament, for Moenahele. Hawaiian source: Kaleo. English trans. by author. [Akana and Gonzalez 2015:34]

Akana and Gonzalez (2015:48) note the name Kanikanilehua can “refer to the chattering of birds on ‘ōhi‘a lehua trees, the rustling of lehua flowers, or the drinking of the rain by lehua flowers.” The Kanikanilehua rain is also known as Kanilehua.

“Ka ua ‘ula” translates to “the red rain.” Akana and Gonzalez (2015:68) also note that Kaua‘ula is the name of a wind and an *ahupua‘a* in Lāhainā. In a *mele ho‘oilina* (legacy song) composed for ‘Emalani Kaleleonālani, wife of Kamehameha IV, Alexander Liholiho, the Kaua‘ula rain is associated with Kāhili, the *pali* (cliff) at the head of Kaua‘ula Valley (Akana and Gonzalez 2015:69). The Kaua‘ula rain is also known as the ‘Ula rain (Akana and Gonzalez 2015:261).

Pa‘ūpili translates as “to soak pili grass” (Akana and Gonzalez 2015:221). The Pa‘ūpili Rain is mentioned in an *‘ōlelo noeau* (proverb), “Keikei Lāhainā i ka ua Pa‘ūpili. *Majestic Lāhainā in the Pa‘ūpili rain*” (Pukui 1983:183). In another *‘ōlelo noeau*, the Pa‘ūpili Rain is described as “Kaua Pa‘ūpili o Lele. *The pili-soaking* [*Pa‘ūpili*] *rain of Lele*” (Pukui 1983:172). Pukui noted, “The plains of Lāhainā, Maui, were covered with pili grass in ancient days. When the rain poured the grass was well soaked.”

The Pa‘ūpili Rain is also mentioned in a *mele aloha* (farewell song) composed by Kini in honor of Nahi‘ena‘ena.

7. Ku‘u hoa mai ka malu ‘ulu o Lele
Ku‘u hoa mai ka la‘i a ke Kiowea
Ku‘u hoa mai ka ua Pa‘ūpili o Lāhainā

My companion from the shade of the ‘ulu trees of Lele
My companion from the calm of the Kiowea wind
My companion from the Pa‘ūpili rain of Lāhainā

From a mele aloha, or farewell song, for Nahi‘ena‘ena by Kini. Hawaiian source: Fornander, *Fornander 6*: 441. English trans. by author. [Akana and Gonzalez 2015:223]

In a *mele olioli* (a type of song that was not typically danced to), Charles Kauluhinano Hoopii described Lāhainā as “beautiful” and “glorious” in the Pa‘ūpili Rain.

10. Nani Lāhainā i ka ua Pa‘ūpili
I pili aloha ‘ia me ka makani he Ma‘a‘a
. . . . . .
Keikei Lāhainā i ka ua Pa‘ūpili
I pili aloha ‘ia

E Maunaho‘omaha me Keka‘a

Beautiful is Lāhainā in the Pa‘ūpili rain
Joined lovingly by the Ma‘a‘a wind
. . . . . .
Lāhainā is glorious in the Pa‘ūpili rain
Held in the bonds of love
By Maunaho‘omaha and Keka‘a

From a mele olioli chanted by Charles Kauluhinano Hoopii of Lāhainā, Maui, who learned it from Pamano, the younger sister of the composer. Hawaiian source: ‘Nani Lahaina.’ English trans. by author. Additional sources: Kanahele 39-40, 54, and 57; Kualu. [Akana and Gonzalez 2015:224]

The Pa‘ūpili Rain is also mentioned in a *mele kālai‘āina* (political chant) composed for ‘Emalani Kaleleonālani.

11. Kau pono i Lāhainā ka ua Pa‘ūpili
Ua Īī ‘ē i nā ukana aka Ma‘a‘a

There in Lāhainā is the Pa‘ūpili rain
Already chilled by the baggage of the Ma‘a‘a wind

From a mele kālai‘āina, or political chant, for ‘Emalani Kaleleonālani. Source: Nogelmeier 178. [Akana and Gonzalez 2015:224]

In a *mele hō‘ihi* (honorific chant), ‘Emalani Kaleleonālani’s hair is also compared to the Pa‘ūpili Rain.

13. Ke oho ua Pa‘ūpili o Lele
Lililehua i uka o Honokawai

Tresses that sweep like the Pa‘ūpili rain of Lele
Like the Lililehua wind and rain above Honokawai

From a mele hō‘ihi, or honorific chant, praising the hair of ‘Emalani Kaleleonālani. Source: Nogelmeier 60. *Note: ‘Honokawai’ is a variant of ‘Honokōwai,’ the name of an ahupua‘a in Kā‘anapali, Maui.* [Akana and Gonzalez 2015:224]

The Pa‘ūpili Rain is also mentioned in a chant composed for the moment ‘Emalani Kaleleonālani sat down to eat.

9. E ‘ai ana kā ‘oe, e Puailahaina, ka ua Pa‘ūpili
Pili iho ka la‘i, pili i ka pohu
Ke kōhi ala i ka hono o Hauola

You are indeed going to eat, O Puailahaina, of the Pa‘ūpili rain
The calm clings, clings to the stillness
Restraining the bay of Hauola

From a chant for ‘Emalani Kaleleonālani for the moment she sat down to eat. Hawaiian source: Nogelmeier 192. English trans. by author. [Akana and Gonzalez 2015:223–224]

The Pa‘ūpili Rain is also mentioned in a *kanikau* (lament) composed for L. Kahuakai.

> 14. Aloha ku‘u hoa o ka ua Pa‘ūpili
> Ku‘u hoa o ka malu o ka ‘ulu
> O ke ahe a ka makani he ‘A‘a
> Ku‘u hoa o ka pi‘ina o Pa‘pa‘u a me na lehua o Līhau
>
> *Love for my dear companion of the Pa‘ūpili rain*
> *My companion of the shade of the ‘ulu trees*
> *Of the gentle blowing of the wind, an ‘A‘a*
> *My companion of the rise of Pa‘upa‘u and the lehua blossoms of Līhau*
>
> From a kanikau, or lament, for L. Kahuakai. Hawaiian source: Kaauwaepaa. English trans. by author. [Akana and Gonzalez 2015:225]

1.5.3 *Nā Makani* (Winds)

Similar to rain, *makani* (wind) were named for various reasons. Names of winds were assigned based on but not limited to their direction, strength, and geographic location. David Malo, a Native Hawaiian historian, explains some general terms related to wind:

> […] There was the *kona*, a wind from the south, of great violence and of wide extent. It affected all sides of an island, east, west, north, and south, and continued for many days […] The *kona* wind often brings rain, though sometimes it is rainless […] The *hoolua*, a wind that blows from the north, sometimes brings rain and sometimes is rainless […] The *hau* is a wind from the mountains, and they are thought to be the cause of it, because this wind invariably blows from the mountains outwards towards the circumference of the island. [Malo 1951:14]

The name of the winds of Maui are listed in a chant concerning a powerful gourd called *The Wind Gourd of La‘amaomao.* According to Handy and Handy (1972:220), the gourd is a *kino lau* (embodiment) of Lono, god of agriculture and fertility. Handy and Handy elaborate, “Lono is the gourd; the cosmic gourd is the heavens whence come winds, clouds, and rain” (Handy and Handy 1972:220). When the gourd was opened, a specific wind could be called to fill the sails of a canoe and take the person in the desired direction. It is within this chant that Kūapāka‘a, the son of Pāka‘a and descendant of La‘amaomao, calls out the winds of the ancient Lāhainā District of Maui (Nakuina 1992:54):

> The cliffs of Kahakuloa,
> Of Waiuli at Honolua,
> Pohakea is at Mahinahina,
> Līlīlehua is at the cliffs,
> ‘Imihau is of Keka‘a,
> Nahua is at Ka‘anapali,
> Unuloa fills the sail,
> Ma‘a‘a is of Lahaina
> [Nakuina 1992:63–64]

1.5.4 *Nā Kahawai* (Streams and Freshwater)

In Wahikuli, the well-watered stream valleys provided a continuous water source for successful agricultural pursuits from the headwaters to the seaward mouth of the streams. Such large gulches are present to the north and south of the current project area.

1.5.5 *Ka Lihikai a me Ka Moana* (the Coast and Ocean)

Traditionally, the seashore and ocean areas were vitally important for resource extraction in the early days of settlement. Fishermen along the coast maintained a respected status within traditional Hawaiian society; Kanahele asserts that “early Hawaiians regarded fishing as the oldest, and hence the most prestigious of professions” (Kanahele 1995:17). For those engaged in this profession, knowledge of the seas, particularly fishing grounds, was especially important. This knowledge was passed down from one generation to another. As D. Kanewanui notes, “our fishing grounds were sought by the ancestors with great patience, and those spots were revealed to their children, which is how that knowledge was passed down” (Kahā‘ulelio 2006:xv).

Both seashore and ocean provided physical and spiritual sustenance (NOAA 2017) for the people of Maui. According to Malo, the ocean was divided into smaller divisions, stretching from *‘ae kai* (water’s edge) to *moana* (pelagic zone) (Malo 1951:25–26). Outside the coastal areas was the belt known as *kua au*, where the shoal water ended (Malo 1951:26). Further out was the *kai au*, deeper waters designated for surfing, swimming, or spearing squid (Malo 1951:26).

Wahikuli State Wayside Park is one of the most popular beach parks along the western coast of Maui. In *Beaches of Maui County*, John Clark (1989:60) noted that Wahikuli State Wayside Park is “usually crowded with picnickers, swimmers, and sunbathers, especially on weekends and holidays.” He pointed out, “[t]here is one small sandy beach that provides good swimming and snorkeling.”

> Wahikuli means ‘noisy place’ and is an alternate name of the ahupua‘a of Mala which includes this park. […] Wahikuli’s popularity is undoubtedly due to its size, its good swimming conditions, its excellent facilities, and its proximity to Lahaina. Facilities include four restrooms with showers, many small pavilions with picnic tables, barbecue grills, and paved parking lots. Almost the entire shoreline of this long roadside park is lined with a retaining wall composed of large boulders. […] The inshore bottom is a combination of sand and rock and slopes gently to the deeper areas offshore. [Clark 1989:60]

1.6 Built Environment

The project area is located on lands within the *ahupua‘a* of Wahikuli at a portion of Kā‘anapali Beach that has been developed into the Villages of Leiali‘i, Phase 1-A Subdivision and its associated amenities. A majority of the project area consists of fallow cane fields. The lands surrounding the project area have been previously impacted and modified by the cultivation of sugarcane. The Kā‘anapali Landing, the primary harbor for sugar and pineapple shipments out of West Maui prior to World War II, was also the location of a large plantation village. Cultivated fields of sugarcane in Kā‘anapali once extended from the mountains to the beach areas of Wahikuli, Kā‘anapali and Honokōwai. Fields of cane were taken out of cultivation in the late 1950s to allow for development of the Kā‘anapali Resorts to the north of the project area. Adjacent to the

project area are a number of municipal buildings, including the Lāhainā Civic Center, Lāhainā District Court, and the Lāhainā Fire Station.

Section 2 CIA Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau*, *oli* (chants), *mele* (songs), traditional *mo‘olelo*, traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH library. Other archives and libraries including the Hawai‘i State Archives, the Bishop Museum Archives, the University of Hawai‘i at Mānoa’s Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau 2014), the State Historic Preservation Division (SHPD) Library, the State of Hawai‘i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives are also repositories where CSH cultural researchers gather information. Information on Land Commission Awards (LCAs) were accessed via Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2022), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2015).

2.2 Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Native Hawaiian Organizations (NHO), agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise and/or knowledge of the *ahupua‘a* of Wahikuli.

2.2.1 Community Outreach, Interview, and Transcription Methods

2.2.1.1 Scoping for Participants

We begin our consultation efforts with utilizing our previous contact list to facilitate the interview process. We then review an in-house database of *kūpuna* (elders), *kama‘āina* (native born), cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior’s NHO list), and community groups. We also contact agencies such as SHPD, OHA, and the appropriate Island Burial Council where the proposed project is located for their response to the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts.

2.2.1.2 “Talk Story” Sessions

Prior to the interview, CSH cultural researchers explain the role of a CIA, how the consent process works, the project purpose, the intent of the study, and how their *‘ike* (knowledge) and *mana‘o* (thought, opinion) will be used in the report. The interviewee is given an Authorization and Release Form to read and sign.

“Talk Story” sessions range from the formal (e.g., sit down and *kūkākūkā* [consultation, discussion] in participant’s choice of place over set interview questions) to the informal (e.g., hiking to cultural sites near the study area and asking questions based on findings during the field outing). In some cases, interviews are recorded and transcribed later.

CSH also conducts group interviews, which range in size. Group interviews usually begin with set, formal questions. As the group interview progresses, questions are based on interviewee’s answers. Group interviews are always transcribed and notes are taken. Recorded interviews assist the cultural researcher in 1) conveying accurate information for interview summaries, 2) reducing misinterpretation, and 3) missing details to *mo‘olelo*.

CSH seeks *kōkua* (assistance) and guidance on identifying past and current traditional cultural practices of the study area. Those aspects include general history of the *ahupua‘a*; past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana*, archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*ka‘ao* and *mo‘olelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area.

In order to ensure the safety of participants and comply with state and county COVID-19 mandates, no in-person interviews were conducted as part of this CIA. While it is always a preference to meet with participants in person, CSH cultural researchers were able to effectively communicate with participants via telephone, email, and video conference call interviews.

2.2.1.3 Completion of Interview

After an interview, CSH cultural researchers transcribe and create an interview summary based on information provided by the interviewee. Cultural researchers give a copy of the transcription and interview summary to the interviewee for review and ask to make any necessary edits. Once the interviewee has made those edits, we incorporate their *‘ike* and *mana‘o* into the report. When the draft report is submitted to the client, cultural researchers then prepare a finalized packet of the participant’s transcription, interview summary, and any photos that were taken during the interview. We also include a thank you card and honoraria. This is for the interviewee’s records.

It is important to CSH cultural researchers to cultivate and maintain community relationships. The CIA report may be completed, but CSH researchers continuously keep in touch with the community and interviewees throughout the year—such as checking in to say hello via email or by phone, volunteering with past interviewees on community service projects, and sending holiday cards to them and their *‘ohana* (family). CSH researchers feel this is an important component to building relationships and being part of an *‘ohana* and community.

“*I ulu no ka lālā i ke kumu*—the branches grow because of the trunk,” an *‘ōlelo no‘eau* (#1261) shared by Mary Kawena Pukui with the simple explanation: “Without our ancestors we would not be here” (Pukui 1983:137). As cultural researchers, we often lose our *kūpuna* but we do not lose their wisdom and words. We routinely check obituaries and gather information from other informants if we have lost our *kūpuna*. CSH makes it a point to reach out to the *‘ohana* of our fallen *kūpuna* and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have on file for genealogical and historical reference.

Section 3 Archival Research Results

3.1 Traditional Accounts

3.1.1 *Nā Ka‘ao a me Nā Mo‘olelo* (Legends and Stories)

Hawaiian storytellers of old were greatly honored; they were a major source of entertainment and their stories contained teachings while interweaving elements of Hawaiian lifestyles, genealogy, history, relationships, arts, and the natural environment (Pukui and Green 1995:IX). According to Pukui and Green (1995), storytelling is better heard rather than read for much becomes lost in the transfer from the spoken to the written word and *ka‘ao* are often full of *kaona* or “double meanings.”

Ka‘ao are defined by Pukui and Elbert as a “legend, tale [...], romance, [and/or], fiction” (Pukui and Elbert 1986:108). *Ka‘ao* may be thought of as oral literature or legends, often fictional or mythic in origin, and have been “consciously composed to tickle the fancy rather than to inform the mind as to supposed events” (Beckwith 1970:1). Conversely, Pukui and Elbert define *mo‘olelo* as a “story, tale, myth, history, [and/or] tradition” (Pukui and Elbert 1986:254). The *mo‘olelo* are generally traditional stories about the gods, historic figures or stories that cover historic events and locate the events with known places. *Mo‘olelo* are often intimately connected to a tangible place or space.

In differentiating *ka‘ao* and *mo‘olelo* it may be useful to think of *ka‘ao* as expressly delving into the *wao akua* (realm of the gods), discussing the exploits of *akua* (gods) in a primordial time. However, it is also necessary to note there are exceptions, and not all *ka‘ao* discuss gods of an ancient past. *Mo‘olelo* on the other hand, reference a host of characters from *ali‘i*, to *akua* and *kupua* (supernatural beings), to finally *maka‘āinana* (commoners), and discuss their varied and complex interactions within the *wao kānaka* (realm of man). Beckwith elaborates, “In reality, the distinction between ka‘ao as fiction and mo‘olelo as fact cannot be pressed too closely. It is rather in the intention than in the fact” (Beckwith 1970:1). Thus, a so-called *mo‘olelo*, which may be enlivened by fantastic adventures of *kupua*, “nevertheless corresponds with the Hawaiian view of the relation between nature and man” (Beckwith 1970:1).

Both *ka‘ao* and *mo‘olelo* provide important insight into a specific geographical area, adding to a rich fabric of traditional knowledge. The preservation and passing on of these stories through oration remains a highly valued tradition. Additionally, oral traditions associated with the study area communicate the intrinsic value and meaning of a place, specifically its meaning to both *kama‘āina* as well as others who also value that place.

The following section presents traditional accounts of ancient Hawaiians living in the vicinity of the Leiali‘i Phase 1-B Subdivision project area. Many relate an age of mythical characters whose epic adventures inadvertently lead to the Hawaiian race of *ali‘i* and *maka‘āinana*. The *ka‘ao* in and around the project area shared below are some of the oldest Hawaiian stories that have survived. They still speak to the characteristics and environment of the area and its people.

3.1.1.1 The Naming of Lāhainā

The *kalana* (division of land smaller than a *moku*) of Lāhainā has been known by three other names in times past. The oldest name was said to have been Na-hono-a-Pi‘ilani, the lands of

Pi‘ilani, as it was surrounded by other islands (Sterling 1998:37). Lāhainā then became known as Lele, a name that has been acknowledged as the ancient name of Lāhainā (Sterling 1998:34, 37) in the story of Kamalalawalu and Halemano in their flight from the O‘ahu Chief Aikanaka in the legend of Halemano (Fornander 1919:238) and in the legend of Pupukea as home to Maui Chief Kamalalawalu (referred to frequently as Kama), a contemporary of Kakuhihewa on O‘ahu (Fornander 1919:436). A third name for Lāhainā is mentioned in the story *Relating to Kekaa* (Fornander 1919:540–544) where Keka‘a is noted as the capital of Maui when Kaka‘alaneo was reigning over West Maui. Fornander speculates that the name of Keka‘a predates that of Lele as the story predates the introduction of breadfruit, the primary food source referred to when speaking of the area as Lele (Fornander 1919:540; Sterling 1998:35).

3.1.1.2 Chief Hua

Pukui et al. (1974:127) translate the literal meaning of Lāhainā as “cruel sun” and note the area is said to have been named for droughts. Mrs. Pia Cockett, cited in Sterling (1998:16), translates the name of the town Lāhainā: “Not Lahaina, it was Lāhainā. Because there was a man, a baldheaded man who went in the sun and his head became sore. That’s why they call it Lāhainā [hainā = cruelty; lā = day, sun].”

According to Sterling (1998:16), Pukui relates that the literal translation of “cruel sun” refers to the drought during the time of Chief Hua, “when the sun was so cruel to the people that it caused everything to wither and dry.” Hua was a chief of Lāhainā who had forsaken his *kahuna*, or priest, Luaho‘omoe, which caused the drought throughout the Hawaiian Islands:

> There lived here in Lahaina a chief named Hua, […] he desired to get some *ua‘u* squabs to eat; then he sent some men up to the mountains above Oloalu [Olowalu] to get some squabs to satisfy his desire. He did not wish for birds from the beach. When the birds were obtained, they were to be taken to the priest for him to ascertain where the birds came from; if he should give out the same information as the men had given to the chief as to the source of the birds, then he would be safe; if he should give a contrary answer, he would be killed. The name of this priest was Luahoomoe, and he also had children. When the men went up, they could not find any mountain birds at all, so they decided to get some shore birds. When they caught some, they daubed the feathers red with dirt so that the chief would think the birds came from the mountain. When they returned and handed the birds to the chief, he was exceedingly glad because he thought the birds came from the mountain. The chief told the men to take them to the priest for his inspection. The priest perceived, however, that the birds came from the seashore […] Then the chief said to the priest: ‘You shall not live, for you have guessed wrongly. I can very well see that these are mountain birds.’ Then and there an imu was prepared in which to bake the priest.
>
> Before he was placed in the imu, however he said to his children: ‘You two wait until the imu is lighted, and when the smoke ascends, should it break for the Oloalu mountains, that indicates the path; move along; and where the smoke becomes stationary, that indicates where you are to reside’ […] Then the priest was cast into the oven and the opening closed up tightly. The smoke arose and darkened the sky; […] after the priest had been in the imu for two days, he reappeared and sat by the

> edge of the imu unknown to any one; the chief thinking all the time that he was dead; but it was not so.
>
> When the smoke ascended and leaned towards the Oloalu mountains, the two sons went off in that direction; the cloud pointed towards Hanaula, and there it stood still, so the two sons ascended to the place and resided there.
>
> Then the whole of Maui became dry; no rain, not even a cloud in the sky, and people died from lack of water. The smoke that hung over Hanaula became a cloud, and rain fell there.
>
> Hua, the chief, lived on, and because of the lack of water and food he sailed for Hawaii, the home of his elder brother; but because Hawaii also suffered from lack of water and food he came back and lived at Wailuku. Wailuku also did not have any water, and that caused the chief to be crazed, so he leaned against the edge of the precipice and died, and that was the origin of the saying ‘The bones of Hua rattle in the sun.’ [Fornander 1919:514, 516]

Fornander (1919:516) notes that “The bones of Hua rattle in the sun” refers to the chief “whose wickedness won him the detestation of his people, who therefore let his body lie where he fell that his bones bleached in the sun and rattled in the wind.” Pukui (1983) relates that the *‘olelo no‘eau* regarding Chief Hua warns others to not talk too much of one’s king and is a reminder that trouble will follow those who destroy the innocent.

> *Ko‘ele na iwi o Hua i ka lā.*
>
> The bones of Hua rattled in the sun. [Pukui 1983:194]

Hua, the island chief who reigned over Maui prior to the tenth century, is credited with constructing the first *heiau* (pre-Christian place of worship) on the island beginning in Lāhainā. Of the six *heiau* documented in Lāhainā, Hua was responsible for the construction of at least two, while his descendent namesake, Hua-nui-kalalailai, built the third *heiau* only two generations later.

3.1.1.3 Kaka‘alaneo

Lāhainā is associated with the chief Kaka‘alaneo, who lived in the present Lāhainā district. Kaka‘alaneo was King of Maui and “has always been famed in Hawaiian traditions as the first king of that island who gave his attention to agriculture [...]” (Nakuina 1904:55). He was famous for planting the *ulu* (breadfruit tree) groves in Lāhainā.

> […] and the place became famous in story and song as the ‘Malu ulu o Lele.’ ‘The shady breadfruit grove of Lele.’ As the place is situated at the base of and leeward of the Lihau range of mountains, where very little rain falls, and is more or less shut off from the cooling influence of the prevailing trade winds, one who is kamaaina can fully appreciate the cool, grateful memories evoked by the mere mention of the ‘Malu ulu o Lele’ […]
>
> In the days of Kakaalaneo, breadfruit trees were a very valuable possession, and to plant one was a meritorious act, worthy of commendation by one’s superior. To plant a grove even if only a small one, was an act worthy of the gods, entitling the planter to the grateful remembrance of posterity, whose duty it was to compose and

> sing songs of praise in his or her honor. It was the same if the grove was a cocoanut one; and conversely, to cut and destroy one tree, either breadfruit or cocoanut, merited death. To destroy many was a declaration of war […] [Nakuina 1904:55–56]

Kaka‘alaneo was also the father of the mischievous Kaulula‘au who cut down breadfruit trees throughout Lāhainā and was eventually exiled to Lāna‘i. Kaulula‘au subsequently out-witted the spirits of that island, making it habitable for humans. In regard to Kaka‘alaneo, Beckwith (1970) explains:

> Many legends mention the name of Kakaalaneo ([alternate spellings] Kukaalaneo, Kaalaneo), who lived in the present Lahaina district on the hill Keka‘a (Black Rock of Sheraton Maui). He also owned fishponds in the Hana district on the opposite end of the island and planted a famous breadfruit grove in Lahaina. His wife was the Molokai chiefess whom Eleio found for him and who brought him the first feather cape ever seen on Maui, and by whom he had the mischievous son Kaululaau who killed off the spirits on Lanai. In his day Lahaina was called Lele.
>
> According to tradition, a group of strangers (haole) who later played an active part in court life and whose names (according to Kamakau), kept in memory as late as Captain Cook’s day, arrived on Maui in Kakaalaneo’s time. Kukanaloa and Kaeka (also Kakae) were the leaders of this group. The ‘last allusion’ in this legend is a pun about chief Lolae of Oahu who abducted the pretty chiefess of Maui, Kelea (sister of Pi‘ilani’s father), while she was out surfing and carried her away to Oahu in the uplands of Lihue (now Schofield Barracks). She later deserted him for his cousin Kalamakua of Ewa (and Waikiki), by whom she became mother of the high chiefess Laie-lohelohe (the drooping pandanus vine), who became the wife of her Maui cousin Pi‘ilani. All these names appear in the chant linked with the coming of Kukanaloa, together with the names of a wife and son of Kakaalaneo. [Beckwith 1970:384–385]

3.1.1.4 Hina and the Demi-god Māui

The region of Lāhainā is also known for the goddess Hina, mother of the demigod Māui:

> A version of the Maui stories is met with representing him as the son of Hina-lauae and Hina, residing above Lahainaluna, Maui, which relate his venturing forth on mischievous pranks before birth. Reference is made to his snaring the sun that Hina might have time to dry her kapas. It says, further, that while absent on this duty Hina bore another son, an owl, which he did not treat with contempt. Setting out one day pole-fishing, Maui was seized and carried away to Moalii, some distance westerly from Lahainaluna, to be placed on the altar the following day as a sacrifice by the king. Hina saw in a vision what was being done so she and the owl followed along, Hina staying at a rock by the wayside. The owl flew on to where Maui was guarded and saw that he was tied with cords. The guards were awake, so the owl waited till near dawn, but they would not sleep.
>
> Maui then spoke: ‘O thou Aina, retard and prolong the night.’ The night being prolonged, the guards fell asleep, whereupon the owl entered and struck at Maui’s

> bonds till they fell off. They then set off to where Hina was waiting, by which time it was daylight. Hiding Maui under the stone, Hina sat outside of him and spread out her sleeping garment and looked for fleas as the searching party came up. To their inquiry for the man which was to be sacrificed by the chief, she said that she had not seen him, having just now arisen, and by the warmth of the sun was looking for fleas. At their departure the owl led Maui forth, and Hina followed till they reached home. Thus was Maui saved. [Thrum 1923:200–201]

3.1.1.5 *He Mo‘o*, the Apotheosis of Kalā‘aiheana, and the Veneration of Kihawahine

Kala‘aiheana was the sister to the chiefly brothers of Kiha-a-pi‘ilani and Lono-a-pi‘ilani (Fornander 1919:176) and sister Pi‘ikea, all of whom were born of Pi‘ilani and La‘ieloheikawai. Thus, Kala‘aiheana was a product of a *pi‘o*, or high ranking marriage (Stagner 1986:113, 114) and double *mo‘o* (lizard, also refers to a genealogy/succession or indigenous royal family) lineage (Klieger 1998:7, 9), a fact that would play significantly upon her death. Kihawahine Mokuhinia Kalama‘ula Kala‘aiheana was her full given name and upon her death she was transformed into a *mo‘o* and referred to as only Kihawahine Mokuhinia Kalama‘ula (Klieger 1998:9). In this way, Beckwith (1970:126) identifies Moku‘ula, more specifically, Loko o Mokuhinia, as the place where Kihawahine Mokuhinia, the *mo‘o* goddess, resided. This *loko,* or pond, was a part of a larger complex of ponds called Kalua o Kiha, literally “The Pit of Kiha” or dwelling place of Kiha, the *mo‘o* goddess.

Loko o Mokuhinia is located near the coast south of the current project area. The lands that immediately surrounded Loko o Mokuhinia were traditionally reserved for the *ali‘i* (chiefs) and those in service to the *ali‘i* (Klieger 1998:64–65). According to Klieger (1998:69), the neighborhood extending out from the royal residence of Moku‘ula and surrounding *loko* resembled concentric layers or bands, and where a person lived within these circles depended on one’s rank and/or position in government. From Moku‘ula and the King’s residence as the center or *piko*, the subsequent rings were as follows: Kalua o Kiha for the government and court; Kalua‘ehu for the *ali‘i* and extended family; and Lāhainā for the traders and *maka‘āinana* of Lāhainā (Klieger 1998:70).

The worship of the *mo‘o* occurred at a *heiau*, located at the summit of Pa‘upa‘u, that was specifically constructed and dedicated to the worship of Kihawahine. According to Fornander (1919:520–523), this mountain rises immediately behind the village of Lāhainā, and is named for a child whose parents wearied of carrying him down and up the mountain in order to bathe him. At the summit of Pa‘upa‘u is Kamohomoho Heiau which was named for the noted Lāhainā Chief Kamohomoho. He was the first “to build a heiau for the worship of the god called Moo. This lizard excelled in strength; it had a stumped tail; that is the way the tails of the lizards of the present time appear, because of Moo, the great and strong” (Fornander 1920:397).

The supernatural powers of Kihawahine were great, as she was one of Kamehameha the Great’s ancestral gods (*‘aumakua*) (Fornander 1920:397). Claimed by Kamehameha, through his marriage to Keōpuolani, and during his campaign to unite the island chain under a single sovereign (Fornander 1920:397), the image of Kihawahine was set as a dominant image in a *heiau* that was dressed “in deep saffron, yellow or light yellow on a patterned *tapa* cloth” (Beckwith 1970:125–126). “In her name [Kamehameha] carried his conquest over the islands” and “Ulumaheihei

Hoapili, who later became an active friend of the missionaries [in Lāhainā] and a leader in establishing the Christian church, was her keeper (*kahu*)" (Beckwith 1970:126).

3.1.2 *Nā Wahi Pana* (Storied Places)

Wahi pana are legendary or storied places in a landscape. These legendary or storied places can be a variety of natural or human-constructed features. Oftentimes dating to the pre-Contact period, many but not all *wahi pana* are connected to particular *mo‘olelo*. Dr. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

> Natural places have mana or spiritual power, and are sacred because of the presence of the gods, the akua, and the ancestral guardian spirits, the ‘aumakua. Human-made structures for the Hawaiian religion and family religious practices are also sacred. These structures and places include temples, and shrines, or heiau, for war, peace, agriculture, fishing, healing, and the like; pu‘uhonua, places of refuge and sanctuaries for healing and rebirth; agricultural sites and sites of food production such as the lo‘i pond fields and terraces slopes, ‘auwai irrigation ditches, and the fishponds; and special function sites such as trails, salt pans, hōlua slides, quarries, petroglyphs, gaming sites, and canoe landings. [McGregor 1996:22]

As McGregor makes clear, *wahi pana* can refer to natural geographic locations such as streams, peaks, rock formations, ridges, offshore islands and reefs, or they can refer to Hawaiian land divisions such as *ahupua‘a* or *‘ili* (land division smaller than an *ahupua‘a*), and man-made structures such as fishponds. In this way, the *wahi pana* of Wahikuli tangibly link the *kama‘āina* of Wahikuli to their past. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* or even certain individuals within an *‘ohana*, and many have been lost, forgotten, or kept secret through time. Place names also convey *kaona* (hidden meanings) and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the Hawaiian Islands, cultural information was exclusively preserved and perpetuated orally. Hawaiians gave names to literally everything in their environment, including individual garden plots and *‘auwai* (water courses), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (stone), *pūnāwai* (freshwater springs), and many others. According to Landgraf (1994), Hawaiian *wahi pana* "physically and poetically describes an area while revealing its historical or legendary significance" (Landgraf 1994:v).

3.1.2.1 Pu‘u Keka‘a

Mo‘olelo of the formation of Pu‘u Keka‘a, a prominent landmark at the coast north of the current project area, as well as other natural features that surround this *pu‘u* (hill) are linked to the deeds of the demi-god Māui and punishment for his naysayers following his great feats of lifting the sky and lassoing the sun. With regard to the creation of the rocky promontory that is Keka‘a, Westervelt (1910) recalls the following story:

> A man who had been watching the process of lifting the sky ridiculed Maui for attempting such a difficult task. When the clouds rested on the tops of the mountains, Maui turned to punish his critic. The man had fled to the other side of the island. Maui rapidly pursued and finally caught him on the sea coast, not many miles north of the town now known as Lahaina. After a brief struggle the man was

> changed, according to the story, into a great black rock, which can be seen by any traveler who desires to localize the legends of Hawaii. [Westervelt 1910:32]

Fornander (1919:538) tells the story of a man, Moemoe, who insulted the demi-god, Māui by saying "You can not [*sic*] catch the sun for you are a low down farmer," for which Māui replied "When I conquer my enemy and satisfy my desire I shall kill you." After successfully lassoing the sun, Māui went to find Moemoe in order to follow through with his threat in which the following account is given:

> On his return he called at Moemoe's place. It was absent. Maui traced it to Kawaiaopilopilo. This place is between Kekaa and James' canefield; Moemoe saw him, and it went on in an irregular manner, now towards the mountain and now towards the sea. Maui became greatly angered, so he flew right on and caught the other above Kekaha; he killed it; it turned, however, into a rock. That rock is still lying along there makai of the new road. Its length is nearly seven feet. While Maui was off on his journey his mother became pregnant with and bore another child, an owl. [Fornander 1919:538]

Keka‘a was also a resting place for Wahine-o-Manua, a woman guided by *pueo* (owl), who fled from an abusive situation:

> Halulukoakoa (Walker Site 11 at Wahikuli), a coral structure, is famed traditionally as having given shelter to Wahine-o-Manua, a very beautiful young woman who fled from her husband in consequence of constant ill treatment. Regardless of the rigid kapu of the heiaus against women being allowed within its sacred walls, she hid herself therein and watched those searching for her. On their departure she ventured forth and on reaching the road an owl god appeared to her as guardian and guide, and by the clapping of its wings led the pursued girl through the brush till she reached the large stone mauka of Kekaa, Kaanapali, where it left her and she lay down and slept till morn, when she arose and departed. The stone is known as Pohaku o Wahine o Manua. [Thrum 1905:45]

Along with the creation of Pu‘u Keka‘a and the natural features nearby, this *pu‘u* is also traditionally known as a *leina a ka ‘uhane* or leaping off place for the souls to enter into the nether world (Pukui and Elbert 1986). In the traditions of Maui Island, the soul has three abiding places: the volcano, in the water, and on dry plains like the plains of Kama‘oma‘o and Keka‘a (Fornander 1919:570–576). Mr. Ahue (in Hill et al. 2007) further explained that one of the ceremonial uses of Pu‘u Keka‘a is more spiritual than physical. The tall cliffs of Pu‘u Keka‘a serve as a spiritual portal, the leaping place for the souls of the departed to return to the afterlife. It is said that when a person dies, his spirit journeys to Keka‘a (Fornander 1919:542) and from this *leina a ka ‘uhane* one is oriented directly west, toward the setting of the sun and the Hawaiian afterlife.

The significance of Keka‘a as a *leina* is featured in the following account recorded by Inez Ashdown (1968) where Kahekili, *ali‘i* of Maui, seeks to solidify his rule:

> Later, when Kamehameha-nui died, he left the Kingdome of Maui to his favorite brother, Maui's final ruler, Kahekili, The Thunderer. Kahekili was a noted athlete and his favorite sport was *Lele kawa*, or the game of leaping from heights into water. Three of the most noted Death Leaps the king won were at Ke‘anae, Ka-ha-

> ku-loa, and Pu‘u Keka‘a. The leap he made at Pu‘u Keka‘a proved he was a true descendant of the gods, because, at that time, no man dared leap from the ‘u-ha-ne-lele, or Soul-leaping Place of Maui. The king leaped from there to prove that the populace should trust him as a god and ruler. [Ashdown 1968 in Sterling 1998:45]

Another account of Pu‘u Keka‘a’s significance states that when Kahekili visited Kā‘anapali, he discovered “the sacred taro patches had been neglected, the sacred fish-pond of Loko-i‘a Kapu-kapu at the mouth of the Honokowai river practically empty of fish, and his people in a state of terror” (Ashdown 1947:49). Kahekili and his priests ascended Pu‘u Keka‘a to pray and he learned the village of Keka‘a and all of Lāhainā had been “afflicted” with “[d]runkenness, disease and idleness” (Ashdown 1947:49). He ordered his men to “destroy stills, to burn filthy, squalid homes, and to renew the village” (Ashdown 1947:49). He also ordered the renewal of “the taro patches and fishpond, the sweet-potato-hills” (Ashdown 1947:49).

> During the time King Kahekili ruled Maui [about AD 1690]. It was told he had visited Kā‘anapali, and to his dismay and anger, there was no feast waiting for him and his company as ‘the sacred taro patches had been neglected, the sacred fish-pond of Loko-i‘a Kapu-kapu at the mouth of the Honokowai river practically empty of fish, and his people in a state of terror’. Kahekili ascended Pu‘u Keka‘a to pray in company with his priests, and there he learned the causes of misery in the area. People had many illnesses, which the local doctors could not understand or cure, and they also had learned to drink liquor. Drunkenness, disease and idleness had afflicted too many in the village of Keka‘a and in all Lahaina. By order of the king, strong men were sent to destroy stills, to burn filthy, squalid homes, and to renew the village. Others were ordered to renew the taro patches and fishpond, the sweet-potato-hills, and then begin life anew. [Ashdown 1947:49]

3.1.2.2 The Origins of Pu‘ulaina, ‘Eke, and Lihau

Pu‘ulaina is a hill located within Wahikuli Ahupua‘a. Fornander (1919:532–534) recounts the following regarding the creation of Pu‘ulaina:

> […] some say it was begotten by two mountains, Eeke (the summit crater of the West Maui Mountains) and Lihau (the mountain top back of Olowalu). Eeke was the husband and Lihau was the wife. They were real persons, but it will be shown later the reason for their being changed to mountains. After they had lived as man and wife, a child was born to them, a son, the subject of this story which we are considering. But after some time Eeke became entangled, for he saw a beautiful woman, Puuwaiohina from Kauaula, and they committed adultery. Because of this, Lihau thought to choke the child to death, so that the two of them could go and do mischief; this caused them to quarrel. Eeke took the child to his mother, Maunahoomaha, and left him with her. After that their god, Hinaikauluau, placed a restriction over them; they were not to live together, nor were they to have any intercourse with others; but ten days after this order, Eeke again committed adultery with Puuwaiohina above referred to, who was a younger sister to Lihau. Because of this their god punished them by making Eeke a mountain and Puuwaiohina a mountain ridge; that is the ridge prominent at Kauaula. There is, it seems, a hole

> below the highest point of this ridge. When sound issues from this hole, that is the time the kanaula wind blows a fierce gale.
>
> After that, Lihau was possessed with love for their child, so she asked Maunahoomaha for permission to meet her son, that was agreeable to her mother-in-law, and when she met her child she was glad. When she realized what a handsome man her favorite son had grown to be, she gave him for husband to Molokini, one of the noted beauties of that time, because she was the wife intended for him.
>
> […] However, arriving on Maui, this was one of Pele’s [the fire goddess] cruel deeds: one of her younger sisters saw how handsome Puulaina was, so she asked Molokini to let her have him for husband. The other refused, for she was greatly in love with her own husband; so she [Molokini] was changed into a little island, and she has remained so to this day.
>
> When Lihau heard of this, she grieved for her daughter-in-law, so she went to consult Pele on the matter. But Pele replied gruffly: ‘If that is the case, then I say to you that you will die; also your son.’ Lihau was there and then changed into a hill where Pele resided for some time; the son also died. But the one whose was the desire, earnestly entreated and begged that her husband be spared. But the red-bleary-eyed [Makole-ulaula, an epithet applied to Pele] did not wish it that way. That was how the son became a hill and has remained such until this day. [Fornander 1919:532–534]

Nicholson (1881:40) relates the following Pu‘ulaina story regarding Pele as she made her way through the Hawaiian Archipelago:

> On Pele’s first arrival at Hawaii Nei, she dwelt on the island of Kauai. Thence she went to Kalaupapa (Molokai), and lived in the crater of Kahua-Ko at that place. Subsequently she departed for Puulaina, near Lahainaluna (on the Island of Maui), and excavated that crater. [Nicholson 1881:40]

Fornander (1919:536) recounts an alternative story regarding the naming of Pu‘ulaina following the creation of that hill by Pele:

> This was the reason for so naming it (Pu‘ulaina): At that time a chief was living on the other side of the hill, and because he was tired of seeing it standing there obstructing his view, and preventing him from seeing the breadfruit grove of Lahaina, he ordered his men to go and construct a ti-leaf house on its top; and the hill was called Puulai. And because it was sightly to those viewing it from Lahaina it was called Puulaina. [Fornander 1919:536]

Fornander (1919:536) further notes that the chief who had constructed the ti (*kī*; *Cordyline terminalis*) leaf house atop Pu‘ulaina also constructed a larger *heiau* on the far, *makai*, side of the hill—a place where people frequently died and were buried on the side of the hill. It is said that because there was such a great number of dead buried there and because the dirt slid down when the graves were being dug, this side of the hill was named Pu‘uhe‘ehe‘e (sliding hill). Jeanne Booth Johnson in Sterling (1998:43) recalls the remnants (three rock mounds) of an old *heiau* atop

Pu‘ulaina that was reportedly dedicated to Pele; this *heiau* is possibly the same as that mentioned in the story related by Fornander (1919:536).

Pu‘ulaina was also a central feature in a conversation recorded in *Ka Nupepa Kuokoa,* (1862) where the deceptive words of a *kahuna* encouraged people to go and gather at this place called Pu‘ulaina, with the thought of finding gold and money.

3.1.2.3 The Stories of Halulukoakoa Heiau

Thomas Maunupau, as recounted by Walker (1931), wrote a series of newspaper articles about his visit to Lāhainā, including an article about a legend associated with a Halulukoakoa Heiau (Walker Site 11) at the southeast corner of the coconut grove at Māla region of Wahikuli Ahupua‘a:

> At one time a temple was located there known as Halulukoakoa. The story goes that a Hawaiian youth Kaili was seized by warriors of a West Maui chieftain at Kahakuloa.
>
> Kaili was taken in a canoe around the western end of the island for the sacrifice at the temple. His sister Nailima saw the capture and skirted the cliffs of the island, keeping her eyes on the canoes which were in the open sea. She arrived at Lahaina and learned her brother had been taken to the temple. She withdrew to the outskirts of the settlement, sat down upon a stone and commenced to cry.
>
> Pueo the owl-god appeared suddenly and learned the cause of her grief. He told her to prey [*sic*] to all the gods for her brother's deliverance while he went to the sacrifice. Here the owl-god unbound the victim from the sacrificial stone and bade him walk backwards from the tmple [*sic*]. At first the youth did not understand, but the owl-god circled and beat his wings. Finally conveying his meaning to the youth. After walking backwards for several miles under the owl-god's guidance, he found the sister.
>
> He immediately heard warriors approaching and hid under the stone upon which Nailima was sitting. When the warriors arrived they asked if a man had been seen passing that way, saying they were searching for Kaili. The sister said she had seen no one. The warriors then fell upon the footprints of Kaili and followed them, little knowing they would lead them back to the temple. [Walker 1931:115]

Thomas Thrum in Sterling (1998:43) accounts a story related to Halulukoakoa Heiau as a shelter, or place of refuge:

> Halulukoakoa, a coral structure, is famed traditionally as having given shelter to Wahine-o-Manua, a very beautiful young woman who fled from her husband in consequence of constant ill treatment. Regardless of the rigid kapu of the heiaus against women being allowed within its sacred walls, she hid herself therein and watched those searching for her. On their departure she ventured forth and on reaching the road an owl god appeared to her as guardian and guide, and by the clapping of its wings led the pursued girl through the brush till she reached the large stone mauka of Kekaa, Kaanapali, where it left her and she lay down and slept till morn, when she arose and departed. The stone is known as Pohaku o Wahine o Manua. [Sterling 1998:43]

3.1.3 *Nā ‘Ōlelo No‘eau* (Proverbs)

Hawaiian knowledge was shared by way of oral histories. Indeed, one's *leo* (voice) is oftentimes presented as *ho‘okupu* ("to cause growth," a gift given to convey appreciation, to strengthen bonds); the high valuation of the spoken word underscores the importance of the oral tradition (in this case, Hawaiian sayings or expressions), and its ability to impart traditional Hawaiian "aesthetic, historic, and educational values" (Pukui 1983:vii). Thus, in many ways these expressions may be understood as inspiring growth within reader or between speaker and listener:

> They reveal with each new reading ever deeper layers of meaning, giving understanding not only of Hawai‘i and its people but of all humanity. Since the sayings carry the immediacy of the spoken word, considered to be the highest form of cultural expression in old Hawai‘i, they bring us closer to the everyday thoughts and lives of the Hawaiians who created them. Taken together, the sayings offer a basis for an understanding of the essence and origins of traditional Hawaiian values. The sayings may be categorized, in Western terms, as proverbs, aphorisms, didactic adages, jokes, riddles, epithets, lines from chants, etc., and they present a variety of literary techniques such as metaphor, analogy, allegory, personification, irony, pun, and repetition. It is worth noting, however, that the sayings were spoken, and that their meanings and purposes should not be assessed by the Western concepts of literary types and techniques. [Pukui 1983:vii]

Simply, *‘ōlelo no‘eau* may be understood as proverbs. The Webster dictionary notes a proverb as "a phrase which is often repeated; especially, a sentence which briefly and forcibly expresses some practical truth, or the result of experience and observation." It is a pithy or short form of folk wisdom. Pukui equates proverbs as a treasury of Hawaiian expressions (Pukui 1995:xii). Oftentimes these Hawaiian expressions or proverbs contain references to places. This section draws from the collection of author and historian Mary Kawena Pukui and her knowledge of Hawaiian proverbs describing *‘āina* (land), chiefs, plants, and places relative to Wahikuli and the larger Lāhainā Moku.

3.1.3.1 ‘Ōlelo No‘eau #430

The following proverb mentions the breadfruit trees of Lāhainā, noted in the Legend of Eleio.

> *Hālau Lahaina, malu i ka ‘ulu.*
>
> **Lahaina is like a large house shaded by breadfruit trees.**
>
> [Pukui 1983:53]

3.1.3.2 ‘Ōlelo No‘eau #1425

The following proverb references Pōhaku-o-Hauola, a stone *makai* at Lāhainā that was popular amongst pregnant women.

> *Ka la‘i o Hauola.*
>
> **The calm of Hauola.**

Peace and comfort. There is a stone in the sea at Lahaina, Maui, called Pōhaku-o-Hauola, where pregnant women went to sit to ensure an easy birth. The umbilical cords of babies were hidden in the crevices in the stone. [Pukui 1983:154]

3.1.3.3 ‘Ōlelo No‘eau #1451

The following proverb mentions the old name for Lāhainā and its associated wind.

Ka Ma‘a‘a wehe lau niu o Lele.

The Ma‘a‘a wind that lifts the coco leaves of Lele.

[Pukui 1983:157]

3.1.3.4 ‘Ōlelo No‘eau #1594

The following proverb mentions the rain found in Lāhainā.

Ka ua Pa‘ūpili o Lele.

The Pili-soaking rain of Lele.

The plains of Lahaina, Maui, were covered with pili grass in ancient days. When the rain poured the grass was well soaked. [Pukui 1983:172]

3.1.3.5 ‘Ōlelo No‘eau #1674

The following proverb talks of the demi-god Māui and one of the many marks he left on the landscape.

Ke ala kīke‘eke‘e a Māui.

The winding trails of Māui.

Trails made by Māui when he was pursued by those who wished to destroy him. One trail was at Waiahole, O‘ahu, one at Keka‘a between Lahaina and Kā‘anapali, and the third at Kealakahakaha, Kahukoloa, Maui. [Pukui 1983:180]

3.1.3.6 ‘Ōlelo No‘eau #1811

The following proverb warns others to not talk too much of one’s king and is a reminder that trouble will follow those who destroy the innocent.

Ko‘ele na iwi o Hua i ka lā.

The bones of Hua rattled in the sun.

A warning not to talk too much of one‘s kin. Also, a reminder that trouble is sure to befall those who destroy the innocent. Hua was a chief of Maui who heeded the lies of jealous men and ordered the death of his faithful priest, Luaho‘omoe. Before he died, he sent his sons to the mountains for safety, because it was foretold by gods what was to come over the land. After his death, drought and famine came. Many died, including the chief Hua. There was no one to hide his remains, so his bones were left exposed to sun and wind. Also expressed *Nakeke na iwi*.... [Pukui 1983:194]

3.1.3.7 ‘Ōlelo No‘eau #1936

The following proverb again mentions the old name for Lāhainā.

Lahaina, i ka malu ‘ulu o Lele.

Lahaina, in the shade of the breadfruit trees of Lele.

The old name for Lahaina was Lele. [Pukui 1983:209]

3.1.3.8 ‘Ōlelo No‘eau #1943

The following proverb recalls the story of Kaululā‘au and his banishment to Lāna‘i.

Lāna‘i a Kaululā‘au.

Lāna‘i of Kaululā‘au.

Said in admiration of Lāna‘i. Kaululā‘au was a Maui cheif banished to Lāna‘i by his father for destroying his breadfruit groves. By trickery Kaululā‘au destroyed the island‘s evil spirits and became its ruler. [Pukui 1983:210]

3.1.4 *Nā Oli* (Chants)

Oli, according to Mary Kawena Pukui (Pukui 1995:xvi–xvii) are often grouped according to content. Chants often were imbued with *mana* (divine power); such *mana* was made manifest through the use of themes and *kaona*. According to Pukui, chants for the gods (*pule*; prayers) came first, and chants for the *ali‘i*, “the descendants of the gods,” came second in significance. Chants “concerning the activities of the earth peopled by common humans” were last in this hierarchy (Pukui 1995:xvi–xvii). Emerson conversely states,

> In its most familiar form the Hawaiians—many of whom [were lyrical masters]—used the oli not only for the songful expression of joy and affection, but as the vehicle of humorous or sarcastic narrative in the entertainment of their comrades. The dividing line, then, between the oli and those other weightier forms of the mele, the inoa, the kanikau (threnody), the pule, and that unnamed variety of mele in which the poet dealt with historic or mythologic subjects, is to be found almost wholly in the mood of the singer. [Emerson 1965:254]

While *oli* may vary thematically, subject to the perspective of the *ho‘opa‘a* (chanter), it was undoubtedly a valued art form used to preserve oral histories, genealogies, and traditions, to recall special places and events, and to offer prayers to *akua* and *‘aumākua* alike. Perhaps most importantly, as Alameida (1993:26) writes, “chants […] created a mystic beauty […] confirming the special feeling for the environment among Hawaiians: their *one hānau* (birthplace), their *kula iwi* (land of their ancestors).”

3.1.4.1 *Oli* Regarding Taxation in Lāhainā

When all the islands were united under the rule of Kamehameha, many of the lesser chiefs overseeing the commoners took advantage of their power and many commoners became slaves on their own lands (Kamakau 1992:231). Kamehameha enforced a law that provided protection to the commoners and that also kept the chiefs and landlords obedient.

> The uniting of the land had brought about excessive taxation. There was an innumerable succession of landlords, and each used the commoner to further his own purpose. The chiefesses demanded such delicacies as the dried intestines of fish, sea slugs, sea cucumbers of various kinds and sea urchins. Because of these oppressions, some men migrated to Tahiti or fled to Kauai to live under Ka-umu-ali‘i. Many chants were composed in those days telling of Hawaii as a land of robbers. Here is one:--

A Lahaina ‘ike i ka lau o na‘ulu,	In Lahaina I saw the leaves of the breadfruit,
‘Ike i ka mea maika‘i a Hawaii,	I saw the good things of Hawaii.
E humuhumu ka waha,	But I must sew up the mouth,
E noho malie ka waha,	Keep quiet,
Ka waha o ka olala e!	Keep the mouth humble!
[Kamakau 1992:232]	

3.1.5 *Nā Mele* (Songs)

The following section draws from the Hawaiian art of *mele*, poetic song.

> Words and word combinations were studied to see whether they were auspicious or not. There were always two things to consider the literal meaning and the *kaona*, or ‘inner meaning.’ The inner meaning was sometimes so veiled that only the people to whom the chant belonged understood it, and sometimes so obvious that anyone who knew the figurative speech of old Hawai‘i could see it very plainly. There are but two meanings: the literal and the *kaona*, or inner meaning. The literal is like the body and the inner meaning is like the spirit of the poem. [Pukui 1949:247]

> The Hawaiians were lovers of poetry and keen observers of nature. Every phase of nature was noted and expressions of this love and observation woven into poems of praise, of satire, of resentment, of love and of celebration for any occasion that might arise. The ancient poets carefully selected men worthy of carrying on their art. These young men were taught the old *meles* and the technique of fashioning new ones. [Pukui 1949:247]

There exist a few *mele* that concern or mention Wahikuli or Lāhainā. These particular *mele* may also be classified as *mele wahi pana* (songs for legendary or historic places). *Mele wahi pana* such as those presented here may or may not be accompanied by *hula* (dance) or *hula wahi pana* (dance for legendary or historic places). As the Hula Preservation Society notes,

> *Hula Wahi Pana* comprise a large class of dances that honor places of such emotional, spiritual, historical, or cultural significance that chants were composed for them. Only the composers of the chants could know the deepest meanings, as they would be reflections of their feelings and experiences […] Since the subjects of *Wahi Pana* compositions are extremely varied, their implementation through hula are as well. Coupled with the differences from one *hula* style and tradition to the next, *Hula Wahi Pana* can be exceptionally diverse. They can be done sitting or standing, with limited body movement or wide free movement; with or without the use of implements or instruments; with the dancers themselves chanting and/or

> playing an implement or being accompanied by the *ho‘opa‘a* [drummer and *hula* chanter (memorizer)]. Beyond the particular *hula* tradition, what ultimately determines the manner in which a *Hula Wahi Pana* is performed are the specific place involved, why it is significant, the story being shared about it, and its importance in the composer’s view. [Hula Preservation Society 2014]

3.1.5.1 No Nahi‘ena‘ena

This *mele inoa,* name song or eulogy, was composed for princess Nahi‘ena‘ena following her tragic death due to complications from childbirth (Kamakau 1992:340). She was the younger sister of Kauikeaouli [Kamehameha III] and daughter of Keopuolani (Emerson 1909:209) and died at just 21 years old (Figure 6; Kamakau 1992:341).

In residence at Lāhainā with her mother, Keopuolani, the princess Nahi‘ena‘ena lived there from May 1823 until her death in 1836. In Lāhainā, a royal roadway was constructed from the shore to the protestant church at Waine‘e, to accommodate her funeral procession and the many mourners of her passing (Kamakau 1992:341).

He inoa no ka Lani	A eulogy for the Princess
No Nahi‘ena‘ena;	For Nahi‘ena‘ena a name!
A ka luna o wahine.	Chief among women
Ho‘i a ka ena a ka makalani	She soothes the cold wind with her flame
Noho ka la‘i i ka malino—	A piece that is mirrored in calm—
Makani ua Ha-aō;	A wind that sheddeth;
Ko ke au i hala ea.	A tide that flowed long ago.
Punawai o Manā,	The water-spring of Manā,
Wai ola na ke kupa	Life-spring for the people,
A ka ilio nanā	A fount where the lapping dog
Hae nanahu i ke kai;	Barks at the incoming wave,
Ehu kai nāna ka pua,	Drifting spray on the bloom
Ka pua o ka iliau.	Of the sand-crawling iliau.
Ka ohai o Mapēpe.	And the scarlet flower of ohai
Ka moena we‘uwe‘u i ulana ia e ke A‘e,	On the wind-woven mat of wild grass,
Ka naku loloa.	Long naku, a springy mattress.
Hea mai o kawelo-hea,	The spout-horn, Kawelo-hea,
Nawai la, e, ke kapu?	Asks, who of right has the tabu?
No Nahi‘ena‘ena.	The Princess Nahi‘ena‘ena.
Ena na pua i ka wai,	The flowers glow in the pool,
Wai au o Holei.	The bathing pool of Holei!
[Emerson 1909:209]	

Figure 6. Photo of Halekamani, which was built for Princess Nahi‘ena‘ena (Bishop Museum n.d.)

3.1.5.2 Song for Kaumuali‘i

Fornander notes the following verses describing the violent weather of Lāhainā. Although the first ten verses refer to locales on the island of O‘ahu (as examples of places where people travel in the rain, and the precautions they must take—so the same measures occur at Lāhainā). The winds and rains that move seaward from the back of the valleys and mountain ridges behind Lāhainā are described,

A Malailua i Nahuina ka ua,	From Malailua to Nahuina it is raining;
Iolo, iolo ku ole ka makani i Kahua.	Soughing and whiffling about, the wind reaches not Kahua,
I Kahuawai, i Kahuawai nunu i ka opeope.	At Kahuawai, at Kahuawai, the bundle is large,
Hume ka malo o ka huakai hele ua,	Gird on the loin cloth for rain traveling;
Palepale ke kapa o ka wahine hele ua o Koolau,	Tuck up the skirts of the rain-traveling women of Koolau
Puolo huna i ka lauki ka malo o ke kanaka	Cover with ti-leaves the loin cloth of the men
Hele Kona a Kawalanakoa lu ka lauki,	In going to Kona, at Kawalanakoa drop the ti-leaves,
Wehewehe kai opeope o ka huakai,	Open up the bundles of the travelers,
Kakua ke kapa o ka wahine pa-u,	Gird on the skirts of the women
Hele Kona o Ewa.	Going from Kona to Ewa.
Ke Kona o Waikiki ke kanaka,	Of Waikiki in Kona is the man.
Me he kanaka la ko aloha e noho nei	Like a man is your love which possesses me.
Kaalo ae no e noho mai ana.	When you look around it is sitting there.
Kauaula ka ua noho i uka	Kauaula is a rain in the mountain
Noho i uka o Kanaha.	Inhabiting the uplands of Kanaha,
Ka makani nu me he hakikili la a noho i uka,	The fierce wind as the rumbling of thunder in the mountain.
Ai la i uka o Hahakea.	There it is the uplands of Hahakea,
Hooneenee ana ka ua i ke pili,	The rain approaches the pili.
O ka ua o ka makani haele i kai,	The rain and the wind move seaward;
Ke kii e kalohe eu ka makani.	Moving to cause damage, the mischevious wind
Pau ka maia, ka lau o ka laau,	Tearing up bananas and leaves of trees,
Ka ulu, ka niu, ka wauke,	The breadfruit, the coconut, the wauke.
Aohe koe i ka hoonaikola ia e ka makani,	Nothing remains through the destructive march of the wind
He ai niho ole ana ka makani i ka ai,	[For] without teeth it is destroying food
Mai Puako a Moalii,	From Puako to Moalii
He ‘lii ka lai, he haku,	A chief is the calm, a lord,
No Lahaina, e no Helelua no kekahi malino,	At Lahaina and at Helelua is another calm

Malino Hauola ia Wailehua	Glossy is the surface of the water at Hauola and on Wailehua
O kekahi lulu Kekaa e noho nei,	Another calm place now is Kekaa
He pohu ko Makila he lai o Kuhua,	Makila is without wind, Kuhua is calm
Ua hee pumaia ka nalu o Uo	The banana stalks [are used] for surfboards at Uo
Kihehe i ka lau maia pala.	Using the split ripe banana leaves
Alalai no ke poo o ke kanaka,	For head covering, for the heads of the people,
No ke kini heenalu o Kelawea,	For the multitude of people surf-riding at Kelawea.
Hoonuinui ana i ka nani o Lahaina,	Lauding the glory of Lahaina
He nui ka puu o Lahaina o ka ea,	But Lahaina is faulty, it is full of dust,
Mai waho mai ka ea a loko o ka hale,	There is dust outside as well as inside the house
He ilina na ka ea o Mokuhinia,	Mokuhinia is the resting place of the dust
Kuhinia i ka olelo palolo eia la	Satisfied with the other’s lying statements,
Hoonuinui i manawa ino au.	Lauding [Lahaina] to cause me to anger

[Fornander 1920:476–477]

[The remainder of this song pertains only to the island of Hawai‘i, specifically the Hilo region]

3.1.5.3 Kananaka

This *mele* mentions the Ma‘a‘a wind of Lāhainā and also speaks of a mermaid that lived in the waters just off Lāhainā.

‘O ka pā mai a ka Ma‘a‘a	The blowing of the Ma‘a‘a wind
Halihali mai ana lā i ke ‘ala	Bears with it a fragrance
Ke ‘ala onaona o ka līpoa	A sweet scent of the līpoa seaweed
Hana ‘oe a kani pono	Get it until you are satisfied
Nani wale ia pu‘e one	Beautiful is that stretch of sand
I ka nalu he‘e mai a‘o Kananaka	With the surf break of Kananaka
Kahi a mākou i he‘e ai	Where we have ridden the waves
I ke ‘ehu‘ehu o ke kai	There amid the spray of the sea
‘O ka mahina hiki aloalo	The moon rises to its zenith in the sky
Ho‘ola‘ila‘i ana lā i nā pali	Poised aloft here above the cliffs
Pōhina wehiwehi i ke onaona	A silvery gleam, lush with fragrance
Koni ma‘e‘ele i ke kino	Bringing a throb and a tingle to the body

Source: Keali‘i Reichel CD – Kananaka was a mermaid who lived in the sea outside of Lahaina, Maui. This hula noho was usually taught to young girls beginning hula instructions. La‘i refers to the peace that follows passion or the thrill of lovemaking. ‘Iwi hilo is the thigh bone or last rib bone, meaning the very core of one’s being in

Hawaiian poetry. Ma‘a‘a is the famous wind at Lahaina. It is believed that when a lot of foam is near the shoreline or the mouth of a stream, the mermaid is present. If the mermaid was in the loko (fishpond), fish could not be caught for food. They would be bitter and not good to eat. He Aloha Mele notes the Maui elders credit this mele to Kauhailikua, a court dancer for King Kalākaua. Translated by Kanani Mana [Huapala n.d.]

This hula often performed as a hula noho, or sitting dance, is about the mermaid Kananaka who lived in the surf outside Lahaina. Mermaids did not exist in traditional Hawaiian lore, and Kananaka may be an innovation inspired by the whalers’ tales in Lahaina. Maui elders credit this song to Kauhailikua, a court dancer for Kalākaua and grandmother of Eddie Kamae. [Wilcox et al. 2008:107]

3.2 Archaeological and Historical Narrative

The workings of traditional Hawaiian land tenure are often reflective of the socio-political intricacies of particular places that were favored among the *ali‘i*, and the area surrounding the *kalana* of Lāhainā is illustrative of that fact. The *moku o loko*, or *moku* as it is most commonly called, literally means “to cut across, divide, separate” (Lucas 1995:77). When used as a term of traditional land tenure, a *moku* is akin to a political district, an overall land division that can contain smaller divisions of land such as *‘okana* (subdistrict), *kalana*, *ahupua‘a*, *‘ili*, and *mo‘o* (narrow strip of land, smaller than an *‘ili*). Lāhainā Moku, located on the south facing flank of Mauna ‘Eke, or the West Maui Mountains as it is commonly called today, consists of multiple *ahupua‘a* that extend from Ukumehame at the southern end to Hanakaō‘ō along the northern end.

The term *kalana* literally translates to mean a thing loosened or released—“to loosen” (*kala*) with the nominal suffix of “*na*” added at the end (Handy et al. 1991:47). In reference to land tenure, *kalana* is a term that is sometimes interchanged or synonymous with the term *‘okana*, which is a sub-division of land that is smaller than a *moku* (Alexander 1890; Lucas 1995:47). On Maui Island, W.D. Alexander (1890) observes that there are five *‘okana* within Hāna Moku, while Lāhainā is termed a *kalana*. Handy et al. (1991:47) speculate that the land divisions designated as *kalana* were politically released from the *‘okana* or even *moku* that they had been a part of during the original division of the islands. These land divisions were then given as separate domains to *ali‘i* of first rank, remaining as autonomous heritages. Curtis Lyons, a surveyor during the Māhele, specifically states that the *kalana* of Lāhainā belonged to no *moku* (Handy et al. 1991:47). While the formal boundaries of the *kalana* of Lāhainā within Lāhainā Moku have never been surveyed, it is possible the area comprising the *kalana* encompassed the fertile strip of lands along the coastline, stretching from Puamana to Māla, and inner reaches of the stream valleys, from Kaua‘ula to Wahikuli.

The geographic arrangement of the typical *ahupua‘a* within the traditional Hawaiian land tenure system is commonly thought of as a “pie-shaped” unit of land that extends from the coastline to the mountains. In this sense, the tenants of an *ahupua‘a* had access to resources for a subsistence lifestyle that included marine resources and fishing rights in the coastal area and rights to arable lands for crop cultivation, as well as water and timber rights in the planting zones and valuable bird catching privileges at the higher elevations (Handy et al. 1991:48). As indicated by Maly and

Maly (2007:82), however, the distribution and geographic boundaries of the *ahupua‘a* of Lāhainā are somewhat unique in the Hawaiian Islands.

Within their cultural landscape study, Maly and Maly (2007:8) note that many of the *ahupua‘a* of the Lāhainā area are small and often configured as detached parcels, or *lele*, that do not run in the typical *mauka* to *makai* "pie-shaped" manner. One section of an *ahupua‘a* may be situated near the coastline, another section bearing the same *ahupua‘a* name may be within the upper reaches of the stream valleys, while still another section might be found within the mid-elevation areas—all separated by intervening *ahupua‘a* bearing different names.

3.2.1 Pre-Contact to Early Post-Contact

3.2.1.1 Settlement and Subsistence Patterns

As emphasized by Handy et al. (1991) in the following summary, the *ali‘i* and *maka‘āinana* were attracted to Lāhainā Moku for its natural resources and geographic position:

> Lāhainā District was a favorable place for the high chiefs of Maui and their entourage for a number of reasons: the abundance of food from both land and sea; its equable climate and its attractiveness as a place of residence; it had probably the largest concentration of population, with its adjoining areas of habitation; easy communication with the other heavily populated areas of eastern and northeastern West Maui, 'The Four Streams' (Na Wai Eha), and with the people living on the western, southwestern and southern slopes of Haleakala; and its propinquity to Lanai and Molokai. [Handy et al. 1991:492]

During the reign of Kaka‘alaneo, Handy (1940:106) relates that the cultivation of bananas, sugarcane, potatoes and more spanned from Keka‘a (Black Rock) to Hāhākea and to Wahikuli. While discussing the fishing traditions of Hawai‘i, Daniel Kahā‘ulelio (2006:91) describes the environment of Lāhainā: "Lahaina was like the Garden of Eden in productiveness from one end to the other. There was none to compare with it before the days of the sugar plantation; this was sure" (Kahā‘ulelio 2006:91).

Handy et al. (1991:492) note that the main taro lands of Lāhainā were watered by two large streams, the Kahoma Stream and Kanahā Stream (a tributary to the Kahoma Stream), which run far back into the valleys. Early descriptions indicate both dry-land (*kula*) and pond-field (*lo‘i*) methods of cultivation were equally employed in the Lāhainā area (Handy et al. 1991:492–493).

At least two notable *‘auwai* that span multiple *ahupua‘a* between Kaua‘ula and Kahoma are described in native lore. Roughly datable by the chiefs associated with them, the earliest in the Lahainaluna vicinity is known as ‘Auwaiawao, reportedly named for the Chiefess Wao, sister of Kaululā‘au, who ruled a portion of Maui ca. 1390. Portions of this *‘auwai* were subsequently incorporated into the construction of the Lahainaluna Ditch. The second ‘*auwai*, known as ‘Auwai o Pi‘ilani, is associated with Pi‘ilani, who ruled Maui and the neighboring islands ca. 1450. The ‘Auwai o Pi‘ilani has its headwaters in the Kaua‘ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna (Maly and Maly 2007:4).

According to Fornander (1919:540, 542), descriptions of the establishment of cultivated areas surrounding Lāhainā offer insight into the variety of agricultural goods in the region:

> […] Kekaa was the capital of Maui when Kaalaneo [Kakaalaneo] was reigning over West Maui. It is said that there were many people there. Many houses were constructed and the people cultivated a great deal of potatoes, bananas, sugarcane, and other things of a like nature. From what I have been told that country from above Kekaa to Hahakea and Wahikuli, that country now covered with cactus in a northwesterly direction from Lahainaluna, was all cultivated; Kekaa became a city populated by a great many; this chief (Kaalaneo) also planted the breadfruit and kukui trees down at Lahaina. [Fornander 1919:540, 542]

Accounts from 1793, collected by Handy (1940:105) illustrate the extensiveness of pre-Contact cultivation near Lāhainā between Paunau and Pana‘ewa Ahupua‘a. Archibald Menzies was the acting surgeon and naturalist onboard the H.M.S. *Discovery* and traveled to the Hawaiian Islands between the years 1792-1794. Captained by George Vancouver, the H.M.S. *Discovery* and Menzies made three visits to Hawai‘i (Menzies 1920). Menzies kept a journal, which included references to two previous trips to Hawai‘i in 1786 and 1787, although no further notes have been located from those earlier trips. Menzies' journals provide highly detailed descriptions of Lāhainā and its deliberately designed agricultural arrangement. The following passages described some of what he saw on these trips.

> [Lahaina, 1793] Here our conductors importuned us to dine […] after which we continued our journey, and soon entered the verge of the woods where we observed rugged banks of a large rivulet that came out of the chasm cultivated and watered with great neatness and industry. Even the shelving cliffs of rock were planted with esculent roots, banked in and watered by aqueducts from the rivulet with as much art as if their level had been taken by the most ingenious engineer. We could not indeed but admire the laudable ingenuity of these people in cultivating their soil with so much economy. The indefatigable labor in making these little fields in so rugged a situation, the care and industry with which they were transplanted, watered and kept in order, surpassed anything of the kind we had ever seen before. It showed in a conspicuous manner the ingenuity of the inhabitants in modifying their husbandry to different situations of soil and exposure, and it was with no small degree of pleasure we here beheld their labor rewarded with productive crops.
>
> March 17. On the forenoon of the 17th, I accompanied Captain Vancouver and a party of officers, with the two Niihau women, to see the village of Lahaina, which we found scattered along shore on a low tract of land that was neatly divided into little fields and laid out in the highest state of cultivation and improvement by being planted in the most regular manner with the different esculent roots and useful vegetables of the country, and watered at pleasure by aqueducts that ran here and there along the banks of intersecting fields, and in this manner branching through the greatest part of the plantation.
>
> These little fields were transplanted in a variety of forms, some in rows, in squares, in clumps and others at random; some according to their nature were kept covered with water, while others were with equal care kept dry by gathering earth around them in little hills. [Handy 1940:105]

Outside the fields and gardens of Lāhainā, the lands were dry and desolate, and observations note the rather abrupt shift in vegetation and cultivation, as well as the apparent severity of the landscape along the alluvial plains with a rise in elevation. Jacques Arago was a French author and artist in service to Captain Vancouver’s company of officers. While working as a draftsman aboard the ships *Uranie* and *Physicienne* under the command of Captain Louis Freycinet during a French scientific expedition of the Pacific in the years 1817–1820, he noted the following about the Lāhainā area:

> The space cultivated by the natives of Lahaina is about three leagues in length, and one in its greatest breadth. Beyond this, all is dry and barren; everything recalls the image of desolation. Nevertheless, the soil and its resources are the same; whence therefore this apparently culpable neglect? It is a natural consequence of the mode of reasoning adopted by these people; they have all that is necessary at hand, what advantage would there be in seeking superfluities from afar? [...] Superfluities are thrown away on these people. Twenty acres of land will not produce them a better dinner than their square of taro. [Arago 1823:120]

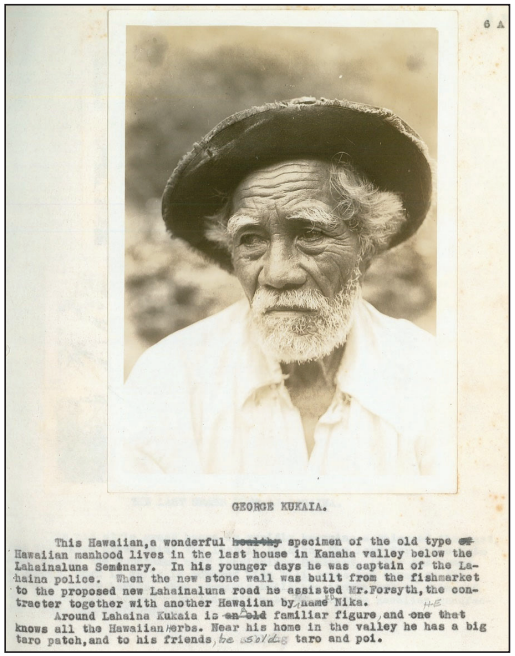
In an unpublished manuscript about life in Lāhainā in 1897, Arthur Waal, former *luna* (foreman, boss) (Figure 7) for Pioneer Mill Sugar Company (PiMCO) and postmaster for the Lāhainā post office, makes the following observation about the population and subsistence practices of native Hawaiians in Lāhainā:

> Lahaina has a mixed population. Many natives had their own kuleanas, up in the valleys where they grew taro, sweet potatoes, vegetables and bananas. Most all of them had chickens and pigs.
>
> I saw the last remaining grass huts in Lahaina, one was near the Kilipaki Village camp on the beach out Kaanapali way, and the other one in Kahumana gulch occupied by a very old Hawaiian with a thick, heavy white beard and hair. This Hawaiian, George Kukaia, was a wonderfully healthy specimen of the old type Hawaiian. Nearby was his taro patch and fruit bearing trees. [Waal 1897:5, 6-6A]

3.2.1.2 Fishing in Lāhainā

The inland ponds, or *loko*, of Aimakalepo, Unahiole, and ‘Alamihi near the mouth of Kahoma, and the famed royal fishpond of Mokuhinia at Waine‘e likely provided a reliable fish resource that was supplemented by off-shore communal or family fishing. Following the island-wide survey conducted by Walker (1931:299), he relates that J.K. Napaepae, a native of Lāhainā, noted that there used to be a pond at Māla named Alanuhi that was primarily for mullet, but “now filled with rubbish and crossed by the road leading out to Mala wharf.”

Kahā‘ulelio (2006:9) notes a particular fishing ground, Kapuali‘ili‘i, that extended from Keawaiki (present-day Lāhainā Harbor) to ‘Uha‘ilio Point, less than one mile along the Lāhainā shore. Fishing often involved a cooperative effort of *lau* (dragnet, seine) fishing, a method using a drag line made of ti leaves. In this manner of fishing, smaller fish and *kakakī* (a type of *kala* or unicornfish) were the primary catches. Other types of fish and marine resources often sought in the waters off Lāhainā include *mahimahi* (Dolphin fish, *Coryphaena hippurus*), *aku* (skipjack Tuna, *Katsuwonus pelamis*), *iheihei* (halfbeak fish family, *Hemiramphidae*), *puhiki‘i* (young



6 A

GEORGE KUKAIA.

This Hawaiian, a wonderful ~~healthy~~ specimen of the old type ~~of~~ Hawaiian manhood lives in the last house in Kanaha valley below the Lahainaluna Seminary. In his younger days he was captain of the Lahaina police. When the new stone wall was built from the fishmarket to the proposed new Lahainaluna road he assisted Mr.Forsyth, the contracter together with another Hawaiian by name Nika.

Around Lahaina Kukaia is ~~an old~~ familiar figure and one that knows all the Hawaiian herbs. Near his home in the valley he has a big taro patch, and to his friends, he sells taro and poi.

Figure 7. Photograph of George Kukaia and excerpt from Waal (1897:6)

malolo, flying fish, *Parexocoetus brachypterus*), *he‘e* (octopus, *Polypus* sp.), *weke* (goatfish, *Mullidae*), *akule* (big eyed scad, *Selar crumenophthalmus*), and many others (Kahā‘ulelio 2006).

3.2.1.3 Politics and Warfare

According to Handy et al. (1991:492), Lāhainā was a favored place for the high chiefs of Maui to reside as the entire *moku* could boast of a mild climate year round, plentiful marine and terrestrial resources, close proximity to Lana‘i and Moloka‘i, and easy communication with other population centers of West Maui as well as settlements along the western, southwestern, and southern shores of Haleakalā. Flanked by excellent fishing grounds, Lāhainā was the primary seat of the *ali‘i* of West Maui (Handy et al. 1991) and later was the center of government for the Kingdom of Hawai‘i.

During battles fought between Kamehameha-nui of Maui and Alapa‘i of Hawai‘i, the Hawai‘i Island warriors attacked the food resources of Lāhainā by drying the streams of Kaua‘ula, Kanahā, and Kahoma and laying waste to the *lo‘i*. This action by Alapa‘i effectively cut off food and freshwater resources from the Maui forces and country people (Kamakau 1961:74). During the wars of unification, Kamehameha landed and occupied the Lāhainā District from Launiupoko to Mala and all the parts of the lands that had been given over to food patches and cane fields were overrun by men from Hawai‘i Island (Kamakau 1961:171). Kamehameha resided at Lāhainā for one year to equip his fleet with food and other provisions supplied by the lands of Maui, Moloka‘i, Lāna‘i, and Kaho‘olawe (Kamakau 1961:188).

3.2.2 Early Historic Period

3.2.2.1 Whaling in Lāhainā

In the heyday of whaling (between 1820–1860), it was estimated that over 50 whalers were sometimes at anchor off Lāhainā at any one time (Alexander 1899:259). By the year 1844, Lāhainā recorded 326 whaling vessels at port with the number that following year increasing by over 50 vessels to 379 (Thrum 1912:8-9). According to Ashdown (1963), it is during the whaling era that Pu‘u Keka‘a became known as “Black Rock” (cited in The Maui Historical Society 1971):

> During the years after the discovery of the Hawaiian Islands in 1778, foreigners taught some Hawaiians to fear ‘ghosts’ and the ‘unknown.’ At Pu‘u Keka‘a, whalers set up kettles in which to try-out whale oil. They could not pronounce the proper name so they called the sacred hill as ‘Black Rock’ and said it was ‘haunted by evil spirits.’ [Ashdown 1947:48]

3.2.2.2 Missionaries in Lāhainā

With the unification of the Hawaiian Islands in 1791 under a single sovereign, followed by the arrival of the first Protestant missionaries in Lāhainā in 1823, changes such as Western-styled commerce and Christianization of the Native Hawaiian people began to sweep across Lāhainā (Alexander 1899:194). The town and surrounding landings played a prominent role in the early economy of the Kingdom. As early as 1862, the lands surrounding Lāhainā were cultivated in commercial sugar (Gilmore 1931:198–203), while the sandalwood trade of the 1810s, the whale trade of the 1830s, the Irish potato trade of the 1840s, and the establishment of the protestant Lahaina Mission Station in the 1820s and the Lahainaluna Seminary in the 1830s drew people to the waterfront areas, which ultimately resulted in a population rise (Kuykendall 1968:234). This

trend made Lāhainā one of the primary economic, religious, and educational centers for the early Hawaiian Kingdom (Kamakau 1992:304).

The Protestant missionary William Ellis, who visited Lāhainā during the 1820s, described the landscape that had entranced both the Hawaiians themselves and the nineteenth century newcomers:

> The appearance of Lāhainā from the anchorage is singularly romantic and beautiful. A fine sandy beach stretches along the margin of the sea, lined for a considerable distance with houses and adorned with shady clumps of kou-trees, or waving groves of cocoa-nuts […] The level land of the whole district, for about three miles, is one continued garden, laid out in beds of taro, potatoes, yams, sugar-cane, or cloth-plants. The lowly cottage of the farmer is seen peeping through the leaves of the luxuriant plantain and banana tree, and in every direction white columns of smoke ascend, curling up among the wide-spreading branches of the bread-fruit tree. The sloping hills immediately behind, and the lofty mountains in the interior, clothed with verdure to their very summits, intersected by deep and dark ravines, frequently enlivened by waterfalls, or divided by winding valleys, terminate the delightful prospect. [Ellis 1969:76–77]

Missionary C.S. Stewart, in his journal from his residence in Hawai‘i between 1823 and 1825, describes Lāhainā and its cultivation and irrigation systems. Stewart described Lāhainā as appearing to be in neglect although his description supplies ample evidence of traditional cultivation:

> The bread-fruit trees stand as thickly as those of an irregularly planted orchard, and beneath them are taro patches and fishponds, twenty or thirty yards square, filled with stagnant water, and interspersed with clumps of tapa tree, groves of the banana, rows of the sugar-cane, and bunches of the potatoe and melon. All these flourish exuberantly from the richness of the soil alone, with but little attention or labor from the hand of man.
>
> It scarce ever rains, not oftener than half a dozen times during the year; and the land is watered entirely by conducting the streams which rush from the mountains, by artificial courses on every plantation. Each farmer has a right, established by custom, to the water every fifth day. The pathways, which are very narrow, are usually along the sides of these water trenches.
>
> The number of inhabitants is about two thousand five hundred. Their houses are generally not more than […] eight or ten feet long, six or eight broad, and from four to six high: having one small hole for a door, which cannot be entered but by creeping, and is the only opening for the admission of light and air. They make little use of these dwellings, except to protect their food and clothing, and to sleep, in during wet and cool weather; and most generally eat, sleep, and live in the open air, under the shade of a kou, or bread-fruit tree. [Stewart 1839]

In August 1826, the Reverend William Richards writes from Lāhainā:

> At the close of my last letter, we were living on the sea beach, a spot rendered unpleasant, not only by the roaring of the surf, which dashed within a few feet of

> our doors, but also, by the numerous houses recently erected on every side […] Our houses, too, had become so bad, that they were a very indifferent shelter from the storm, and we were daily expecting that the wind would take them entirely away.
>
> Ka‘ahumanu soon wrote to me, that she had ordered the governor of Lahaina to make over to me, a small piece of taro and potato ground, and also a garden and building spot. Two large well built native houses were standing in the yard, to which we immediately removed, and in which we now live. Directly in front of us, are several taro gardens and fish ponds, surrounded with cocoa nuts [*sic*], *hala*, and *kou* trees, in the midst of which stands the brick house erected by Tamehameha, and called by Vancouver, ‘the royal palace.’
>
> Back of our houses, and inclosed [*sic*] in the same yard, is about an acre of excellent land, designed for a garden. It contains three breadfruit trees, and on its borders, are a few cocoa nuts. It is now covered with bananas, plantains and sugar cane, interspersed with melons, cucumbers, beans, cabbage and yams.
>
> On the 26th of October, the schools of Lahaina were all publickly [*sic*] examined. There were present, nineteen schools containing *nine hundred and twenty two* [italics theirs] scholars. The school of Nahienaena, in a particular manner, distinguished itself for its improvement. [Richards 1827]

The Reverend Richards also wrote in the *Missionary Herald*, October 1830, to discuss religious matters at the missionary station of Lāhainā:

> The state of things at Lahaina, on the island of Maui, continues to be encouraging […] Public worship on the Sabbath was established on the 18th of February, 1825. Then, ten persons were present—now more than as many hundreds […] In every considerable village from one end of the island to the other, the people have erected a house for the worship of God. At Olualu, [Olowalu] a village eight miles distant from Lahaina, we have preached during the season, nearly thirty sermons to a congregation of five to six hundred. This and a single Sabbath at Kanepale, [Kā‘anapali] a village equally distant from Lahaina in another direction, is all that we have been able to do for the people on this side of the island. [Richards 1831]

Census figures provided by Protestant missionaries throughout the Hawaiian Islands beginning in 1831 provide the earliest documentation of the size of the Native Hawaiian population after the first decades of Western Contact. During the first census of Maui Island in 1831-1832, a population of 8,415 was recorded for the Lāhainā District, which comprised 24% of the entire island population of 35,062 (Schmitt 1977:11–12). By the time of the next census in 1835-1836, the Lāhainā population had dropped to 5,234 comprising 22% of the Maui Island population of 24,199 (Schmitt 1977:11–12).

3.2.2.3 Lahainaluna School

Lāhainā, being a center of pre-Contact and post-Contact economic activity, saw many missionaries moving into Lāhainā Town and beyond to acquire lands for the construction of churches and schools. South of the current project area, the western end of Pana‘ewa Ahupua‘a was selected as the location for the Lahainaluna School. The Reverend Lorrin Andrews established a school for men at Lahainaluna in 1831. Protestant missionaries endeavoring to instruct Native

Hawaiians in Christianity had convinced the chiefs and royalty of Lāhainā that a school was needed to educate and provide a supply of native teachers for the people of Maui (Lahaina Restoration Foundation 2008). The governor of Maui, Hoapili, and his wife granted lands “*mai ka wai i ka wai*” (all between the two streams) to the missionaries on the lower slopes of Pu‘u Pa‘upa‘u. The construction of school buildings in the native style was undertaken by the students themselves. Missionaries Lorrin Andrews and Jonathan Green “shouldered their axes and headed a progression of future students up the mountain for timber. Academic work began September 5, 1831, with twenty-five young men” (Alexander 1953:69). Lahainaluna was “the first high school in the islands” and “reported an enrollment of 34 students in 1835 and offered courses in algebra, geometry, trigonometry, and surveying, all taught in Hawaiian” (Schmitt 1977:xx).

Following the initial construction of the school, food supplies from the hillside potato plots were often found wanting to provide for the teachers and resident students. In 1835 missionaries pushed for additional favorable lands to be allocated to the school; the King then tasked Ulu-maheihei to acquire what lands he deemed suitable for the school (Kamakau 1961:355). In addition to taro lands by the stream of Kanahā and within the lands of Makaili‘i and Kukuikapa, Ulu-maheihei also allocated to the school:

> […] two cattle pastures: the plain of Ku‘ia to Kaua‘ula turning upward as far as Kahili, and the plain of Pana‘ewa between Kanaha and Kahoma where is the plain of Pahalona […] and when the chiefs complained and said that these were their lands given by Kamehameha, and that all their taro land had been taken away and nothing left but a few breadfruit trees, Ulu-maheihei answered, ‘It is a fine thing; do not get excited about the land. Give your land to those who are seeking knowledge. This is the thing which will establish the government of your chiefs […] Knowledge is fundamental to living as a chief.’ When Elizabeth Kina‘u visited Lahainaluna in 1837 she gave more land extending to the creek of Wao. [Kamakau 1961:355]

A theological department was established in 1843, headed by Reverend Sheldon Dibble, but the early death of Rev. Dibble in 1845 ended all systematic theological instruction on Maui until Reverend W.D. Alexander began teaching theology at Wailuku in 1865.

David Malo, although 38, entered the school with the first class of students. With Rev. Sheldon Dibble, Malo helped to translate portions of the Bible, which were then printed and bound by Lahainaluna students. Malo wrote an account of Kamehameha I, entitled *Hawaiian Antiquities*, but the original manuscript was lost. The account, published by its translator Nathaniel B. Emerson in 1903, and published by the Bishop Museum in 1951, is considered one of the foremost ethnological works in the Hawaiian language. It was Malo who said, “*O keia ke kukui pio ole i Ka Makani o Kauaula*,” or “This is the torch which the Winds of Kaua‘ula cannot extinguish,” meaning the educational impact of Lahainaluna High School was permanent and unaffected, even by the most famous storm winds of the region. The first newspaper published serving the Pacific Ocean was the *Ka Lama Hawaii* (The Torch of Hawaii) issued at Lahainaluna in 1834 (Alexander 1894).

By 1837, Charles Burnham had finished building a two-story house of stone walls, wood rafters and a thatched roof for the school. A printing press was installed in this first stone building of the new Lahainaluna Seminary, which was operated by students who set type and printed lesson books

in their native language (Hale Pa‘i o Lahainaluna 2008). In 1838, student Samuel P. Kalama engraved the first *ahupua‘a* map of the Hawaiian Islands at Lahainaluna. The map was a groundbreaking achievement at the time (Moffat and Fitzpatrick 2004) and was hand-tinted with colors to call attention to larger land districts. In 1841, a Royal Historical Society was formed at Lahainaluna. At age 26, Lahainaluna student Samuel M. Kamakau was selected as one of the officers, along with Kamehameha III, Kauikeaouli, (president), William Richards (vice president), and Sheldon Dibble (secretary). Kamakau (1961) authored *Ruling Chiefs of Hawaii*, which remains the best compilation of the generations of Hawaiian chiefs before Kamehameha I.

In 1842, the Reverend John S. Emerson began construction of the Lahainaluna Ditch, a waterway modeled after a native *‘auwai*, which had carried water between the Kanahā and Kaua‘ula streams (Maly and Maly 2007). Rev. Emerson remained at the Seminary until the completion of the waterway in 1846. In 1843, the Lahainaluna press published “The Laws and the Resolutions Passed at the Annual Council of the Hawaiian Nobles and Representatives Convened According to the Constitution,” the first printed record of actions supporting the new constitution. A missionary instructor at the Seminary, Sheldon Dibble, published the first history of the Sandwich Islands at Lahainaluna that same year (Anderson 1864).

Accounts by Reverend William Richards in 1845 (Lahaina Restoration Foundation 2008), and Mr. Chester S. Lyman in 1846 (Maly and Maly 2007) referred to the ongoing construction of the Lahainaluna Ditch. The lands of Lahainaluna, first administered by missionaries of the Protestant church, were transferred from the American Board of Commissioners for Foreign Missions (ABCFM) to the Hawaiian Government in 1849 and remained under government control thereafter (*Maui News* 1926).

In 1836, following the death of Kauikeaouli’s sister, Harrieta Keōpūolani Nāhi‘ena‘ena, from illness following labor and childbirth, the king arranged to transport her remains from O‘ahu to “[…] have her laid away on Maui, the land where her mother, Harriet Ke-opu-o-lani had been laid away, ‘in the calm of Hauola’” (Kamakau 1961:341). After being escorted to Lāhainā by a number of smaller schooners carrying a very large retinue of attendant *ali‘i* and the entourage of Nāhi‘ena‘ena, a road was prepared for the funeral procession that would travel a loop through the busy port town:

> The body remained on the ship while a roadway was prepared by cutting down breadfruit trees and *kou* trees of Molakia and covering the way with sand, then a layer of grass, and finally mats spread all along the path. (This roadway) began at the horse gate at Pana‘ewa […] [Kamakau 1961:341]

This event held a special significance at a time when the Kingdom of Hawai‘i was experiencing a shift in the power of the Monarchy during the reign of Kauikeaouli. According to Kamakau (1961:342):

> On the day of funeral many high chiefs gathered, such as the king and queen, Kina‘u, Ke-ka-ulu-ohi, Kuini Liliha, Ke-kau-‘onohi, Ke-ano, and many others who were the last of their race to be entitled to the great royal *kahili* from which have branched off the *kahili* of today with their variegated feathers. [Kamakau 1961:342]

3.2.3 The Māhele and the Kūleana Act

The most significant change in land use patterns and land allocation came with the Māhele and the privatization of land in Hawai‘i. The 1839 establishment by Kamehameha III (Kauikeaouli) of a Bill of Rights for the people of Hawai‘i, followed by a formal constitution in 1840, hastened the shift of the Hawaiian economy from that of a subsistence-based economy to that of a market-based economy. The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—which introduced the concept of ownership of private property into Hawaiian society. During the Māhele, all of the lands in the Kingdom of Hawai‘i were divided between *mō‘i* (king), *ali‘i*, *konohiki* (overseer of an *ahupua‘a*), and *maka‘āinana*, and passed into the western land tenure model of private ownership. On 8 March 1848, Kauikeaouli further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners, and in 1850 the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995:41–51).

The *maka‘āinana* were offered fee-simple titles for their house lots and lands which they cultivated for themselves. *Kuleana* awards for individual parcels within the *ahupua‘a* were subsequently granted through a land commission. These awards were first presented to Native Hawaiian tenants followed by the naturalized foreigners (non-Hawaiians born in the islands) or long-term resident foreigners who could prove occupancy on the parcels before 1845.

Land Commission Awards (LCAs) were granted by ministers representing the Kingdom of Hawai‘i’s Department of the Interior. Native testimony to establish title to real property was recorded by Native Register—wherein claimants would provide traditional proof of ownership—and in like manner foreign testimony by Foreign Register—wherein boundary survey evidence would support traditional claims.

A small area in the northern portion of the project area was once part of Land Grant 7715M, an LCA that encompassed the entire *ahupua‘a* of Hanakao‘o. LCA 7715M was awarded to Lot Kapuaiwa (King Kamehameha V), and after his death on 11 December 1872, was transferred to Ruth Keelikolani, his half-sister and heir (Figure 8 and Figure 9). Eventually this property became part of Lahaina Sugar Company—later to be absorbed into the Pioneer Mill Company (PiMCo).

3.2.4 Mid-Nineteenth to Early Twentieth Century

The whaling industry in the Pacific Ocean reached its peak in 1859. Prices for whale oil collapsed five years later. Since the 1840s, the Hawaiian economy had been dependent primarily on supplying whale ships during their long layovers in the Islands. With the dwindling number of ships arriving during the 1860s, the population of Lāhainā Town and neighboring West Maui *ahupua‘a,* dependent on the prosperity of Lāhainā, migrated to other parts of Maui and to other islands (Schmitt 1977). In 1853, 4,833 persons were recorded as living in the Lāhainā District. In 1878, the total district population had dropped to 2,448, and by 1896, the population was 2,398 (Schmitt 1977:12–13). A Dodge (1880) map depicts the location of Lahainaluna School (Figure 10). The school and major development in the vicinity are also shown on a Dodge (1885) Hawaiian Government Survey map of Maui (Figure 11).

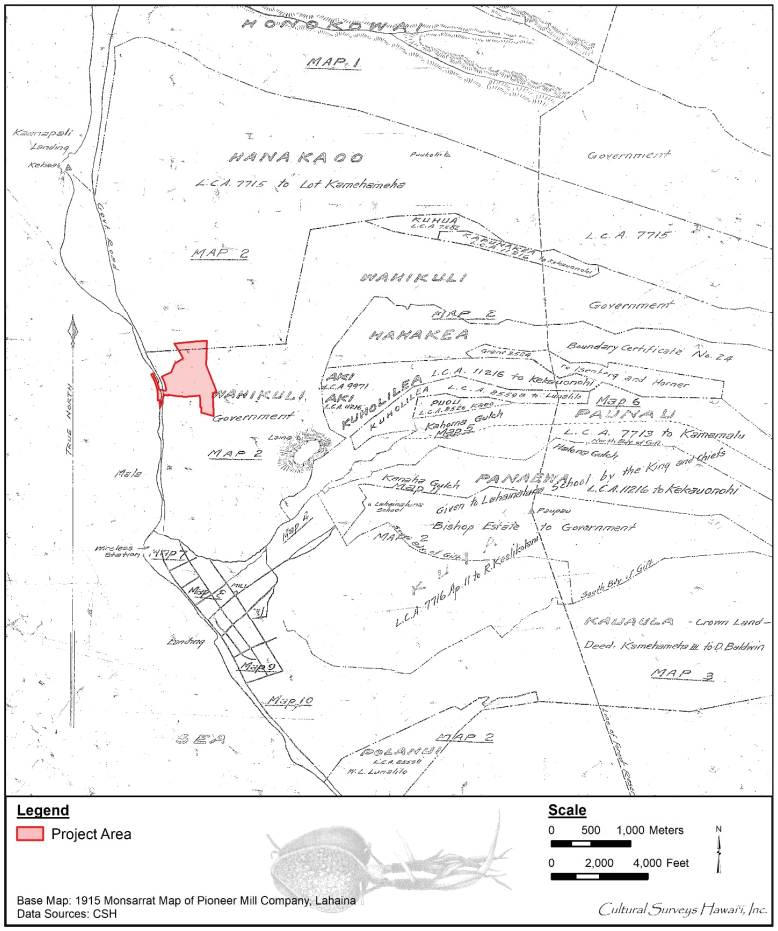


Figure 8. Monsarrat (1915) map showing project area in relation to LCA 7715

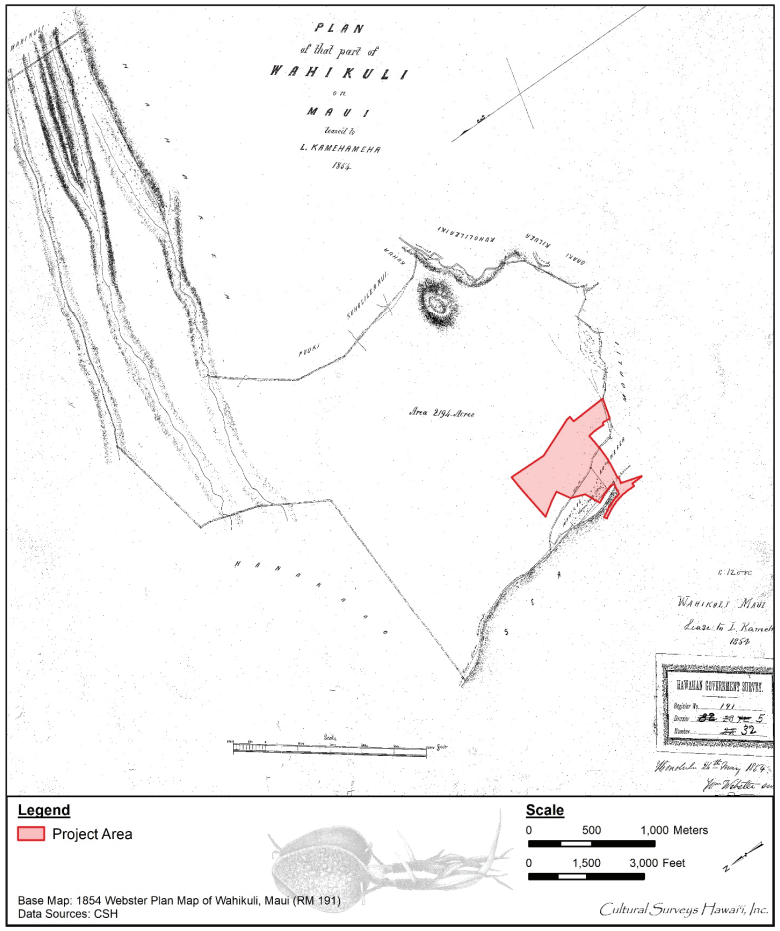


Figure 9. Webster (1854) map of Wahikuli showing the project area

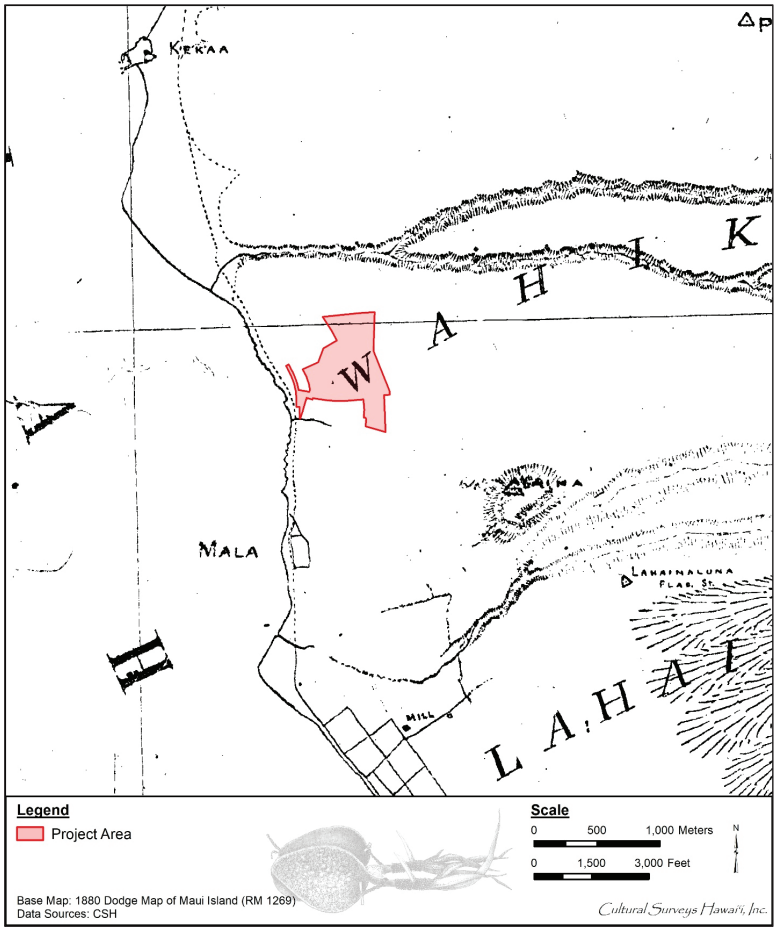


Figure 10. Dodge (1880) map of Wahikuli showing the project area and Lahainaluna School to the southeast

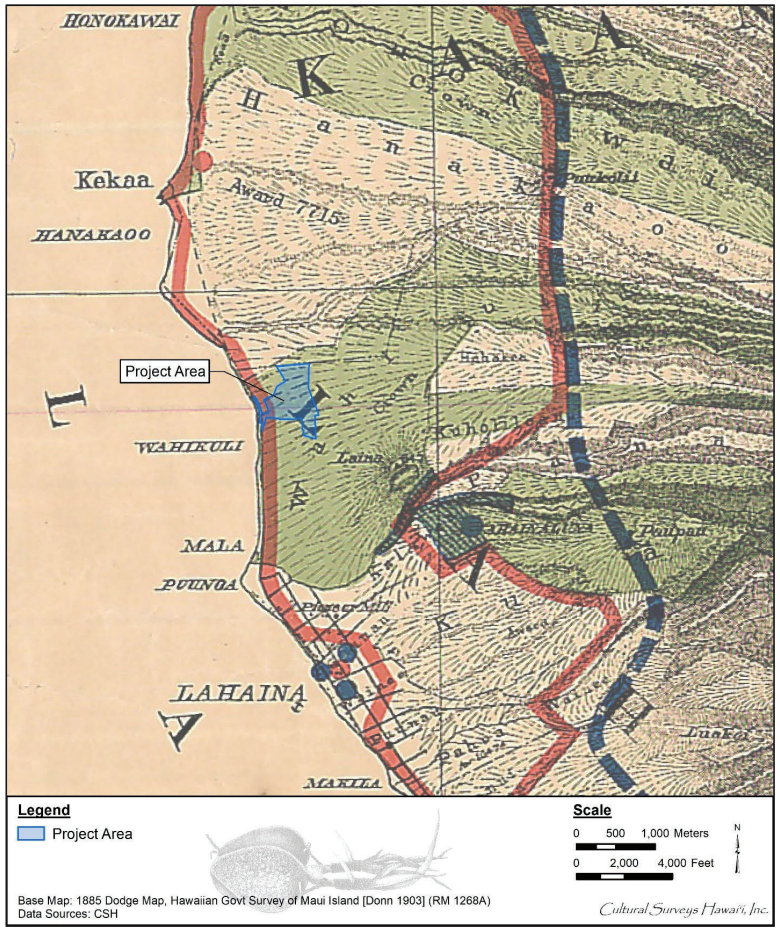


Figure 11. Portion of Dodge (1885) Hawaiian Government Survey map of Maui showing the project area and Lahainaluna School to the southeast; Crown Lands shown in green

3.2.4.1 Development of Sugar as a Commercial Crop

Kō (sugarcane) originally is believed to have been brought to the Hawaiian Islands during the initial Polynesian settlement of the island chain. Early Hawaiians cultivated several varieties of *kō*, each with different cultural associations. *Kō* was also considered to be therapeutic and was a primary ingredient of many native compounds (Handy et al. 1991:183–189).

As the Hawaiian economy shifted following the enactment of the Māhele, *kō* (sugarcane; *Saccharum officinarum*) would soon become important as a major cash crop. From 1840 to 1850, a cane field and a rude mill, consisting of three whaling ship try-pots on adobe and stonework with wooden rollers and iron bands, was owned and operated by David Malo in Lāhainā for the production of molasses that was sold primarily for home consumption (Rolph 1917:168–169). As foreign entrepreneurs looked to expand their exportable crops and increase their profits, sugar became the answer, and by 1849 Judge A.W. Parsons was operating a commercial mill in Lāhainā (Jensen 1989). A milestone for the sugar industry of Hawai‘i occurred in either 1854 or 1855 when Captain Pardon Edwards brought a variety of sugarcane from the Marquesas to Lāhainā. Originally intended for transport to Charles Titcomb of Hanalei on Kaua‘i Island, several stalks of the Marquesan cane were given to Consul Chase and F.A. Oudinot of Lāhainā to plant in their gardens (Kew Royal Gardens 1894:419). It was quickly recognized that this variety of cane outperformed the Cuban varieties of sugarcane being grown in the Hawaiian Archipelago at that time, as the cane introduced by Captain Edwards produced cane with a very sweet quality and a remarkably fast growing time (Kew Royal Gardens 1894:418–419). This newly introduced cane came to be known as Lāhainā Cane and, to the exclusion of others, was the premier type of sugarcane grown in Hawai‘i (Stubbs 1900:59, 66). With the introduction of improved technology and the first steam-driven mill, the next 20 years saw an explosion in the sugarcane industry in Hawai‘i with over 22 plantations or mills operating on the island of Maui by 1884 (Wilcox 1996:2–5). Two of the 22 plantations in operation toward the end of the nineteenth century, West Maui Sugar Company and Pioneer Mill Company, led the sugar industry in the Lāhainā District.

3.2.4.2 West Maui Sugar Company

In 1864, Lot Kamehameha (Kamehameha V) ventured into the sugar industry with two established sugar entrepreneurs, F.W. Hutchison, of the Lahaina Sugar Company, and James Makee, of the Rose Ranch sugar plantation in Ulupalakua, to form the West Maui Sugar Company. To start, the King leased the crown lands in Olowalu and Ukumehame to the West Maui Sugar Company (Olowalu 2008). An additional tract of 2,194 acres of crown land in Wahikuli was also leased by Lot Kamehameha in 1854, nine years prior to his coronation as king; it is unclear, however, if these lands were included in the lands under cultivation by West Maui Sugar Company. Overall, sugar production was fair for the fledgling company. Lacking a mill, however, the company sent its crop to PiMCo for processing (Olowalu 2008).

In the late 1860s, Z.S. Spalding became a partner in the West Maui Sugar Company and, taking over as manager, had West Maui Sugar Company acquire the Lahaina Sugar Company mill to end its reliance on the PiMCo mill for processing. The company was formed under the premise that the high prices of sugar set during the American Civil War would continue. However, Louisiana’s sugar beet industry recovered in the mid-1860s, causing American sugar prices to fall. King Lot blamed the company’s financial woes on Spalding, who years before had been a spy for the U.S. government concerning the U.S. interest in annexing the Islands. Finally, after the King threatened

to withhold his land leases (Wilcox 1996:127), Z.S. Spalding was dismissed and James Makee’s son, Parker Makee, filled in as manager (Olowalu 2008). Following the death of Lot Kamehameha in 1872, the land leases under his name were transferred to the West Maui Sugar Company and two years later the associates of the company sold their assets to James Campbell and Henry Turton of the Pioneer Mill Company (Wilcox 1996:127).

3.2.4.3 Pioneer Mill Company

In 1862, a fire swept through the original three school buildings and two dwelling houses of the Lahainaluna Seminary. Repairs were swift, with Lot Kamehameha personally supervising construction efforts to replace the lost buildings and restore the school. By this time, descendants of the early missionaries to the “Sandwich Islands” were returning from schools in the U.S. as ordained ministers, or finding positions as engineers, teachers, or doctors in the Hawaiian Islands. Many missionaries who labored during the “Great Awakening” between 1837 and 1842 were “sustaining pastoral relations” and retiring from active missionary service. Samuel T. Alexander had been sent from his family home at Lahainaluna to study at Oahu College (Punahou School), and at Williams College in Massachusetts. S.T. Alexander returned to Lahainaluna in 1862 as a teacher and is credited with improving sugarcane and banana yields there with his students. By 1863, S.T. Alexander was named manager of the Waihee Sugar Plantation (Dean 1950).

As the Hawaiian population of West Maui declined during the nineteenth century, missionaries and entrepreneurs moved into the district, reshaping the landscape for western enterprises and pursuits. Reverend Dwight Baldwin (1798–1886) had arrived in the Hawaiian Islands in 1831 and was stationed at Lāhainā between 1835 and 1870. In the early 1850s, Rev. Baldwin was granted 2,675 acres of land in northwest Maui. This land holding became the basis for enterprises expanding over areas of West Maui undertaken by his son, Henry Perrine Baldwin, during the nineteenth century (Dean 1950).

Henry Perrine Baldwin excelled at studies at Oahu College. While working for his brother’s sugar plantation in Lāhainā to raise money for an anticipated medical school education, he was hired away by S.T. Alexander to be head *luna* (boss) at the Waihee Plantation. In 1869, both S.T. Alexander and H.P. Baldwin resigned and established the Haiku Plantation. In 1876, they started a project to bring East Maui water to the dry leeward isthmus of Central Maui. It was modeled after a successful irrigation project undertaken on Kaua‘i in 1866 and demonstrated a process which would be repeated many times throughout the Hawaiian Islands (Wilcox 1996). The system by which mountain water was brought to the PiMCo fields in Lāhainā from Honokōhau was modeled on the same principle.

The Pioneer Mill Company was established as a partnership in 1863 between James Campbell, Henry Turton, and Benjamin Pittman. A plantation village, the Kā‘anapali Village, and a production facility were established at Pu‘u Keka‘a along with a shipping port at Kā‘anapali Landing. In order to increase the amount of land under cultivation and the crop yields, the new plantation worked out long-term land leases along with the appurtenant water rights from regional small landowners (Simpich 1974). The growing of sugarcane along the west coast of Maui required the development of sources for mountain water. Using gravity flow water from mountain streams, PiMCo produced 500 tons of sugar in 1866 (Dorrance and Morgan 2000). With the acquisition of lands and water rights controlled by the West Maui Sugar Association in 1874 (Waal 1897), PiMCo was able to significantly expand its land holdings and crop yields. In 1872, production had

reached 1,000 tons annually, and by the turn of the century, production had cleared over 10,000 tons of sugar a year (Thrum 1900:41).

In 1877, Harry Turton bought out his partners and was the sole owner of the Pioneer Mill Company; by 1879, almost 4,500 acres of land were under contract to the company (*Maui News* 1926). In 1885, H. Hackfield & Company, later American Factors (AmFac/JMB), the sugar agency representing the Pioneer Mill Company, purchased the controlling shares in the company and negotiated additional leases to acquire large tracts of land in Kaua‘ula. These lands were controlled by the Bernice Pauahi Bishop Estate and included water sources essential to the expansion of the plantation.

By 1890, Pioneer Mill holdings had grown to 10,000 acres of regional watershed, cultivatable land, and transportation right-of-ways (personal communication, Lahaina Restoration Foundation, 2008). With increasing acreage under cultivation resulting in higher crop yields, PiMCo was one of the first to put in a rail system for hauling cane from the fields to the mill (Condé and Best 1973:252). In the early days of PiMCo, the sugar grown along the coast of Lāhainā was wholly dependent on the flow of mountain water. The development of additional water sources and pumping water to areas not previously irrigated became the means of expanding and maintaining sugar cultivation along the alluvial plains of Lāhainā. Minimal development is shown within the current project area on a Monsarrat (1915) map of Pioneer Mill Company (see Figure 8). A Wall (1913) map describes the land within the project area as “covered with many large boulders” and requiring “hand cultivation” (Figure 12). A 1929 map shows development around Lāhainā town to the south and near Keka‘a Point to the north (Figure 13). A 1933 Maui Island USGS topographic quadrangle depicts a railway line near the coast and a large unimproved road along the eastern boundary of the current project area (Figure 14).

3.2.4.3.1 Drilling for Well Water

Between 1860 and 1881, aside from limited diversions of the various streams issuing from the valleys in back of Lāhainā, Olowalu, and Ukumehame, no large-scale development for irrigated water had been attempted by PiMCo or any of the other sugar enterprises of West Maui. The McCandless Brothers, an engineering enterprise from Honolulu, were hired in 1883 to drill the first well for PiMCo at Kā‘anapali. While ample water was found, Turton considered the drilling a failure as he was hoping for an artesian source at Kā‘anapali that did not require the more costly expenditure of pumping (McCandless 1936). In 1896, the Pioneer Mill Company hired the McCandless Brothers again to resume drilling near their first drilling location. This resulted in the development of nine wells at Kā‘anapali, as well as a system of pumps that would make this location a success as a source of water. The successful installation of wells at Kā‘anapali, Wahikuli, Māla, and Waine‘e in 1897 effectively doubled the production of sugar at PiMCo (Gilmore 1931; Stearns and MacDonald 1942). The Wahikuli Pump Ditch, among others, is depicted on an undated map by PiMCo (Figure 15). Note the map also shows the locations of two plantation camps, Kelawea Camp and Wahikuli Camp. A 1953 PiMCo map shows the extensive pump system that was established surrounding the project area (Figure 16).

An additional 14 wells were developed in 1900, with 12 more in 1921, for a grand total of 36 wells at the Kā‘anapali turbo-electric pumping stations. With this successful development, the McCandless Brothers continued to drill 26 more wells in the vicinity of Lāhainā. The Lāhainā

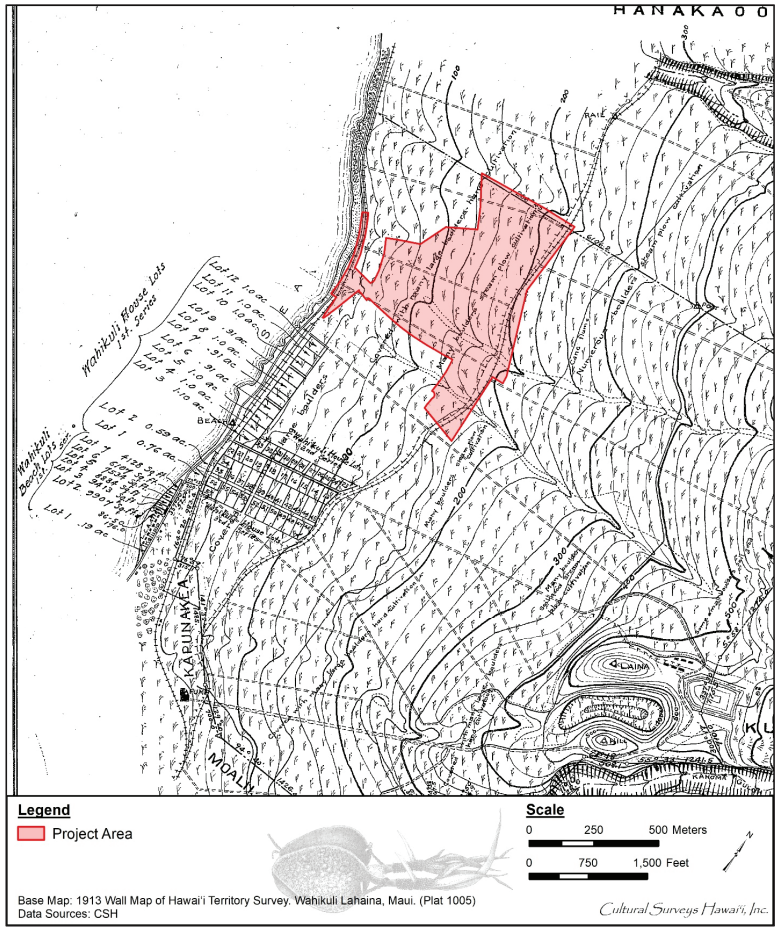


Figure 12. Portion of Wall (1913) map showing the land of the project area as “covered with many large boulders hand cultivation”

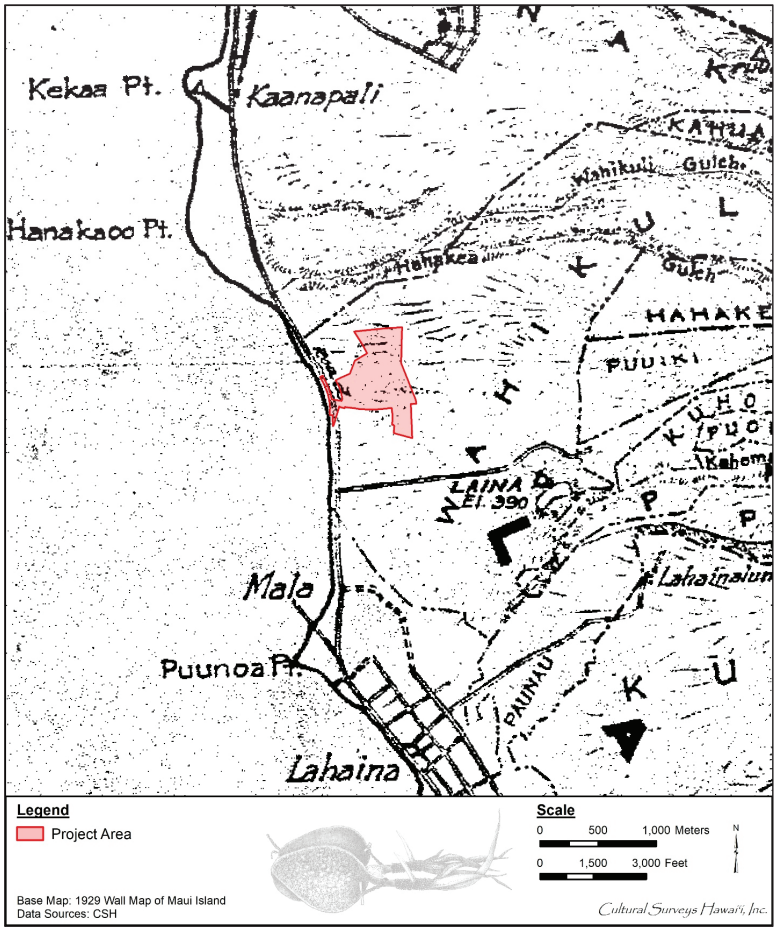


Figure 13. Portion of Wall (1929) map showing the gulches and development near the project area

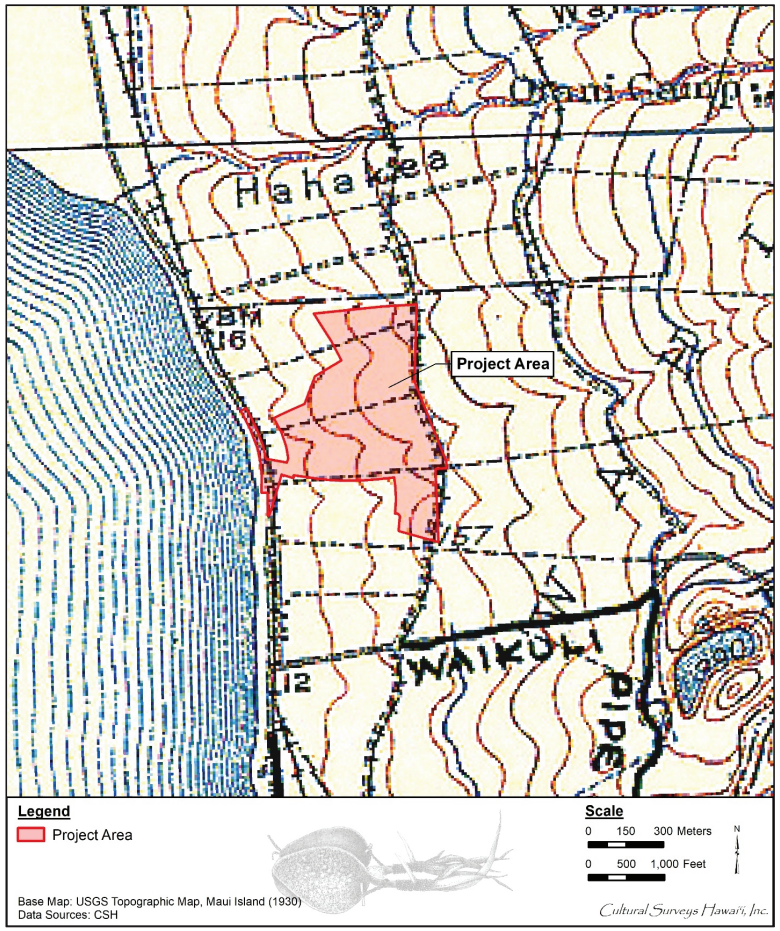


Figure 14. Portion of the 1930 Maui Island USGS topographic quadrangle showing the project area and surrounding railway lines, unimproved roads, and the Waikuli Pipe

Figure 15. Undated Pioneer Mill Company map showing ditch systems and camps (Pioneer Mill Company n.d.)

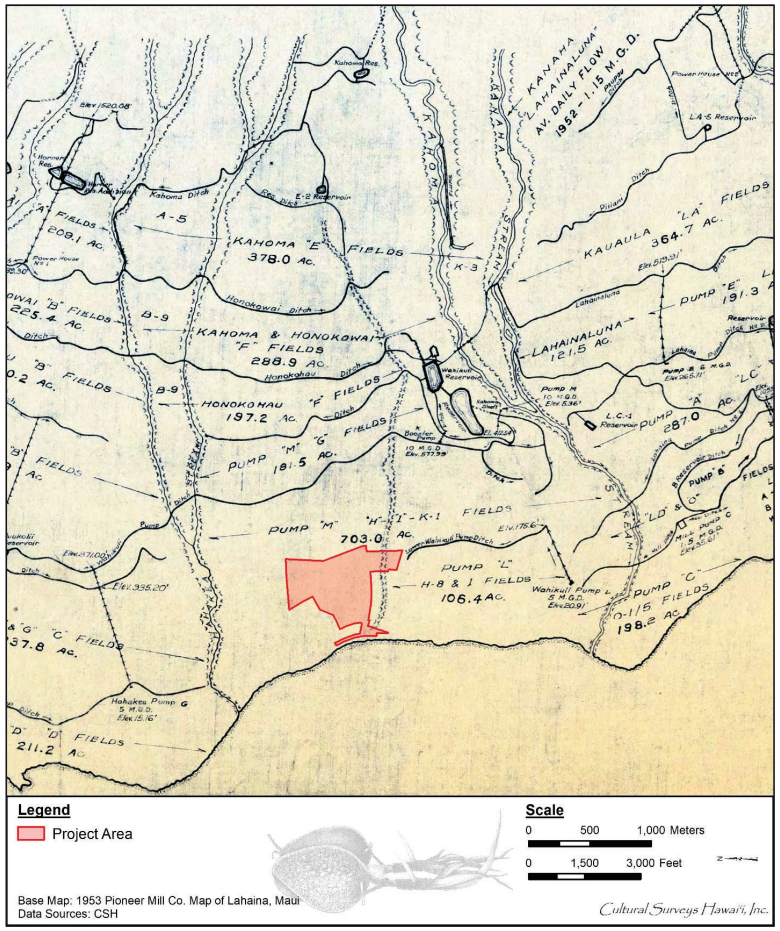


Figure 16. Pioneer Mill Company (1953) showing the pumps and cane fields around the project area

wells were sunk 100 to 300 ft deep into formations representing a mixture of “clay, gravel, and boulders, down to the basalt bedrock” (McCandless 1936).

“Maui-type well” is a name applied throughout Hawai‘i to a particularly successful type of well, a vertical mine-like shaft to the basal water table, with one or more horizontal infiltration tunnels skimming off the fresh water from the underlying salt water (Stearns and MacDonald 1942:126). The substantial increase in the volume of irrigation water from Maui-type wells provided the Pioneer Mill Company (Table 1) with the ability to further expand its cultivated acreage; between 1895 and 1905, the number of acres harvested increased from 525 to 3,000 (Gilmore 1936).

3.2.4.3.2 Tunneling for Perched Water

In 1898, PiMCo installed a simple galvanized iron flume in the Honokōwai Stream, but the mechanism by which arid coastal lands could receive mountain waters was perfected in 1904 on Maui’s western coastline with the building of the Honokōhau Ditch. The Honokōhau Ditch consisted of tunnels and flumes 14 miles long, and it delivered 20 million gallons per day (mgd) to the PiMCo fields. In a similar manner, each of the other ditch systems was developed to provide large-scale water resources to fields along the Kahoma, Kanahā, Kaua‘ula, Launiupoko, Olowalu, and Ukumehame stream valleys (Wilcox 1996:134). To fully develop each stream valley, a series of tunnels were driven high into the water-bearing valley walls by company engineers (Table 2).

According to Stearns and MacDonald (1942) the dike complexes and dike swarms at the headlands of each stream valley were found to contain abundant water. The West Maui dike swarms not only stored water from areas of high rainfall in the mountains, but dispersed water in all directions. The dikes were found to crop out at the head of every major valley and supply practically all the perennial streams (Stearns and MacDonald 1942:165).

The successful drilling of Tunnel 16 in 1901 at Kaua‘ula produced a steady flow of 4,325,000 gallons in a 24-hour period as reported in 1903 (Barkhausen 1903), however, by 1904 the flow at Tunnel 16 dropped to 2,000,000 gallons per day, as reported in the table below (Stearns and MacDonald 1942:213). Tunnel 16 was considered relatively short and its cost, at $3,813.53, was one-third the cost of continuing work on the Kahoma flume. The year-end plantation report for 1904 reported that a similar drilling project at Tunnel 18 at Kahoma produced a steady flow of over 1.5 million gallons a day. Developing water resources by drilling tunnels into lava formations at high elevations to intercept large flows of water carried by lava tubes was a program successfully undertaken at nine other Pioneer Mill Company locations (Wadsworth 1936). Further work by the plantation in 1910 to increase sources for fresh water resulted in the replacement of the Kahoma flume with a tunnel 5,300 ft long, resulting in better capture of storm runoff water (Weizheimer 1911). Between 1908 and 1912, PiMCo consistently shipped over 25,000 tons of sugar annually out of Kā‘anapali Landing at Pu‘u Keka‘a, a production increase of over 150% following the improved supply of irrigation water made available in the early 1900s (Thrum 1912).

3.2.4.3.3 The Honokohau Ditch Project

Additional sources of water were required for the successful expansion of acreage under cultivation. To this end, a large-scale ditch project was proposed that would put the Pioneer Mill Company on par with sugar operations in Maui’s central isthmus. The largest water sources on the Lāhainā side of the island were the Honokōhau and Honolua streams, on lands owned by H.P.

Table 1. Maui-type wells on Pioneer Mill Company lands (adapted from Stearns and MacDonald (1942)

USGS No.	Plant. No.	Name	Date	Elev. (ft)	Depth (ft)	Capacity mgd	Aquifer
2	F	Honokowai	1921	65	65	5.00	Wailuku basalt
3	D, H	Kaanapali	1897	27	25	15.00	Wailuku basalt
4	G	Hāhākea	1923	14	12	5.00	Wailuku basalt
5	M	Kahoma	1933	322	323	10.00	Wailuku basalt
6	L	Wahikuli	1897	26	27	5.00	Wailuku basalt
7	C	Pioneer Mill	1897	34	39	10.00	Wailuku basalt
8, 9	B, A, E	Wainee	1897	30	31	13.90	Wailuku basalt
10	N	Olowalu	1933	165	300	5.25	Wailuku basalt
11	O	Olowalu	1905	20	20	3.00	Wailuku basalt
12	P	Ukumehame	1934	79	143	4.75	Wailuku basalt

Table 2. Tunnels driven for perched ground water by the Pioneer Mill Company (Stearns and MacDonald 1942:213)

No.	Valley	Elev. (ft)	Yield (gallon/ day)	Length (ft)	Geologic Structure/Perching Formation
13	Olowalu	1,710	100,000	3,000	Vent breccias of Wailuku caldera complex cut by dikes
14	Olowalu	775	Dry		Dike swarm in Wailuku basalt
15	Launiupoko	1,425	100,000	1,320	Tunnel cuts through 20 dikes in Wailuku basalt
16	Kauaula	2,920	2,000,000	656	Tunnel cuts through 194 dikes
17	Kahoma	1,923	Dry	2,500	Tunnel cuts through 19 dikes
18	Kahoma	1,984	1,900,000	3,080	Tunnel cuts through 47 dikes
19	Kahoma	2,350	10,000	739	Tunnel cuts through 16 dikes
20a	Honokōwai	1,700	2,000,000	1,250	Tunnel cuts through 18 dikes
20b	Honokōwai	1,600	500,000	1,050	Tunnel cuts through 7 dikes

Baldwin and the Honolua Ranch Company. The construction of the Honokōhau Ditch began in 1902. The ditch started at an elevation of 700 ft AMSL with intakes at Honokōhau, Kaluanui, and Honolua streams. The ditch and flumes ran along soft hillsides where landslides frequently choked the ditch and damaged the flumes, but teams of workers kept the waterways clear. Work was completed in May 1904 with capacity averaging 25 mgd (Wilcox 1996).

The Honokōhau Ditch supplied water to nine reservoirs with a combined storage capacity of 70 million gallons. Not having to pump water to field elevations at 700 ft AMSL represented an immediate savings. As a result, more than 1,000 new acres were placed in irrigation, offsetting nearly $30,000 in permanent improvement costs (Barkhausen 1905).

3.2.5 Contemporary Land Use

At the beginning of the twentieth century, most of the field jobs were performed by contract gangs. Each type of contract gang was paid at a different rate, which was sometimes dependent on the difficulty of the terrain. Gangs were organized for planting, harvesting, cutting, packing, laying flumes, laying portable railroad track, and other similar field jobs (Eckart 1911). Preparation of the fields was accomplished by either a tractor/steam plow where the fields are virtually rock free (approximately 60% of the fields under cultivation in 1934) or via hand preparation with handpicks and shovels in rocky areas that would not be suitable for plowing (approximately 40% of the fields under cultivation in 1934) (Gilmore 1936:199–200).

With the availability of ample water, one method by which sugarcane was transported to the main railroad lines of the Pioneer Mill railway was fluming. PiMCo operated flumes averaging about 3,500 ft long, which required 75,000 to 175,000 gallons of water per hour to flume sugarcane downslope. A full flume gang consisted of 68 men, of whom 24 were assigned to *hāpai kō*, carry the harvested sugarcane to a spot where the cane would be handled by the chute workers. The remaining members of the flume gang typically were comprised of eight men assigned to the chute, six flume carpenters for repairing field breaks and leaks, six overseers, and 24 flume workers to clear jams and unload the sugarcane into railroad cars (Carter 1934).

By 1910, PiMCo employed over 1,600 workers and cultivated over 8,000 acres of sugarcane. By 1920, the lands under cultivation stretched from Ukumehame to Honokōwai. Through the years, the company changed hands and the new owners kept on the leading edge of industrialization, implementing changes such as increasing the number of rollers in the mill until it reached its peak production of 34,980 tons in 1924. In 1931, the company acquired the Olowalu Sugar Company, further increasing its holdings.

Beginning in 1912, a two-year project to completely rebuild the Honokōhau Ditch was undertaken by David T. Fleming, manager of the Honolua Ranch. The new ditch was able to collect and deliver 25 million gallons of water per day—all of which was sold to PiMCo (Wilcox 1996). The much-needed water saved the harvest of 1914, when the crops were about to be abandoned due to a drought (Weizheimer 1914).

By 1930, PiMCo’s power and irrigation water pumping system required a new source for the Kahoma region. A concrete-lined well shaft was constructed to a diameter of 12 ft and sunk 325 ft underground (Watts 1939). A steam plow engine was modified to provide power for an elevator designed to lower workers into the well. The resulting Maui-type well was able to pump fresh water at a rate of 10 mgd.

In the rocky fields that would not allow for plowing, sugar cultivation was accomplished in the following manner:

> In these fields the rocks are cleared away and built into a series of stone walls from 5 to 6 feet apart and often 3 feet high. These stone walls form the banks of the cane row; and between these walls the ground is softened up with a pick and the seed then planted. [Gilmore 1936:200]

Gilmore (1936:200) noted that though extremely difficult and time consuming to plant, the soil of these rocky areas was very fertile and yielded between 90 to 100 tons of sugarcane per acre, presumably making it worth the time and manpower to continue cultivation in these labor intensive areas.

By 1940, acreage harvested had peaked at 5,237, including 550 acres from the purchase of the Olowalu Plantation in 1931 (Meyers 1954). After World War II, improvements in heavy equipment and mechanized farming brought on more efficient field clearing and planting methods, and from 1947 to 1950, PiMCo started a rock removal program to increase overall sugar production (Pioneer Mill Company 1951). The program used heavy equipment to bulldoze rocks from the fields, which were stacked into large piles that still dot the landscape today. At this time, many of the terraced fields described above were either abandoned in hard-to-access areas with a higher degree of slope relief or cleared via this new machinery. While the railroad had provided an efficient means of transporting sugar prior to the 1950s, by 1952 it was no longer economically feasible to keep the railway operating. In response to the increasing expenses of maintenance and operation, the rail system was replaced with the more efficient cane haul trucks and a feeder conveyer and crane system for loading (Nishimoto et al. 2003:101–102).

PiMCo thrived throughout major dips in the American economy; however, all ventures are susceptible to market change, and PiMCo was no exception. Faced with foreign competition that had lower land and labor costs, the company closed in 1999 (Kubota 1999). Today, fallow fields, the smokestack, and a 6-mile segment of the track are all that remain of the Pioneer Mill Company. In 1970, the Kaanapali & Pacific Railroad used the 6-mile segment of track to create a tourist Sugar Cane Train ride *mauka* of Lāhainā Town. Although the sugarcane industry has disappeared from this area of Maui the industry has left a lasting imprint on the landscape of West Maui.

With the primary emphasis on tourism and the promotion of Lāhainā and Kā‘anapali as a destination resort and vacation area, along with economic pressure from low sugar prices, AmFac was forced to phase out regional sugar cultivation and milling operations. The last sugar harvest for Pioneer Mill occurred in 1999, and the mill closed in 2003, thereby ending the chapter on the “Sugar Era” of West Maui (Kubota 2004).

A series of aerial images depicts the region of the project area between 1949 and 1987 (Figure 17 through Figure 21). Overall, the project area has consisted of agricultural cane fields with very little development in the immediate region. Meanwhile, the coastal area to the south increasingly became populated with residential and commercial activities. The Lāhainā Civic Center is shown adjacent to the project area in a 1978 aerial image (see Figure 20).

In the years immediately following statehood in 1959, the Kā‘anapali area north of Lāhainā was master-planned as a resort destination. AmFac developed the cane lands located in Kā‘anapali into the Royal Kaanapali Golf Course and the first hotel along the coastline, the Sheraton Maui Hotel,

Figure 17. 1949 orthophotoquad of Wahikuli showing the project area (UH SOEST 1949)

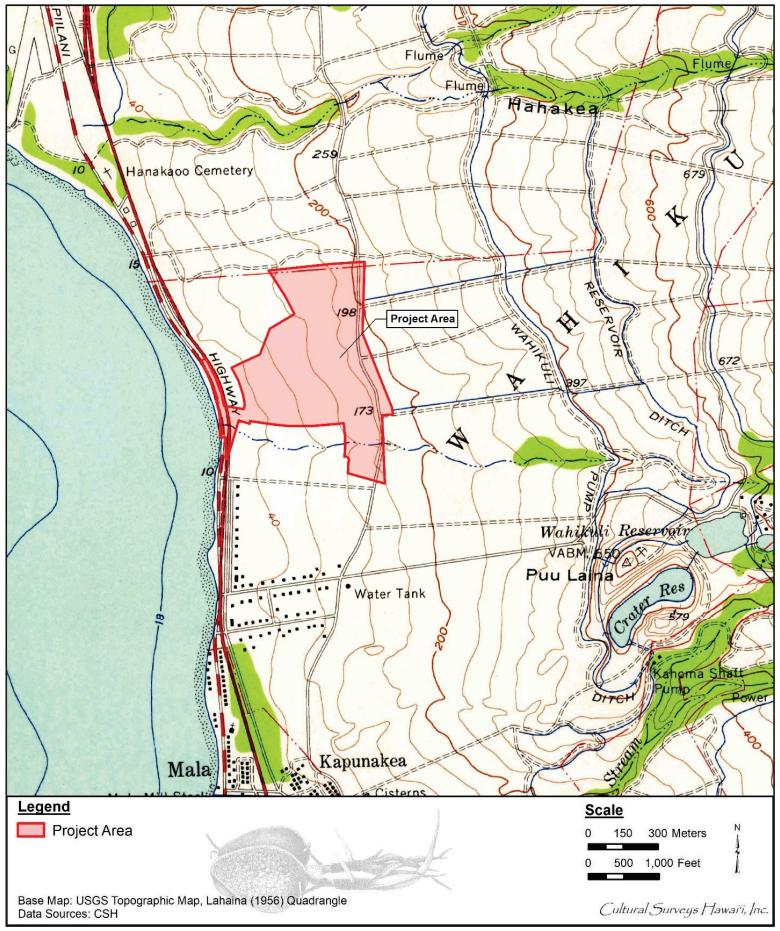


Figure 18. Portion of the 1956 Lahaina USGS 7.5-minute topographic quadrangle showing the project area

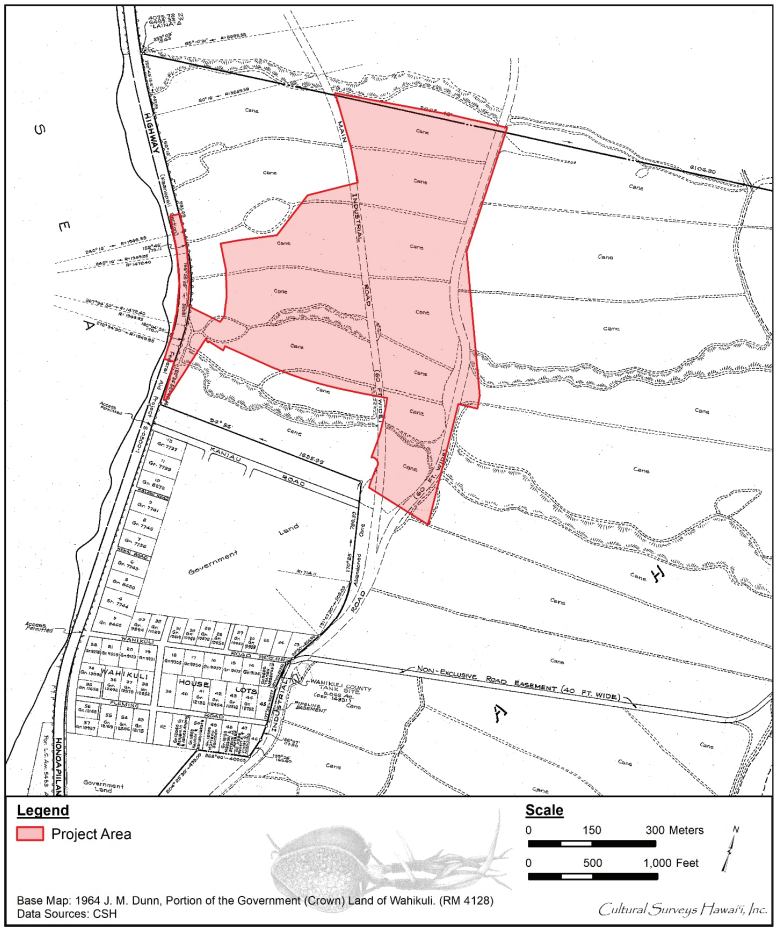


Figure 19. Dunn (1964) portion of the Government (Crown) Land of Wahikuli map (RM 4128) showing the project area and development to the south; the road within the project area is labeled “Industrial Road (60 ft. Wide)”

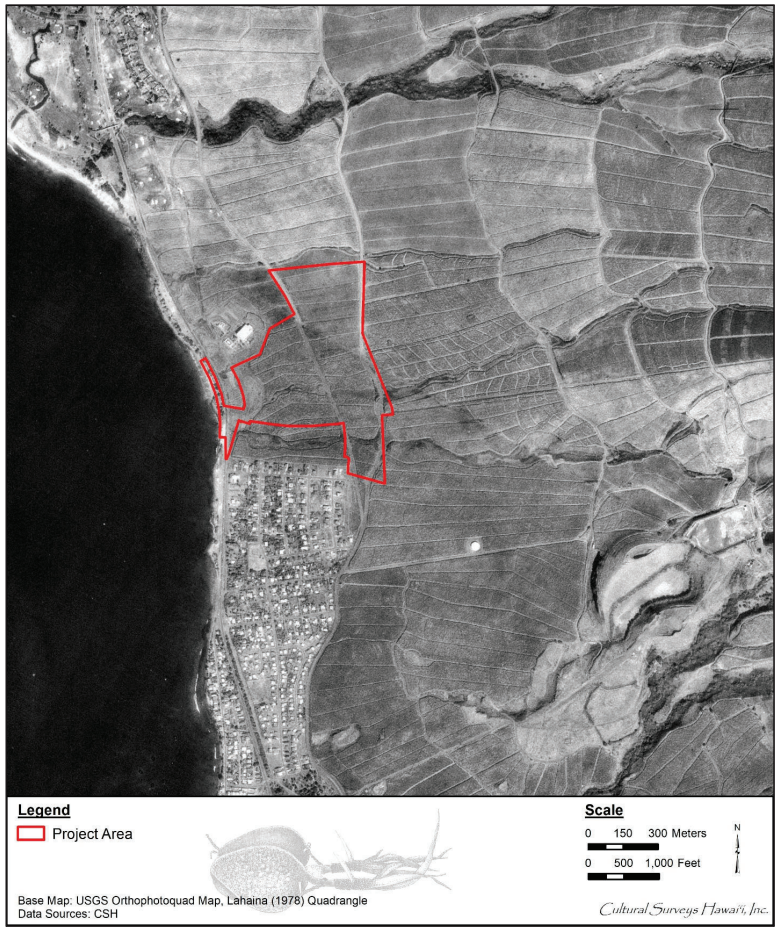


Figure 20. Portion of the 1978 Lahaina USGS orthophotoquad showing the project area and immediate vicinity

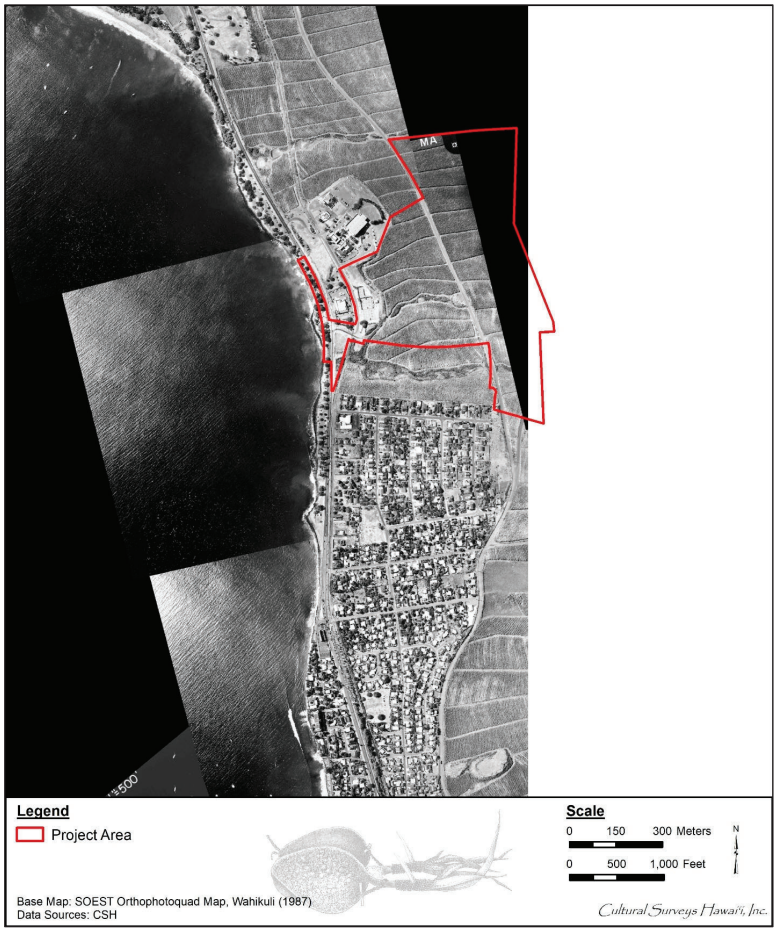


Figure 21. 1987 orthophotoquad of Wahikuli showing the project area (UH SOEST 1987)

opened on Kā‘anapali Beach in 1963. Following the development of the Kā‘anapali Beach Hotel and the Whalers Shopping Village in 1970, the Maui Surf Hotel opened in 1971 at what is known today as the Westin Maui Resort & Spa’s Ocean Tower (Fischer 2013).

Recently, as part of the DHHL general and regional plans for Honokowai and Wahikuli, the Villages of Leiali‘i Phase 1-A subdivision were completed. This subdivision consists of 104 house lots averaging 6,500 sq ft and associated amenities including roadways, water, sewer, fire protection, drainage improvements, and landscaping. The first beneficiaries of this project began occupying homes in 2007, and all homes in the subdivision were occupied by December 2007.

3.3 Archaeological and Historic Properties

A discussion of previously identified archaeological resources in the project area vicinity is included in this CIA to inform understandings of land and local communities from the initial Hawaiian discovery and settlement of the islands through the historic era, and to provide additional context for the historic documentation, traditional cultural practices, and oral histories associated with the project area and vicinity.

No *heiau* or other sites were documented in the immediate vicinity of the current project area. Historic properties in the vicinity of the current project area have been identified along the stream valleys to the north and south and primarily include pre- and post-Contact agricultural complexes and burial sites, and pre-Contact habitation areas and fishponds (Figure 22 and Table 3).

A total of 111 historic properties are located in the project area vicinity. These include pre-Contact to post-Contact agricultural sites, habitation sites, historic roads/trails, religious/ceremonial areas, and cemeteries/burials.

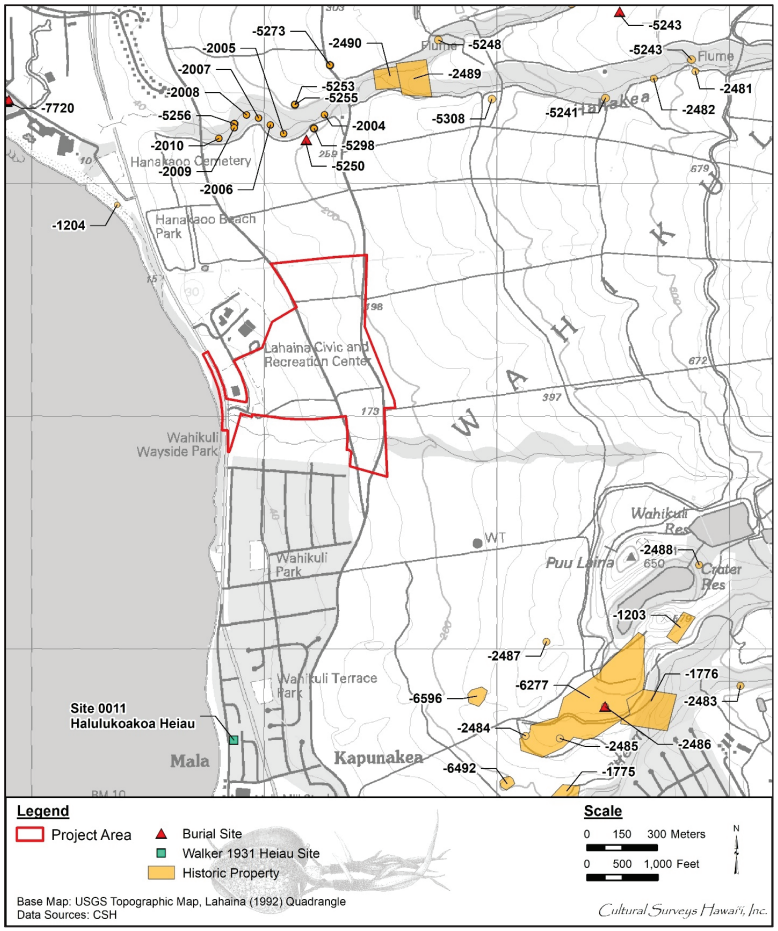


Figure 22. Previously identified historic properties within the vicinity of the project area

Table 3. Archaeological historic properties in the project area vicinity

State Inventory of Historic Places (SIHP) Number (50-50-03****)	Type	Results	Reference
Site 0011	Halulukoakoa Heiau	Large *heiau* for human sacrifice of which few wall fragments remain	Walker 1931
SIHP # -0226	Burial area near the stream mouth (beyond vicinity of current project area)	Contains at least 25 burials, marked by a cement tomb, a headstone, and 23 low stone platforms	Connolly 1974
SIHP # -1203	Kahoma Complex	Includes agricultural terraces (Features A, C, and D), raised and faced habitation terrace (Feature B), and a small habitation cave (Feature E) located on southern side of north Kahoma Stream branch; Features on opposite side of floodplain include agricultural terraces (Features F and H) and terracing with a possible habitation area associated (Feature G)	Jensen 1989
SIHP # -1204	Hanakao‘o (Hahakea) grinding stones	Neller (1982) noted the Grinding Stone Site (SIHP # -1204) previously had been recorded in 1973-1974 by SHPD, and it was used for finishing pre-form adze blanks.	Keau 1981, Neller 1982

State Inventory of Historic Places (SIHP) Number (50-50-03****)	Type	Results	Reference
SIHP # -1775	Kahoma Stream Terrace System	Includes “36 terraces with stone-reinforced retaining walls (probably historic), seven cement structures (historic), and four free-standing walls, and two ditches [water-diversion channels]” (Connolly 1974:6); structures were remnants of Yamashiro Dairy	Connolly 1974
SIHP # -1776	Haia Terrace System at the stream confluence	Contained a house site with probable pre-Contact foundation	Connolly 1974
SIHP #s -2001 through 2010	Terraces, walls, probable road	SIHP #s -2001 through -2003 (terraces/walls) in northern gulch, -2004 through -2006 (terraces), -2008 (probable road), -2009 (terrace complex), and -2010 (wall) in southern gulch; SIHP #s -2001 through -2010 contained “more than 30 features, including more than 23 terraces, as well as 3 probable fragments of roads or broad trails, 3 walls and a possible religious site [an upright stone at SIHP # -2001]” (Hommon 1982:19)	Hommon 1982
SIHP # -2478	Terrace	Agricultural terrace near Hahakea Gulch; note SIHP # -2478 is outside area shown in Figure 22	Jensen 1989
SIHP # -2479	Terraces	Two agricultural terraces near Hahakea Gulch; note SIHP # -2489 is outside area shown in Figure 22	Jensen 1989

State Inventory of Historic Places (SIHP) Number (50-50-03****)	Type	Results	Reference
SIHP # -2480	Enclosures	Two contiguous walled enclosures near Hahakea Gulch; note SIHP # -2480 is outside area shown in Figure 22	Jensen 1989
SIHP # -2481	Terraces	Two agricultural terraces near Hahakea Gulch	Jensen 1989
SIHP # -2482	Terrace	Agricultural terrace near Hahakea Gulch	Jensen 1989
SIHP # -2483	Complex	Walled enclosure and eight segments of agricultural terraces on south branch of Kahoma Stream	Jensen 1989
SIHP # -2484	Enclosure	Walled enclosure or L-shaped wall near western end of existing agricultural airstrip above Kahoma Stream Gulch	Jensen 1989
SIHP # -2485	Enclosure	Walled enclosure near existing agricultural airstrip above Kahoma Stream Gulch	Jensen 1989
SIHP # -2486	Grave Ccmplex	Large formal cairn/marker and 13 mounds interpreted as probable graves/grave markers approx. 200 m southwest of Puu Laina	Jensen 1989
SIHP # -2487	Historic road	Approx. 270-m long historic agricultural access road west of Crater Reservoir	Jensen 1989
SIHP # -2488	Enclosure	Walled enclosure east of Crater Reservoir	Jensen 1989

State Inventory of Historic Places (SIHP) Number (50-50-03****)	Type	Results	Reference
SIHP # -2489 and -2490	Two agricultural complexes	SIHP #s -2004 through -2010 (Hommon 1982), -2489 and -2490 contained total of 49 component features, including “agricultural terraces, small habitation terraces, walled enclosures, walls, a possible grave, a single footpath, and agricultural access roads” (Jensen 1990:14); functions of sites tentatively included “temporary habitation, possible habitation, possible burial, transportation, and prehistoric and contemporary agriculture” (Jensen 1990:14)	Jensen 1990
SIHP # -2693	Subsurface cultural layer	Prehistoric cultural deposit included sparse midden, volcanic glass flakes, and charcoal and ash lenses suggestive of habitation-related activities (Haun 1988:14); second site consisted of buried pond-field sediments; background research indicated two fishponds had been in area in mid-1800s and area also had been used to grow taro	Haun 1988
SIHP # -2893	Puukolii Cemetery	Plantation era cemetery	Fredericksen and Fredericksen 2003

State Inventory of Historic Places (SIHP) Number (50-50-03****)	Type	Results	Reference
SIHP #s -5241 through -5321	Pre-Contact to post-Contact agricultural sites, habitation areas, petroglyph panel sites, plantation era sites, and possible ceremonial areas, shrines, burial features	“[…] single and multiple component dry land agricultural sites, and one large, wet valley agricultural site in Honokowai Gulch. These agricultural sites are composed primarily of terraces. Other identified site types included temporary and more permanent habitation areas, several petroglyph panel sites, possible ceremonial areas and shrines, possible burial features, and plantation era sites” (Fredericksen and Fredericksen 2003:Abstract)	Fredericksen and Fredericksen 2003
SIHP # -6277	Early historic agricultural complex of terraces and irrigation ditches	Documented over 400 agricultural terraces and associated irrigation channels	Lee-Greig et al. 2008
SIHP # -6492	Historic agricultural push pile	Remnant of agricultural field improvement activity	Lee-Greig et al. 2008
SIHP # -6596	Historic agricultural push pile	Remnant of agricultural field improvement activity	Lee-Greig et al. 2008
SIHP # -7720	Burial preserve area	11 finds of human remains reinterred within a burial preserve area	Frey and Fredericksen 2015

Section 4 Consultation Results

4.1 Introduction

Throughout the course of this assessment, an effort was made to contact and consult with NHO, agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise and/or knowledge of the *ahupua‘a* of Wahikuli. CSH initiated its outreach effort in October 2021 through letters, emails, and/or telephone calls. CSH completed the community consultation in July 2022.

4.2 Community Contact Letter

Letters along with maps and aerial photographs (Appendix A) of the project areas were mailed with the following text:

> *Aloha mai kāua*,
>
> With this letter, Cultural Surveys Hawai‘i (CSH) humbly requests your *mana‘o* and *‘ike* (experience, insights, and perspectives) regarding past and ongoing cultural, practices, beliefs, and resources within Wahikuli Ahupua‘a.
>
> Consultation with traditional cultural practitioners, *kūpuna*, *kama‘āina*, and Hawai‘i’s diverse ethnic communities is an important and deeply valued part of our work and the environmental review process for proposed projects in Hawai‘i. Your contributions will revitalize and keep alive knowledge of cultural practices, storied places, and life experiences that will remind Hawai‘i’s children of their history for generations to come.
>
> Project Description
>
> On behalf of the Department of Hawaiian Home Lands (DHHL), CSH is conducting a cultural impact assessment (CIA) for the DHHL Villages of Leiali‘i Phase 1B Project, Wahikuli Ahupua‘a, Lāhainā District, Maui TMK: [2] 4-5-021:020, [2] 4-5-021:021 por., [2] 4-5-021:010 por, [2] 4-5-036:112, [2] 4-5-021:015, and the Honoapi‘ilani Highway Right of Way. The location and boundaries of the proposed project are delineated on a 1992 Lahaina USGS topographic map quadrangle (Figure 1) and a 2019 aerial photograph (Figure 2) attached to this invitation.
>
> The DHHL proposes to develop the Phase 1-B subdivision on lands identified by Tax Map Key (TMK) (2)4-5-021:020, an approximately 51-acre area of land owned by the DHHL located north of Leiali‘i Parkway and the existing DHHL Villages of Leiali‘i Phase 1-A (Phase 1-A) subdivision. Phase 1-B, as currently planned, consists of single family homes, and possible multi-family units, totaling approximately 250 units. Access from the subdivision will be provided from Leiali‘i Parkway. The new housing units will be made available to DHHL native Hawaiian beneficiaries currently on the waitlist for a residential lease on Maui. The subdivision will be developed in two (2) phases.

> In order to develop the proposed subdivision, the following offsite improvements are required, and will also be developed as part of the proposed action:
>
> - Development of two (2) new offsite retention basins *mauka* of Phase 1-B, on lands owned by HHFDC
> - Adjustment of the outlet drainage pipes in the existing retention basin *mauka* of Phase 1-A, on lands owned by HHFDC, and enlargement of the basin
> - Grading and development of drainage interceptor ditches *mauka* of Phase 1-B, on lands owned by HHFDC
> - Extension of three (3) existing 48-inch culverts *makai* of Phase 1-A
> - Roadway improvements to Leiali‘i Parkway and Honoapi‘ilani Highway
> - Roadway repairs to existing portions of Leiali‘i Parkway
>
> The drainage improvements discussed above will be located on TMK (2)4-5-021:021, owned by HHFDC, and TMK (2)4-5-021:015, owned by the State of Hawai‘i. The proposed improvements along Leiali‘i Parkway include widening of Leiali‘i Parkway from two (2) lanes to four (4) lanes, restriping, relocation of the traffic signals at the intersection with Honoapi‘ilani Highway, which may involve the relocation of existing traffic signals within Wahikuli Wayside Park, and any needed repairs and improvements as required for future dedication of the roadway to the County of Maui. Restriping along Honoapi‘ilani Highway is also being proposed. In addition, due to the widening of Leiali‘i Parkway, reconfiguration of the access driveway to the Lahaina Post Office will also be required. It is noted that Leiali‘i Parkway is encompassed by two (2) TMKs, identified as (2)4-5-036:112, owned by HHFDC, and (2)4-5-021:010, owned by the State. Honoapi‘ilani Highway is a State of Hawai‘i, Department of Transportation (SDOT) owned highway.
>
> Purpose of this Study
>
> The purpose of a CIA is to gather information on Hawai‘i’s cultural resources, practices, or beliefs that have occurred or still occur within the proposed project area and Wahikuli Ahupua‘a. This is accomplished through consultation and background research using previously written documents, studies, and interviews. This information is used to assess potential impacts by the proposed project to the specific identified resources, practices, and beliefs in the project area and throughout Wahikuli Ahupua‘a. As a traditional cultural practitioner and holder of long-term knowledge, your insight, input, and perspective provide a valuable contribution to the assessment of potential effects of this project and an understanding of how to protect these resources and practices.
>
> Insights focused on the following topics in the project area (shown on the attached Figures 1 and 2) are especially helpful and appreciated:
>
> - Your knowledge of traditional cultural practices of the past within the proposed project area and Wahikuli Ahupua‘a

- Your specific traditional cultural practice and its connection to the proposed project area and Wahikuli Ahupua‘a
- The different natural resources associated with your specific traditional cultural practice
- Legends, stories, or chants associated with your specific traditional cultural practices and their relationships to the proposed project area and Wahikuli Ahupua‘a
- Referrals to other *kūpuna*, *kama‘āīna*, and traditional cultural practitioners knowledgeable about the proposed project area and Wahikuli Ahupua‘a
- Your comments or thoughts on the potential impacts the proposed project may have on your ongoing traditional cultural practices and natural resources within the proposed project area and Wahikuli Ahupua‘a
- Your knowledge of cultural sites and *wahi pana* (storied places) within the proposed project area and Wahikuli Ahupua‘a
- Your comments or thoughts on the potential impacts the proposed project may have on cultural sites and *wahi pana* within the proposed project area and Wahikuli Ahupua‘a

Consultation Information

Consultation is an important and deeply valued part of the CIA and environmental review process. Your contributions will revitalize and keep alive our combined knowledge of past and ongoing cultural practices, historic places, and experiences, reminding our children of their history generation after generation.

With your agreement to participate in this study, your contributions will become part of the comprehensive understanding of traditions of the area; and will be part of the public record. The study will be included as an appendix of the Environmental Assessment (EA) which is being prepared for the proposed project; the EA and CIA will be available for future access through the Office of Environmental Quality Control (https://health.hawaii.gov/oeqc/) and at the State Historic Preservation Division Library (https://dlnr.hawaii.gov/shpd/about/research-resources-library).

As a part of this process, your knowledge may be used to inform future CIAs and other heritage studies of cultural practices and resources that need protection from impacts of proposed future projects. If you engage in consultation, and the *mana‘o* and *‘ike* you provide appears in the study, we would like to recognize your contribution by including your name. If you prefer not to allow your name to be included, your information can be attributed to an anonymous source.

The consultation interview structure and format are flexible. We will accommodate your preference on how to get together; talk story, over the phone, by email correspondence, remotely via Zoom, MS Teams, Google Chat or other remote meeting platforms.

Your knowledge of the resources and potential effect of the project on traditional practices in the project area and Wahikuli Ahupua‘a focusing on the topics in the

bullet points above can also be submitted in a written statement. CSH will provide return postage of your written statement on request.

CSH is happy to provide a list of topics for discussion, a more structured questionnaire of interview questions, or any other assistance that might be helpful.

[...].

Mahalo nui loa for your time and attention to this request for consultation.

On 20 May 2022, CSH was notified that TMK [2] 4-5-021:015 was removed from project area and TMK [2] 4-5-021:014 (Lahaina Post Office) was added to the project area for driveway improvements. CSH notified consulted parties of change to project area but did not receive any additional testimony.

4.3 Community Outreach Table

Table 4 contains the names, affiliations, dates of contact, and comments from NHOs, individuals, organizations, and agencies that participated in the consultation process. Results are presented below in alphabetical order.

Table 4. Community outreach table

Name	Affiliation	Comments
Ampong, Foster	Aha Moku Council Wailuku Representative; Aha Moku Council Burial Committee	Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021
Baybayan, Kalā	Navigator of Mookiha, Maui’s canoe	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Crozier, Pomaikai	Puu Kukui Watershed Preserve Conservation Manager	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Mail returned Letter and figures sent via email 1 February 2021
Dizon, Yolanda	President of Ho‘ea, Inc., and Manager of Ku‘ikahi, LLC	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Eaton, Antonette	District Supervisor, Maui District Office, Homestead Services Division, Department of Hawaiian Home Lands	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Farden, Hailama	President, Association of Hawaiian Civic Clubs (AHCC)	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021
Feiteira, Blossom	President, Association of Hawaiians for Homestead Lands	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Mail returned

Name	Affiliation	Comments
Fisher, Scott	Chief Conservation Officer, Hawaiian Islands Land Trust (HILT)	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021 Dr. Fisher replied via email 1 February 2022 recommending speaking with Colleen Medeiros CSH replied via email 1 February 2022
Garcia, William	Lineal/Cultural Descendant; Royal Order of Kamehameha I	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022 Mail returned
Haia, Louella	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021
Holt-Padilla, Hokulani	Kumu Hula, Pā‘ū o Hi‘iaka/Cultural Specialist	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022 Letter and figures sent via USPS 31 January 2022 Mail returned
Hussey, Sylvia	Ka Pouhana, OHA	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
I‘i, Lehua	Maui Marriott Ocean Club	Letter and figures sent via USPS 31 January 2022
Jaentsch, Phillip	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Johns, Donnalyn	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Kahumoku, George	Musician; Farmer	Ke‘eaumoku Kapu contacted Mr. Kahumoku Mr. Kahumoku called CSH 22 October 2021 Letter and figures via email 22 October 2021 CSH followed up 10 November 2021 CSH followed up 1 December 2021 CSH followed up 2 February 2022
Kapaku, Mona	Department of Hawaiian Homelands	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Kapu, Kalani	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Kapu, Ke‘eaumoku	Chair, Aha Moku o Maui/Koani Foundation (501C3)	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Mr. Kapu replied via email 20 October 2021 recommending contacting Keahi ‘Ohana, Kamana Ng, and Ella Kekai ‘Ohana. Mr Kapu also requested meeting over Zoom. CSH replied via email 21 October 2021 offering to set up Zoom meeting. CSH followed up 10 November 2021 CSH followed up 1 December 2021

Name	Affiliation	Comments
		CSH followed up 2 February 2022
Kapu, Uilani	Treasurer, Na Aikane o Maui	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021
Keahi Ohana	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Kekona, Thomas	*Kama‘āina* (Kailihou ‘Ohana)	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Keliipio, Josephine	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021 Mail returned Letter and figures sent via USPS 31 January 2022 Mail returned
Kiili, Keoki	Royal Order of Kamehameha	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022 Mail returned
Kuloloio, Manuel	Makuakāne, Kuloloi‘a Lineage - I ke Kai ‘o Kuloloi‘a	Letter and figures sent via USPS 19 October 2021 Mail returned Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021
Lahaina Hawaiian Civic Club		Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021
Lake-Farm, Sissy	Executive Director, Maui Museum/ Kumu Hula, Nā Hanona Kūlike ‘o Pi‘ilani	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021
Lindsey, Charlie	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Lindsey, III, Edwin “Ekolu”	President, Maui Cultural Lands	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021 Mr. Lindsey replied via email 2 February 2022 requesting additional information CSH provided Mr. Lindsey with exhibits depicting locations of TMKs, drainage improvements and development phases via email 2 February 2022 CSH followed up 10 March 2022 Summary of email correspondence sent for review 4 May 2022 Mr. Lindsey approved summary 14 May 2022
Medeiros, Colleen	Recommended by Scott Fisher	CSH reached out to Ms. Medeiros via email 3 February 2022 Ms. Medeiros replied 3 February 2022

Name	Affiliation	Comments
		CSH followed up 10 March 2022 CSH followed up 6 April 2022 CSH followed up 24 May 2022 CSH followed up 27 June 2022
Molitau, Kaponoai	Owner, Native Intelligence	Letter and figures sent via email 20 October 2021 Letter and figures sent via email 1 February 2021
Nakahashi, Ikaika	Cultural Historian, SHPD	Letter and figures sent via email 20 October 2021 Mr. Nakahashi replied via email 10 November 2021 recommended contacting Ke‘eaumoku Kapu, ‘Aha Moku o Maui Inc. CSH replied via email 10 November 2021
Nishiyama, Patty	Na Kupuna O Maui	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Thelma, Shimaoka	Office of Hawaiian Affairs	Letter and figures sent via USPS 19 October 2021 Mail returned Letter and figures sent via USPS 31 January 2022
Suter, Lillian	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021
Takitani, Hervey	*Kama‘āina* (Kailihou ‘Ohana)	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
Vierra, Walter	President, Hawaiian Canoe Racing Association	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022
White, Victoria	*Kama‘āina*	Letter and figures sent via USPS 19 October 2021 Letter and figures sent via USPS 31 January 2022

4.4 *Kama‘āina* Interview Discussions

4.4.1 Edwin “Ekolu” Lindsey III

4.4.1.1 Interview synthesis (biographical data, broad discussion of interview topics covered and insights offered)

Edwin “Ekolu” Lindsey III is the President of Maui Cultural Lands, Inc (MCL), a “Maui-based grassroots land trust organization whose mission is to stabilize, protect, and restore Hawaiian cultural resources” (Maui Cultural Lands 2020).

4.4.1.2 Individual’s knowledge of traditional cultural practices of the past within the proposed project area and greater *ahupua‘a* (e.g., gathering, agriculture, Hawaiian herbal medicine, marine and freshwater resources)

Mr. Lindsey stated that there are “cultural resources and practices that are occurring across the street along the shoreline.”

4.4.1.3 Individual’s comments or thoughts on the potential impacts the proposed project may have on ongoing traditional cultural practices and natural resources within the proposed project area and greater *ahupua‘a*

Mr. Lindsey expressed concern that sedimentation from construction activities could impact the ocean and marine resources. He also mentioned that sewage may potentially have “negative impacts to the ocean and resources.” He asked, “Do we have the capacity?” He pointed out that the proposed project will result in “increased density” and “increased traffic,” and stated that he is worried about the impact the increase in traffic will have on “all the kids and beach access.” He stated that “Mitigation projects will be necessary.”

Mr. Lindsey also expressed his concern regarding “water resources.” He asked, “Is there enough?” pointing out that, “We are struggling to have stream flow, let alone more drinking water.”

Section 5 Cultural Practices and Cultural Resources Identified During Consultation as Associated with the Project Area/ Greater Ahupua‘a

5.1 Habitation and Agricultural Practices

No habitation sites or agricultural practices were identified within the proposed project area and Wahikuli Ahupua‘a during the consultation process.

5.2 *Nā Mo‘olelo* and *Wahi Pana*

No *mo‘olelo* and *wahi pana* were identified within the proposed project area and Wahikuli Ahupua‘a during the consultation process.

5.3 Plant Resources

No plant resources were identified within the proposed project area and Wahikuli Ahupua‘a during the consultation process.

5.4 Marine Resources

Mr. Lindsey stated that there are “cultural resources and practices that are occurring across the street along the shoreline.”

5.5 Trails

No trails were identified within the proposed project area and Wahikuli Ahupua‘a during the consultation process.

5.6 Burial Practices

No burials were identified within the proposed project area and Wahikuli Ahupua‘a during the consultation process.

Section 6 Summary and Recommendations

6.1 Summary of Cultural Practices and Resources Identified during Background Research and Consultation

6.1.1 Habitation and Agricultural Practices

According to historic accounts, the precipitous and deep valleys of Kahoma and Kanahā were Lāhainā’s principal taro lands (Handy et al. 1991:492). Fornander (1919) also reported that during the reign of Kaka‘alaneo, the lands spanning from Wahikuli and Hāhākea to the ancient village of Keka‘a were continuously cultivated. Numerous LCA claims describe a variety of agricultural practices existing in Kahoma and Kanahā valleys. House lots, *lo‘i kalo*, *kula* lands, and an *‘ulu* grove (*Artocarpus altilis*, breadfruit) were all noted in the LCA documents.

Archaeological sites identified in the vicinity of the project area provide evidence that lands of Wahikuli Ahupua‘a were utilized for habitation, agricultural endeavors, and burial and ceremonial purposes. Archaeological studies (Dagan et al. 2009; Jensen 1989; Lee-Greig 2008) have identified pre-Contact agricultural, habitation, and burial sites as well as historic-era plantation sites. Historic properties located within and adjacent to Hāhākea Gulch include six agricultural terraces (SIHP #s 50-50-03-2478, -2479, -2481, and -2482) and two walled enclosures (SIHP # 50-50-03-2480) (Jensen 1989). Historic properties recorded on the plateau lands of Wahikuli Ahupua‘a include four walled enclosures (SIHP #s 50-50-03-2483, -2484, -2485 and -2488), a well-constructed circular platform, 13 grave markers associated with this platform (SIHP # 50-50-03-2486), and a historic agricultural access road (SIHP # 50-50-03-2487) (Jensen 1989). Upon completion of further archaeological and data recovery work (Lee-Greig 2008) function and site type designations for site SIHP # -2484 were reinterpreted as a plantation-era vegetable garden. In addition, SIHP # -2485, initially documented as a possible habitation enclosure, was later described as a family cemetery (Dagan et al. 2009).

Other historic properties in the vicinity of the project area were identified as being associated with habitation and agriculture. Along the Kanahā Stream (described in Jensen’s report as “the south branch of the Kahoma Stream”), is SIHP # 50-50-03-2483, which consists of eight agricultural terraces and one habitation site (Jensen 1989). Also located at the interface of the floodplain and cliff face of the Kahoma Stream is SIHP # -1203, described as the “Kahoma Complex.” This complex consists of agricultural terraces and habitation sites, 38 petroglyphs, and a cave (Jensen 1989). Additional sites, SIHP # -1775 (Kahoma Terrace System) and SIHP # -1776 (Haia Terrace System), are located in the Kahoma Stream valley and consist of large terracing systems, which also include habitation, *‘auwai*, and wall features (Connelly 1974).

6.1.2 *Mo‘olelo* and *Wahi Pana*

Historic accounts describe Lāhainā as a traditionally and culturally significant place. From the off-shore fishing grounds that lie between Lāna‘i and West Maui, to the coastline cooled by the *Ma‘a‘a* breeze (the name of the wind associated with Lāhainā), past the plains that were once showered with the *Pa‘ūpili* rains (rain which dampens the *pili* grass) and up into the hills and peaks, the Lāhainā Moku is steeped in traditional Hawaiian mythology. It can be said that the *kalana* of Lāhainā is indeed a *wahi pana* unto itself.

The stories from which tradition speaks tell of the birth in human form of Pu‘ulaina to Eke and Lihau (at Olowalu) and how the three came to be mountains and hills. In pre-Contact as well as historic times, Lāhainā was no stranger to warfare, and Kahoma and Kanahā valleys played important roles in each era as places of both tactical advantage and refuge.

Lāhainā is described as a place where subsistence resources thrive, and as such, was a favorite home of high ranking *ali‘i*. With the high regard of the *ali‘i*, so came the flow of *mana* or power to this area.

Place names traditionally were, and continue to be, of great importance to Hawaiians. Hawaiians named all things, from taro patches to rocks, *heiau*, houses, and tiny areas of significance (Pukui et al. 1974:x). Names imbued places and things with meaning and *mana*. Hawaiians also took pleasure in lyrical expression in the form of poetry and jokes with cleverly mixed meanings or *kauna*.

Moku‘ula, a sacred and religious site of Maui’s ruling *ali‘i*, was located in Lāhainā Moku. The *mo‘o* (lizard) goddess Kihawahine Mokuhinia dwelt in the inland marshes and ponds along the coastal plain, and served as guardian to Maui’s *ali‘i nui*.

6.1.3 Plant Resources

Kahoma and Kanahā valleys, as well as the mountains above, were accessed for the collection of medicinal and food resources, as well as resources that were necessary for maintaining the household. Medicinal plants were also found in and amongst the cane fields that once covered the Wahikuli Plains.

Lāhainā is associated with *Ka-ua Pa‘ūpili o Lele,* the *pili*-soaking rain of Lele (Pukui (1983:172). Pukui explains that the plains of Lāhainā were once covered with *pili* grass in the ancient days and that when the Pa‘ūpili rains came, the grass was well soaked.

Arthur Waal describes the construction style of the last of the *pili hale* (houses of *pili* grass, *Heteropogon contortus*) that were located in Lāhainā and within Kahoma Valley in the following manner:

> The logs for these huts were out in the mountains near Lahainaluna Seminary. After the frame work is up, it is covered with pili grass and woven to the frame in heavy layers. When properly built they are impervious to rain, and the floors, covered with the soft mats of old time Hawaiian manufacture were very comfortable. [Waal 1897:6B]

With regard to the plains of *pili* grass that once covered the mid-elevations of Wahikuli, it is apparent that the area once abundant with this traditionally used plant has been thoroughly altered by extensive modifications to the landscape during historic and modern times (see also Section 3.2.4.3). As a result of large-scale commercial agricultural modifications to the landscape, the dominant vegetation of the study area currently consists mostly of modern plantings in and around the nearby subdivision, including ground cover species such as Bermuda grass, beach morning glory, *naupaka* and *hau* in the beachside areas; plantings of exotic species such as bird-of-paradise, sword ferns fan palms, and torch ginger in shaded areas; bougainvillea, wedelia, and plumeria (*Plumeria rubra*) coconut trees, autograph trees, and monkeypod. Hedges were mostly of flowering hibiscus, mock-orange, and flowering rose (see also Section 1.5).

6.1.4 Marine Resources

Freshwater resources, in addition to marine resources, supplied the Hawaiian diet with a rich source of protein. Background research indicates Kahoma and Kanahā streams as well as the Crater Reservoir provided freshwater food resources. With the exception of occasional flooding events resulting from heavy winter rains, the waters of Kahoma and Kanahā streams no longer flow to the sea—a result of the diversion of water resources for the cultivation of sugarcane during the historic era and continued diversion for domestic consumption today.

Lāhainā also had numerous *loko* including Aimakalepo, Unahiole, and ‘Alamihi near the mouth of Kahoma, and the famed royal fishpond of Mokuhinia at Waine‘e which provided reliable fish resources. A previous archaeological study conducted in the vicinity of the project area (Haun 1988) also documented a prehistoric cultural deposit that consisted of buried pond-field sediments (SIHP # -2693). Background research indicated two fishponds had been in the area in the mid-1800s.

In this leeward environment, ocean-based subsistence practices also contributed to the food resources of the traditional diet. Traditional practices that occurred within the coastal reaches of Lāhainā included fishing and the harvesting of *limu*. Other types of fish and marine resources often sought in the waters off Lāhainā included *mahimahi*, *aku*, *iheihei*, *puhiki‘i*, *he‘e*, *weke*, *akule*, and many others (Kahā‘ulelio 2006). Fishing also often involved the cooperative effort of *lau* fishing to catch smaller fish and *kakakī*.

A fishing ground, Kapuali‘ili‘i, extended for less than one mile along the Lāhainā shore from Keawaiki (present-day Lāhainā Harbor) to ‘Uha‘ilio Point (Kahā‘ulelio 2006:9).

Mr. Lindsey stated that there are “cultural resources and practices that are occurring across the street [from the project area] along the shoreline.”

6.1.5 Trails

Lāhainā is also associated with *Ke ala kīke‘eke‘e a Māui,* the winding trails of Māui (Pukui 1983:180). According to Pukui, the demi-god Māui made a trail “at Keka‘a between Lahaina and Kā‘anapali” when he was being pursued by “those who wished to destroy him” (Pukui 1983:180).

Previous archaeological studies in the vicinity of the project area (Hommon 1982; Jensen 1989 and 1990) have also documented remnants of a probable road (SIHP # -2008), a single footpath (SIHP # -2489) and historic agricultural access roads (SIHP #s -2008, -2487, -2489).

6.1.6 Burial Practices

While traditional Hawaiian funerary practices varied prior to European Contact, Hawaiians most commonly interred their dead in sand dune deposits and caves. Often buried in a flexed position, with knees drawn up to the chest, arms wrapped with hands tucked under knees, and head rested on knees, individuals may have been wrapped in *tapa* (bark cloth) with an outer layer of *lau hala* or other woven material. In cave burials, said to have existed at one time in the walls along Kahoma Valley, the bodies might have been flexed or laid in an extended position, or selected long bones and skull might be bundled in *tapa* (Buck 1957:565–573). Buck also describes platform tombs; one such he described as being circular, approximately 12 ft in diameter, and placed over a shallow flexed burial (Buck 1957:572). Additionally, individuals may have been buried with *moepū* (items placed with the dead) or any number of personal effects such as personal adornments,

weaponry, or other sentimental items. This might have been due to the *kapu* (restriction) customarily placed on the deceased individual's family and their personal items (Buck 1957:565–573).

There are several known cemeteries and burial sites located in the vicinity of the project area: SIHP # 50-50-03-2486 consists of 13 probable grave markers; SIHP # 50-50-03-2485 was recorded as an enclosure and more recently identified as a family cemetery; SIHP # 50-50-03-1776 is the Haia Terrace System, which includes a cemetery; and SIHP # 50-50-03-0226 is the Pu‘u Piha Cemetery (former Māla graveyard and fishpond) that consists of both historic era coffin burials and pre-Contact pit burials.

6.2 Summary of Community Outreach and *Kama‘āina* Perspectives

6.2.1 Comments/thoughts on the potential impacts the proposed project may have on ongoing traditional cultural practices and natural resources within the proposed project area and greater *ahupua‘a*

Mr. Lindsey expressed concern that sedimentation from construction activities could impact the ocean and marine resources. He also mentioned that sewage may potentially have "negative impacts to the ocean and resources." He asked, "Do we have the capacity?" He pointed out that the proposed project will result in "increased density" and "increased traffic," and stated that he is worried about the impact the increase in traffic will have on "all the kids and beach access." He stated that "Mitigation projects will be necessary."

Mr. Lindsey also expressed his concern regarding "water resources." He asked, "Is there enough?" pointing out that, "We are struggling to have stream flow, let alone more drinking water."

6.2.2 Comments/thoughts on the potential impacts the proposed project may have on cultural sites and *wahi pana* within the proposed project area and greater *ahupua‘a*

No impacts to ongoing cultural sites and *wahi pana* within the proposed project area and Wahikuli Ahupua‘a were identified during the consultation process.

6.3 Assessment of Impacts Posed to Cultural Practices and Cultural Resources

6.3.1 Individual's comments or thoughts on the potential impacts the proposed project may have on ongoing traditional cultural practices and natural resources within the proposed project area and greater *ahupua‘a*

Mr. Lindsey expressed concern that sedimentation from construction activities could impact the ocean and marine resources. He also mentioned that sewage may also potentially have "negative impacts to the ocean and resources." He asked, "Do we have the capacity?" He pointed out that the proposed project will result in "increased density" and "increased traffic," and stated that he is worried about the impact the increase in traffic will have on "all the kids and beach access." He stated that "Mitigation projects will be necessary."

Table 5. Past and present cultural resources associated with the project area and vicinity identified during consultation

Consultee	Project Area Affiliation	Past Resource/Type/Area	Present Resource/Type/Area	Concerns/Opinions
Edwin "Ekolu" Lindsey III	Maui Cultural Lands (MCL)		Ocean/marine resources along shoreline	Concerned that sedimentation from construction activities and sewage could negatively impact the ocean and marine resources. Also concerned increased traffic may negatively impact access to beach.
Edwin "Ekolu" Lindsey III	Maui Cultural Lands (MCL)		Freshwater resources	Concerned amount of drinking water and stream flow could be impacted due to increased density

Mr. Lindsey also expressed his concern regarding “water resources.” He asked, “Is there enough?” pointing out that, “We are struggling to have stream flow, let alone more drinking water.”

6.3.2 Comments or thoughts on the potential impacts the proposed project may have cultural sites and *wahi pana* within the proposed project area and greater *ahupua‘a*

No impacts to ongoing cultural sites and *wahi pana* within the proposed project area and Wahikuli Ahupua‘a were identified during the consultation process.

6.3.3 CSH Assessment of Impacts Posed to Cultural Practices and Cultural Resources, integrating perspectives from consultation, and evidence from background research

Archaeological sites identified in the vicinity of the project area indicate that lands of Wahikuli Ahupua‘a were utilized for habitation, agricultural endeavors, and burial and ceremonial purposes. Previous archaeological studies (Dagan et al. 2009; Jensen 1989; Lee-Greig 2008) have identified pre-Contact agricultural, habitation, and burial sites as well as historic-era plantation sites. No archaeological sites have been identified within or in the immediate vicinity of the proposed project area during background research or the consultation process.

LCA documents have also noted house lots, *lo‘i kalo*, *kula* lands, and an *‘ulu* grove. A small area in the northern portion of the project area was once part of Land Grant 7715M, an LCA that encompassed the entire *ahupua‘a* of Hanakao‘o. This property became part of Lahaina Sugar Company and was eventually absorbed into the Pioneer Mill Company (PiMCo).

The *mauka* regions of Wahikuli were once accessed for the collection of food and medicinal resources. The mid-elevations of Wahikuli were once also covered by plains of *pili* grass, however, the area has been thoroughly altered by large-scale commercial agricultural modifications to the landscape during historic and modern times. As a result, the dominant vegetation of the study area consists mostly of modern plantings in and around the nearby subdivision, including ground cover species such as Bermuda grass, beach morning glory, *naupaka* and *hau* in the beachside areas; exotic species such as bird-of-paradise, sword ferns fan palms, and torch ginger in shaded areas; bougainvillea, wedelia, and plumeria, coconut trees, autograph trees, and monkeypod trees; and hedges of flowering hibiscus, mock-orange, and flowering rose. Medicinal plants were also found in and amongst the cane fields that covered the Wahikuli Plains.

Background research indicate that Kahoma and Kanahā streams as well as the Crater Reservoir provided freshwater food resources, however, due to the diversion of water resources for the cultivation of sugarcane during the historic era and continued diversion for domestic consumption today, the waters of Kahoma and Kanahā streams no longer flow to the sea except during occasional flooding events resulting from heavy winter rains. Mr. Lindsey mentioned the lack of freshwater resources. He noted that, “We are struggling to have stream flow, let alone more drinking water.”

Ocean-based subsistence practices such as fishing and the harvesting of *limu* also contributed to the food resources of the traditional diet. Along the shore, a fishing ground, Kapuali‘ili‘i, extended from Keawaiki (present-day Lāhainā Harbor) to ‘Uha‘ilio Point (Kahā‘ulelio 2006:9). Mr. Lindsey also mentioned that “cultural resources and practices” are occurring “along the shoreline,” across the street from the project area. He

Several known cemeteries and burial sites are located in the vicinity of the project area including historic and pre-Contact burials. No burials have been identified within or in the immediate vicinity of the proposed project area during background research or the consultation process.

Table 6. Potential impacts posed by the proposed project to cultural resources or activities within the project area vicinity

Cultural Resource or Activity	Potential Impacts	Explanation
Marine resources	Fishing, *limu* gathering	Potential impacts to marine resources resulting from sedimentation from construction activities and sewage from increased density
Freshwater resources	Drinking water, stream flow	Potential impacts to water resources resulting from increased density

6.3.4 Discussion of impacts to historic properties (i.e., cultural resources) identified during background research and consultation

No impacts to historic properties within the proposed project area and Wahikuli Ahupua‘a were identified during the consultation process.

6.3.5 Discussion of impacts to cultural practices and resources identified during background research and consultation

Mr. Lindsey stated that there are “cultural resources and practices that are occurring across the street along the shoreline.” These ocean and marine resources may potentially be negatively impacted by sedimentation from construction activities and sewage. The increase in population density and traffic resulting from the proposed project may also negatively impact access to the beach. The increased population density may also impact existing freshwater resources such as stream flow and drinking water.

6.4 Mitigation Possibilities Identified During Consultation and Background Research

Mr. Lindsey stated that “Mitigation projects will be necessary” to address the potential impacts that the increase in population density and traffic will have on beach access. CSH recommends that, as part of the project’s environmental review process, that any potential effect of increased traffic and population density on beach access imposed by the proposed project be reviewed and, if appropriate, mitigated.

Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended.

In the event that *iwi kūpuna* and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance.

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Appendix A Community Outreach Letter

CULTURAL SURVEYS HAWAI‘I

ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL DOCUMENTATION SERVICES - SINCE 1982

P.O. Box 1114 Kailua, Hawai‘i 96734 Ph: (808) 262-9972 Fax: (808) 262-4950

Aloha mai kāua,

With this letter, Cultural Surveys Hawai‘i (CSH) humbly requests your *mana‘o* and *‘ike* (experience, insights, and perspectives) regarding past and ongoing cultural, practices, beliefs, and resources within Wahikuli Ahupua‘a.

Consultation with traditional cultural practitioners, *kūpuna*, *kama‘āina*, and Hawai‘i’s diverse ethnic communities is an important and deeply valued part of our work and the environmental review process for proposed projects in Hawai‘i. Your contributions will revitalize and keep alive knowledge of cultural practices, storied places, and life experiences that will remind Hawai‘i’s children of their history for generations to come.

Project Description

On behalf of the Department of Hawaiian Home Lands (DHHL), CSH is conducting a cultural impact assessment (CIA) for the DHHL Villages of Leiali‘i Phase 1B Project, Wahikuli Ahupua‘a, Lāhainā District, Maui TMK: [2] 4-5-021:020, [2] 4-5-021:021 por., [2] 4-5-021:010 por, [2] 4-5-036:112, [2] 4-5-021:015, and the Honoapi‘ilani Highway Right of Way. The location and boundaries of the proposed project are delineated on a 1992 Lahaina USGS topographic map quadrangle (Figure 1) and a 2019 aerial photograph (Figure 2) attached to this invitation.

The DHHL proposes to develop the Phase 1-B subdivision on lands identified by Tax Map Key (TMK) (2)4-5-021:020, an approximately 51-acre area of land owned by the DHHL located north of Leiali‘i Parkway and the existing DHHL Villages of Leiali‘i Phase 1-A (Phase 1-A) subdivision. Phase 1-B, as currently planned, consists of single family homes, and possible multi-family units, totaling approximately 250 units. Access from the subdivision will be provided from Leiali‘i Parkway. The new housing units will be made available to DHHL native Hawaiian beneficiaries currently on the waitlist for a residential lease on Maui. The subdivision will be developed in two (2) phases.

In order to develop the proposed subdivision, the following offsite improvements are required, and will also be developed as part of the proposed action:

- Development of two (2) new offsite retention basins *mauka* of Phase 1-B, on lands owned by HHFDC
- Adjustment of the outlet drainage pipes in the existing retention basin *mauka* of Phase 1-A, on lands owned by HHFDC, and enlargement of the basin
- Grading and development of drainage interceptor ditches *mauka* of Phase 1-B, on lands owned by HHFDC
- Extension of three (3) existing 48-inch culverts *makai* of Phase 1-A
- Roadway improvements to Leiali‘i Parkway and Honoapi‘ilani Highway
- Roadway repairs to existing portions of Leiali‘i Parkway

CIA for the DHHL Villages of Leiali‘i Phase 1B Project

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The drainage improvements discussed above will be located on TMK (2)4-5-021:021, owned by HHFDC, and TMK (2)4-5-021:015, owned by the State of Hawai‘i. The proposed improvements along Leiali‘i Parkway include widening of Leiali‘i Parkway from two (2) lanes to four (4) lanes, restriping, relocation of the traffic signals at the intersection with Honoapi‘ilani Highway, which may involve the relocation of existing traffic signals within Wahikuli Wayside Park, and any needed repairs and improvements as required for future dedication of the roadway to the County of Maui. Restriping along Honoapi‘ilani Highway is also being proposed. In addition, due to the widening of Leiali‘i Parkway, reconfiguration of the access driveway to the Lahaina Post Office will also be required. It is noted that Leiali‘i Parkway is encompassed by two (2) TMKs, identified as (2)4-5-036:112, owned by HHFDC, and (2)4-5-021:010, owned by the State. Honoapi‘ilani Highway is a State of Hawai‘i, Department of Transportation (SDOT) owned highway.

Purpose of this Study

The purpose of a CIA is to gather information on Hawai‘i’s cultural resources, practices, or beliefs that have occurred or still occur within the proposed project area and Wahikuli Ahupua‘a. This is accomplished through consultation and background research using previously written documents, studies, and interviews. This information is used to assess potential impacts by the proposed project to the specific identified resources, practices, and beliefs in the project area and throughout Wahikuli Ahupua‘a. As a traditional cultural practitioner and holder of long-term knowledge, your insight, input, and perspective provide a valuable contribution to the assessment of potential effects of this project and an understanding of how to protect these resources and practices.

Insights focused on the following topics in the project area (shown on the attached Figure 1 and Figure 2) are especially helpful and appreciated:

- Your knowledge of traditional cultural practices of the past within the proposed project area and Wahikuli Ahupua‘a
- Your specific traditional cultural practice and its connection to the proposed project area and Wahikuli Ahupua‘a
- The different natural resources associated with your specific traditional cultural practice
- Legends, stories, or chants associated with your specific traditional cultural practices and their relationships to the proposed project area and Wahikuli Ahupua‘a
- Referrals to other *kūpuna*, *kama‘āina*, and traditional cultural practitioners knowledgeable about the proposed project area and Wahikuli Ahupua‘a
- Your comments or thoughts on the potential impacts the proposed project may have on your ongoing traditional cultural practices and natural resources within the proposed project area and Wahikuli Ahupua‘a
- Your knowledge of cultural sites and *wahi pana* (storied places) within the proposed project area and Wahikuli Ahupua‘a

CIA for the DHHL Villages of Leiali‘i Phase 1B Project

Page 3

- Your comments or thoughts on the potential impacts the proposed project may have on cultural sites and *wahi pana* within the proposed project area and Wahikuli Ahupua‘a

Consultation Information

Consultation is an important and deeply valued part of the CIA and environmental review process. Your contributions will revitalize and keep alive our combined knowledge of past and ongoing cultural practices, historic places, and experiences, reminding our children of their history generation after generation.

With your agreement to participate in this study, your contributions will become part of the comprehensive understanding of traditions of the area; and will be part of the public record. The study will be included as an appendix of the Environmental Assessment (EA) which is being prepared for the proposed project; the EA and CIA will be available for future access through the Office of Environmental Quality Control (https://health.hawaii.gov/oeqc/) and at the State Historic Preservation Division Library (https://dlnr.hawaii.gov/shpd/about/research-resources-library).

As a part of this process, your knowledge may be used to inform future CIAs and other heritage studies of cultural practices and resources that need protection from impacts of proposed future projects. If you engage in consultation, and the *mana‘o* and *‘ike* you provide appears in the study, we would like to recognize your contribution by including your name. If you prefer not to allow your name to be included, your information can be attributed to an anonymous source.

The consultation interview structure and format are flexible. We will accommodate your preference on how to get together; talk story, over the phone, by email correspondence, remotely via Zoom, MS Teams, Google Chat or other remote meeting platforms.

Your knowledge of the resources and potential effect of the project on traditional practices in the project area and Wahikuli Ahupua‘a focusing on the topics in the bullet points above can also be submitted in a written statement. CSH will provide return postage of your written statement on request.

CSH is happy to provide a list of topics for discussion, a more structured questionnaire of interview questions, or any other assistance that might be helpful.

If you have questions regarding consultation, or are interested in participating in this study, please contact Kellen Tanaka by email at ktanaka@culturalsurveys.com or phone at (808) 262-9972 or Chantellee Spencer at cspencer@culturalsurveys.com.

Mahalo nui loa for your time and attention to this request for consultation.

Yours with much aloha and appreciation,

Kellen Tanaka
CSH Cultural Researcher

Appendix B Permissions/Release Forms

Cultural Surveys Hawai‘i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawai‘i 96734 Ph: (808) 262-9972 Fax: (808) 262-4950

Job code: WAHIKULI 4 **ktanaka@culturalsurveys.com** www.culturalsurveys.com

AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai‘i (CSH) appreciates the generosity of the *kūpuna* and *kama‘āina* who are sharing their knowledge of cultural and historic places, experiences of past and present cultural practices. At the request of Department of Hawaiian Home Lands (DHHL), Cultural Surveys Hawai‘i (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed DHHL Villages of Leiali‘i Phase 1B Project.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. You will have the opportunity to review the written transcript or notes of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. You will be given a copy of the interview transcript or notes for your records.
4. You will be given a copy of this release form for your records.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.

I, Edwin Lindsey (Please print your name here), agree to the procedures outlined above and, by my signature, give my consent and release for this interview and/or photograph to be used as specified.

(Signature)

5/14/2022
(Date)

Appendix C Consultee Interview Summaries

C 1 Edwin “Ekolu” Lindsey III

On 2 February 2022, Edwin “Ekolu” Lindsey III, President of Maui Cultural Lands, Inc., contacted Cultural Surveys Hawai‘i (CSH) to share his concerns regarding the DHHL Villages of Leiali‘i Phase 1B project. Maui Cultural Lands, Inc. (MCL) is a “Maui-based grassroots land trust organization whose mission is to stabilize, protect, and restore Hawaiian cultural resources” (Maui Cultural Lands 2020).

Mr. Lindsey expressed concern regarding sedimentation going to the ocean during construction activities. He also stated that he finds it “a little challenging to envision where the site improvements will be constructed/altered.” He noted the “[i]dentification of retention basins, pipe extensions, drainage, etc… should be clearly mapped out.” Correspondence with Mr. Lindsey is included in its entirety in Appendix D.

On 2 February 2022, CSH replied to Mr. Lindsey and provided him with the Conceptual Offsite Improvements Site Plan (Figure 23) and Property Location Map (Figure 24) for the proposed project.

Mr. Lindsey replied via email on 3 February 2022. He noted his “first impression” that the proposed project will result in “increased density.” He pointed out, “That’s a lot of people squished in to a small space” and asked, “Does this affect quality of life?” He also noted the project will cause “increased traffic.” He stated he is worried about the impact the increase in traffic will have on “all the kids and beach access.” He stated that “Mitigation projects will be necessary.” He also expressed concern regarding “sewage impacts.” He asked, “Do we have the capacity?” He mentioned that sewage may potentially have “negative impacts to the ocean and resources.” He also expressed his concern regarding “water resources.” He asked, “Is there enough?” He noted, “We are struggling to have stream flow, let alone more drinking water.”

Mr. Lindsey emphasized, “All of this does affect cultural resources and practices that are occurring across the street along the shoreline.”

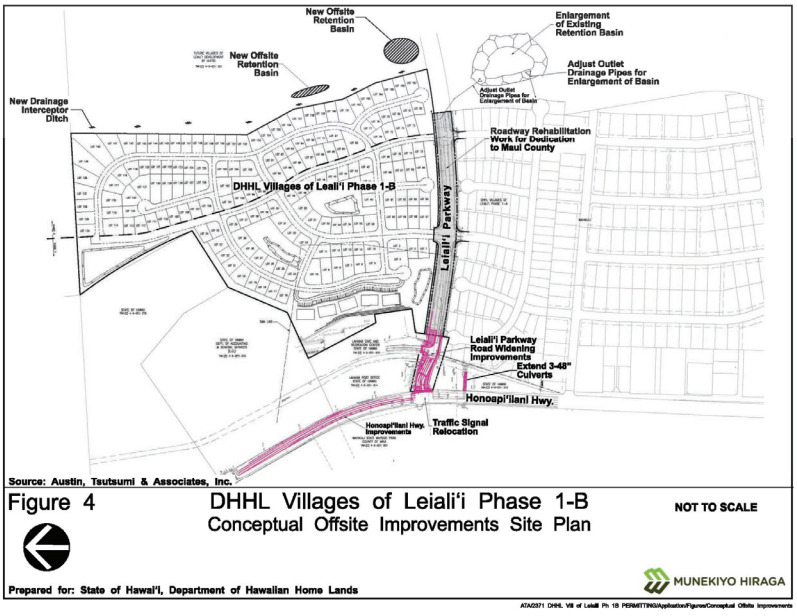

Figure 4 DHHL Villages of Leali‘i Phase 1-B Conceptual Offsite Improvements Site Plan NOT TO SCALE

Prepared for: State of Hawai‘i, Department of Hawaiian Home Lands

MUNEKIYO HIRAGA

Figure 23. DHHL Villages of Leali‘i Phase 1-B Conceptual Offsite Improvements Site Plan

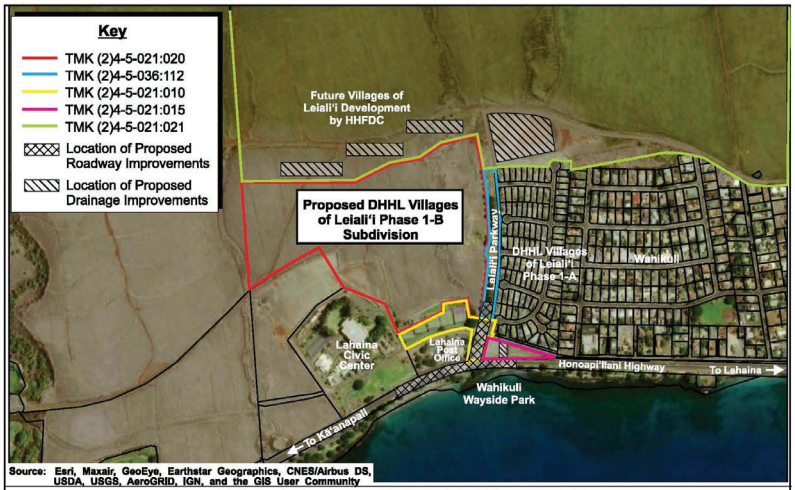

Figure 2 DHHL Villages of Leali‘i Phase 1-B Property Location Map

0 175 350 700 Feet

Prepared for: State of Hawai‘i, Department of Hawaiian Home Lands

MUNEKIYO HIRAGA

Figure 24. DHHL Villages of Leali‘i Phase 1-B Property Location Map

Appendix D Correspondence with Edwin “Ekolu” Lindsey III

Ekolu Lindsey email dated 2 February 2022:

Thank you,

I find this a little challenging to envision where the site improvements will be constructed/altered. I don’t know where phase 1A & 1B is located and is not identified on your map. Identification of retention basins, pipe extensions, drainage, etc… should be clearly mapped out. I cannot give proper input without these specifics.

I am concerned about sedimentation to the ocean. Especially during construction. If you can provide the information, it would be greatly appreciated. Even providing the Tax Maps will help. This should be as easy as possible for the community to respond. As it is now, this forces me to go and look up the individual TMK’s, to try and figure out what the plan is. I’m happy to produce feedback, that engineers cannot. Especially when it comes to cultural resources that will be potentially impacted in the ocean.

Mahalo,

Cultural Surveys replied via email 2 February 2022:

Mahalo for your quick response. I attached two exhibits to this email. One shows the location of each TMK (color-coded) and the location of each phase of development. Phase 1-A has already been completed. The other exhibit shows the location of all proposed drainage improvements. These improvements will be placed *mauka* of the housing development.

Feel free to let me know if you have any questions or need any additional info.

Ekolu Lindsey replied via email dated 3 February 2022:

That’s way better. Thank you. This should be included in the packet you send out. I’m sure others have the same questions. And you should get a better response. I’ll let this digest before getting back to you.

My first impression is:

- Increased density
  - That’s a lot of people squished in to a small space
    - Does this affect quality of life
  - In addition to the other planned development projects
- Increased traffic
  - Mitigation projects will be necessary

  - I worry about all the kids and beach access
- Sewage impacts
  - Do we have the capacity
  - Negative impacts to the ocean and resources
- Water resources
  - Is there enough
  - We are struggling to have stream flow, let along more drinking water.

All of this does affect cultural resources and practices that are occurring across the street along the shoreline.

That’s my quick overview.

Thanks,

TRAFFIC IMPACT ANALYSIS REPORT

APPENDIX

H

TRAFFIC IMPACT ANALYSIS REPORT
DHHL VILLAGES OF LEIALII PHASE 1B
LAHAINA, MAUI, HAWAII

FINAL DRAFT

March 4, 2022

Prepared for:

Department of Hawaiian Home Lands
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Kapolei, Hawaii 96707

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TRAFFIC IMPACT ANALYSIS REPORT

DHHL VILLAGES OF LEALII PHASE 1B

Lahaina, Maui, Hawaii

1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the proposed Department of Hawaiian Home Lands (DHHL) Villages of Lealii Phase 1B Development (hereinafter referred to as the "Project") located in Lahaina, Maui, Hawaii.

1.1 Project Location

The Project is located in Lahaina on the island of Maui on a parcel of land more specifically identified as TMK: (2) 4-5-021:020. The Project is located mauka of Honoapiilani Highway and bounded by Lahaina Civic Center to the north and Lealii Parkway to the south. The first phase of the Villages of Leialii is currently completed and occupied just south of Lealii Parkway. See Figure 1.1 for Project location.

1.2 Project Description

The Project proposes to develop approximately 50.8-acres of land in two (2) increments. Increment 1 will provide 86 single-family lots. Increment 2 may provide 95 single-family lots, 164 multi-family units, or a combination of both. The subdivision is not planned to exceed 250 units for Increment 1 and Increment 2 combined. For purposes of this TIAR, Increment 2 was analyzed with the maximum build-out of 164 multi-family units, since it results in a slightly higher trip generation than the 95 single-family lots. If Increment 2 changes to a mix of single-family and multi-family lots, the overall Project trip generation may slightly increase but not significant to alter conclusions of this study. Vehicular traffic to the Project will be provided along Lealii Parkway via the existing intersections with Hooli Street and Hanohano Street. The Project is anticipated to be completed by the Year 2030. See Figure 1.2 for Project Site Plan.

VILLAGES OF LEIALII
PHASE 1B DEVELOPMENT

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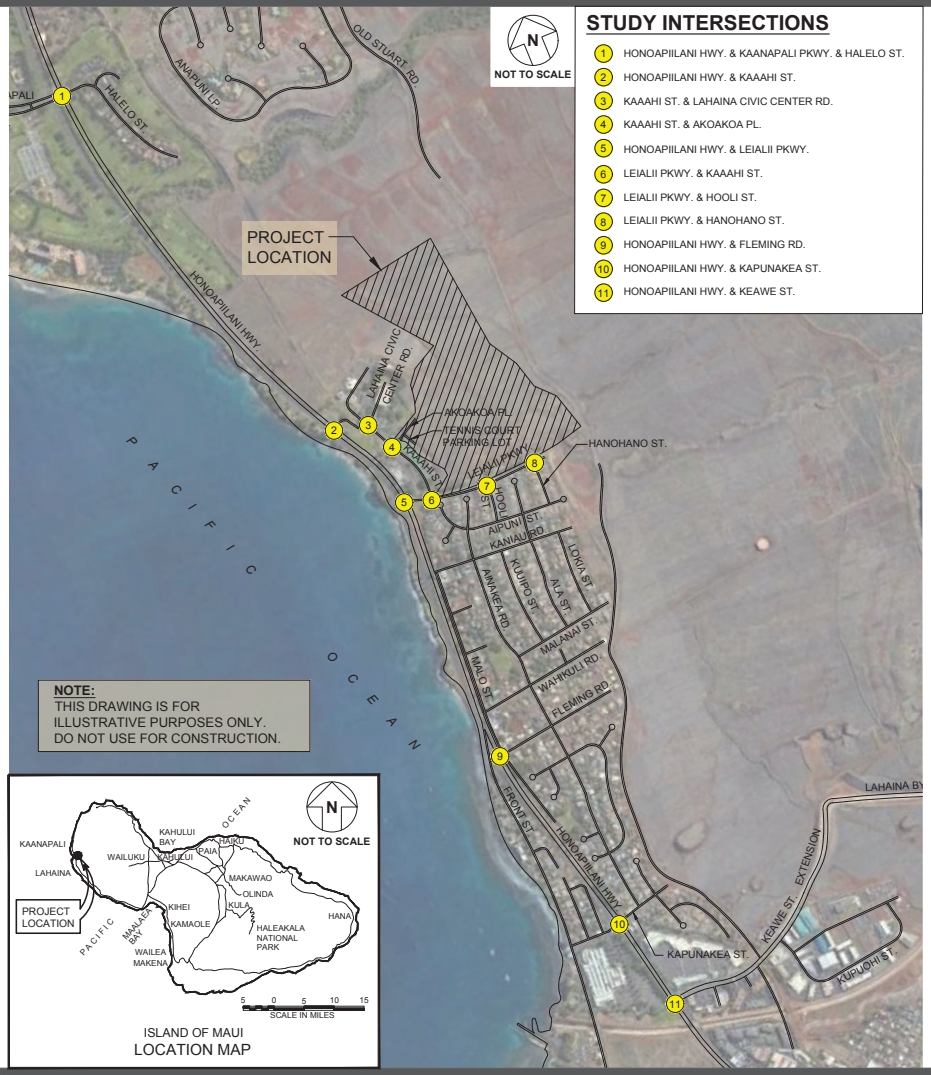


STUDY INTERSECTIONS

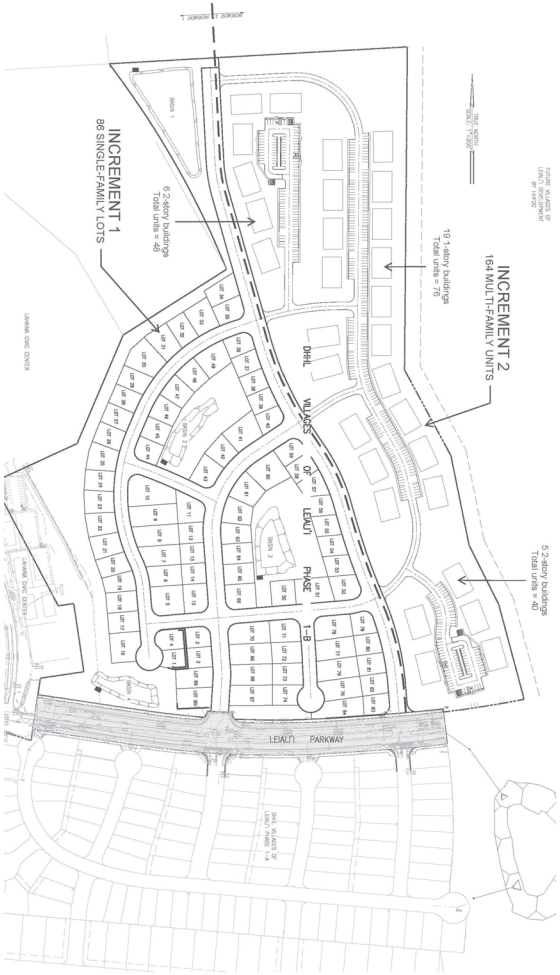
1. HONOAPIILANI HWY. & KAANAPALI PKWY. & HALELO ST.
2. HONOAPIILANI HWY. & KAAAHI ST.
3. KAAAHI ST. & LAHAINA CIVIC CENTER RD.
4. KAAAHI ST. & AKOAKOA PL.
5. HONOAPIILANI HWY. & LEIALII PKWY.
6. LEIALII PKWY. & KAAAHI ST.
7. LEIALII PKWY. & HOOLI ST.
8. LEIALII PKWY. & HANOHANO ST.
9. HONOAPIILANI HWY. & FLEMING RD.
10. HONOAPIILANI HWY. & KAPUNAKEA ST.
11. HONOAPIILANI HWY. & KEAWE ST.

FIGURE 1.1

LOCATION MAP

FIGURE 1.2

SITE PLAN



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2. METHODOLOGY

2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.
- Traffic projections for Base Year 2030 (without the Project) including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate. These other known developments are projects that are currently under construction or known new/future developments that are anticipated to affect traffic demand and operations within the study area.
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for Future Year 2030 (with the Project), which includes Base Year traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations for Base Year and Future Year roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by known developments in the region or the Project.

2.2 Intersection Analysis

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix B.

Analyses for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.

2.3 Study Area Intersection Analysis

Intersection analysis within the Project's study area was performed on the following intersections due to their proximity to the Project:

- Honoapiilani Highway/Kaanapali Parkway/Halelo Street (signalized)
- Honoapiilani Highway/Wailuku Wayside Park Exit/Lahaina Civic Ctr Road (unsignalized)
- Kaaahi Street/Lahaina Civic Ctr Road (unsignalized)
- Kaaahi Street/Akoakoa Place (unsignalized)
- Honoapiilani Highway/Lealii Parkway (signalized)
- Lealii Parkway/Kaaahi Street (unsignalized)
- Lealii Parkway/Hooli Street (unsignalized)

- Lealii Parkway/Hanohano Street (unsignalized)
- Honoapiilani Highway/Fleming Road (signalized)
- Honoapiilani Highway/Kapunakea Street (signalized)
- Honoapiilani Highway/Keawe Street (signalized)

2.4 Multimodal Facilities

Sidewalks are currently provided along the USPS frontage on Leialii Parkway and Kaahi Street, continuing further north along Kaahi Street until its termination at the Lahaina Fire Station. Sidewalks are also provided along both sides of Leialii Parkway between Kaahi Street to its mauka termination near Hanohano Street. Paved shoulders are provided along Honoapiilani Highway in lieu of sidewalks.

Maui County currently provides a bus system that offers several routes for West Maui. The West Maui Islander Route #28 provides regional connectivity between Napili and Lahaina Town, with no bus stops near Leialii Parkway. The Kaanapali Islander Route #25 provides connectivity between Kaanapali and Lahaina Town. The Lahaina Villager Route #23 serves various areas of Lahaina Town and provides multiple stops along the residential Wahikuli area on Ainakea Road. A bus stop for the Lahaina Villager Route is provided near the Project, along Leialii Parkway near its intersection with Hooli Street and another further north at the Lahaina Civic Center.

HDOT created the Bike Plan Hawaii Master Plan, which identifies existing and proposed bicycle routes that could potentially be implemented in the future. In the vicinity of the Project, a signed shared roadway is currently provided along Honoapiilani Highway in the study area. Figures 2.1 and 2.2 show the existing pedestrian, bicycle and bus facilities provided in the area.

VILLAGES OF LEIALII
PHASE 1B DEVELOPMENT

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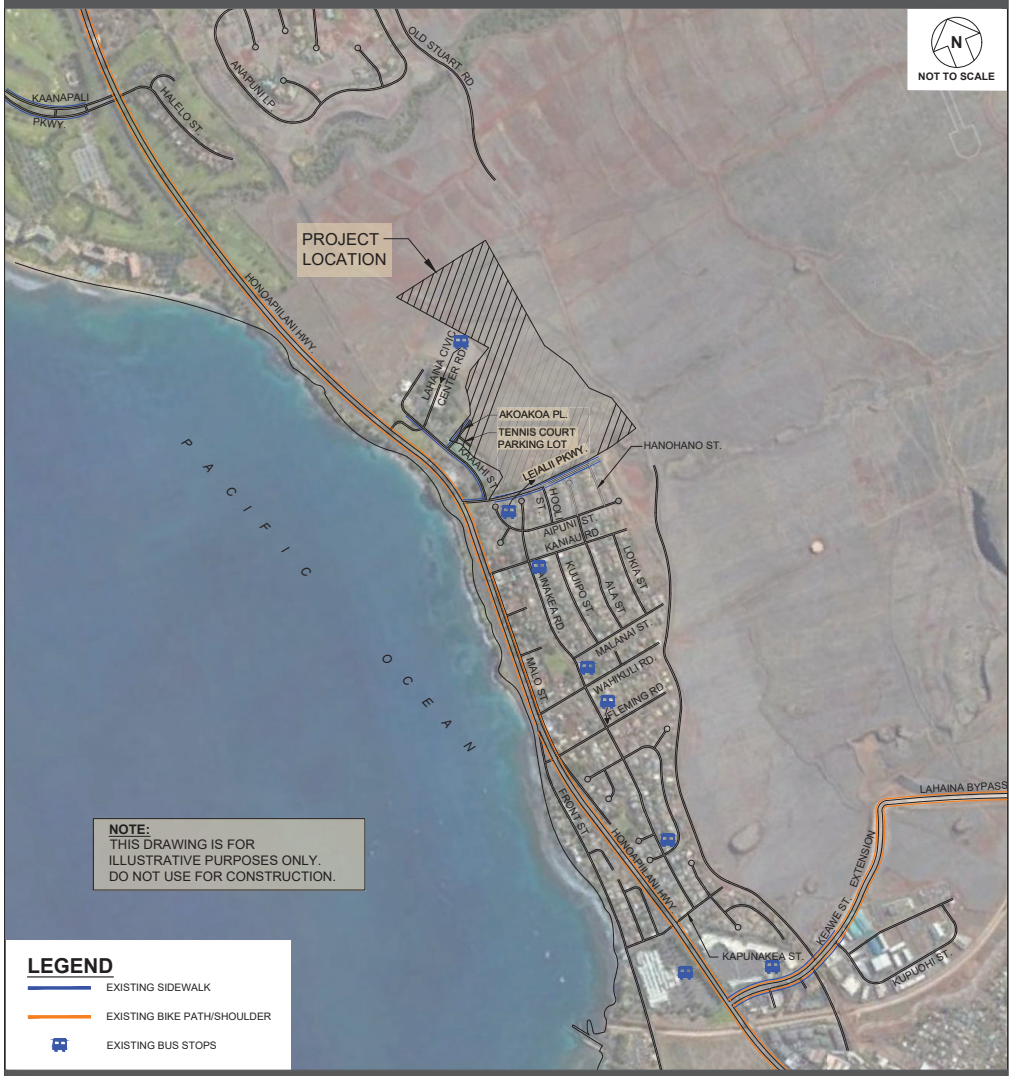

FIGURE 2.1

EXISTING PEDESTRIAN/BIKE FACILITIES AND BUS STOP LOCATIONS

VILLAGES OF LEIALII
PHASE 1B DEVELOPMENT

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FIGURE 2.2

EXISTING MAUI BUS ROUTES

3. EXISTING TRAFFIC CONDITIONS

3.1 Roadway System

The following are descriptions of the existing roadways studied within the vicinity of the Project:

Honoapiilani Highway – is a State highway that provides regional connectivity for West Maui. Honoapiilani Highway begins in Wailuku where it transitions from South High Street and continues southward toward Maalaea. The highway borders the coastline as it curves back around West Maui and northward again toward Kapalua, where it transitions into Kahekili Highway near Honokohau Bay. In the vicinity of the Project, Honoapiilani Highway is generally a two-way, four-lane undivided road with a speed limit of 35 mph.

Kaanapali Parkway – is a roadway that provides access to various hotels and businesses. The roadway begins to the east at its intersection with Honoapiilani Highway and travels northwest before terminating near the Royal Kaanapali Golf Course. In the vicinity of the Project, Kaanapali Parkway is a two-way, two-lane divided road.

Lealii Parkway – is a collector road that provides access to the Lahaina Civic Center, Lahaina Fire and Police Station and the US Post Office. The roadway begins to the west at its intersection with Honoapiilani Highway and terminates to the east as a dead end. The stretch of the roadway between Kaahi Street and its mauka termination is paved for 4 lanes with a median divided, but only two lanes (two-way) south of the median are currently in use, with the 2 northernmost lanes blocked. Lealii Parkway has a posted speed limit of 25 mph.

Kaaahi Street – is a two-way, two-lane road that provides access to the Lahaina Civic Center, Lahaina Fire Department, and the Lahaina District Court. The roadway begins to the south at its intersection with Lealii Parkway and continues north until its terminus near the Lahaina Fire Department. In the vicinity of the Project, Kaaahi Street is a two-way, two-lane undivided road with a posted speed limit of 15 mph.

Akoakoa Place – is a local two-way, two-lane road which dead-ends approximately 500' from its intersection with Kaaahi Street and primarily serves the adjacent tennis courts and Lahaina Comprehensive Health Center. No speed limit signs were observed along Akoakoa Place.

Front Street – is a County collector road that provides access to businesses and residential areas. The roadway begins to the south at its intersection with Honoapiilani Highway just north of Hokiokio Place. The road then travels north parallel to the coast and the highway before reconnecting with Honoapiilani Highway at Fleming Road. In the vicinity of the Project, Front Street is a two-way, two-lane undivided road with a posted speed limit of 20 mph.

Kapunakea Road – is a roadway that provides access to businesses and residential areas. The roadway begins to the west at its intersection with Front Street and terminates to the east past its intersection with Honoapiilani Highway. West of its intersection with Honoapiilani Highway, Kapunakea Road is a two-way, three-lane undivided roadway. East of its intersection with Honoapiilani Highway, Kapunakea Road is a two-way, two-lane undivided roadway.

Keawe Street – is a two-way, four-lane divided roadway which connects Honoapiilani Highway and Lahaina Bypass Road (LBR) via Keawe Street and currently serves as the northernmost terminus of LBR until the construction of the future LBR Phase 1C and 1D. Keawe Street also serves Lahaina Gateway and Lahaina Business Park.

3.2 Existing Traffic Volumes

The hourly traffic volume data utilized in this report was collected on Tuesday, May 14, 2019. The existing traffic count data is provided in Appendix A. The weekday AM and PM peak hours of traffic were determined to occur between 7:15 AM and 8:15 AM and between 3:30 PM to 4:30 PM, respectively.

3.3 Existing Observations and Intersection Analysis

3.3.1 Regional Analysis

In the study area, Honoapiilani Highway generally operates as a 4-lane highway from Kaanapali Parkway to Keawe Street. Several intersections along the stretch operate on a coordinated timing plan and favor throughput along the major northbound and southbound Honoapiilani Highway movements. As a result, numerous mainline left-turn movements and minor street approaches at various study intersections experience lengthy delays and subsequent LOS E/F conditions.

3.3.2 Existing Intersection Analysis

Honoapiilani Highway & Kaanapali Parkway/Halelo Street

During the AM peak hour, all movements operate at LOS D or better and under capacity. During the PM peak hour, all left-turn movements operate at LOS E, with all remaining movements operating at LOS D or better, and all movements operate under capacity. The northbound and southbound through movements operate at LOS B and LOS C, respectively. This is consistent with observations that indicate through signal phases often gapping out prior to reaching its maximum through timing. Overall, the intersection operates at LOS C during both the AM and PM peak hours of traffic.

Honoapiilani Highway & Wahikuli Wayside Park Exit/Lahaina Civic Center Road

During both AM and PM peak hours, the eastbound approach operates at LOS F, but services a very low volume, with only 2(2) eastbound left-turn and through vehicles during the AM(PM) peak hours, respectively.

Honoapiilani Highway & Leialii Parkway

During both peak hours, turning movements on the major and minor approaches generally operate at LOS E or F, but all movements operate under capacity. Mainline northbound and southbound through movements operate at LOS A and under capacity. Overall, the intersection operates at LOS B during both peak hours. Based on observations, southbound queues can occasionally extend beyond the Kaahi Street/Lahaina Civic Center Road intersection during parts of the PM peak hour, but clear when mainline through traffic clears the signalized Leialii Parkway intersection. Existing southbound left-turn queues were observed to extend for 1-3 vehicles on average and occasionally extended to 5-6 vehicles, reaching the end of the striped southbound left-turn taper. All westbound approach queues were observed to clear within one signal cycle. Westbound queues occasionally spilled back to the Post Office (USPS) driveway, but was not observed to impede any flows along Leialii Parkway.

Honoapiilani Highway & Front Street/Fleming Road

During both peak hours, turning movements on the major street and the minor street operate at LOS E or F as the signal favors the major northbound and southbound Honoapiilani through movements. The mainline northbound and southbound movements along Honoapiilani Highway operate at LOS B or better during both peak hours. Overall, the intersection operates at LOS B during the AM and PM peak hours.

Honoapiilani Highway and Kapunakea Street

Similar to other coordinated signalized intersections, the through movements along Honoapiilani Highway are prioritized over turning movements on the major and minor street approaches. As a result, the turning movements operate at LOS E or better during both peak hours. The mainline northbound and southbound movements along Honoapiilani Highway operate at LOS D or better during both peak hours. Overall, the intersection operates at LOS B(C) during the AM(PM) peak hours, respectively.

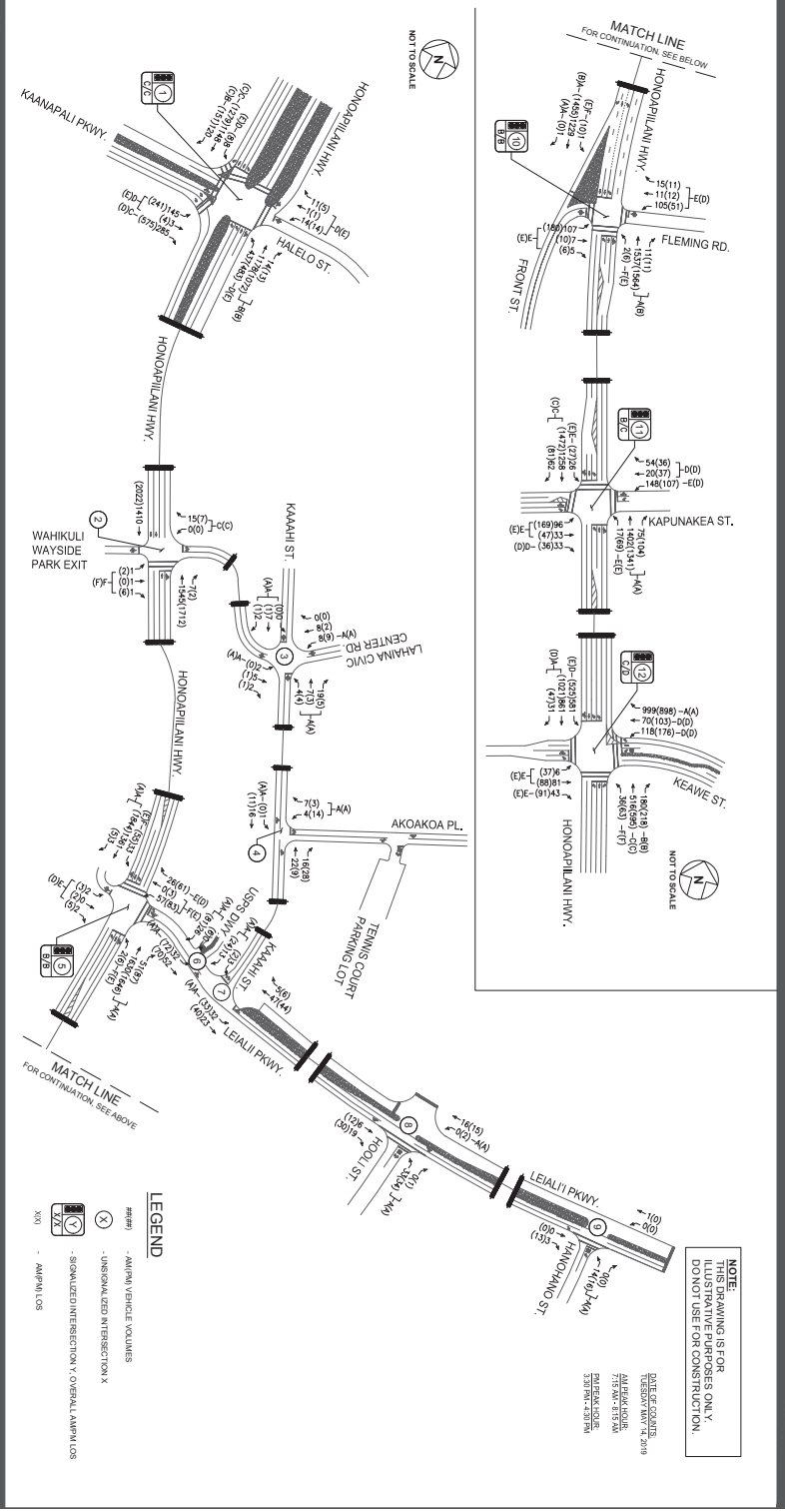
Honoapiilani Highway & Keawe Street

The Honoapiilani Highway & Keawe Street intersection currently provides access to the northern terminus of Lahaina Bypass Road (LBR) via Keawe Street. Therefore, the southbound left-turn and westbound right-turn movements service heavy volumes. Like with other coordinated signalized intersections, turning movements on the major and minor approaches operate at LOS E/F. Major through movements operate at LOS D or better during both peak hours with all movements operating under capacity. Overall, the intersection operates at LOS C(D) during the AM(PM) peak hours, respectively.

Figure 3.1 illustrates the existing lane configuration, existing traffic volumes, and LOS for each study intersection. Table 3.1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Appendix C.

FIGURE 3.1

EXISTING CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS



VILLAGES OF LEIALII PHASE 1B DEVELOPMENT

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Table 3.1 : Existing Conditions Level of Service Summary

Intersection	Existing Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street						
NB LT	39.9	0.76	D	59.8	0.83	E
NB TH/RT	12.0	0.57	B	15.0	0.51	B
EB LT/TH	41.8	0.64	D	58.9	0.79	E
EB RT	24.7	0.12	C	35.2	0.40	D
WB LT/TH/RT	47.4	0.21	D	69.8	0.23	E
SB LT	48.2	0.16	D	72.1	0.21	E
SB TH	23.0	0.75	C	34.6	0.82	C
SB RT	15.2	0.11	B	22.0	0.16	C
Overall	22.1	-	C	33.6	-	C
2: Honoapiilani Highway & Kaahi St/Lahaina Civic Center Rd						
EB LT/TH/RT	261.5	0.19	F	304.6	0.46	F
WB LT/TH/RT	17.4	0.05	C	18.8	0.03	C
Overall	0.4	-	-	0.7	-	-
3: Kaaahi Street & Lahaina Civic Center Rd						
NB LT/TH/RT	8.7	0.03	A	8.7	0.01	A
EB LT	7.2	0.00	A	0.0	-	A
WB LT	7.2	0.01	A	7.2	0.01	A
SB LT/TH/RT	9.1	0.01	A	8.8	0.00	A
Overall	6.5	-	-	6.9	-	-
4: Kaaahi Street & Akoakoa Pl						
WB LT/RT	8.6	0.01	A	8.7	0.02	A
SB LT	7.3	0.00	A	0.0	-	A
Overall	1.5	-	-	2.3	-	-
5: Honoapiilani Highway & Leialii Parkway						
NB LT	259.3	0.96	F	68.5	0.45	E
NB TH/RT	9.6	0.63	A	9.9	0.70	A
EB LT/TH/RT	76.8	0.02	E	50.3	0.03	D
WB LT/TH	81.3	0.36	F	55.1	0.47	E
WB RT	77.5	0.01	E	51.0	0.02	D
SB LT	94.0	0.56	F	60.3	0.60	E
SB TH/RT	5.3	0.49	A	7.1	0.69	A
Overall	10.2	-	B	10.4	-	B
6: Leialii Parkway & USPS Dwy						
EB LT	7.4	0.02	A	7.5	0.05	A
SB LT/RT	8.7	0.03	A	9.2	0.10	A
Overall	2.7	-	-	4.5	-	-
7: Leialii Parkway & Kaaahi Street						
EB LT	7.4	0.02	A	7.4	0.02	A
SB LT/RT	8.8	0.02	A	8.7	0.03	A
Overall	3.1	-	-	3.1	-	-
8: Hooli St & Leialii Parkway						
NB LT/RT	8.8	0.04	A	8.9	0.04	A
WB LT	0.0	-	A	7.3	0.00	A
Overall	3.9	-	-	3.5	-	-
9: Hanohano St & Leialii Parkway						
NB LT/RT	8.6	0.02	A	8.6	0.02	A
Overall	6.7	-	-	4.6	-	-

* Denotes overcapacity condition, v/c ≥ 1.

Table 3.1: Existing Conditions Level of Service Summary Cont'd

Intersection	Existing Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
10: Honoapiilani Highway & Front Street/Fleming Road						
NB LT	84.7	0.42	F	74.8	0.46	E
NB TH/RT	6.1	0.57	A	16.7	0.70	B
EB LT/TH/RT	64.0	0.60	E	64.2	0.76	E
WB LT/TH/RT	63.5	0.62	E	43.6	0.18	D
SB LT	101.9	0.41	F	72.7	0.50	E
SB TH	4.8	0.47	A	14.3	0.66	B
SB RT	0.0	0.00	A	0.0	0.00	A
Overall	10.3	-	B	19.3	-	B
11: Honoapiilani Highway & Kapunakea Street						
NB LT	67.5	0.56	E	66.0	0.80	E
NB TH	0.2	0.61	A	2.1	0.62	A
NB TH/RT	0.2	0.62	A	2.2	0.63	A
EB LT/TH	56.5	0.51	E	75.0	0.82	E
EB RT	48.3	0.02	D	45.8	0.02	D
WB LT	63.3	0.69	E	50.2	0.35	D
WB TH/RT	49.2	0.10	D	47.3	0.15	D
SB LT	74.0	0.66	E	73.4	0.67	E
SB TH/RT	21.3	0.55	C	29.9	0.70	C
Overall	15.7	-	B	23.1	-	C
12: Honoapiilani Highway & Lahaina Cannery Mall/Keawe Street						
NB LT	92.2	0.77	F	81.4	0.77	F
NB TH	25.3	0.57	C	31.3	0.70	C
NB RT	17.2	0.11	B	19.7	0.16	B
EB LT/TH	65.1	0.55	E	62.2	0.61	E
EB RT	59.6	0.04	E	55.6	0.07	E
WB LT	51.1	0.43	D	51.8	0.60	D
WB TH	48.8	0.22	D	45.5	0.27	D
WB RT	0.0	0.00	A	0.0	0.00	A
SB LT	52.3	0.91	D	71.0	0.88	E
SB TH/RT	0.7	0.39	A	36.7	0.50	D
Overall	26.9	-	C	44.8	-	D

* Denotes overcapacity condition, v/c ≥ 1.

4. BASE YEAR 2030 TRAFFIC CONDITIONS

The Year 2030 was selected to reflect the Project completion year. The Base Year 2030 scenario represents the traffic conditions within the study area without the Project. Traffic projections were formulated by applying a defacto growth rate to the existing 2019 traffic count volumes, plus trips generated by known future developments in the vicinity of the Project.

4.1 Defacto Growth Rate

Projections for Base Year traffic were based upon the Maui MPO's Travel Demand Model (TDM) growth for forecast years between 2019 and 2025. An overall annual growth rate of 0.5% was applied along Honoapiilani Highway to Base Year 2030.

4.2 Traffic Forecasts for Known Developments

4.2.1 Background Projects

By Base Year 2030, numerous developments are anticipated to be completed within the Project study area. The known developments that are projected to be complete by Base Year 2030 and generate traffic within the Project study area are illustrated in Figure 4.1 and 4.2 and are listed below based on the best information available.

Known Developments in West Maui

- Mahana Estates – This project is located in Kapalua, mauka of Honoapiilani Highway within the larger Kapalua Mauka Residential development. The project proposes to develop 51 single-family luxury homes. Completion and occupancy of the project is assumed to occur by 2030.
- Residences of Pailolo Place – This project is located in Kapalua, mauka of Lower Honoapiilani Road. The project proposes to develop a 42-unit multi-family condo across from the Napili Kai Beach Resort. Completion and occupancy of the project is assumed to occur by 2030.
- Wailele Ridge – Previously known as West Maui Village, this project is located south of Honoapiilani Highway and just east of Maui Preparatory Academy. The project proposes to develop 158 single-family units in 25 buildings. Construction of the project is ongoing with completion expected by 2030.
- Pulelehua Development – This project currently proposes to develop approximately 310 acres of land to provide 100 single-family residential units with an ohana unit allowed on each lot, 800 multi-family residential units, an elementary school, a 10-acre park and three (3) retail centers, totaling 70,000 square feet. In addition, a new roadway will be constructed just east and parallel to Honoapiilani Highway that will provide vehicular, bike and pedestrian access to link the Project's development north and south of Mahinahina Gulch. Construction is anticipated to occur in seven (7) phases, with all aforementioned uses anticipated to be constructed by 2030 with the exception of the future elementary school. This elementary school will be planned and developed by the Department of Education (DOE)
- DHHL Honokowai Development – This project currently proposes to develop approximately 800 acres of land to provide up to 250 homestead subsistence agriculture lots, 335 homestead residential single-family lots, 543 homestead multi-family residential units, 14 acres of supplemental agriculture, 17 acres of community use agriculture, 30 acres of community park space, 25 acres of community commercial use and 16 acres of industrial use. A TIAR was prepared for DHHL Honokowai by Fehr & Peers, dated June 8, 2021. Based on this TIAR, the DHHL Honokowai development would generate a total net new vehicular trips of 1,035 AM peak hour trips and 1,552 PM peak hour trips, with full build-out by Year 2028.

- West Maui Hospital and Medical Center – This project is located east of Honoapiilani Highway in the Kaanapali region. The project proposes to develop a critical access hospital, a skilled nursing facility, an assisted living facility, medical office buildings and a rehabilitation facility. At the time of this report, the project is currently on hold. However, it was conservatively assumed that all components of the project would be completed by 2030 for the purposes of this report.
- Lanikeha Kaanapali – This project is located east of Honoapiiliani Highway and across from Kaanapali Parkway. The project consists of 132 lots in a gated community, with Honoapiilani Highway access provided via Kekaa Drive and Kualapa Loop. At the time of this report, several lots were completed or under construction with additional lots still available for purchase.
- Lahaina Cannery Mall Gas Station – This project is an expansion of the existing Lahaina Cannery Mall located at the northwest corner of Honoapiilani Highway and Keawe Street. The expansion is proposed between the existing access across of Keawe Street and the Kahoma Stream Flood Control Channel. The project proposes to develop an 18-pump gas station with a convenience market. Completion of the project is expected to be completed by 2030.
- Kahoma Village – This project is located south of the Lahaina Cannery Mall on 22 acres of land. The project proposes to develop 101 single-family homes and 102 multi-family homes. Construction of the project began in late 2016 with a portion completed and occupied in 2018. Full build out of the project is expected to be complete by 2030.
- HHFDC Keawe Street Apartments – This project is located across from Lahaina Business Park on the north side of Keawe Street, mauka of the Wash It car wash facility. The project proposes to develop 200 affordable rental apartment units through the Hawaiian Housing Finance and Development Corporation (HHFDC).
- Lahaina Gateway Infill – From the time of counts taken in 2019, approximately 50,800 SF of Lahaina Gateway was occupied (52% occupancy). Full occupancy of the Lahaina Gateway is conservatively assumed to occur by 2030.
- Lahaina Business Park Infill – Lahaina Business Park is approximately 68% occupied with several lots currently undeveloped. Full occupancy of the business park is conservatively assumed to occur by 2030.
- Kaiaulu O Kupuohi Apartments – This project is located in the Lahaina Business Park south of Keawe Street and proposes to develop 89 rental apartment units. Completion and occupancy of the project is assumed to occur by 2030.
- Kahoma Residential Subdivision – This project is located east of the proposed Kahoma Village and south of the Kahoma Stream Flood Control Channel. The project is complete and provides 68 single-family lots and a neighborhood park. For purposes of this study, 34 SF lots are included based on the estimated number of unoccupied lots from the time of the counts in 2019.

- Makila Farms is expected to consist of a combination of workforce residential dwelling units residential market lots for a total of 34 dwelling units with access to be provided via Haniu Street and Punakea Street.

4.2.2 Trip Generation

The Institute of Transportation Engineers (ITE) publishes a book based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms, and associations. This publication, titled Trip Generation Manual, 10th Edition, provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables. The independent variables can range from Dwelling Units (DU) for single-family attached homes to Gross Floor Area (GFA) for commercial or office development. These trip rates/formulae and their associated directional distributions were used to estimate the increase in the number of vehicular trips generated by each of the respective projects. The rates selected were based on the land use description. See Tables 4.1 for Trip Generation projections for the background developments.

4.3 Planned Roadway Improvements

The Lahaina Bypass Road (LBR) is a major bypass road parallel and mauka to Honoapiilani Highway that is expected to be completed in five (5) total phases to address regional traffic congestion within Lahaina. The first two phases (1A and 1B-1) were completed in 2013 with an LBR connection from Keawe Street to Hokiokio Place. Phase 1B-2 was completed in 2018 and extended the LBR from Hokiokio Place to its current southern terminus with Honoapiilani Highway. Future LBR 1C will extend LBR further north from its current terminus at Keawe Street to Kakaalaneo Drive, with a midway LBR connection to Honoapiilani Highway via a "Kaanapali Connector Road" at some point south of Kaanapali Parkway. Future LBR 1D may extend LBR further north beyond Honokowai.

When LBR is extended further north, regional trips along Honoapiilani Highway will decrease as vehicles shift to the LBR connections at Kakaalaneo Drive and Kaanapali Connector Road. Funding for construction of Phase 1C to extend the LBR to Kaanapali is pending. Based on the high level of background development forecast in this TIAR, a "Without LBR 1C" and "With LBR 1C" scenario is provided for both Base and Future Year scenarios.

VILLAGES OF LEALII
PHASE 1B DEVELOPMENT

Austin Tsutsumi & ASSOCIATES, INC. Engineers & Surveyors

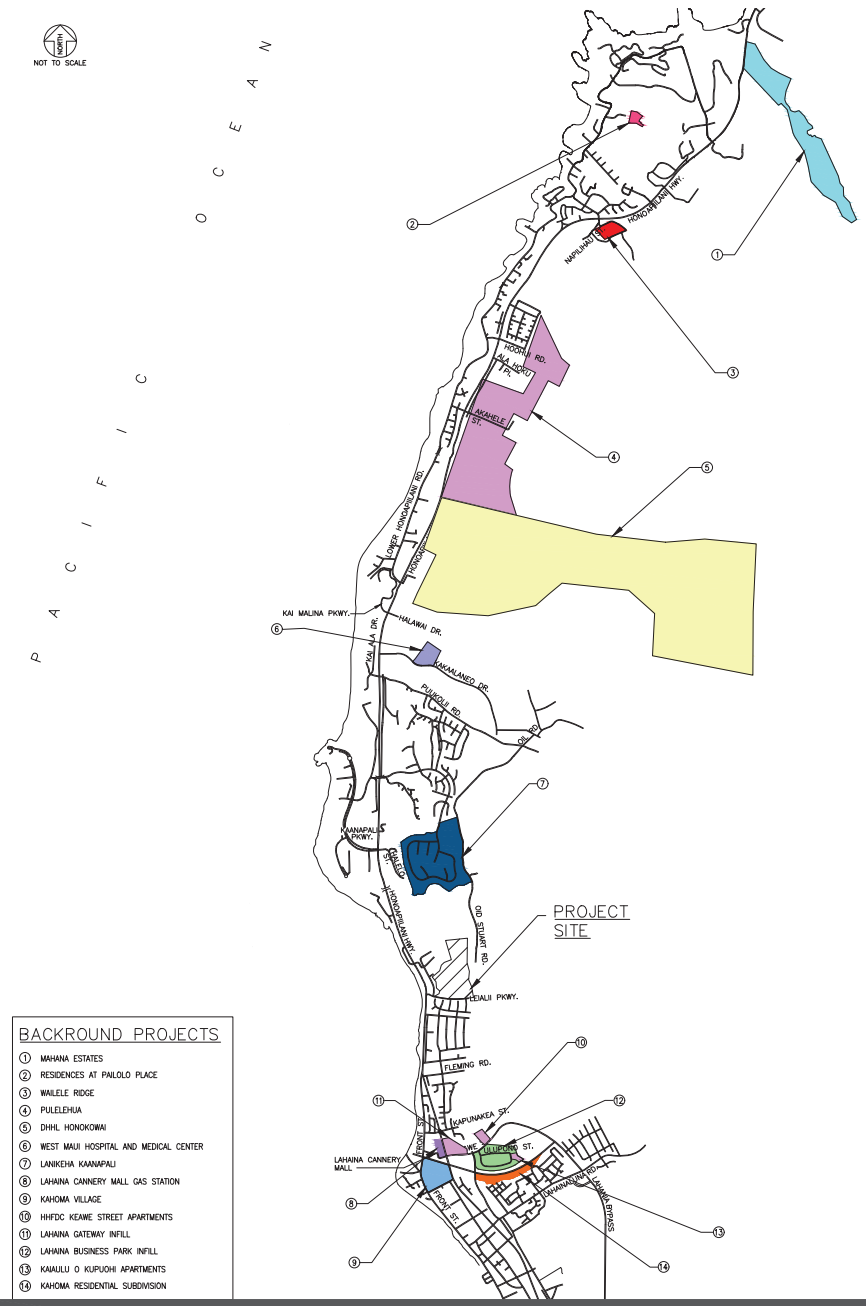

FIGURE 4.1

BACKGROUND PROJECTS IN LAHAINA AND KAANAPALI

Table 4.1: Background Projects Trip Generation

Land Use	Independent Variable	AM Peak Hour			PM Peak Hour		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
Known Developments in Lahaina							
Mahana Estates	51 SF DU	8	4	12	6	9	15
Residences of Pailolo Place	42 MF DU	4	15	19	15	9	24
Wailele Ridge	158 SF DU	13	51	64	54	31	85
Pulelehua Development [1]	1000 SF/MF DU 70,000 Sq. Ft. Shopping Center 2 Field Soccer Complex	204	382	585	473	338	815
DHHL Honokowai [1]	250 Ag Lots 335 SF Lots 543 MF DU 31 acres Ag use 30 acres park space 25 acres commercial 16 acres industrial	459	576	1035	818	734	1552
West Maui Hospital and Medical Center	25 Bed Hospital 40 Bed Skilled Nursing Facility 40 Bed Assisted Living Facility 40 Bed Rehabilitation Facility 60,000 Sq. Ft. Medical Office Bldg.	184	62	246	86	201	287
Lanikeha Kaanapali	132 SF DU	20	10	30	15	22	37
Lahaina Cannery Mall Gas Station [1]	18 Fueling Positions	44	42	85	129	123	252
Kahoma Village	203 SF/MF DU	23	75	97	80	48	128
HHFDC Keawe Street Apartments	200 MF DU	16	63	79	67	40	107
Lahaina Gateway Infill	~41,500 Sq. Ft. retail	13	8	21	66	71	137
Lahaina Business Park Infill	~121,570 Sq. Ft. Light Industrial	39	10	49	10	39	49
Kaiaulu O Kupuohi Apartments	89 MF DU	8	30	38	31	18	49
Kahoma Residential Subdivision	16 SF DU	4	12	16	11	7	18
Makila Farms	34 SF DU	7	22	29	23	14	37
Total Background External Trips		**1046**	**1362**	**2405**	**1884**	**1704**	**3592**

Notes
- SF DU = Single-Family Dwelling Unit
- MF DU = Multi-Family Dwelling Unit
- Forecast trips are either derived from available TIAR's for each Project, ITE Trip Generation and/or updated to reflect current status.
- Table 4.1 shows total external trips generated by known developments in the vicinity of the Project.
1. Includes pass-by trip reductions based on the project TIAR.

VILLAGES OF LEIALII
PHASE 1B DEVELOPMENT

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Engineers & Surveyors

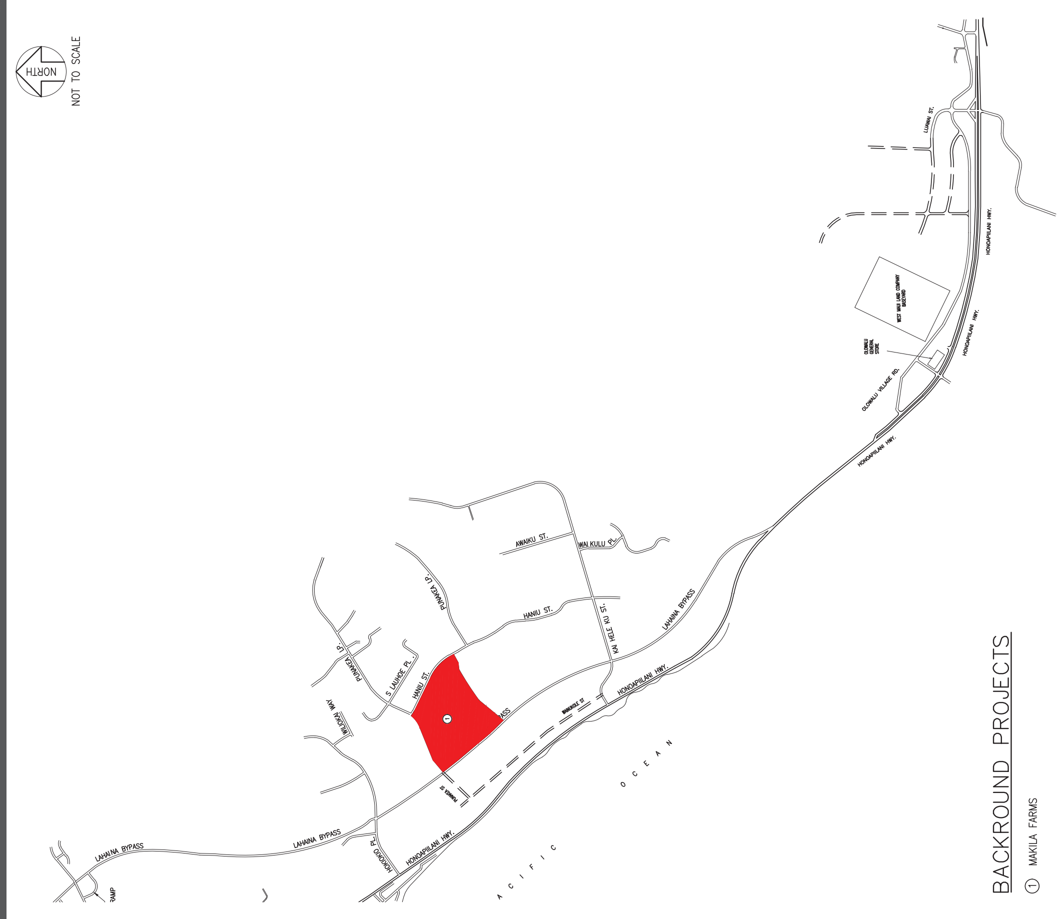

FIGURE 4.2

BACKGROUND PROJECT
LAUNIUPOKO

4.4 Base Year 2030 Analysis (Without LBR 1C)

This Base Year 2030 scenario assumes that the current alignment of LBR is maintained from its existing southern terminus to Keawe Street.

Overall, traffic volumes are anticipated to increase significantly due to infill growth and numerous planned developments in the Kapalua, Napili, Kahana, Honokowai, Kaanapali, Lahaina and Lauiniupoko areas. Based on forecast volumes, traffic is projected to increase by 500 to 700 vehicles per peak hour per direction. This translates to a traffic volume increase of approximately 20-30% during the AM peak hour and 35-40% during the PM peak hour per direction along Honoapiilani Highway when compared to existing conditions. Some through movements are forecast to operate at over-capacity conditions.

Honoapiilani Highway & Kaanapali Parkway/Halelo Street

Vehicular delays are forecast to increase throughout the intersection resulting in continued LOS E/F conditions for various minor street and mainline left-turn movements. In addition, the southbound through movement will worsen to LOS E conditions and overall LOS E during the PM peak hour. The eastbound approach is recommended to be restriped to provide an additional eastbound left-turn lane, resulting in one (1) eastbound left-turn lane and one (1) shared eastbound/through lane.

Honoapiilani Highway & Wahikuli Wayside Park Exit/Lahaina Civic Center Road

Higher volume along Honoapiilani Highway increased the delay for the eastbound approach, which is anticipated to operate at LOS F and overcapacity conditions during the PM peak hour of traffic. However, volumes along this eastbound approach will continue to be low, with only 1(2) vehicles exiting the Wahikuli Wayside Park during the AM(PM) peak hour, respectively. The signals at the adjacent Honoapiilani Highway intersections with Lealii Parkway and Kaanapali Parkway will continue to manage through flows and provide gaps in through traffic to allow unimpeded turning movements.

Honoapiilani Highway & Leialii Parkway, Front Street/Fleming Road and Kapunakea Street

As with other intersections along the Honoapiilani Highway route, increased volumes resulted in higher delays for most movements at these intersections. Some turning movements worsened to LOS E or F conditions. While all movements continue to operate below capacity at the Leialii Parkway intersection, the northbound through movement at the Front Street/Fleming Road intersection and southbound through movement at the Kapunakea Street intersection will worsen to LOS F and over-capacity conditions during the PM peak hour.

Honoapiilani Highway & Keawe Street

Without the extension of LBR 1C, Keawe Street will continue to serve as the primary connector road for regional flows to/from LBR and development further north. With the increases in background traffic flows, the northbound through and southbound left-turn movements will operate at LOS F and over-capacity conditions during the PM peak hour.

Figure 4.3 illustrates the lane configuration, forecast traffic volumes and movement LOS for Base Year 2030 (Without LBR 1C). Table 4.3 shows a LOS summary for existing and Base Year 2030 conditions with and without LBR 1C. LOS worksheets are provided in Appendix C.

4.5 Base Year 2030 (With LBR 1C)

4.5.1 LBR 1C Reroutes

This Base Year 2030 scenario assumes that LBR is extended further north from its current terminus at Keawe Street to Kakaalaneo Drive, with a midway LBR connection to Honoapiilani Highway via a “Kaanapali Connector Road” at some point south of Kaanapali Parkway.

With LBR 1C, regional trips along Honoapiilani Highway will decrease as vehicles shift to the LBR connections at Kakaalaneo Drive and Kaanapali Connector Road. The following summarizes the anticipated reroutes:

- Approximately 100-150 vehicles entering Lahaina Gateway/Walgreens from Honoapiilani Highway were deemed regional trips north of Kaanapali and rerouted to LBR 1C.
- Approximately 50 vehicles exiting Walgreens via left-turn exit towards Honoapiilani Highway were deemed regional trips north of Kaanapali and rerouted to LBR 1C.
- Approximately 100-170 vehicles entering/exiting Lahaina Business Park to Honoapiilani Highway were deemed regional trips north of Kaanapali and rerouted to LBR 1C.
- Approximately 35% of all through vehicles entering/exiting Lahaina via Kai Hele Ku Street intersections with Honoapiilani Highway and LBR were deemed regional trips north of Kaanapali and rerouted to LBR 1C. The 35% reroute was based on a number of factors such as assessing regional traffic turning on/off Kai Hele Ku Street and Hokiokio Place, turn movements generated by Lahaina Gateway and Lahaina Business Park and population, employment and hotel unit figures taken from the Maui MPO Travel Demand Model.

Based on the above reroutes, about 600 to 800 vehicles per peak hour per direction is forecast to reroute to the LBR 1C connections at Kakaalaneo Drive and Kaanapali Connector Road. This translates to an overall 30% reroute of vehicles shifting from Honoapiilani Highway to LBR 1C.

4.5.2 Base Year 2030 Analysis (With LBR 1C)

With LBR 1C, all study intersections will improve from the Base Year 2030 (Without LBR 1C) scenario and all previously identified over-capacity conditions will improve and operate below capacity due to traffic volume reductions on Honoapiilani Highway.

Traffic volumes at the Honoapiilani Highway/Kaanapali Parkway intersection will still increase overall by about 200-300 through vehicles from existing conditions. However, LBR 1C reroutes about 300-450 through vehicles from Honoapiilani Highway to LBR 1C via the new Kakaalaneo Drive LBR connection. As a result, all movements will operate adequately below capacity and the overall PM peak hour LOS will improve from LOS E to LOS D.

At the remaining signalized Honoapiilani Highway intersections, through traffic volumes along Honoapiilani Highway will reduce overall by about 600-800 vehicles, as additional regional vehicles will be rerouted to LBR 1C via Kaanapali Connector Road. As a result, through volumes along these remaining Honoapiilani Highway intersections will operate at levels similar to or slightly lower than existing conditions and improve to below capacity conditions.

Figure 4.4 illustrates the lane configuration, forecast traffic volumes and movement LOS for Base Year 2030 (With LBR 1C). Table 4.3 shows a LOS summary for existing and Base Year 2030 conditions with and without LBR 1C. LOS worksheets are provided in Appendix C.

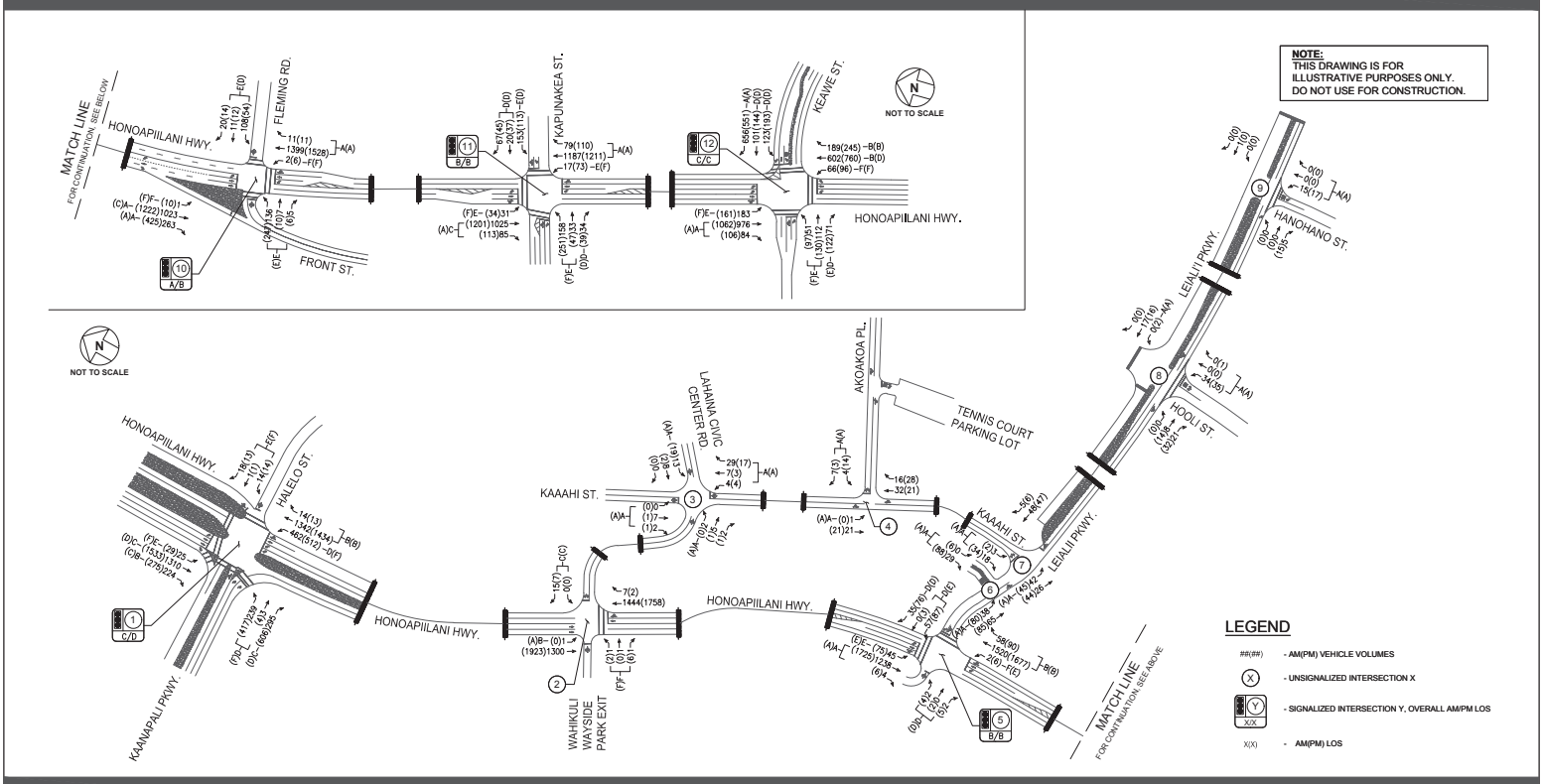

FIGURE 4.4

BASE YEAR 2030 - WITH LAHAINA BYPASS PHASE 1C
LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

VILLAGES OF LEIALII PHASE 1B
DEVELOPMENT

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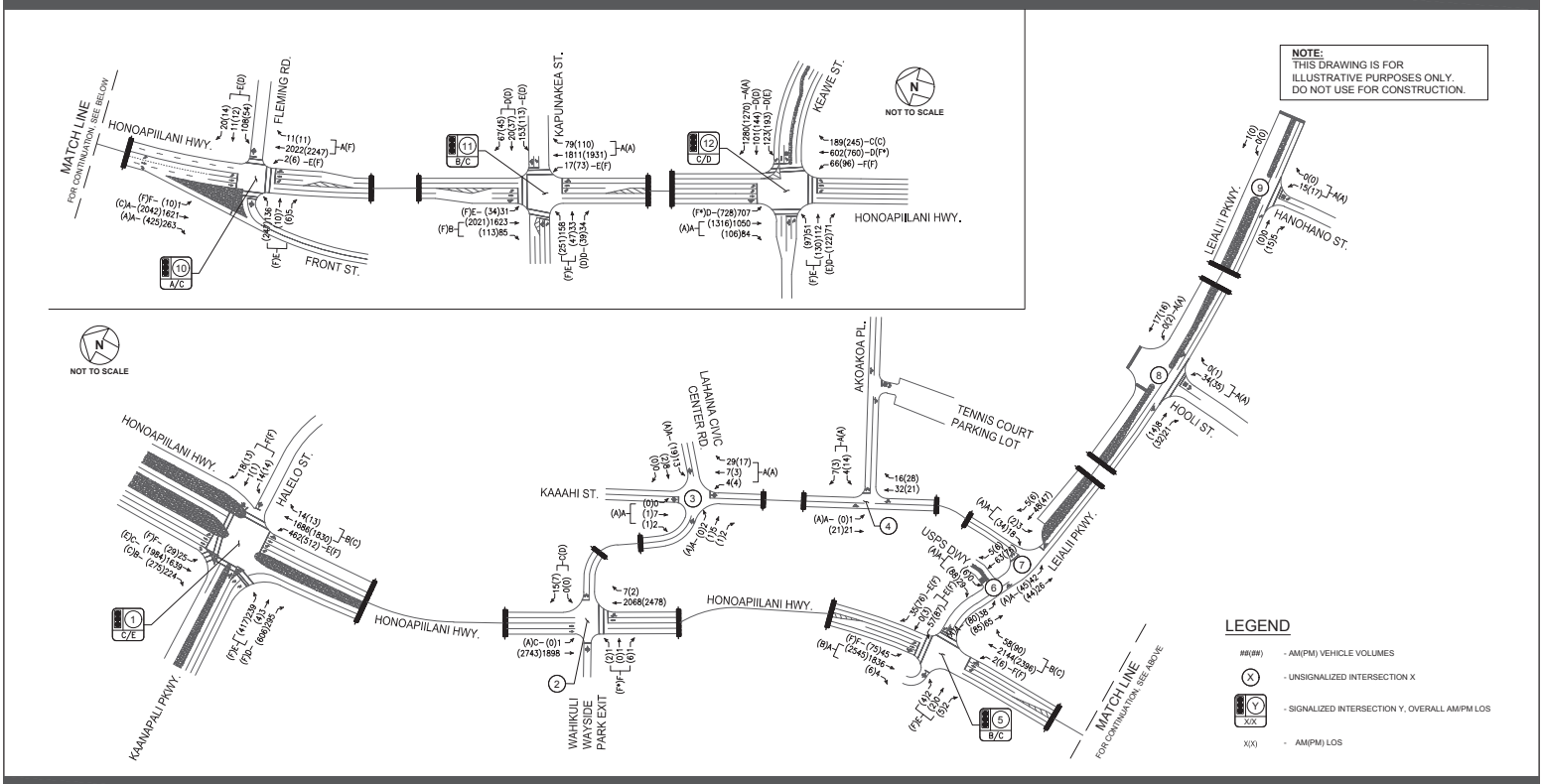


FIGURE 4.3

BASE YEAR 2030 WITHOUT LAHAINA BYPASS PHASE 1C
CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

Table 4.2: Existing and Base Year 2030 (With and Without Lahaina Bypass Phase 1C) Level of Service Summary

Intersection	Existing Conditions						Base Year 2030 Conditions Without Lahaina Bypass Phase 1C						Base Year 2030 Conditions With Lahaina Bypass Phase 1C					
	AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
8: Hooli St & Leialii Parkway																		
NB LT/RT	8.8	0.04	A	8.9	0.04	A	8.8	0.04	A	8.9	0.04	A	8.8	0.04	A	8.9	0.04	A
WB LT	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A
Overall	3.9	-	-	3.5	-	-	3.7	-	-	3.3	-	-	3.7	-	-	3.3	-	-
9: Hanohano St & Leialii Parkway																		
NB LT/RT	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A
Overall	6.7	-	-	4.6	-	-	6.1	-	-	4.4	-	-	6.1	-	-	4.4	-	-
10: Honoapiilani Highway & Front Street/Fleming Road																		
NB LT	84.7	0.42	F	74.8	0.46	E	76.6	0.42	E	89.0	0.48	F	85.6	0.42	F	94.5	0.48	F
NB TH/RT	6.1	0.57	A	16.7	0.70	B	1.4	0.78	A	17.1	1.03	F*	1.1	0.54	A	3.2	0.75	A
EB LT/TH/RT	64.0	0.60	E	64.2	0.76	E	62.6	0.66	E	109.0	0.96	F	62.6	0.66	E	79.2	0.85	E
WB LT/TH/RT	63.5	0.62	E	43.6	0.18	D	59.4	0.54	E	51.2	0.18	D	59.4	0.54	E	45.8	0.16	D
SB LT	101.9	0.41	F	72.7	0.50	E	96.4	0.41	F	90.6	0.53	F	101.9	0.41	F	93.6	0.53	F
SB TH	4.8	0.47	A	14.3	0.66	B	7.5	0.64	A	31.5	0.95	C	5.3	0.40	A	21.7	0.60	C
SB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
Overall	10.3	-	B	19.3	-	B	8.2	-	A	29.3	-	C	9.0	-	A	18.4	-	B
11: Honoapiilani Highway & Kapunakea Street																		
NB LT	67.5	0.56	E	66.0	0.80	E	67.5	0.56	E	84.4	0.83	F	69.8	0.56	E	102.2	0.83	F
NB TH	0.2	0.61	A	2.1	0.62	A	0.5	0.80	A	3.1	0.96	A	0.8	0.54	A	1.4	0.63	A
NB TH/RT	0.2	0.62	A	2.2	0.63	A	0.5	0.81	A	4.6	0.98	A	0.8	0.54	A	1.4	0.63	A
EB LT/TH	56.5	0.51	E	75.0	0.82	E	62.0	0.73	E	80.5	0.85	F	62.0	0.73	E	80.5	0.85	F
EB RT	48.3	0.02	D	45.8	0.02	D	46.6	0.02	D	47.6	0.02	D	46.6	0.02	D	47.6	0.02	D
WB LT	63.3	0.69	E	50.2	0.35	D	56.0	0.61	E	51.6	0.26	D	56.0	0.61	E	51.6	0.26	D
WB TH/RT	49.2	0.10	D	47.3	0.15	D	47.6	0.11	D	49.3	0.13	D	47.6	0.11	D	49.3	0.13	D
SB LT	74.0	0.66	E	73.4	0.67	E	73.3	0.73	E	102.3	0.78	F	75.4	0.73	E	125.8	0.78	F
SB TH/RT	21.3	0.55	C	29.9	0.70	C	14.8	0.73	B	37.6	1.07	F*	20.1	0.47	C	2.5	0.66	A
Overall	15.7	-	B	23.1	-	C	12.8	-	B	25.9	-	C	17.5	-	B	15.5	-	B
12: Honoapiilani Highway & Keawe Street																		
NB LT	92.2	0.77	F	81.4	0.77	F	80.8	0.78	F	99.2	0.84	F	80.8	0.78	F	99.2	0.84	F
NB TH	25.3	0.57	C	31.3	0.70	C	35.4	0.74	D	87.5	1.02	F*	16.4	0.55	B	35.5	0.78	D
NB RT	17.2	0.11	B	19.7	0.16	B	21.3	0.15	C	33.8	0.28	C	10.6	0.13	B	19.8	0.23	B
EB LT/TH	65.1	0.55	E	62.2	0.61	E	66.7	0.73	E	113.2	0.93	F	66.7	0.73	E	94.4	0.85	F
EB RT	59.6	0.04	E	55.6	0.07	E	53.7	0.03	D	66.7	0.20	E	53.7	0.03	D	64.1	0.18	E
WB LT	51.1	0.43	D	51.8	0.60	D	50.7	0.51	D	59.2	0.62	E	50.7	0.51	D	53.6	0.56	D
WB TH	48.8	0.22	D	45.5	0.27	D	48.3	0.30	D	53.2	0.31	D	48.3	0.30	D	49.3	0.29	D
WB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
SB LT	52.3	0.91	D	71.0	0.88	E	46.7	0.94	D	59.8	1.00	F*	62.1	0.75	E	81.8	0.78	F
SB TH/RT	0.7	0.39	A	36.7	0.50	D	0.8	0.52	A	0.4	0.73	A	1.1	0.49	A	2.0	0.63	A
Overall	26.9	-	C	44.8	-	D	28.4	-	C	45.9	-	D	21.2	-	C	32.7	-	C

* Denotes overcapacity condition, v/c ≥ 1.

Table 4.2: Existing and Base Year 2030 (With and Without Lahaina Bypass Phase 1C) Level of Service Summary

Intersection	Existing Conditions						Base Year 2030 Conditions Without Lahaina Bypass Phase 1C						Base Year 2030 Conditions With Lahaina Bypass Phase 1C					
	AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street																		
NB LT	39.9	0.76	D	59.8	0.83	E	69.9	0.84	E	179.5	0.99	F	49.1	0.80	D	89.4	0.88	F
NB TH/RT	12.0	0.57	B	15.0	0.51	B	13.8	0.70	B	23.2	0.72	C	12.3	0.61	B	17.3	0.62	B
EB LT/TH	41.8	0.64	D	58.9	0.79	E	74.1	0.69	E	178.1	0.95	F	52.2	0.62	D	91.0	0.81	F
EB RT	24.7	0.12	C	35.2	0.40	D	46.2	0.10	D	102.0	0.51	F	31.6	0.09	C	54.6	0.44	D
WB LT/TH/RT	47.4	0.21	D	69.8	0.23	E	83.2	0.32	F	169.8	0.41	F	59.0	0.26	E	100.4	0.31	F
SB LT	48.2	0.16	D	72.1	0.21	E	82.8	0.46	F	172.6	0.64	F	58.8	0.37	E	103.1	0.55	F
SB TH	23.0	0.75	C	34.6	0.82	C	31.1	0.85	C	71.9	0.96	E	24.3	0.76	C	42.3	0.85	D
SB RT	15.2	0.11	B	22.0	0.16	C	16.5	0.22	B	28.5	0.25	C	16.2	0.24	B	25.2	0.27	C
Overall	22.1	-	C	33.6	-	C	31.0	-	C	75.1	-	E	24.9	-	C	45.1	-	D
2: Honoapiilani Highway & Wahikuli Wayside Park Exit/Lahaina Civic Center Rd																		
EB LT/TH/RT	261.5	0.19	F	304.6	0.46	F	1439.5	0.82	F	2143.9	2.17	F*	169.5	0.13	F	304.6	0.46	F
WB LT/TH/RT	17.4	0.05	C	18.8	0.03	C	24.8	0.08	C	32.0	0.05	D	16.4	0.05	C	19.4	0.03	C
SB LT	0.0	0.00	0.0	0.0	0.00	0.0	21.1	0.01	C	0.0	0.00	A	13.7	0.00	B	0.0	0.00	A
Overall	0.4	-	-	0.7	-	-	1.2	-	-	3.3	-	-	0.3	-	-	0.7	-	-
3: Kaaahi Street & Lahaina Civic Center Rd																		
NB LT/TH/RT	8.7	0.03	A	8.7	0.01	A	8.7	0.04	A	8.6	0.03	A	8.7	0.04	A	8.6	0.03	A
EB LT	7.2	0.00	A	0.0	-	A	7.2	0.00	A	0.0	-	A	7.2	0.00	A	0.0	-	A
WB LT	7.2	0.01	A	7.2	0.01	A	7.2	0.01	A	7.3	0.01	A	7.2	0.01	A	7.3	0.01	A
SB LT/TH/RT	9.1	0.01	A	8.8	0.00	A	9.1	0.01	A	8.8	0.00	A	9.1	0.01	A	8.8	0.00	A
Overall	6.5	-	-	6.9	-	-	6.8	-	-	7.4	-	-	6.8	-	-	7.4	-	-
4: Kaaahi Street & Akoakoa Pl																		
WB LT/RT	8.6	0.01	A	8.7	0.02	A	8.7	0.01	A	8.8	0.02	A	8.7	0.01	A	8.8	0.02	A
SB LT	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A
Overall	1.5	-	-	2.3	-	-	1.3	-	-	1.7	-	-	1.3	-	-	1.7	-	-
5: Honoapiilani Highway & Leialii Parkway																		
NB LT	259.3	0.96	F	68.5	0.45	E	257.6	0.96	F	129.3	0.51	F	229.5	0.98	F	71.6	0.46	E
NB TH/RT	9.6	0.63	A	9.9	0.70	A	16.0	0.83	B	27.3	0.92	C	11.5	0.68	B	10.5	0.72	B
EB LT/TH/RT	76.8	0.02	E	50.3	0.03	D	74.8	0.02	E	101.6	0.04	F	42.2	0.01	D	52.5	0.03	D
WB LT/TH	81.3	0.36	F	55.1	0.47	E	79.1	0.35	E	115.2	0.66	F	44.4	0.23	D	57.8	0.49	E
WB RT	77.5	0.01	E	51.0	0.02	D	75.4	0.01	E	102.0	0.01	F	42.9	0.00	D	53.3	0.03	D
SB LT	94.0	0.56	F	60.3	0.60	E	94.3	0.69	F	124.7	0.85	F	55.1	0.50	E	67.9	0.79	E
SB TH/RT	5.3	0.49	A	7.1	0.69	A	7.0	0.66	A	16.9	0.89	B	6.3	0.49	A	6.6	0.65	A
Overall	10.2	-	B	10.4	-	B	13.8	-	B	25.1	-	C	10.8	-	B	11.2	-	B
6: Leialii Parkway & USPS Dwy																		
EB LT	7.4	0.02	A	7.5	0.05	A	7.4	0.03	A	7.5	0.06	A	7.4	0.03	A	7.5	0.06	A
SB LT/RT	8.7	0.03	A	9.2	0.10	A	0.0	0.03	A	9.3	0.11	A	8.8	0.03	A	9.3	0.11	A
Overall	2.7	-	-	4.5	-	-	2.7	-	-	4.4	-	-	2.7	-	-	4.4	-	-
7: Leialii Parkway & Kaaahi Street																		
EB LT	7.4	0.02	A	7.4	0.02	A	7.4	0.03	A	7.4	0.03	A	7.4	0.03	A	7.4	0.03	A
SB LT/RT	8.8	0.02	A	8.7	0.03	A	8.8	0.02	A	8.8	0.04	A	8.8	0.02	A	8.8	0.04	A
Overall	3.1	-	-	3.1	-	-	3.5	-	-	3.6	-	-	3.5	-	-	3.6	-	-

* Denotes overcapacity condition, v/c ≥ 1.

5. FUTURE YEAR 2030 TRAFFIC CONDITIONS

The Future Year 2030 scenario represents the traffic conditions within the Project study area with the full build-out of the Project.

5.1 Background

The Project proposes to develop approximately 50.8-acres of land in two (2) increments. Increment 1 will provide 86 single-family lots. Increment 2 may provide 95 single-family lots, 164 multi-family units, or a combination of both. The subdivision is not planned to exceed 250 units for Increment 1 and Increment 2 combined. For purposes of this TIAR, Increment 2 was analyzed with the maximum build-out of 164 multi-family units, since it results in a slightly higher trip generation than the 95 single-family lots. If Increment 2 changes to a mix of single-family and multi-family lots, the overall Project trip generation may slightly increase but not significant to alter conclusions of this study. Vehicular traffic to the Project will be provided along Lealii Parkway via the existing intersections with Hooli Street and Hanohano Street. The Project is anticipated to be completed by the Year 2030.

5.2 Travel Demand Estimations

5.2.1 Trip Generation

The Institute of Transportation Engineers (ITE) publishes a book based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms, and associations. This publication, titled Trip Generation Manual, 10th Edition, provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables. The independent variables can range from Dwelling Units (DU) for single-family detached homes to Gross Floor Area (GFA) for commercial or office development. These trip rates/formulae and their associated directional distributions were used to estimate the increase in the number of vehicular trips generated by the proposed Project. The rates selected were based on the land use description.

See Tables 5.1 and 5.2 for Trip Generation formulae and projections for the Project.

Table 5.1: Project Trip Generation Rates

Land Use (ITE Code)	Independent Variable	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Single Family Detached Housing (210)	DU	[a]	26%	[b]	63%
Multi-Family (Low-Rise) Housing (220)	DU	[c]	23%	[d]	63%

Notes
DU= Dwelling Units
[a] = EXP(0.91 LN(X) + 0.12)
[b] = EXP(0.94 Ln(X) + 0.27)
[c] = 0.31*(X) + 22.85
[d] = 0.43*(X) + 20.55

Table 5.2: Project-Generated Trips

Land Use Type (ITE Code)	Independent Variable	Weekday AM Peak Hour			Weekday PM Peak Hour		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
Single Family Detached Housing (210)	86 Units	17	48	65	55	32	87
Multi-Family (Low-Rise) Housing (220)	164 Units	17	57	74	58	34	92

5.2.2 Trip Distribution & Assignment

The Project is anticipated to generate a total of 139(179) trips during the AM and PM peak hours, respectively. Trips generated by the Project were assigned throughout the study area generally based upon existing travel patterns in the study area. Approximately 30-40% of Project trips were distributed to/from Kaanapali and beyond and 60-70% were distributed to/from Lahaina Town. The traffic generated by the Project was added to the forecast Base Year 2030 traffic volumes within the vicinity of the Project to constitute the traffic volumes for the Future Year 2030 traffic conditions. Since Leialii Parkway is not planned to connect to LBR 1C, Project trips were only forecast for one route and no Project reroutes are planned with LBR 1C. Project-generated trips are shown in Figure 5.1.

5.3 Future Year 2030 Analysis

Upon completion of the Project, all study intersections are forecast to operate with similar LOS as Base Year 2030 traffic conditions, with or without LBR 1C.

Without LBR 1C, various movements will continue to operate over-capacity similar to the Base Year 2030 (Without LBR 1C) scenario.

With LBR 1C, all study intersections will improve from the Base Year 2030 (Without LBR 1C) scenario and all previously identified over-capacity conditions will improve and operate below capacity due to traffic volume reductions on Honoapiilani Highway. All through movements will operate adequately at LOS D or better and below capacity.

Regionally along Honoapiilani Highway, traffic generated by the Project will increase by approximately 20-75 vehicles per direction per peak hour, which translates to a 1.3% increase in traffic in the Kaanapali region and 2.2% increase in traffic in Lahaina Town when compared to the Base Year 2030 (With LBR 1C) scenario. Due to generally low traffic increases as a result of the Project the majority of movement vehicular delays generally increased minimally by 1-6 seconds.

Figure 5.2 illustrates the lane configuration, forecast traffic volumes and movement LOS for Future Year 2030 (Without LBR 1C). Figure 5.3 illustrates the lane configuration, forecast traffic volumes and movement LOS for Future Year 2030 (With LBR 1C). Table 5.3 shows a LOS

summary for existing, Base Year 2030 and Future Year 2030 conditions with and without LBR 1C. LOS worksheets are provided in Appendix C.

5.3.1 Project Recommendations

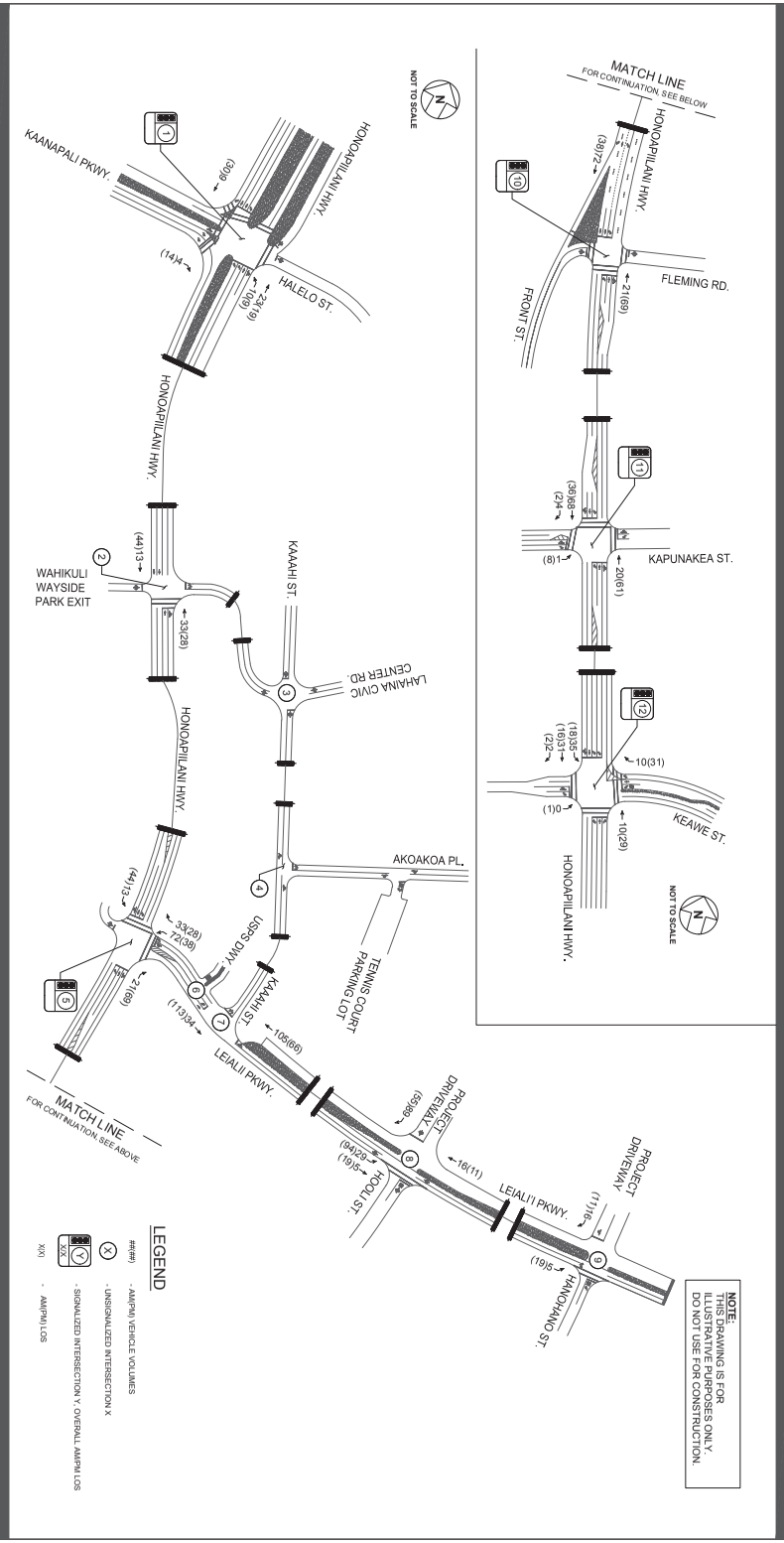
At the Honoapiilani Highway/Leialii Parkway intersection, the Project is expected to increase traffic for the southbound left-turn movement by approximately 13(44) vehicles during the AM(PM) peak hours, respectively. Based on A Policy on Geometric Design of Highways and Streets, by the American Association of State Highway and Transportation Officials (AASHTO Green Book), dated 2011, a 300' southbound left-turn storage length is recommended (exclusive of tapers and deceleration lengths). Table 5.4 shows the calculations for the southbound left-turn deceleration length.

As part of the Project, DHHL is also proposing to widen Leialii Parkway with the following modifications. It should be noted that these improvements are not based on Project traffic increases and are not a requirement of previous land use conditions or agency agreements.

- Maintain two westbound lanes along Leialii Parkway but restripe to delineate separate lanes from Honoapiilani Highway to Kaahi Street.
- Widen eastbound lanes along Leialii Parkway to provide one (1) exclusive left-turn lane into Kaahi Street and one (1) through lane continuing further up Leialii Parkway from Honoapiilani Highway to Kaahi Street.
- Provide a new crosswalk across Kaahi Street on the north leg of its intersection with Leialii Parkway.
- Upgrade the northeast and southeast curb ramps at the Honoapiilani Highway/Leialii Parkway intersection and lengthen the marked crosswalk across Leialii Parkway to accommodate the widening.

FIGURE 5.1

PROJECT TRIPS



PROJECT TRIPS

VILLAGES OF LEIALII PHASE 1B
DEVELOPMENT

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

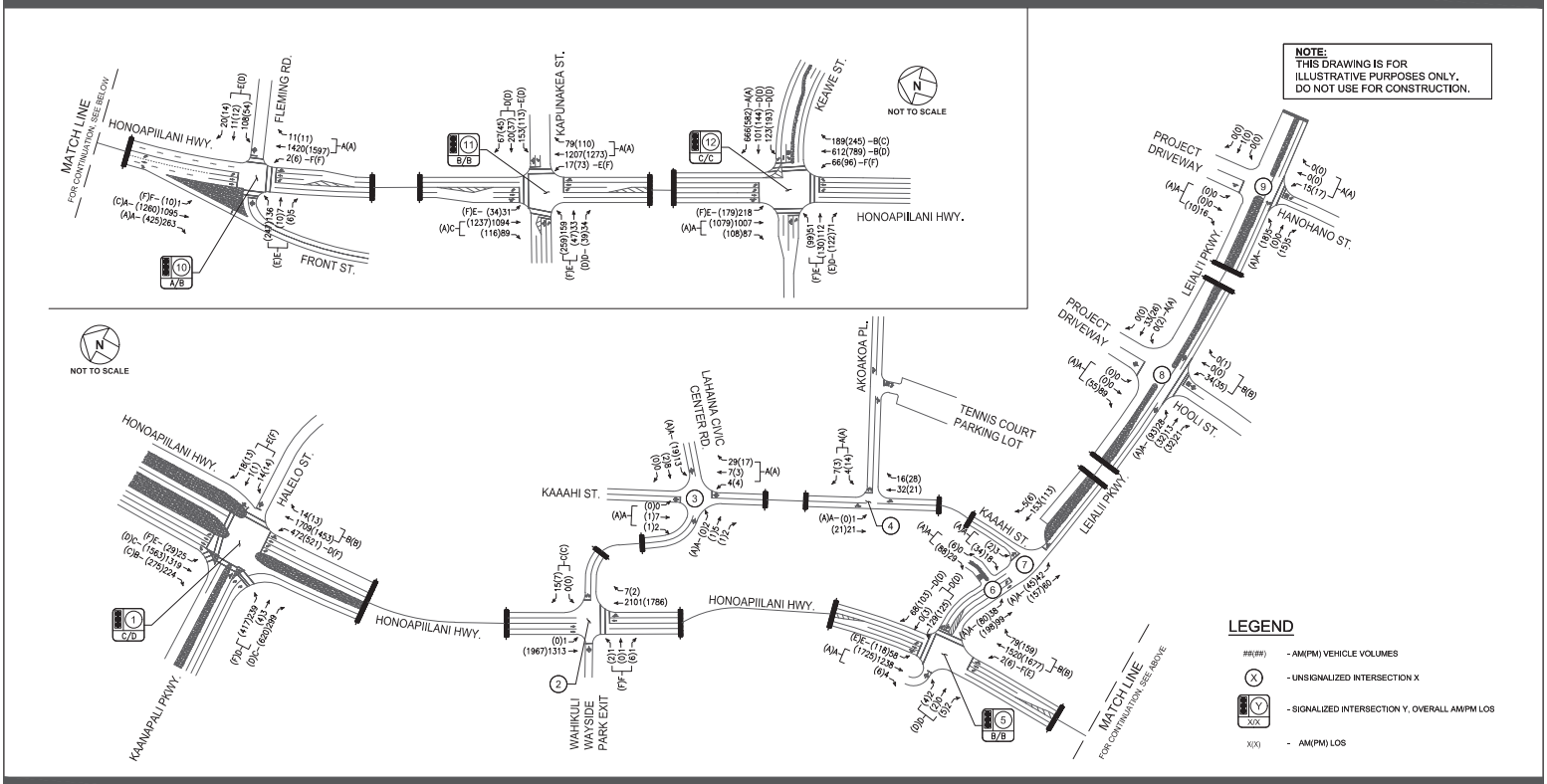


FIGURE 5.3

FUTURE YEAR 2030 - WITH LBR 1C LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

VILLAGES OF LEIALII PHASE 1B
DEVELOPMENT

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

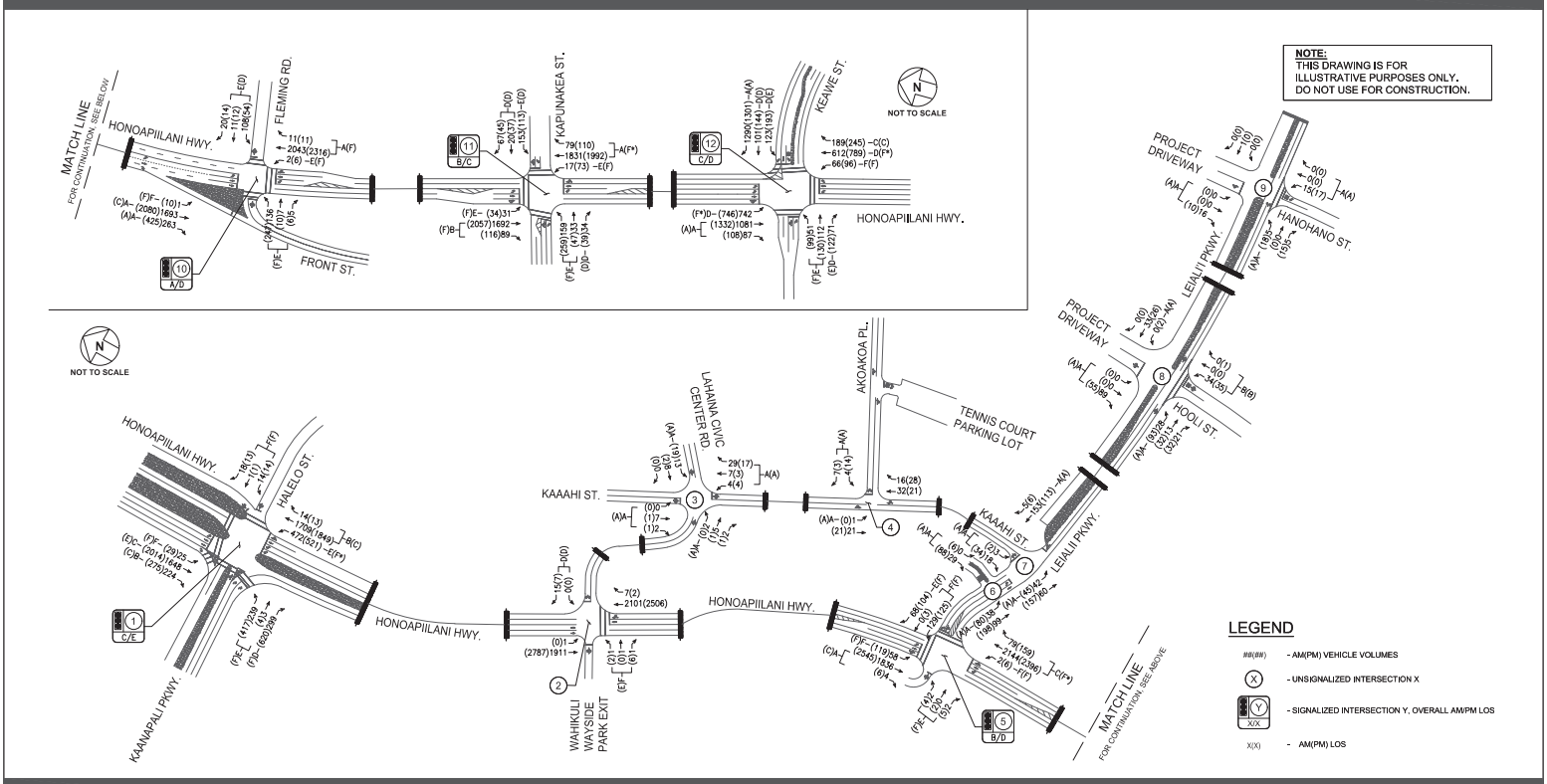


FIGURE 5.2

FUTURE YEAR 2030 - NO LBR 1C LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

Table 5.3: Existing, Base Year 2030 and Future Year 2030 (With and Without Lahaina Bypass Phase 1C) Conditions Level of Service Summary

Intersection	Existing Conditions						Base Year 2030 Conditions Without Lahaina Bypass Phase 1C						Base Year 2030 Conditions With Lahaina Bypass Phase 1C						Future Year 2030 Conditions Without Lahaina Bypass Phase 1C						Future Year 2030 Conditions With Lahaina Bypass Phase 1C					
	AM			PM			AM			PM			AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
11: Honoapiilani Highway & Kapunakea Street																														
NB LT	67.5	0.56	E	66.0	0.80	E	67.5	0.56	E	84.4	0.83	F	69.8	0.56	E	102.2	0.83	F	67.5	0.56	E	84.4	0.83	F	69.6	0.56	E	99.2	0.83	F
NB TH	0.2	0.61	A	2.1	0.62	A	0.5	0.80	A	3.1	0.96	A	0.8	0.54	A	1.4	0.63	A	0.6	0.81	A	8.1	1.00	A*	0.8	0.55	A	1.4	0.66	A
NB TH/RT	0.2	0.62	A	2.2	0.63	A	0.5	0.81	A	4.6	0.98	A	0.8	0.54	A	1.4	0.63	A	0.6	0.82	A	13.1	1.02	F*	0.8	0.55	A	1.4	0.67	A
EB LT/TH	56.5	0.51	E	75.0	0.82	E	62.0	0.73	E	80.5	0.85	F	62.0	0.73	E	80.5	0.85	F	62.0	0.73	E	80.9	0.85	F	62.0	0.73	E	80.9	0.85	F
EB RT	48.3	0.02	D	45.8	0.02	D	46.6	0.02	D	47.6	0.02	D	46.6	0.02	D	47.6	0.02	D	46.5	0.02	D	46.9	0.02	D	46.5	0.02	D	46.9	0.02	D
WB LT	63.3	0.69	E	50.2	0.35	D	56.0	0.61	E	51.6	0.26	D	56.0	0.61	E	51.6	0.26	D	55.9	0.61	E	50.8	0.26	D	55.9	0.61	E	50.8	0.26	D
WB TH/RT	49.2	0.10	D	47.3	0.15	D	47.6	0.11	D	49.3	0.13	D	47.6	0.11	D	49.3	0.13	D	47.5	0.11	D	48.5	0.13	D	47.5	0.11	D	48.5	0.13	D
SB LT	74.0	0.66	E	73.4	0.67	E	73.3	0.73	E	102.3	0.78	F	75.4	0.73	E	125.8	0.78	F	73.0	0.73	E	100.7	0.78	F	75.3	0.73	E	125.4	0.78	F
SB TH/RT	21.3	0.55	C	29.9	0.70	C	14.8	0.73	B	37.6	1.07	F*	20.1	0.47	C	2.5	0.66	A	15.7	0.76	B	49.3	1.10	F*	21.0	0.50	C	2.8	0.68	A
Overall	15.7	-	B	23.1	-	C	12.8	-	B	25.9	-	C	17.5	-	B	15.5	-	B	13.2	-	B	33.7	-	C	17.8	-	B	15.3	-	B
12: Honoapiilani Highway & Keawe Street																														
NB LT	92.2	0.77	F	81.4	0.77	F	80.8	0.78	F	99.2	0.84	F	80.8	0.78	F	99.2	0.84	F	80.8	0.78	F	99.2	0.84	F	80.8	0.78	F	99.2	0.84	F
NB TH	25.3	0.57	C	31.3	0.70	C	35.4	0.74	D	87.5	1.02	F*	16.4	0.55	B	35.5	0.78	D	37.5	0.76	D	99.3	1.06	F*	17.7	0.57	B	38.9	0.82	D
NB RT	17.2	0.11	B	19.7	0.16	B	21.3	0.15	C	33.8	0.28	C	10.6	0.13	B	19.8	0.23	B	22.0	0.15	C	33.9	0.28	C	11.3	0.14	B	20.5	0.24	C
EB LT/TH	65.1	0.55	E	62.2	0.61	E	66.7	0.73	E	113.2	0.93	F	66.7	0.73	E	94.4	0.85	F	66.7	0.73	E	116.5	0.94	F	66.7	0.73	E	95.7	0.86	F
EB RT	59.6	0.04	E	55.6	0.07	E	53.7	0.03	D	66.7	0.20	E	53.7	0.03	D	64.1	0.18	E	53.7	0.03	D	66.7	0.20	E	53.7	0.03	D	64.0	0.18	E
WB LT	51.1	0.43	D	51.8	0.60	D	50.7	0.51	D	59.2	0.62	E	50.7	0.51	D	53.6	0.56	D	50.7	0.51	D	59.1	0.61	E	50.7	0.51	D	53.4	0.55	D
WB TH	48.8	0.22	D	45.5	0.27	D	48.3	0.30	D	53.2	0.31	D	48.3	0.30	D	49.3	0.29	D	48.3	0.30	D	53.2	0.31	D	48.3	0.30	D	49.2	0.29	D
WB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
SB LT	52.3	0.91	D	71.0	0.88	E	46.7	0.94	D	59.8	1.00	F*	62.1	0.75	E	81.8	0.78	F	46.9	0.96	D	67.7	1.03	F*	60.2	0.77	E	80.4	0.79	F
SB TH/RT	0.7	0.39	A	36.7	0.50	D	0.8	0.52	A	0.4	0.73	A	1.1	0.49	A	2.0	0.63	A	0.8	0.54	A	0.4	0.74	A	1.2	0.50	A	2.0	0.64	A
Overall	26.9	-	C	44.8	-	D	28.4	-	C	45.9	-	D	21.2	-	C	32.7	-	C	28.7	-	C	50.3	-	D	21.7	-	C	33.8	-	C

* Denotes overcapacity condition, v/c ≥ 1.

Table 5.3: Existing, Base Year 2030 and Future Year 2030 (With and Without Lahaina Bypass Phase 1C) Conditions Level of Service Summary

Intersection	Existing Conditions						Base Year 2030 Conditions Without Lahaina Bypass Phase 1C						Base Year 2030 Conditions With Lahaina Bypass Phase 1C						Future Year 2030 Conditions Without Lahaina Bypass Phase 1C						Future Year 2030 Conditions With Lahaina Bypass Phase 1C					
	AM			PM			AM			PM			AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street																														
NB LT	39.9	0.76	D	59.8	0.83	E	69.9	0.84	E	179.5	0.99	F	49.1	0.80	D	89.4	0.88	F	71.4	0.85	E	187.4	1.01	F*	49.8	0.80	D	86.5	0.88	F
NB TH/RT	12.0	0.57	B	15.0	0.51	B	13.8	0.70	B	23.2	0.72	C	12.3	0.61	B	17.3	0.62	B	14.0	0.70	B	23.8	0.73	C	12.3	0.61	B	17.8	0.62	B
EB LT/TH	41.8	0.64	D	58.9	0.79	E	74.1	0.69	E	178.1	0.95	F	52.2	0.62	D	91.0	0.81	F	75.3	0.69	E	181.2	0.96	F	53.2	0.62	D	91.8	0.81	F
EB RT	24.7	0.12	C	35.2	0.40	D	46.2	0.10	D	102.0	0.51	F	31.6	0.09	C	54.6	0.44	D	46.7	0.10	D	105.7	0.57	F	32.0	0.09	C	54.9	0.43	D
WB LT/TH/RT	47.4	0.21	D	69.8	0.23	E	83.2	0.32	F	169.8	0.41	F	59.0	0.26	E	100.4	0.31	F	84.6	0.33	F	171.0	0.43	F	60.1	0.26	E	102.4	0.34	F
SB LT	48.2	0.16	D	72.1	0.21	E	82.8	0.46	F	172.6	0.64	F	58.8	0.37	E	103.1	0.55	F	84.2	0.46	F	173.8	0.64	F	59.9	0.38	E	104.9	0.55	F
SB TH	23.0	0.75	C	34.6	0.82	C	31.1	0.85	C	71.9	0.96	E	24.3	0.76	C	42.3	0.85	D	32.0	0.85	C	75.6	0.98	E	24.7	0.77	C	45.6	0.87	D
SB RT	15.2	0.11	B	22.0	0.16	C	16.5	0.22	B	28.5	0.25	C	16.2	0.24	B	25.2	0.27	C	16.8	0.22	B	28.7	0.26	C	16.4	0.24	B	26.2	0.29	C
Overall	22.1	-	C	33.6	-	C	31.0	-	C	75.1	-	E	24.9	-	C	45.1	-	D	31.7	-	C	78.1	-	E	25.3	-	C	46.1	-	D
2: Honoapiilani Highway & Wahikuli Wayside Park Exit/Lahaina Civic Center Rd																														
EB LT/TH/RT	261.5	0.19	F	304.6	0.46	F	1439.5	0.82	F	2143.9	2.17	F*	169.5	0.13	F	304.6	0.46	F	1439.5	0.82	F	41.2	0.08	E	177.3	0.14	F	304.6	0.46	F
WB LT/TH/RT	17.4	0.05	C	18.8	0.03	C	24.8	0.08	C	32.0	0.05	D	16.4	0.05	C	19.4	0.03	C	25.4	0.08	D	32.6	0.06	D	16.7	0.05	C	19.7	0.03	C
Overall	0.4	-	-	0.7	-	-	1.2	-	-	3.3	-	-	0.3	-	-	0.7	-	-	1.2	-	-	0.1	-	-	0.3	-	-	0.7	-	-
3: Kaaahi Street & Lahaina Civic Center Rd																														
NB LT/TH/RT	8.7	0.03	A	8.7	0.01	A	8.7	0.04	A	8.6	0.03	A	8.7	0.04	A	8.6	0.03	A	8.7	0.04	A	8.6	0.03	A	8.7	0.04	A	8.6	0.03	A
EB LT	7.2	0.00	A	0.0	-	A	7.2	0.00	A	0.0	-	A	7.2	0.00	A	0.0	-	A	7.2	0.00	A	0.0	-	A	7.2	0.00	A	0.0	-	A
WB LT	7.2	0.01	A	7.2	0.01	A	7.2	0.01	A	7.3	0.01	A	7.2	0.01	A	7.3	0.01	A	7.2	0.01	A	7.3	0.01	A	7.2	0.01	A	7.3	0.01	A
SB LT/TH/RT	9.1	0.01	A	8.8	0.00	A	9.1	0.01	A	8.8	0.00	A	9.1	0.01	A	8.8	0.00	A	9.1	0.01	A	8.8	0.00	A	9.1	0.01	A	8.8	0.00	A
Overall	6.5	-	-	6.9	-	-	6.8	-	-	7.4	-	-	6.8	-	-	7.4	-	-	6.8	-	-	7.4	-	-	6.8	-	-	7.4	-	-
4: Kaaahi Street & Akoakoa Pl																														
WB LT/RT	8.6	0.01	A	8.7	0.02	A	8.7	0.01	A	8.8	0.02	A	8.7	0.01	A	8.8	0.02	A	8.7	0.01	A	8.8	0.02	A	8.7	0.01	A	8.8	0.02	A
SB LT	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A
Overall	1.5	-	-	2.3	-	-	1.3	-	-	1.7	-	-	1.3	-	-	1.7	-	-	1.3	-	-	1.7	-	-	1.3	-	-	1.7	-	-
5: Honoapiilani Highway & Lelalii Parkway																														
NB LT	259.3	0.96	F	68.5	0.45	E	257.6	0.96	F	129.3	0.51	F	229.5	0.98	F	71.6	0.46	E	261.1	0.96	F	136.9	0.51	F	231.5	0.98	F	69.7	0.46	E
NB TH/RT	9.6	0.83	A	9.9	0.70	A	16.0	0.83	B	27.3	0.92	C	11.5	0.68	B	10.5	0.72	B	20.3	0.86	C	52.7	1.00	F*	12.4	0.69	B	18.3	0.81	B
EB LT/TH/RT	76.8	0.02	E	50.3	0.03	D	74.8	0.02	E	101.6	0.04	F	42.2	0.01	D	52.5	0.03	D	75.2	0.01	E	104.5	0.03	F	43.6	0.01	D	47.9	0.03	D
WB LT/TH	81.3	0.36	F	55.1	0.47	E	79.1	0.35	E	115.2	0.66	F	44.4	0.23	D	57.8	0.49	E	87.6	0.70	F	144.3	0.83	F	49.7	0.52	D	54.8	0.58	D
WB RT	77.5	0.01	E	51.0	0.02	D	75.4	0.01	E	102.0	0.01	F	42.9	0.00	D	53.3	0.03	D	76.0	0.02	E	105.2	0.03	F	44.3	0.01	D	48.8	0.05	D
SB LT	94.0	0.56	F	60.3	0.60	E	94.3	0.69	F	124.7	0.85	F	55.1	0.50	E	67.9	0.79	E	101.9	0.80	F	139.3	0.90	F	58.5	0.60	E	63.0	0.82	E
SB TH/RT	5.3	0.49	A	7.1	0.69	A	7.0	0.66	A	16.9	0.89	B	6.3	0.49	A	6.6	0.65	A	8.5	0.67	A	20.1	0.90	C	6.6	0.49	A	8.7	0.67	A
Overall	10.2	-	B	10.4	-	B	13.8	-	B	25.1	-	C	10.8	-	B	11.2	-	B	18.4	-	B	40.1	-	D	12.7	-	B	16.5	-	B
6: Lelalii Parkway & USPS Dwy																														
EB LT	7.4	0.02	A	7.5	0.05	A	7.4	0.03	A	7.5	0.06	A	7.4	0.03	A	7.5	0.06	A	7.7	0.03	A	7.7	0.06	A	7.7	0.03	A	7.7	0.06	A
SB LT/RT	8.7	0.03	A	9.2	0.10	A	0.0	0.03	A	9.3	0.11	A	8.8	0.03	A	9.3	0.11	A	9.4	0.04	A	9.9	0.12	A	9.4	0.04	A	9.9	0.12	A
Overall	2.7	-	-	4.5	-	-	2.7	-	-	4.4	-	-	2.7	-	-	4.4	-	-	1.7	-	-	3.0	-	-	1.7	-	-	3.0	-	-
7: Lelalii Parkway & Kaaahi Street																														
EB LT	7.4	0.02	A	7.4	0.02	A	7.4	0.03	A	7.4	0.03	A	7.4	0.03	A	7.4	0.03	A	7.7	0.03	A	7.6	0.03	A	7.7	0.03	A	7.6	0.03	A
SB LT/RT	8.8	0.02	A	8.7	0.03	A	8.8	0.02	A	8.8	0.04	A	8.8	0.02	A	8.8	0.04	A	9.5	0.03	A	9.2	0.04	A	9.5	0.03	A	9.2	0.04	A
Overall	3.1	-	-	3.1	-	-	3.5	-	-	3.6	-	-	3.5	-	-	3.6	-	-	1.9	-	-	1.9	-	-	1.9	-	-	1.9	-	-
8: Hooli St & Lelalii Parkway																														
NB LT/TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.4	0.05	B	11.7	0.07	B	10.4	0.05	B	11.7	0.07	B
NB LT/RT	8.8	0.04	A	8.9	0.04	A	8.8	0.04	A	8.9	0.04	A	8.8	0.04	A	8.9	0.04	A	-	-	-	-	-	-	-	-	-	-	-	-
EB LT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	0.02	A	7.4	0.06	A	7.3	0.02	A	7.4	0.06	A
WB LT	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A	7.3	0.00	A	0.0	-	A	7.4	0.00	A	0.0	-	A	7.4	0.00	A
SB LT/TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.8	0.09	A	8.6	0.06	A	8.8	0.09	A	8.6	0.06	A
Overall	3.9	-	-	3.5	-	-	3.7	-	-	3.3	-	-	3.7	-	-	3.3	-	-	6.2	-	-	5.8	-	-	6.2	-	-	5.8	-	-
9: Hanohano St & Lelalii Parkway																														
NB LT/TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.8	0.02	A	9.0	0.02	A	8.8	0.02	A	9.0	0.02	A
NB LT/RT	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A	8.6	0.02	A	-	-	-	-	-	-	-	-	-	-	-	-
EB LT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	0.00	A	7.2	0.01	A	7.2	0.00	A	7.2	0.01	A
SB LT/TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	0.02	A	8.4	0.01	A	8.4	0.02	A	8.4	0.01	A
Overall	6.7	-	-	4.6	-	-	6.1	-	-	4.4	-	-	6.1	-	-	4.4	-	-	7.2	-	-	6.0	-	-	7.2	-	-	6.0	-	-
10: Honoapiilani Highway & Front Street/Fleming Road																														
NB LT	84.7	0.42	F	74.8	0.46	E	76.6	0.42	E	89.0	0.48	F	85.6	0.42	F	94.5	0.48	F	76.4	0.42	E	89.0	0.48	F	85.4	0.42	F	94.1	0.48	F
NB TH/RT	6.1	0.57	A	16.7	0.70	B	1.4	0.78	A	17.1	1.03	F*	1.1	0.54	A	3.2	0.75	A	1.4	0.78	A	29.4	1.06	F*	1.1	0.55	A	3.6	0.78	A
EB LT/TH/RT	64.0	0.60	E	64.2	0.76	E	62.6	0.66	E	109.0	0.96	F	62.6	0.66	E	79.2	0.85	E	62.6	0.66	E	109.0	0.96	F	62.6	0.66	E	79.2	0.85	E
WB LT/TH/RT	63.5	0.62	E	43.6	0.18	D	59.4	0.54	E	51.2	0.18	D	59.4	0.54	E	45.8	0.16	D	59.4	0.54	E	51.2	0.18	D	59.4	0.54	E	45.8	0.16	D
SB LT	101.9	0.41	F	72.7	0.50	E	96.4	0.41	F	90.6	0.53	F	101.9	0.41	F	93.6	0.53	F	95.3	0.41	F	90.6	0.53	F	101.5	0.41	F	93.5	0.53	F
SB TH	4.8	0.47	A	14.3	0.66	B	7.5	0.64	A	31.5	0.95	C	5.3	0.40	A	21.7	0.60	C	7.9	0.66	A	33.6	0.97	C	5.5	0.43	A	22.2	0.62	C
SB RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
Overall	10.3	-	B	19.3	-	B	8.2	-	A	29.3	-	C	9.0	-	A	18.4	-	B	8.4	-	A	36.0	-	D	8.9	-	A	18.5	-	B

* Denotes overcapacity condition, v/c ≥ 1.

6. CONCLUSIONS

The Project proposes to develop approximately 50.8-acres of land in two (2) increments. Increment 1 will provide 86 single-family lots. Increment 2 may provide 95 single-family lots, 164 multi-family units, or a combination of both. The subdivision is not planned to exceed 250 units for Increment 1 and Increment 2 combined. For purposes of this TIAR, Increment 2 was analyzed with the maximum build-out of 164 multi-family units, since it results in a slightly higher trip generation than the 95 single-family lots. If Increment 2 changes to a mix of single-family and multi-family lots, the overall Project trip generation may slightly increase but not significant to alter conclusions of this study. Vehicular traffic to the Project will be provided along Lealii Parkway via the existing intersections with Hooli Street and Hanohano Street. The Project is anticipated to be completed by the Year 2030.

6.1 Existing Conditions

In the study area, Honoapiilani Highway generally operates as a 4-lane highway from Kaanapali Parkway to Keawe Street. Several intersections along the stretch operate on a coordinated timing plan and favor throughput along the major northbound and southbound Honoapiilani Highway movements. As a result, numerous mainline left-turn movements and minor street approaches at various study intersections experience lengthy delays and subsequent LOS E/F conditions. All study intersections currently operate at LOS D or better for all mainline through movements for overall LOS. In addition, all movements operate below capacity.

At the Honoapiilani Highway/Leialii Parkway intersection, turning movements on the major and minor approaches generally operate at LOS E or F, but all movements operate under capacity during both peak hours. Mainline northbound and southbound through movements operate at LOS A and under capacity. Overall, the intersection operates at LOS B during both peak hours. Based on observations, southbound queues can occasionally extend beyond the Kaahi Street/Lahaina Civic Center Road intersection during parts of the PM peak hour, but clear when mainline through traffic clears the signalized Leialii Parkway intersection. Existing southbound left-turn queues were observed to extend for 1-3 vehicles on average and occasionally extended to 5-6 vehicles, reaching the end of the striped southbound left-turn taper. All westbound approach queues were observed to clear within one signal cycle. Westbound queues occasionally spilled back to the Post Office (USPS) driveway, but was not observed to impede any flows along Leialii Parkway.

6.2 Base Year 2030 (Without LBR 1C)

This Base Year 2030 scenario assumes that the current alignment of LBR is maintained from its existing southern terminus to Keawe Street.

Overall, traffic volumes are anticipated to increase significantly due to infill growth and numerous planned developments in the Kapalua, Napili, Kahana, Honokowai, Kaanapali, Lahaina and Lauiniupoko areas. Based on forecast volumes, traffic is projected to increase by 500 to 700 vehicles per peak hour per direction. This translates to a traffic volume increase of approximately 20-30% during the AM peak hour and 35-40% during the PM peak hour per direction along Honoapiilani Highway when compared to existing conditions. Some through movements are forecast to operate at over-capacity conditions.

At the Honoapiilani Highway/Kaanapali Parkway intersection, vehicular delays are forecast to increase throughout the intersection resulting in continued LOS E/F conditions for various minor

Table 5.4: Future Year 2030
Auxiliary Storage Lane Length Calculations

Honoapiilani Highway & Leialii Parkway Intersection

Movement	Peak Hour	Design Volume per lane (veh)	Cycle Length (sec) [1]	Cycles per Hour	Average Veh. per Cycle	Minimum Storage Length (1.5 factor) [2]		Storage length [3]	Deceleration length [4]	Taper length [5]	Total Lane Length [6]
						Veh	Ft				
Southbound Left-turn lane	PM	119	234	15	8	12	**300**	300 ft	415 ft	165 ft.	880 ft
									240 ft		705 ft

Notes:

1. Existing max cycle @ 234s (~ 4min).
2. Minimum storage length is 1.5 times the average number of vehicles per cycle; assume 1 vehicle length = 25 ft. and higher PM peak hour volume.
3. Recommended storage length is exclusive of taper length or deceleration length. To be verified upon design.
4. Deceleration based on design speed 50 mph; 415 ft based on full deceleration from AASHTO 2011 OR 240 ft based on partial deceleration "when needed" from AASHTO 2018.
5. Taper length based on 15:1, assumed 11' wide auxiliary lane.
6. Total southbound left-turn lane length recommended at 880 ft. if full deceleration is accomodable OR 705 ft. to accommodate partial deceleration, when needed.

street and mainline left-turn movements. In addition, the southbound through movement will worsen to LOS F and overall LOS E during the PM peak hour. The eastbound approach is recommended to be restriped to provide an additional eastbound left-turn lane, resulting in one (1) eastbound left-turn lane and one (1) shared eastbound/through lane.

At most other signalized study intersections along Honoapiilani Highway, various movements are forecast to operate at over-capacity conditions.

6.3 Base Year 2030 (With LBR 1C)

The Future LBR 1C will extend LBR further north from its current terminus at Keawe Street to Kakaalaneo Drive, with a midway LBR connection to Honoapiilani Highway via a "Kaanapali Connector Road" at some point south of Kaanapali Parkway. When LBR is extended further north, regional trips along Honoapiilani Highway will decrease as vehicles shift to the LBR connections at Kakaalaneo Drive and Kaanapali Connector Road. Funding for construction of Phase 1C to extend the LBR to Kaanapali is pending.

Based on the forecast reroutes from LBR 1C, about 600 to 800 vehicles per peak hour per direction is forecast to reroute to the LBR 1C connections at Kakaalaneo Drive and Kaanapali Connector Road. This translates to an overall 30% reroute of vehicles shifting from Honoapiilani Highway to LBR 1C.

With LBR 1C, all study intersections will improve from the Base Year 2030 (Without LBR 1C) scenario and all previously identified over-capacity conditions will improve and operate below capacity due to traffic volume reductions on Honoapiilani Highway.

Traffic volumes at the Honoapiilani Highway/Kaanapali Parkway intersection will still increase overall by about 200-300 through vehicles from existing conditions. However, LBR 1C reroutes about 300-450 through vehicles from Honoapiilani Highway to LBR 1C via the new Kakaalaneo Drive LBR connection. As a result, all movements will operate adequately below capacity and the overall PM peak hour LOS will improve from LOS E to LOS D.

At the remaining signalized Honoapiilani Highway intersections, through traffic volumes along Honoapiilani Highway will reduce overall by about 600-800 vehicles, as additional regional vehicles will be rerouted to LBR 1C via Kaanapali Connector Road. As a result, through volumes along these remaining Honoapiilani Highway intersections will operate at levels similar to or slightly lower than existing conditions and improve to below capacity conditions.

6.4 Future Year 2030 (With and Without LBR 1C)

The Project is anticipated to generate 139(179) trips during the AM and PM peak hours, respectively. Approximately 30-40% of Project trips were distributed to/from Kaanapali and beyond and 60-70% were distributed to/from Lahaina Town.

Upon completion of the Project, all study intersections are forecast to operate with similar LOS as Base Year 2030 traffic conditions, with or without LBR 1C.

Without LBR 1C, various movements will continue to operate over-capacity similar to the Base Year 2030 (Without LBR 1C) scenario.

With LBR 1C, all study intersections will improve from the Base Year 2030 (Without LBR 1C) scenario and all previously identified over-capacity conditions will improve and operate below

capacity due to traffic volume reductions on Honoapiilani Highway. All through movements will operate adequately at LOS D or better and below capacity.

Regionally along Honoapiilani Highway, traffic generated by the Project will increase by approximately 20-75 vehicles per direction per peak hour, which translates to a 1.3% increase in traffic in the Kaanapali region and 2.2% increase in traffic in Lahaina Town when compared to the Base Year 2030 (With LBR 1C) scenario. Due to generally low traffic increases as a result of the Project the majority of movement vehicular delays generally increased minimally by 1-7 seconds.

7. RECOMMENDATIONS

7.1 Base Year 2030 Mitigation

<u>Honoapiilani Highway/Kaanapali Parkway/Halelo Street</u>

- Modify eastbound approach by restriping and provide an additional eastbound left-turn lane, resulting in one (1) eastbound left-turn lane and one (1) shared eastbound/through lane.

7.2 Future Year 2030 Mitigation

<u>Honoapiilani Highway/Leialii Parkway</u>

- Lengthen the southbound left-turn lane to provide a minimum 300' storage length (exclusive of taper and deceleration length)
- Maintain two westbound lanes along Leialii Parkway but restripe to delineate separate lanes from Honoapiilani Highway to Kaahi Street.
- Widen eastbound lanes along Leialii Parkway to provide one (1) exclusive left-turn lane into Kaahi Street and one (1) through lane continuing further up Leialii Parkway from Honoapiilani Highway to Kaahi Street.
- Provide a new crosswalk across Kaahi Street on the north leg of its intersection with Leialii Parkway.
- Upgrade the northeast and southeast curb ramps at the Honoapiilani Highway/Leialii Parkway intersection and lengthen the marked crosswalk across Leialii Parkway to accommodate the widening.

8. REFERENCES

1. American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2011.
2. Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2009.
3. Institute of Transportation Engineers, Trip Generation, 10th Edition, 2017.
4. Transportation Research Board, Highway Capacity Manual, 6th Edition, 2016.

APPENDICES

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX A

TRAFFIC COUNT DATA

Austin Tsutsumi & Associates

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File Name : Honoapiilani Hwy-Kaanapali Pkwy
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				HALELO ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				KAANAPALI PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	173	24	1	1	0	0	0	86	208	0	0	13	0	56	0	562
06:45	4	263	22	0	2	0	0	0	89	183	1	0	25	0	54	0	643
Total	4	436	46	1	3	0	0	0	175	391	1	0	38	0	110	0	1205
07:00	1	233	25	1	3	0	1	0	87	195	1	0	24	0	100	0	671
07:15	4	294	29	0	3	1	1	0	110	238	6	0	31	1	72	2	792
07:30	1	310	42	0	6	0	3	0	90	287	3	0	31	0	71	0	844
07:45	1	273	29	0	4	0	3	1	160	372	3	0	40	0	76	1	963
Total	7	1110	125	1	16	1	8	1	447	1092	13	0	126	1	319	3	3270
08:00	2	271	20	0	1	0	4	0	77	281	2	0	43	2	66	0	769
08:15	0	250	22	0	5	0	4	1	110	218	5	0	37	0	90	0	742
Grand Total	13	2067	213	2	25	1	16	2	809	1982	21	0	244	3	585	3	5986
Apprch %	0.6	90.1	9.3	0.1	56.8	2.3	36.4	4.5	28.8	70.5	0.7	0	29.2	0.4	70.1	0.4	
Total %	0.2	34.5	3.6	0	0.4	0	0.3	0	13.5	33.1	0.4	0	4.1	0.1	9.8	0.1	
Motorcycles	0	7	2	0	0	0	0	0	7	9	0	0	0	0	0	0	25
% Motorcycles	0	0.3	0.9	0	0	0	0	0	0.9	0.5	0	0	0	0	0	0	0.4
Cars & Light Goods	13	2025	209	0	25	1	14	0	789	1918	21	0	233	3	570	0	5821
% Cars & Light Goods	100	98	98.1	0	100	100	87.5	0	97.5	96.8	100	0	95.5	100	97.4	0	97.2
Buses	0	19	1	0	0	0	1	0	3	9	0	0	8	0	12	0	53
% Buses	0	0.9	0.5	0	0	0	6.2	0	0.4	0.5	0	0	3.3	0	2.1	0	0.9
Single-Unit Trucks	0	11	0	0	0	0	1	0	9	38	0	0	3	0	3	0	65
% Single-Unit Trucks	0	0.5	0	0	0	0	6.2	0	1.1	1.9	0	0	1.2	0	0.5	0	1.1
Articulated Trucks	0	4	1	0	0	0	0	0	1	5	0	0	0	0	0	0	11
% Articulated Trucks	0	0.2	0.5	0	0	0	0	0	0.1	0.3	0	0	0	0	0	0	0.2
Bicycles on Road	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	3	6
% Pedestrians	0	0	0	100	0	0	0	50	0	0	0	0	0	0	0	100	0.1

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File Name : Honoapiilani Hwy-Kaanapali Pkwy
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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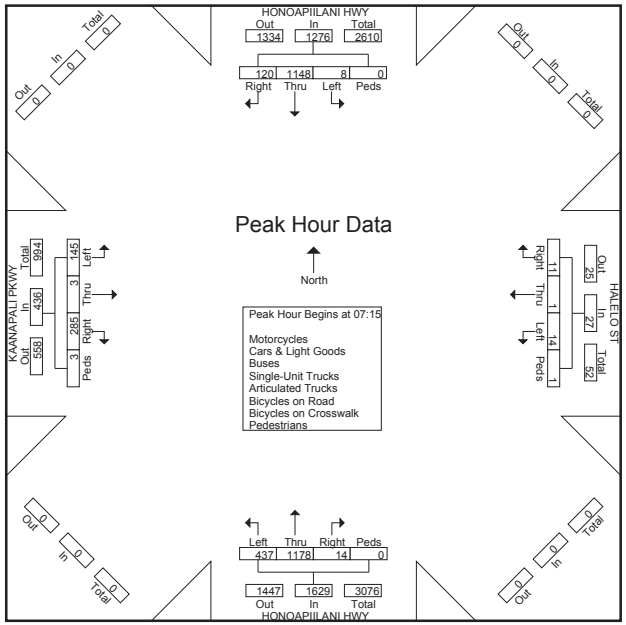
	HONOAPIILANI HWY SOUTHBOUND					HALELO ST WESTBOUND					HONOAPIILANI HWY NORTHBOUND					KAANAPALI PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	**4**	294	29	0	327	3	**1**	1	0	5	110	238	**6**	0	354	31	1	72	**2**	106	792
07:30	1	**310**	**42**	0	**353**	**6**	0	3	0	**9**	90	287	3	0	380	31	0	71	0	102	844
07:45	1	273	29	0	303	4	0	3	**1**	8	**160**	**372**	3	0	**535**	40	0	**76**	1	**117**	**963**
08:00	2	271	20	0	293	1	0	**4**	0	5	77	281	2	0	360	**43**	**2**	66	0	111	769
Total Volume	8	1148	120	0	1276	14	1	11	1	27	437	1178	14	0	1629	145	3	285	3	436	3368
% App. Total	0.6	90	9.4	0		51.9	3.7	40.7	3.7		26.8	72.3	0.9	0		33.3	0.7	65.4	0.7		
PHF	.500	.926	.714	.000	.904	.583	.250	.688	.250	.750	.683	.792	.583	.000	.761	.843	.375	.938	.375	.932	.874



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File Name : Honoapiilani Hwy-Kaanapali Pkwy
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				HALELO ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				KAANAPALI PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	2	310	40	0	3	0	4	0	142	279	3	0	53	1	131	0	968
15:30	2	337	49	0	7	1	3	0	144	277	4	0	55	1	121	0	1001
15:45	2	279	30	0	4	0	1	0	128	255	7	0	51	1	112	0	870
Total	6	926	119	0	14	1	8	0	414	811	14	0	159	3	364	0	2839
16:00	1	349	37	0	1	0	1	0	108	298	0	0	55	2	158	0	1010
16:15	3	314	35	0	2	0	0	0	103	242	2	0	80	0	184	0	965
16:30	0	304	38	0	6	2	2	0	119	265	1	0	53	0	131	0	921
16:45	2	322	42	0	4	0	1	0	101	255	3	0	42	0	115	0	887
Total	6	1289	152	0	13	2	4	0	431	1060	6	0	230	2	588	0	3783
17:00	0	266	41	0	3	0	2	0	88	239	3	0	79	0	148	0	869
Grand Total	12	2481	312	0	30	3	14	0	933	2110	23	0	468	5	1100	0	7491
Apprch %	0.4	88.4	11.1	0	63.8	6.4	29.8	0	30.4	68.8	0.8	0	29.8	0.3	69.9	0	
Total %	0.2	33.1	4.2	0	0.4	0	0.2	0	12.5	28.2	0.3	0	6.2	0.1	14.7	0	
Motorcycles	0	19	0	0	0	0	0	0	2	3	2	0	1	0	4	0	31
% Motorcycles	0	0.8	0	0	0	0	0	0	0.2	0.1	8.7	0	0.2	0	0.4	0	0.4
Cars & Light Goods	12	2423	312	0	29	3	10	0	919	2086	20	0	458	3	1067	0	7342
% Cars & Light Goods	100	97.7	100	0	96.7	100	71.4	0	98.5	98.9	87	0	97.9	60	97	0	98
Buses	0	9	0	0	0	0	0	0	8	5	0	0	8	1	19	0	50
% Buses	0	0.4	0	0	0	0	0	0	0.9	0.2	0	0	1.7	20	1.7	0	0.7
Single-Unit Trucks	0	28	0	0	1	0	0	0	4	12	0	0	1	0	10	0	56
% Single-Unit Trucks	0	1.1	0	0	3.3	0	0	0	0.4	0.6	0	0	0.2	0	0.9	0	0.7
Articulated Trucks	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	0	6
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
Bicycles on Road	0	0	0	0	0	0	4	0	0	0	1	0	0	1	0	0	6
% Bicycles on Road	0	0	0	0	0	0	28.6	0	0	0	4.3	0	0	20	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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File Name : Honoapiilani Hwy-Kaanapali Pkwy
Site Code : 18-552 DHHL Villages of Leialii
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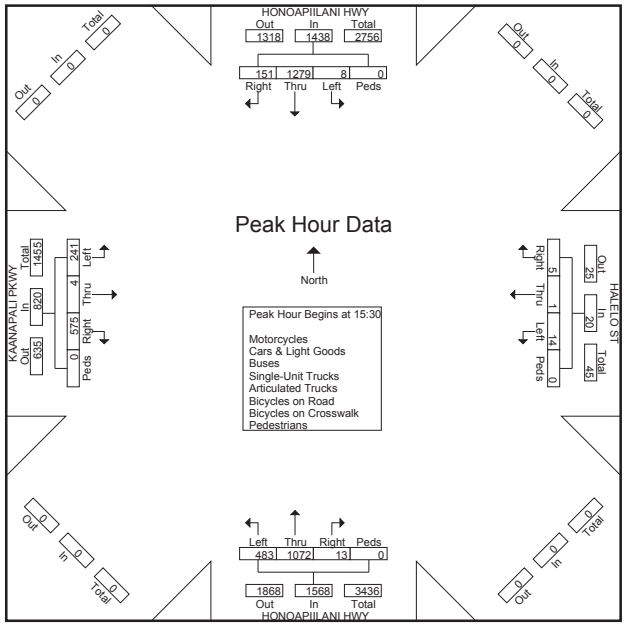
	HONOAPIILANI HWY SOUTHBOUND					HALELO ST WESTBOUND					HONOAPIILANI HWY NORTHBOUND					KAANAPALI PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	2	337	**49**	0	**388**	**7**	**1**	**3**	0	**11**	**144**	277	4	0	**425**	55	1	121	0	177	1001
15:45	2	279	30	0	311	4	0	1	0	5	128	255	**7**	0	390	51	1	112	0	164	870
16:00	1	**349**	37	0	387	1	0	1	0	2	108	**298**	0	0	406	55	**2**	158	0	215	**1010**
16:15	**3**	314	35	0	352	2	0	0	0	2	103	242	2	0	347	**80**	0	**184**	0	**264**	965
Total Volume	8	1279	151	0	1438	14	1	5	0	20	483	1072	13	0	1568	241	4	575	0	820	3846
% App. Total	0.6	88.9	10.5	0		70	5	25	0		30.8	68.4	0.8	0		29.4	0.5	70.1	0		
PHF	.667	.916	.770	.000	.927	.500	.250	.417	.000	.455	.839	.899	.464	.000	.922	.753	.500	.781	.000	.777	.952



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File Name : Honoapiilani Hwy-Kaahi St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				KAAHI ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				PARK PARKING DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	238	0	0	0	0	2	0	0	311	1	0	0	0	0	0	552
06:45	0	278	0	0	0	0	0	0	0	339	1	0	0	0	0	0	618
Total	0	516	0	0	0	0	2	0	0	650	2	0	0	0	0	0	1170
07:00	0	366	0	0	0	0	0	0	0	322	1	0	0	0	0	0	689
07:15	0	378	0	0	0	0	2	0	0	376	3	0	0	0	1	1	761
07:30	0	386	0	0	0	0	6	0	0	387	2	0	0	0	0	0	781
07:45	1	324	0	0	0	0	2	1	0	412	0	0	0	1	0	1	742
Total	1	1454	0	0	0	0	10	1	0	1497	6	0	0	1	1	2	2973
08:00	0	322	0	0	0	0	5	0	1	370	2	0	1	0	0	1	702
08:15	0	360	0	0	0	0	0	1	0	325	1	0	0	0	0	0	687
Grand Total	1	2652	0	0	0	0	17	2	1	2842	11	0	1	1	1	3	5532
Apprch %	0	100	0	0	0	0	89.5	10.5	0	99.6	0.4	0	16.7	16.7	16.7	50	
Total %	0	47.9	0	0	0	0	0.3	0	0	51.4	0.2	0	0	0	0	0.1	
Motorcycles	0	9	0	0	0	0	0	0	0	20	0	0	0	0	0	0	29
% Motorcycles	0	0.3	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0.5
Cars & Light Goods	1	2596	0	0	0	0	15	0	1	2748	10	0	1	1	1	0	5374
% Cars & Light Goods	100	97.9	0	0	0	0	88.2	0	100	96.7	90.9	0	100	100	100	0	97.1
Buses	0	28	0	0	0	0	0	0	0	17	0	0	0	0	0	0	45
% Buses	0	1.1	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0.8
Single-Unit Trucks	0	16	0	0	0	0	2	0	0	48	1	0	0	0	0	0	67
% Single-Unit Trucks	0	0.6	0	0	0	0	11.8	0	0	1.7	9.1	0	0	0	0	0	1.2
Articulated Trucks	0	3	0	0	0	0	0	0	0	7	0	0	0	0	0	0	10
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0.1
Pedestrians	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0

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File Name : Honoapiilani Hwy-Kaahi St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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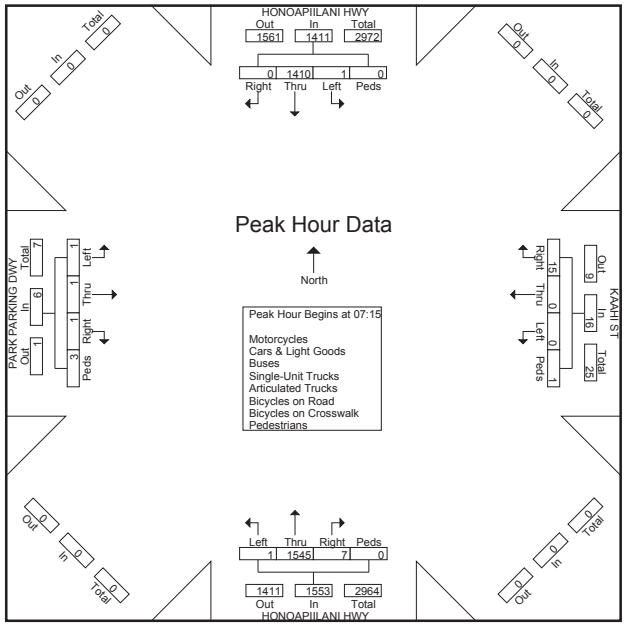
	HONOAPIILANI HWY SOUTHBOUND					KAAHI ST WESTBOUND					HONOAPIILANI HWY NORTHBOUND					PARK PARKING DWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	378	0	0	378	0	0	2	0	2	0	376	**3**	0	379	0	0	**1**	**1**	**2**	761
07:30	0	**386**	0	0	**386**	0	0	**6**	0	**6**	0	387	2	0	389	0	0	0	0	0	**781**
07:45	**1**	324	0	0	325	0	0	2	**1**	3	0	**412**	0	0	**412**	0	**1**	0	1	2	742
08:00	0	322	0	0	322	0	0	5	0	5	**1**	370	2	0	373	**1**	0	0	1	2	702
Total Volume	1	1410	0	0	1411	0	0	15	1	16	1	1545	7	0	1553	1	1	1	3	6	2986
% App. Total	0.1	99.9	0	0		0	0	93.8	6.2		0.1	99.5	0.5	0		16.7	16.7	16.7	50		
PHF	.250	.913	.000	.000	.914	.000	.000	.625	.250	.667	.250	.938	.583	.000	.942	.250	.250	.250	.750	.750	.956



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File Name : Honoapiilani Hwy-Kaahi St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				KAAHI ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				PARK PARKING DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	0	467	0	0	0	0	1	0	0	413	0	0	0	0	2	0	883
15:30	0	475	0	0	0	0	3	0	0	479	0	0	0	0	1	0	958
15:45	0	431	0	0	0	0	1	0	0	418	0	0	0	0	1	0	851
Total	0	1373	0	0	0	0	5	0	0	1310	0	0	0	0	4	0	2692
16:00	0	497	0	0	0	0	1	0	0	431	1	0	2	0	2	1	935
16:15	0	619	0	0	0	0	2	0	0	384	1	0	0	0	2	0	1008
16:30	0	523	1	0	0	0	6	0	0	429	1	0	0	0	0	2	962
16:45	0	443	1	0	0	0	2	1	0	369	1	0	0	0	1	0	818
Total	0	2082	2	0	0	0	11	1	0	1613	4	0	2	0	5	3	3723
17:00	0	444	0	0	0	0	3	0	0	367	0	0	1	0	2	0	817
Grand Total	0	3899	2	0	0	0	19	1	0	3290	4	0	3	0	11	3	7232
Apprch %	0	99.9	0.1	0	0	0	95	5	0	99.9	0.1	0	17.6	0	64.7	17.6	
Total %	0	53.9	0	0	0	0	0.3	0	0	45.5	0.1	0	0	0	0.2	0	
Motorcycles	0	24	0	0	0	0	0	0	0	16	0	0	0	0	0	0	40
% Motorcycles	0	0.6	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0.6
Cars & Light Goods	0	3800	2	0	0	0	19	0	0	3231	4	0	3	0	10	0	7069
% Cars & Light Goods	0	97.5	100	0	0	0	100	0	0	98.2	100	0	100	0	90.9	0	97.7
Buses	0	26	0	0	0	0	0	0	0	14	0	0	0	0	0	0	40
% Buses	0	0.7	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0.6
Single-Unit Trucks	0	44	0	0	0	0	0	0	0	22	0	0	0	0	1	0	67
% Single-Unit Trucks	0	1.1	0	0	0	0	0	0	0	0.7	0	0	0	0	9.1	0	0.9
Articulated Trucks	0	3	0	0	0	0	0	0	0	6	0	0	0	0	0	0	9
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
Bicycles on Road	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
% Bicycles on Road	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.3	0
Pedestrians	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	3
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	66.7	0

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File Name : Honoapiilani Hwy-Kaahi St
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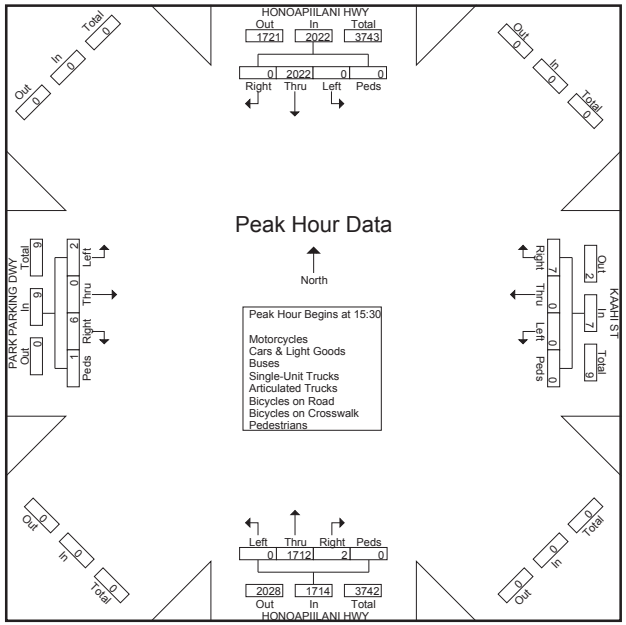
	HONOAPIILANI HWY SOUTHBOUND					KAAHI ST WESTBOUND					HONOAPIILANI HWY NORTHBOUND					PARK PARKING DWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	475	0	0	475	0	0	**3**	0	**3**	0	**479**	0	0	**479**	0	0	1	0	1	958
15:45	0	431	0	0	431	0	0	1	0	1	0	418	0	0	418	0	0	1	0	1	851
16:00	0	497	0	0	497	0	0	1	0	1	0	431	**1**	0	432	**2**	0	**2**	**1**	**5**	935
16:15	0	**619**	0	0	**619**	0	0	2	0	2	0	384	1	0	385	0	0	2	0	2	**1008**
Total Volume	0	2022	0	0	2022	0	0	7	0	7	0	1712	2	0	1714	2	0	6	1	9	3752
% App. Total	0	100	0	0		0	0	100	0		0	99.9	0.1	0		22.2	0	66.7	11.1		
PHF	.000	.817	.000	.000	.817	.000	.000	.583	.000	.583	.000	.894	.500	.000	.895	.250	.000	.750	.250	.450	.931



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File Name : Kaahi St-Civic Ctr Rd
Site Code : 18-DHHL Villages of Leialii
Start Date : 5/14/2019
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAAHI ST SOUTHBOUND				CIVIC CTR RD WESTBOUND				KAAHI ST NORTHBOUND				HONOAPIILANI HWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	0	0	0	4	1	0	0	1	0	2	0	0	0	1	0	9
06:45	0	1	0	0	0	0	0	0	0	2	2	0	0	1	0	0	6
Total	0	1	0	0	4	1	0	0	1	2	4	0	0	1	1	0	15
07:00	0	0	0	0	3	3	0	0	0	4	2	0	0	1	0	0	13
07:15	0	4	0	0	2	0	0	0	1	2	3	0	0	2	1	0	15
07:30	0	1	0	0	0	5	0	0	1	1	5	0	1	1	0	0	15
07:45	0	2	1	0	4	1	0	0	0	3	4	0	0	1	1	0	17
Total	0	7	1	0	9	9	0	0	2	10	14	0	1	5	2	0	60
08:00	0	0	1	0	2	2	0	0	2	1	7	0	1	1	0	0	17
08:15	0	1	0	0	5	0	1	0	0	1	10	0	0	1	0	0	19
Grand Total	0	9	2	0	20	12	1	0	5	14	35	0	2	8	3	0	111
Apprch %	0	81.8	18.2	0	60.6	36.4	3	0	9.3	25.9	64.8	0	15.4	61.5	23.1	0	
Total %	0	8.1	1.8	0	18	10.8	0.9	0	4.5	12.6	31.5	0	1.8	7.2	2.7	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	9	2	0	18	11	1	0	4	13	33	0	2	7	3	0	103
% Cars & Light Goods	0	100	100	0	90	91.7	100	0	80	92.9	94.3	0	100	87.5	100	0	92.8
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	0	0	0	2	1	0	0	1	1	1	0	0	1	0	0	7
% Single-Unit Trucks	0	0	0	0	10	8.3	0	0	20	7.1	2.9	0	0	12.5	0	0	6.3
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	2.9	0	0	0	0	0	0.9
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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File Name : Kaahi St-Civic Ctr Rd
Site Code : 18-DHHL Villages of Leialii
Start Date : 5/14/2019
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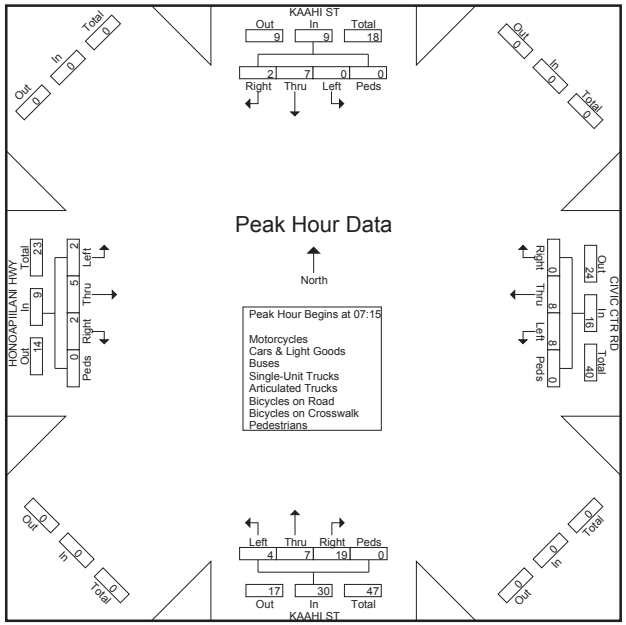
	KAAHI ST SOUTHBOUND					CIVIC CTR RD WESTBOUND					KAAHI ST NORTHBOUND					HONOAPIILANI HWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	**4**	0	0	**4**	2	0	0	0	2	1	2	3	0	6	0	**2**	**1**	0	**3**	15
07:30	0	1	0	0	1	0	**5**	0	0	**5**	1	1	5	0	7	**1**	1	0	0	2	15
07:45	0	2	**1**	0	3	**4**	1	0	0	5	0	**3**	4	0	7	0	1	1	0	2	**17**
08:00	0	0	1	0	1	2	2	0	0	4	**2**	1	**7**	0	**10**	1	1	0	0	2	17
Total Volume	0	7	2	0	9	8	8	0	0	16	4	7	19	0	30	2	5	2	0	9	64
% App. Total	0	77.8	22.2	0		50	50	0	0		13.3	23.3	63.3	0		22.2	55.6	22.2	0		
PHF	.000	.438	.500	.000	.563	.500	.400	.000	.000	.800	.500	.583	.679	.000	.750	.500	.625	.500	.000	.750	.941



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File Name : Kaahi St-Civic Ctr Rd
Site Code : 18-DHHL Villages of Leialii
Start Date : 5/14/2019
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAAHI ST SOUTHBOUND				CIVIC CTR RD WESTBOUND				KAAHI ST NORTHBOUND				HONOAPIILANI HWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	0	0	0	0	3	1	0	0	0	0	1	0	0	0	0	0	5
15:30	0	0	0	0	4	1	0	0	2	0	2	0	0	0	0	0	9
15:45	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	3
Total	0	0	0	0	7	2	0	0	3	0	5	0	0	0	0	0	17
16:00	0	0	1	0	4	0	0	0	0	2	0	0	0	1	0	0	8
16:15	0	1	0	0	1	1	0	0	1	1	1	0	0	0	1	0	7
16:30	0	3	0	0	0	1	0	0	5	0	1	0	0	1	0	0	11
16:45	0	0	0	0	2	0	0	0	2	0	0	0	0	1	0	0	5
Total	0	4	1	0	7	2	0	0	8	3	2	0	0	3	1	0	31
17:00	0	1	0	0	1	0	0	0	3	0	1	0	0	0	0	0	6
Grand Total	0	5	1	0	15	4	0	0	14	3	8	0	0	3	1	0	54
Apprch %	0	83.3	16.7	0	78.9	21.1	0	0	56	12	32	0	0	75	25	0	
Total %	0	9.3	1.9	0	27.8	7.4	0	0	25.9	5.6	14.8	0	0	5.6	1.9	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	5	1	0	15	4	0	0	14	3	8	0	0	3	1	0	54
% Cars & Light Goods	0	100	100	0	100	100	0	0	100	100	100	0	0	100	100	0	100
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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File Name : Kaahi St-Civic Ctr Rd
Site Code : 18-DHHL Villages of Leialii
Start Date : 5/14/2019
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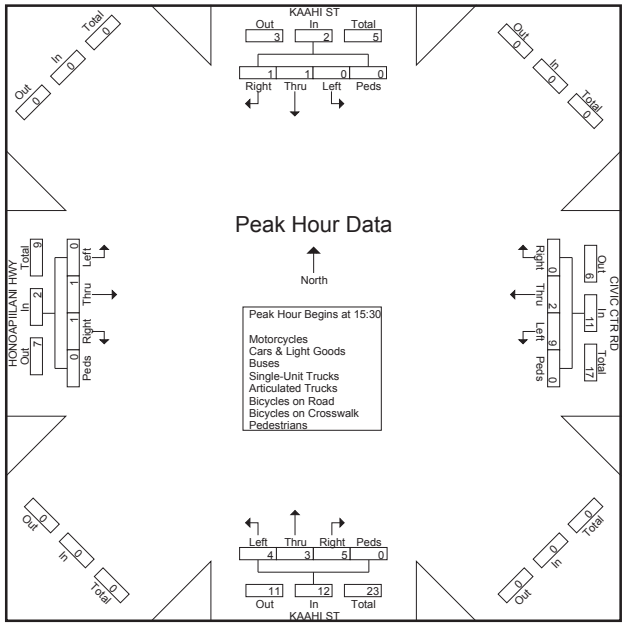
	KAAHI ST SOUTHBOUND					CIVIC CTR RD WESTBOUND					KAAHI ST NORTHBOUND					HONOAPIILANI HWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	0	0	0	0	**4**	**1**	0	0	**5**	**2**	0	**2**	0	**4**	0	0	0	0	0	**9**
15:45	0	0	0	0	0	0	0	0	0	0	1	0	2	0	3	0	0	0	0	0	3
16:00	0	0	**1**	0	**1**	4	0	0	0	4	0	**2**	0	0	2	0	**1**	0	0	**1**	8
16:15	0	**1**	0	0	1	1	1	0	0	2	1	1	1	0	3	0	0	**1**	0	1	7
Total Volume	0	1	1	0	2	9	2	0	0	11	4	3	5	0	12	0	1	1	0	2	27
% App. Total	0	50	50	0		81.8	18.2	0	0		33.3	25	41.7	0		0	50	50	0		
PHF	.000	.250	.250	.000	.500	.563	.500	.000	.000	.550	.500	.375	.625	.000	.750	.000	.250	.250	.000	.500	.750



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File Name : Kaahi St-Akoakoa Pl
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAAHI ST SOUTHBOUND				AKOAKOA PL WESTBOUND				KAAHI ST NORTHBOUND				EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	5	0	0	1	0	1	0	0	2	1	0	0	0	0	0	10
06:45	0	1	0	0	2	0	1	0	0	3	1	0	0	0	0	0	8
Total	0	6	0	0	3	0	2	0	0	5	2	0	0	0	0	0	18
07:00	1	2	0	0	3	0	0	0	0	6	3	2	0	0	0	0	17
07:15	1	5	0	0	0	0	2	0	0	4	4	0	0	0	0	0	16
07:30	0	2	0	0	1	0	2	0	0	6	4	0	0	0	0	0	15
07:45	0	6	0	0	2	0	0	0	0	6	4	0	0	0	0	0	18
Total	2	15	0	0	6	0	4	0	0	22	15	2	0	0	0	0	66
08:00	0	3	0	0	1	0	3	0	0	6	4	0	0	0	0	0	17
08:15	1	4	0	0	3	0	2	0	0	11	11	0	0	0	0	0	32
Grand Total	3	28	0	0	13	0	11	0	0	44	32	2	0	0	0	0	133
Apprch %	9.7	90.3	0	0	54.2	0	45.8	0	0	56.4	41	2.6	0	0	0	0	
Total %	2.3	21.1	0	0	9.8	0	8.3	0	0	33.1	24.1	1.5	0	0	0	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	3	26	0	0	12	0	10	0	0	42	31	0	0	0	0	0	124
% Cars & Light Goods	100	92.9	0	0	92.3	0	90.9	0	0	95.5	96.9	0	0	0	0	0	93.2
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	2	0	0	0	0	1	0	0	2	0	0	0	0	0	0	5
% Single-Unit Trucks	0	7.1	0	0	0	0	9.1	0	0	4.5	0	0	0	0	0	0	3.8
Articulated Trucks	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	2
% Articulated Trucks	0	0	0	0	7.7	0	0	0	0	0	3.1	0	0	0	0	0	1.5
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	1.5

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File Name : Kaahi St-Akoakoa Pl
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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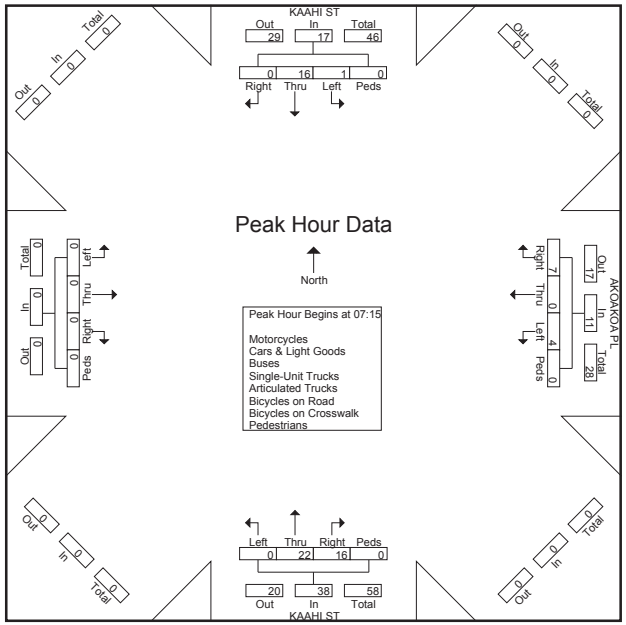
	KAAHI ST SOUTHBOUND					AKOAKOA PL WESTBOUND					KAAHI ST NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	**1**	5	0	0	**6**	0	0	2	0	2	0	4	**4**	0	8	0	0	0	0	0	16
07:30	0	2	0	0	2	1	0	2	0	3	0	**6**	4	0	**10**	0	0	0	0	0	15
07:45	0	**6**	0	0	6	**2**	0	0	0	2	0	6	4	0	10	0	0	0	0	0	**18**
08:00	0	3	0	0	3	1	0	**3**	0	**4**	0	6	4	0	10	0	0	0	0	0	17
Total Volume	1	16	0	0	17	4	0	7	0	11	0	22	16	0	38	0	0	0	0	0	66
% App. Total	5.9	94.1	0	0		36.4	0	63.6	0		0	57.9	42.1	0		0	0	0	0		
PHF	.250	.667	.000	.000	.708	.500	.000	.583	.000	.688	.000	.917	1.00	.000	.950	.000	.000	.000	.000	.000	.917



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAAHI ST SOUTHBOUND				AKOAKOA PL WESTBOUND				KAAHI ST NORTHBOUND				EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	0	4	0	0	2	0	0	0	0	1	2	0	0	0	0	0	9
15:30	0	4	0	0	3	0	1	0	0	3	6	0	0	0	0	0	17
15:45	0	0	0	0	6	0	1	0	0	2	9	0	0	0	0	0	18
Total	0	8	0	0	11	0	2	0	0	6	17	0	0	0	0	0	44
16:00	0	4	0	0	3	0	0	0	0	2	6	0	0	0	0	0	15
16:15	0	3	0	0	2	0	1	1	0	2	7	1	0	0	0	0	17
16:30	0	3	0	2	2	0	3	0	0	3	8	0	0	0	0	0	21
16:45	0	2	0	0	1	0	1	0	0	1	7	2	0	0	0	0	14
Total	0	12	0	2	8	0	5	1	0	8	28	3	0	0	0	0	67
17:00	0	2	0	0	2	0	1	0	0	3	3	0	0	0	0	0	11
Grand Total	0	22	0	2	21	0	8	1	0	17	48	3	0	0	0	0	122
Apprch %	0	91.7	0	8.3	70	0	26.7	3.3	0	25	70.6	4.4	0	0	0	0	
Total %	0	18	0	1.6	17.2	0	6.6	0.8	0	13.9	39.3	2.5	0	0	0	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	22	0	0	20	0	8	0	0	17	48	0	0	0	0	0	115
% Cars & Light Goods	0	100	0	0	95.2	0	100	0	0	100	100	0	0	0	0	0	94.3
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	4.8	0	0	0	0	0	0	0	0	0	0	0	0.8
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	2	0	0	0	1	0	0	0	3	0	0	0	0	6
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	0	4.9

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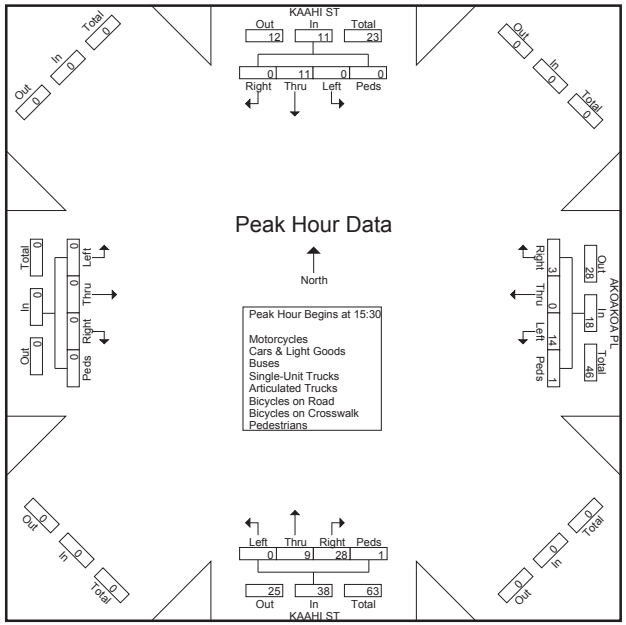
	KAAHI ST SOUTHBOUND					AKOAKOA PL WESTBOUND					KAAHI ST NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	**4**	0	0	**4**	3	0	**1**	0	4	0	**3**	6	0	9	0	0	0	0	0	17
15:45	0	0	0	0	0	**6**	0	1	0	**7**	0	2	**9**	0	**11**	0	0	0	0	0	**18**
16:00	0	4	0	0	4	3	0	0	0	3	0	2	6	0	8	0	0	0	0	0	15
16:15	0	3	0	0	3	2	0	1	**1**	4	0	2	7	**1**	10	0	0	0	0	0	17
Total Volume	0	11	0	0	11	14	0	3	1	18	0	9	28	1	38	0	0	0	0	0	67
% App. Total	0	100	0	0		77.8	0	16.7	5.6		0	23.7	73.7	2.6		0	0	0	0		
PHF	.000	.688	.000	.000	.688	.583	.000	.750	.250	.643	.000	.750	.778	.250	.864	.000	.000	.000	.000	.000	.931



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File Name : Honoapiilani Hwy-Leialii Pkwy
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				LEIALII PKWY WESTBOUND				HONOAPIILANI HWY NORTHBOUND				WAHIKULI WAYSIDE PK DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	6	231	0	1	12	0	8	1	0	300	5	0	0	0	0	1	565
06:45	1	282	0	3	14	0	6	0	1	282	12	0	0	0	1	0	602
Total	7	513	0	4	26	0	14	1	1	582	17	0	0	0	1	1	1167
07:00	3	349	0	0	15	0	6	0	0	339	17	0	0	0	0	0	729
07:15	4	390	1	2	10	0	7	0	1	373	11	0	0	0	1	0	800
07:30	12	336	0	1	19	0	7	0	1	414	11	0	0	0	0	0	801
07:45	11	321	1	5	18	0	7	3	0	489	13	1	1	0	0	4	874
Total	30	1396	2	8	62	0	27	3	2	1615	52	1	1	0	1	4	3204
08:00	6	314	1	2	10	0	5	0	0	354	16	0	1	0	1	2	712
08:15	17	324	2	0	14	0	7	1	0	337	13	0	0	0	0	0	715
Grand Total	60	2547	5	14	112	0	53	5	3	2888	98	1	2	0	3	7	5798
Apprch %	2.3	97	0.2	0.5	65.9	0	31.2	2.9	0.1	96.6	3.3	0	16.7	0	25	58.3	
Total %	1	43.9	0.1	0.2	1.9	0	0.9	0.1	0.1	49.8	1.7	0	0	0	0.1	0.1	
Motorcycles	0	6	0	0	0	0	0	0	0	23	0	0	0	0	0	0	29
% Motorcycles	0	0.2	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0.5
Cars & Light Goods	54	2497	5	0	108	0	51	0	3	2795	95	0	2	0	3	0	5613
% Cars & Light Goods	90	98	100	0	96.4	0	96.2	0	100	96.8	96.9	0	100	0	100	0	96.8
Buses	4	26	0	0	1	0	0	0	0	12	0	0	0	0	0	0	43
% Buses	6.7	1	0	0	0.9	0	0	0	0	0.4	0	0	0	0	0	0	0.7
Single-Unit Trucks	1	13	0	0	2	0	1	0	0	47	2	0	0	0	0	0	66
% Single-Unit Trucks	1.7	0.5	0	0	1.8	0	1.9	0	0	1.6	2	0	0	0	0	0	1.1
Articulated Trucks	1	3	0	0	1	0	0	0	0	7	0	0	0	0	0	0	12
% Articulated Trucks	1.7	0.1	0	0	0.9	0	0	0	0	0.2	0	0	0	0	0	0	0.2
Bicycles on Road	0	2	0	0	0	0	1	0	0	4	1	0	0	0	0	0	8
% Bicycles on Road	0	0.1	0	0	0	0	1.9	0	0	0.1	1	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	5	0	0	0	1	0	0	0	1	0	0	0	2	9
% Bicycles on Crosswalk	0	0	0	35.7	0	0	0	20	0	0	0	100	0	0	0	28.6	0.2
Pedestrians	0	0	0	9	0	0	0	4	0	0	0	0	0	0	0	5	18
% Pedestrians	0	0	0	64.3	0	0	0	80	0	0	0	0	0	0	0	71.4	0.3

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File Name : Honoapiilani Hwy-Leialii Pkwy
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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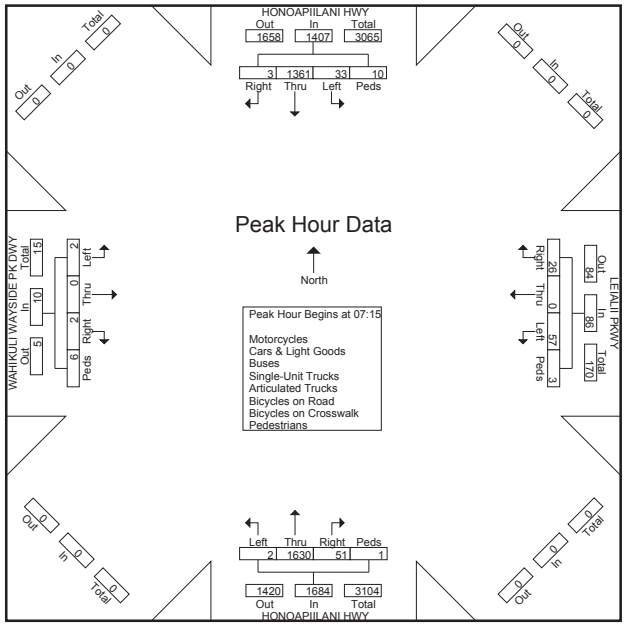
	HONOAPIILANI HWY SOUTHBOUND					LEIALII PKWY WESTBOUND					HONOAPIILANI HWY NORTHBOUND					WAHIKULI WAYSIDE PK DWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	4	**390**	**1**	2	**397**	10	0	**7**	0	17	**1**	373	11	0	385	0	0	**1**	0	1	800
07:30	**12**	336	0	1	349	**19**	0	7	0	26	1	414	11	0	426	0	0	0	0	0	801
07:45	11	321	1	**5**	338	18	0	7	**3**	**28**	0	**489**	13	**1**	**503**	**1**	0	0	**4**	**5**	**874**
08:00	6	314	1	2	323	10	0	5	0	15	0	354	**16**	0	370	1	0	1	2	4	712
Total Volume	33	1361	3	10	1407	57	0	26	3	86	2	1630	51	1	1684	2	0	2	6	10	3187
% App. Total	2.3	96.7	0.2	0.7		66.3	0	30.2	3.5		0.1	96.8	3	0.1		20	0	20	60		
PHF	.688	.872	.750	.500	.886	.750	.000	.929	.250	.768	.500	.833	.797	.250	.837	.500	.000	.500	.375	.500	.912



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Start Date : 5/14/2019
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				LEIALII PKWY WESTBOUND				HONOAPIILANI HWY NORTHBOUND				WAHIKULI WAYSIDE PK DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	15	461	1	1	16	1	10	0	2	425	13	0	0	0	3	0	948
15:30	15	458	1	0	30	0	18	0	2	434	23	0	2	2	1	0	986
15:45	17	412	1	2	17	1	23	2	2	414	26	0	1	0	1	0	919
Total	47	1331	3	3	63	2	51	2	6	1273	62	0	3	2	5	0	2853
16:00	15	451	1	1	21	2	11	1	2	409	14	0	0	0	2	1	931
16:15	8	523	2	1	15	0	9	1	0	389	24	0	0	0	1	0	973
16:30	16	430	0	8	12	1	11	0	0	434	13	0	0	0	1	0	926
16:45	9	418	0	3	8	0	8	0	0	316	8	0	0	0	1	0	771
Total	48	1822	3	13	56	3	39	2	2	1548	59	0	0	0	5	1	3601
17:00	9	424	0	0	11	1	10	0	3	340	13	0	0	0	3	0	814
Grand Total	104	3577	6	16	130	6	100	4	11	3161	134	0	3	2	13	1	7268
Apprch %	2.8	96.6	0.2	0.4	54.2	2.5	41.7	1.7	0.3	95.6	4.1	0	15.8	10.5	68.4	5.3	
Total %	1.4	49.2	0.1	0.2	1.8	0.1	1.4	0.1	0.2	43.5	1.8	0	0	0	0.2	0	
Motorcycles	1	21	0	0	2	0	1	0	1	10	1	0	0	0	1	0	38
% Motorcycles	1	0.6	0	0	1.5	0	1	0	9.1	0.3	0.7	0	0	0	7.7	0	0.5
Cars & Light Goods	102	3492	6	0	125	6	98	0	10	3111	130	0	3	2	12	0	7097
% Cars & Light Goods	98.1	97.6	100	0	96.2	100	98	0	90.9	98.4	97	0	100	100	92.3	0	97.6
Buses	0	22	0	0	2	0	0	0	0	14	1	0	0	0	0	0	39
% Buses	0	0.6	0	0	1.5	0	0	0	0	0.4	0.7	0	0	0	0	0	0.5
Single-Unit Trucks	1	37	0	0	1	0	1	0	0	20	1	0	0	0	0	0	61
% Single-Unit Trucks	1	1	0	0	0.8	0	1	0	0	0.6	0.7	0	0	0	0	0	0.8
Articulated Trucks	0	4	0	0	0	0	0	0	0	5	0	0	0	0	0	0	9
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
Bicycles on Road	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	3
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	100	0
Pedestrians	0	0	0	16	0	0	0	3	0	0	0	0	0	0	0	0	19
% Pedestrians	0	0	0	100	0	0	0	75	0	0	0	0	0	0	0	0	0.3

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File Name : Honoapiilani Hwy-Leialii Pkwy
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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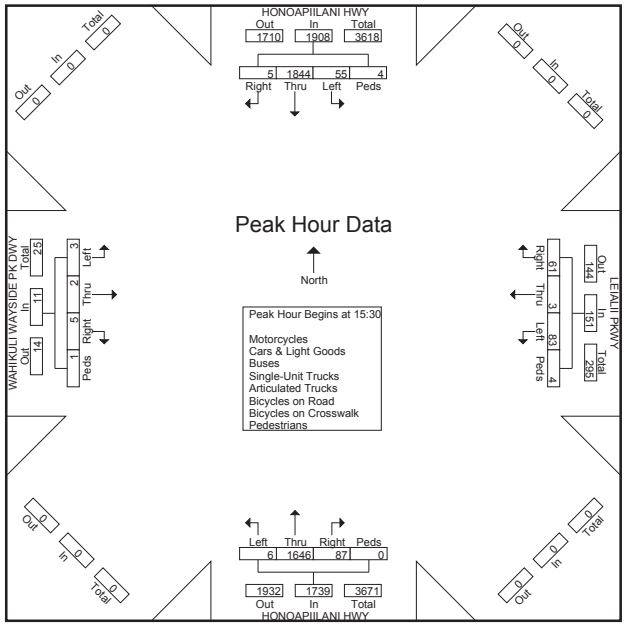
	HONOAPIILANI HWY SOUTHBOUND					LEIALII PKWY WESTBOUND					HONOAPIILANI HWY NORTHBOUND					WAHIKULI WAYSIDE PK DWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:15 to 17:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	15	458	1	0	474	**30**	0	18	0	**48**	**2**	**434**	23	0	**459**	**2**	**2**	1	0	**5**	**986**
15:45	**17**	412	1	**2**	432	17	1	**23**	**2**	43	2	414	**26**	0	442	1	0	1	0	2	919
16:00	15	451	1	1	468	21	**2**	11	1	35	2	409	14	0	425	0	0	**2**	**1**	3	931
16:15	8	**523**	**2**	1	**534**	15	0	9	1	25	0	389	24	0	413	0	0	1	0	1	973
Total Volume	55	1844	5	4	1908	83	3	61	4	151	6	1646	87	0	1739	3	2	5	1	11	3809
% App. Total	2.9	96.6	0.3	0.2		55	2	40.4	2.6		0.3	94.7	5	0		27.3	18.2	45.5	9.1		
PHF	.809	.881	.625	.500	.893	.692	.375	.663	.500	.786	.750	.948	.837	.000	.947	.375	.250	.625	.250	.550	.966



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File Name : Leialii Pkwy-Kaahi St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAAHI ST SOUTHBOUND				LEIALII PKWY WESTBOUND				NORTHBOUND				LEIALII PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	0	6	2	0	11	2	2	0	0	0	0	1	5	0	0	29
06:45	0	0	3	1	0	15	0	1	0	0	0	0	4	2	0	2	28
Total	0	0	9	3	0	26	2	3	0	0	0	0	5	7	0	2	57
07:00	1	0	4	0	0	18	0	0	0	0	0	0	11	6	0	0	40
07:15	2	0	3	0	0	13	1	0	0	0	0	0	5	4	0	0	28
07:30	0	0	3	0	0	15	3	0	0	0	0	0	8	5	0	0	34
07:45	1	0	7	1	0	16	1	1	0	0	0	0	8	9	0	0	44
Total	4	0	17	1	0	62	5	1	0	0	0	0	32	24	0	0	146
08:00	0	0	3	0	0	3	0	0	0	0	0	0	11	5	0	0	22
08:15	4	0	4	0	0	15	4	0	0	0	0	0	17	7	0	0	51
Grand Total	8	0	33	4	0	106	11	4	0	0	0	0	65	43	0	2	276
Apprch %	17.8	0	73.3	8.9	0	87.6	9.1	3.3	0	0	0	0	59.1	39.1	0	1.8	
Total %	2.9	0	12	1.4	0	38.4	4	1.4	0	0	0	0	23.6	15.6	0	0.7	
Motorcycles	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Motorcycles	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.4
Cars & Light Goods	8	0	30	0	0	102	11	0	0	0	0	0	62	38	0	0	251
% Cars & Light Goods	100	0	90.9	0	0	96.2	100	0	0	0	0	0	95.4	88.4	0	0	90.9
Buses	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	0	5
% Buses	0	0	0	0	0	0.9	0	0	0	0	0	0	0	9.3	0	0	1.8
Single-Unit Trucks	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	4
% Single-Unit Trucks	0	0	6.1	0	0	0	0	0	0	0	0	0	3.1	0	0	0	1.4
Articulated Trucks	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
% Articulated Trucks	0	0	3	0	0	0	0	0	0	0	0	0	1.5	0	0	0	0.7
Bicycles on Road	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Bicycles on Road	0	0	0	0	0	1.9	0	0	0	0	0	0	0	2.3	0	0	1.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	4	0	0	0	4	0	0	0	0	0	0	0	2	10
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0	100	3.6

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File Name : Leialii Pkwy-Kaahi St
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Start Date : 5/14/2019
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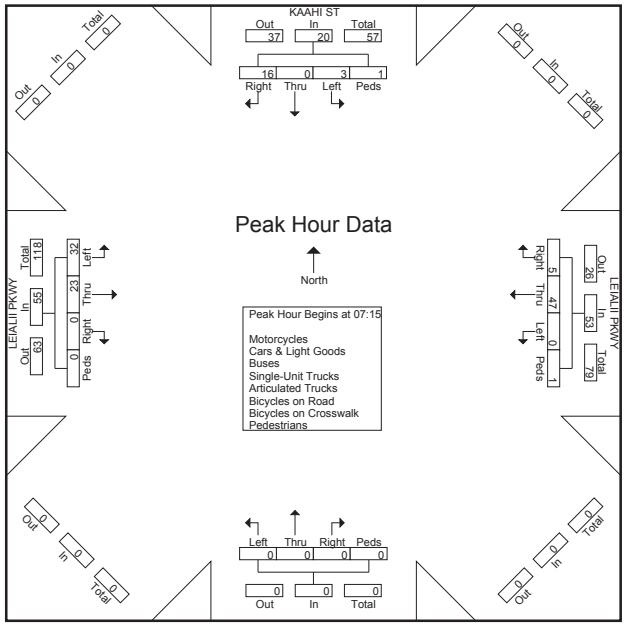
	KAAHI ST SOUTHBOUND					LEIALII PKWY WESTBOUND					NORTHBOUND					LEIALII PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	**2**	0	3	0	5	0	13	1	0	14	0	0	0	0	0	5	4	0	0	9	28
07:30	0	0	3	0	3	0	15	**3**	0	**18**	0	0	0	0	0	8	5	0	0	13	34
07:45	1	0	**7**	**1**	**9**	0	**16**	1	**1**	18	0	0	0	0	0	8	**9**	0	0	**17**	**44**
08:00	0	0	3	0	3	0	3	0	0	3	0	0	0	0	0	**11**	5	0	0	16	22
Total Volume	3	0	16	1	20	0	47	5	1	53	0	0	0	0	0	32	23	0	0	55	128
% App. Total	15	0	80	5		0	88.7	9.4	1.9		0	0	0	0		58.2	41.8	0	0		
PHF	.375	.000	.571	.250	.556	.000	.734	.417	.250	.736	.000	.000	.000	.000	.000	.727	.639	.000	.000	.809	.727



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KAAHI ST SOUTHBOUND				LEIALII PKWY WESTBOUND				NORTHBOUND				LEIALII PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	1	0	4	0	0	11	1	1	0	0	0	0	2	9	0	0	29
15:30	0	0	9	0	0	14	4	0	0	0	0	0	6	12	0	0	45
15:45	0	0	4	0	0	13	0	0	0	0	0	0	11	8	0	0	36
Total	1	0	17	0	0	38	5	1	0	0	0	0	19	29	0	0	110
16:00	0	0	9	2	0	5	0	2	0	0	0	0	8	10	0	0	36
16:15	2	0	2	0	0	12	2	0	0	0	0	0	8	10	0	0	36
16:30	3	0	4	1	0	8	1	0	0	0	0	0	12	4	0	0	33
16:45	0	0	3	1	0	4	0	1	0	0	0	0	8	8	0	0	25
Total	5	0	18	4	0	29	3	3	0	0	0	0	36	32	0	0	130
17:00	0	0	4	0	0	4	0	0	0	0	0	0	6	6	0	0	20
Grand Total	6	0	39	4	0	71	8	4	0	0	0	0	61	67	0	0	260
Apprch %	12.2	0	79.6	8.2	0	85.5	9.6	4.8	0	0	0	0	47.7	52.3	0	0	
Total %	2.3	0	15	1.5	0	27.3	3.1	1.5	0	0	0	0	23.5	25.8	0	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0.4
Cars & Light Goods	5	0	39	0	0	68	8	0	0	0	0	0	61	64	0	0	245
% Cars & Light Goods	83.3	0	100	0	0	95.8	100	0	0	0	0	0	100	95.5	0	0	94.2
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Buses	0	0	0	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0.8
Single-Unit Trucks	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
% Single-Unit Trucks	0	0	0	0	0	1.4	0	0	0	0	0	0	0	1.5	0	0	0.8
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
% Bicycles on Road	16.7	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0.8
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0.4
Pedestrians	0	0	0	4	0	0	0	3	0	0	0	0	0	0	0	0	7
% Pedestrians	0	0	0	100	0	0	0	75	0	0	0	0	0	0	0	0	2.7

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File Name : Leialii Pkwy-Kaahi St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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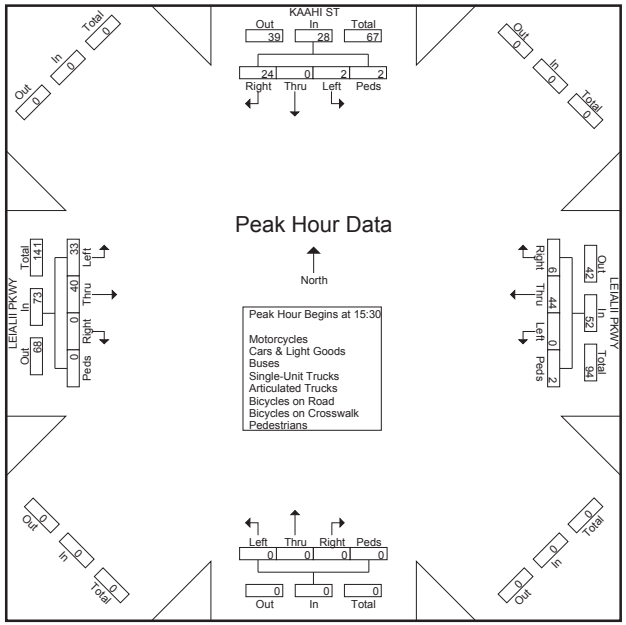
	KAAHI ST SOUTHBOUND					LEIALII PKWY WESTBOUND					NORTHBOUND					LEIALII PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:15 to 17:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	0	**9**	0	9	0	**14**	**4**	0	**18**	0	0	0	0	0	6	**12**	0	0	18	**45**
15:45	0	0	4	0	4	0	13	0	0	13	0	0	0	0	0	**11**	8	0	0	**19**	36
16:00	0	0	9	**2**	**11**	0	5	0	**2**	7	0	0	0	0	0	8	10	0	0	18	36
16:15	**2**	0	2	0	4	0	12	2	0	14	0	0	0	0	0	8	10	0	0	18	36
Total Volume	2	0	24	2	28	0	44	6	2	52	0	0	0	0	0	33	40	0	0	73	153
% App. Total	7.1	0	85.7	7.1		0	84.6	11.5	3.8		0	0	0	0		45.2	54.8	0	0		
PHF	.250	.000	.667	.250	.636	.000	.786	.375	.250	.722	.000	.000	.000	.000	.000	.750	.833	.000	.000	.961	.850



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File Name : Leialii Pkwy-Hooli St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				LEIALII PKWY WESTBOUND				HOOLI ST NORTHBOUND				LEIALII PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	0	0	0	0	2	0	0	10	0	0	1	0	2	2	0	17
06:45	0	0	0	0	0	4	0	0	11	0	0	0	0	1	1	0	17
Total	0	0	0	0	0	6	0	0	21	0	0	1	0	3	3	0	34
07:00	0	0	0	0	0	7	0	0	13	0	0	0	0	5	3	1	29
07:15	0	0	0	0	0	7	0	0	7	0	0	0	0	0	6	0	20
07:30	0	0	0	0	0	5	0	0	13	0	0	0	0	1	4	0	23
07:45	0	0	0	0	0	4	0	0	10	0	0	0	0	4	6	0	24
Total	0	0	0	0	0	23	0	0	43	0	0	0	0	10	19	1	96
08:00	0	0	0	0	0	0	0	0	3	0	0	0	0	1	3	0	7
08:15	0	0	0	0	0	2	0	0	15	0	0	0	0	0	9	0	26
Grand Total	0	0	0	0	0	31	0	0	82	0	0	1	0	14	34	1	163
Apprch %	0	0	0	0	0	100	0	0	98.8	0	0	1.2	0	28.6	69.4	2	
Total %	0	0	0	0	0	19	0	0	50.3	0	0	0.6	0	8.6	20.9	0.6	
Motorcycles	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
% Motorcycles	0	0	0	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0.6
Cars & Light Goods	0	0	0	0	0	30	0	0	81	0	0	0	0	13	32	0	156
% Cars & Light Goods	0	0	0	0	0	96.8	0	0	98.8	0	0	0	0	92.9	94.1	0	95.7
Buses	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	4
% Buses	0	0	0	0	0	3.2	0	0	0	0	0	0	0	7.1	5.9	0	2.5
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	1.2

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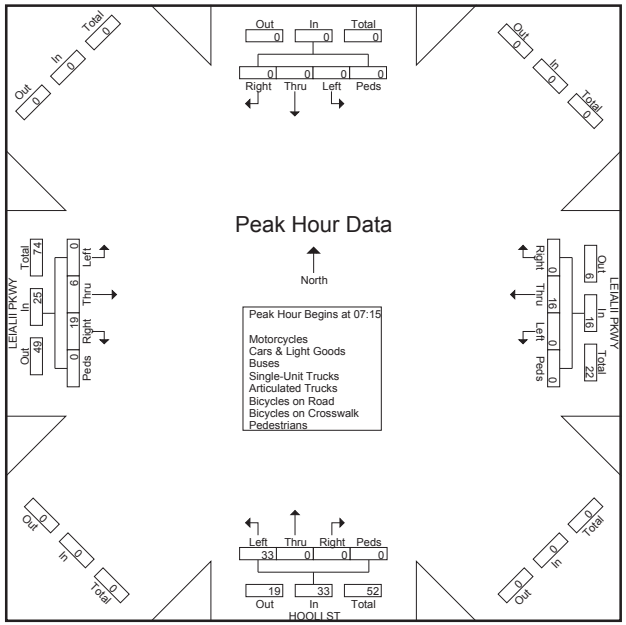
File Name : Leialii Pkwy-Hooli St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 2

	SOUTHBOUND					LEIALII PKWY WESTBOUND					HOOLI ST NORTHBOUND					LEIALII PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	0	0	0	0	0	**7**	0	0	**7**	7	0	0	0	7	0	0	**6**	0	6	20
07:30	0	0	0	0	0	0	5	0	0	5	**13**	0	0	0	**13**	0	1	4	0	5	23
07:45	0	0	0	0	0	0	4	0	0	4	10	0	0	0	10	0	**4**	6	0	**10**	**24**
08:00	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	1	3	0	4	7
Total Volume	0	0	0	0	0	0	16	0	0	16	33	0	0	0	33	0	6	19	0	25	74
% App. Total	0	0	0	0		0	100	0	0		100	0	0	0		0	24	76	0		
PHF	.000	.000	.000	.000	.000	.000	.571	.000	.000	.571	.635	.000	.000	.000	.635	.000	.375	.792	.000	.625	.771



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File Name : Leialii Pkwy-Hooli St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				LEIALII PKWY WESTBOUND				HOOLI ST NORTHBOUND				LEIALII PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	0	0	0	0	1	2	0	0	9	0	1	0	0	3	6	0	22
15:30	0	0	0	0	0	3	0	0	14	0	1	0	0	3	8	0	29
15:45	0	0	0	0	2	4	0	0	9	0	0	0	0	2	7	0	24
Total	0	0	0	0	3	9	0	0	32	0	2	0	0	8	21	0	75
16:00	0	0	0	0	0	3	0	0	3	0	0	0	0	3	5	0	14
16:15	0	0	0	0	0	5	0	0	8	0	0	0	0	4	10	0	27
16:30	0	0	0	0	1	1	0	0	8	0	0	0	0	1	5	0	16
16:45	0	0	0	0	0	0	0	0	4	0	0	0	0	1	7	0	12
Total	0	0	0	0	1	9	0	0	23	0	0	0	0	9	27	0	69
17:00	0	0	0	0	0	1	0	0	3	0	0	0	0	3	3	0	10
Grand Total	0	0	0	0	4	19	0	0	58	0	2	0	0	20	51	0	154
Apprch %	0	0	0	0	17.4	82.6	0	0	96.7	0	3.3	0	0	28.2	71.8	0	
Total %	0	0	0	0	2.6	12.3	0	0	37.7	0	1.3	0	0	13	33.1	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0.6
Cars & Light Goods	0	0	0	0	4	19	0	0	55	0	2	0	0	20	49	0	149
% Cars & Light Goods	0	0	0	0	100	100	0	0	94.8	0	100	0	0	100	96.1	0	96.8
Buses	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
% Buses	0	0	0	0	0	0	0	0	3.4	0	0	0	0	0	0	0	1.3
Single-Unit Trucks	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2
% Single-Unit Trucks	0	0	0	0	0	0	0	0	1.7	0	0	0	0	0	2	0	1.3
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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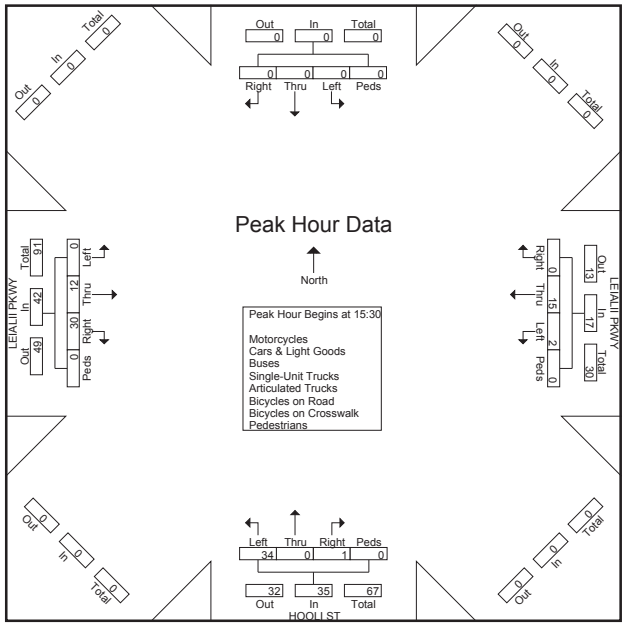
File Name : Leialii Pkwy-Hooli St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 2

	SOUTHBOUND					LEIALII PKWY WESTBOUND					HOOLI ST NORTHBOUND					LEIALII PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:15 to 17:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	0	0	0	0	0	3	0	0	3	**14**	0	**1**	0	**15**	0	3	8	0	11	**29**
15:45	0	0	0	0	0	**2**	4	0	0	**6**	9	0	0	0	9	0	2	7	0	9	24
16:00	0	0	0	0	0	0	3	0	0	3	3	0	0	0	3	0	3	5	0	8	14
16:15	0	0	0	0	0	0	**5**	0	0	5	8	0	0	0	8	0	**4**	**10**	0	**14**	27
Total Volume	0	0	0	0	0	2	15	0	0	17	34	0	1	0	35	0	12	30	0	42	94
% App. Total	0	0	0	0		11.8	88.2	0	0		97.1	0	2.9	0		0	28.6	71.4	0		
PHF	.000	.000	.000	.000	.000	.250	.750	.000	.000	.708	.607	.000	.250	.000	.583	.000	.750	.750	.000	.750	.810



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File Name : Leialii Pkwy-Hanohano St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				LEIALII PKWY WESTBOUND				HANOHANO ST NORTHBOUND				LEIALII PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	0	0	0	0	0	0	0	3	0	0	0	0	1	1	0	5
06:45	0	0	0	0	0	0	0	0	4	0	0	0	0	0	1	0	5
Total	0	0	0	0	0	0	0	0	7	0	0	0	0	1	2	0	10
07:00	0	0	0	0	0	0	0	0	7	0	0	0	0	0	5	0	12
07:15	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	7
07:30	0	0	0	0	0	1	0	0	3	0	0	0	0	0	1	0	5
07:45	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
Total	0	0	0	0	0	1	0	0	21	0	0	0	0	0	6	0	28
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
08:15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	0	1	0	0	29	0	0	0	0	1	10	0	41
Apprch %	0	0	0	0	0	100	0	0	100	0	0	0	0	9.1	90.9	0	
Total %	0	0	0	0	0	2.4	0	0	70.7	0	0	0	0	2.4	24.4	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	0	0	0	0	1	0	0	28	0	0	0	0	1	9	0	39
% Cars & Light Goods	0	0	0	0	0	100	0	0	96.6	0	0	0	0	100	90	0	95.1
Buses	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2
% Buses	0	0	0	0	0	0	0	0	3.4	0	0	0	0	0	10	0	4.9
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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File Name : Leialii Pkwy-Hanohano St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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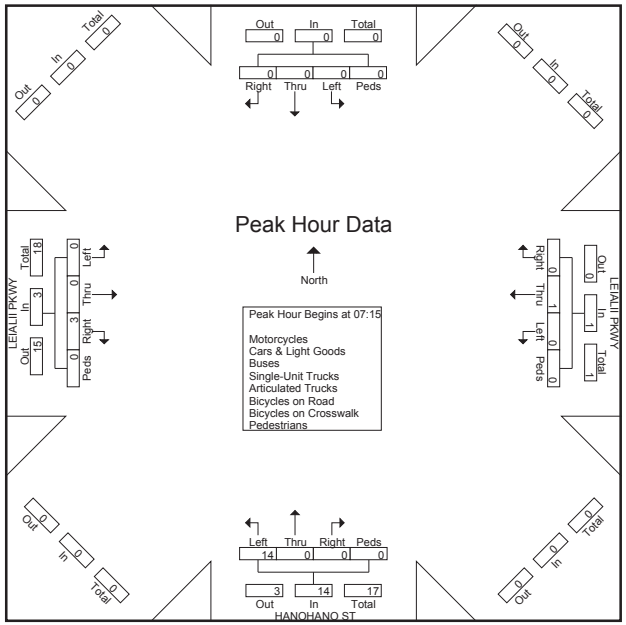
	SOUTHBOUND					LEIALII PKWY WESTBOUND					HANOHANO ST NORTHBOUND					LEIALII PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 to 08:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	0	0	0	0	0	0	0	0	0	**7**	0	0	0	**7**	0	0	0	0	0	**7**
07:30	0	0	0	0	0	0	**1**	0	0	**1**	3	0	0	0	3	0	0	1	0	1	5
07:45	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	4
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**	0	**2**	2
Total Volume	0	0	0	0	0	0	1	0	0	1	14	0	0	0	14	0	0	3	0	3	18
% App. Total	0	0	0	0		0	100	0	0		100	0	0	0		0	0	100	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.500	.000	.000	.000	.500	.000	.000	.375	.000	.375	.643



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Start Date : 5/14/2019
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				LEIALII PKWY WESTBOUND				HANOHANO ST NORTHBOUND				LEIALII PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	4
15:30	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	8
15:45	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	5
Total	0	0	0	0	0	0	0	0	9	0	0	0	0	0	8	0	17
16:00	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	6
16:15	0	0	0	0	0	0	0	0	6	0	0	0	0	0	4	0	10
16:30	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	3
16:45	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
Total	0	0	0	0	0	0	0	1	11	0	0	0	0	0	9	0	21
17:00	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	4
Grand Total	0	0	0	0	0	0	0	1	22	0	0	0	0	0	19	0	42
Apprch %	0	0	0	0	0	0	0	100	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	0	0	0	2.4	52.4	0	0	0	0	0	45.2	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.3	0	2.4
Cars & Light Goods	0	0	0	0	0	0	0	0	22	0	0	0	0	0	18	0	40
% Cars & Light Goods	0	0	0	0	0	0	0	0	100	0	0	0	0	0	94.7	0	95.2
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	2.4

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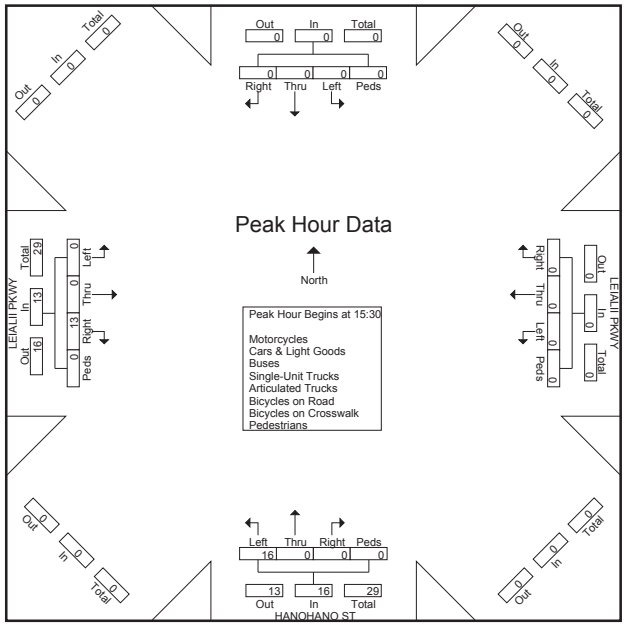
File Name : Leialii Pkwy-Hanohano St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 2

	SOUTHBOUND					LEIALII PKWY WESTBOUND					HANOHANO ST NORTHBOUND					LEIALII PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:15 to 17:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	**4**	0	**4**	8
15:45	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	2	0	2	5
16:00	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	3	0	3	6
16:15	0	0	0	0	0	0	0	0	0	0	**6**	0	0	0	**6**	0	0	4	0	4	**10**
Total Volume	0	0	0	0	0	0	0	0	0	0	16	0	0	0	16	0	0	13	0	13	29
% App. Total	0	0	0	0		0	0	0	0		100	0	0	0		0	0	100	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.667	.000	.000	.000	.667	.000	.000	.813	.000	.813	.725



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File Name : Honoapiilani Hwy-Fleming Rd
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				FLEMING RD WESTBOUND				HONOAPIILANI HWY NORTHBOUND				FRONT ST EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	0	204	0	0	9	3	1	0	0	285	3	1	11	0	0	7	524
06:45	0	256	0	0	36	1	3	0	0	274	4	0	18	0	1	8	601
Total	0	460	0	0	45	4	4	0	0	559	7	1	29	0	1	15	1125
07:00	1	310	0	0	24	3	2	0	0	306	3	1	20	0	0	6	676
07:15	0	305	0	0	36	4	3	2	0	338	3	0	27	1	0	1	720
07:30	0	334	1	0	28	2	5	1	2	425	1	1	27	2	1	2	832
07:45	0	274	0	0	26	3	4	1	0	427	2	0	29	2	3	2	773
Total	1	1223	1	0	114	12	14	4	2	1496	9	2	103	5	4	11	3001
08:00	1	316	0	0	15	2	3	0	0	347	5	0	24	2	1	2	718
08:15	0	263	0	0	13	2	3	0	0	314	1	0	22	1	2	1	622
Grand Total	2	2262	1	0	187	20	24	4	2	2716	22	3	178	8	8	29	5466
Apprch %	0.1	99.9	0	0	79.6	8.5	10.2	1.7	0.1	99	0.8	0.1	79.8	3.6	3.6	13	
Total %	0	41.4	0	0	3.4	0.4	0.4	0.1	0	49.7	0.4	0.1	3.3	0.1	0.1	0.5	
Motorcycles	0	5	0	0	1	0	0	0	0	12	1	0	3	0	0	0	22
% Motorcycles	0	0.2	0	0	0.5	0	0	0	0	0.4	4.5	0	1.7	0	0	0	0.4
Cars & Light Goods	2	2222	1	0	182	19	24	0	2	2636	20	0	171	8	7	0	5294
% Cars & Light Goods	100	98.2	100	0	97.3	95	100	0	100	97.1	90.9	0	96.1	100	87.5	0	96.9
Buses	0	21	0	0	2	0	0	0	0	15	0	0	0	0	1	0	39
% Buses	0	0.9	0	0	1.1	0	0	0	0	0.6	0	0	0	0	12.5	0	0.7
Single-Unit Trucks	0	11	0	0	2	0	0	0	0	44	1	0	3	0	0	0	61
% Single-Unit Trucks	0	0.5	0	0	1.1	0	0	0	0	1.6	4.5	0	1.7	0	0	0	1.1
Articulated Trucks	0	3	0	0	0	0	0	0	0	6	0	0	0	0	0	0	9
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.2
Bicycles on Road	0	0	0	0	0	1	0	0	0	3	0	0	1	0	0	0	5
% Bicycles on Road	0	0	0	0	0	5	0	0	0	0.1	0	0	0.6	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	9	10
% Bicycles on Crosswalk	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	31	0.2
Pedestrians	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	20	26
% Pedestrians	0	0	0	0	0	0	0	75	0	0	0	100	0	0	0	69	0.5

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File Name : Honoapiilani Hwy-Fleming Rd
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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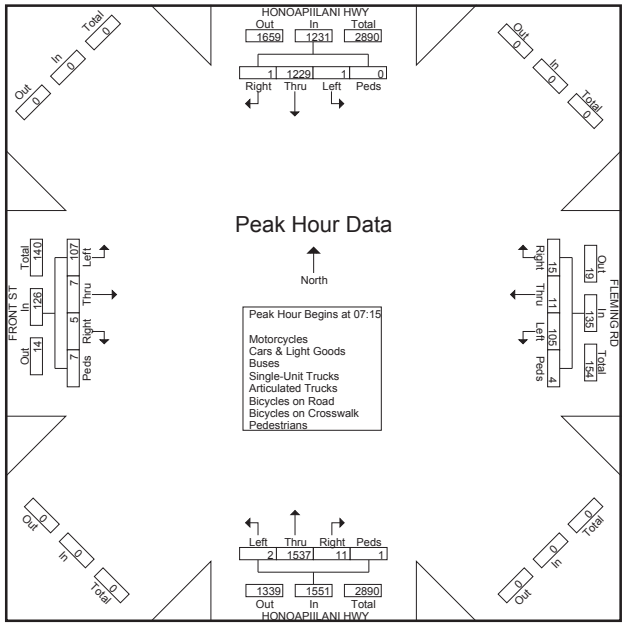
	HONOAPIILANI HWY SOUTHBOUND					FLEMING RD WESTBOUND					HONOAPIILANI HWY NORTHBOUND					FRONT ST EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	305	0	0	305	**36**	**4**	3	**2**	**45**	0	338	3	0	341	27	1	0	1	29	720
07:30	0	**334**	**1**	0	**335**	28	2	**5**	1	36	**2**	425	1	**1**	**429**	27	**2**	1	**2**	32	**832**
07:45	0	274	0	0	274	26	3	4	1	34	0	**427**	2	0	429	**29**	2	**3**	2	**36**	773
08:00	**1**	316	0	0	317	15	2	3	0	20	0	347	**5**	0	352	24	2	1	2	29	718
Total Volume	1	1229	1	0	1231	105	11	15	4	135	2	1537	11	1	1551	107	7	5	7	126	3043
% App. Total	0.1	99.8	0.1	0		77.8	8.1	11.1	3		0.1	99.1	0.7	0.1		84.9	5.6	4	5.6		
PHF	.250	.920	.250	.000	.919	.729	.688	.750	.500	.750	.250	.900	.550	.250	.904	.922	.875	.417	.875	.875	.914



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Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				FLEMING RD WESTBOUND				HONOAPIILANI HWY NORTHBOUND				FLEMING RD EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	0	357	0	0	28	3	2	0	1	378	4	2	48	3	2	1	829
15:30	5	355	0	0	15	3	3	0	0	417	4	0	58	4	1	0	865
15:45	1	300	0	0	8	5	4	0	1	402	2	0	34	1	1	0	759
Total	6	1012	0	0	51	11	9	0	2	1197	10	2	140	8	4	1	2453
16:00	2	336	0	0	12	4	1	0	2	356	4	0	45	2	1	0	765
16:15	2	464	0	0	16	0	3	0	3	389	1	0	43	3	3	0	927
16:30	1	352	0	0	18	3	2	0	1	362	3	0	55	1	1	0	799
16:45	1	348	0	0	12	1	1	0	1	368	4	0	32	2	0	0	770
Total	6	1500	0	0	58	8	7	0	7	1475	12	0	175	8	5	0	3261
17:00	0	325	0	0	15	2	1	0	1	318	5	0	37	2	0	0	706
Grand Total	12	2837	0	0	124	21	17	0	10	2990	27	2	352	18	9	1	6420
Apprch %	0.4	99.6	0	0	76.5	13	10.5	0	0.3	98.7	0.9	0.1	92.6	4.7	2.4	0.3	
Total %	0.2	44.2	0	0	1.9	0.3	0.3	0	0.2	46.6	0.4	0	5.5	0.3	0.1	0	
Motorcycles	0	7	0	0	1	1	0	0	0	12	0	0	2	2	0	0	25
% Motorcycles	0	0.2	0	0	0.8	4.8	0	0	0	0.4	0	0	0.6	11.1	0	0	0.4
Cars & Light Goods	12	2769	0	0	122	20	17	0	10	2942	27	0	347	16	9	0	6291
% Cars & Light Goods	100	97.6	0	0	98.4	95.2	100	0	100	98.4	100	0	98.6	88.9	100	0	98
Buses	0	27	0	0	0	0	0	0	0	14	0	0	1	0	0	0	42
% Buses	0	1	0	0	0	0	0	0	0	0.5	0	0	0.3	0	0	0	0.7
Single-Unit Trucks	0	28	0	0	1	0	0	0	0	13	0	0	1	0	0	0	43
% Single-Unit Trucks	0	1	0	0	0.8	0	0	0	0	0.4	0	0	0.3	0	0	0	0.7
Articulated Trucks	0	3	0	0	0	0	0	0	0	6	0	0	1	0	0	0	10
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0.3	0	0	0	0.2
Bicycles on Road	0	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	6
% Bicycles on Road	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	0

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File Name : Honoapiilani Hwy-Fleming Rd
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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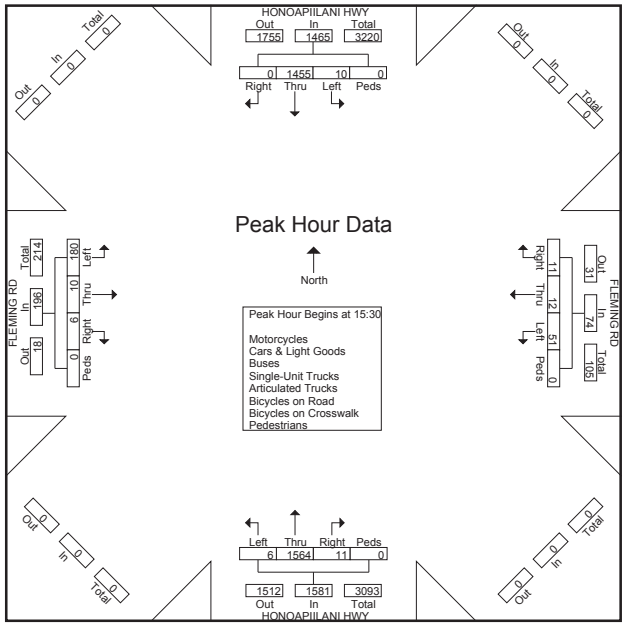
	HONOAPIILANI HWY SOUTHBOUND					FLEMING RD WESTBOUND					HONOAPIILANI HWY NORTHBOUND					FLEMING RD EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:15 to 17:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	**5**	355	0	0	360	15	3	3	0	**21**	0	**417**	**4**	0	**421**	**58**	**4**	1	0	**63**	865
15:45	1	300	0	0	301	8	**5**	**4**	0	17	1	402	2	0	405	34	1	1	0	36	759
16:00	2	336	0	0	338	12	4	1	0	17	2	356	4	0	362	45	2	1	0	48	765
16:15	2	**464**	0	0	**466**	**16**	0	3	0	19	**3**	389	1	0	393	43	3	**3**	0	49	**927**
Total Volume	10	1455	0	0	1465	51	12	11	0	74	6	1564	11	0	1581	180	10	6	0	196	3316
% App. Total	0.7	99.3	0	0		68.9	16.2	14.9	0		0.4	98.9	0.7	0		91.8	5.1	3.1	0		
PHF	.500	.784	.000	.000	.786	.797	.600	.688	.000	.881	.500	.938	.688	.000	.939	.776	.625	.500	.000	.778	.894



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File Name : Honoapiilani Hwy-Kapunakea St
Site Code : 18-552 DHHL Villages of Leialii
Start Date : 5/14/2019
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				KAPUNAKEA ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				KAPUNAKEA ST EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	4	192	11	5	14	3	16	0	1	255	11	0	12	8	3	3	538
06:45	6	267	11	1	30	6	9	1	6	260	9	0	10	0	9	0	625
Total	10	459	22	6	44	9	25	1	7	515	20	0	22	8	12	3	1163
07:00	5	286	16	2	44	5	8	0	4	269	7	1	23	5	12	0	687
07:15	6	338	18	6	49	2	19	1	3	329	14	0	21	7	7	0	820
07:30	10	322	16	8	32	9	18	3	3	364	26	0	24	7	8	0	850
07:45	7	311	18	3	38	1	9	0	7	395	21	0	27	6	10	0	853
Total	28	1257	68	19	163	17	54	4	17	1357	68	1	95	25	37	0	3210
08:00	3	287	10	2	29	8	8	1	4	314	14	0	24	13	8	1	726
08:15	5	282	16	1	37	7	6	0	6	305	18	0	29	9	6	1	728
Grand Total	46	2285	116	28	273	41	93	6	34	2491	120	1	170	55	63	5	5827
Apprch %	1.9	92.3	4.7	1.1	66.1	9.9	22.5	1.5	1.3	94.1	4.5	0	58	18.8	21.5	1.7	
Total %	0.8	39.2	2	0.5	4.7	0.7	1.6	0.1	0.6	42.7	2.1	0	2.9	0.9	1.1	0.1	
Motorcycles	1	2	1	0	4	6	0	0	0	9	0	0	1	2	0	0	26
% Motorcycles	2.2	0.1	0.9	0	1.5	14.6	0	0	0	0.4	0	0	0.6	3.6	0	0	0.4
Cars & Light Goods	45	2244	112	0	264	31	93	0	31	2408	119	0	162	52	62	0	5623
% Cars & Light Goods	97.8	98.2	96.6	0	96.7	75.6	100	0	91.2	96.7	99.2	0	95.3	94.5	98.4	0	96.5
Buses	0	24	2	0	5	0	0	0	2	14	1	0	2	0	0	0	50
% Buses	0	1.1	1.7	0	1.8	0	0	0	5.9	0.6	0.8	0	1.2	0	0	0	0.9
Single-Unit Trucks	0	11	0	0	0	1	0	0	0	51	0	0	5	0	1	0	69
% Single-Unit Trucks	0	0.5	0	0	0	2.4	0	0	0	2	0	0	2.9	0	1.6	0	1.2
Articulated Trucks	0	2	0	0	0	0	0	0	1	5	0	0	0	0	0	0	8
% Articulated Trucks	0	0.1	0	0	0	0	0	0	2.9	0.2	0	0	0	0	0	0	0.1
Bicycles on Road	0	2	1	0	0	3	0	0	0	4	0	0	0	1	0	0	11
% Bicycles on Road	0	0.1	0.9	0	0	7.3	0	0	0	0.2	0	0	0	1.8	0	0	0.2
Bicycles on Crosswalk	0	0	0	5	0	0	0	0	0	0	0	1	0	0	0	0	6
% Bicycles on Crosswalk	0	0	0	17.9	0	0	0	0	0	0	0	100	0	0	0	0	0.1
Pedestrians	0	0	0	23	0	0	0	6	0	0	0	0	0	0	0	5	34
% Pedestrians	0	0	0	82.1	0	0	0	100	0	0	0	0	0	0	0	100	0.6

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File Name : Honoapiilani Hwy-Kapunakea St
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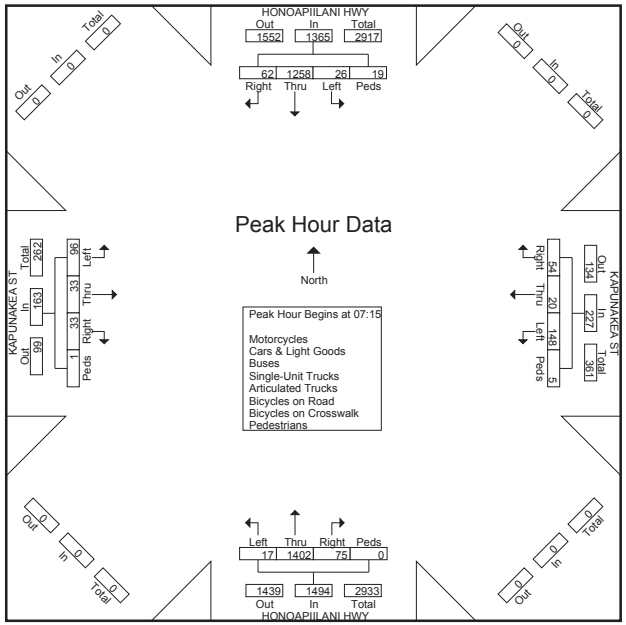
	HONOAPIILANI HWY SOUTHBOUND					KAPUNAKEA ST WESTBOUND					HONOAPIILANI HWY NORTHBOUND					KAPUNAKEA ST EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	6	**338**	**18**	6	**368**	**49**	2	**19**	1	**71**	3	329	14	0	346	21	7	7	0	35	820
07:30	**10**	322	16	**8**	356	32	**9**	18	**3**	62	3	364	**26**	0	393	24	7	8	0	39	850
07:45	7	311	18	3	339	38	1	9	0	48	**7**	**395**	21	0	**423**	**27**	6	**10**	0	43	**853**
08:00	3	287	10	2	302	29	8	8	1	46	4	314	14	0	332	24	**13**	8	**1**	**46**	726
Total Volume	26	1258	62	19	1365	148	20	54	5	227	17	1402	75	0	1494	96	33	33	1	163	3249
% App. Total	1.9	92.2	4.5	1.4		65.2	8.8	23.8	2.2		1.1	93.8	5	0		58.9	20.2	20.2	0.6		
PHF	.650	.930	.861	.594	.927	.755	.556	.711	.417	.799	.607	.887	.721	.000	.883	.889	.635	.825	.250	.886	.952



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				KAPUNAKEA ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				KAPUNAKEA ST EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	11	400	34	0	18	4	8	0	16	371	26	0	44	10	8	0	950
15:30	5	369	22	2	25	6	11	0	15	370	32	0	34	17	8	0	916
15:45	6	337	19	2	32	12	8	0	22	331	18	0	45	8	13	0	853
Total	22	1106	75	4	75	22	27	0	53	1072	76	0	123	35	29	0	2719
16:00	7	382	16	1	27	12	14	0	17	320	30	0	40	9	8	0	883
16:15	9	384	24	3	23	7	3	1	15	320	24	0	50	13	7	1	884
16:30	8	376	19	1	19	8	3	0	17	360	32	0	39	10	7	0	899
16:45	7	336	21	1	21	4	10	0	11	278	29	1	45	5	12	0	781
Total	31	1478	80	6	90	31	30	1	60	1278	115	1	174	37	34	1	3447
17:00	7	310	25	1	18	5	14	0	14	297	17	0	32	17	14	0	771
Grand Total	60	2894	180	11	183	58	71	1	127	2647	208	1	329	89	77	1	6937
Apprch %	1.9	92	5.7	0.3	58.5	18.5	22.7	0.3	4.3	88.7	7	0	66.3	17.9	15.5	0.2	
Total %	0.9	41.7	2.6	0.2	2.6	0.8	1	0	1.8	38.2	3	0	4.7	1.3	1.1	0	
Motorcycles	1	8	0	0	5	7	0	0	0	6	4	0	3	4	2	0	40
% Motorcycles	1.7	0.3	0	0	2.7	12.1	0	0	0	0.2	1.9	0	0.9	4.5	2.6	0	0.6
Cars & Light Goods	58	2832	170	0	176	51	70	0	127	2606	198	0	323	85	74	0	6770
% Cars & Light Goods	96.7	97.9	94.4	0	96.2	87.9	98.6	0	100	98.5	95.2	0	98.2	95.5	96.1	0	97.6
Buses	0	16	10	0	0	0	0	0	0	11	2	0	1	0	0	0	40
% Buses	0	0.6	5.6	0	0	0	0	0	0	0.4	1	0	0.3	0	0	0	0.6
Single-Unit Trucks	1	30	0	0	0	0	0	0	0	16	0	0	2	0	1	0	50
% Single-Unit Trucks	1.7	1	0	0	0	0	0	0	0	0.6	0	0	0.6	0	1.3	0	0.7
Articulated Trucks	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	0	6
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
Bicycles on Road	0	6	0	0	2	0	1	0	0	4	4	0	0	0	0	0	17
% Bicycles on Road	0	0.2	0	0	1.1	0	1.4	0	0	0.2	1.9	0	0	0	0	0	0.2
Bicycles on Crosswalk	0	0	0	3	0	0	0	1	0	0	0	1	0	0	0	0	5
% Bicycles on Crosswalk	0	0	0	27.3	0	0	0	100	0	0	0	100	0	0	0	0	0.1
Pedestrians	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	1	9
% Pedestrians	0	0	0	72.7	0	0	0	0	0	0	0	0	0	0	0	100	0.1

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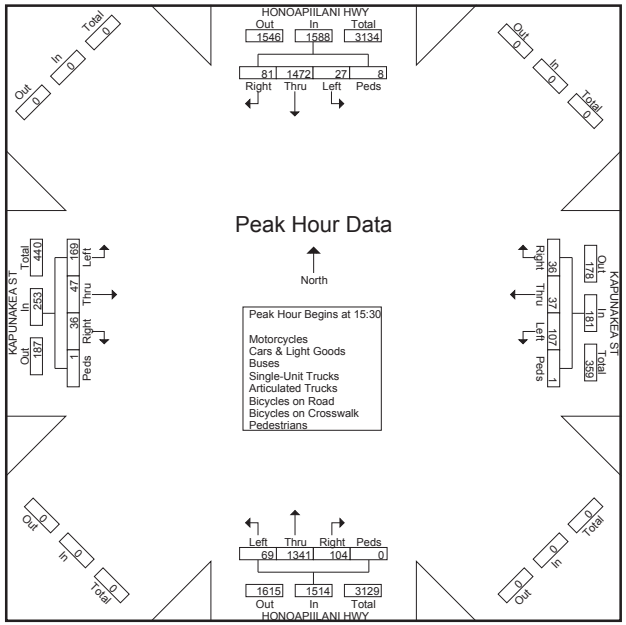
	HONOAPIILANI HWY SOUTHBOUND					KAPUNAKEA ST WESTBOUND					HONOAPIILANI HWY NORTHBOUND					KAPUNAKEA ST EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	5	369	22	2	398	25	6	11	0	42	15	**370**	**32**	0	**417**	34	**17**	8	0	59	**916**
15:45	6	337	19	2	364	**32**	**12**	8	0	52	**22**	331	18	0	371	45	8	**13**	0	66	853
16:00	7	382	16	1	406	27	12	**14**	0	**53**	17	320	30	0	367	40	9	8	0	57	883
16:15	**9**	**384**	**24**	**3**	**420**	23	7	3	**1**	34	15	320	24	0	359	**50**	13	7	**1**	**71**	884
Total Volume	27	1472	81	8	1588	107	37	36	1	181	69	1341	104	0	1514	169	47	36	1	253	3536
% App. Total	1.7	92.7	5.1	0.5		59.1	20.4	19.9	0.6		4.6	88.6	6.9	0		66.8	18.6	14.2	0.4		
PHF	.750	.958	.844	.667	.945	.836	.771	.643	.250	.854	.784	.906	.813	.000	.908	.845	.691	.692	.250	.891	.965



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File Name : Honoapiilani Hwy-Keawe St
Site Code : 18-552 DHHL Villages of Leialii
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				KEAWE ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				LAHAINA CANNERY DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30	65	126	6	0	19	10	189	0	8	78	15	0	0	4	7	0	527
06:45	126	189	6	0	16	13	203	0	7	85	23	2	2	10	8	0	690
Total	191	315	12	0	35	23	392	0	15	163	38	2	2	14	15	0	1217
07:00	130	192	5	0	25	16	193	0	6	107	32	2	1	18	12	0	739
07:15	166	202	9	0	18	14	263	0	10	93	30	3	1	21	12	0	842
07:30	136	254	7	0	26	8	267	2	6	153	37	0	3	11	8	0	918
07:45	139	212	4	0	32	25	256	0	10	137	57	1	1	21	12	0	907
Total	571	860	25	0	101	63	979	2	32	490	156	6	6	71	44	0	3406
08:00	140	193	11	0	42	23	213	0	10	133	56	0	1	28	11	0	861
08:15	114	201	5	0	28	15	194	2	11	113	37	3	1	19	6	2	751
Grand Total	1016	1569	53	0	206	124	1778	4	68	899	287	11	10	132	76	2	6235
Apprch %	38.5	59.5	2	0	9.8	5.9	84.2	0.2	5.4	71.1	22.7	0.9	4.5	60	34.5	0.9	
Total %	16.3	25.2	0.9	0	3.3	2	28.5	0.1	1.1	14.4	4.6	0.2	0.2	2.1	1.2	0	
Motorcycles	5	5	0	0	1	0	7	0	0	6	3	0	0	4	1	0	32
% Motorcycles	0.5	0.3	0	0	0.5	0	0.4	0	0	0.7	1	0	0	3	1.3	0	0.5
Cars & Light Goods	984	1537	53	0	196	118	1716	0	61	869	273	0	8	122	73	0	6010
% Cars & Light Goods	96.9	98	100	0	95.1	95.2	96.5	0	89.7	96.7	95.1	0	80	92.4	96.1	0	96.4
Buses	20	15	0	0	2	1	9	0	0	7	1	0	2	0	0	0	57
% Buses	2	1	0	0	1	0.8	0.5	0	0	0.8	0.3	0	20	0	0	0	0.9
Single-Unit Trucks	5	9	0	0	4	4	42	0	6	9	7	0	0	5	0	0	91
% Single-Unit Trucks	0.5	0.6	0	0	1.9	3.2	2.4	0	8.8	1	2.4	0	0	3.8	0	0	1.5
Articulated Trucks	2	0	0	0	1	0	2	0	0	6	1	0	0	0	0	0	12
% Articulated Trucks	0.2	0	0	0	0.5	0	0.1	0	0	0.7	0.3	0	0	0	0	0	0.2
Bicycles on Road	0	3	0	0	2	1	2	0	1	2	2	0	0	1	2	0	16
% Bicycles on Road	0	0.2	0	0	1	0.8	0.1	0	1.5	0.2	0.7	0	0	0.8	2.6	0	0.3
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	18.2	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	4	0	0	0	9	0	0	0	2	15
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	81.8	0	0	0	100	0.2

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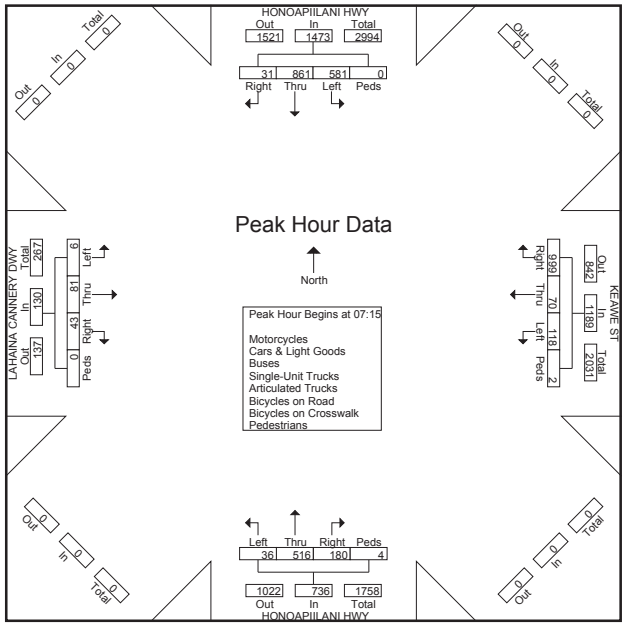
	HONOAPIILANI HWY SOUTHBOUND					KEAWE ST WESTBOUND					HONOAPIILANI HWY NORTHBOUND					LAHAINA CANNERY DWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	**166**	202	9	0	377	18	14	263	0	295	**10**	93	30	**3**	136	1	21	**12**	0	34	842
07:30	136	**254**	7	0	**397**	26	8	**267**	**2**	303	6	**153**	37	0	196	**3**	11	8	0	22	**918**
07:45	139	212	4	0	355	32	**25**	256	0	**313**	10	137	**57**	1	**205**	1	21	12	0	34	907
08:00	140	193	**11**	0	344	**42**	23	213	0	278	10	133	56	0	199	1	**28**	11	0	**40**	861
Total Volume	581	861	31	0	1473	118	70	999	2	1189	36	516	180	4	736	6	81	43	0	130	3528
% App. Total	39.4	58.5	2.1	0		9.9	5.9	84	0.2		4.9	70.1	24.5	0.5		4.6	62.3	33.1	0		
PHF	.875	.847	.705	.000	.928	.702	.700	.935	.250	.950	.900	.843	.789	.333	.898	.500	.723	.896	.000	.813	.961



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HONOAPIILANI HWY SOUTHBOUND				KEAWE ST WESTBOUND				HONOAPIILANI HWY NORTHBOUND				LAHAINA CANNERY DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:15	143	251	7	0	39	31	277	4	21	111	54	0	12	26	19	2	997
15:30	128	265	13	0	47	30	243	3	13	164	55	1	10	26	25	0	1023
15:45	124	225	8	0	58	28	234	2	21	139	58	2	9	28	25	4	965
Total	395	741	28	0	144	89	754	9	55	414	167	3	31	80	69	6	2985
16:00	143	246	10	0	32	23	203	3	19	139	58	3	7	14	30	0	930
16:15	130	285	16	0	39	22	218	1	10	153	47	2	11	20	11	0	965
16:30	143	246	8	0	41	19	237	0	14	138	56	0	6	32	22	0	962
16:45	125	238	10	0	33	20	185	0	26	146	35	8	11	16	20	0	873
Total	541	1015	44	0	145	84	843	4	69	576	196	13	35	82	83	0	3730
17:00	131	201	11	0	34	27	193	2	17	118	45	2	12	31	29	0	853
Grand Total	1067	1957	83	0	323	200	1790	15	141	1108	408	18	78	193	181	6	7568
Apprch %	34.3	63	2.7	0	13.9	8.6	76.9	0.6	8.4	66.1	24.4	1.1	17	42.1	39.5	1.3	
Total %	14.1	25.9	1.1	0	4.3	2.6	23.7	0.2	1.9	14.6	5.4	0.2	1	2.6	2.4	0.1	
Motorcycles	5	11	1	0	2	1	4	0	2	5	4	0	1	2	4	0	42
% Motorcycles	0.5	0.6	1.2	0	0.6	0.5	0.2	0	1.4	0.5	1	0	1.3	1	2.2	0	0.6
Cars & Light Goods	1049	1897	80	0	314	196	1764	0	137	1091	399	0	73	187	169	0	7356
% Cars & Light Goods	98.3	96.9	96.4	0	97.2	98	98.5	0	97.2	98.5	97.8	0	93.6	96.9	93.4	0	97.2
Buses	0	17	0	0	1	0	8	0	1	4	2	0	4	0	4	0	41
% Buses	0	0.9	0	0	0.3	0	0.4	0	0.7	0.4	0.5	0	5.1	0	2.2	0	0.5
Single-Unit Trucks	12	27	0	0	3	1	14	0	0	4	1	0	0	3	1	0	66
% Single-Unit Trucks	1.1	1.4	0	0	0.9	0.5	0.8	0	0	0.4	0.2	0	0	1.6	0.6	0	0.9
Articulated Trucks	0	2	0	0	0	1	0	0	1	4	0	0	0	0	1	0	9
% Articulated Trucks	0	0.1	0	0	0	0.5	0	0	0.7	0.4	0	0	0	0	0.6	0	0.1
Bicycles on Road	1	3	2	0	3	1	0	0	0	0	2	0	0	1	2	0	15
% Bicycles on Road	0.1	0.2	2.4	0	0.9	0.5	0	0	0	0	0.5	0	0	0.5	1.1	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	6	0	0	0	5	0	0	0	2	13
% Bicycles on Crosswalk	0	0	0	0	0	0	0	40	0	0	0	27.8	0	0	0	33.3	0.2
Pedestrians	0	0	0	0	0	0	0	9	0	0	0	13	0	0	0	4	26
% Pedestrians	0	0	0	0	0	0	0	60	0	0	0	72.2	0	0	0	66.7	0.3

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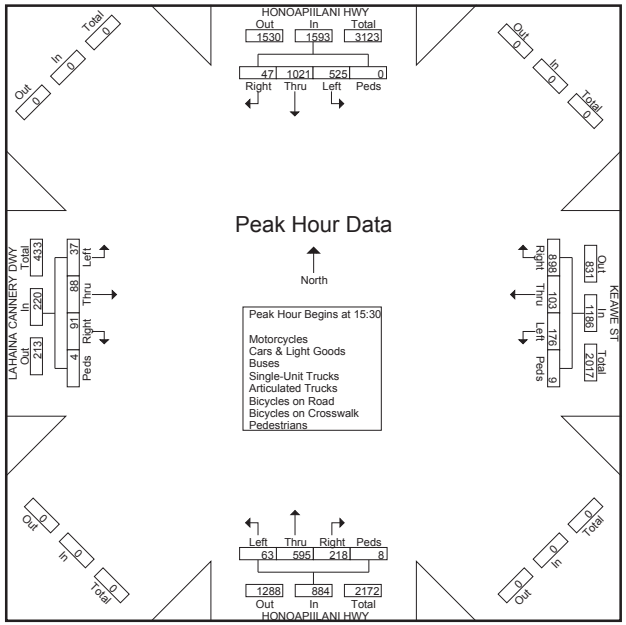
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	128	265	13	0	406	47	**30**	**243**	**3**	**323**	13	**164**	55	1	**233**	10	26	25	0	61	**1023**
15:45	124	225	8	0	357	**58**	28	234	2	322	**21**	139	**58**	2	220	9	**28**	25	**4**	**66**	965
16:00	**143**	246	10	0	399	32	23	203	3	261	19	139	58	**3**	219	7	14	**30**	0	51	930
16:15	130	**285**	**16**	0	**431**	39	22	218	1	280	10	153	47	2	212	**11**	20	11	0	42	965
Total Volume	525	1021	47	0	1593	176	103	898	9	1186	63	595	218	8	884	37	88	91	4	220	3883
% App. Total	33	64.1	3	0		14.8	8.7	75.7	0.8		7.1	67.3	24.7	0.9		16.8	40	41.4	1.8		
PHF	.918	.896	.734	.000	.924	.759	.858	.924	.750	.918	.750	.907	.940	.667	.948	.841	.786	.758	.250	.833	.949



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APPENDIX B

LEVEL OF SERVICE CRITERIA

APPENDIX B – LEVEL OF SERVICE (LOS) CRITERIA

VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6th EDITION)

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

VEHICULAR LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6th EDITION)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing AM Conditions

HCM 6th Signalized Intersection Summary
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	3	285	14	1	11	437	1178	14	8	1148	120
Future Volume (veh/h)	145	3	285	14	1	11	437	1178	14	8	1148	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	158	3	108	15	1	2	475	1280	15	9	1248	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	248	5	876	72	5	10	629	2228	26	55	1664	741
Arrive On Green	0.14	0.14	0.13	0.05	0.05	0.02	0.18	0.62	0.60	0.03	0.47	0.47
Sat Flow, veh/h	1750	33	2790	1468	98	196	3456	3597	42	1781	3554	1582
Grp Volume(v), veh/h	161	0	108	18	0	0	475	632	663	9	1248	84
Grp Sat Flow(s),veh/h/ln	1783	0	1395	1762	0	0	1728	1777	1863	1781	1777	1582
Q Serve(g_s), s	8.6	0.0	2.8	1.0	0.0	0.0	13.2	21.2	21.3	0.5	29.1	3.0
Cycle Q Clear(g_c), s	8.6	0.0	2.8	1.0	0.0	0.0	13.2	21.2	21.3	0.5	29.1	3.0
Prop In Lane	0.98		1.00	0.83		0.11	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	253	0	876	87	0	0	629	1100	1154	55	1664	741
V/C Ratio(X)	0.64	0.00	0.12	0.21	0.00	0.00	0.76	0.57	0.57	0.16	0.75	0.11
Avail Cap(c_a), veh/h	1625	0	3023	576	0	0	1643	2605	2731	388	4295	1912
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.8	0.0	24.7	46.2	0.0	0.0	39.2	11.4	11.4	47.6	22.0	15.1
Incr Delay (d2), s/veh	1.0	0.0	0.0	1.2	0.0	0.0	0.7	0.7	0.6	0.5	1.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	0.0	0.9	0.5	0.0	0.0	5.4	7.2	7.5	0.2	11.1	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.8	0.0	24.7	47.4	0.0	0.0	39.9	12.0	12.0	48.2	23.0	15.2
LnGrp LOS	D	A	C	D	A	A	D	B	B	D	C	B
Approach Vol, veh/h		269			18			1770			1341	
Approach Delay, s/veh		35.0			47.4			19.5			22.7	
Approach LOS		C			D			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	22.4	51.3		9.0	7.1	66.5		18.3				
Change Period (Y+Rc), s	6.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	46.0	120.0		30.0	20.0	146.0		89.0				
Max Q Clear Time (g_c+I1), s	15.2	31.1		3.0	2.5	23.3		10.6				
Green Ext Time (p_c), s	1.2	14.2		0.0	0.0	12.2		0.7				

Intersection Summary			
HCM 6th Ctrl Delay			22.1
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	0	0	15	0	1545	7	1	1410	0
Future Vol, veh/h	1	1	1	0	0	15	0	1545	7	1	1410	0
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	0	0	16	0	1679	8	1	1533	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2375	3223	767	2453	3219	845	-	0	0	1688	0	0
Stage 1	1535	1535	-	1684	1684	-	-	-	-	-	-	-
Stage 2	840	1688	-	769	1535	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	18	9	345	16	10	306	0	-	-	375	-	0
Stage 1	122	176	-	98	149	-	0	-	-	-	-	0
Stage 2	326	148	-	360	176	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	17	9	345	14	10	306	-	-	-	375	-	-
Mov Cap-2 Maneuver	17	9	-	14	10	-	-	-	-	-	-	-
Stage 1	122	173	-	98	149	-	-	-	-	-	-	-
Stage 2	309	148	-	350	173	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	261.5	17.4	0	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	17	306	375	-
HCM Lane V/C Ratio	-	-	0.192	0.053	0.003	-
HCM Control Delay (s)	-	-	261.5	17.4	14.6	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	0.5	0.2	0	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	5	2	8	8	0	4	7	19	0	7	2
Future Vol, veh/h	2	5	2	8	8	0	4	7	19	0	7	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	5	2	9	9	0	4	8	21	0	8	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	9	0	0	7	0	0	42	37	6	52	38	9
Stage 1	-	-	-	-	-	-	10	10	-	27	27	-
Stage 2	-	-	-	-	-	-	32	27	-	25	11	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1611	-	-	1614	-	-	961	855	1077	947	854	1073
Stage 1	-	-	-	-	-	-	1011	887	-	990	873	-
Stage 2	-	-	-	-	-	-	984	873	-	993	886	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1611	-	-	1614	-	-	948	849	1077	918	848	1073
Mov Cap-2 Maneuver	-	-	-	-	-	-	948	849	-	918	848	-
Stage 1	-	-	-	-	-	-	1010	886	-	989	868	-
Stage 2	-	-	-	-	-	-	968	868	-	965	885	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	3.6	8.7	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	996	1611	-	-	1614	-	-	889
HCM Lane V/C Ratio	0.033	0.001	-	-	0.005	-	-	0.011
HCM Control Delay (s)	8.7	7.2	0	-	7.2	0	-	9.1
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

HCM 6th TWSC
4: Kaaahi Street & Akoakoa Pl

08/20/2020

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	7	22	16	1	16
Future Vol, veh/h	4	7	22	16	1	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	8	24	17	1	17

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	52	33	0	0	41	0
Stage 1	33	-	-	-	-	-
Stage 2	19	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	957	1041	-	-	1568	-
Stage 1	989	-	-	-	-	-
Stage 2	1004	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	956	1041	-	-	1568	-
Mov Cap-2 Maneuver	956	-	-	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	1004	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1008	1568	-
HCM Lane V/C Ratio	-	-	0.012	0.001	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

HCM 6th Signalized Intersection Summary
6: Honoapiilani Highway & Leialii Parkway

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	2	57	0	26	2	1630	51	33	1361	3
Future Volume (veh/h)	2	0	2	57	0	26	2	1630	51	33	1361	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.97		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	2	0	1	62	0	1	2	1772	54	36	1479	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	130	6	52	175	0	143	2	2822	86	64	3043	6
Arrive On Green	0.10	0.00	0.09	0.10	0.00	0.09	0.00	0.80	0.80	0.04	0.84	0.83
Sat Flow, veh/h	989	62	526	1379	0	1534	1781	3521	107	1781	3638	7
Grp Volume(v), veh/h	3	0	0	62	0	1	2	891	935	36	722	760
Grp Sat Flow(s),veh/h/ln	1578	0	0	1379	0	1534	1781	1777	1851	1781	1777	1869
Q Serve(g_s), s	0.0	0.0	0.0	7.7	0.0	0.1	0.2	37.6	38.3	3.7	21.1	21.1
Cycle Q Clear(g_c), s	0.3	0.0	0.0	7.9	0.0	0.1	0.2	37.6	38.3	3.7	21.1	21.1
Prop In Lane	0.67		0.33	1.00		1.00	1.00		0.06	1.00		0.00
Lane Grp Cap(c), veh/h	188	0	0	175	0	143	2	1424	1483	64	1486	1563
V/C Ratio(X)	0.02	0.00	0.00	0.36	0.00	0.01	0.96	0.63	0.63	0.56	0.49	0.49
Avail Cap(c_a), veh/h	188	0	0	374	0	366	142	1424	1483	236	1486	1563
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	76.8	0.0	0.0	80.0	0.0	77.5	94.1	7.4	7.5	89.3	4.3	4.3
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.2	0.0	0.0	165.2	2.1	2.0	4.6	1.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	2.9	0.0	0.0	0.2	13.0	13.8	1.8	6.6	6.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.8	0.0	0.0	81.3	0.0	77.5	259.3	9.5	9.6	94.0	5.4	5.3
LnGrp LOS	E	A	A	F	A	E	F	A	A	F	A	A
Approach Vol, veh/h		3			63			1828			1518	
Approach Delay, s/veh		76.8			81.2			9.8			7.5	
Approach LOS		E			F			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.2	161.6		22.6	10.8	155.0		22.6
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	150.0		45.0	25.0	150.0		15.0
Max Q Clear Time (g_c+I1), s	2.2	23.1		9.9	5.7	40.3		2.3
Green Ext Time (p_c), s	0.0	28.9		0.2	0.0	48.8		0.0

Intersection Summary	
HCM 6th Ctrl Delay	10.2
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	32	23	47	5	3	13
Future Vol, veh/h	32	23	47	5	3	13
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	25	51	5	3	14

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	57	0	-	0	150	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	95	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1547	-	-	-	842	1012
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	929	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1546	-	-	-	821	1011
Mov Cap-2 Maneuver	-	-	-	-	821	-
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	928	-

Approach	EB	WB	SB
HCM Control Delay, s	4.3	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1546	-	-	-	969
HCM Lane V/C Ratio	0.022	-	-	-	0.018
HCM Control Delay (s)	7.4	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	6	19	0	16	33	0
Future Vol, veh/h	6	19	0	16	33	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	21	0	17	36	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	28	0	35	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	17	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1585	-	978	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	1006	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1585	-	978	1061
Mov Cap-2 Maneuver	-	-	-	-	978	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	1006	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	978	-	-	1585	-
HCM Lane V/C Ratio	0.037	-	-	-	-
HCM Control Delay (s)	8.8	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

HCM 6th TWSC
9: Hanohano St & Leialii Parkway

08/20/2020

Intersection	
Int Delay, s/veh	6.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	3	0	1	14	0
Future Vol, veh/h	0	3	0	1	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	0	1	15	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	3	0	3	2
Stage 1	-	-	-	-	2	-
Stage 2	-	-	-	-	1	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1619	-	1019	1082
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	1022	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1619	-	1019	1082
Mov Cap-2 Maneuver	-	-	-	-	1019	-
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	1022	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1619	-
HCM Lane V/C Ratio	0.015	-	-	-	-
HCM Control Delay (s)	8.6	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

HCM 6th Signalized Intersection Summary
10: Honoapiilani Highway & Front Street/Fleming Road

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	107	7	5	105	11	15	2	1537	11	1	1229	1
Future Volume (veh/h)	107	7	5	105	11	15	2	1537	11	1	1229	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	116	8	4	114	12	13	2	1671	12	1	1336	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	198	10	5	192	15	17	5	2912	21	2	2857	
Arrive On Green	0.11	0.11	0.10	0.11	0.11	0.10	0.00	0.81	0.80	0.00	0.80	0.00
Sat Flow, veh/h	1381	95	48	1354	143	154	1781	3616	26	1781	3554	1585
Grp Volume(v), veh/h	128	0	0	139	0	0	2	820	863	1	1336	0
Grp Sat Flow(s),veh/h/ln	1524	0	0	1651	0	0	1781	1777	1866	1781	1777	1585
Q Serve(g_s), s	0.2	0.0	0.0	0.0	0.0	0.0	0.2	23.4	23.4	0.1	16.5	0.0
Cycle Q Clear(g_c), s	11.1	0.0	0.0	11.0	0.0	0.0	0.2	23.4	23.4	0.1	16.5	0.0
Prop In Lane	0.91		0.03	0.82		0.09	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	213	0	0	224	0	0	5	1431	1502	2	2857	
V/C Ratio(X)	0.60	0.00	0.00	0.62	0.00	0.00	0.42	0.57	0.57	0.41	0.47	
Avail Cap(c_a), veh/h	374	0	0	389	0	0	140	1431	1502	140	2857	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.72	0.72	0.72	0.86	0.86	0.00
Uniform Delay (d), s/veh	60.7	0.0	0.0	60.7	0.0	0.0	69.7	4.9	4.9	69.8	4.3	0.0
Incr Delay (d2), s/veh	3.3	0.0	0.0	2.8	0.0	0.0	15.0	1.2	1.2	32.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.0	0.0	5.0	0.0	0.0	0.1	6.6	6.9	0.1	4.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.0	0.0	0.0	63.5	0.0	0.0	84.7	6.1	6.1	101.9	4.8	0.0
LnGrp LOS	E	A	A	E	A	A	F	A	A	F	A	
Approach Vol, veh/h		128			139			1685			1337	A
Approach Delay, s/veh		64.0			63.5			6.2			4.9	
Approach LOS		E			E			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.4	116.6		19.1	4.2	116.7		19.1
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	11.0	85.0		30.0	11.0	85.0		30.0
Max Q Clear Time (g_c+I1), s	2.2	18.5		13.0	2.1	25.4		13.1
Green Ext Time (p_c), s	0.0	31.4		0.4	0.0	41.1		0.5

Intersection Summary	
HCM 6th Ctrl Delay	10.3
HCM 6th LOS	B

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
11: Honoapiilani Highway & Kapunakea Street

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	33	33	148	20	54	17	1402	75	26	1258	62
Future Volume (veh/h)	96	33	33	148	20	54	17	1402	75	26	1258	62
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.97	0.98		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1477	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	104	36	4	161	22	7	18	1524	79	28	1367	65
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	213	59	262	234	230	73	32	2474	128	42	2505	119
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.16	0.04	1.00	1.00	0.02	0.49	0.48
Sat Flow, veh/h	986	347	1532	1059	1347	428	1781	3437	177	1781	3453	164
Grp Volume(v), veh/h	140	0	4	161	0	29	18	785	818	28	702	730
Grp Sat Flow(s),veh/h/ln	1333	0	1532	1059	0	1775	1781	1777	1838	1781	1777	1840
Q Serve(g_s), s	12.6	0.0	0.3	6.0	0.0	1.9	1.4	0.0	0.0	2.2	38.7	38.9
Cycle Q Clear(g_c), s	14.5	0.0	0.3	20.5	0.0	1.9	1.4	0.0	0.0	2.2	38.7	38.9
Prop In Lane	0.74		1.00	1.00		0.24	1.00		0.10	1.00		0.09
Lane Grp Cap(c), veh/h	272	0	262	234	0	303	32	1279	1323	42	1289	1335
V/C Ratio(X)	0.51	0.00	0.02	0.69	0.00	0.10	0.56	0.61	0.62	0.66	0.54	0.55
Avail Cap(c_a), veh/h	304	0	295	258	0	342	76	1279	1323	76	1289	1335
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	0.67	0.67	0.67
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.09	0.09	0.09	0.87	0.87	0.87
Uniform Delay (d), s/veh	55.0	0.0	48.3	56.6	0.0	49.0	66.9	0.0	0.0	68.3	19.8	19.9
Incr Delay (d2), s/veh	1.5	0.0	0.0	6.7	0.0	0.1	0.5	0.2	0.2	5.7	1.4	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	0.0	0.1	6.0	0.0	0.9	0.6	0.1	0.1	1.1	17.4	18.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.5	0.0	48.3	63.3	0.0	49.2	67.5	0.2	0.2	74.0	21.3	21.3
LnGrp LOS	E	A	D	E	A	D	E	A	A	E	C	C
Approach Vol, veh/h		144			190			1621			1460	
Approach Delay, s/veh		56.3			61.1			0.9			22.3	
Approach LOS		E			E			A			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.5	105.6		27.9	7.3	104.8		27.9
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	6.0	94.0		26.0	6.0	94.0		26.0
Max Q Clear Time (g_c+I1), s	3.4	40.9		22.5	4.2	2.0		16.5
Green Ext Time (p_c), s	0.0	22.3		0.3	0.0	33.5		0.3

Intersection Summary	
HCM 6th Ctrl Delay	15.7
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary
12: Honoapiilani Highway & Lahaina Cannery Mall/Keawe Street

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	81	43	118	70	999	36	516	180	581	861	31
Future Volume (veh/h)	6	81	43	118	70	999	36	516	180	581	861	31
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	88	5	128	76	0	39	561	92	632	936	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	33	141	124	300	346		51	977	827	691	2429	86
Arrive On Green	0.08	0.08	0.08	0.08	0.18	0.00	0.03	0.52	0.52	0.40	1.00	1.00
Sat Flow, veh/h	63	1780	1561	1781	1870	1585	1781	1870	1583	3456	3501	123
Grp Volume(v), veh/h	95	0	5	128	76	0	39	561	92	632	475	494
Grp Sat Flow(s),veh/h/ln	1843	0	1561	1781	1870	1585	1781	1870	1583	1728	1777	1848
Q Serve(g_s), s	1.1	0.0	0.4	8.8	4.8	0.0	3.0	28.7	4.1	24.2	0.0	0.0
Cycle Q Clear(g_c), s	6.9	0.0	0.4	8.8	4.8	0.0	3.0	28.7	4.1	24.2	0.0	0.0
Prop In Lane	0.07		1.00	1.00		1.00	1.00		1.00	1.00		0.07
Lane Grp Cap(c), veh/h	174	0	124	300	346		51	977	827	691	1232	1282
V/C Ratio(X)	0.55	0.00	0.04	0.43	0.22		0.77	0.57	0.11	0.91	0.39	0.39
Avail Cap(c_a), veh/h	315	0	245	303	494		331	977	827	790	1232	1282
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.76	0.76	0.76
Uniform Delay (d), s/veh	62.5	0.0	59.5	50.1	48.5	0.0	67.5	22.8	17.0	40.9	0.0	0.0
Incr Delay (d2), s/veh	2.6	0.0	0.1	1.0	0.3	0.0	24.6	2.5	0.3	11.5	0.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	0.0	0.2	4.1	2.3	0.0	1.7	12.7	1.6	9.2	0.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.1	0.0	59.6	51.1	48.8	0.0	92.2	25.3	17.2	52.3	0.7	0.7
LnGrp LOS	E	A	E	D	D		F	C	B	D	A	A
Approach Vol, veh/h		100			204	A		692			1601	
Approach Delay, s/veh		64.9			50.2			28.0			21.1	
Approach LOS		E			D			C			C	

Timer - Assigned Phs	1	2		4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.0	101.1		30.9	32.0	77.1	14.8	16.1
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0	4.0	5.0
Max Green Setting (Gmax), s	26.0	63.0		37.0	32.0	57.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	5.0	2.0		6.8	26.2	30.7	10.8	8.9
Green Ext Time (p_c), s	0.1	11.7		0.4	1.8	6.3	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	26.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing PM Conditions

HCM 6th Signalized Intersection Summary
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	241	4	575	14	1	5	483	1072	13	8	1279	151
Future Volume (veh/h)	241	4	575	14	1	5	483	1072	13	8	1279	151
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	262	4	409	15	1	1	525	1165	14	9	1390	121
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	334	5	1020	64	4	4	630	2293	28	43	1703	759
Arrive On Green	0.19	0.19	0.18	0.04	0.04	0.02	0.18	0.64	0.62	0.02	0.48	0.48
Sat Flow, veh/h	1756	27	2790	1564	104	104	3456	3596	43	1781	3554	1585
Grp Volume(v), veh/h	266	0	409	17	0	0	525	576	603	9	1390	121
Grp Sat Flow(s),veh/h/ln	1783	0	1395	1772	0	0	1728	1777	1863	1781	1777	1585
Q Serve(g_s), s	21.1	0.0	16.2	1.4	0.0	0.0	21.8	25.8	25.9	0.7	49.8	6.4
Cycle Q Clear(g_c), s	21.1	0.0	16.2	1.4	0.0	0.0	21.8	25.8	25.9	0.7	49.8	6.4
Prop In Lane	0.98		1.00	0.88		0.06	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	339	0	1020	73	0	0	630	1133	1187	43	1703	759
V/C Ratio(X)	0.79	0.00	0.40	0.23	0.00	0.00	0.83	0.51	0.51	0.21	0.82	0.16
Avail Cap(c_a), veh/h	1102	0	2215	393	0	0	1115	1768	1853	263	2914	1300
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	57.4	0.0	35.1	69.2	0.0	0.0	58.6	14.5	14.5	71.2	33.2	21.9
Incr Delay (d2), s/veh	1.5	0.0	0.1	0.6	0.0	0.0	1.1	0.5	0.5	0.9	1.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.8	0.0	5.7	0.6	0.0	0.0	9.5	9.9	10.4	0.3	20.8	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	58.9	0.0	35.2	69.8	0.0	0.0	59.8	15.0	15.0	72.1	34.6	22.0
LnGrp LOS	E	A	D	E	A	A	E	B	B	E	C	C
Approach Vol, veh/h		675			17			1704			1520	
Approach Delay, s/veh		44.5			69.8			28.8			33.8	
Approach LOS		D			E			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	31.1	75.3		10.1	7.6	98.8		32.3				
Change Period (Y+Rc), s	6.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	46.0	120.0		30.0	20.0	146.0		89.0				
Max Q Clear Time (g_c+I1), s	23.8	51.8		3.4	2.7	27.9		23.1				
Green Ext Time (p_c), s	1.3	17.5		0.0	0.0	10.3		2.1				

Intersection Summary			
HCM 6th Ctrl Delay			33.6
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	0	6	0	0	7	0	1712	2	0	2022	0
Future Vol, veh/h	2	0	6	0	0	7	0	1712	2	0	2022	0
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	0	7	0	0	8	0	1861	2	0	2198	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3129	4061	1099	2961	4060	932	-	0	0	-	-	0
Stage 1	2198	2198	-	1862	1862	-	-	-	-	-	-	-
Stage 2	931	1863	-	1099	2198	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	-	-	-	-	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	-	-	-	-	-	-
Pot Cap-1 Maneuver	5	3	207	6	3	268	0	-	-	0	-	0
Stage 1	46	82	-	75	121	-	0	-	-	0	-	0
Stage 2	287	121	-	227	82	-	0	-	-	0	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	5	3	207	6	3	268	-	-	-	-	-	-
Mov Cap-2 Maneuver	5	3	-	6	3	-	-	-	-	-	-	-
Stage 1	46	82	-	75	121	-	-	-	-	-	-	-
Stage 2	279	121	-	220	82	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 304.6	18.8	0	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBT
Capacity (veh/h)	-	-	19	268	-
HCM Lane V/C Ratio	-	-	0.458	0.028	-
HCM Control Delay (s)	-	-	$ 304.6	18.8	-
HCM Lane LOS	-	-	F	C	-
HCM 95th %tile Q(veh)	-	-	1.3	0.1	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	9	2	0	4	3	5	0	1	1
Future Vol, veh/h	0	1	1	9	2	0	4	3	5	0	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	10	2	0	4	3	5	0	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	2	0	0	25	24	2	28	24	2
Stage 1	-	-	-	-	-	-	2	2	-	22	22	-
Stage 2	-	-	-	-	-	-	23	22	-	6	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1620	-	-	986	869	1082	981	869	1082
Stage 1	-	-	-	-	-	-	1021	894	-	996	877	-
Stage 2	-	-	-	-	-	-	995	877	-	1016	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1620	-	-	979	864	1082	969	864	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	979	864	-	969	864	-
Stage 1	-	-	-	-	-	-	1021	894	-	996	872	-
Stage 2	-	-	-	-	-	-	987	872	-	1007	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.9	8.7	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	985	1620	-	-	1620	-	-	961
HCM Lane V/C Ratio	0.013	-	-	-	0.006	-	-	0.002
HCM Control Delay (s)	8.7	0	-	-	7.2	0	-	8.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

HCM 6th TWSC
4: Kaaahi St & Akoakoa Pl

08/20/2020

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	3	9	28	0	11
Future Vol, veh/h	14	3	9	28	0	11
Conflicting Peds, #/hr	1	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	3	10	30	0	12

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	39	26	0	0	41	0
Stage 1	26	-	-	-	-	-
Stage 2	13	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	973	1050	-	-	1568	-
Stage 1	997	-	-	-	-	-
Stage 2	1010	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	971	1049	-	-	1567	-
Mov Cap-2 Maneuver	971	-	-	-	-	-
Stage 1	996	-	-	-	-	-
Stage 2	1009	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	984	1567	-
HCM Lane V/C Ratio	-	-	0.019	-	-
HCM Control Delay (s)	-	-	8.7	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

HCM 6th Signalized Intersection Summary
6: Honoapiilani Highway & Leialii Parkway

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	2	5	83	3	61	6	1646	87	55	1844	5
Future Volume (veh/h)	3	2	5	83	3	61	6	1646	87	55	1844	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	3	2	1	90	3	3	7	1789	94	60	2004	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	116	72	29	195	5	144	15	2562	134	101	2887	7
Arrive On Green	0.10	0.10	0.09	0.10	0.10	0.09	0.01	0.75	0.74	0.06	0.79	0.79
Sat Flow, veh/h	716	717	287	1373	46	1564	1781	3435	179	1781	3636	9
Grp Volume(v), veh/h	6	0	0	93	0	3	7	918	965	60	979	1030
Grp Sat Flow(s),veh/h/ln	1720	0	0	1419	0	1564	1781	1777	1838	1781	1777	1869
Q Serve(g_s), s	0.0	0.0	0.0	7.4	0.0	0.2	0.5	33.6	34.7	4.1	31.2	31.3
Cycle Q Clear(g_c), s	0.4	0.0	0.0	7.8	0.0	0.2	0.5	33.6	34.7	4.1	31.2	31.3
Prop In Lane	0.50		0.17	0.97		1.00	1.00		0.10	1.00		0.00
Lane Grp Cap(c), veh/h	216	0	0	200	0	144	15	1325	1371	101	1410	1483
V/C Ratio(X)	0.03	0.00	0.00	0.47	0.00	0.02	0.45	0.69	0.70	0.60	0.69	0.69
Avail Cap(c_a), veh/h	262	0	0	583	0	570	216	2173	2248	361	2173	2286
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.2	0.0	0.0	53.4	0.0	51.0	60.9	8.2	8.4	56.9	5.8	5.9
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.7	0.0	0.1	7.6	1.4	1.4	3.4	1.3	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	2.9	0.0	0.1	0.2	10.3	11.0	1.9	8.2	8.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.3	0.0	0.0	55.1	0.0	51.0	68.5	9.7	9.9	60.3	7.2	7.1
LnGrp LOS	D	A	A	E	A	D	E	A	A	E	A	A
Approach Vol, veh/h		6			96			1890			2069	
Approach Delay, s/veh		50.3			55.0			10.0			8.7	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.1	102.0		16.4	11.0	96.1		16.4
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	150.0		45.0	25.0	150.0		15.0
Max Q Clear Time (g_c+I1), s	2.5	33.3		9.8	6.1	36.7		2.4
Green Ext Time (p_c), s	0.0	63.7		0.4	0.1	53.6		0.0

Intersection Summary	
HCM 6th Ctrl Delay	10.4
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	33	40	44	6	2	24
Future Vol, veh/h	33	40	44	6	2	24
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	43	48	7	2	26

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	57	0	-	0	171	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	117	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1547	-	-	-	819	1013
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	908	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1544	-	-	-	796	1011
Mov Cap-2 Maneuver	-	-	-	-	796	-
Stage 1	-	-	-	-	944	-
Stage 2	-	-	-	-	906	-

Approach	EB	WB	SB
HCM Control Delay, s	3.3	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1544	-	-	-	990
HCM Lane V/C Ratio	0.023	-	-	-	0.029
HCM Control Delay (s)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	12	30	2	15	34	1
Future Vol, veh/h	12	30	2	15	34	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	33	2	16	37	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	46	0	50	30
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	20	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1562	-	959	1044
Stage 1	-	-	-	-	993	-
Stage 2	-	-	-	-	1003	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1562	-	958	1044
Mov Cap-2 Maneuver	-	-	-	-	958	-
Stage 1	-	-	-	-	992	-
Stage 2	-	-	-	-	1003	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	960	-	-	1562	-
HCM Lane V/C Ratio	0.04	-	-	0.001	-
HCM Control Delay (s)	8.9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

HCM 6th TWSC
9: Hanohano St & Leialii Parkway

08/20/2020

Intersection	
Int Delay, s/veh	4.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	13	0	0	16	0
Future Vol, veh/h	0	13	0	0	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	14	0	0	17	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	14	0	8	7
Stage 1	-	-	-	-	7	-
Stage 2	-	-	-	-	1	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1604	-	1013	1075
Stage 1	-	-	-	-	1016	-
Stage 2	-	-	-	-	1022	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1604	-	1013	1075
Mov Cap-2 Maneuver	-	-	-	-	1013	-
Stage 1	-	-	-	-	1016	-
Stage 2	-	-	-	-	1022	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1013	-	-	1604	-
HCM Lane V/C Ratio	0.017	-	-	-	-
HCM Control Delay (s)	8.6	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

HCM 6th Signalized Intersection Summary
10: Honoapiilani Highway & Front Street/Fleming Road

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	10	6	51	12	11	6	1564	11	10	1455	0
Future Volume (veh/h)	180	10	6	51	12	11	6	1564	11	10	1455	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1281	1281	1281	1723	1723	1723	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	196	11	6	55	13	7	7	1700	12	11	1582	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	226	10	5	268	61	29	15	2565	18	22	2533	
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.01	0.94	0.93	0.01	0.71	0.00
Sat Flow, veh/h	917	51	28	1156	315	151	1781	3617	26	1781	3554	1585
Grp Volume(v), veh/h	213	0	0	75	0	0	7	834	878	11	1582	0
Grp Sat Flow(s),veh/h/ln	996	0	0	1622	0	0	1781	1777	1866	1781	1777	1585
Q Serve(g_s), s	21.5	0.0	0.0	0.0	0.0	0.0	0.5	10.0	10.0	0.9	32.2	0.0
Cycle Q Clear(g_c), s	27.0	0.0	0.0	5.5	0.0	0.0	0.5	10.0	10.0	0.9	32.2	0.0
Prop In Lane	0.92		0.03	0.73		0.09	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	241	0	0	357	0	0	15	1260	1323	22	2533	
V/C Ratio(X)	0.88	0.00	0.00	0.21	0.00	0.00	0.46	0.66	0.66	0.50	0.62	
Avail Cap(c_a), veh/h	241	0	0	357	0	0	102	1260	1323	102	2533	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.72	0.72	0.72	0.63	0.63	0.00
Uniform Delay (d), s/veh	57.6	0.0	0.0	47.8	0.0	0.0	68.9	1.4	1.5	68.7	10.4	0.0
Incr Delay (d2), s/veh	29.6	0.0	0.0	0.3	0.0	0.0	5.7	2.0	1.9	4.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.7	0.0	0.0	2.3	0.0	0.0	0.3	2.1	2.2	0.4	11.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	87.1	0.0	0.0	48.1	0.0	0.0	74.6	3.4	3.4	72.7	11.1	0.0
LnGrp LOS	F	A	A	D	A	A	E	A	A	E	B	
Approach Vol, veh/h		213			75			1719			1593	A
Approach Delay, s/veh		87.1			48.1			3.7			11.6	
Approach LOS		F			D			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.2	103.8		31.0	5.7	103.3		31.0
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	92.0		26.0	8.0	92.0		26.0
Max Q Clear Time (g_c+I1), s	2.5	34.2		7.5	2.9	12.0		29.0
Green Ext Time (p_c), s	0.0	37.4		0.2	0.0	51.2		0.0

Intersection Summary	
HCM 6th Ctrl Delay	13.0
HCM 6th LOS	B

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
11: Honoapiilani Highway & Kapunakea Street

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	169	47	36	107	37	36	69	1341	104	27	1472	81
Future Volume (veh/h)	169	47	36	107	37	36	69	1341	104	27	1472	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	184	51	5	116	40	12	75	1458	109	29	1600	85
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	234	52	302	332	265	80	94	2338	174	43	2295	121
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.07	0.93	0.92	0.01	0.22	0.22
Sat Flow, veh/h	977	271	1565	1346	1377	413	1781	3353	249	1781	3433	181
Grp Volume(v), veh/h	235	0	5	116	0	52	75	769	798	29	824	861
Grp Sat Flow(s),veh/h/ln	1247	0	1565	1346	0	1790	1781	1777	1825	1781	1777	1838
Q Serve(g_s), s	23.0	0.0	0.4	0.0	0.0	3.4	5.8	10.4	10.8	2.3	59.8	60.5
Cycle Q Clear(g_c), s	26.3	0.0	0.4	9.8	0.0	3.4	5.8	10.4	10.8	2.3	59.8	60.5
Prop In Lane	0.78		1.00	1.00		0.23	1.00		0.14	1.00		0.10
Lane Grp Cap(c), veh/h	286	0	302	332	0	345	94	1239	1273	43	1188	1229
V/C Ratio(X)	0.82	0.00	0.02	0.35	0.00	0.15	0.80	0.62	0.63	0.67	0.69	0.70
Avail Cap(c_a), veh/h	286	0	302	332	0	345	127	1239	1273	127	1188	1229
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.09	0.09	0.09	0.76	0.76	0.76
Uniform Delay (d), s/veh	57.9	0.0	45.7	49.6	0.0	47.1	64.3	1.9	2.0	68.9	41.4	41.7
Incr Delay (d2), s/veh	17.0	0.0	0.0	0.6	0.0	0.2	1.6	0.2	0.2	5.1	2.6	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.7	0.0	0.1	3.7	0.0	1.6	2.6	1.8	1.9	1.1	29.2	30.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.0	0.0	45.8	50.2	0.0	47.3	66.0	2.1	2.2	74.0	43.9	44.2
LnGrp LOS	E	A	D	D	A	D	E	A	A	E	D	D
Approach Vol, veh/h		240			168			1642			1714	
Approach Delay, s/veh		74.4			49.3			5.1			44.6	
Approach LOS		E			D			A			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.4	97.6		31.0	7.4	101.6		31.0
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	10.6	90.0		26.0	10.0	90.0		26.0
Max Q Clear Time (g_c+I1), s	7.8	62.5		11.8	4.3	12.8		28.3
Green Ext Time (p_c), s	0.0	19.5		0.7	0.0	30.4		0.0

Intersection Summary	
HCM 6th Ctrl Delay	29.5
HCM 6th LOS	C

HCM 6th Signalized Intersection Summary
12: Honoapiilani Highway & Lahaina Cannery Mall/Keawe Street

08/20/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	88	91	176	103	898	63	595	218	525	1021	47
Future Volume (veh/h)	37	88	91	176	103	898	63	595	218	525	1021	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.99		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	40	96	13	191	112	0	68	647	127	571	1110	49
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	79	146	177	318	414		88	930	784	651	2206	97
Arrive On Green	0.11	0.11	0.11	0.08	0.22	0.00	0.05	0.50	0.50	0.06	0.21	0.21
Sat Flow, veh/h	398	1278	1552	1781	1870	1585	1781	1870	1576	3456	3465	153
Grp Volume(v), veh/h	136	0	13	191	112	0	68	647	127	571	569	590
Grp Sat Flow(s),veh/h/ln	1677	0	1552	1781	1870	1585	1781	1870	1576	1728	1777	1842
Q Serve(g_s), s	8.1	0.0	1.0	11.0	6.9	0.0	5.3	37.2	6.2	22.9	39.6	39.6
Cycle Q Clear(g_c), s	10.8	0.0	1.0	11.0	6.9	0.0	5.3	37.2	6.2	22.9	39.6	39.6
Prop In Lane	0.29		1.00	1.00		1.00	1.00		1.00	1.00		0.08
Lane Grp Cap(c), veh/h	225	0	177	318	414		88	930	784	651	1131	1172
V/C Ratio(X)	0.61	0.00	0.07	0.60	0.27		0.77	0.70	0.16	0.88	0.50	0.50
Avail Cap(c_a), veh/h	318	0	266	318	521		382	930	784	741	1131	1172
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.60	0.60	0.60
Uniform Delay (d), s/veh	59.6	0.0	55.4	48.7	45.2	0.0	65.8	27.0	19.2	64.0	35.7	35.8
Incr Delay (d2), s/veh	2.6	0.0	0.2	3.1	0.3	0.0	15.6	4.3	0.4	6.9	1.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	0.4	6.3	3.3	0.0	2.7	16.9	2.4	11.3	19.1	19.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.2	0.0	55.6	51.8	45.5	0.0	81.4	31.3	19.7	71.0	36.7	36.7
LnGrp LOS	E	A	E	D	D		F	C	B	E	D	D
Approach Vol, veh/h		149			303	A		842			1730	
Approach Delay, s/veh		61.6			49.5			33.6			48.0	
Approach LOS		E			D			C			D	

Timer - Assigned Phs	1	2		4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.9	93.1		36.0	30.4	73.6	15.0	21.0
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	30.6	57.0		39.0	30.0	57.0	10.0	24.0
Max Q Clear Time (g_c+I1), s	7.3	41.6		8.9	24.9	39.2	13.0	12.8
Green Ext Time (p_c), s	0.2	8.7		0.6	1.4	6.6	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	44.8
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2030 without Project AM Peak Conditions

HCM 6th Signalized Intersection Summary
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	3	297	14	1	13	467	1565	14	42	1526	140
Future Volume (veh/h)	168	3	297	14	1	13	467	1565	14	42	1526	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	183	3	94	15	1	2	508	1701	15	46	1659	113
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	238	4	849	52	3	7	604	2478	22	81	1979	881
Arrive On Green	0.14	0.14	0.13	0.04	0.04	0.02	0.17	0.69	0.67	0.05	0.56	0.56
Sat Flow, veh/h	1754	29	2790	1468	98	196	3456	3610	32	1781	3554	1582
Grp Volume(v), veh/h	186	0	94	18	0	0	508	837	879	46	1659	113
Grp Sat Flow(s),veh/h/ln	1783	0	1395	1762	0	0	1728	1777	1865	1781	1777	1582
Q Serve(g_s), s	16.6	0.0	4.0	1.6	0.0	0.0	23.4	45.9	46.1	4.2	63.8	5.6
Cycle Q Clear(g_c), s	16.6	0.0	4.0	1.6	0.0	0.0	23.4	45.9	46.1	4.2	63.8	5.6
Prop In Lane	0.98		1.00	0.83		0.11	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	242	0	849	62	0	0	604	1220	1280	81	1979	881
V/C Ratio(X)	0.77	0.00	0.11	0.29	0.00	0.00	0.84	0.69	0.69	0.57	0.84	0.13
Avail Cap(c_a), veh/h	997	0	2032	354	0	0	1009	1599	1678	238	2637	1174
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.6	0.0	41.2	77.5	0.0	0.0	65.6	15.3	15.3	76.9	30.3	17.4
Incr Delay (d2), s/veh	1.9	0.0	0.0	2.5	0.0	0.0	1.3	1.1	1.0	2.3	2.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.8	0.0	1.4	0.8	0.0	0.0	10.4	18.1	19.0	2.0	27.3	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.5	0.0	41.2	80.0	0.0	0.0	67.0	16.4	16.4	79.3	32.5	17.5
LnGrp LOS	E	A	D	E	A	A	E	B	B	E	C	B
Approach Vol, veh/h		280			18			2224			1818	
Approach Delay, s/veh		60.7			80.0			27.9			32.8	
Approach LOS		E			E			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	32.7	95.6		9.8	11.4	116.9		26.3				
Change Period (Y+Rc), s	6.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	46.0	120.0		30.0	20.0	146.0		89.0				
Max Q Clear Time (g_c+I1), s	25.4	65.8		3.6	6.2	48.1		18.6				
Green Ext Time (p_c), s	1.4	23.8		0.0	0.0	24.9		0.8				

Intersection Summary			
HCM 6th Ctrl Delay			32.3
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	0	0	15	0	1983	7	1	1815	0
Future Vol, veh/h	1	1	1	0	0	15	0	1983	7	1	1815	0
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	0	0	16	0	2155	8	1	1973	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3053	4139	987	3149	4135	1083	-	0	0	2164	0	0
Stage 1	1975	1975	-	2160	2160	-	-	-	-	-	-	-
Stage 2	1078	2164	-	989	1975	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	5	2	246	5	2	213	0	-	-	244	-	0
Stage 1	64	106	-	49	85	-	0	-	-	-	-	0
Stage 2	233	85	-	265	106	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	5	2	246	3	2	213	-	-	-	244	-	-
Mov Cap-2 Maneuver	5	2	-	3	2	-	-	-	-	-	-	-
Stage 1	64	106	-	49	85	-	-	-	-	-	-	-
Stage 2	215	85	-	261	106	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, $	1439.5	23.3	0	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	4	213	244	-
HCM Lane V/C Ratio	-	-	0.815	0.077	0.004	-
HCM Control Delay (s)	-		$ 1439.5	23.3	19.8	-
HCM Lane LOS	-	-	F	C	C	-
HCM 95th %tile Q(veh)	-	-	1.1	0.2	0	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	5	2	12	8	0	4	7	28	0	7	2
Future Vol, veh/h	2	5	2	12	8	0	4	7	28	0	7	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	5	2	13	9	0	4	8	30	0	8	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	9	0	0	7	0	0	50	45	6	64	46	9
Stage 1	-	-	-	-	-	-	10	10	-	35	35	-
Stage 2	-	-	-	-	-	-	40	35	-	29	11	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1611	-	-	1614	-	-	950	847	1077	930	846	1073
Stage 1	-	-	-	-	-	-	1011	887	-	981	866	-
Stage 2	-	-	-	-	-	-	975	866	-	988	886	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1611	-	-	1614	-	-	935	839	1077	891	838	1073
Mov Cap-2 Maneuver	-	-	-	-	-	-	935	839	-	891	838	-
Stage 1	-	-	-	-	-	-	1010	886	-	980	859	-
Stage 2	-	-	-	-	-	-	957	859	-	951	885	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	4.3	8.7	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1010	1611	-	-	1614	-	-	881
HCM Lane V/C Ratio	0.042	0.001	-	-	0.008	-	-	0.011
HCM Control Delay (s)	8.7	7.2	0	-	7.2	0	-	9.1
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	7	31	16	1	20
Future Vol, veh/h	4	7	31	16	1	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	8	34	17	1	22

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	67	43	0	0	51	0
Stage 1	43	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	938	1027	-	-	1555	-
Stage 1	979	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	937	1027	-	-	1555	-
Mov Cap-2 Maneuver	937	-	-	-	-	-
Stage 1	978	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	0.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	992	1555	-
HCM Lane V/C Ratio	-	-	0.012	0.001	-
HCM Control Delay (s)	-	-	8.7	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	2	59	0	30	2	2069	61	39	1758	4
Future Volume (veh/h)	3	0	2	59	0	30	2	2069	61	39	1758	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.97		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	3	0	1	64	0	1	2	2249	66	42	1911	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	140	4	38	167	0	138	2	2849	83	65	3068	6
Arrive On Green	0.09	0.00	0.09	0.09	0.00	0.09	0.00	0.81	0.80	0.04	0.84	0.84
Sat Flow, veh/h	1138	47	395	1380	0	1532	1781	3525	103	1781	3638	8
Grp Volume(v), veh/h	4	0	0	64	0	1	2	1128	1187	42	933	982
Grp Sat Flow(s),veh/h/ln	1580	0	0	1380	0	1532	1781	1777	1851	1781	1777	1869
Q Serve(g_s), s	0.0	0.0	0.0	8.3	0.0	0.1	0.2	66.1	68.0	4.6	34.3	34.4
Cycle Q Clear(g_c), s	0.4	0.0	0.0	8.7	0.0	0.1	0.2	66.1	68.0	4.6	34.3	34.4
Prop In Lane	0.75		0.25	1.00		1.00	1.00		0.06	1.00		0.00
Lane Grp Cap(c), veh/h	182	0	0	167	0	138	2	1436	1496	65	1498	1576
V/C Ratio(X)	0.02	0.00	0.00	0.38	0.00	0.01	0.96	0.79	0.79	0.65	0.62	0.62
Avail Cap(c_a), veh/h	376	0	0	356	0	348	135	1436	1496	225	1498	1576
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	81.4	0.0	0.0	85.0	0.0	82.1	98.9	10.0	10.2	94.2	5.1	5.1
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.4	0.0	0.0	164.4	4.4	4.4	6.5	2.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	3.2	0.0	0.0	0.2	24.8	26.6	2.3	11.7	12.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	81.4	0.0	0.0	86.4	0.0	82.1	263.3	14.4	14.6	100.6	7.1	7.0
LnGrp LOS	F	A	A	F	A	F	F	B	B	F	A	A
Approach Vol, veh/h		4			65			2317			1957	
Approach Delay, s/veh		81.4			86.3			14.7			9.0	
Approach LOS		F			F			B			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.2	171.0		22.8	11.2	164.0		22.8
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	166.0		45.0	25.0	156.0		45.0
Max Q Clear Time (g_c+I1), s	2.2	36.4		10.7	6.6	70.0		2.4
Green Ext Time (p_c), s	0.0	62.0		0.2	0.1	70.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	13.3
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	41	29	50	5	3	17
Future Vol, veh/h	41	29	50	5	3	17
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	32	54	5	3	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	60	0	-	0	180	58
Stage 1	-	-	-	-	58	-
Stage 2	-	-	-	-	122	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1544	-	-	-	810	1008
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	903	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1543	-	-	-	784	1007
Mov Cap-2 Maneuver	-	-	-	-	784	-
Stage 1	-	-	-	-	935	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	SB
HCM Control Delay, s	4.3	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1543	-	-	-	966
HCM Lane V/C Ratio	0.029	-	-	-	0.023
HCM Control Delay (s)	7.4	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	9	22	0	18	35	0
Future Vol, veh/h	9	22	0	18	35	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	24	0	20	38	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	34	0	42	22
Stage 1	-	-	-	-	22	-
Stage 2	-	-	-	-	20	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1578	-	969	1055
Stage 1	-	-	-	-	1001	-
Stage 2	-	-	-	-	1003	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1578	-	969	1055
Mov Cap-2 Maneuver	-	-	-	-	969	-
Stage 1	-	-	-	-	1001	-
Stage 2	-	-	-	-	1003	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	969	-	-	1578	-
HCM Lane V/C Ratio	0.039	-	-	-	-
HCM Control Delay (s)	8.9	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	6	0	1	16	0
Future Vol, veh/h	0	6	0	1	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	7	0	1	17	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	7	0	5	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	1	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1614	-	1017	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	1022	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1614	-	1017	1080
Mov Cap-2 Maneuver	-	-	-	-	1017	-
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	1022	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1017	-	-	1614	-
HCM Lane V/C Ratio	0.017	-	-	-	-
HCM Control Delay (s)	8.6	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	117	7	5	109	11	17	2	1969	11	2	1584	36
Future Volume (veh/h)	117	7	5	109	11	17	2	1969	11	2	1584	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	127	8	4	118	12	14	2	2140	12	2	1722	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	209	10	5	204	16	19	5	2886	16	5	2830	
Arrive On Green	0.12	0.12	0.11	0.12	0.12	0.11	0.01	1.00	1.00	0.00	0.80	0.00
Sat Flow, veh/h	1384	87	44	1364	139	162	1781	3623	20	1781	3554	1585
Grp Volume(v), veh/h	139	0	0	144	0	0	2	1048	1104	2	1722	0
Grp Sat Flow(s),veh/h/ln	1515	0	0	1664	0	0	1781	1777	1867	1781	1777	1585
Q Serve(g_s), s	1.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	26.8	0.0
Cycle Q Clear(g_c), s	12.2	0.0	0.0	11.2	0.0	0.0	0.2	0.0	0.0	0.2	26.8	0.0
Prop In Lane	0.91		0.03	0.82		0.10	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	224	0	0	238	0	0	5	1415	1487	5	2830	
V/C Ratio(X)	0.62	0.00	0.00	0.60	0.00	0.00	0.42	0.74	0.74	0.42	0.61	
Avail Cap(c_a), veh/h	373	0	0	392	0	0	140	1415	1487	140	2830	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.37	0.37	0.37	0.73	0.73	0.00
Uniform Delay (d), s/veh	60.2	0.0	0.0	59.8	0.0	0.0	69.5	0.0	0.0	69.7	5.6	0.0
Incr Delay (d2), s/veh	3.4	0.0	0.0	2.5	0.0	0.0	7.9	1.3	1.3	15.2	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	0.0	0.0	5.2	0.0	0.0	0.1	0.5	0.5	0.1	8.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.6	0.0	0.0	62.3	0.0	0.0	77.4	1.3	1.3	84.9	6.3	0.0
LnGrp LOS	E	A	A	E	A	A	E	A	A	F	A	
Approach Vol, veh/h		139			144			2154			1724	A
Approach Delay, s/veh		63.6			62.3			1.4			6.4	
Approach LOS		E			E			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.4	115.5		20.1	4.4	115.5		20.1
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	11.0	85.0		30.0	11.0	85.0		30.0
Max Q Clear Time (g_c+I1), s	2.2	28.8		13.2	2.2	2.0		14.2
Green Ext Time (p_c), s	0.0	41.5		0.4	0.0	72.7		0.5

Intersection Summary		
HCM 6th Ctrl Delay		7.7
HCM 6th LOS		A

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
11: Honoapiilani Highway & Kapunakea Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	147	33	33	156	20	57	17	1771	79	27	1606	74
Future Volume (veh/h)	147	33	33	156	20	57	17	1771	79	27	1606	74
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.97	0.98		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1477	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	160	36	7	170	22	11	18	1925	84	29	1746	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	232	42	271	258	205	103	32	2475	107	43	2493	111
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.17	0.04	1.00	1.00	0.02	0.72	0.71
Sat Flow, veh/h	1047	236	1534	1064	1161	581	1781	3469	150	1781	3465	154
Grp Volume(v), veh/h	196	0	7	170	0	33	18	979	1030	29	890	934
Grp Sat Flow(s),veh/h/ln	1283	0	1534	1064	0	1742	1781	1777	1843	1781	1777	1842
Q Serve(g_s), s	19.0	0.0	0.5	0.0	0.0	2.2	1.4	0.0	0.0	2.3	39.4	40.4
Cycle Q Clear(g_c), s	21.2	0.0	0.5	19.3	0.0	2.2	1.4	0.0	0.0	2.3	39.4	40.4
Prop In Lane	0.82		1.00	1.00		0.33	1.00		0.08	1.00		0.08
Lane Grp Cap(c), veh/h	273	0	271	258	0	308	32	1268	1315	43	1279	1326
V/C Ratio(X)	0.72	0.00	0.03	0.66	0.00	0.11	0.56	0.77	0.78	0.67	0.70	0.70
Avail Cap(c_a), veh/h	367	0	373	328	0	423	76	1268	1315	76	1279	1326
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.09	0.09	0.09	0.74	0.74	0.74
Uniform Delay (d), s/veh	57.3	0.0	47.7	55.4	0.0	48.5	66.9	0.0	0.0	67.8	11.0	11.2
Incr Delay (d2), s/veh	4.4	0.0	0.0	3.2	0.0	0.2	0.5	0.4	0.4	5.0	2.3	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	0.0	0.2	6.1	0.0	1.0	0.6	0.2	0.2	1.1	14.8	15.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.6	0.0	47.7	58.6	0.0	48.7	67.5	0.4	0.4	72.7	13.4	13.5
LnGrp LOS	E	A	D	E	A	D	E	A	A	E	B	B
Approach Vol, veh/h		203			203			2027			1853	
Approach Delay, s/veh		61.1			57.0			1.0			14.4	
Approach LOS		E			E			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.5	104.7		28.7	7.4	103.9		28.7
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	6.0	87.0		33.0	6.0	87.0		33.0
Max Q Clear Time (g_c+I1), s	3.4	42.4		21.3	4.3	2.0		23.2
Green Ext Time (p_c), s	0.0	31.1		0.8	0.0	55.8		0.5

Intersection Summary	
HCM 6th Ctrl Delay	12.3
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary
12: Honoapiilani Highway & Keawe Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	115	71	124	101	1211	66	630	194	691	1053	80
Future Volume (veh/h)	51	115	71	124	101	1211	66	630	194	691	1053	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	55	125	6	135	110	0	72	685	118	751	1145	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	91	155	201	261	373		93	889	753	803	2201	161
Arrive On Green	0.13	0.13	0.13	0.05	0.20	0.00	0.05	0.48	0.48	0.46	1.00	1.00
Sat Flow, veh/h	446	1214	1570	1781	1870	1585	1781	1870	1583	3456	3356	246
Grp Volume(v), veh/h	180	0	6	135	110	0	72	685	118	751	606	623
Grp Sat Flow(s),veh/h/ln	1661	0	1570	1781	1870	1585	1781	1870	1583	1728	1777	1826
Q Serve(g_s), s	12.9	0.0	0.5	7.0	7.0	0.0	5.6	42.4	5.9	28.8	0.0	0.0
Cycle Q Clear(g_c), s	14.8	0.0	0.5	7.0	7.0	0.0	5.6	42.4	5.9	28.8	0.0	0.0
Prop In Lane	0.31		1.00	1.00		1.00	1.00		1.00	1.00		0.13
Lane Grp Cap(c), veh/h	246	0	201	261	373		93	889	753	803	1165	1197
V/C Ratio(X)	0.73	0.00	0.03	0.52	0.29		0.78	0.77	0.16	0.94	0.52	0.52
Avail Cap(c_a), veh/h	294	0	247	261	428		331	889	753	864	1165	1197
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.53	0.53	0.53
Uniform Delay (d), s/veh	59.6	0.0	53.4	49.0	47.7	0.0	65.6	30.4	20.8	36.5	0.0	0.0
Incr Delay (d2), s/veh	7.4	0.0	0.1	1.8	0.4	0.0	15.3	6.4	0.4	10.2	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.8	0.0	0.2	4.4	3.4	0.0	2.9	20.3	2.4	10.8	0.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.9	0.0	53.5	50.7	48.1	0.0	80.8	36.8	21.3	46.7	0.9	0.9
LnGrp LOS	E	A	D	D	D		F	D	C	D	A	A
Approach Vol, veh/h		186			245	A		875			1980	
Approach Delay, s/veh		66.5			49.6			38.3			18.3	
Approach LOS		E			D			D			B	

Timer - Assigned Phs	1	2		4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.3	95.8		32.9	36.5	70.6	10.0	22.9
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0	4.0	5.0
Max Green Setting (Gmax), s	26.0	68.0		32.0	35.0	59.0	6.0	22.0
Max Q Clear Time (g_c+I1), s	7.6	2.0		9.0	30.8	44.4	9.0	16.8
Green Ext Time (p_c), s	0.2	18.9		0.5	1.7	6.4	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	28.7
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2030 without Project PM Peak Conditions

HCM 6th Signalized Intersection Summary
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	302	4	604	14	1	6	504	1528	13	36	1727	174
Future Volume (veh/h)	302	4	604	14	1	6	504	1528	13	36	1727	174
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	331	0	468	15	1	2	548	1661	14	39	1877	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	511	0	1001	44	3	6	609	2625	22	64	2084	930
Arrive On Green	0.14	0.00	0.14	0.03	0.03	0.02	0.18	0.73	0.72	0.04	0.59	0.59
Sat Flow, veh/h	3563	0	3170	1465	98	195	3456	3611	30	1781	3554	1585
Grp Volume(v), veh/h	331	0	468	18	0	0	548	817	858	39	1877	153
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1758	0	0	1728	1777	1865	1781	1777	1585
Q Serve(g_s), s	21.9	0.0	29.6	2.5	0.0	0.0	38.8	58.1	58.3	5.4	115.8	11.1
Cycle Q Clear(g_c), s	21.9	0.0	29.6	2.5	0.0	0.0	38.8	58.1	58.3	5.4	115.8	11.1
Prop In Lane	1.00		1.00	0.83		0.11	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	511	0	1001	53	0	0	609	1291	1355	64	2084	930
V/C Ratio(X)	0.65	0.00	0.47	0.34	0.00	0.00	0.90	0.63	0.63	0.61	0.90	0.16
Avail Cap(c_a), veh/h	556	0	1040	232	0	0	760	1442	1514	142	2387	1065
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	101.1	0.0	68.7	119.1	0.0	0.0	100.9	17.3	17.3	118.9	45.3	23.7
Incr Delay (d2), s/veh	1.6	0.0	0.1	1.4	0.0	0.0	10.5	1.0	0.9	3.5	5.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.5	0.0	12.3	1.2	0.0	0.0	18.4	23.6	24.9	2.6	51.5	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.8	0.0	68.8	120.5	0.0	0.0	111.4	18.2	18.2	122.4	50.3	23.8
LnGrp LOS	F	A	E	F	A	A	F	B	B	F	D	C
Approach Vol, veh/h		799			18			2223			2069	
Approach Delay, s/veh		82.9			120.5			41.2			49.7	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	48.0	150.7		11.5	12.9	185.8		39.9				
Change Period (Y+Rc), s	6.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	53.0	166.0		30.0	18.0	201.0		36.0				
Max Q Clear Time (g_c+I1), s	40.8	117.8		4.5	7.4	60.3		31.6				
Green Ext Time (p_c), s	1.2	26.9		0.0	0.0	22.1		1.3				

Intersection Summary			
HCM 6th Ctrl Delay			51.4
HCM 6th LOS			D

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	0	6	0	0	7	0	2222	2	0	2542	0
Future Vol, veh/h	2	0	6	0	0	7	0	2222	2	0	2542	0
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	0	7	0	0	8	0	2415	2	0	2763	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3971	5180	1382	3798	5179	1209	-	0	0	-	-	0
Stage 1	2763	2763	-	2416	2416	-	-	-	-	-	-	-
Stage 2	1208	2417	-	1382	2763	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	-	-	-	-	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	-	-	-	-	-	-
Pot Cap-1 Maneuver	~ 1	0	134	1	0	175	0	-	-	0	-	0
Stage 1	20	41	-	33	63	-	0	-	-	0	-	0
Stage 2	194	63	-	151	41	-	0	-	-	0	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	~ 1	0	134	1	0	175	-	-	-	-	-	-
Mov Cap-2 Maneuver	~ 1	0	-	1	0	-	-	-	-	-	-	-
Stage 1	20	41	-	33	63	-	-	-	-	-	-	-
Stage 2	186	63	-	144	41	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, $	2143.9	26.5	0	0
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBT
Capacity (veh/h)	-	-	4	175	-
HCM Lane V/C Ratio	-	-	2.174	0.043	-
HCM Control Delay (s)	-	-	$ 2143.9	26.5	-
HCM Lane LOS	-	-	F	D	-
HCM 95th %tile Q(veh)	-	-	2.1	0.1	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	19	2	0	4	3	16	0	1	1
Future Vol, veh/h	0	1	1	19	2	0	4	3	16	0	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	21	2	0	4	3	17	0	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	2	0	0	47	46	2	56	46	2
Stage 1	-	-	-	-	-	-	2	2	-	44	44	-
Stage 2	-	-	-	-	-	-	45	44	-	12	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1620	-	-	954	846	1082	941	846	1082
Stage 1	-	-	-	-	-	-	1021	894	-	970	858	-
Stage 2	-	-	-	-	-	-	969	858	-	1009	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1620	-	-	943	835	1082	914	835	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	943	835	-	914	835	-
Stage 1	-	-	-	-	-	-	1021	894	-	970	847	-
Stage 2	-	-	-	-	-	-	954	847	-	989	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	6.6	8.6	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1017	1620	-	-	1620	-	-	943
HCM Lane V/C Ratio	0.025	-	-	-	0.013	-	-	0.002
HCM Control Delay (s)	8.6	0	-	-	7.3	0	-	8.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

HCM 6th TWSC
4: Kaaahi St & Akoakoa Pl

09/28/2020

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	3	20	28	0	21
Future Vol, veh/h	14	3	20	28	0	21
Conflicting Peds, #/hr	1	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	3	22	30	0	23

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	62	38	0	0	53	0
Stage 1	38	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	944	1034	-	-	1553	-
Stage 1	984	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	942	1033	-	-	1552	-
Mov Cap-2 Maneuver	942	-	-	-	-	-
Stage 1	983	-	-	-	-	-
Stage 2	998	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	957	1552	-
HCM Lane V/C Ratio	-	-	0.019	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

HCM 6th Signalized Intersection Summary
6: Honoapiilani Highway & Leialii Parkway

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	2	5	91	3	69	6	2145	94	67	2342	6
Future Volume (veh/h)	4	2	5	91	3	69	6	2145	94	67	2342	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	4	2	1	99	3	2	7	2332	101	73	2546	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	117	56	24	170	4	140	15	2738	118	90	3023	8
Arrive On Green	0.09	0.09	0.09	0.09	0.09	0.09	0.01	0.79	0.78	0.05	0.83	0.83
Sat Flow, veh/h	904	586	248	1378	42	1564	1781	3471	149	1781	3635	10
Grp Volume(v), veh/h	7	0	0	102	0	2	7	1185	1248	73	1244	1309
Grp Sat Flow(s),veh/h/ln	1738	0	0	1420	0	1564	1781	1777	1843	1781	1777	1869
Q Serve(g_s), s	0.0	0.0	0.0	12.2	0.0	0.2	0.7	77.6	81.2	7.4	72.1	72.4
Cycle Q Clear(g_c), s	0.6	0.0	0.0	12.8	0.0	0.2	0.7	77.6	81.2	7.4	72.1	72.4
Prop In Lane	0.57		0.14	0.97		1.00	1.00		0.08	1.00		0.01
Lane Grp Cap(c), veh/h	196	0	0	173	0	140	15	1402	1454	90	1477	1554
V/C Ratio(X)	0.04	0.00	0.00	0.59	0.00	0.01	0.48	0.85	0.86	0.81	0.84	0.84
Avail Cap(c_a), veh/h	435	0	0	393	0	384	146	1463	1518	243	1560	1641
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	75.5	0.0	0.0	80.8	0.0	76.1	90.6	12.3	12.7	86.1	8.7	8.7
Incr Delay (d2), s/veh	0.1	0.0	0.0	3.1	0.0	0.0	8.8	5.2	5.6	9.9	4.8	4.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	4.9	0.0	0.1	0.4	27.7	30.2	3.7	22.9	24.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.5	0.0	0.0	84.0	0.0	76.2	99.4	17.5	18.3	96.0	13.4	13.3
LnGrp LOS	E	A	A	F	A	E	F	B	B	F	B	B
Approach Vol, veh/h		7			104			2440			2626	
Approach Delay, s/veh		75.5			83.8			18.1			15.7	
Approach LOS		E			F			B			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.5	156.5		21.4	13.3	148.7		21.4
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	160.0		45.0	25.0	150.0		45.0
Max Q Clear Time (g_c+I1), s	2.7	74.4		14.8	9.4	83.2		2.6
Green Ext Time (p_c), s	0.0	77.1		0.4	0.1	59.1		0.0

Intersection Summary	
HCM 6th Ctrl Delay	18.3
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	44	49	50	6	2	34
Future Vol, veh/h	44	49	50	6	2	34
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	53	54	7	2	37

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	63	0	-	0	211	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	151	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1540	-	-	-	777	1005
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	877	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1537	-	-	-	749	1003
Mov Cap-2 Maneuver	-	-	-	-	749	-
Stage 1	-	-	-	-	930	-
Stage 2	-	-	-	-	875	-

Approach	EB	WB	SB
HCM Control Delay, s	3.5	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1537	-	-	-	984
HCM Lane V/C Ratio	0.031	-	-	-	0.04
HCM Control Delay (s)	7.4	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	17	35	2	18	37	1
Future Vol, veh/h	17	35	2	18	37	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	38	2	20	40	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	56	0	61	37
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	24	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1549	-	945	1035
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	999	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1549	-	944	1035
Mov Cap-2 Maneuver	-	-	-	-	944	-
Stage 1	-	-	-	-	984	-
Stage 2	-	-	-	-	999	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	946	-	-	1549	-
HCM Lane V/C Ratio	0.044	-	-	0.001	-
HCM Control Delay (s)	9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	18	0	0	19	0
Future Vol, veh/h	0	18	0	0	19	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	20	0	0	21	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	20	0	11	10
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	1	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1596	-	1009	1071
Stage 1	-	-	-	-	1013	-
Stage 2	-	-	-	-	1022	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1596	-	1009	1071
Mov Cap-2 Maneuver	-	-	-	-	1009	-
Stage 1	-	-	-	-	1013	-
Stage 2	-	-	-	-	1022	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1009	-	-	1596	-
HCM Lane V/C Ratio	0.02	-	-	-	-
HCM Control Delay (s)	8.6	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	208	10	6	54	12	12	6	2037	11	11	1897	43
Future Volume (veh/h)	208	10	6	54	12	12	6	2037	11	11	1897	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1281	1281	1281	1723	1723	1723	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	226	11	6	59	13	9	7	2214	12	12	2062	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	276	12	6	338	73	47	15	2388	13	22	2357	
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.02	1.00	1.00	0.01	0.66	0.00
Sat Flow, veh/h	908	44	24	1158	279	180	1781	3624	20	1781	3554	1585
Grp Volume(v), veh/h	243	0	0	81	0	0	7	1084	1142	12	2062	0
Grp Sat Flow(s),veh/h/ln	976	0	0	1616	0	0	1781	1777	1867	1781	1777	1585
Q Serve(g_s), s	37.1	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	1.2	83.8	0.0
Cycle Q Clear(g_c), s	44.0	0.0	0.0	6.9	0.0	0.0	0.7	0.0	0.0	1.2	83.8	0.0
Prop In Lane	0.93		0.02	0.73		0.11	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	294	0	0	458	0	0	15	1171	1230	22	2357	
V/C Ratio(X)	0.83	0.00	0.00	0.18	0.00	0.00	0.48	0.93	0.93	0.54	0.87	
Avail Cap(c_a), veh/h	299	0	0	464	0	0	79	1171	1230	49	2357	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.36	0.36	0.36	0.40	0.40	0.00
Uniform Delay (d), s/veh	65.1	0.0	0.0	51.6	0.0	0.0	88.1	0.0	0.0	88.4	24.3	0.0
Incr Delay (d2), s/veh	17.3	0.0	0.0	0.2	0.0	0.0	3.2	5.9	5.8	3.0	2.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.5	0.0	0.0	2.9	0.0	0.0	0.3	1.9	2.0	0.6	33.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.4	0.0	0.0	51.8	0.0	0.0	91.4	5.9	5.8	91.3	26.4	0.0
LnGrp LOS	F	A	A	D	A	A	F	A	A	F	C	
Approach Vol, veh/h		243			81			2233			2074	A
Approach Delay, s/veh		82.4			51.8			6.1			26.7	
Approach LOS		F			D			A			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.5	123.4		51.1	6.3	122.6		51.1
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	111.0		47.0	5.0	114.0		47.0
Max Q Clear Time (g_c+I1), s	2.7	85.8		8.9	3.2	2.0		46.0
Green Ext Time (p_c), s	0.0	23.4		0.3	0.0	96.1		0.1

Intersection Summary		
HCM 6th Ctrl Delay		20.1
HCM 6th LOS		C

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
11: Honoapiilani Highway & Kapunakea Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	220	47	39	112	37	37	71	1748	109	29	1893	100
Future Volume (veh/h)	220	47	39	112	37	37	71	1748	109	29	1893	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	51	8	122	40	17	77	1900	116	32	2058	107
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	297	56	392	418	310	132	93	2250	136	41	2171	112
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.24	0.10	1.00	1.00	0.05	1.00	1.00
Sat Flow, veh/h	1043	223	1570	1347	1242	528	1781	3404	206	1781	3438	177
Grp Volume(v), veh/h	290	0	8	122	0	57	77	982	1034	32	1055	1110
Grp Sat Flow(s),veh/h/ln	1266	0	1570	1347	0	1769	1781	1777	1833	1781	1777	1838
Q Serve(g_s), s	36.2	0.0	0.7	0.0	0.0	4.5	7.6	0.0	0.0	3.2	0.0	0.0
Cycle Q Clear(g_c), s	40.7	0.0	0.7	11.7	0.0	4.5	7.6	0.0	0.0	3.2	0.0	0.0
Prop In Lane	0.82		1.00	1.00		0.30	1.00		0.11	1.00		0.10
Lane Grp Cap(c), veh/h	352	0	392	418	0	441	93	1174	1211	41	1122	1161
V/C Ratio(X)	0.82	0.00	0.02	0.29	0.00	0.13	0.83	0.84	0.85	0.78	0.94	0.96
Avail Cap(c_a), veh/h	416	0	462	479	0	521	99	1174	1211	49	1122	1161
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.09	0.09	0.09	0.47	0.47	0.47
Uniform Delay (d), s/veh	68.2	0.0	51.0	55.1	0.0	52.5	79.8	0.0	0.0	85.4	0.0	0.0
Incr Delay (d2), s/veh	11.0	0.0	0.0	0.4	0.0	0.1	4.6	0.7	0.8	21.0	8.9	10.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.3	0.0	0.3	4.7	0.0	2.1	3.4	0.2	0.3	1.7	2.8	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.2	0.0	51.0	55.5	0.0	52.6	84.4	0.7	0.8	106.4	8.9	10.4
LnGrp LOS	E	A	D	E	A	D	F	A	A	F	A	B
Approach Vol, veh/h		298			179			2093			2197	
Approach Delay, s/veh		78.4			54.6			3.8			11.1	
Approach LOS		E			D			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.4	117.7		48.9	8.1	123.0		48.9
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	10.6	104.0		52.0	5.0	109.0		52.0
Max Q Clear Time (g_c+I1), s	9.6	2.0		13.7	5.2	2.0		42.7
Green Ext Time (p_c), s	0.0	70.1		1.1	0.0	61.9		1.2

Intersection Summary	
HCM 6th Ctrl Delay	13.7
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary
12: Honoapiilani Highway & Keawe Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	126	122	187	140	1110	96	736	235	660	1295	100
Future Volume (veh/h)	91	126	122	187	140	1110	96	736	235	660	1295	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	99	137	49	203	152	0	104	800	179	717	1408	106
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	128	138	243	338	499		124	829	698	753	1982	149
Arrive On Green	0.16	0.16	0.16	0.09	0.27	0.00	0.07	0.44	0.44	0.44	1.00	1.00
Sat Flow, veh/h	641	887	1561	1781	1870	1585	1781	1870	1575	3456	3349	251
Grp Volume(v), veh/h	236	0	49	203	152	0	104	800	179	717	744	770
Grp Sat Flow(s),veh/h/ln	1528	0	1561	1781	1870	1585	1781	1870	1575	1728	1777	1823
Q Serve(g_s), s	27.8	0.0	4.9	16.0	11.7	0.0	10.4	74.9	12.8	36.0	0.0	0.0
Cycle Q Clear(g_c), s	27.8	0.0	4.9	16.0	11.7	0.0	10.4	74.9	12.8	36.0	0.0	0.0
Prop In Lane	0.42		1.00	1.00		1.00	1.00		1.00	1.00		0.14
Lane Grp Cap(c), veh/h	266	0	243	338	499		124	829	698	753	1051	1079
V/C Ratio(X)	0.89	0.00	0.20	0.60	0.30		0.84	0.97	0.26	0.95	0.71	0.71
Avail Cap(c_a), veh/h	266	0	243	338	499		208	829	698	787	1051	1079
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.17	0.17	0.17
Uniform Delay (d), s/veh	75.9	0.0	66.3	55.5	52.7	0.0	82.8	48.8	31.5	49.9	0.0	0.0
Incr Delay (d2), s/veh	28.1	0.0	0.4	2.9	0.3	0.0	16.5	23.8	0.9	5.6	0.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.1	0.0	2.0	8.1	5.7	0.0	5.3	39.4	5.3	13.5	0.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	104.0	0.0	66.7	58.4	53.0	0.0	99.2	72.6	32.4	55.5	0.7	0.7
LnGrp LOS	F	A	E	E	D		F	E	C	E	A	A
Approach Vol, veh/h		285			355	A		1083			2231	
Approach Delay, s/veh		97.6			56.1			68.5			18.3	
Approach LOS		F			E			E			B	

Timer - Assigned Phs	1	2		4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.5	110.5		53.0	43.2	83.8	20.0	33.0
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	21.6	97.0		48.0	41.0	77.0	15.0	28.0
Max Q Clear Time (g_c+I1), s	12.4	2.0		13.7	38.0	76.9	18.0	29.8
Green Ext Time (p_c), s	0.2	29.6		0.9	1.2	0.1	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	41.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2030 with Project AM Peak Conditions

HCM 6th Signalized Intersection Summary
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	3	300	14	1	13	474	1590	14	42	1536	140
Future Volume (veh/h)	168	3	300	14	1	13	474	1590	14	42	1536	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	183	3	97	15	1	2	515	1728	15	46	1670	113
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	237	4	853	51	3	7	610	2488	22	80	1982	883
Arrive On Green	0.14	0.14	0.13	0.03	0.03	0.02	0.18	0.69	0.68	0.05	0.56	0.56
Sat Flow, veh/h	1754	29	2790	1468	98	196	3456	3610	31	1781	3554	1582
Grp Volume(v), veh/h	186	0	97	18	0	0	515	850	893	46	1670	113
Grp Sat Flow(s),veh/h/ln	1783	0	1395	1762	0	0	1728	1777	1865	1781	1777	1582
Q Serve(g_s), s	16.8	0.0	4.2	1.7	0.0	0.0	24.1	47.6	47.8	4.2	65.6	5.7
Cycle Q Clear(g_c), s	16.8	0.0	4.2	1.7	0.0	0.0	24.1	47.6	47.8	4.2	65.6	5.7
Prop In Lane	0.98		1.00	0.83		0.11	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	241	0	853	61	0	0	610	1224	1285	80	1982	883
V/C Ratio(X)	0.77	0.00	0.11	0.29	0.00	0.00	0.84	0.69	0.70	0.57	0.84	0.13
Avail Cap(c_a), veh/h	981	0	2010	348	0	0	992	1573	1650	234	2593	1154
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.8	0.0	41.8	78.9	0.0	0.0	66.6	15.5	15.5	78.3	30.8	17.6
Incr Delay (d2), s/veh	2.0	0.0	0.0	2.6	0.0	0.0	1.8	1.2	1.2	2.4	2.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.9	0.0	1.5	0.8	0.0	0.0	10.8	18.8	19.8	2.0	28.1	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.8	0.0	41.8	81.5	0.0	0.0	68.5	16.7	16.7	80.7	33.2	17.7
LnGrp LOS	E	A	D	F	A	A	E	B	B	F	C	B
Approach Vol, veh/h		283			18			2258			1829	
Approach Delay, s/veh		61.5			81.5			28.5			33.5	
Approach LOS		E			F			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	33.5	97.3		9.8	11.5	119.2		26.6				
Change Period (Y+Rc), s	6.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	46.0	120.0		30.0	20.0	146.0		89.0				
Max Q Clear Time (g_c+I1), s	26.1	67.6		3.7	6.2	49.8		18.8				
Green Ext Time (p_c), s	1.4	23.7		0.0	0.0	25.9		0.8				

Intersection Summary			
HCM 6th Ctrl Delay			32.9
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	0	0	15	0	2015	7	1	1828	0
Future Vol, veh/h	1	1	1	0	0	15	0	2015	7	1	1828	0
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	0	0	16	0	2190	8	1	1987	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3084	4188	994	3191	4184	1100	-	0	0	2199	0	0
Stage 1	1989	1989	-	2195	2195	-	-	-	-	-	-	-
Stage 2	1095	2199	-	996	1989	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	5	2	244	4	2	207	0	-	-	236	-	0
Stage 1	63	105	-	46	82	-	0	-	-	-	-	0
Stage 2	228	82	-	262	105	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	5	2	244	2	2	207	-	-	-	236	-	-
Mov Cap-2 Maneuver	5	2	-	2	2	-	-	-	-	-	-	-
Stage 1	63	105	-	46	82	-	-	-	-	-	-	-
Stage 2	210	82	-	258	105	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, $	1439.5	23.9	0	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	4	207	236	-
HCM Lane V/C Ratio	-	-	0.815	0.079	0.005	-
HCM Control Delay (s)	-	-	$ 1439.5	23.9	20.3	-
HCM Lane LOS	-	-	F	C	C	-
HCM 95th %tile Q(veh)	-	-	1.1	0.3	0	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	5	2	12	8	0	4	7	28	0	7	2
Future Vol, veh/h	2	5	2	12	8	0	4	7	28	0	7	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	5	2	13	9	0	4	8	30	0	8	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	9	0	0	7	0	0	50	45	6	64	46	9
Stage 1	-	-	-	-	-	-	10	10	-	35	35	-
Stage 2	-	-	-	-	-	-	40	35	-	29	11	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1611	-	-	1614	-	-	950	847	1077	930	846	1073
Stage 1	-	-	-	-	-	-	1011	887	-	981	866	-
Stage 2	-	-	-	-	-	-	975	866	-	988	886	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1611	-	-	1614	-	-	935	839	1077	891	838	1073
Mov Cap-2 Maneuver	-	-	-	-	-	-	935	839	-	891	838	-
Stage 1	-	-	-	-	-	-	1010	886	-	980	859	-
Stage 2	-	-	-	-	-	-	957	859	-	951	885	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	4.3	8.7	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1010	1611	-	-	1614	-	-	881
HCM Lane V/C Ratio	0.042	0.001	-	-	0.008	-	-	0.011
HCM Control Delay (s)	8.7	7.2	0	-	7.2	0	-	9.1
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	7	31	16	1	20
Future Vol, veh/h	4	7	31	16	1	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	8	34	17	1	22

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	67	43	0	0	51	0
Stage 1	43	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	938	1027	-	-	1555	-
Stage 1	979	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	937	1027	-	-	1555	-
Mov Cap-2 Maneuver	937	-	-	-	-	-
Stage 1	978	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	0.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	992	1555	-
HCM Lane V/C Ratio	-	-	0.012	0.001	-
HCM Control Delay (s)	-	-	8.7	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	2	128	0	62	2	2069	82	52	1758	4
Future Volume (veh/h)	3	0	2	128	0	62	2	2069	82	52	1758	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.97		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	3	0	1	139	0	3	2	2249	88	57	1911	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	178	4	50	196	0	171	2	2736	106	72	2997	6
Arrive On Green	0.12	0.00	0.11	0.12	0.00	0.11	0.00	0.78	0.78	0.04	0.82	0.82
Sat Flow, veh/h	1265	38	434	1386	0	1542	1781	3487	135	1781	3638	8
Grp Volume(v), veh/h	4	0	0	139	0	3	2	1139	1198	57	933	982
Grp Sat Flow(s),veh/h/ln	1738	0	0	1386	0	1542	1781	1777	1845	1781	1777	1869
Q Serve(g_s), s	0.0	0.0	0.0	19.6	0.0	0.4	0.2	77.8	80.9	6.4	39.5	39.5
Cycle Q Clear(g_c), s	0.4	0.0	0.0	20.0	0.0	0.4	0.2	77.8	80.9	6.4	39.5	39.5
Prop In Lane	0.75		0.25	1.00		1.00	1.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	232	0	0	196	0	171	2	1394	1448	72	1464	1540
V/C Ratio(X)	0.02	0.00	0.00	0.71	0.00	0.02	0.96	0.82	0.83	0.79	0.64	0.64
Avail Cap(c_a), veh/h	392	0	0	349	0	342	132	1394	1448	220	1464	1540
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	79.5	0.0	0.0	88.0	0.0	80.3	101.2	13.1	13.4	96.4	6.6	6.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	4.7	0.0	0.0	164.0	5.4	5.6	11.4	2.1	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	7.5	0.0	0.1	0.2	30.7	33.1	3.2	14.2	14.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.6	0.0	0.0	92.7	0.0	80.3	265.2	18.5	19.0	107.8	8.8	8.7
LnGrp LOS	E	A	A	F	A	F	F	B	B	F	A	A
Approach Vol, veh/h		4			142			2339			1972	
Approach Delay, s/veh		79.6			92.4			18.9			11.6	
Approach LOS		E			F			B			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.2	171.0		27.5	12.2	163.1		27.5
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	166.0		45.0	25.0	156.0		45.0
Max Q Clear Time (g_c+I1), s	2.2	41.5		22.0	8.4	82.9		2.4
Green Ext Time (p_c), s	0.0	61.0		0.5	0.1	62.4		0.0

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	41	63	151	5	3	17
Future Vol, veh/h	41	63	151	5	3	17
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	68	164	5	3	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	170	0	-	0	326	168
Stage 1	-	-	-	-	168	-
Stage 2	-	-	-	-	158	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1407	-	-	-	668	876
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	871	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1406	-	-	-	645	875
Mov Cap-2 Maneuver	-	-	-	-	645	-
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	870	-

Approach	EB	WB	SB
HCM Control Delay, s	3	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1406	-	-	-	831
HCM Lane V/C Ratio	0.032	-	-	-	0.026
HCM Control Delay (s)	7.6	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	19	22	0	50	0	35	0	0	0	0	69
Future Vol, veh/h	24	19	22	0	50	0	35	0	0	0	0	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	21	24	0	54	0	38	0	0	0	0	75

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	54	0	0	45	0	0	177	-	-	139	151	54
Stage 1	-	-	-	-	-	-	85	-	-	54	54	-
Stage 2	-	-	-	-	-	-	92	-	-	85	97	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1551	-	-	1563	-	0	785	0	0	831	741	1013
Stage 1	-	-	-	-	-	0	923	0	0	958	850	-
Stage 2	-	-	-	-	-	0	915	0	0	923	815	-
Platoon blocked, %		-	-		-				-			
Mov Cap-1 Maneuver	1551	-	-	1563	-	-	717	-	-	820	728	1013
Mov Cap-2 Maneuver	-	-	-	-	-	-	717	-	-	820	728	-
Stage 1	-	-	-	-	-	-	907	-	-	942	850	-
Stage 2	-	-	-	-	-	-	847	-	-	907	801	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	0	10.3	8.8
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	SBLn1
Capacity (veh/h)	717	1551	-	-	1563	-	1013
HCM Lane V/C Ratio	0.053	0.017	-	-	-	-	0.074
HCM Control Delay (s)	10.3	7.4	-	-	0	-	8.8
HCM Lane LOS	B	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	0.2

HCM 6th TWSC
9: Hanohano St & Leialii Parkway

09/28/2020

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	0	6	0	1	0	16	0	0	0	0	32
Future Vol, veh/h	10	0	6	0	1	0	16	0	0	0	0	32
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	0	7	0	1	0	17	0	0	0	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	7	0	0	45	27	4	27	30	1
Stage 1	-	-	-	-	-	-	26	26	-	1	1	-
Stage 2	-	-	-	-	-	-	19	1	-	26	29	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1614	-	-	957	866	1080	983	863	1084
Stage 1	-	-	-	-	-	-	992	874	-	1022	895	-
Stage 2	-	-	-	-	-	-	1000	895	-	992	871	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1614	-	-	922	860	1080	978	857	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	922	860	-	978	857	-
Stage 1	-	-	-	-	-	-	985	868	-	1015	895	-
Stage 2	-	-	-	-	-	-	968	895	-	985	865	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.5	0	9	8.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	922	1622	-	-	1614	-	-	1084
HCM Lane V/C Ratio	0.019	0.007	-	-	-	-	-	0.032
HCM Control Delay (s)	9	7.2	0	-	0	-	-	8.4
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

HCM 6th Signalized Intersection Summary
10: Honoapiilani Highway & Front Street/Fleming Road

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	117	7	5	109	11	17	2	1990	11	2	1653	36
Future Volume (veh/h)	117	7	5	109	11	17	2	1990	11	2	1653	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	127	8	4	118	12	14	2	2163	12	2	1797	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	209	10	5	204	16	19	5	2886	16	5	2830	
Arrive On Green	0.12	0.12	0.11	0.12	0.12	0.11	0.01	1.00	1.00	0.00	0.80	0.00
Sat Flow, veh/h	1384	87	44	1364	139	162	1781	3623	20	1781	3554	1585
Grp Volume(v), veh/h	139	0	0	144	0	0	2	1060	1115	2	1797	0
Grp Sat Flow(s),veh/h/ln	1515	0	0	1664	0	0	1781	1777	1867	1781	1777	1585
Q Serve(g_s), s	1.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	29.2	0.0
Cycle Q Clear(g_c), s	12.2	0.0	0.0	11.2	0.0	0.0	0.2	0.0	0.0	0.2	29.2	0.0
Prop In Lane	0.91		0.03	0.82		0.10	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	224	0	0	238	0	0	5	1415	1487	5	2830	
V/C Ratio(X)	0.62	0.00	0.00	0.60	0.00	0.00	0.42	0.75	0.75	0.42	0.63	
Avail Cap(c_a), veh/h	373	0	0	392	0	0	140	1415	1487	140	2830	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.35	0.35	0.35	0.70	0.70	0.00
Uniform Delay (d), s/veh	60.2	0.0	0.0	59.8	0.0	0.0	69.5	0.0	0.0	69.7	5.9	0.0
Incr Delay (d2), s/veh	3.4	0.0	0.0	2.5	0.0	0.0	7.5	1.3	1.3	14.6	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	0.0	0.0	5.2	0.0	0.0	0.1	0.5	0.5	0.1	9.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.6	0.0	0.0	62.3	0.0	0.0	77.0	1.3	1.3	84.3	6.6	0.0
LnGrp LOS	E	A	A	E	A	A	E	A	A	F	A	
Approach Vol, veh/h		139			144			2177			1799	A
Approach Delay, s/veh		63.6			62.3			1.4			6.7	
Approach LOS		E			E			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.4	115.5		20.1	4.4	115.5		20.1
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	11.0	85.0		30.0	11.0	85.0		30.0
Max Q Clear Time (g_c+I1), s	2.2	31.2		13.2	2.2	2.0		14.2
Green Ext Time (p_c), s	0.0	42.0		0.4	0.0	73.4		0.5

Intersection Summary	
HCM 6th Ctrl Delay	7.7
HCM 6th LOS	A

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
11: Honoapiilani Highway & Kapunakea Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	147	33	33	156	20	57	17	1792	79	27	1675	74
Future Volume (veh/h)	147	33	33	156	20	57	17	1792	79	27	1675	74
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.97	0.98		0.97	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1477	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	160	36	7	170	22	11	18	1948	84	29	1821	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	232	42	271	258	205	103	32	2477	106	43	2499	106
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.17	0.04	1.00	1.00	0.02	0.72	0.71
Sat Flow, veh/h	1047	236	1534	1064	1161	581	1781	3471	149	1781	3472	148
Grp Volume(v), veh/h	196	0	7	170	0	33	18	990	1042	29	926	973
Grp Sat Flow(s),veh/h/ln	1283	0	1534	1064	0	1742	1781	1777	1843	1781	1777	1843
Q Serve(g_s), s	19.0	0.0	0.5	0.0	0.0	2.2	1.4	0.0	0.0	2.3	42.7	44.0
Cycle Q Clear(g_c), s	21.2	0.0	0.5	19.3	0.0	2.2	1.4	0.0	0.0	2.3	42.7	44.0
Prop In Lane	0.82		1.00	1.00		0.33	1.00		0.08	1.00		0.08
Lane Grp Cap(c), veh/h	273	0	271	258	0	308	32	1268	1315	43	1279	1326
V/C Ratio(X)	0.72	0.00	0.03	0.66	0.00	0.11	0.56	0.78	0.79	0.67	0.72	0.73
Avail Cap(c_a), veh/h	367	0	373	328	0	423	76	1268	1315	76	1279	1326
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.09	0.09	0.09	0.71	0.71	0.71
Uniform Delay (d), s/veh	57.3	0.0	47.7	55.4	0.0	48.5	66.9	0.0	0.0	67.8	11.5	11.7
Incr Delay (d2), s/veh	4.4	0.0	0.0	3.2	0.0	0.2	0.5	0.5	0.5	4.8	2.6	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	0.0	0.2	6.1	0.0	1.0	0.6	0.2	0.2	1.1	16.0	17.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.6	0.0	47.7	58.6	0.0	48.7	67.5	0.5	0.5	72.5	14.1	14.3
LnGrp LOS	E	A	D	E	A	D	E	A	A	E	B	B
Approach Vol, veh/h		203			203			2050			1928	
Approach Delay, s/veh		61.1			57.0			1.0			15.1	
Approach LOS		E			E			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.5	104.7		28.7	7.4	103.9		28.7
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	6.0	87.0		33.0	6.0	87.0		33.0
Max Q Clear Time (g_c+I1), s	3.4	46.0		21.3	4.3	2.0		23.2
Green Ext Time (p_c), s	0.0	30.8		0.8	0.0	57.0		0.5

Intersection Summary	
HCM 6th Ctrl Delay	12.6
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary
12: Honoapiilani Highway & Keawe Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	115	71	124	101	1222	66	640	194	726	1087	80
Future Volume (veh/h)	51	115	71	124	101	1222	66	640	194	726	1087	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	55	125	6	135	110	0	72	696	119	789	1182	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	91	155	201	261	373		93	874	740	831	2206	157
Arrive On Green	0.13	0.13	0.13	0.05	0.20	0.00	0.05	0.47	0.47	0.48	1.00	1.00
Sat Flow, veh/h	446	1214	1570	1781	1870	1585	1781	1870	1583	3456	3365	239
Grp Volume(v), veh/h	180	0	6	135	110	0	72	696	119	789	624	642
Grp Sat Flow(s),veh/h/ln	1661	0	1570	1781	1870	1585	1781	1870	1583	1728	1777	1827
Q Serve(g_s), s	12.9	0.0	0.5	7.0	7.0	0.0	5.6	44.2	6.1	30.5	0.0	0.0
Cycle Q Clear(g_c), s	14.8	0.0	0.5	7.0	7.0	0.0	5.6	44.2	6.1	30.5	0.0	0.0
Prop In Lane	0.31		1.00	1.00		1.00	1.00		1.00	1.00		0.13
Lane Grp Cap(c), veh/h	246	0	201	261	373		93	874	740	831	1165	1198
V/C Ratio(X)	0.73	0.00	0.03	0.52	0.29		0.78	0.80	0.16	0.95	0.54	0.54
Avail Cap(c_a), veh/h	294	0	247	261	428		331	874	740	864	1165	1198
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.48	0.48	0.48
Uniform Delay (d), s/veh	59.6	0.0	53.4	49.0	47.7	0.0	65.6	31.6	21.5	35.5	0.0	0.0
Incr Delay (d2), s/veh	7.4	0.0	0.1	1.8	0.4	0.0	15.3	7.5	0.5	11.3	0.9	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.8	0.0	0.2	4.4	3.4	0.0	2.9	21.3	2.4	11.4	0.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.9	0.0	53.5	50.7	48.1	0.0	80.8	39.1	22.0	46.8	0.9	0.8
LnGrp LOS	E	A	D	D	D		F	D	C	D	A	A
Approach Vol, veh/h		186			245	A		887			2055	
Approach Delay, s/veh		66.5			49.6			40.2			18.5	
Approach LOS		E			D			D			B	

Timer - Assigned Phs	1	2		4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.3	95.8		32.9	37.7	69.4	10.0	22.9
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0	4.0	5.0
Max Green Setting (Gmax), s	26.0	68.0		32.0	35.0	59.0	6.0	22.0
Max Q Clear Time (g_c+I1), s	7.4	2.0		9.0	32.5	46.2	9.0	16.8
Green Ext Time (p_c), s	0.2	19.9		0.5	1.2	6.0	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	29.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

• Future Year 2030 with Project PM Peak Conditions

HCM 6th Signalized Intersection Summary
1: Honoapiilani Highway & Kaanapali Parkway/Halelo Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	302	4	613	14	1	6	510	1551	13	36	1762	174
Future Volume (veh/h)	302	4	613	14	1	6	510	1551	13	36	1762	174
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	331	0	478	15	1	2	554	1686	14	39	1915	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	511	0	1004	43	3	6	611	2639	22	63	2093	934
Arrive On Green	0.14	0.00	0.14	0.03	0.03	0.02	0.18	0.73	0.72	0.04	0.59	0.59
Sat Flow, veh/h	3563	0	3170	1465	98	195	3456	3612	30	1781	3554	1585
Grp Volume(v), veh/h	331	0	478	18	0	0	554	829	871	39	1915	153
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1758	0	0	1728	1777	1865	1781	1777	1585
Q Serve(g_s), s	22.9	0.0	31.6	2.6	0.0	0.0	41.0	61.4	61.6	5.6	125.2	11.4
Cycle Q Clear(g_c), s	22.9	0.0	31.6	2.6	0.0	0.0	41.0	61.4	61.6	5.6	125.2	11.4
Prop In Lane	1.00		1.00	0.83		0.11	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	511	0	1004	51	0	0	611	1298	1363	63	2093	934
V/C Ratio(X)	0.65	0.00	0.48	0.35	0.00	0.00	0.91	0.64	0.64	0.62	0.91	0.16
Avail Cap(c_a), veh/h	533	0	1023	223	0	0	729	1384	1452	137	2290	1021
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	105.4	0.0	71.7	124.3	0.0	0.0	105.2	17.7	17.8	124.0	47.7	24.4
Incr Delay (d2), s/veh	1.9	0.0	0.1	1.5	0.0	0.0	12.3	1.1	1.0	3.7	6.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.0	0.0	13.2	1.3	0.0	0.0	19.5	25.2	26.5	2.7	56.2	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	107.3	0.0	71.8	125.8	0.0	0.0	117.5	18.8	18.8	127.7	53.9	24.5
LnGrp LOS	F	A	E	F	A	A	F	B	B	F	D	C
Approach Vol, veh/h		809			18			2254			2107	
Approach Delay, s/veh		86.4			125.8			43.1			53.1	
Approach LOS		F			F			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	50.1	157.6		11.6	13.2	194.5		41.4				
Change Period (Y+Rc), s	6.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	53.0	166.0		30.0	18.0	201.0		36.0				
Max Q Clear Time (g_c+I1), s	43.0	127.2		4.6	7.6	63.6		33.6				
Green Ext Time (p_c), s	1.1	24.4		0.0	0.0	23.0		0.8				

Intersection Summary	
HCM 6th Ctrl Delay	54.2
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	0	6	0	0	7	0	2251	2	0	2586	0
Future Vol, veh/h	2	0	6	0	0	7	0	2251	2	0	2586	0
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	0	7	0	0	8	0	2447	2	0	2811	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	4035	5260	1406	3854	5259	1225	-	0	0	-	-	0
Stage 1	2811	2811	-	2448	2448	-	-	-	-	-	-	-
Stage 2	1224	2449	-	1406	2811	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	-	-	-	-	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	-	-	-	-	-	-
Pot Cap-1 Maneuver	~ 1	0	129	1	0	171	0	-	-	0	-	0
Stage 1	18	39	-	32	61	-	0	-	-	0	-	0
Stage 2	190	60	-	146	39	-	0	-	-	0	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	~ 1	0	129	1	0	171	-	-	-	-	-	-
Mov Cap-2 Maneuver	~ 1	0	-	1	0	-	-	-	-	-	-	-
Stage 1	18	39	-	32	61	-	-	-	-	-	-	-
Stage 2	182	60	-	139	39	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, $	2143.9	27	0	0
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBT
Capacity (veh/h)	-	-	4	171	-
HCM Lane V/C Ratio	-	-	2.174	0.044	-
HCM Control Delay (s)	-	-	$ 2143.9	27	-
HCM Lane LOS	-	-	F	D	-
HCM 95th %tile Q(veh)	-	-	2.1	0.1	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	19	2	0	4	3	16	0	1	1
Future Vol, veh/h	0	1	1	19	2	0	4	3	16	0	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	21	2	0	4	3	17	0	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	2	0	0	47	46	2	56	46	2
Stage 1	-	-	-	-	-	-	2	2	-	44	44	-
Stage 2	-	-	-	-	-	-	45	44	-	12	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1620	-	-	954	846	1082	941	846	1082
Stage 1	-	-	-	-	-	-	1021	894	-	970	858	-
Stage 2	-	-	-	-	-	-	969	858	-	1009	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1620	-	-	943	835	1082	914	835	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	943	835	-	914	835	-
Stage 1	-	-	-	-	-	-	1021	894	-	970	847	-
Stage 2	-	-	-	-	-	-	954	847	-	989	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	6.6	8.6	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1017	1620	-	-	1620	-	-	943
HCM Lane V/C Ratio	0.025	-	-	-	0.013	-	-	0.002
HCM Control Delay (s)	8.6	0	-	-	7.3	0	-	8.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	3	20	28	0	21
Future Vol, veh/h	14	3	20	28	0	21
Conflicting Peds, #/hr	1	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	3	22	30	0	23

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	62	38	0	0	53	0
Stage 1	38	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	944	1034	-	-	1553	-
Stage 1	984	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	942	1033	-	-	1552	-
Mov Cap-2 Maneuver	942	-	-	-	-	-
Stage 1	983	-	-	-	-	-
Stage 2	998	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	957	1552	-
HCM Lane V/C Ratio	-	-	0.019	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	2	5	130	3	98	6	2145	164	111	2342	6
Future Volume (veh/h)	4	2	5	130	3	98	6	2145	164	111	2342	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	4	2	1	141	3	6	7	2332	176	121	2546	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	139	67	30	198	3	176	14	2498	186	139	2963	8
Arrive On Green	0.12	0.12	0.11	0.12	0.12	0.11	0.01	0.75	0.74	0.08	0.82	0.81
Sat Flow, veh/h	948	573	253	1388	30	1568	1781	3352	250	1781	3635	10
Grp Volume(v), veh/h	7	0	0	144	0	6	7	1222	1286	121	1244	1309
Grp Sat Flow(s),veh/h/ln	1774	0	0	1417	0	1568	1781	1777	1825	1781	1777	1869
Q Serve(g_s), s	0.0	0.0	0.0	19.4	0.0	0.7	0.8	112.8	122.5	13.5	86.8	87.1
Cycle Q Clear(g_c), s	0.7	0.0	0.0	20.1	0.0	0.7	0.8	112.8	122.5	13.5	86.8	87.1
Prop In Lane	0.57		0.14	0.98		1.00	1.00		0.14	1.00		0.01
Lane Grp Cap(c), veh/h	236	0	0	202	0	176	14	1324	1360	139	1448	1523
V/C Ratio(X)	0.03	0.00	0.00	0.71	0.00	0.03	0.49	0.92	0.95	0.87	0.86	0.86
Avail Cap(c_a), veh/h	408	0	0	358	0	351	133	1333	1369	221	1448	1523
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	78.8	0.0	0.0	87.2	0.0	79.6	99.4	20.9	22.2	91.8	11.5	11.5
Incr Delay (d2), s/veh	0.1	0.0	0.0	4.7	0.0	0.1	9.3	11.2	13.8	15.1	5.9	5.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	7.7	0.0	0.3	0.4	45.9	51.9	6.8	30.5	32.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	78.8	0.0	0.0	91.9	0.0	79.7	108.7	32.1	36.0	106.9	17.3	17.1
LnGrp LOS	E	A	A	F	A	E	F	C	D	F	B	B
Approach Vol, veh/h		7			150			2515			2674	
Approach Delay, s/veh		78.8			91.4			34.3			21.3	
Approach LOS		E			F			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.6	168.0		27.6	19.7	154.0		27.6
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	160.0		45.0	25.0	150.0		45.0
Max Q Clear Time (g_c+I1), s	2.8	89.1		22.1	15.5	124.5		2.7
Green Ext Time (p_c), s	0.0	64.9		0.5	0.2	24.5		0.0

Intersection Summary	
HCM 6th Ctrl Delay	29.4
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	44	163	118	6	2	34
Future Vol, veh/h	44	163	118	6	2	34
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	177	128	7	2	37

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	137	0	-	0	409	134
Stage 1	-	-	-	-	134	-
Stage 2	-	-	-	-	275	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1447	-	-	-	599	915
Stage 1	-	-	-	-	892	-
Stage 2	-	-	-	-	771	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1445	-	-	-	574	913
Mov Cap-2 Maneuver	-	-	-	-	574	-
Stage 1	-	-	-	-	857	-
Stage 2	-	-	-	-	769	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1445	-	-	-	884
HCM Lane V/C Ratio	0.033	-	-	-	0.044
HCM Control Delay (s)	7.6	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	78	53	35	2	39	0	37	0	1	0	0	47
Future Vol, veh/h	78	53	35	2	39	0	37	0	1	0	0	47
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	85	58	38	2	42	0	40	0	1	0	0	51

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	42	0	0	96	0	0	319	-	77	294	312	42
Stage 1	-	-	-	-	-	-	247	-	-	46	46	-
Stage 2	-	-	-	-	-	-	72	-	-	248	266	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	-	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	-	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1567	-	-	1498	-	0	634	0	984	658	603	1029
Stage 1	-	-	-	-	-	0	757	0	-	968	857	-
Stage 2	-	-	-	-	-	0	938	0	-	756	689	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1567	-	-	1498	-	-	576	-	984	628	567	1029
Mov Cap-2 Maneuver	-	-	-	-	-	-	576	-	-	628	567	-
Stage 1	-	-	-	-	-	-	713	-	-	912	856	-
Stage 2	-	-	-	-	-	-	891	-	-	711	649	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.5	0.4	11.7	8.7
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	SBLn1
Capacity (veh/h)	582	1567	-	-	1498	-	1029
HCM Lane V/C Ratio	0.071	0.054	-	-	0.001	-	0.05
HCM Control Delay (s)	11.7	7.4	-	-	7.4	0	8.7
HCM Lane LOS	B	A	-	-	A	A	A
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0	-	0.2

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	36	0	18	0	0	0	19	0	0	0	0	21
Future Vol, veh/h	36	0	18	0	0	0	19	0	0	0	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	39	0	20	0	0	0	21	0	0	0	0	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	20	0	0	101	89	10	89	99	1
Stage 1	-	-	-	-	-	-	88	88	-	1	1	-
Stage 2	-	-	-	-	-	-	13	1	-	88	98	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1596	-	-	880	801	1071	896	791	1084
Stage 1	-	-	-	-	-	-	920	822	-	1022	895	-
Stage 2	-	-	-	-	-	-	1007	895	-	920	814	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1596	-	-	846	782	1071	880	772	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	846	782	-	880	772	-
Stage 1	-	-	-	-	-	-	898	802	-	997	895	-
Stage 2	-	-	-	-	-	-	986	895	-	898	794	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.8	0	9.4	8.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	846	1622	-	-	1596	-	-	1084
HCM Lane V/C Ratio	0.024	0.024	-	-	-	-	-	0.021
HCM Control Delay (s)	9.4	7.3	0	-	0	-	-	8.4
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	208	10	6	54	12	12	6	2107	11	11	1936	43
Future Volume (veh/h)	208	10	6	54	12	12	6	2107	11	11	1936	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1281	1281	1281	1723	1723	1723	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	226	11	6	59	13	9	7	2290	12	12	2104	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	276	12	6	338	73	47	15	2389	13	22	2357	
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.02	1.00	1.00	0.01	0.66	0.00
Sat Flow, veh/h	908	44	24	1158	279	180	1781	3625	19	1781	3554	1585
Grp Volume(v), veh/h	243	0	0	81	0	0	7	1121	1181	12	2104	0
Grp Sat Flow(s),veh/h/ln	976	0	0	1616	0	0	1781	1777	1867	1781	1777	1585
Q Serve(g_s), s	37.1	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	1.2	88.0	0.0
Cycle Q Clear(g_c), s	44.0	0.0	0.0	6.9	0.0	0.0	0.7	0.0	0.0	1.2	88.0	0.0
Prop In Lane	0.93		0.02	0.73		0.11	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	294	0	0	458	0	0	15	1171	1230	22	2357	
V/C Ratio(X)	0.83	0.00	0.00	0.18	0.00	0.00	0.48	0.96	0.96	0.54	0.89	
Avail Cap(c_a), veh/h	299	0	0	464	0	0	79	1171	1230	49	2357	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.30	0.30	0.30	0.33	0.33	0.00
Uniform Delay (d), s/veh	65.1	0.0	0.0	51.6	0.0	0.0	88.1	0.0	0.0	88.4	25.0	0.0
Incr Delay (d2), s/veh	17.3	0.0	0.0	0.2	0.0	0.0	2.7	7.5	7.4	2.5	2.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.5	0.0	0.0	2.9	0.0	0.0	0.3	2.4	2.5	0.6	34.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.4	0.0	0.0	51.8	0.0	0.0	90.8	7.5	7.4	90.8	27.0	0.0
LnGrp LOS	F	A	A	D	A	A	F	A	A	F	C	
Approach Vol, veh/h		243			81			2309			2116	A
Approach Delay, s/veh		82.4			51.8			7.7			27.4	
Approach LOS		F			D			A			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.5	123.4		51.1	6.3	122.6		51.1
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	111.0		47.0	5.0	114.0		47.0
Max Q Clear Time (g_c+I1), s	2.7	90.0		8.9	3.2	2.0		46.0
Green Ext Time (p_c), s	0.0	19.8		0.3	0.0	99.5		0.1

Intersection Summary	
HCM 6th Ctrl Delay	21.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
11: Honoapiilani Highway & Kapunakea Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	220	47	39	112	37	37	71	1818	109	29	1932	100
Future Volume (veh/h)	220	47	39	112	37	37	71	1818	109	29	1932	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	51	8	122	40	17	77	1976	116	32	2100	107
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	297	56	392	418	310	132	93	2255	131	41	2174	110
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.24	0.10	1.00	1.00	0.05	1.00	1.00
Sat Flow, veh/h	1043	223	1570	1347	1242	528	1781	3413	198	1781	3442	174
Grp Volume(v), veh/h	290	0	8	122	0	57	77	1019	1073	32	1075	1132
Grp Sat Flow(s),veh/h/ln	1266	0	1570	1347	0	1769	1781	1777	1834	1781	1777	1839
Q Serve(g_s), s	36.2	0.0	0.7	0.0	0.0	4.5	7.6	0.0	0.0	3.2	0.0	0.0
Cycle Q Clear(g_c), s	40.7	0.0	0.7	11.7	0.0	4.5	7.6	0.0	0.0	3.2	0.0	0.0
Prop In Lane	0.82		1.00	1.00		0.30	1.00		0.11	1.00		0.09
Lane Grp Cap(c), veh/h	352	0	392	418	0	441	93	1174	1212	41	1122	1161
V/C Ratio(X)	0.82	0.00	0.02	0.29	0.00	0.13	0.83	0.87	0.88	0.78	0.96	0.97
Avail Cap(c_a), veh/h	416	0	462	479	0	521	99	1174	1212	49	1122	1161
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.09	0.09	0.09	0.44	0.44	0.44
Uniform Delay (d), s/veh	68.2	0.0	51.0	55.1	0.0	52.5	79.8	0.0	0.0	85.4	0.0	0.0
Incr Delay (d2), s/veh	11.0	0.0	0.0	0.4	0.0	0.1	4.6	0.9	1.0	19.9	10.4	12.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.3	0.0	0.3	4.7	0.0	2.1	3.4	0.3	0.3	1.7	3.2	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.2	0.0	51.0	55.5	0.0	52.6	84.4	0.9	1.0	105.3	10.4	12.5
LnGrp LOS	E	A	D	E	A	D	F	A	A	F	B	B
Approach Vol, veh/h		298			179			2169			2239	
Approach Delay, s/veh		78.4			54.6			3.9			12.8	
Approach LOS		E			D			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.4	117.7		48.9	8.1	123.0		48.9
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	10.6	104.0		52.0	5.0	109.0		52.0
Max Q Clear Time (g_c+I1), s	9.6	2.0		13.7	5.2	2.0		42.7
Green Ext Time (p_c), s	0.0	72.7		1.1	0.0	67.3		1.2

Intersection Summary	
HCM 6th Ctrl Delay	14.4
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary
12: Honoapiilani Highway & Keawe Street

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	126	122	187	140	1145	96	771	235	680	1314	100
Future Volume (veh/h)	91	126	122	187	140	1145	96	771	235	680	1314	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	99	137	49	203	152	0	104	838	182	739	1428	106
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	128	138	243	338	499		124	820	691	769	1984	147
Arrive On Green	0.16	0.16	0.16	0.09	0.27	0.00	0.07	0.44	0.44	0.45	1.00	1.00
Sat Flow, veh/h	641	887	1561	1781	1870	1585	1781	1870	1575	3456	3353	248
Grp Volume(v), veh/h	236	0	49	203	152	0	104	838	182	739	754	780
Grp Sat Flow(s),veh/h/ln	1528	0	1561	1781	1870	1585	1781	1870	1575	1728	1777	1824
Q Serve(g_s), s	27.8	0.0	4.9	16.0	11.7	0.0	10.4	78.9	13.2	37.3	0.0	0.0
Cycle Q Clear(g_c), s	27.8	0.0	4.9	16.0	11.7	0.0	10.4	78.9	13.2	37.3	0.0	0.0
Prop In Lane	0.42		1.00	1.00		1.00	1.00		1.00	1.00		0.14
Lane Grp Cap(c), veh/h	266	0	243	338	499		124	820	691	769	1051	1079
V/C Ratio(X)	0.89	0.00	0.20	0.60	0.30		0.84	1.02	0.26	0.96	0.72	0.72
Avail Cap(c_a), veh/h	266	0	243	338	499		208	820	691	787	1051	1079
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.13	0.13	0.13
Uniform Delay (d), s/veh	75.9	0.0	66.3	55.5	52.7	0.0	82.8	50.5	32.1	49.2	0.0	0.0
Incr Delay (d2), s/veh	28.1	0.0	0.4	2.9	0.3	0.0	16.5	37.0	0.9	5.2	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.1	0.0	2.0	8.1	5.7	0.0	5.3	44.2	5.4	13.9	0.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	104.0	0.0	66.7	58.4	53.0	0.0	99.2	87.5	33.0	54.4	0.6	0.6
LnGrp LOS	F	A	E	E	D		F	F	C	D	A	A
Approach Vol, veh/h		285			355	A		1124			2273	
Approach Delay, s/veh		97.6			56.1			79.8			18.1	
Approach LOS		F			E			E			B	

Timer - Assigned Phs	1	2		4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.5	110.5		53.0	44.1	82.9	20.0	33.0
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	21.6	97.0		48.0	41.0	77.0	15.0	28.0
Max Q Clear Time (g_c+I1), s	12.4	2.0		13.7	39.3	80.9	18.0	29.8
Green Ext Time (p_c), s	0.2	30.5		0.9	0.7	0.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	44.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

ANALYSIS OF THE PROJECT'S CONFORMANCE WITH THE HAWAI'I STATE PLAN

APPENDIX

I

APPENDIX I

Analysis of Project Applicability to Hawai‘i State Plan

Chapter 226, Hawai‘i Revised Statutes (HRS), also known as the Hawai‘i State Plan, is a long-range comprehensive plan which serves as a guide for the future long-term development of the State by identifying goals, objectives, policies, and priorities, as well as implementation mechanisms. The Plan consists of three (3) parts. Part I includes the Overall Theme, Goals, Objectives, and Policies; Part II includes Planning, Coordination, and Implementation; and Part III establishes Priority Guidelines. Inasmuch as Part II of the State Plan covers its administrative structure and implementation process, discussion of the proposed project’s applicability to Part II is not appropriate. Below is an analysis of the project’s applicability to Part I and Part III of the Hawai‘i State Plan.

The methodology for the analysis involves examining the project’s applicability to the Hawai‘i State Plan’s goals, objectives, and policies. “Applicability” refers to a project’s need, purpose and effects, and how these advance or promote a particular set of goals, objectives and priority guidelines. In assessing the relationship between a proposed action and the Hawai‘i State Plan, an action may be categorized in one of the following groups:

1. **Directly applicable**: the action and its potential effects directly advances or promotes the objective, policy or priority guideline.

   Example: A county project to develop a new water source and related transmission facilities would be directly applicable to the objectives and policies for Facility Systems-Water (HRS 226-16) which states” *(5) Support water supply services to areas experiencing critical water problems.*

2. **Indirectly applicable**: the action and its potential effects indirectly supports or advances the objective, policy or priority guideline.

   Example: The county water source project cited above supports other related objectives and policies for the economy (HRS 226-6, General), which, by example, states: *(9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.* In this case, the principle purpose of the project was not to create new construction activities, but nonetheless, supports this policy by creating temporary construction activity during the implementation of the project. In this instance, the proposed action may be deemed to be indirectly applicable to the objective and policy of the Hawai‘i State Plan.

3. **Not applicable**: the action and its potential effects have no direct or indirect relationship to the objectives and policies of the Hawai‘i State Plan.

   Example: That same county water source improvement project referenced above, may not have direct or indirect linkage to objectives and policies for the economy-Federal Expenditures (HRS 226-9) which states: *(1) Encourage the sustained flow of federal expenditures in Hawaii that generates long-term government civilian employment*. From the standpoint of the agency proposing the water system improvement, and assuming no Federal Funding for the project, there is an unlikely intent that the proposed water source project would be connected to or reliant upon the foregoing policy. Hence, from the standpoint of judiciously applied policy analysis, the proposed action would be considered not applicable to the policy.

In general, a proposed action’s applicability the objectives, policies and priority guidelines of the Hawai‘i State Plan is judged on the basis of the action’s direct or indirect relationship to the respective objectives, policies and priority directions. It is recognized that the categorization of “applicability” is subject to interpretation and should be appropriately considered in the context of local and regional conditions.

Hawai‘i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies **Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable**	**DA**	**IA**	**NA**
HRS 226-1: Findings and Purpose			
HRS 226-2: Definitions			
HRS 226-3: Overall Theme			
HRS 226-4: State Goals. In order to guarantee, for the present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self determination, it shall be the goal of the State to achieve: (1) 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. (2) 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. (3) 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.			
Analysis: **The proposed project provides additional homestead opportunities for Department of Hawaiian Home Lands (DHHL) beneficiaries in an area that is close to the existing business, commercial, and visitor destination areas of West Maui.**			
Chapter 226-5 Objective and Policies for Population			
Objective: It shall be the objective in planning for the State’s population to guide population growth to be consistent with the achievement of physical, economic and social objectives contained in this chapter.		✓	
Policies:			
(1) Manage population growth statewide in a manner that provides increased opportunities for Hawaii’s people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.		✓	
(2) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires.		✓	
(3) Promote increased opportunities for Hawaii’s people to pursue their socio-economic aspirations throughout the islands.		✓	

Hawai‘i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable	DA	IA	NA
(4) Encourage research activities and public awareness programs to foster an understanding of Hawaii's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawaii's population.			✓
(5) Encourage federal actions and coordination among major governmental agencies to promote a more balanced distribution of immigrants among the states, provided that such actions do not prevent the reunion of immediate family members.			✓
(6) Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population.			✓
(7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.		✓	
Analysis: **The proposed project indirectly supports the objectives and policies for population as it will be implemented in a developed area in West Maui, in close proximity to existing business, commercial, and visitor destination areas at Lahaina and Kā‘anapali.**			
Chapter 226-6 Objectives and policies for the economy – – in general			
Objectives: Planning for the State's economy in general shall be directed toward achievement of the following objectives:			
(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people, while at the same time stimulating the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.		✓	
(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.		✓	
Policies:			
(1) Promote and encourage entrepreneurship within Hawaii by residents and nonresidents of the State.			✓
(2) Expand Hawaii's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.			✓
(3) Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.			✓
(4) Transform and maintain Hawaii as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities.			✓
(5) Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawaii.			✓
(6) Seek broader outlets for new or expanded Hawaii business investments.			✓
(7) Expand existing markets and penetrate new markets for Hawaii's products and services.			✓
(8) Assure that the basic economic needs of Hawaii's people are maintained in the event of disruptions in overseas transportation.			✓

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(9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.		✓	
(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaii's small scale producers, manufacturers, and distributors.			✓
(11) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.			✓
(12) Encourage innovative activities that may not be labor-intensive, but may otherwise contribute to the economy of Hawaii.			✓
(13) Foster greater cooperation and coordination between the government and private sectors in developing Hawaii's employment and economic growth opportunities.			✓
(14) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.			✓
(15) Maintain acceptable working conditions and standards for Hawaii's workers.			✓
(16) Provide equal employment opportunities for all segments of Hawaii's population through affirmative action and nondiscrimination measures.			✓
(17) Stimulate the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.			✓
(18) Encourage businesses that have favorable financial multiplier effects within Hawaii's economy, particularly with respect to emerging industries in science and technology.			✓
(19) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.			✓
(20) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new or innovative potential growth industries in particular.			✓
(21) Foster a business climate in Hawaii--including attitudes, tax and regulatory policies, and financial and technical assistance programs-- that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.			✓
Analysis: **The proposed action indirectly supports the general objectives and policies for the economy by supporting design and construction activity which contributes to increased employment opportunities, job choices, and living standards. Businesses positively affected by the project are those which support design and construction such as architects and engineers, material suppliers, equipment rental companies, and landscape companies.**			
Chapter 226-7 Objectives and policies for the economy – – agriculture.			
Objectives: Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:			
(1) Viability of Hawaii's sugar and pineapple industries.			✓
(2) Growth and development of diversified agriculture throughout the State.			✓

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(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.			✓
Policies:			
(1) Establish a clear direction for Hawaii's agriculture through stakeholder commitment and advocacy.			✓
(2) Encourage agriculture by making the best use of natural resources.			✓
(3) Provide the governor and the legislature with information and options needed for prudent decision-making for the development of agriculture.			✓
(4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.			✓
(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawaii's economy.			✓
(6) Seek the enactment and retention of federal and state legislation that benefits Hawaii's agricultural industries.			✓
(7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawaii's food producers and consumers in the State, nation, and world.			✓
(8) Support research and development activities that strengthen economic productivity in agriculture, stimulate greater efficiency, and enhance the development of new products and agricultural by-products.			✓
(9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.			✓
(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.			✓
(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.			✓
(12) In addition to the State's priority on food, expand Hawaii's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.			✓
(13) Promote economically competitive activities that increase Hawaii's agricultural self-sufficiency, including the increased purchase and use of Hawaii-grown food and food products by residents, businesses, and governmental bodies as defined under section 103D-104.			✓
(14) Promote and assist in the establishment of sound financial programs for diversified agriculture.			✓
(15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.			✓
(16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.			✓
(17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko i‘a, māla, and irrigated lo‘i, and growth of traditional Hawaiian crops, such as kalo, ‘uala, and ‘ulu.			✓

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(18) Increase and develop small-scale farms.			✓
Analysis: **The proposed action does not directly or indirectly affect the objectives for agriculture. The proposed project will be developed on lands designated for agriculture use. Although designated for agriculture, the lands have not been in cultivation for several years. In the context of the amount of viable agriculture lands on the island of Maui, implementation of the proposed action is not considered to adversely affect agricultural productivity on Maui. In addition, it is noted that the proposed action will be located adjacent to an existing, similarly scaled DHHL residential subdivision.**			
Chapter 226-8 Objective and policies for the economy – – visitor industry.			
Objective: Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawaii's economy.			✓
Policies:			
(1) Support and assist in the promotion of Hawaii's visitor attractions and facilities.			✓
(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people.			✓
(3) Improve the quality of existing visitor destination areas by utilizing Hawaii's strengths in science and technology.			✓
(4) Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.			✓
(5) Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawaii's people.			✓
(6) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the visitor industry.			✓
(7) Foster a recognition of the contribution of the visitor industry to Hawaii's economy and the need to perpetuate the aloha spirit.			✓
(8) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawaii's cultures and values.			✓
Analysis: **The proposed action is not directly or indirectly applicable to the objective and policies for the visitor industry. The proposed action has no implications for enhancement or growth of the visitor industry.**			
Chapter 226-9 Objective and policies for the economy – – federal expenditures.			
Objective: Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaii's economy.			✓
Policies:			
(1) Encourage the sustained flow of federal expenditures in Hawaii that generates long-term government civilian employment;			✓
(2) Promote Hawaii's supportive role in national defense, in a manner consistent with Hawaii's social, environmental, and cultural goals by building upon dual-use and defense applications to develop thriving ocean engineering,			✓

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aerospace research and development, and related dual-use technology sectors in Hawaii's economy;			
(3) Promote the development of federally supported activities in Hawaii that respect statewide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawaii's environment;			✓
(4) Increase opportunities for entry and advancement of Hawaii's people into federal government service;			✓
(5) Promote federal use of local commodities, services, and facilities available in Hawaii;			✓
(6) Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaii; and			✓
(7) Pursue the return of federally controlled lands in Hawaii that are not required for either the defense of the nation or for other purposes of national importance, and promote the mutually beneficial exchanges of land between federal agencies, the State, and the counties.			✓
Analysis: **The proposed action is not reliant on federal funding, and does not directly or indirectly advance the objective and policies for strengthening or increasing federal expenditures for the betterment of Hawai‘i's economy.**			
Chapter 226-10 Objective and policies for the economy – – potential growth and innovative activities.			
Objective: Planning for the State's economy with regard to potential growth and innovative activities shall be directed towards achievement of the objective of development and expansion of potential growth and innovative activities that serve to increase and diversify Hawaii's economic base.			✓
Policies:			
(1) Facilitate investment and employment growth in economic activities that have the potential to expand and diversify Hawaii's economy, including but not limited to diversified agriculture, aquaculture, renewable energy development, creative media, health care, and science and technology-based sectors;			✓
(2) Facilitate investment in innovative activity that may pose risks or be less labor-intensive than other traditional business activity, but if successful, will generate revenue in Hawaii through the export of services or products or substitution of imported services or products;			✓
(3) Encourage entrepreneurship in innovative activity by academic researchers and instructors who may not have the background, skill, or initial inclination to commercially exploit their discoveries or achievements;			✓
(4) Recognize that innovative activity is not exclusively dependent upon individuals with advanced formal education, but that many self-taught, motivated individuals are able, willing, sufficiently knowledgeable, and equipped with the attitude necessary to undertake innovative activity;			✓
(5) Increase the opportunities for investors in innovative activity and talent engaged in innovative activity to personally meet and interact at cultural, art, entertainment, culinary, athletic, or visitor-oriented events without a business focus;			✓
(6) Expand Hawaii's capacity to attract and service international programs and activities that generate employment for Hawaii's people;			✓

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(7) Enhance and promote Hawaii's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts;			✓
(8) Accelerate research and development of new energy-related industries based on wind, solar, ocean, underground resources, and solid waste;			✓
(9) Promote Hawaii's geographic, environmental, social, and technological advantages to attract new or innovative economic activities into the State;			✓
(10) Provide public incentives and encourage private initiative to attract new or innovative industries that best support Hawaii's social, economic, physical, and environmental objectives;			✓
(11) Increase research and the development of ocean-related economic activities such as mining, food production, and scientific research;			✓
(12) Develop, promote, and support research and educational and training programs that will enhance Hawaii's ability to attract and develop economic activities of benefit to Hawaii;			✓
(13) Foster a broader public recognition and understanding of the potential benefits of new or innovative growth-oriented industry in Hawaii;			✓
(14) Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawaii's social, economic, physical, and environmental objectives;			✓
(15) Increase research and development of businesses and services in the telecommunications and information industries;			✓
(16) Foster the research and development of nonfossil fuel and energy efficient modes of transportation; and			✓
(17) Recognize and promote health care and health care information technology as growth industries.			✓
Analysis: **As a residential project, the proposed action does not directly or indirectly affect the development and expansion of innovative activities to increase and diversify Hawai‘i's economic base.**			
Chapter 226-10.5 Objectives and policies for the economy – – information industry.			
Objective: Planning for the State's economy with regard to telecommunications and information technology shall be directed toward recognizing that broadband and wireless communication capability and infrastructure are foundations for an innovative economy and positioning Hawaii as a leader in broadband and wireless communications and applications in the Pacific Region.			✓
Policies:			
(1) Promote efforts to attain the highest speeds of electronic and wireless communication within Hawaii and between Hawaii and the world, and make high speed communication available to all residents and businesses in Hawaii;			✓
(2) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawaii to accommodate future growth and innovation in Hawaii's economy;			✓
(3) Facilitate the development of new or innovative business and service ventures in the information industry which will provide employment opportunities for the people of Hawaii;			✓

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(4) Encourage mainland- and foreign-based companies of all sizes, whether information technology-focused or not, to allow their principals, employees, or contractors to live in and work from Hawaii, using technology to communicate with their headquarters, offices, or customers located out-of-state;			✓
(5) Encourage greater cooperation between the public and private sectors in developing and maintaining a well-designed information industry;			✓
(6) Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people;			✓
(7) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the information industry;			✓
(8) Foster a recognition of the contribution of the information industry to Hawaii's economy; and			✓
(9) Assist in the promotion of Hawaii as a broker, creator, and processor of information in the Pacific.			✓
Analysis: **The proposed action does not directly or indirectly affect Hawai'i's capacity to be a leader in the broadband and wireless communications industries, nor does it affect these innovative industries in advancing Hawai'i's economic position in the Pacific.**			
Chapter 226-11 Objectives and policies for the physical environment – – land based, shoreline, and marine resources.			
Objectives: Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:			
(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.		✓	
(2) Effective protection of Hawaii's unique and fragile environmental resources.			✓
Policies:			
(1) Exercise an overall conservation ethic in the use of Hawaii's natural resources.		✓	
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.		✓	
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.		✓	
(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.			✓
(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.			✓
(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.		✓	
(7) Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion.			✓
(8) Pursue compatible relationships among activities, facilities, and natural resources.			✓
(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.			✓

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Analysis: The proposed project will utilize Best Management Practices (BMPs) to ensure that natural resources such as the coastal environment is not impacted by construction activities. The use of BMPs also ensures compatibility between land-based and water-based functions, resources, and ecological systems. The biological resources study conducted as part of the environmental review process represents an effort to protect any rare and endangered plant and animal species, and their habitats native to Hawai'i that may be present in the vicinity of the proposed action.			
Chapter 226-12 Objective and policies for the physical environment – – scenic, natural beauty, and historic resources.			
Objective: Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.		✓	
Policies:			
(1) Promote the preservation and restoration of significant natural and historic resources.		✓	
(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities.			✓
(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.		✓	
(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.		✓	
(5) Encourage the design of developments and activities that complement the natural beauty of the islands.		✓	
Analysis: **The project will be carefully designed taking into consideration residential scale and massing so as to not adversely impact scenic views and vistas. The proposed homes will be similar in scale and size to existing residential developments nearby and will be built in accordance with established subdivision standards. Archaeological investigations and coordination for the proposed action are aimed at ensuring the preservation of historic resources which may be impacted by the project. Landscaping proposed in connection with the project is intended to enhance the project's visual relationship with its immediate surrounding environs.**			
Chapter 226-13 Objectives and policies for the physical environment – – land, air, and water quality.			
Objectives: Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives.			
(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.		✓	
(2) Greater public awareness and appreciation of Hawaii's environmental resources.		✓	
Policies:			
(1) Foster educational activities that promote a better understanding of Hawaii's limited environmental resources.			✓
(2) Promote the proper management of Hawaii's land and water resources.		✓	

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(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.			✓
(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.		✓	
(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.		✓	
(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.		✓	
(7) Encourage urban developments in close proximity to existing services and facilities.		✓	
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors.			✓
Analysis: **The proposed project will be implemented adjacent to a developed area in West Maui, in proximity to existing infrastructure and services. Improved land, air, and water quality are directly and indirectly advanced by the proposed action. Construction BMPs will be used to manage and control erosion control during grading operations to minimize downstream water quality impacts. Work on the project is not anticipated to be affected by natural hazards, and industry standard design and construction practices have been and will be employed for the project.**			
Chapter 226-14 Objective and policies for facility systems – – in general.			
Objective: Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.		✓	
Policies:			
(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.		✓	
(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.		✓	
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.		✓	
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.			✓
Analysis: **The proposed action is indirectly applicable to the general objective and policies for facility systems. Infrastructure improvements required to service the project, including water, wastewater, roadway, drainage, and electrical and telecommunication infrastructure, will be provided as part of the project.**			
Chapter 226-15 Objectives and policies for facility systems – – solid and liquid waste.			
Objectives: Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:			

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(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.		✓	
(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.		✓	
Policies:			
(1) Encourage the adequate development of sewerage facilities that complement planned growth.		✓	
(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.			✓
(3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.			✓
Analysis: **The proposed project indirectly supports the objectives and goals for solid and liquid waste facility systems as it will connect to the County wastewater system. Coordination will be undertaken with the County Department of Environmental Management (DEM) to determine if certain improvements to the County's wastewater system will be required to service the project aside from the new sewerline that is proposed as part of the overall project. Furthermore, construction waste will be disposed at the County's Central Maui Landfill or appropriate construction recycling centers. In addition, once built and occupied, the project is anticipated to be served by the County's refuse collection service.**			
Chapter 226-16 Objective and policies for facility systems – – water.			
Objective: Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.		✓	
Policies:			
(1) Coordinate development of land use activities with existing and potential water supply.		✓	
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.			✓
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.			✓
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.			✓
(5) Support water supply services to areas experiencing critical water problems.			✓
(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.			✓
Analysis: **The project indirectly supports the objective and polices for water facility systems enhancement as it is located in an area that may be serviced by County water infrastructure. Coordination will be undertaken with the County Department of Water Supply (DWS) to determine if certain improvements to the County's water system will be required to service the project.**			
Chapter 226-17 Objectives and policies for facility systems – – transportation.			
Objectives: Planning for the State's facility systems with regard to transportation shall be directed			

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towards the achievement of the following objectives:			
(1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods.		✓	
(2) A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State.			✓
Policies:			
(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter;		✓	
(2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives;			✓
(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties;			✓
(4) Provide for improved accessibility to shipping, docking, and storage facilities;			✓
(5) Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs;			✓
(6) Encourage transportation systems that serve to accommodate present and future development needs of communities;			✓
(7) Encourage a variety of carriers to offer increased opportunities and advantages to interisland movement of people and goods;			✓
(8) Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs;			✓
(9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification;			✓
(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment;			✓
(11) Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation;			✓
(12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives; and			✓
(13) Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.		✓	
Analysis: **The proposed project indirectly supports the objectives and policies of transportation facility systems as it is located along an existing public bus route. In addition, the proposed highway improvements maintain an existing bike route and reflects a coordinated effort to implement capital improvement priorities for the island's residents. Sidewalk improvements are proposed to provide for pedestrian connectivity.**			
Chapter 226-18 Objectives and policies for facility systems – – energy.			
Objectives: Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:			
(1) Dependable, efficient, and economical statewide energy systems capable of			✓

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supporting the needs of the people;			
(2) Increased energy security and self-sufficiency through the reduction and ultimate elimination of Hawaii's dependence on imported fuels for electrical generation and ground transportation.		✓	
(3) Greater diversification of energy generation in the face of threats to Hawaii's energy supplies and systems;		✓	
(4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use; and			✓
(5) Utility models that make the social and financial interests of Hawaii's utility customers a priority.			✓
Policies:			
(b) To achieve the energy objectives, it shall be the policy of this State to ensure the short- and long-term provision of adequate, reasonably prices, and dependable energy services to accommodate demand.		✓	
(1) Support research and development as well as promote the use of renewable energy sources;		✓	
(2) Ensure that the combination of energy supplies and energy-saving systems is sufficient to support the demands of growth;			✓
(3) Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits;			✓
(4) Promote all cost-effective conservation of power and fuel supplies through measures, including:			✓
(A) Development of cost-effective demand-side management programs;			✓
(B) Education;			✓
(C) Adoption of energy-efficient practices and technologies; and			✓
(D) Increasing energy efficiency and decreasing energy use in public infrastructure		✓	
(5) Ensure, to the extent that new supply-side resources are needed, that the development or expansion of energy systems uses the least-cost energy supply option and maximizes efficient technologies; and			✓
(6) Support research, development, demonstration, and use of energy efficiency, load management, and other demand-side management programs, practices, and technologies;			✓
(7) Promote alternate fuels and transportation energy efficiency;			✓
(8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications;			✓
(9) Support actions that reduce, avoid, or sequester Hawaii's greenhouse gas emissions through agriculture and forestry initiatives;			✓

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(10) Provide priority handling and processing for all state and county permits required for renewable energy projects;			✓
(11) Ensure that liquefied natural gas is used only as a cost-effective transitional, limited-term replacement of petroleum for electricity generation and does not impede the development and use of other cost-effective renewable energy sources; and			✓
(12) Promote the development of indigenous geothermal energy resources that are located on public trust land as an affordable and reliable source of firm power for Hawaii.			✓
Analysis: **In addition to solar water heating systems, individual homeowners will be able to install solar PV systems on their homes if desired, thus indirectly supporting the objectives and policies for energy facility systems by advancing measures to lessen dependence on fossil fuel based energy.**			
Chapter 226-18.5 Objectives and policies for facility systems – – telecommunications.			
Objectives:			
(a) Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people.			✓
(b) To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand.			✓
Policies:			
(1) Facilitate research and development of telecommunications systems and resources;			✓
(2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning;			✓
(3) Promote efficient management and use of existing telecommunications systems and services; and			✓
(4) Facilitate the development of education and training of telecommunications personnel.			✓
Analysis: **The proposed action does not directly or indirectly affect telecommunications systems dependability, efficiency, and cost parameters. In particular, the project does not promote research and development of telecommunications systems and resources and does not advance efficient management and use of existing telecommunications systems and services.**			
Chapter 226-19 Objectives and policies for socio-cultural advancement – – housing.			
Objectives: Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:			
(1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaii's population.	✓		

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(2) The orderly development of residential areas sensitive to community needs and other land uses.	✓		
(3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people.			✓
Policies:			
(1) Effectively accommodate the housing needs of Hawaii's people.	✓		
(2) Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.	✓		
(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.	✓		
(4) Promote appropriate improvement, rehabilitation, and maintenance of existing housing units and residential areas.			✓
(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.	✓		
(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.			✓
(7) Foster a variety of lifestyles traditional to Hawaii through the design and maintenance of neighborhoods that reflect the culture and values of the community.			✓
(8) Promote research and development of methods to reduce the cost of housing construction in Hawaii.			✓
Analysis: **The proposed project is directly applicable to the objectives and policies related to housing as it provides needed additional homestead opportunities for DHHL beneficiaries in an area that is close to the business, commercial, and visitor destination areas of Lahaina and Kā'anapali. In addition, the project will be implemented in a developed area in West Maui with other similar residential subdivisions, in proximity to existing infrastructure and services.**			
Chapter 226-20 Objectives and policies for socio-cultural advancement – – health.			
Objectives: Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:			
(1) Fulfillment of basic individual health needs of the general public.			✓
(2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.			✓
(3) Elimination of health disparities by identifying and addressing social determinants of health.			✓
Policies:			
(1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.			✓
(2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.			✓
(3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.			✓

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(4) Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures.			✓
(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.			✓
(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.			✓
(7) Prioritize programs, services, interventions, and activities that address identified social determinants of health to improve native Hawaiian health and well-being consistent with the United States Congress' declaration of policy as codified in title 42 United States Code section 11702, and to reduce health disparities of disproportionately affected demographics, including native Hawaiians, other Pacific Islanders, and Filipinos. The prioritization of affected demographic groups other than native Hawaiians may be reviewed every ten years and revised based on the best available epidemiological and public health data.			✓
Analysis: **The proposed action does not directly or indirectly affect the objectives and policies for health. The proposed action does not affect individual health needs, sanitation and health conditions, and health disparities.**			
Chapter 226-21 Objectives and policies for Socio-cultural advancement – – education.			
Objective: Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.		✓	
Policies:			
(1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.			✓
(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.		✓	
(3) Provide appropriate educational opportunities for groups with special needs.			✓
(4) Promote educational programs which enhance understanding of Hawaii's cultural heritage.			✓
(5) Provide higher educational opportunities that enable Hawaii's people to adapt to changing employment demands.			✓
(6) Assist individuals, especially those experiencing critical employment problems or barriers, or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities.			✓
(7) Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.			✓
(8) Emphasize quality educational programs in Hawaii's institutions to promote academic excellence.			✓
(9) Support research programs and activities that enhance the education programs of the State.			✓

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Analysis: **Through the payment of impact fees, the proposed project indirectly supports the objectives and policies for education by supporting the provision of adequate and accessible educational services and facilities in West Maui.**			
Chapter 226-22 Objective and policies for socio-cultural advancement – – social services.			
Objective: Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being.		✓	
Policies:			
(1) Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities.		✓	
(2) Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society.			✓
(3) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawaii's communities.			✓
(4) Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations.			✓
(5) Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect.			✓
(6) Promote programs which assist people in need of family planning services to enable them to meet their needs.			✓
Analysis: **The objective and policies for improving public and private social services are indirectly supported by the proposed action through the provision of affordable homesteading opportunities to beneficiaries of the State DHHL.**			
Chapter 226-23 Objective and policies for socio-cultural advancement – – leisure.			
Objective: Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.			✓
Policies:			
(1) Foster and preserve Hawaii's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.			✓
(2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.			✓
(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.			✓
(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.			✓

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(5) Ensure opportunities for everyone to use and enjoy Hawaii's recreational resources.			✓
(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.			✓
(7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaii's people.			✓
(8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.			✓
(9) Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawaii's population to participate in the creative arts.			✓
(10) Assure adequate access to significant natural and cultural resources in public ownership.			✓
Analysis: **As a residential project, the proposed action does not directly or indirectly advance the objective and policies for leisure.**			
Chapter 226-24 Objective and policies for socio-cultural advancement – – individual rights and personal well-being.			
Objective: Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations.			✓
Policies:			
(1) Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment.			✓
(2) Uphold and protect the national and state constitutional rights of every individual.			✓
(3) Assure access to, and availability of, legal assistance, consumer protection, and other public services which strive to attain social justice.			✓
(4) Ensure equal opportunities for individual participation in society.			✓
Analysis: **The proposed residential project does not directly or indirectly affect the objective and policies related to individual rights and personal well-being.**			
Chapter 226-25 Objective and policies for socio-cultural advancement – – culture.			
Objective: Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawaii's people.		✓	
Policies:			
(1) Foster increased knowledge and understanding of Hawaii's ethnic and cultural heritages and the history of Hawaii.		✓	
(2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawaii's people and which are sensitive and responsive to family and community needs.			✓
(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in			✓

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Hawaii.			
(4) Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawaii's people and visitors.			✓
Analysis: **A Cultural Impact Assessment (CIA) was prepared for the proposed project as part of the environmental review process. The CIA fosters increased knowledge of native Hawaiian cultural practices, as well as the history of the project area. In this context, the proposed action indirectly advances the objective and policies related to culture.**			
Chapter 226-26 Objectives and policies for socio-cultural advancement – – public safety.			
Objective: Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives:			
(1) Assurance of public safety and adequate protection of life and property for all people.			✓
(2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic well-being of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.			✓
(3) Promotion of a sense of community responsibility for the welfare and safety of Hawaii's people.			✓
Policies (Public Safety):			
(1) Ensure that public safety programs are effective and responsive to community needs.			✓
(2) Encourage increased community awareness and participation in public safety programs.			✓
Policies (Public Safety-Criminal Justice):			
(1) Support criminal justice programs aimed at preventing and curtailing criminal activities.			✓
(2) Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies.			✓
(3) Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community.			✓
Policies (Public Safety – Emergency Management):			
(1) 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) Enhance the coordination between emergency management programs throughout the State.			✓
Analysis: **The proposed action does not directly or indirectly affect the objectives and policies for public safety. In particular, the project does not address protection of life and property parameters, organizational readiness and capacity, and community responsibility for peoples' welfare and safety.**			
Chapter 226-27 Objectives and policies for socio-cultural advancement – – government.			
Objectives: Planning the State's socio-cultural advancement with regard to government shall be			

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directed towards the achievement of the following objectives:			
(1) Efficient, effective, and responsive government services at all levels in the State.		✓	
(2) Fiscal integrity, responsibility, and efficiency in the state government and county governments.			✓
Policies:			
(1) Provide for necessary public goods and services not assumed by the private sector.			✓
(2) Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response.		✓	
(3) Minimize the size of government to that necessary to be effective.			✓
(4) Stimulate the responsibility in citizens to productively participate in government for a better Hawaii.			✓
(5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.			✓
(6) Provide for a balanced fiscal budget.			✓
(7) Improve the fiscal budgeting and management system of the State.			✓
(8) Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible.			✓
Analysis: **The proposed action has indirect applicability to the objectives and policies for government. In particular, the project will comply with regulatory requirements which advance transparency in the flow of project-related information to the public. Such requirements include the Chapter 343, HRS environmental review process.**			

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Chapter 226-101: Purpose. The purpose of this part is to establish overall priority guidelines to address areas of statewide concern.			
Chapter 226-102: Overall direction. The State shall strive to improve the quality of life for Hawaii's present and future population through the pursuit of desirable courses of action in seven major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education, principles of sustainability, and climate change adaptation.			
Chapter 226-103: Economic priority guidelines.			
(a) Priority guidelines to stimulate economic growth and encourage business expansion and development to provide needed jobs for Hawaii's people and achieve a stable and diversified economy:		✓	
(1) Seek a variety of means to increase the availability of investment capital for new and expanding enterprises.			✓
(A) Encourage investments which:			✓
(i) Reflect long term commitments to the State;			✓
(ii) Rely on economic linkages within the local economy;			✓
(iii) Diversify the economy;			✓
(iv) Reinvest in the local economy;		✓	
(v) Are sensitive to community needs and priorities; and		✓	
(vi) Demonstrate a commitment to provide management opportunities to Hawaii residents; and			✓
(B) Encourage investments in innovative activities that have a nexus to the State, such as:			✓
(i) Present or former residents acting as entrepreneurs or principals;			✓
(ii) Academic support from an institution of higher education in Hawaii;			✓
(iii) Investment interest from Hawaii residents;			✓
(iv) Resources unique to Hawaii that are required for innovative activity; and			✓
(v) Complementary or supportive industries or government programs or projects.			✓
(2) Encourage the expansion of technological research to assist industry development and support the development and commercialization of technological advancements.			✓
(3) Improve the quality, accessibility, and range of services provided by government to business, including data and reference services and assistance in complying with governmental regulations.			✓
(4) Seek to ensure that state business tax and labor laws and administrative policies are equitable, rational, and predictable.			✓
(5) Streamline the processes for building and development permit and review, and telecommunication infrastructure installation approval and eliminate or consolidate other burdensome or duplicative governmental requirements imposed on business, where scientific evidence indicates that public health, safety and welfare would not be adversely affected.			✓
(6) Encourage the formation of cooperatives and other favorable marketing or distribution arrangements at the regional or local level to assist Hawaii's small-scale producers, manufacturers, and distributors.			✓

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(7) Continue to seek legislation to protect Hawaii from transportation interruptions between Hawaii and the continental United States.			✓
(8) Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics:			✓
(A) An industry that can take advantage of Hawaii's unique location and available physical and human resources.			✓
(B) A clean industry that would have minimal adverse effects on Hawaii's environment.			✓
(C) An industry that is willing to hire and train Hawaii's people to meet the industry's labor needs at all levels of employment.			✓
(D) An industry that would provide reasonable income and steady employment.			✓
(9) Support and encourage, through educational and technical assistance programs and other means, expanded opportunities for employee ownership and participation in Hawaii business.			✓
(10) Enhance the quality of Hawaii's labor force and develop and maintain career opportunities for Hawaii's people through the following actions:			✓
(A) Expand vocational training in diversified agriculture, aquaculture, information industry, and other areas where growth is desired and feasible.			✓
(B) Encourage more effective career counseling and guidance in high schools and post-secondary institutions to inform students of present and future career opportunities.			✓
(C) Allocate educational resources to career areas where high employment is expected and where growth of new industries is desired.			✓
(D) Promote career opportunities in all industries for Hawaii's people by encouraging firms doing business in the State to hire residents.			✓
(E) Promote greater public and private sector cooperation in determining industrial training needs and in developing relevant curricula and on-the-job training opportunities.			✓
(F) Provide retraining programs and other support services to assist entry of displaced workers into alternative employment.			✓
(b) Priority guidelines to promote the economic health and quality of the visitor industry:			✓
(1) Promote visitor satisfaction by fostering an environment which enhances the Aloha Spirit and minimizes inconveniences to Hawaii's residents and visitors.			✓
(2) Encourage the development and maintenance of well-designed, adequately serviced hotels and resort destination areas which are sensitive to neighboring communities and activities and which provide for adequate shoreline setbacks and beach access.			✓
(3) Support appropriate capital improvements to enhance the quality of existing resort destination areas and provide incentives to encourage investment in upgrading, repair, and maintenance of visitor facilities.			✓
(4) Encourage visitor industry practices and activities which respect, preserve, and enhance Hawaii's significant natural, scenic, historic, and cultural resources.			✓
(5) Develop and maintain career opportunities in the visitor industry for Hawaii's people, with emphasis on managerial positions.			✓
(6) Support and coordinate tourism promotion abroad to enhance Hawaii's share of existing and potential visitor markets.			✓

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(7) Maintain and encourage a more favorable resort investment climate consistent with the objectives of this chapter.			✓
(8) Support law enforcement activities that provide a safer environment for both visitors and residents alike.			✓
(9) Coordinate visitor industry activities and promotions to business visitors through the state network of advanced data communication techniques.			✓
(c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:			✓
(1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.			✓
(2) Continue efforts to maintain federal support to provide stable sugar prices high enough to allow profitable operations in Hawaii.			✓
(3) Support research and development, as appropriate, to improve the quality and production of sugar and pineapple crops.			✓
(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:			✓
(1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.			✓
(2) Assist in providing adequate, reasonably priced water for agricultural activities.			✓
(3) Encourage public and private investment to increase water supply and to improve transmission, storage, and irrigation facilities in support of diversified agriculture and aquaculture.			✓
(4) Assist in the formation and operation of production and marketing associations and cooperatives to reduce production and marketing costs.			✓
(5) Encourage and assist with the development of a waterborne and airborne freight and cargo system capable of meeting the needs of Hawaii's agricultural community.			✓
(6) Seek favorable freight rates for Hawaii's agricultural products from interisland and overseas transportation operators.			✓
(7) Encourage the development and expansion of agricultural and aquacultural activities which offer long-term economic growth potential and employment opportunities.			✓
(8) Continue the development of agricultural parks and other programs to assist small independent farmers in securing agricultural lands and loans.			✓
(9) Require agricultural uses in agricultural subdivisions and closely monitor the uses in these subdivisions.			✓
(10) Support the continuation of land currently in use for diversified agriculture.			✓
(11) Encourage residents and visitors to support Hawaii's farmers by purchasing locally grown food and food products.			✓
(e) Priority guidelines for water use and development:			✓
(1) Maintain and improve water conservation programs to reduce the overall water consumption rate.			✓
(2) Encourage the improvement of irrigation technology and promote the use of nonpotable water for agricultural and landscaping purposes.			✓
(3) Increase the support for research and development of economically feasible alternative water sources.			✓
(4) Explore alternative funding sources and approaches to support future water development programs and water system improvements.			✓

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(f) Priority guidelines for energy use and development:		✓	
(1) Encourage the development, demonstration, and commercialization of renewable energy sources.		✓	
(2) Initiate, maintain, and improve energy conservation programs aimed at reducing energy waste and increasing public awareness of the need to conserve energy.			✓
(3) Provide incentives to encourage the use of energy conserving technology in residential, industrial, and other buildings.			✓
(4) Encourage the development and use of energy conserving and cost-efficient transportation systems.			✓
(g) Priority guidelines to promote the development of the information industry:			✓
(1) Establish an information network, with an emphasis on broadband and wireless infrastructure and capability that will serve as the foundation of and catalyst for overall economic growth and diversification in Hawaii.			✓
(2) Encourage the development of services such as financial data processing, a products and services exchange, foreign language translations, telemarketing, teleconferencing, a twenty-four-hour international stock exchange, international banking, and a Pacific Rim management center.			✓
(3) Encourage the development of small businesses in the information field such as software development; the development of new information systems, peripherals, and applications; data conversion and data entry services; and home or cottage services such as computer programming, secretarial, and accounting services.			✓
(4) Encourage the development or expansion of educational and training opportunities for residents in the information and telecommunications fields.			✓
(5) Encourage research activities, including legal research in the information and telecommunications fields.			✓
(6) Support promotional activities to market Hawaii's information industry services.			✓
(7) Encourage the location or co-location of telecommunication or wireless information relay facilities in the community, including public areas, where scientific evidence indicates that the public health, safety, and welfare would not be adversely affected.			✓
Analysis: **The proposed action indirectly supports the economic priority guidelines by supporting construction activity which contributes to increased employment opportunities, job choices, and living standards. In addition, solar water heating systems will be installed, and homeowners will be able to install solar PV systems in their individual homes, if desired, thereby advancing measures to lessen dependence on fossil fuel based energy.**			
Chapter 226-104: Population growth and land resources priority guidelines.			
(a) Priority guidelines to effect desired statewide growth and distribution:		✓	
(1) 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.			✓
(2) Manage a growth rate for Hawaii's economy that will parallel future employment needs for Hawaii's people.			✓
(3) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.			✓
(4) Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate.		✓	

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(5) Explore the possibility of making available urban land, low-interest loans, and housing subsidies to encourage the provision of housing to support selective economic and population growth on the neighbor islands.			✓
(6) Seek federal funds and other funding sources outside the State for research, program development, and training to provide future employment opportunities on the neighbor islands.			✓
(7) Support the development of high technology parks on the neighbor islands.			✓
(b) Priority guidelines for regional growth distribution and land resource utilization:			
(1) Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures, and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.		✓	
(2) Make available marginal or nonessential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.			✓
(3) Restrict development when drafting of water would result in exceeding the sustainable yield or in significantly diminishing the recharge capacity of any groundwater area.			✓
(4) Encourage restriction of new urban development in areas where water is insufficient from any source for both agricultural and domestic use.			✓
(5) In order to preserve green belts, give priority to state capital-improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a noncontiguous new urban core.			✓
(6) Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.			✓
(7) Pursue rehabilitation of appropriate urban areas.			✓
(8) Support the redevelopment of Kakaako into a viable residential, industrial, and commercial community.			✓
(9) Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized.		✓	
(10) Identify critical environmental areas in Hawaii to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources.			✓
(11) Identify all areas where priority should be given to preserving rural character and lifestyle.			✓
(12) Utilize Hawaii's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.		✓	
(13) Protect and enhance Hawaii's shoreline, open spaces, and scenic resources.			✓

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Analysis: **The proposed project supports population growth and land resources priority guidelines as it repurposes agricultural land while providing additional homestead opportunities for DHHL beneficiaries in an area that is close to the business, commercial, and visitor destination areas of Lahaina and Kā'anapali. In addition, the project will be implemented in a developed area in West Maui, in proximity to existing infrastructure and services.**			
Chapter 226-105: Crime and criminal justice.			
Priority guidelines in the area of crime and criminal justice:			✓
(1) Support law enforcement activities and other criminal justice efforts that are directed to provide a safer environment.			✓
(2) Target state and local resources on efforts to reduce the incidence of violent crime and on programs relating to the apprehension and prosecution of repeat offenders.			✓
(3) Support community and neighborhood program initiatives that enable residents to assist law enforcement agencies in preventing criminal activities.			✓
(4) Reduce overcrowding or substandard conditions in correctional facilities through a comprehensive approach among all criminal justice agencies which may include sentencing law revisions and use of alternative sanctions other than incarceration for persons who pose no danger to their community.			✓
(5) Provide a range of appropriate sanctions for juvenile offenders, including community-based programs and other alternative sanctions.			✓
(6) Increase public and private efforts to assist witnesses and victims of crimes and to minimize the costs of victimization.			✓
Analysis: **The proposed action does not directly or indirectly affect the priority guidelines for crime and criminal justice.**			
Chapter 226-106: Affordable housing.			
Priority guidelines for the provision of affordable housing:	✓		
(1) Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.	✓		
(2) Encourage the use of alternative construction and development methods as a means of reducing production costs.			✓
(3) Improve information and analysis relative to land availability and suitability for housing.			✓
(4) Create incentives for development which would increase home ownership and rental opportunities for Hawaii's low- and moderate-income households, gap-group households, and residents with special needs.			✓
(5) Encourage continued support for government or private housing programs that provide low interest mortgages to Hawaii's people for the purchase of initial owner-occupied housing.	✓		
(6) Encourage public and private sector cooperation in the development of rental housing alternatives.			✓
(7) Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations.			✓
(8) Give higher priority to the provision of quality housing that is affordable for Hawaii's residents and less priority to development of housing intended primarily for individuals outside of Hawaii.	✓		
Analysis: **The proposed project directly affects the priority guidelines for affordable housing as it repurposes agricultural land while providing additional homestead opportunities**			

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable	DA	IA	N/A
for DHHL beneficiaries in an area that is close to the business, commercial, and visitor destination areas of Lahaina and Kā'anapali.			
Chapter 226-107: Quality education.			
Priority guidelines to promote quality education:			✓
(1) Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement;			✓
(2) Continue emphasis on general education "core" requirements to provide common background to students and essential support to other university programs;			✓
(3) Initiate efforts to improve the quality of education by improving the capabilities of the education work force;			✓
(4) Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision making responsibilities;			✓
(5) Increase and improve the use of information technology in education by the availability of telecommunications equipment for:			✓
(A) The electronic exchange of information;			✓
(B) Statewide electronic mail; and			✓
(C) Access to the Internet.			✓
(6) Encourage programs that increase the public's awareness and understanding of the impact of information technologies on our lives;			✓
(7) Pursue the establishment of Hawaii's public and private universities and colleges as research and training centers of the Pacific;			✓
(8) Develop resources and programs for early childhood education;			✓
(9) Explore alternatives for funding and delivery of educational services to improve the overall quality of education; and			✓
(10) Strengthen and expand educational programs and services for students with special needs.			✓
Analysis: **The proposed action does not directly or indirectly affect the priority guidelines for education.**			
CHAPTER 226-108: Sustainability			
Priority guidelines and principles to promote sustainability shall include:		✓	
(1) Encouraging balanced economic, social, community, and environmental priorities;			✓
(2) Encouraging planning that respects and promotes living within the natural resources and limits of the State;			✓
(3) Promoting a diversified and dynamic economy;			✓
(4) Encouraging respect for the host culture;			✓
(5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations;		✓	
(6) Considering the principles of the ahupuaa system; and			✓
(7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaii.			✓
Analysis: **The proposed action indirectly affects the priority guidelines for sustainability by providing much needed affordable homestead for DHHL beneficiaries without compromising the needs of future generations of DHHL beneficiaries.**			
CHAPTER 226-109: Climate change adaptation			

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable	DA	IA	N/A
Priority guidelines and principles to promote climate change adaptation shall include:		✓	
(1) Ensure that Hawaii's people are educated, informed, and aware of the impacts climate change may have on their communities;			✓
(2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies;			✓
(3) Invest in continued monitoring and research of Hawaii's climate and the impacts of climate change on the State;			✓
(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change;			✓
(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change;		✓	
(6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments;			✓
(7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options;			✓
(8) Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities;			✓
(9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans; and			✓
(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.		✓	
Analysis: **The proposed project indirectly supports the climate change priority guidelines as it will be implemented in an area that is outside of natural landscape features such as flood zones, the tsunami evacuation zone, as well as the projected sea level rise hazard area in order to avoid impacts related to climate change.**			

ANALYSIS OF THE PROJECT'S CONFORMANCE WITH THE COUNTYWIDE PLAN

APPENDIX I-1

APPENDIX I-1

Analysis of Project Applicability to Countywide Policy Plan

The Countywide Policy Plan was adopted in March 2010 and is a comprehensive policy document for the islands of Maui County to the year 2030. The plan replaces the *General Plan of the County of Maui 1990 Update* and provides the policy framework for the development of the forthcoming Maui Island Plan as well as for updating the nine detailed Community Plans.

The Countywide Policy Plan provides broad goals, objectives, policies and implementing actions that portray the desired direction of the County's future. Goals are intended to describe a desirable condition of the County by the year 2030 and are intentionally general. Objectives tend to be more specific and may be regarded as milestones to achieve the larger goals. Policies are not intended as regulations, but instead provide a general guideline for County decision makers, departments, and collaborating organizations toward the attainment of goals and objectives. Implementing actions are specific tasks, procedures, programs, or techniques that carry out policy.

Discussion of the proposed project conforms to the relevant goals, objectives, policies, and implementing actions of the Countywide Policy Plan is provided below. The methodology for assessing a project's relationship to the Countywide Policy Plan involves examining the project's applicability to the Plan's goals, objectives, and policies. "Applicability" refers to a project's need, purpose and effects, and how they advance or promote a particular set of goals, objectives and policies. In assessing the relationship between a proposed action and the Countywide Policy Plan, an action may be categorized in one of the following groups:

1. **Directly applicable:** the action and its potential effects directly advances, promotes or affects the relevant goal, objective, or policy.

   Example: A County project to develop a new water source and related transmission facilities would be directly applicable to improving physical infrastructure. The relevant objective states: *"Improve water systems to assure access to sustainable, clean, reliable, and affordable sources of water*" (Objective I.1). A policy within this objective category states: *Ensure that adequate supplies of water are available prior to approval of subdivision or construction documents* (Policy I.1.a).

   In this instance, the proposed action is considered to be directly applicable to the cited objective and policy.

2. **Indirectly applicable:** the action and its potential effects indirectly supports, advances or affects the objective, policy or priority guideline.

   Example: The county water source project cited above supports the objective to: *"Improve land use management and implement a directed-growth strategy"* (Objective J.1). A related policy encompassed by this objective states: *"Direct new development in*

and around communities with existing infrastructure and service capacity, and protect natural, scenic, shoreline, and cultural resources" (Policy J.1.h). In this case, the principle purpose of the project is not to create source specifically intended to improve land use management. Nonetheless, the proposed action indirectly supports the Countywide Policy Plan's directives relating to appropriate locations for new development.

3. **Not applicable:** the action and its potential effects have no direct or indirect relationship to the objectives and policies of the Countywide Policy Plan.

   Example: The county water source improvement project referenced above, may not have direct or indirect linkage to Objective D.1, which states: *"In cooperation with the Federal and State governments and nonprofit agencies, broaden access to social and healthcare services and expand options to improve the overall wellness of the people of Maui County"*. Hence, from a policy analysis and linkage standpoint, the proposed action would be considered not applicable to this set of objectives and policies.

It is recognized that policy analysis is subject to interpretation and is best considered in the context of the proposed action's local and regional conditions.

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
A. PROTECT THE NATURAL ENVIRONMENT			
Goal: Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.		✓	
Objective:			
(1) Improve the opportunity to experience the natural beauty and native biodiversity of the islands for present and future generations.		✓	
Policies:			
(a) Perpetuate native Hawaiian biodiversity by preventing the introduction of invasive species, containing or eliminating existing noxious pests, and protecting critical habitat areas.			✓
(b) Preserve and reestablish indigenous and endemic species' habitats and their connectivity.			✓
(c) Restore and protect forests, wetlands, watersheds, and stream flows, and guard against wildfires, flooding, and erosion.			✓
(d) Protect baseline stream flows for perennial streams, and support policies that ensure adequate stream flow to support Native Hawaiian aquatic species, traditional kalo cultivation, and self-sustaining ahupua'a.			✓
(e) Protect undeveloped beaches, dunes, and coastal ecosystems, and restore natural shoreline processes.			✓
(f) Protect the natural state and integrity of unique terrain, valued natural environments, and geological features.			✓
(g) Preserve and provide ongoing care for important scenic vistas, view planes, landscapes, and open-space resources.		✓	
(h) Expand coordination with the State and nonprofit agencies and their volunteers to reduce invasive species, replant indigenous species, and identify critical habitat.			✓
Implementing Actions:			
(a) Develop island-wide networks of greenways, watercourses, and habitat corridors.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
Analysis: **This project directly improves the opportunity for future beneficiaries of the Department of Hawaiian Home Lands (DHHL) to experience, live, and thrive in the natural beauty of our island home. This land will be cared for in years to come while also providing much needed housing opportunities. The project has been carefully designed taking into consideration lot configuration and massing. The proposed dwellings will be similar in scale and size to existing residential developments nearby and will be built in accordance with established subdivision standards.**			
Objective:			
(2) Improve the quality of environmentally sensitive, locally valued natural resources and native ecology of each island.		✓	
Policies:			
(a) Protect and restore nearshore reef environments and water quality.			✓
(b) Protect marine resources and valued wildlife.			✓
(c) Improve the connection between urban environments and the natural landscape, and incorporate natural features of the land into urban design.		✓	
(d) Utilize land-conservation tools to ensure the permanence of valued open spaces.			✓
(e) Mitigate the negative effects of upland uses on coastal wetlands, marine life, and coral reefs.		✓	
(f) Strengthen coastal-zone management, re-naturalization of shorelines, where possible, and filtration or treatment of urban and agricultural runoff.			✓
(g) Regulate the use and maintenance of stormwater-treatment systems that incorporate the use of native vegetation and mimic natural systems.			✓
(h) Advocate for stronger regulation of fishing, boating, cruise ship, and ecotourism activities.			✓
(i) Restore watersheds and aquifer-recharge areas to healthy and productive status, and increase public knowledge about the importance of watershed stewardship, water conservation, and groundwater protection.			✓
Implementing Actions:			
(a) Develop regulations to minimize runoff of pollutants into nearshore waters and reduce nonpoint and point source pollution.			✓
Analysis: **The proposed project will utilize Best Management Practices (BMPs) to ensure that natural resources such as the coastal environment is not impacted by construction activities. The use of BMPs also ensures compatibility between land-based and water-based functions, resources, and ecological systems. The biological resources study conducted as part of the environmental review process represents an effort to protect any rare and endangered plant and animal species, and their habitats that may be present in the vicinity of the proposed action.**			
Objective:			
(3) Improve the stewardship of the natural environment.		✓	
Policies:			
(a) Preserve and protect natural resources with significant scenic, economic, cultural, environmental, or recreational value.			✓
(b) Improve communication, coordination, and collaboration among government agencies, nonprofit organizations, communities, individuals, and land owners that work for the protection of the natural environment.			✓
(c) Evaluate development to assess potential short-term and long-term impacts on land, air, aquatic, and marine environments.		✓	
(d) Improve efforts to mitigate and plan for the impact of natural disasters, human influenced emergencies, and global warming.		✓	
(e) Regulate access to sensitive ecological sites and landscapes.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(f) Reduce air, noise, light, land, and water pollution, and reduce Maui County's contribution to global climate change.			✓
(g) Plan and prepare for and educate visitors and residents about the possible effects of global warming.			✓
(h) Provide public access to beaches and shorelines for recreational and cultural purposes where appropriate.			✓
(i) Educate the construction and landscape industries and property owners about the use of best management practices to prevent erosion and nonpoint source pollution.		✓	
(j) Support the acquisition of resources with scenic, environmental, and recreational value, and encumber their use.			✓
(k) Improve enforcement activities relating to the natural environment.			✓
(l) For each shoreline community, identify and prioritize beach-conservation objectives, and develop action plans for their implementation.			✓
Implementing Actions:			✓
(a) Document, record, and monitor existing conditions, populations, and locations of flora and fauna communities.			✓
(b) Implement Federal and State policies that require a reduction of greenhouse-gas emissions.			✓
(c) Establish a baseline inventory of available natural resources and their respective carrying capacities.			✓
Analysis: **The proposed project indirectly meets the objective of improving the stewardship of the natural environment. The project will employ BMPs to prevent impacts from construction, including temporary erosion control, stormwater management and dust control. In addition, the EA thoroughly evaluated the proposed action's potential impacts on the environment, and where applicable, advances mitigative measures aimed at reducing impacts.**			
Objective:			
(4) Educate residents and visitors about responsible stewardship practices and the interconnectedness of the natural environment and people.			✓
Policies:			
(a) Expand education about native flora, fauna, and ecosystems.			✓
(b) Align priorities to recognize that the health of the natural environment and the health of people are inextricably linked.			✓
(c) Promote programs and incentives that decrease greenhouse-gas emissions and improve environmental stewardship.			✓
Analysis: **The proposed project does not have direct or indirect relationships to the objective of educating residents and visitors about responsible stewardship practices and the interconnectedness of the natural environment and people. However, this objective is an integral value to native Hawaiians who are beneficiaries of this project.**			
B. PRESERVE LOCAL CULTURES AND TRADITIONS			
Goal: Maui County will foster a spirit of pono and protect, perpetuate, and reinvigorate its residents multi-cultural values and traditions to ensure that current and future generations will enjoy the benefits of their rich island heritage.		✓	
Objective:			
(1) Perpetuate the Hawaiian culture as a vital force in the lives of residents.		✓	
Policies:			
(a) Protect and preserve access to mountain, ocean, and island resources for traditional Hawaiian cultural practices.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(b) Prohibit inappropriate development of cultural lands and sites that are important for traditional Hawaiian cultural practices, and establish mandates for the special protection of these lands in perpetuity.		✓	
(c) Promote the use of ahupuaʻa and moku management practices.			✓
(d) Encourage the use of traditional Hawaiian architecture and craftsmanship.			✓
(e) Promote the use of the Hawaiian language.			✓
(f) Recognize and preserve the unique natural and cultural characteristics of each ahupuaʻa or district.			✓
(g) Encourage schools to promote broader incorporation of Hawaiian and other local cultures' history and values lessons into curriculum.			✓
(h) Ensure the protection of Native Hawaiian rights.		✓	
(i) Promote, encourage, and require the correct use of traditional place names, particularly in government documents, signage, and the tourism industry.			✓
Implementing Actions:			
(a) Establish alternative land use and overlay zoning designations that recognize and preserve the unique natural and cultural characteristics of each ahupuaʻa or district.			✓
(b) Develop requirements for all County applicants to perpetuate and use proper traditional place names in all applications submitted.			✓
***Analysis:* The proposed project will indirectly benefit Native Hawaiian people for generations and ensure the perpetuation of Hawaiian culture. This development is an appropriate development of lands for native Hawaiians. The proposed project is located adjacent to Villages of Leialiʻi, an established DHHL homestead community in West Maui. A Cultural Impact Assessment (CIA) was prepared for the proposed project as part of the environmental review process. The CIA fosters increased knowledge of Native Hawaiian cultural practices in the project area.**			
Objective:			
(2) Emphasize respect for our island lifestyle and our unique local cultures, family, and natural environment.		✓	
Policies:			
(a) Acknowledge the Hawaiian culture as the host culture, and foster respect and humility among residents and visitors toward the Hawaiian people and their practices.			✓
(b) Perpetuate a respect for diversity, and recognize the historic blending of cultures and ethnicities.			✓
(c) Encourage the perpetuation of each culture's unique cuisine, attire, dance, music, and folklore, and other unique island traditions and recreational activities.			✓
(d) Recognize the interconnectedness between the natural environment and the cultural heritage of the islands.		✓	
(e) Protect and prioritize funding for recreational activities that support local cultural practices, such as surfing, fishing, and outrigger-canoe paddling.			✓
***Analysis:* The project supports this objective and policy as the CIA acknowledges the relationship between the natural environment and cultural resources found in the project vicinity.**			
Objective:			
(3) Preserve for present and future generations the opportunity to know and experience the arts, culture, and history of Maui County.			✓
Policies:			
(a) Foster teaching opportunities for cultural practitioners to share their knowledge and skills.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(b) Support the development of cultural centers.			✓
(c) Broaden opportunities for public art and the display of local artwork.			✓
(d) Foster the Aloha Spirit by celebrating the Hawaiian host culture and other Maui County cultures through support of cultural-education programs, festivals, celebrations, and ceremonies.			✓
(e) Support the perpetuation of Hawaiian arts and culture.			✓
(f) Support programs and activities that record the oral and pictorial history of residents.			✓
(g) Support the development of repositories for culture, history, genealogy, oral history, film, and interactive learning.			✓
Implementing Actions:			
(a) Establish incentives for the display of public art.			✓
(b) Establish centers and programs of excellence for the perpetuation of Hawaiian arts and culture.			✓
***Analysis:* The proposed project does not have direct or indirect relationships to the objective of preserving the arts, culture, and history of Maui County for present and future generations. This is a residential project for Native Hawaiian beneficiaries that will help meet the housing need in Maui.**			
Objective:			
(4) Preserve and restore significant historic architecture, structures, cultural sites, cultural districts, and cultural landscapes.		✓	
Policies:			
(a) Support the development of island-wide historic, archaeological, and cultural resources inventories.		✓	
(b) Promote the rehabilitation and adaptive reuse of historic sites, buildings, and structures to perpetuate a traditional sense of place.			✓
(c) Identify a sustainable rate of use and set forth specific policies to protect cultural resources.			✓
(d) Protect and preserve lands that are culturally or historically significant.			✓
(e) Support programs that protect, record, restore, maintain, provide education about, and interpret cultural districts, landscapes, sites, and artifacts in both natural and museum settings.			✓
(f) Perpetuate the authentic character and historic integrity of rural communities and small towns.			✓
(g) Seek solutions that honor the traditions and practices of the host culture while recognizing the needs of the community.			✓
(h) Support the development of an Archaeological District Ordinance.			✓
(i) Protect summits, slopes, and ridgelines from inappropriate development.			✓
(j) Support the registering of important historic sites on the State and Federal historic registers.			✓
(k) Provide opportunities for public involvement with restoration and enhancement of all types of cultural resources.			✓
(l) Foster partnerships to identify and preserve or revitalize historic and cultural sites.			✓
Implementing Actions:			
(a) Identify, develop, map, and maintain an inventory of locally significant natural. cultural, and historical resources for protection.		✓	

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(b) Prepare, continually update, and implement a cultural-management plan for cultural sites, districts, and landscapes, where appropriate.			✓
(c) Enact an Archaeological District Ordinance.			✓
(d) Nominate important historic sites to the State and Federal historic registers.			✓
Analysis: **The proposed action is indirectly applicable to these objectives and related policies and implementing actions. Archaeological investigations and coordination for the proposed action are aimed at ensuring the preservation of historic resources which may be impacted by the project.**			
C. IMPROVE EDUCATION			
Goal: Residents will have access to lifelong formal and informal educational options enabling them to realize their ambitions.		✓	
Objective:			
(1) Encourage the State to attract and retain school administrators and educators of the highest quality.			✓
Policies:			
(a) Encourage the State to provide teachers with nationally competitive pay and benefit packages.			✓
(b) Encourage the State to ensure teachers will have the teaching tools and support staff needed to provide students with an excellent education.			✓
(c) Explore Maui County district- and school-based decision making in public education.			✓
Analysis: **Indirectly, this project meets the goal of giving residents access to lifelong formal and informal educational options. This is an affordable homestead development project which will provide homes for a number of families, putting them and their children closer to schools, allowing for easier access to education.**			
Objective:			
(2) Provide nurturing learning environments that build skills for the 21st century.		✓	
Policies:			
(a) Expand professional-development opportunities in disciplines that support the economic-development goals of Maui County.			✓
(b) Plan for demographic, social, and technological changes in a timely manner.			✓
(c) Encourage collaborative partnerships to improve conditions of learning environments.			✓
(d) Promote development of neighborhood schools and educational centers.		✓	
(e) Integrate schools, community parks, and playgrounds, and expand each community's use of these facilities.			✓
(f) Support coordination between land use and school-facility planning agencies.			✓
(g) Encourage the upgrade and ongoing maintenance of public-school facilities.		✓	
(h) Encourage the State Department of Education to seek reliable, innovative, and alternative methods to support a level of per-pupil funding that places Hawai'i among the top tier of states nationally for its financial support of public schools.			✓
(i) Encourage the State to promote healthier, more productive learning environments, including by providing healthy meals, more physical activity, natural lighting, and passive cooling.			✓
(j) Encourage the State to support the development of benchmarks to measure the success of Hawai'i's public-education system and clarify lines of accountability.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(k) Design school and park facilities in proximity to residential areas.			✓
(l) Support technology- and natural-environment-based learning.			✓
(m) Encourage the State to support lower student-teacher ratios in public schools.			✓
(n) Encourage alternative learning and educational opportunities.			✓
Implementing Actions:			
(a) Develop safe walking and bicycling programs for school children.			✓
Analysis: **Through the payment of impact fees to the Department of Education, the proposed project indirectly ensures the provision of adequate and accessible educational services and facilities in West Maui.**			
Objective:			
(3) Provide all residents with educational opportunities that can help them better understand themselves and their surroundings and allow them to realize their ambitions.			✓
Policies:			
(a) Encourage the State to improve Maui Community College as a comprehensive community college that will serve each community.			✓
(b) Broaden the use of technology and telecommunications to improve educational opportunities throughout the County.			✓
(c) Attract graduate-level research programs and institutions.			✓
(d) Promote the teaching of traditional practices, including aquaculture; subsistence agriculture; Pacific Island, Asian, and other forms of alternative health practices; and indigenous Hawaiian architecture.			✓
(e) Integrate cultural and environmental values in education, including self-sufficiency and sustainability.			✓
(f) Foster a partnership and ongoing dialogue between business organizations, formal educational institutions, and vocational training centers to tailor learning and mentoring programs to County needs.			✓
(g) Ensure teaching of the arts to all ages.			✓
(h) Expand and develop vocational learning opportunities by establishing trade schools.			✓
(i) Encourage the State to integrate financial and economic literacy in elementary, secondary, and higher-education levels.			✓
Implementing Actions:			
(a) Encourage the State to establish a four-year university, and support the development of other higher-education institutions to enable residents to obtain bachelor degrees and postgraduate degrees in Maui County.			✓
Analysis: **The proposed project is not directly or indirectly related to the objective and policies related to provision of educational opportunities.**			
Objective:			
(4) Maximize community-based educational opportunities.			✓
Policies:			
(a) Encourage the State and others to expand pre-school, after-school, and homebased (parent-child) learning.			✓
(b) Support public-private partnerships to develop youth-internship, -apprenticeship, and -mentoring programs.			✓
(c) Support the development of a wide range of informal educational and cultural programs for all residents.			✓
(d) Improve partnerships that utilize the skills and talents at Hawai'i's colleges and			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
universities to benefit the County.			
(e) Support career-development and job-recruitment programs and centers.			✓
(f) Attract learning institutions and specialty schools to diversify and enhance educational opportunities.			✓
(g) Expand education of important life skills for the general public.			✓
(h) Support community facilities such as museums, libraries, nature centers, and open spaces that provide interactive-learning opportunities for all ages.			✓
Analysis: **The project does not directly or indirectly maximize community-based educational opportunities. While these objectives and policies are valuable, this project concentrates on fulfilling native Hawaiian housing needs.**			
D. STRENGTHEN SOCIAL AND HEALTHCARE SERVICES			
Goal: Health and social services in Maui County will fully and comprehensively serve all segments of the population.		✓	
Objective:			
(1) In cooperation with the Federal and State governments and nonprofit agencies, broaden access to social and healthcare services and expand options to improve the overall wellness of the people of Maui County.		✓	
Policies:			
(a) Work with other levels of government and the nonprofit sector to expand services to address hunger, homelessness, and poverty.			✓
(b) Support the improvement of opportunities for disadvantaged youth, encourage the tradition of hanai relatives, and support expanded opportunities for foster care.			✓
(c) Support expanded long-term-care options, both in institutions and at home, for patients requiring ongoing assistance and medical attention.			✓
(d) Encourage the expansion and improvement of local hospitals, facilitate the establishment of new healthcare facilities, and facilitate prompt and high-quality emergency- and urgent-care services for all.			✓
(e) Support broadened access to affordable health insurance and health care, and recognize the unique economic challenges posed to families when healthcare services are provided off-island.			✓
(f) Encourage equal access to social and healthcare services through both technological and traditional means.		✓	
Analysis: **Indirectly, this proposed project will support access to services. By providing affordable housing to families in an area located in proximity to the commercial centers of Lahaina and Kāʻanapali, they will have easier access to utilize social and healthcare services, if needed.**			
Objective:			
(2) Encourage the Federal and State governments and the private sector to improve the quality and delivery of social and healthcare services.		✓	
Policies:			
(a) Strengthen partnerships with government, nonprofit, and private organizations to provide funding and to improve counseling and other assistance to address substance abuse, domestic violence, and other pressing social challenges.			✓
(b) Encourage the State to improve the quality of medical personnel, facilities, services, and equipment.			✓
(c) Encourage investment to improve the recruitment of medical professionals and the quality of medical facilities and equipment throughout Maui County.			✓
(d) Promote the development of continuum-of-care facilities that provide assisted living, hospice, home-care, and skilled-nursing options allowing the individual to be cared for in a manner congruent with his or her needs and desires.			✓

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(e) Support improved social, healthcare, and governmental services for special needs populations.			✓
(f) Plan for the needs of an aging population and the resulting impacts on social services, housing, and healthcare delivery.			✓
(g) Improve coordination among the police, the courts, and the public in the administration of social and healthcare services.			✓
(h) Support programs that address needs of veterans.			✓
(i) Support programs that address the needs of immigrants.			✓
Implementing Actions:			
(a) Invest in programs designed to improve the general welfare and quality of life of Native Hawaiians.		✓	
(b) Assist and facilitate the State Department of Public Safety and others in efforts to strengthen programs and facilities that will improve the mental and social health of incarcerated people and assist in prison inmates' successful transition back into Maui County communities.			✓
(c) Develop and maintain a comprehensive index that will measure the health and wellness needs of families.			✓
(d) Provide heliports countywide for emergency health and safety purposes.			✓
Analysis: **While most of these policies are not directly or indirectly applicable to the project, one of the implementing actions of investing in programs designed to improve the general welfare and quality of life of Native Hawaiians holds merit. This project directly affects native Hawaiians and aspires to improve their quality of life by providing affordable homes.**			
Objective:			
(3) Strengthen public-awareness programs related to healthy lifestyles and social and medical services.			✓
Policies:			
(a) Expand public awareness about personal safety and crime prevention.			✓
(b) Encourage residents to pursue education and training for careers in the healthcare, social services, and community-development fields.			✓
(c) Expand public awareness and promote programs to achieve healthy eating habits and drug-free lifestyles.			✓
Analysis: **The objective and policies related to strengthening public-awareness programs related to healthy lifestyles and social and medical services are not directly or indirectly applicable to this affordable homestead project.**			
E. EXPAND HOUSING OPPORTUNITIES FOR RESIDENTS			
Goal: Quality, island-appropriate housing will be available to all residents.	✓		
Objective:			
(1) Reduce the affordable housing deficit for residents.	✓		
Policies:			
(a) Ensure that an adequate and permanent supply of affordable housing, both new and existing units, is made available for purchase or rental to our resident and/or workforce population, with special emphasis on providing housing for low- to moderate-income families, and ensure that all affordable housing remains affordable in perpetuity.			✓
(b) Seek innovative ways to lower housing costs without compromising the quality of our island lifestyle.			✓
(c) Seek innovative methods to secure land for the development of low- and moderate- income housing.			✓
(d) Provide the homeless population with emergency and transitional shelter and			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
other supportive programs.			
(e) Provide for a range of senior-citizen and special needs housing choices on each island that affordably facilitates a continuum of care and services.			✓
(f) Support the Department of Hawaiian Home Lands' development of homestead lands.	✓		
(g) Manage property-tax burdens to protect affordable resident homeownership.			✓
(h) Explore taxation mechanisms to increase and maintain access to affordable housing.			✓
(i) Improve awareness regarding available affordable homeowner's insurance.			✓
(j) Redevelop commercial areas with a mixture of affordable residential and business uses, where appropriate.			✓
(k) Ensure residents are given priority to obtain affordable housing units developed in their communities, consistent with all applicable regulations.		✓	
(l) Establish pricing for affordable housing that is more reflective of Maui County's workforce than the United States Housing and Urban Development's median-income estimates for Maui County.			✓
(m) Develop neighborhoods with a mixture of accessible and integrated community facilities and services.			✓
(n) Provide alternative regulatory frameworks to facilitate the use of Kuleana lands by the descendants of Native Hawaiians who received those lands pursuant to the Kuleana Act of 1850.			✓
(o) Work with lending institutions to expand housing options and safeguard the financial security of homeowners.			✓
(p) Promote the use of the community land trust model and other land-lease and land- financing options.	✓		
(q) Support the opportunity to age in place by providing accessible and appropriately designed residential units.			✓
Analysis: **The proposed project supports this objective and related policies and implementing actions as it provides additional affordable homestead opportunities for DHHL beneficiaries in an area that is close to the business, commercial, and visitor destination areas of Lahaina and Kāʻanapali. In addition, the project will be implemented in a developed area in West Maui, in proximity to existing infrastructure and services.**			
Objective:			
(2) Increase the mix of housing types in towns and neighborhoods to promote sustainable land use planning, expand consumer choice, and protect the County's rural and small town character.	✓		
Policies:			
(a) Seek innovative ways to develop ʻohana cottages and accessory-dwelling units as affordable housing.			✓
(b) Design neighborhoods to foster interaction among neighbors.			✓
(c) Encourage a mix of social, economic, and age groups within neighborhoods.			✓
(d) Promote infill housing in urban areas at scales that capitalize on existing infrastructure, lower development costs, and are consistent with existing or desired patterns of development.	✓		
(e) Encourage the building industry to use environmentally sustainable materials, technologies, and site planning.			✓
(f) Develop workforce housing in proximity to job centers and transit facilities.		✓	
(g) Provide incentives to developers and owners who incorporate green building practices and energy-efficient technologies into their housing developments.			✓
Implementing Actions:			

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(a) Revise laws to support neighborhood designs that incorporate a mix of housing types that are appropriate for island living.			✓
Analysis: **The proposed project provides additional homestead opportunities for DHHL beneficiaries in an area that is consistent with beneficiaries' preferences, close to the business, commercial, and visitor destination areas of Lahaina and Kāʻanapali. In addition, the project will be implemented in a developed area in West Maui, in proximity to existing infrastructure and services.**			
Objective:			
(3) Increase and maintain the affordable housing inventory.	✓		
Policies:			
(a) Recognize housing as a basic human need, and work to fulfill that need.	✓		
(b) Prioritize available infrastructure capacity for affordable housing.			✓
(c) Improve communication, collaboration, and coordination among housing providers and social-service organizations.			✓
(d) Study future projected housing needs, monitor economic cycles, and prepare for future conditions on each island.			✓
(e) Develop public-private and nonprofit partnerships that facilitate the construction of quality affordable housing.			✓
(f) Streamline the review process for high-quality, affordable housing developments that implement the goals, objectives, and policies of the General Plan.			✓
(g) Minimize the intrusion of housing on prime, productive, and potentially productive agricultural lands and regionally valuable agricultural lands.			✓
(h) Encourage long-term residential use of existing and future housing to meet residential needs.		✓	
Implementing Actions:			
(a) Develop policies to even out the peaks and valleys in Maui County's construction-demand cycles.			✓
Analysis: **The project presents an opportunity to provide affordable homesteads for DHHL beneficiaries in an area that is close to the business, commercial, and visitor destination areas of Lahaina and Kāʻanapali.**			
Objective:			
(4) Expand access to education related to housing options, homeownership, financing, and residential construction.		✓	
Policies:			
(a) Broaden access to information about County, State, and Federal programs that provide financial assistance to renters and home buyers.			✓
(b) Expand access to information about opportunities for homeownership and self-help housing.			✓
(c) Educate residents about making housing choices that support their individual needs, the needs of their communities, and the health of the islands' natural systems.			✓
(d) Improve home buyers' education on all aspects of homeownership.		✓	
Analysis: **Indirectly, this project will help to educate the DHHL beneficiaries' knowledge about home ownership and financing. The DHHL provides educational programs for beneficiaries regarding financing and financial planning. Through the process of owning a home, owners will need to educate themselves about home ownership, thereby increasing their knowledge base.**			
F. STRENGTHEN THE LOCAL ECONOMY			
Goal: Maui County's economy will be diverse, sustainable, and supportive of community values.		✓	

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
Objective:			
(1) Promote an economic climate that will encourage diversification of the County's economic base and a sustainable rate of economic growth.		✓	
Policies:			
(a) Support economic decisions that create long-term benefits.		✓	
(b) Promote lifelong education, career development, and technical training for existing and emerging industries.			✓
(c) Invest in infrastructure, facilities, and programs that foster economic diversification.			✓
(d) Support and promote locally produced products and locally owned operations and businesses that benefit local communities and meet local demand.			✓
(e) Support programs that assist industries to retain and attract more local labor and facilitate the creation of jobs that offer a living wage.			✓
(f) Encourage work environments that are safe, rewarding, and fulfilling to employees.			✓
(g) Support home-based businesses that are appropriate for and in character with the community.			✓
(h) Encourage businesses that promote the health and well-being of the residents, produce value-added products, and support community values.			✓
(i) Foster an understanding of the role of all industries in our economy.			✓
(j) Support efforts to improve conditions that foster economic vitality in our historic small towns.			✓
(k) Support and encourage traditional host-culture businesses and indigenous agricultural practices.			✓
(l) Support public and private entities that assist entrepreneurs in establishing locally operated businesses.			✓
Implementing Actions:			
(a) Develop regulations and programs that support opportunities for local merchants, farmers, and small businesses to sell their goods and services directly to the public.			✓
(b) Monitor the carrying capacity of the islands' social, ecological, and infrastructure systems with respect to the economy.			✓
Analysis: **This affordable homestead project will indirectly support Maui County's economy. The proposed project will have positive economic and fiscal impacts to the County of Maui during and after construction. The proposed subdivision of 250 single-family residential lots will support local businesses in the area.**			
Objective:			
(2) Diversify and expand sustainable forms of agriculture and aquaculture.			✓
Policies:			
(a) Support programs that position Maui County's agricultural products as premium export products.			✓
(b) Prioritize the use of agricultural land to feed the local population, and promote the use of agricultural lands for sustainable and diversified agricultural activities.			✓
(c) Capitalize on Hawai'i's economic opportunities in the ecologically sensitive aquaculture industries.			✓
(d) Assist farmers to help make Maui County more self-sufficient in food production.			✓
(e) Support ordinances, programs, and policies that keep agricultural land and water available and affordable to farmers.			✓
(f) Support a tax structure that is conducive to the growth of the agricultural economy.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(g) Enhance County efforts to monitor and regulate important agricultural issues.			✓
(h) Support education, research, and facilities that strengthen the agricultural industry.			✓
(i) Maintain the genetic integrity of existing food crops.			✓
(j) Encourage healthy and organic farm practices that contribute to land health and regeneration.			✓
(k) Support cooperatives and other types of nontraditional communal farming and efforts.			✓
(l) Encourage methods of monitoring and controlling genetically modified crops to prevent adverse effects.			✓
(m) Work with the State to ease the permitting process for the revitalization of traditional fish ponds.			✓
Implementing Actions:			
(a) Redirect efforts in the Office of Economic Development to further facilitate the development of the agricultural section and to monitor agricultural legislation and issues.			✓
(b) Publicly identify, with signage and other means, the field locations of all genetically modified crops.			✓
(c) Create agricultural parks in areas distant from genetically modified crops.			✓
Analysis: **The objective and policies as it relates to diversification and expansion of sustainable forms of agriculture and aquaculture are not directly or indirectly applicable to the proposed project.**			
Objective:			
(3) Support a visitor industry that respects the resident culture and the environment.			✓
Policies:			
(a) Promote traditional Hawaiian practices in visitor-related facilities and activities.			✓
(b) Encourage and educate the visitor industry to be sensitive to island lifestyles and cultural values.			✓
(c) Encourage a spirit of welcome for residents at visitor facilities, such as by offering kama'aina incentives and discount programs.			✓
(d) Support the renovation and enhancement of existing visitor facilities.			✓
(e) Support policies, programs, and a tax structure that redirect the benefits of the visitor industry back into the local community.			✓
(f) Encourage resident ownership of visitor-related businesses and facilities.			✓
(g) Develop partnerships to provide educational and training facilities to residents employed in the visitor industry.			✓
(h) Foster an understanding of local cultures, customs, and etiquette, and emphasize the importance of the Aloha Spirit as a common good for all.			✓
(i) Support the diversification, development, evolution, and integration of the visitor industry in a way that is compatible with the traditional, social, economic, spiritual, and environmental values of island residents			✓
(j) Improve collaboration between the visitor industry and the other sectors of Maui County's economy.			✓
(k) Perpetuate an authentic image of the Hawaiian culture and history and an appropriate recognition of the host culture.			✓
(l) Support the programs and initiatives outlined in the Maui County Tourism Strategic Plan 2006-2015.			✓

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(m) Promote water conservation, beach conservation, and open-space conservation in areas providing services for visitors.			✓
(n) Recognize the important contributions that the visitor industry makes to the County's economy, and support a healthy and vibrant visitor industry.			✓
Analysis: **The proposed project is an affordable homestead project for the DHHL beneficiaries. The objectives and policies around supporting a visitor industry is not applicable to the project.**			
Objective:			
(4) Expand economic sectors that increase living-wage job choices and are compatible with community values.		✓	
Policies:			
(a) Support emerging industries, including the following: • Health and wellness industry; • Sports and recreation industry; • Film and entertainment industry; • Arts and culture industry; • Renewable-energy industry; • Research and development industry; • High-technology and knowledge-based industries; • Education and training industry; • Ecotourism industry; and • Agritourism industry.		✓	
Analysis: **The objective of expanding economic sectors that increase living-wage job choices compatible with community values is indirectly applicable to the proposed residential project through supporting contractors, renewable-energy system providers and small businesses in the construction industry which have historically provided good living-wage job choices that are compatible with community values.**			
G. IMPROVE PARKS AND PUBLIC FACILITIES			
Goal: A full range of island-appropriate public facilities and recreational opportunities will be provided to improve the quality of life for residents and visitors.		✓	
Objective:			
(1) Expand access to recreational opportunities and community facilities to meet the present and future needs of residents of all ages and physical abilities.		✓	
Policies:			
(a) Protect, enhance, and expand access to public shoreline and mountain resources.			✓
(b) Expand and enhance the network of parks, multi-use paths, and bikeways.			✓
(c) Assist communities in developing recreational facilities that promote physical fitness.			✓
(d) Expand venue options for recreation and performances that enrich the lifestyles of Maui County's people.			✓
(e) Expand affordable recreational and after-school programs for youth.			✓
(f) Encourage and invest in recreational, social, and leisure activities that bring people together and build community pride.			✓
(g) Promote the development and enhancement of community centers, civic spaces, and gathering places throughout our communities.			✓
(h) Expand affordable access to recreational opportunities that support the local lifestyle.		✓	
Implementing Actions:			
(a) Identify and reserve lands for cemeteries, and preserve existing cemeteries on all islands, appropriately accommodating varying cultural and, faith-based traditions.			✓
Analysis: **The proposed residential project will indirectly support the goal, objective, and policies of expanding access to recreational opportunities and community facilities to meet**			

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the needs of residents. The centrally located and highly desirable site of this project will provide easy access to existing recreational activities and community facilities located in West Maui.			
Objective:			
(2) Improve the quality and adequacy of community facilities.			✓
Policies:			
(a) Provide an adequate supply of dedicated shelters and facilities for disaster relief.			✓
(b) Provide and maintain community facilities that are appropriately designed to reflect the traditions and customs of local cultures.			✓
(c) Ensure that parks and public facilities are safe and adequately equipped for the needs of all ages and physical abilities to the extent reasonable.			✓
(d) Maintain, enhance, expand, and provide new active and passive recreational facilities in ways that preserve the natural beauty of their locations.			✓
(e) Redesign or retrofit public facilities to adapt to major shifts in environmental or urban conditions to the extent reasonable.			✓
Analysis: **The objective and policies to improve the quality and adequacy of community facilities does not apply to this housing project.**			
Objective:			
(3) Enhance the funding, management, and planning of public facilities and park lands.			✓
Policies:			
(a) Identify and encourage the establishment of regulated and environmentally sound campgrounds.			✓
(b) Manage park use and control access to natural resources in order to rest sensitive places and utilize the resources in a sustainable manner.			✓
(c) Provide public-recreational facilities that are clean and well-maintained.			✓
(d) Develop partnerships to ensure proper stewardship of the islands' trails, public lands, and access systems.			✓
(e) Ensure that there is an adequate supply of public restrooms in convenient locations.			✓
Implementing Actions:			
(a) Encourage the State to allow for overnight fishing along the shoreline in accordance with management plans and regulations.			✓
(b) Develop and regularly update functional plans, including those relating to public facilities, parks, and campgrounds.			✓
(c) Develop and adopt local level-of service standards for public facilities and parks.			✓
(d) Identify, acquire, and develop lands for parks, civic spaces, and public uses.			✓
Analysis: **The proposed project does not meet the objective of enhancing funding, management, and planning of public facilities and park lands. The policies outlined to meet this objective do not apply to the proposed project.**			
H. DIVERSIFY TRANSPORTATION OPTIONS			
Goal: Maui County will have an efficient, economical, and environmentally sensitive means of moving people and goods.		✓	
Objective:			
(1) Provide an effective, affordable, and convenient ground-transportation system that is environmentally sustainable.		✓	
Policies:			
(a) Execute planning strategies to reduce traffic congestion.		✓	

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(b) Plan for the efficient relocation of roadways for the public benefit.			✓
(c) Support the use of alternative roadway designs, such as traffic-calming techniques and modern roundabouts.			✓
(d) Increase route and mode options in the ground-transportation network.		✓	
(e) Ensure that roadway systems are safe, efficient, and maintained in good condition.		✓	
(f) Preserve roadway corridors that have historic, scenic, or unique physical attributes that enhance the character and scenic resources of communities.			✓
(g) Design new roads and roadway improvements to retain and enhance the existing character and scenic resources of the communities through which they pass.		✓	
(h) Promote a variety of affordable and convenient transportation services that meet countywide and community needs and expand ridership of transit systems.			✓
(i) Collaborate with transit agencies, government agencies, employers, and operators to provide planning strategies that reduce peak-hour traffic.			✓
(j) Develop and expand an attractive, island-appropriate, and efficient public transportation system.			✓
(k) Provide and encourage the development of specialized transportation options for the young, the elderly, and persons with disabilities.			✓
(l) Evaluate all alternatives to preserve quality of life before widening roads.			✓
(m) Encourage businesses in the promotion of alternative transportation options for resident and visitor use.			✓
(n) Support the development of carbon-emission standards and an incentive program aimed at achieving County carbon-emission goals.			✓
Implementing Actions:			
(a) Create incentives and implement strategies to reduce visitor dependence on rental cars.			✓
(b) Establish efficient public-transit routes between employment centers and primary workforce residential areas.			✓
(c) Create attractive, island-appropriate, conveniently located park-and-ride and ride- share facilities.			✓
Analysis: **The proposed project will provide specific roadway improvements as determined by the Traffic Impact Analysis Report (TIAR) and as discussed with the State Department of Transportation and County of Maui. Such improvements will comply with applicable federal policies for roadway safety and efficiency which will benefit the greater community.**			
Objective:			
(2) Reduce the reliance on the automobile and fossil fuels by encouraging walking, bicycling, and other energy-efficient and safe alternative modes of transportation.		✓	
Policies:			
(a) Make walking and bicycling transportation safe and easy between and within communities.		✓	
(b) Require development to be designed with the pedestrian in mind.			✓
(c) Design new and retrofit existing rights-of-way with adequate sidewalks, bicycle lanes, or separated multi-use transit corridors.		✓	
(d) Support the development of a countywide network of bikeways, equestrian trails, and pedestrian paths.			✓
(e) Support the reestablishment of traditional trails between communities, to the ocean, and through the mountains for public use.			✓
(f) Encourage educational programs to increase safety for pedestrians and bicyclists.			✓
Implementing Actions:			

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(a) Design, build, and modify existing bikeways to improve safety and separation from automobiles.			✓
(b) Increase enforcement to reduce abuse of bicycle and pedestrian lanes by motorized vehicles.			✓
(c) Identify non-motorized transportation options as a priority for new sources of funding.			✓
Analysis: **Proposed affordable homestead project is located in proximity to the commercial centers of Lahaina and Kāʻanapali. The roadway improvements on Leialiʻi Parkway and the intersection with Honoapiʻilani Highway will maintain existing bike routes that will provide residents with an alternative form of transportation. Sidewalks will be provided to promote pedestrian connectivity.**			
Objective:			
(3) Improve opportunities for affordable, efficient, safe, and reliable air transportation.			✓
Policies:			
(a) Discourage private helicopter and fixed-wing landing sites to mitigate environmental and social impacts.			✓
(b) Encourage the use of quieter aircraft and noise-abatement procedures for arrivals and departures.			✓
(c) Encourage the modernization and maintenance of air-transportation facilities for general-aviation activities.			✓
(d) Encourage a viable and competitive atmosphere for air carriers to expand service and ensure sufficient intra-County flights and affordable fares for consumers.			✓
(e) Continue to support secondary airports, and encourage the State to provide them with adequate funding.			✓
(f) During Community Plan updates, explore the use of the smaller airports.			✓
(g) Encourage the State to provide efficient, adequate, and affordable parking and transit connections within and around airports.			✓
Analysis: **The residential project does not meet the objective and policies of improving opportunities for affordable, efficient, safe, and reliable air transportation.**			
Objective:			
(4) Improve opportunities for affordable, efficient, safe, and reliable ocean transportation.			✓
Policies:			
(a) Support programs and regulations that reduce the disposal of maritime waste and prevent spills into the ocean.			✓
(b) Encourage the upgrading of harbors to resist damage from natural hazards and disasters.			✓
(c) Encourage the State to study the use of existing harbors and set priorities for future use.			✓
(d) Explore all options to protect the traditional recreational uses of harbors, and mitigate harbor-upgrade impacts to recreational uses where feasible.			✓
(e) Encourage the upgrading of harbors and the separation of cargo and bulk materials from passenger and recreational uses.			✓
(f) Encourage the State to provide for improved capacity at shipping, docking, and storage facilities.			✓
(g) Encourage the State to provide adequate parking facilities and transit connections within and around harbor areas.			✓
(h) Encourage the redevelopment and revitalization of harbors while preserving historic and cultural assets in harbor districts.			✓
(i) Encourage the State to provide adequate facilities for small-boat operations, including small-boat launch ramps, according to community needs.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(j) Support the maintenance and cleanliness of harbor facilities.			✓
(k) Support the redevelopment of harbors as pedestrian-oriented gathering places.			✓
Analysis: **Improving opportunities for affordable, efficient, safe, and reliable ocean transportation is not applicable to the goal of providing affordable homesteads for DHHL beneficiaries.**			
Objective:			
(5) Improve and expand the planning and management of transportation systems.		✓	
Policies:			
(a) Encourage progressive community design and development that will reduce transportation trips.		✓	
(b) Require new developments to contribute their pro rata share of local and regional infrastructure costs.		✓	
(c) Establish appropriate user fees for private enterprises that utilize public transportation facilities for recreational purposes.			✓
(d) Support the revision of roadway-design criteria and standards so that roads are compatible with surrounding neighborhoods and the character of rural areas.			✓
(e) Plan for multi-modal transportation and utility corridors on each island.			✓
(f) Support designing all transportation facilities, including airport, harbor, and mass-transit stations, to reflect Hawaiian architecture.			✓
(g) Utilize transportation-demand management as an integral part of transportation planning.			✓
(h) Accommodate the planting of street trees and other appropriate landscaping in all public rights-of-way.			✓
Analysis: **The proposed project will indirectly support the improvement of transportation systems. The project is located in proximity to Lahaina and Kāʻanapali which will allow families to be closer to work, school, activities, and services, thereby limiting long distance road trips to West Maui. The project will also be making roadway improvements to Leialiʻi Parkway and Honoapiʻilani Highway as well as at the intersection of Leialiʻi Parkway and Honoapiʻilani Highway.**			
I. IMPROVE PHYSICAL INFRASTRUCTURE			
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:			
(1) Improve water systems to assure access to sustainable, clean, reliable, and affordable sources of water.		✓	
Policies:			
(a) Ensure that adequate supplies of water are available prior to approval of subdivision or construction documents.		✓	
(b) Develop and fund improved water-delivery systems.			✓
(c) Ensure a reliable and affordable supply of water for productive agricultural uses.			✓
(d) Promote the reclamation of gray water, and enable the use of reclaimed, gray, and brackish water for activities that do not require potable water.			✓
(e) Retain and expand public control and ownership of water resources and delivery systems.			✓
(f) Improve the management of water systems so that surface-water and groundwater resources are not degraded by overuse or pollution.			✓
(g) Explore and promote alternative water-source-development methods.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(h) Seek reliable long-term sources of water to serve developments that achieve consistency with the appropriate Community Plans.			✓
Implementing Actions:			
(a) Develop a process to review all applications for desalination.			✓
Analysis: **The project indirectly supports this objective and related policies as it is located in an area that may be serviced by County water infrastructure. Coordination will be undertaken with the DWS to determine if certain improvements to the County's water system will be required to service the project.**			
Objective:			
(2) Improve waste-disposal practices and systems to be efficient, safe, and as environmentally sound as possible.		✓	
Policies:			
(a) Provide sustainable waste-disposal systems and comprehensive, convenient recycling programs to reduce the flow of waste into landfills.		✓	
(b) Support innovative and alternative practices in recycling solid waste and wastewater and disposing of hazardous waste.			✓
(c) Encourage vendors and owners of automobile, appliance, and white goods to participate in the safe disposal and recycling of such goods, and ensure greater accountability for large waste producers.			✓
(d) Develop strategies to promote public awareness to reduce pollution and litter, and encourage residents to reduce, reuse, recycle, and compost waste materials.			✓
(e) Pursue improvements and upgrades to existing wastewater and solid-waste systems consistent with current and future plans and the County's Capital Improvement Program.		✓	
Implementing Actions:			
(a) Establish recycling, trash-separation, and materials recovery programs and facilities to reduce the flow of waste into landfills.			✓
(b) Study the feasibility of developing environmentally safe waste-to-energy facilities.			✓
(c) Utilize taxes and fees as means to encourage conservation and recycling.			✓
(d) Implement and regularly update the Integrated Solid Waste Management Plan.			✓
(e) Phase out the use of injection wells.			✓
Analysis: **The objectives, policies and actions are indirectly applicable to the proposed project. The project proposes connection to the County wastewater system and improvements that would be needed to connect to the system. Coordination will be undertaken with the DEM to determine if certain improvements to the County's wastewater system will be required to service the project. Construction waste will be disposed at the County's Central Maui Landfill or appropriate construction recycling centers. In addition, once built and occupied, the project is anticipated to be served by the County's refuse collection service.**			
Objective:			
(3) Significantly increase the use of renewable and green technologies to promote energy efficiency and energy self-sufficiency.		✓	
Policies:			
(a) Promote the use of locally renewable energy sources, and reward energy efficiency.			✓
(b) Consider tax incentives and credits for the development of sustainable- and renewable-energy sources.			✓
(c) Expand education about energy conservation and self-sufficiency.			✓
(d) Encourage small-scale energy generation that utilizes wind, sun, water,		✓	

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
biowaste, and other renewable sources of energy.			
(e) Expand renewable-energy production.		✓	
(f) Develop public-private partnerships to ensure the use of renewable energy and increase energy efficiency.			✓
(g) 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.			✓
(h) Encourage the use of sustainable energy to power vehicles.			✓
(i) Promote the retrofitting of existing buildings and new development to incorporate energy-saving design concepts and devices.			✓
(j) Encourage green footprint practices.			✓
(k) Reduce Maui County's dependence on fossil fuels and energy imports.		✓	
(l) Support green building practices such as the construction of buildings that aim to minimize carbon dioxide production, produce renewable energy, and recycle water.			✓
(m) Promote and support environmentally friendly practices in all energy sectors.			✓
Implementing Actions:			
(a) Adopt an energy-efficiency policy for Maui County government as a model for other jurisdictions.			✓
(b) Adopt a Green Building Code, and support green building practices.			✓
Analysis: **Each home built, whether turn-key or lessee built, will be required to have a solar water heater system pursuant to MCC, Section 16.16B.R403.5.5. In addition, individual homeowners may choose to install solar PV systems on their homes if desired, thus indirectly supporting this objective and related policies by advancing measures to lessen dependence on fossil fuel based energy.**			
Objective:			
(4) Direct growth in a way that makes efficient use of existing infrastructure and to areas where there is available infrastructure capacity.		✓	
Policies:			
(a) Capitalize on existing infrastructure capacity as a priority over infrastructure expansion.		✓	
(b) Planning for new towns should only be considered if a region's growth is too large to be directed into infill and adjacent growth areas.			✓
(c) Utilize appropriate infrastructure technologies in the appropriate locations.			✓
(d) Promote land use patterns that can be provided with infrastructure and public facilities in a cost-effective manner.		✓	
(e) 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.			✓
Implementing Actions:			
(a) Develop a streamlining system for urban infill projects.			✓
(b) Identify appropriate areas for urban expansion of existing towns where infrastructure and public facilities can be provided in a cost-effective manner.			✓
Analysis: **The proposed project will be implemented in a developed area in West Maui, in proximity to existing infrastructure and services. DHHL beneficiaries will be located near jobs, schools, recreation, and other services in Lahaina and Kāʻanapali.**			
Objective:			
(5) Improve the planning and management of infrastructure systems.		✓	

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
Policies:			
(a) Provide a reliable and sufficient level of funding to enhance and maintain infrastructure systems.			✓
(b) Require new developments to contribute their pro rata share of local and regional infrastructure costs.			✓
(c) Improve coordination among infrastructure providers and planning agencies to minimize construction impacts.			✓
(d) Maintain inventories of infrastructure capacity, and project future infrastructure needs.			✓
(e) Require social-justice and -equity issues to be considered during the infrastructure-planning process.			✓
(f) Discourage the development of critical infrastructure systems within hazard zones and the tsunami-inundation zone to the extent practical.			✓
(g) Ensure that infrastructure is built concurrent with or prior to development.		✓	
(h) Ensure that basic infrastructure needs can be met during a disaster.			✓
(i) Locate public facilities and emergency services in appropriate locations that support the health, safety, and welfare of each community and that minimize delivery inefficiencies.			✓
(j) Promote the undergrounding of utility and other distribution lines for health safety, and aesthetic reasons.			✓
Implementing Actions:			
(a) Develop and regularly update functional plans for infrastructure systems.			✓
(b) Develop, adopt, and regularly update local or community-sensitive level-of service standards for infrastructure systems.			✓
Analysis: **The proposed project will be implemented in a developed area in West Maui, in proximity to existing infrastructure and services. It is important to note that this project will support the native Hawaiian population to provide equitable access to housing. The project will also be implementing infrastructure improvements to service the proposed residential lots.**			
J. 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:			
(1) Improve land use management and implement a directed-growth strategy.		✓	
Policies:			
(a) Establish, map, and enforce urban- and rural-growth limits.		✓	
(b) Direct urban and rural growth to designated areas.		✓	
(c) Limit the number of visitor-accommodation units and facilities in Community Plan Areas.			✓
(d) Maintain a sustainable balance between the resident, part-time resident, and visitor populations.			✓
(e) Encourage redevelopment and infill in existing communities on lands intended for urban use to protect productive farm land and open-space resources.			✓
(f) Discourage new entitlements for residential, resort, or commercial development along the shoreline.			✓
(g) Restrict development in areas that are prone to natural hazards, disasters, or sea-level rise.		✓	
(h) Direct new development in and around communities with existing infrastructure and service capacity, and protect natural, scenic, shoreline, and cultural		✓	

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
resources.			
(i) Establish and maintain permanent open space between communities to protect each community's identity.			✓
(j) Support the dedication of land for public uses.			✓
(k) Preserve the public's rights of access to and continuous lateral access along all shorelines.			✓
(l) Enable existing and future communities to be self-sufficient through sustainable land use planning and management practices.			✓
(m) Protect summits, slopes, and ridgelines from inappropriate development.			✓
Implementing Actions:			
(a) Regularly update urban- and rural-growth boundaries and their maps.			✓
(b) Establish transfer and purchase of development rights programs.			✓
(c) Develop and adopt a green infrastructure plan.			✓
(d) Develop studies to help determine a sustainable social, environmental, and economic carrying capacity for each island.			✓
(e) Identify and define resort-destination areas.			✓
Analysis: **Although the proposed project repurposes lands designated for agricultural uses for residential purposes, the project area is located within the Urban Growth Boundary as designated by the County of Maui's Maui Island Plan and within an area planned for growth. The proposed project will be implemented in a developed area in West Maui, in proximity to existing infrastructure and services and in an area outside of flood, tsunami, and sea level rise hazard areas.**			
Objective:			
(2) Improve planning for and management of agricultural lands and rural areas.			✓
Policies:			
(a) Protect prime, productive, and potentially productive agricultural lands to maintain the islands' agricultural and rural identities and economies.			✓
(b) Provide opportunities and incentives for self-sufficient and subsistence homesteads and farms.			✓
(c) Discourage developing or subdividing agriculturally designated lands when non-agricultural activities would be primary uses.			✓
(d) Conduct agricultural-development planning to facilitate robust and sustainable agricultural activities.			✓
Implementing Actions:			
(a) Inventory and protect prime, productive, and potentially productive agricultural lands from competing non-agricultural land uses.			✓
Analysis: **As previously discussed, the proposed project will be developed on lands designated for agriculture use. Although designated for agriculture, the lands have not been in cultivation for several years. In the context of the amount of viable agriculture lands on the island of Maui, implementation of the proposed action to create much needed housing in a developed area with other residential subdivisions is not considered to adversely affect agricultural productivity on Maui. As such, the objective of improving planning for and managing agriculture lands and rural areas are not applicable to this project.**			
Objective:			
(3) Design all developments to be in harmony with the environment and to protect each community's sense of place.			✓
Policies:			
(a) Support and provide incentives for green building practices.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(b) Encourage the incorporation of green building practices and technologies into all government facilities to the extent practicable.			✓
(c) Protect and enhance the unique architectural and landscape characteristics of each Community Plan Area, small town, and neighborhood.			✓
(d) Ensure that adequate recreational areas, open spaces, and public-gathering places are provided and maintained in all urban centers and neighborhoods.			✓
(e) Ensure business districts are distinctive, attractive, and pedestrian-friendly destinations.			✓
(f) Use trees and other forms of landscaping along rights-of-way and within parking lots to provide shade, beauty, urban-heat reduction, and separation of pedestrians from automobile traffic in accordance with community desires.			✓
(g) Where appropriate, integrate public-transit, equestrian, pedestrian, and bicycle facilities, and public rights-of-way as design elements in new and existing communities.			✓
(h) Ensure better connectivity and linkages between land uses.			✓
(i) Adequately buffer and mitigate noise and air pollution in mixed-use areas to maintain residential quality of life.			✓
(j) Protect rural communities and traditional small towns by regulating the footprint, locations, site planning, and design of structures.			✓
(k) Support small-town revitalization and preservation.			✓
(l) Facilitate safe pedestrian access, and create linkages between destinations and within parking areas.			✓
Implementing Actions:			
(a) Establish design guidelines and standards to enhance urban and rural environments.			✓
(b) Provide funding for civic-center and civic-space developments.			✓
(c) Establish and enhance urban forests in neighborhoods and business districts.			✓
Analysis: **The objectives and policies are not directly or indirectly applicable to the proposed project.**			
Objective:			
(4) Improve and increase efficiency in land use planning and management.		✓	
Policies:			
(a) Assess the cumulative impact of developments on natural ecosystems, natural resources, wildlife habitat, and surrounding uses.		✓	
(b) Ensure that new development projects requiring discretionary permits demonstrate a community need, show consistency with the General Plan, and provide an analysis of impacts.			✓
(c) Encourage public and private partnerships to preserve lands of importance, develop housing, and meet the needs of residents.		✓	
(d) Promote creative subdivision designs that implement best practices in land development, sustainable management of natural and physical resources, increased pedestrian and bicycle functionality and safety, and the principles of livable communities.		✓	
(e) Coordinate with Federal, State, and County officials in order to ensure that land use decisions are consistent with County plans and the vision local populations have for their communities.			✓
(f) Enable greater public participation in the review of subdivisions.			✓
(g) Improve land use decision making through the use of land- and geographic information systems.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
Implementing Actions:			
(a) Institute a time limit and sunsetting stipulations on development entitlements and their implementation.			✓
Analysis: **The proposed project entails the development of affordable homestead lots for beneficiaries of the DHHL. The design and environmental review processes involved detailed analysis of the proposed project's potential impacts on the environment, infrastructure, and socio-economic conditions. In addition, opportunities for public input were afforded through the environmental review process.**			
K. STRIVE FOR GOOD GOVERNANCE			
Objective:			
(1) Strengthen governmental planning, coordination, consensus building, and decision making.		✓	
Policies:			
(a) Plan and prepare for the effects of social, demographic, economic, and environmental shifts.			✓
(b) Plan for and address the possible implications of Hawaiian sovereignty.			✓
(c) Encourage collaboration among government agencies to reduce duplication of efforts and promote information availability and exchange.		✓	
(d) Expand opportunities for the County to be involved in and affect State and Federal decision making.			✓
(e) Plan and prepare for large-scale emergencies and contingencies.			✓
(f) Improve public awareness about preparing for natural hazards, disasters, and evacuation plans.			✓
(g) Improve coordination among Federal, State, and County agencies.			✓
Implementing Actions:			
(a) Develop policies, regulations, and programs to protect and enhance the unique character and needs of the County's various communities.			✓
(b) Evaluate and if necessary, recommend modifications to the County Charter that could result in a possible change to the form of governance for Maui County.			✓
(c) Study and evaluate the feasibility and implications of voting in Maui County Council elections.			✓
(d) Study and evaluate the feasibility of authorizing town governments in Maui County.			✓
Analysis: **The objective of strengthening governmental planning, coordination, consensus building, and decision making along with the policies that support this objective is not directly applicable to the proposed project. However, it is important to note that continuing coordination between government entities is critical to the success of the project.**			
Objective:			
(2) Promote civic engagement.		✓	
Policies:			
(a) Foster consensus building through in-depth, innovative, and accessible public participatory processes.		✓	
(b) Promote and ensure public participation and equal access to government among all citizens.			✓
(c) Encourage a broad cross-section of residents to volunteer on boards and commissions.			✓
(d) Encourage the State to improve its community-involvement processes.			✓
(e) Support community-based decision making.		✓	
(f) Expand advisory functions at the community level.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(g) Expand opportunities for all members of the public to participate in public meetings and forums.		✓	
(h) Facilitate the community's ability to obtain relevant documentation.			✓
(i) Increase voter registration and turnout.			✓
Implementing Actions:			
(a) Implement two-way communication using audio-visual technology that allows residents to participate in the County's planning processes.			✓
(b) Ensure and expand the use of online notification of County business and public meetings, and ensure the posting of all County board and commission meeting minutes.			✓
(c) Explore funding mechanisms to improve participation by volunteers on boards and commissions.			✓
(d) Develop a project-review process that mandates early and ongoing consultation in and with communities affected by planning and land use activities.			✓
Analysis: **As mentioned previously, the design and environmental review processes involved opportunities for the public to provide input throughout the environmental review process. Public meetings and requests for comments were included which provided the space or engagement and feedback opportunities. Additionally, the Hawaiian Homes Commission meetings are open to the public.**			
Objective:			
(3) Improve the efficiency, reliability, and transparency of County government's internal processes and decision making.			✓
Policies:			
(a) Use advanced technology to improve efficiency.			✓
(b) Simplify and clarify the permitting process to provide uniformity, reliability, efficiency, and transparency.			✓
(c) Improve communication with Lana'i and Moloka'i through the expanded use of information technologies, expanded staffing, and the creation and expansion of government-service centers.			✓
(d) Ensure that laws, policies, and regulations are internally consistent and effectuate the intent of the General Plan.			✓
Implementing Actions:			
(a) Update the County Code to be consistent with the General Plan.			✓
(b) Identify and update County regulations and procedures to increase the productivity and efficiency of County government.			✓
(c) Develop local level-of-service standards for infrastructure, public facilities, and services.			✓
(d) Implement plans through programs, regulations, and capital improvements in a timely manner.			✓
(e) Expand government online services.			✓
Analysis: **The objective and policies as it relates to improving the efficiency, reliability, and transparency of County government's internal processes and decision making is not applicable to the proposed project.**			
Objective:			
(4) Adequately fund in order to effectively administer, implement, and enforce the General Plan.			✓
Policies:			
(a) Adequately fund, staff, and support the timely update and implementation of planning policy, programs, functional plans, and enforcement activities.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(b) Ensure that the County's General Plan process provides for efficient planning at the County, island, town, and neighborhood level.			✓
(c) Encourage ongoing professional development, education, and training of County employees.			✓
(d) Encourage competitive compensation packages for County employees to attract and retain County personnel.			✓
(e) Enable the County government to be more responsive in implementing our General Plan and Community Plans.			✓
(f) Review discretionary permits for compliance with the Countywide Policy Plan.			✓
(g) Strengthen the enforcement of County, State, and Federal land use laws.			✓
Implementing Actions:			
(a) Establish penalties to ensure compliance with County, State, and Federal land use laws.			✓
Analysis: **The objective and policies regarding the funding of the General Plan do not apply to the proposed action.**			
Objective:			
(5) Strive for County government to be a role model for implementing cultural and environmental policies and practices.			✓
Policies:			
(a) Educate residents on the benefits of sustainable practices.			✓
(b) Encourage the retention and hiring of qualified professionals who can improve cultural and environmental practices.			✓
(c) Incorporate environmentally sound and culturally appropriate practices in government operations and services.			✓
(d) Encourage all vendors with County contracts to incorporate environmentally sound and culturally appropriate practices.			✓
Analysis: **The objective and policies regarding the County of Maui implementing cultural and environmental practices does not apply to the proposed DHHL project.**			
L. MITIGATE CLIMATE CHANGE AND WORK TOWARD RESILIENCE			
Goal: Minimize the causes and negative effects of climate change.		✓	
Objective:			
(1) Lower carbon emissions levels to mitigate climate change impacts and limit the rate of global warming.		✓	
Policies:			
(a) Increase reforestation efforts by encouraging residents and visitors to plant non-invasive gardens and trees.			✓
(b) Improve communication, coordination, and collaboration among those that work to mitigate climate change impacts.			✓
(c) Promote the teaching and use of regenerative agriculture.			✓
(d) Invest in infrastructure that is not dependent on fossil fuels and utilizes renewable energy.			✓
(e) Improve efforts to mitigate and plan for the impact of natural disasters and global warming.			✓
(f) Encourage the building industry to use environmentally sustainable materials, technology, and site planning.			✓
(g) Reduce air, noise, light, land, and water pollution, and reduce Maui County's contribution to global climate change.			✓
(h) Plan and prepare for and educate visitors and residents about the possible effects of global warming.			✓

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(i) Promote programs and incentives that decrease greenhouse-gas emissions and improve environmental stewardship.			✓
(j) Support the development of carbon-emission standards and an incentive program aimed at achieving County carbon-emission goals.			✓
Implementing Actions:			
(a) Implement Federal and State policies that require a reduction of greenhouse-gas emissions.			✓
(b) Establish a Countywide Climate Action Plan			✓
(c) Develop programs that assist residents and businesses with obtaining access to renewable energy sources.			✓
(d) Revise laws to support neighborhood designs that incorporate the use of renewable energy sources that are appropriate for island living.			✓
(e) Incorporate planting of native and indigenous trees as a major component of Urban Design to both cool neighborhoods and reduce carbon dioxide.			✓
(f) Coordinate with State, County, and private landowners in the development of forestry and prioritizing of native and indigenous trees to reduce carbon dioxide.			✓
(g) Strongly support efforts to restore and improve Maui County's watersheds for the purpose of improving the water supply, controlling carbon dioxide levels, decreasing soil runoff, and reducing coastal flooding.			✓
Analysis: **The proposed subdivision will implement green building practices such as, solar water heating which indirectly lowers carbon emission levels and limits the rate of global warming.**			
Objective:			
(2) Reduce the impacts of sea-level rise by acknowledging climate change, adapting, mitigating, and planning accordingly.		✓	
Policies:			
(a) Evaluate development to assess potential short-term and long-term sea-level rise impacts on nearshore environments.		✓	
(b) Improve efforts to mitigate and plan for the impact of sea-level rise.			✓
(c) Protect undeveloped beaches, dunes, and ecosystems, and restore natural shoreline processes.			✓
(d) Develop an inventory of private wastewater systems (septic systems, cesspools) that may be affected by sea-level rise.			✓
(e) Strengthen coastal-zone management, re-naturalization of shorelines, where possible, and filtration or treatment of urban and agricultural runoff.			✓
(f) Educate the construction and landscape industries and property owners about the use of best management practices to prevent erosion and nonpoint source pollution.			✓
(g) Discourage beach hardening processes such as building sea walls and revetments that block movement of the shoreline and can accelerate erosion.			✓
(h) Discourage new entitlements for residential, resort, or commercial development along the shoreline.			✓
(i) Restrict development in areas that are prone to sea-level rise.			✓
(j) Move or rebuild public facilities away from nearshore environments to account for sea-level rise to the extent reasonable.			✓
(k) Move or rebuild roads that are in sea-level ri0se inundation zones to the extent reasonable.			✓
(l) Ensure that public or affordable housing projects include siting and design standards that promote equity and resilience for vulnerable populations.			✓
(m) Identify, research, and evaluate innovative and sustainable financing to support mitigation and adaptation to sea level rise.			✓
Implementing Actions:			

COUNTYWIDE POLICY PLAN (Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable)	DA	IA	NA
(a) Develop programs to help transition shoreline property owners out of their nearshore locations and develop a long-term plan to stay out of the way of natural beach migration.			✓
(b) Identify buildings, roads, and other infrastructure that are in sea-level rise inundation zones and assist in adaptive efforts, including nature-based solutions, elevation, or moving them away from such zones.			✓
(c) Identify disaster redevelopment alternatives that support resilience-focused adaptation to sea level rise in the event of a catastrophic coastal event.			✓
Analysis: **The proposed subdivision will be located inland, away from the coastline and the 3.2-foot sea-level rise exposure area, indirectly mitigating the effects of climate change and ensuring the long-term viability of the project. In addition, BMPs to prevent erosion and nonpoint source pollution will be implemented by the contractor to minimize negative impacts to the environment.**			
Objective:			
(3) Significantly increase the use of renewable and green technologies to. promote energy efficiency and energy self-sufficiency.		✓	
Policies:			
(a) Promote the use of locally renewable energy sources, and reward energy efficiency.		✓	
(b) Consider tax incentives and credits for the development of sustainable- and renewable-energy sources.			✓
(c) Expand education about energy conservation and self-sufficiency.			✓
(d) Encourage small-scale energy generation that utilizes wind, sun, water, biowaste, and other renewable sources of energy.			✓
(e) Expand renewable-energy production.			✓
(f) Develop public-private partnerships to ensure the use of renewable energy and increase energy efficiency.			✓
(g) 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.			✓
(h) Encourage the use of sustainable energy to power vehicles.			✓
(i) Promote the retrofitting of existing buildings and new development to incorporate energy-saving design concepts and devices.		✓	
(j) Encourage green footprint practices.			✓
(k) Reduce Maui County's dependence on fossil fuels and energy imports.		✓	
(l) Support green building practices such as the construction of buildings that aim to minimize carbon dioxide production, produce renewable energy, and recycle water.			✓
(m) Promote and support environmentally friendly practices in all energy sectors.			✓
Implementing Actions:			
(a) Adopt an energy-efficiency policy for Maui County government as a model for other jurisdictions.			✓
(b) Adopt a Green Building Code and support green building practices.			✓
Analysis: **Through the installation of solar water heating for the proposed subdivision, the project indirectly promotes the use of renewable energy sources and incorporates energy-efficient design into the project, helping to reduce dependence on fossil fuels and energy imports.**			

ANALYSIS OF THE PROJECT'S CONFORMANCE WITH THE MAUI ISLAND PLAN

APPENDIX

I-2

APPENDIX I-2

Analysis of Project Applicability to Maui Island Plan

The Maui Island Plan (MIP) is applicable to the island of Maui only, providing more specific policy-based strategies for population, land use, transportation, public and community facilities, water and wastewater systems, visitor destinations, urban design, and other matters related to future growth.

As provided by Chapter 2.80B, the MIP shall include the following components:

1. *An island-wide land use strategy, including a managed and directed growth plan*
2. *A water element assessing supply, demand and quality parameters*
3. *A nearshore ecosystem element assessing nearshore waters and requirements for preservation and restoration*
4. *An implementation program which addresses the County's 20-year capital improvement requirements, financial program for implementation, and action implementation schedule*
5. *Milestone indicators designed to measure implementation progress of the MIP*

It is noted that Ordinance No. 4004 does not address the component relating to the implementation program. Chapter 2.80B of the Maui County Code, relating to the General Plan, was amended via Ordinance No. 3979, October 5, 2012, to provide that the implementation program component be adopted no later than one (1) year following the effective date of Ordinance No. 4004. In December 2013 and March 2014, the Council approved time extensions for approval and adoption of the implementation chapter of the MIP. The implementation program component of the MIP was adopted as Ordinance No. 4126 on May 29, 2014.

The MIP addresses a number of planning categories with detailed policy analysis and recommendations which are framed in terms of goals, objectives, policies and implementing actions. These planning categories address the following areas:

1. *Population*
2. *Heritage Resources*
3. *Natural Hazards*
4. *Economic Development*
5. *Housing*
6. *Infrastructure and Public Facilities*
7. *Land Use*

The proposed project has been reviewed with respect to pertinent goals, objectives, policies and implementing actions of the MIP. The analysis is presented in the table below.

The methodology used for assessing a project's relationship to the MIP involves examining the project's applicability to the Plan's goals, objectives, and policies. "Applicability" refers to a project's need, purpose and effects, and how these advance or promote a particular set of goals, objectives and priority guidelines. In assessing the relationship between a proposed action and the MIP, an action may be categorized in one of the following groups:

1. **Directly applicable:** the action and its potential effects directly advances or promotes the objective, policy or priority guideline.

   Example: Using a county project to develop a new water source and related transmission facilities as an example, a project of this nature would be directly applicable to the MIP's Objective 6.3.2, which states: *"Increase the efficiency and capacity of the water systems in striving to meet the needs and balance the island's water needs".* As well, this action would directly advance the MIP's Policy 6.3.2.f, which states: *Acquire and develop additional sources of potable water.* The need, purpose and effects of the proposed new water source project is directly applicable to the foregoing objective and policy.

2. **Indirectly applicable:** the action's potential effects indirectly supports or advances the objective, policy or priority guideline.

   Example: The county water source project cited above supports the MIP's Objective 7.3.2 which states: *"Facilitate more self-sufficient and sustainable communities".* Additionally, this kind of action is indirectly applicable to the related MIP Policy 7.3.2.f, which states: *"Facilitate the development of housing by focusing projects in locations where land and infrastructure costs facilitate the development of affordably-priced housing".* In this case, the principle purpose of the project was not to specifically facilitate the development of affordably-priced housing. However, the project's contribution to adequate infrastructure systems is supportive of the policy. In this instance, the proposed action may be deemed to be indirectly applicable to the objective and policy of the MIP.

3. **Not applicable:** The action and its potential effects have no direct or indirect relationship to the objectives and policies of the Maui Island Plan.

   Example: That same county water source improvement project referenced above, may not have direct or indirect linkage to the MIP's Objective 4.2.1, which states: *"Increase the economic contribution of the visitor industry to the island's environmental well-being for the island's residents' quality of life".* In this case, there is no reasonably deduced direct or indirect relationship between the proposed action and Objective 4.2.1. Hence, the proposed action would be considered not applicable to the objective.

In general, a proposed action's applicability to the MIP is assessed on the basis of the action's direct or indirect relationship to the respective objectives, policies and implementing actions. It is recognized that the categorization of "applicability" is subject to interpretation and should be appropriately considered in the context of local and regional conditions.

Maui Island Plan Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable	DA	IA	NA
CHAPTER 1 – POPULATION			
Goal:			
1.1 Maui's people, values, and lifestyles thrive through strong, healthy, and vibrant island communities.		✓	
Objective:			
1.1.1 Greater retention and return of island residents by providing viable work, education, and lifestyle options.		✓	
Policies:			
1.1.1.a Expand programs that enable the community to meet the education, employment, housing, and social goals of youth and young adults.			✓
1.1.1.b Expand housing, transportation, employment, and social opportunities to ensure residents are able to comfortably age within their communities.		✓	
1.1.1.c Measure and track resident satisfaction through surveys and community indicators.			✓
1.1.1.d Support funding for transportation, housing, health care, recreation, and social service programs that help those with special needs (including the elderly and disabled).			✓
Analysis: **The proposed project provides additional homestead opportunities for Department of Hawaiian Home Lands (DHHL) beneficiaries in an area that is close to business, commercial, and visitor destination areas of Lahaina and Kāʻanapali. The proposed project will provide greater housing, indirectly promoting a strong, healthy, and vibrant island community and greater retention of island residents closer to their local employment, education, and social opportunities.**			
CHAPTER 2 – HERITAGE RESOURCES			
CULTURAL, HISTORICAL, AND ARCHAEOLOGICAL RESOURCES ISSUES			
Goal:			
2.1 Our community respects and protects archaeological and cultural resources while perpetuating diverse cultural identities and traditions.			✓
Objective:			
2.1.1 An island culture and lifestyle that is healthy and vibrant as measured by the ability of residents to live on Maui, access and enjoy the natural environment, and practice Hawaiian customs and traditions in accordance with Article XII, Section 7, Hawaiʻi State Constitution, and Section 7-1, Hawai`i Revised Statutes (HRS).			✓
Policies:			
2.1.1.a Perpetuate the spirit of aloha and celebrate the host Hawaiian culture and other ethnic cultures.			✓
2.1.1.b Perpetuate a respect for diversity and recognize the broad blending of cultures and ethnicities as vital to the quality of life on Maui.			✓

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2.1.1.c Ensure traditional public access routes, including native Hawaiian trails, are maintained for public use.			✓
2.1.1.d Support the education of visitors and new residents about the customs and etiquette of the Hawaiian culture, as well as other cultures.			✓
Analysis: **The objective and policies related to maintaining an island cultural and lifestyle that is healthy and vibrant are not directly or indirectly applicable to the proposed project.**			
Objective:			
2.1.2 A more effective and efficient planning and review process that incorporates the best available cultural resources inventory, protection techniques, and preservation strategies.		✓	
Policies:			
2.1.2.a Ensure that the island has a comprehensive and up-to-date inventory of historic and archaeological resources, and their cultural significance.		✓	
2.1.2.b Require the update of existing planning and regulatory mechanisms to protect the natural, cultural, scenic, and historic resources within designated Heritage Areas (see Cultural Resources Overlay/Scenic Corridor Protection Technical Reference Map).			✓
2.1.2.c Ensure that cultural, historic, and archaeological resources are protected for the benefit of present and future generations.		✓	
Objective:			
2.1.3 Enhance the island's historic, archaeological, and cultural resources.		✓	
Policies:			
2.1.3.a Identify and pursue a listing of the properties and sites on the State and National Register of Historic Places.			✓
2.1.3.b Support the use of easements, dedications, and other mechanisms to acquire, maintain, and protect lands with cultural, archaeological, and historic significance.			✓
2.1.3.c Support regulations to require developers, when appropriate, to prepare an Archaeological Inventory Survey, Cultural Impact Assessment, and Ethnographic Inventories that are reviewed and commented upon by the Office of Hawaiian Affairs, Native Hawaiian advisory bodies, the State Historic Preservation Division (SHPD), and the Office of Environmental Quality Control, and systematically comply with the steps listed in SHPD's administrative rules, including consultation and monitoring during construction phases of projects.		✓	
2.1.3.d Promote the rehabilitation and adaptive reuse of historic sites, buildings, and structures.			✓
2.1.3.e Encourage property owners to register historic and archaeological sites on the State and National Register.			✓
2.1.3.f Support opportunities for public involvement with the intent to facilitate the protection and restoration of historic and archeological sites, including consultation with stakeholders.		✓	
2.1.3.g Encourage the resolution of land title questions relating to Land Commission Awards and Royal patents.			✓

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2.1.3.h Ensure compliance with historic preservation laws, and discourage demolition of properties that are determined to be eligible for listing on the National or State Register of Historic Places.		✓	
Analysis: **The objectives and policies relating to ensuring an effective and efficient planning and review process incorporating best available cultural resources inventory, protection techniques, and preservation strategies and enhancement of the island's historic, archaeological, and cultural resources are directly and indirectly applicable to the proposed project. An Archaeology Inventory Survey (AIS) was prepared to identify any potential historic resources present within the project area and advance mitigation measures so as to avoid significant project-related impacts. In addition, a Cultural Impact Assessment (CIA) was prepared for the proposed project and noted that based on historical research and consultation, there is evidence of cultural practices related to Hawaiian rights related to agricultural pursuits, access to resources, and other customary activities presently occurring in the vicinity of the proposed project, but not necessarily within the proposed project area itself.**			
SHORELINE, REEFS, AND NEARSHORE WATERS			
Goal:			
2.2 An intact, ecologically functional system of reef, shoreline, and nearshore waters that are protected in perpetuity.		✓	
Objective:			
2.2.1 A more comprehensive and community-based ICZM program.			✓
Policies:			
2.2.1.a Encourage a management system that protects and temporarily rests the reef ecosystems from overuse.			✓
2.2.1.b Support the establishment of additional MMAs and reef replenishment areas.			✓
2.2.1.c Work with appropriate agencies and community members to protect any special managed conservation areas from overuse and ensure that surrounding land uses do not contribute to the degradation of the natural resources, such as 'Ahihi-Kina'u Natural Area Reserve, Honolua-Mokulē'ia Bay Marine Life Conservation District, and Mākena State Park.			✓
2.2.1.d Incorporate the following into the MIP, where consistent with the MIP:			✓
(1) Beach Management Plan for Maui;			✓
(2) Coastal Nonpoint Pollution Control Program Management Plan;			✓
(3) Implementation Plan for Polluted Runoff Control; and			✓
(4) Ocean Resource Management Plan.			✓
2.2.1.e Support greater coordination among governmental agencies involved with the protection of the island's marine resources.			✓
Objective:			
2.2.2 Improved reef health, coastal water quality, and marine life.		✓	
Policies:			
2.2.2.a Create additional mechanisms where needed to contain and control runoff and		✓	

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pollution.			
2.2.2.b Allow extraction of high quality, Class A, low silt sands only when they will be used to protect or restore Maui's shorelines and beaches.			✓
2.2.2.c Carefully manage beach nourishment activities to protect the coastal and marine ecosystem.			✓
2.2.2.d Require, where appropriate, a buffer between landscaped areas and the shoreline, gulches, and streams to reduce the runoff of fertilizers, pesticides, herbicides, and other pollutants into coastal waters.			✓
2.2.2.e Strictly regulate shoreline armoring in accordance with adopted Shoreline Rules, with an intent to protect the coastal and marine ecosystem.			✓
2.2.2.f Support greater protection of Keālia Pond National Wildlife Refuge through the following:			✓
(1) Enhancement of marine ecosystems;			✓
(2) Beach and sand dune restoration; and			✓
(3) Expansion of habitat for Maui's threatened or endangered sea turtles, birds, and other species.			✓
2.2.2.g Support the development of regulations to prevent the excessive depletion of fish stocks due to non-sustainable practices and gear such as SCUBA spear-fishing and lay nets, within the context of nearshore ecosystems.			✓
2.2.2.h Encourage the State to conduct a regular census of fish populations and monitor coral health.			✓
2.2.2.i Encourage the State to significantly increase the number of park rangers, enforcement officers, and marine biologists to protect coastal resources.			✓
2.2.2.j Encourage the State to prohibit the collection and exportation of fish, coral, algae, and other marine species for the ornamental and aquarium trade.			✓
Objective:			
2.2.3 Water quality that meets or exceeds State Clean Water Act standards.		✓	
Policies:			
2.2.3.a Reduce the amount of impervious surface and devise site plan standards that aim to minimize storm runoff and NPS pollution.		✓	
2.2.3.b Support the revision of existing regulations to require an Erosion and Sedimentation Control Plan (ESCP) for development activities that may pose a threat to water quality.			✓
2.2.3.c Require an on-site monitoring program, where applicable, when grading may pose a threat to water quality or when recommended in the ESCP.			✓
2.2.3.d Avoid development actions that impair Maui's reef systems and remove identified stressors.			✓
2.2.3.e Phase out cesspools and restrict the use of septic systems in ecologically sensitive coastal areas by converting to environmentally-friendly alternative sewage treatment systems, and connecting to central sewerage systems when and where feasible.			✓
2.2.3.f Prohibit the development of new wastewater injection wells, except when unavoidable for public health and safety purposes.			✓

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2.2.3.g Ensure that the County upholds its affirmative duty under the Clean Water Act by monitoring and reducing point and NPS pollution to help safeguard coastal waters.			✓
Objective:			
2.2.4 Acquire additional shoreline lands and shoreline access rights.			✓
Policies:			
2.2.4.a Promote the use of conservation easements, land trusts, transfer and purchase of development rights, and mitigation banking.			✓
2.2.4.b Require the dedication of public beach and rocky shoreline access ways to and along the shoreline where it serves a practical public interest as a condition of development or subdivision approval; future subdivisions and developments shall be consistent with and effectuate, to the extent practicable, the *Shoreline Access Inventory Update - Final Report* (March 2005), and its updates.			✓
2.2.4.c Incorporate the *Shoreline Access Inventory Update - Final Report* (March 2005), and its regular updates, into this plan.			✓
2.2.4.d Identify access points while further acquiring key shoreline parcels and easement rights to enhance and protect beach access and shoreline recreation.			✓
***Analysis:* There are no direct project considerations as it relates to shoreline management programming, reef health, coastal water quality, marine life or shoreline lands and access rights. However, inasmuch as the proposed action does involve grading and earth moving activities, the project may be considered to have indirect applicability to objectives and policies relating to coastal water quality. As such, appropriate Best Management Practices (BMPs) will be implemented during construction to ensure that soil erosion and runoff do not adversely affect coastal water.**			
WATERSHEDS, STREAMS, AND WETLANDS ISSUES			
Goal:			
2.3 Healthy watersheds, streams, and riparian environments.		✓	
Objective:			
2.3.1 Greater protection and enhancement of watersheds, streams, and riparian environments.			✓
Policies:			
2.3.1.a All present and future watershed management plans shall incorporate concepts of ahupuaʻa management based on the interconnectedness of upland and coastal ecosystems/species.			✓
2.3.1.b Continue to support and be an active member of watershed partnerships.			✓
2.3.1.c Support the establishment of regional water trusts, composed of public and private members, to manage water resources.			✓
2.3.1.d Support regulations to require developments to utilize ahupuaʻa management practices.			✓
2.3.1.e Work with private and non-profit entities to educate the public about the connection between upland activities within the watershed and the impacts on nearshore ecosystems and coral reefs.			✓

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2.3.1.f Provide adequate funding and staff to develop and implement watershed protection plans and policies, including acquisition and management of watershed resources and land.			✓
2.3.1.g Encourage the State to mandate instream assessment to provide adequate water for native species.			✓
2.3.1.h Maui will protect all watersheds and streams in a manner that guarantees a healthy, sustainable riparian environment.			✓
Objective:			
2.3.2 Decreased NPS and point source pollution.		✓	
Policies:			
2.3.2.a Enforce water pollution related standards and codes.			✓
2.3.2.b Support the use of LID Techniques such as those described in the State of Hawaiʻi LID Practitioner's Guide (June 2006), as amended.		✓	
2.3.2.c Encourage farmers and ranchers to use agricultural BMPs to address NPS pollution.			✓
Objective:			
2.3.3 Preserve existing wetlands and improve and restore degraded wetlands.			✓
Policies:			
2.3.3.a Prohibit the destruction and degradation of existing upland, mid-elevation, and coastal wetlands.			✓
2.3.3.b Support and fund wetland protection and improvement, and restoration of degraded wetlands.			✓
2.3.3.c Where applicable, require developers to provide a wetland protection buffer and/or other protective measures around and between development and wetland resources.			✓
Objective:			
2.3.4 Greater preservation of native flora and fauna biodiversity to protect native species.			✓
Policies:			
2.3.4.a Work with appropriate agencies to eliminate feral ungulate populations and invasive species.			✓
2.3.4.b Encourage the State to provide adequate funding to preserve biodiversity, protect native species, and contain or eliminate invasive species.			✓
2.3.4.c Support the work of conservation groups and organizations that protect, reestablish, manage, and nurture sensitive ecological areas and threatened indigenous ecosystems.			✓
Objective:			
2.3.5 Limited development in critical watershed areas.			✓
Policies:			
2.3.5.a Discourage development and subdivision of land within critical watersheds and in areas susceptible to high erosion and sediment loss.			✓

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2.3.5.b Designate critical watershed areas as conservation lands.			✓
2.3.5.c Strongly encourage new subdivisions and developments that are proximate to environmentally sensitive watershed resources to prepare and implement CSD plans.			✓
Objective:			
2.3.6 Enhance the vitality and functioning of streams, while balancing the multiple needs of the community.			✓
Policies			
2.3.6.a Protect and enhance natural streambeds and discourage stream alteration.			✓
2.3.6.b Work with appropriate agencies to establish minimum stream flow levels and ensure adequate stream flow to sustain riparian ecosystems, traditional kalo cultivation, and self-sustaining ahupua'a.			✓
2.3.6.c Respect and participate in the resolution of native Hawaiian residual land and water rights issues (kuleana lands, ceded lands, and historic agricultural and gathering rights).			✓
2.3.6.d Ensure that stream flows implement laws and policies found in the State Constitution and Water Code.			✓
2.3.6.e Work with appropriate agencies and stakeholders to establish minimum stream flow levels, promote actions to support riparian habitat and the use of available lo'i, and maintain adequate flows for the production of healthy kalo crops.			✓
***Analysis:* The proposed project is not directly applicable to the goal of maintaining healthy watersheds, streams, and riparian environments, however, appropriate BMPs will be used during construction and applicable drainage detention and water quality measures will be provided for the long-term habitation of the site. LID measures will also be incorporated into the project.**			
WILDLIFE AND NATURAL AREAS			
Goal:			
2.4 Maui's natural areas and indigenous flora and fauna will be protected.		✓	
Objective:			
2.4.1 A comprehensive management strategy that includes further identification, protection, and restoration of indigenous wildlife habitats.		✓	
Policies:			
2.4.1.a Identify and inventory the following:			✓
(1) Natural, recreational, and open space resources;			✓
(2) Flora and fauna with medium, high, and very high concentrations of threatened or endangered species; and			✓
(3) Location and extent of invasive species.			✓
2.4.1.b Require flora and fauna assessment and protection plans for development in areas with concentrations of indigenous flora and fauna; development shall comply with the assessment and protection plan and shall use the avoidance, minimization, and mitigation approach respectively, with an emphasis on		✓	

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avoidance.			
2.4.1.c Support the implementation of Hawai`i's Comprehensive Wildlife Conservation Strategy (October 2005).			✓
Objective:			
2.4.2 A decrease in invasive species through programs and partnerships that eradicate undesirable species and protect native habitat.			✓
Policies:			
2.4.2.a Prevent the introduction of invasive species at all of Maui's airports and harbors.			✓
2.4.2.b Encourage the State to increase funding in support of invasive species interception, control, and eradication.			✓
2.4.2.c Encourage the State to develop programs that allow students to participate in invasive species eradication projects.			✓
Objective:			
2.4.3 Greater protection of sensitive lands, indigenous habitat, and native flora and fauna.		✓	
Policies:			
2.4.3.a Secure an interconnected network of sensitive lands, greenways, watercourses, and habitats.			✓
2.4.3.b Protect Maui's sensitive lands (see Sensitive Lands on Protected Areas Diagrams).			✓
2.4.3.c Promote innovative environmental-planning methods and site-planning standards that preserve and re-establish indigenous flora and fauna habitat, to preserve and restore connected habitat corridors and open space.			✓
2.4.3.d Utilize protection tools such as conservation easements, land trusts, land banks, Purchase of Developments Rights (PDRs), Transfer of Development Rights (TDRs), and other stewardship tools to acquire natural areas			✓
2.4.3.e Encourage discussions with communities to designate heritage areas that protect recreational and cultural lifestyles and resources.			✓
2.4.3.f Support the expansion of Haleakalā National Park, and the creation of new national parks, where appropriate and supported by local communities.			✓
2.4.3.g Encourage reforestation efforts that increase native species' habitat.			✓
2.4.3.h Utilize the Natural Area Partnership Program (NAPP) and other programs to protect natural lands.			✓
2.4.3.i Support increased dedicated funding for the acquisition, protection, restoration, or preservation of important natural areas or open space through the following: grants from the Land and Water Conservation Fund; dedicated funding from real property taxes or other appropriate revenues; bond issues; real estate transfer tax; revenues from the Transient Accommodations Tax; development mitigation fees; and other appropriate funding sources.			✓
***Analysis:* The environmental review process for the proposed action included a flora and fauna survey addressing biological resources in the project area. This assessment addresses the objective of identification and protection (as applicable) restoration of wildlife habitats.**			

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SCENIC RESOURCES			
Goal:			
2.5 Maui will continue to be a beautiful island steeped in coastal, mountain, open space, and historically significant views that are preserved to enrich the residents' quality of life, attract visitors, provide a connection to the past, and promote a sense of place.		✓	
Objective:			
2.5.1 A greater level of protection for scenic resources.		✓	
Policies:			
2.5.1.a Protect views to include, but not be limited to, Haleakalā, 'Īao Valley, the Mauna Kahalawai (West Maui Mountains), Pu'u Ō'la'i, Kaho'olawe, Molokini, Moloka'i, and Lāna'i, Mauna Kea, Mauna Loa, sea stacks, the Pacific Ocean, and significant water features, ridgelines, and landforms.			✓
2.5.1.b Identify, preserve, and provide ongoing management of important scenic vistas and open space resources, including mauka-to-makai and makai-to-mauka view planes.			✓
2.5.1.c Protect "night sky" resources by encouraging the implementation of ambient light ordinances and encouraging conversion of all sources that create excessive light pollution, affecting our ability to view the stars.			✓
2.5.1.d Protect ridgelines from development where practicable to facilitate the protection of public views.			✓
2.5.1.e Protect scenic resources along Maui's scenic roadway corridors.		✓	
Objective:			
2.5.2. Reduce impacts of development projects and public-utility improvements on scenic resources.		✓	
Policies:			
2.5.2.a Enforce the policies and guidelines of the SMA regarding the protection of views.		✓	
2.5.2.b Require any new subdivision of land, development, or redevelopment adjacent to a "high" or "exceptional" scenic corridor to submit an impact assessment of the project's scenic impacts; this assessment shall use the avoidance, minimization, and mitigation steps respectively, with an emphasis on avoidance.			✓
2.5.2.c Require appropriate building setbacks and limits on wall heights to protect views along scenic corridors.		✓	
2.5.2.d Encourage the State of Hawai`i Board of Land and Natural Resources to deny any development within the State Conservation District that interferes with a scenic landscape or disrupts important open space resources.			✓
2.5.2.e Require Urban Design and Review Board (UDRB) review and approval of utility poles, facilities, and other visible infrastructure improvements along scenic corridors.			✓
2.5.2.f Ensure little or no effect on scenic resources from utility improvements, primarily power poles.			✓
2.5.2.g Protect scenic vistas from intrusion by power poles.			✓

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Objective:			
2.5.3 Greater protection of and access to scenic vistas, access points, and scenic lookout points.		✓	
Policy:			
2.5.3.a Protect, enhance, and acquire access to Maui's scenic vistas and resources.			✓
Analysis: **The objectives and policies relating to protecting and maintaining scenic resources are indirectly applicable to the proposed project. The proposed project will be implemented along Leiali'i Parkway which provides views of the Pacific Ocean and the West Maui Mountains. The project is being carefully designed taking into consideration subdivision configuration and massing. The proposed residential development will be similar in scale and size to existing residential developments nearby and will be built in accordance with established subdivision standards.**			
CHAPTER 3 – NATURAL HAZARDS			
Goal:			
3.1 Maui will be disaster resilient.			✓
Objective:			
3.1.1 Increased inter-agency coordination.			✓
Policy:			
3.1.1.a Reinforce the island's preparedness capacity by:			✓
(1) Applying the latest data-gathering techniques/technology;			✓
(2) Pursuing funding opportunities;			✓
(3) Improving monitoring and advance warning systems;			✓
(4) Fostering public awareness; and			✓
(5) Working with external agencies to coordinate disaster mitigation and response.			✓
Objective:			
3.1.2 Greater protection of life and property.			✓
Policies:			
3.1.2.a Identify critical infrastructure, lifelines, roads, and populations that are vulnerable to coastal hazards, and encourage strategic retreat and relocation to safer areas.			✓
3.1.2.b Consider the location of dams, reservoirs, holding ponds, and other water-containing entities that are upstream of inhabited areas to anticipate, avoid, and mitigate inundation risks, and discourage new development in areas where possible inundation hazards may exist.			✓
3.1.2.c Strengthen current development standards to minimize destruction of land and property.			✓
3.1.2.d Encourage the use of construction techniques that reduce the potential for			✓

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damage from natural hazards.			
3.1.2.e Increase the County's resilience to drought.			✓
3.1.2.f Increase food and energy security through local production and storage.			✓
Objective:			
3.1.3 A more coordinated emergency response system that includes clearly defined and mapped evacuation routes.			✓
Policy:			
3.1.3.a Identify and expand shelter facilities and evacuation routes away from areas susceptible to natural hazards.			✓
Objective:			
3.1.4 A more educated and involved public that is aware of and prepared for natural hazards.			✓
Policies:			
3.1.4.a Promote public education and involvement related to natural hazards awareness and preparedness.			✓
3.1.4.b Coordinate a multi-agency effort to establish and promote a comprehensive public education program that will focus on practical approaches to preparedness, damage prevention, and hazard mitigation.			✓
***Analysis:* The objectives and policies related to making Maui disaster-resilient are not directly or indirectly applicable to the proposed project. The proposed action is limited to the development of a new residential subdivision for beneficiaries of the DHHL.**			
CHAPTER 4 – ECONOMIC DEVELOPMENT			
ECONOMIC DIVERSIFICATION			
Goal:			
4.1 Maui will have a balanced economy composed of a variety of industries that offer employment opportunities and well-paying jobs and a business environment that is sensitive to resident needs and the island's unique natural and cultural resources.		✓	
Objective:			
4.1.1 A more diversified economy.		✓	
Policies:			
4.1.1.a Encourage an economy that is driven by innovation, research and development, and human resource development, including but not limited to, increasing technology- and knowledge-based sectors to be a major component in Maui County's economic base.			✓
4.1.1.b Support the creation of new jobs and industries that provide a living wage.		✓	
4.1.1.c Facilitate and expedite permits and approvals.			✓
4.1.1.d Develop linkages and partnerships among international research and development activities and Maui businesses.			✓
Objective:			

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4.1.2 Increase activities that support principles of sustainability.			✓
Policies:			
4.1.2.a Support industries that are sustainable, and culturally and environmentally sensitive.			✓
4.1.2.b Encourage and support local businesses.		✓	
4.1.2.c Substitute imports with locally-produced services and products where practicable.			✓
4.1.2.d Support the development of economic development clusters in targeted industry sectors.			✓
4.1.2.e Encourage all businesses to save energy, water, and other resources.			✓
Objective:			
4.1.3 Improve the island's business climate.		✓	
Policies:			
4.1.3.a Upgrade, maintain the quality of, and improve access to telecommunications infrastructure.			✓
4.1.3.b Ensure an adequate supply of affordable workforce housing.		✓	
4.1.3.c Develop neighborhoods and communities that are attractive to the workforce of a diversified economy.			✓
4.1.3.d Encourage, nurture, and reward entrepreneurship and innovation.			✓
4.1.3.e Encourage employers to establish incentive programs. Support flexibility in workforce policies compatible with business and quality of life goals.			✓
4.1.3.f Assist community development organizations with revitalization and development of neighborhoods and communities that are attractive to the workforce of a diversified economy.			✓
***Analysis:* The proposed project will generate short-term construction-related employment opportunities, as well as supporting the construction industry as a whole, including local businesses that rely on said industry. Further, the proposed action will indirectly affect the local economy, as it is anticipated that residents of the project will support small businesses nearby. The proposed project also provides affordable housing options for native Hawaiian beneficiaries of the DHHL.**			
TOURISM			
Goal:			
4.2 A healthy visitor industry that provides economic well-being with stable and diverse employment opportunities.			✓
Objective:			
4.2.1 Increase the economic contribution of the visitor industry to the island's environmental well-being for the island's residents' quality of life.			✓
Policies:			
4.2.1.a Engage the visitor industry in the growth of emerging sectors where practicable.			✓

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4.2.1.b Support the implementation of the Maui County TSP, when consistent with the MIP.			✓
4.2.1.c Focus economic growth in the visitor industry through enhanced visitor experiences and an emphasis on attracting higher-spending.			✓
4.2.1.d Provide a rich visitor experience, while protecting the island's natural beauty, culture, lifestyles, and aloha spirit.			✓
4.2.1.e Diversify the tourism industry by supporting appropriate niche activities such as ecotourism, cultural tourism, voluntourism, ag-tourism, health and wellness tourism, educational tourism, medical tourism, and other viable tourism-related businesses in appropriate locations.			✓
4.2.1.f Recognize the important economic contributions that the visitor industry makes and support a healthy and vibrant visitor industry.			✓
4.2.1.g Support the increased availability of kamaʻāina discount programs.			✓
Objective:			
4.2.2 Comprehensively manage future visitor-unit expansion.			✓
Policies:			
4.2.2.a Mitigate the impact of tourism on the host culture, natural environment, and resident lifestyles.			✓
4.2.2.b Allow, where permitted by the community plan, the development of business hotels and small, sensitively-designed inns.			✓
4.2.2.c Manage impacts from transient vacation rentals, hotels, bed and breakfast units, timeshares, and resort condominiums on residential communities, public infrastructure, and community facilities.			✓
4.2.2.d Discourage supplanting of existing island housing to visitor accommodations that may have a negative impact on long-term rental housing, price of housing, and price of land.			✓
4.2.2.e Allow the designation of retreat/mini-conference centers in appropriate locations through the community plan process.			✓
4.2.2.f Community plans should consider establishing standards such as limits on building size, room count, and the number of inns, if any, that will be allowed in small towns.			✓
Objective:			
4.2.3 Maximize residents' benefits from the visitor industry.			✓
Policies:			
4.2.3.a Promote a desirable island population by striving to not exceed an island-wide visitor population of roughly 33 percent of the resident population.			✓
4.2.3.b Use the required General Plan Annual Status Report to monitor trends related to residents and visitors.			✓
Analysis: **The proposed project does not have direct or indirect relationships to the goal for tourism and its accompanying objectives for increasing the visitor industry's contributions to our**			

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island's quality of life, managing future visitor unit expansion, and maximizing residents' benefits from the visitor industry.			
AGRICULTURE			
Goal:			
4.3 Maui will have a diversified agricultural industry contributing to greater economic, food, and energy security and prosperity.			✓
Objective:			
4.3.1 Strive for at least 85 percent of locally-consumed fruits and vegetables and 30 percent of all other locally-consumed foods to be grown in-State.			✓
Policies:			
4.3.1.a Strive to substitute food/agricultural product imports with a reliable supply of locally produced food and agricultural products.			✓
4.3.1.b Facilitate and support the direct marketing/sale of the island's agricultural products to local consumers, through farmers markets and similar venues.			✓
4.3.1.c Encourage growing a diverse variety of crops and livestock to ensure the stewardship of our land while safeguarding consumer safety.			✓
4.3.1.d Work with the State to regulate and monitor genetically-modified-organism (GMO) crops to ensure the safety of all crops and label all GMO products.			✓
Objective:			
4.3.2 Maintain or increase agriculture's share of the total island economy.			✓
Policies:			
4.3.2.a Encourage the export of the island's agricultural products to offshore markets.			✓
4.3.2.b Support infrastructure investments at harbors, such as ferry service, airports, and other facilities for the rapid and cost-effective export of island-grown products.			✓
4.3.2.c Encourage the continued viability of sugar cane production, or other agricultural crops, in central Maui and all of Maui Island.			✓
4.3.2.d Work with the State to reduce excise taxes for commercial agricultural products produced within the State.			✓
4.3.2.e Coordinate with appropriate State and Federal Departments and agencies, private shipping companies, and farmers associations to assist in the rapid and cost-effective export of Maui's agricultural products to off-island markets.			✓
Objective:			
4.3.3 Expand diversified agriculture production at an average annual rate of 4 percent.			✓
Policies:			
4.3.3.a Promote the development of locally-grown and ecologically-sound biofuels, aquaculture, and forest products.			✓
4.3.3.b Support the development of farming associations/cooperatives.			✓
4.3.3.c Work with educational institutions and appropriate agencies to provide education and training for farm owners and entrepreneurs.			✓

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Analysis: **The proposed project does not have direct or indirect relationships to the goal for agriculture and its related objectives for consumption for locally produced fruits and vegetables, maintaining or increasing agriculture's share in the local economy, and expanding diversified agricultural production. The proposed project is located on fallow agricultural lands that have not been used for active agricultural production in many years. As such, the proposed action is a prudent use of the land to provide much needed housing for beneficiaries of the DHHL in a developed area with other similar residential subdivisions.**			
EMERGING SECTORS			
Goal:			
4.4 A diverse array of emerging economic sectors.			✓
Objective:			
4.4.1 Support increased investment and expanded activity in emerging industries.			✓
Policies:			
4.4.1.a Support the development of and access to state-of-the-art voice, video, and data telecommunications systems and high-speed Internet.			✓
4.4.1.b Attract and assist industries to compete in high technology activities such as those related to renewable energy, green technologies, diversified agriculture, ocean sciences, health sciences, space technologies, and other knowledge-based industries.			✓
4.4.1.c Support new industries that are environmentally and culturally sensitive such as health and wellness, sports and outdoor activities, cultural activities, the arts, film-making, entertainment, and digital media.			✓
4.4.1.d Support a sustainable, culturally sensitive, astronomy industry.			✓
4.4.1.e Support the continued development of the Maui Research and Technology Park in Kihei, as a center for research and development, education, and diversified economic development, as provided by the Maui County Code.			✓
4.4.1.f Work with appropriate organizations to support the development of high technology clusters around renewable energy, diversified agriculture, ocean sciences, health sciences, and other knowledge-based industries.			✓
Objective:			
4.4.2 Increase the development of renewable energy technologies that are supported by the local community.			✓
Policies:			
4.4.2.a Support the expansion of the renewable energy sector and the use of solar, wind, wave, and biofuel technologies.			✓
4.4.2.b Provide incentives to encourage renewable energy development, the use of green energy technologies, and energy conservation.			✓
4.4.2.c Ensure an adequate supply of land and facilitate permitting to meet the needs for renewable energy technologies such as solar, wind, wave, biofuel, and other technologies, provided that environmental, view plane, and cultural impacts are addressed.			✓
4.4.2.d Support the Maui County Energy Alliance Plan where consistent with the MIP.			✓

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Analysis: **The proposed project does not have a direct or indirect relationship to the goal for emerging sectors.**			
SMALL BUSINESS DEVELOPMENT			
Goal:			
4.5 Small businesses will play a key role in Maui's economy.		✓	
Objective:			
4.5.1 Increase the number of and revenue generated by small businesses and decrease the percentage of small business failures.		✓	
Policies:			
4.5.1.a Provide incentives and support for small businesses and entrepreneurs that incorporate sustainable technologies and practices into their operations, utilize local materials, or produce and sell locally-made goods or services.			✓
4.5.1.b Assist traditional "mom and pop" business establishments.		✓	
4.5.1.c Reduce barriers to small business development.			✓
4.5.1.d Require, where feasible, the government procurement of goods and services from locally-owned, small businesses.			✓
4.5.1.e Support community markets and venues that sell locally-made produce, goods, and services.		✓	
Analysis: **The proposed project consists of the development of a new residential subdivision in the West Maui for beneficiaries of the DHHL. Though the goal of making small businesses play a key role in Maui's economy is not directly applicable to the proposed project, it is anticipated that residents of the project will support small, locally-owned businesses that are in the vicinity. In addition, the proposed project will support construction trades, many of which are small family run companies. As such, the objective and policies related to small business development are indirectly applicable to the proposed action.**			
HEALTH CARE SECTOR			
Goal:			
4.6 Maui will have a health care industry and options that broaden career opportunities that are reliable, efficient, and provide social well-being.			✓
Objective:			
4.6.1 Expand the economic benefits of the health care sector.			✓
Policies:			
4.6.1.a Encourage expanded services at MMMC and at other medical facilities.			✓
4.6.1.b Support expansion of federally qualified health centers with the direct involvement of the residents of the communities served.			✓
4.6.1.c Support the use of multimedia as a means to provide healthcare information.			✓
4.6.1.d Encourage digitalization of all diagnostic equipment at all facilities on Maui to enable sharing of data and more efficient use of limited provider workforce, consistent with data protection and patient privacy.			✓
4.6.1.e Support the expansion of telemedicine.			✓

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4.6.1.f Encourage expansion and improved access to emergency care in all communities.			✓
Objective:			
4.6.2 Be more efficient in the delivery of health care services and in minimizing health care costs.			✓
Policies:			
4.6.2.a Support expansion of health care providers and facilities to improve access to quality care throughout the island.			✓
4.6.2.b Encourage the expansion of veteran health care services.			✓
4.6.2.c Allow home-based out-patient medical care that does not interfere with surrounding neighborhoods.			✓
Objective:			
4.6.3. Expand Maui's alternative health care services, including spiritual practices.			✓
Policies:			
4.6.3.a Support efforts to promote alternative medicine.			✓
4.6.3.b Allow small-scale home-alternative medicine businesses such as massage, chiropractic care, traditional Hawaiian healing, and acupuncture that do not interfere with surrounding neighborhoods.			✓
***Analysis:* The proposed project does not have direct or indirect relationships to the goal for the health care and its related objectives for expanding the economic benefits of the health care sector, increasing efficiency of the health care delivery system, minimizing the costs of health care, and expanding Maui's alternative health care system.**			
EDUCATION AND WORKFORCE DEVELOPMENT			
Goal:			
4.7 Maui will have effective education and workforce development programs and initiatives that are aligned with economic development goals.			✓
Objective:			
4.7.1 Improve preschool and K-12 education to allow our youth to develop the skills needed to successfully navigate the 21st century.			✓
Objective:			
4.7.1.a Encourage the State to implement programs such as:			✓
(1) Universally available preschool for children between the ages of one and five;			✓
(2) Mandatory kindergarten;			✓
(3) Mandatory K-5th grade classroom size limits of 1 teacher to 20 students;			✓
(4) Mandatory nutrition programs; and			✓
(5) Mandatory Native Hawaiian programs at all grade levels.			✓
4.7.1.b Encourage the DOE to extend the school day by at least an hour.			✓

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4.7.1.c Encourage the State to increase funding for public education so that Hawai'i is among the top 10 states nationally as measured by investment per pupil.			✓
4.7.1.d Encourage the State to ensure teacher certifications relate to effective delivery and improved student performances, and develop an industry experience/equivalency certification to assure our DOE students have access to career technical education and training.			✓
4.7.1.e Encourage the UHMC to provide dormitory space for high school students.			✓
4.7.1.f Encourage the development and implementation of curriculum on native Hawaiian history, culture, and practices, in consultation with native Hawaiian groups and associations.			✓
Objective:			
4.7.2 Encourage an increase in the number of certificate recipients and associate, bachelors, and graduate degrees conferred.			✓
Policies:			
4.7.2.a Encourage the State to increase the number of articulation agreements between the UHMC and four-year universities, particularly the University of Hawai'i at Manoa.			✓
4.7.2.b Encourage the State to expand accredited 2-year, 4-year, and graduate programs through the UHMC.			✓
4.7.2.c Encourage the education and training of our residents to meet the needs of a diversified economy.			✓
4.7.2.d Support education and training programs such as student internships, vocational training, and career development opportunities to ensure a highly skilled workforce			✓
4.7.2.e Work with educational institutions to improve and expand access to education and training through multiple modes, including distance learning.			✓
Objective:			
4.7.3 Strive to ensure that more of Maui's jobs are developed in STEM-related sectors by 2030.			✓
Policies:			
4.7.3.a Support the development of STEM-related certificates and degrees at the two- and four year levels.			✓
4.7.3.b Support the education initiatives of the Maui Agricultural Development Plan.			✓
4.7.3.c Expand and seek funding for internships, mentoring, job shadowing, etc. to foster interest in health and green workforce careers.			✓
4.7.3.d Work with MEDB, UHMC, and other similar organizations to expand internship/education programs to support STEM careers.			✓
4.7.3.e Continue to partner with the MEDB and other similar organizations to recruit, assist, and retain emerging industries, research and development activities, and educational/workforce opportunities.			✓
***Analysis:* The goal for education and workforce development is not directly or indirectly applicable to the proposed action. As well, the related objectives of improving preschool and K-12 education,**			

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increasing higher education certificates and degrees, and developing more jobs in the STEM-related sectors are not affected by the proposed project.			
CHAPTER 5 – HOUSING			
Goal:			
5.1 Maui will have safe, decent, appropriate, and affordable housing for all residents developed in a way that contributes to strong neighborhoods and a thriving island community.	✓		
Objective:			
5.1.1 More livable communities that provide for a mix of housing types, land uses, income levels, and age.	✓		
Policies:			
5.1.1.a Promote livable communities (compact/walkable/bikeable, access to transit) that provide for a mix of housing types and land uses, including parks, open space, and recreational areas.	✓		
5.1.1.b Promote planning approaches that provide a mix of multifamily and single-family housing units to expand housing choices.			✓
5.1.1.c Discourage gated communities.		✓	
5.1.1.d Provide incentives for the rehabilitation or adaptive reuse of historic structures to facilitate more housing choices.			✓
5.1.1.e Use planning and regulatory approaches to provide higher housing densities.		✓	
Objective:			
5.1.2 Better monitoring, evaluation, and refinement of affordable housing policy in conjunction with the economic cycle.		✓	
Policies:			
5.1.2.a Improve data on resident and nonresident housing.			✓
5.1.2.b Utilize the following approaches to promote resident housing and to minimize offshore market impacts:			✓
(1) Ensure that the future housing stock is composed of a mix of housing types (multifamily, small lots, ohana units, co-housing, cottage houses, etc.);			✓
(2) Encourage new housing in proximity to jobs and services, in places that are conducive/affordable to island residents; and		✓	
(3) Explore taxation alternatives and building fee structures.			✓
Objective:			
5.1.3 Provide affordable housing, rental or in fee, to the broad spectrum of our island community.	✓		
Policies:			
5.1.3.a Consider regulations that can help keep affordable housing available at affordable rents.			✓
5.1.3.b Seek to have ownership of affordable for-sale and rental housing vested in a non-profit community land trust, or other qualified housing provider, committed to keeping such housing affordable in perpetuity.	✓		

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5.1.3.c Facilitate the use of public lands in urban areas that are suitable for affordable housing.			✓
5.1.3.d Develop or support partnerships and initiatives that provide housing-related education/outreach.			✓
5.1.3.e Support the continuing efforts of the County and its community partners to:			✓
(1) Disseminate information on different housing/financial assistance programs (loans, grants, etc.) including information on housing rehabilitation/restoration/adaptive reuse;			✓
(2) Provide housing-related counseling including budget, credit, and financial planning assistance; and			✓
(3) Create and maintain a comprehensive/master list of available affordable housing to help residents secure a unit that satisfies their need.			✓
Objective:			
5.1.4 Provide infrastructure in a more timely manner to support the development of affordable housing.			✓
Policies:			
5.1.4.a Prioritize the development of infrastructure that supports the development of affordable housing.			✓
5.1.4.b Utilize appropriate financing approaches and assistance tools to encourage the development of infrastructure and public facilities.			✓
5.1.4.c Tailor infrastructure requirements to correspond with appropriate level-of-service standards to help control housing costs and to maintain safety.			✓
Objective:			
5.1.5 A wider range of affordable housing options and programs for those with special needs.			✓
Policies:			
5.1.5.a Ensure that residents with special needs have access to appropriate housing.			✓
5.1.5.b Encourage housing to be built or rehabilitated to allow the elderly and those with special needs to live in their homes.			✓
5.1.5.c Ensure and facilitate programs to assist those with special needs from becoming homeless.			✓
5.1.5.d Promote programs that stimulate the production of sustainable homeless shelters and alternative housing technologies.			✓
5.1.5.e Support programs that offer home modification counseling on low-interest retrofit loans and grants to those with special needs.			✓
Objective:			
5.1.6 Reduce the cost to developers of providing housing that is affordable to families with household incomes 160 percent and below of annual median income.			✓
Policies:			

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5.1.6.a Support fast-track processing procedures for the following housing-related entitlements: affordable housing projects/units; indigenous Hawaiian housing/units; and special-needs housing units (seniors, disabled, homeless, etc.).	✓		
5.1.6.b Require the construction of affordable for-sale and rental housing units as part of the construction of new housing developments.			✓
5.1.6.c Offer extra incentives in boom periods and withdraw incentives during slack periods.			✓
Objective:			
5.1.7 Increased preservation and promotion of indigenous Hawaiian housing and architecture.		✓	
Policies:			
5.1.7.a Preserve, promote, and give priority to Hawaiian housing/architecture forms to preserve Hawaiian culture.		✓	
5.1.7.b Provide for indigenous architecture as an allowable structure for native Hawaiian uses to include hula and lāʻau lapaʻau.			✓
Analysis: **The proposed project provides additional affordable homestead opportunities for DHHL beneficiaries and indirectly promotes the preservation of Hawaiian culture.**			
CHAPTER 6 – INFRASTRUCTURE AND PUBLIC FACILITES			
SOLID WASTE			
Goal:			
6.1 Maui will have implemented the ISWMP thereby diverting waste from its landfills, extending their capacities.		✓	
Objective:			
6.1.1 Meet our future solid waste needs with a more comprehensive planning and management strategy.		✓	
Policies:			
6.1.1.a Update and publicize the ISWMP every ten years.			✓
6.1.1.b Strengthen inter-agency coordination including Planning and Environmental Management departments.			✓
6.1.1.c Divert waste from the landfills and educate the public about the recommendations of the ISWMP.		✓	
6.1.1.d Minimize future active, unlined landfill cells to the extent feasible.			✓
Objective:			
6.1.2 Divert at least 60 percent of solid waste from the island's landfills.			✓
Policies:			
6.1.2.a Require residents and commercial enterprises that generate waste to pay a fair proportion of disposal costs.			✓
6.1.2.b Encourage environmentally safe waste-to-energy solutions.			✓

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6.1.2.c Facilitate the reduction of solid waste generated by packaging, food service products, construction waste, etc.			✓
6.1.2.d Educate residents and visitors about the impacts of and methods to reduce, reuse, and recycle.			✓
6.1.2.e Discourage the disposal of landfill leachate by diversion to wastewater treatment plants, where practicable.			✓
Analysis: **Solid waste generated by the project during construction will be recycled to the extent practicable and disposed at appropriately permitted construction waste disposal sites.**			
WASTEWATER			
Goal:			
6.2 Maui will have wastewater systems that comply with or exceed State and Federal regulations; meet levels-of-service needs; provide adequate capacity to accommodate projected demand; ensure efficient, effective, and environmentally sensitive operation; and maximize wastewater reuse where feasible.		✓	
Objective:			
6.2.1 A wastewater planning program capable of efficiently providing timely and adequate capacity to service projected demand where economically feasible and practicable.		✓	
Policies:			
6.2.1.a Encourage the use of renewable energy in support of wastewater treatment facilities.			✓
6.2.1.b Focus the expansion of wastewater systems to accommodate planned growth consistent with the MIP Directed Growth Strategy.		✓	
6.2.1.c Establish new wastewater treatment plant(s) outside the tsunami zone.			✓
Objective:			
6.2.2 Adequate levels of wastewater service with minimal environmental impacts.			✓
Policies:			
6.2.2.a Meet or exceed all State and Federal standards regulating wastewater disposal or reuse.			✓
6.2.2.b Encourage tertiary treatment for all municipal wastewater that is disposed through deep injection wells. Phase out all municipal and private injection wells in coordination with water reuse programs, where feasible, by 2020.			✓
6.2.2.c Improve and upgrade the County's existing wastewater collection, treatment, and reuse facilities consistent with current and future plans and the County's CIP.			✓
6.2.2.d Maintain an ongoing sewer inspection program for public and private multi-user systems to identify potential problems and forecast each system's residual life.			✓
6.2.2.e Require all new developments to fund system improvements in proportion to the development impact and in accordance with the County's wastewater functional plan.			✓

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6.2.2.f Require appropriate funding mechanisms, such as a sinking fund, to adequately maintain or replace aging water-system components.			✓
6.2.2.g Strongly encourage the phase out of cesspools.			✓
Objective:			
6.2.3 Increase the reuse of wastewater.			✓
Policies:			
6.2.3.a Strengthen coordination between the Department of Water Supply (DWS) and the WWRD to promote reuse/recycling of wastewater.			✓
6.2.3.b Expand the reuse of wastewater from the Central Maui, Kīhei, Lahaina, and other wastewater systems.			✓
***Analysis:* The proposed project will connect to the County wastewater system. Coordination will be undertaken with the Department of Environmental Management (DEM) to determine if certain improvements to the County's wastewater system will be required to service the project.**			
WATER			
Goal:			
6.3 Maui will have an environmentally sustainable, reliable, safe, and efficient water system.		✓	
Objective:			
6.3.1 More comprehensive approach to water resources planning to effectively protect, recharge, and manage water resources including watersheds, groundwater, streams, and aquifers.			✓
Policies:			
6.3.1.a Ensure that DWS actions reflect its public trust responsibilities toward water.			✓
6.3.1.b Ensure the WUDP implements the State Water Code and MIP's goals, objectives, and policies.			✓
6.3.1.c Regularly update the WUDP, to maintain compliance with the General Plan.			✓
6.3.1.d Ensure that the County's CIP for water-source development is consistent with the WUDP and the MIP.			✓
6.3.1.e Where desirable, retain and expand public ownership and management of watersheds and fresh-water systems.			✓
6.3.1.f Encourage and improve data exchange and coordination among Federal, State, County, and private land use planning and water resource management agencies.			✓
Objective:			
6.3.2 Increase the efficiency and capacity of the water systems in striving to meet the needs and balance the island's water needs.		✓	
Policies:			
6.3.2.a Ensure the efficiency of all water system elements including well and stream intakes, water catchment, transmission lines, reservoirs, and all other system			✓

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infrastructure.			
6.3.2.b Encourage increased education about and use of private catchment systems where practicable for nonpotable uses.			✓
6.3.2.c Maximize the efficient use of reclaimed wastewater to serve nonpotable needs.			✓
6.3.2.d Work with appropriate State and County agencies to achieve a balance in resolving the needs of water users in keeping with the water allocation priorities of the MIP.		✓	
6.3.2.e Ensure water conservation through education, incentives, and regulations.			✓
6.3.2.f Acquire and develop additional sources of potable water.			✓
Objective:			
6.3 Improve water quality and the monitoring of public and private water systems.			✓
Policy:			
6.3.3.a Protect and maintain water delivery systems.			✓
***Analysis:* The objective and policies related to water service, systems and quality are indirectly applicable to the project. The project is located in an area that may be serviced by County water infrastructure. Coordination will be undertaken with the Department of Water Supply (DWS) to determine if certain improvements to the County's water system will be required to service the project.**			
TRANSPORTATION			
Goal:			
6.4 An interconnected, efficient, and well-maintained, multimodal transportation system.		✓	
Objective:			
6.4.1 Provide for a more integrated island-wide transportation and land use planning program that reduces congestion and promotes more efficient (transit-friendly) land use patterns.		✓	
Policies:			
6.4.1.a Plan for an integrated multi-modal transportation system comprised of public transit, bicycle, pedestrian, automobile, and other transportation modes.		✓	
6.4.1.b Refocus transportation investment from the construction of additional roadways only for the automobile to the expansion of a multimodal transportation system.			✓
6.4.1.c Encourage the use of "complete streets" design methods.		✓	
6.4.1.d Encourage employers to implement TDM strategies.			✓
Objective:			
6.4.2 Safe, interconnected transit, roadway, bicycle, equestrian, and pedestrian network.			✓
Policies:			

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6.4.2.a Ensure transit-, roadway-, and pedestrian-facilities design and level-of-service standards respect the unique character of our communities.		✓	
6.4.2.b Prioritize transportation improvements list to cost-effectively meet existing and future needs consistent with the MIP.			✓
6.4.2.c Require new development, where appropriate, to integrate sidewalks, pathways, bikeways, and transit infrastructure into new commercial and residential projects while enhancing community character.		✓	
6.4.2.d Identify and improve hazardous and substandard sections of roadways, drainage infrastructure, and bridges, provided that the historical integrity of the roads and bridges are protected.			✓
6.4.2.e Consider identification, acquisition where appropriate, and utilization of abandoned right of-ways for bikeways, pedestrian pathways, and open-space networks.			✓
6.4.2.f Support the implementation of the *Central Maui Pedestrian & Bicycle Master Plan* (March 2012), when consistent with the MIP.			✓
Objective:			
6.4.3 An island-wide, multimodal transportation system that respects and enhances the natural environment, scenic views, and each community's character.		✓	
Policies:			
6.4.3.a Ensure that the roadway and transit alignments respect the natural environment and scenic views.		✓	
6.4.3.b Ensure that roadways and transit systems in rural areas and small towns enhance community character.			✓
6.4.3.c Design all transit systems to respect visual corridors and Maui's character.			✓
Analysis: **The proposed project will provide improvements to safely integrate the project generated traffic to local roadways. DHHL will provide pedestrian sidewalk improvements to create a safer pedestrian condition within the project. The project is located along an existing bike route on Honoapiʻilani Highway. These improvements directly and indirectly support the objectives of providing a safe, interconnected roadway, bicycle, and pedestrian network, as well as a multimodal transportation system that respects and enhances the natural environment, scenic views, and the surrounding community's character.**			
TRANSIT			
Goal:			
6.5 An island-wide transit system that addresses the needs of residents and visitors and contributes to healthy and livable communities.			✓
Objective:			
6.5.1 An integrated transit system that better serves all mobility needs of Maui's residents and visitors.			✓
Policies:			
6.5.1.a Maximize access to public transit in town centers, commercial districts, and employment centers.			✓
6.5.1.b Expand regional and inter-regional transit services, where appropriate, in heavily traveled corridors and within communities			✓

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6.5.1.c Increase the frequency of current service, add additional bus routes as demand requires, and transition to nonpolluting transit vehicles, as funding permits.			✓
6.5.1.d Provide adequate transit infrastructure (e.g., bus pullouts, waiting benches and shelters, signs) along existing and future transit right-of-ways.			✓
6.5.1.e Require new development where appropriate, to provide right-of-ways (ROWs) to accommodate transit circulation and support facilities.			✓
6.5.1.f Identify, protect, and preserve, or acquire corridors for future inter-community transit use, including but not limited to, rail and also multimodal use corridors.			✓
6.5.1.g Establish transit corridors by planning for and securing right-of-way when appropriate for alternative modes of transportation (such as rail and water ferry service).			✓
6.5.1.h Pursue improvements and upgrades to the existing transit system consistent with updated MDOT planning studies/transit plans (within the framework of comprehensive island-wide multimodal transportation plans).			✓
6.5.1.i Increase inter-agency coordination between the Department of Planning, State Department of Transportation, County Department of Public Works, and other applicable agencies.			✓
Objective:			
6.5.2 Plan for a more diversified and stable funding base to support transportation goals.			✓
Policies:			
6.5.2.a Support alternative methods and sources of funding transportation improvements (including impact fees, higher taxes, fare adjustments, dedicated sources of funding, and assessments).			✓
6.5.2.b Collaborate with public-private entities or nonprofit organizations to reduce public transit operational expenses.			✓
6.5.2.c Coordinate with appropriate Federal, State, and County agencies to fund transportation projects in areas where growth is anticipated.			✓
Analysis: **While the proposed project includes roadway improvements to Honoapiʻilani Highway, it does not directly or indirectly affect the goal and objectives for transit, specifically those relating to the advancement of an integrated island wide transit system, and funding to support transit improvements and operations.**			
PARKS			
Goal:			
6.6 Maui will have a diverse range of active and passive recreational parks, wilderness areas, and other natural-resource areas linked, where feasible, by a network of greenways, bikeways, pathways, and roads that are accessible to all.			✓
Objective:			
6.6.1 More effective, long-range planning of parks and recreation programs able to meet community needs.			✓
Policies:			
6.6.1.a Support, consistent with the MIP, the implementation of open-space and recreational plans, such as the *Pali to Puamana Parkway* Master Plan and the			✓

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Upcountry Greenways Master Plan.			
6.6.1.b Utilize the ahupuaʻa approach by integrating mauka-to-makai natural landscapes into an island-wide parks and recreation functional plan.			✓
6.6.1.c Provide a balanced mix of passive and active parks, including neighborhood, community, and regional parks, in each community plan area.			✓
6.6.1.d Support the expansion of Haleakala National Park, where supported by affected communities.			✓
6.6.1.e Support loʻi and dryland taro restoration in County, State, and Federal parks.			✓
6.6.1.f Encourage private landowners to dedicate land to Federal, State, or County governments, or nonprofit land trusts, for parks and open-space protection consistent with the MIP.			✓
6.6.1.g Strengthen inter-agency coordination including State and County departments, such as resolving joint use of facilities and properties.			✓
6.6.1.h Work with the State to prepare and implement a master management plan for ʻĀhihi-Kīnaʻu and La Perouse-Keoneʻōʻio Bay to Kanaloa Point region.			✓
Objective:			
6.6.2 Achieve parks and recreation opportunities to meet the diverse needs of our community.			✓
Policies:			
6.6.2.a Establish appropriate level-of-service standards at the neighborhood, community, and regional levels.			✓
6.6.2.b Identify and acquire parks and recreational facilities that address existing park inadequacies and complement and enhance neighborhoods, communities, and natural land features.			✓
6.6.2.c Design park facilities to preserve and enhance natural site characteristics, maximize views, protect environmental and cultural sites, and minimize water demands.			✓
6.6.2.d Acquire lands along the shoreline, between coastal roadways and the ocean.			✓
6.6.2.e Encourage the development of regional parks, district parks, and greenways in a manner that helps to contain sprawl, provide separation between distinct communities, or offer open space within urban communities.			✓
6.6.2.f Require large master-planned communities that incorporate a mixture of park facilities pursuant to parks standards and functional plans.			✓
6.6.2.g Support appropriate areas for cultural parks (e.g., Kepaniwai) in each community plan area.			✓
6.6.2.h Incorporate community input to determine the appropriate location, design, and long-term stewardship of parks and recreation facilities.			✓
6.6.2.i Manage commercial activities at public parks to minimize impacts to residents.			✓
6.6.2.j Support public-private partnerships to implement the acquisition and development of parks when consistent with the General Plan.			✓
6.6.2.k Support a coordinated program to improve, operate, and maintain joint-use facilities and grounds.			✓

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Objective:			
6.6.3 An expanded network of greenways, trails, pathways, and bikeways.			✓
Policies:			
6.6.3.a Link existing and future park sites, natural areas, the shoreline, and residential areas with a network of bikeways, pedestrian paths, trails, and greenways.			✓
6.6.3.b Support the implementation of plans and programs that facilitate pedestrian mobility and access to active and passive recreation areas and sites.			✓
6.6.3.c Collaborate with the State and private land owners to ensure perpetual access and proper stewardship of traditional trails and access systems.			✓
6.6.3.d Facilitate the development of well-managed noncommercial campgrounds throughout the island.			✓
6.6.3.e Consider requiring commercial bike rental businesses to provide funding that supports a mauka-to-makai Haleakalā bikeway improvement program.			✓
6.6.3.f Ensure ADA compliance and seek opportunities to make all parks and recreational facilities accessible to people with disabilities.			✓
Analysis: **The objective and policy relating to linking existing residential areas with a network of bikeways is not directly or indirectly supported by the proposed project.**			
PUBLIC FACILITIES			
Goal:			
6.7 Maui will have adequate public facilities that meet the diverse needs of residents.			✓
Objective:			
6.7.1 More effective planning for public facilities to meet community needs.			✓
Policies:			
6.7.1.a Ensure the development and update of island-wide public facilities functional plans that incorporate prioritized facilities, programs, and a financial component.			✓
6.7.1.b Establish appropriate level-of-service standards for public facilities provided by the County.			✓
6.7.1.c Pursue improvements and upgrades of County public facilities consistent with the public facilities functional plan.			✓
6.7.1.d Recognize Wailuku Town as Maui's Civic Center and support the revitalization of the Civic Center District by consolidating government office spaces, enhancing landscape beautification, and providing adequate public parking.			✓
6.7.1.e Support, with community input, the relocation of the Maui Community Correctional Center from Wailuku to an appropriate location in Puʻunēnē.			✓
6.7.1.f Adequately plan and fund public safety facilities (fire, police, ambulance, civil defense) to meet community needs.			✓
6.7.1.g Increase joint facilities utilization and program coordination between State and County agencies such as baseyards, communication centers, recreational facilities, etc., where feasible.			✓

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6.7.1.h Focus future expenditures for additional government office space, parking, and related facilities in Wailuku's Civic Center District.			✓
6.7.1.i Encourage continuous and safe walkways for children within one mile of each school.			✓
6.7.1.j Encourage public-private partnerships to identify and resolve public facility plan shortcomings when consistent with the General Plan.			✓
6.7.1.k Incorporate community/area residents' input to determine the appropriate location and design of public facilities.			✓
***Analysis:* The proposed action does not have direct or indirect relationships to the goal for public facilities. In this context, the project does not advance or promote the objective or more effective planning for public facilities which meet community needs.**			
SCHOOLS AND LIBRARIES			
Goal:			
6.8 Maui will have school and library facilities that meet residents' needs and goals.		✓	
Objective:			
6.8.1 Assist in providing appropriate school and library facilities in a timely manner and in strategic locations.		✓	
Policies:			
6.8.1.a Work in partnership with all educational institutions to meet current and future needs including appropriate location, timing, and design of future facilities.			✓
6.8.1.b Allow for the expansion and intensification of uses at the UHMC including satellite campuses operating in remote areas.			✓
6.8.1.c Encourage the DOE to build and maintain smaller, community-oriented schools.			✓
6.8.1.d Encourage better cooperation by the State and County for use of State and County facilities.			✓
6.8.1.e Encourage the State to upgrade, modernize, and expand school facilities, including those in remote communities.		✓	
6.8.1.f Work with the State to develop a master plan for the expansion of UHMC in accordance with the MIP.			✓
6.8.1.g Support partnerships (public/private/nonprofit) to build and staff new schools and improve existing facilities.			✓
6.8.1.h Work with the BOE HSPLS to provide centralized library services (including telecommunications) to all areas of Maui.			✓
6.8.1.i Work with the State to expedite planning and construction of Kīhei High School, including the integration of the high school with the Maui Research and Technology Park.			✓
6.8.1.j Work with the State to identify intermediate school sites in Central Maui and other areas where needed.			✓
Objective:			
6.8.2 Provide a more expansive network of safe and convenient pedestrian-friendly streets, trails, pathways, and bikeways between neighborhoods and schools		✓	

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where appropriate.			
Policies:			
6.8.2.a Encourage the State to build new school facilities in appropriate locations that minimize time and distance for students to travel to and from school.			✓
6.8.2.b Encourage the State to implement the Safe Routes to School initiative with funding commitments to help the County plan and fund projects that ensure safe access routes to school.		✓	
***Analysis:* Through the payment of impact fees to the Department of Education (DOE), the proposed project indirectly ensures the provision of adequate and accessible educational services and facilities in West Maui. Further, the objective and policy related to providing a more expansive network of safe and convenient pedestrian-friendly streets, trails, pathways, and bikeways between neighborhoods and schools is indirectly supported by the proposed action, as there will be sidewalks installed within the projects, and roadway improvements such as maintaining a bike route within the paved shoulder along Honoapiʻilani Highway.**			
HEALTH CARE			
Goal:			
6.9 All of Maui residents will have the best possible health care to include healthy living, disease prevention, as well as acute and long-term care.			✓
Objective:			
6.9.1 Greater autonomy to the Maui region in their efforts to improve medical care on the island.			✓
Policies:			
6.9.1.a Encourage the State to give greater autonomy to the Maui region in their efforts to improve medical care on the island.			✓
6.9.1.b Support innovative financial solutions, such as capital partnerships, joint ventures, and consolidations for MMMC and other health institutions.			✓
6.9.1.c Support MMMC as a major core medical center that provides a greater range of services.			✓
6.9.1.d Support the immediate development of a critical access hospital in West Maui.			✓
6.9.1.e Support the expansion of regional critical-access facilities, where allowed by Federal regulations.			✓
6.9.1.f Improve medical service to remote and outlying regions.			✓
6.9.1.g Support transportation services for dialysis patients and community dialysis programs.			✓
6.9.1.h Work with the State to determine the feasibility of appropriate medical facilities in South Maui and Hāna, including the possible reestablishment of a small community hospital in Hāna, the establishment of a hospital in South Maui, and assist the State in securing funding to meet Maui's health care needs.			✓
Objective:			
6.9.2 An expansion of long-term care facilities and long-term care alternatives to meet the needs of our aging population.			✓

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Policies:			
6.9.2.a Support efforts to increase Maui's long-term care bed capacity to cover current and future needs, close to large population centers.			✓
6.9.2.b Recognize that facilities for low-income elders who need long-term care are a needed form of affordable and subsidized housing.			✓
6.9.2.c Evaluate the needs of the long-term disabled and provide planning support for their care, if there is a need for long-term care facilities.			✓
6.9.2.d Consider long-term care facilities as a major potential employment base and encourage the recruitment and training of potential employees.			✓
Objective:			
6.9.3 More support to home-care and community-based programs so they become alternatives to traditional nursing homes.			✓
Policies:			
6.9.3.a Support the establishment of a program to assist the elderly and people with disabilities to remain in their homes or in a home-like setting.			✓
6.9.3.b Support the establishment of senior and adult-day-care centers and senior housing.			✓
6.9.3.c Continue to support existing senior centers (e.g. Kaunoa), and establish new senior centers that will provide day-care sites and programs for the disabled and elderly.			✓
6.9.3.d Support funding alternatives for community-based services that assist home-care efforts.			✓
6.9.3.e Encourage the State to adopt the recommendations contained within the Legislative Reference Bureau's report entitled "Gimme a Break: Respite Care Services in Other States," (December 2007) where appropriate, feasible, and consistent with the MIP.			✓
Objective:			
6.9.4 Improved preventative medicine and primary health care.			✓
Policies:			
6.9.4.a Develop and utilize health-status benchmarks to measure prevention and primary health care service delivery.			✓
6.9.4.b Support programs that provide family planning assistance.			✓
Analysis: **The proposed action does not have direct or indirect relationships to the goal for healthcare. In this context, the residential housing project does not advance or promote the objectives for greater healthcare system autonomy, increase long-term care capacity and alternatives, support home care and community based programs, and improve preventative medicine and primary health care.**			
ENERGY			
Goal:			
6.10 Maui will meet its energy needs through local sources of clean, renewable energy, and through conservation.		✓	

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Objective:			
6.10.1 Reduce fossil fuel consumption. Using the 2005 electricity consumption as a baseline, reduce by 15 percent in 2015; 20 percent by 2020; and 30 percent by 2030.		✓	
Policies:			
6.10.1.a Support energy efficient systems, processes, and methods in public and private operations, buildings, and facilities.		✓	
6.10.1.b Support the Maui Solar Rooftop initiative.		✓	
6.10.1.c Support Hawai`i Energy and other Public Utility Commission (PUC) approved energy efficiency programs.		✓	
Objective:			
6.10.2 Increase the minimum percentage of electricity obtained from clean, renewable energy sources. By 2015, more than 15 percent of Maui's electricity will be produced from locally-produced, clean, renewable energy sources, 25 percent by 2020, and 40 percent by 2030.		✓	
Policies:			
6.10.2.a Evaluate available renewable energy resource sites and applicable technologies.			✓
6.10.2.b Encourage the installation of renewable energy systems, where appropriate.		✓	
6.10.2.c Support the establishment of new renewable energy facilities at appropriate locations provided that environmental, view plane, and cultural impacts are addressed.			✓
6.10.2.d Encourage all new County facilities completed after January 1, 2015, to produce at least 15 percent of their projected electricity needs with onsite renewable energy.			✓
Objective:			
6.10.3 Increased use of clean, renewable energy.		✓	
Policies:			
6.10.3.a Support efforts in the PUC to upgrade Maui's power grid to integrate renewable energy from multiple sources and wheeling of electricity.			✓
6.10.3.b Encourage the PUC to work with the County to implement and expedite community supported renewable energy projects.			✓
6.10.3.c Encourage efforts to produce more renewable energy using distributed generation.			✓
6.10.3.d Encourage import substitution by MECO and the broader community to become more self-sufficient in energy production.			✓
6.10.3.e Educate the public on the economic and environmental benefits from the increased use of renewable energy.			✓
6.10.3.f Encourage support from the Federal government, State, and the private sector for Maui's renewable energy objectives.			✓
6.10.3.g Encourage incentives to support the development and use of renewable energy.			✓

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Objective:			
6.10.4 More efficient distribution of power throughout the island while preserving island beauty.			✓
Analysis: **Each home built, whether turn-key or lessee-built, will be required to have a solar water heater system pursuant to MCC, Section 16.16B.R403.5.5. In addition, individual homeowners may install photovoltaic panels on their homes if they so choose. With this information in mind, the objectives and policies of the goal to meeting Maui's energy needs through local sources of clean, renewable energy and through conservation are indirectly applicable to the proposed project.**			
HARBORS AND AIRPORT			
Goal:			
6.11 Maui will have harbors and airports that will efficiently, dependably, and safely facilitate the movement of passengers and cargo.			✓
Objective:			
6.11.1 Upgraded harbor facilities to handle larger volumes of freight and passengers and additional small boat harbors.			✓
Policies:			
6.11.1.a Support the expansion and upgrade of Kahului Harbor through the following, provided that any expansion is respectful of cultural practices and existing recreational uses and supports improved water quality:			✓
(1) Accommodate increasing volumes of cargo;			✓
(2) Provide deeper pier depths and greater fuel-receiving and storing capacities; and			✓
(3) Ensure safe and efficient work areas, including separating passenger operations from fuel and cargo operations.			✓
6.11.1.b Work with public and private entities to provide adequate pier slips, utilities, repair facilities, and waste-disposal capabilities.			✓
6.11.1.c Encourage the State to safely separate passenger (cruise and ferry) operations from hazardous bulk fuels and heavy cargo transporting operations, while not decreasing harbor's capacity to safely support various recreational uses.			✓
6.11.1.d Encourage the State to develop cargo inspecting sites and facilities for efficient cargo and container processing and transportation and to prevent alien species entry.			✓
6.11.1.e Support a State and County task force to study the feasibility of a second commercial harbor on Maui.			✓
Objective:			
6.11.2 Establish more economically thriving and environmentally sensitive small boat harbors accommodating resident and business activity, including fishing, recreation, and tour boats.			✓
Policy:			
6.11.2.a Provide for needed shore-side facilities and capabilities to support small boat harbor users (e.g. repair facilities, parking, cold storage, and mass-transit connections).			✓

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Objective:			
6.11.3 Upgraded airport facilities and navigation aids to serve the needs of passengers, freight movements, and general aviation.			✓
Policies:			
6.11.3.a Protect the island's airports from encroaching urbanization that may negatively impact the airport operations.			✓
6.11.3.b Support State efforts to improve Kahului Airport operations to better serve passenger and cargo needs.			✓
6.11.3.c Support State efforts to identify sites and plan to relocate and accommodate small and rotary wing aircraft.			✓
6.11.3.d Encourage the State to improve airport safety including lighting, fuel transmission, fuel safety, etc.			✓
6.11.3.e Consider expansion of rental car facilities in West and South Maui.			✓
6.11.3.f Consider expansion of mass transit (bus, fixed-rail, shuttle, and taxis, bicycle, and pedestrian facilities) to and from Kahului Airport and not limited to passenger movements (allowing for luggage and cargo).			✓
6.11.3.g Encourage the State to maintain airport capacity and to encourage more responsive air services to Hāna and Kapalua.			✓
Analysis: **The goal for harbors and airports are not applicable to the proposed project.**			
CHAPTER 7 – LAND USE			
AGRICULTURAL LANDS			
Goal:			
7.1 Maui will have a prosperous agricultural industry and will protect agricultural lands.			✓
Objective:			
7.1.1 Significantly reduce the loss of productive agricultural lands.			✓
Policies:			
7.1.1.a Allow, where appropriate, the clustering of development on agricultural lands when approved as a CSD plan or similar approval mechanism.			✓
7.1.1.b Require, where appropriate, the review and approval of CSD plans prior to the subdivision of agricultural land.			✓
7.1.1.c Discourage developing or subdividing productive agricultural lands for residential uses in which the residence would be the primary use and any agricultural activities would be secondary uses.			✓
7.1.1.d Consider requirements for public notification and review of the subdivision of agricultural land into four or more lots.			✓
7.1.1.e Focus urban growth, to the extent practicable, away from productive and important agricultural lands.			✓

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7.1.1.f Strongly discourage the conversion of productive and important agricultural lands (such as sugar, pineapple, and other produce lands) to rural or urban use, unless justified during the General Plan update, or when other overriding factors are present.			✓
7.1.1.g Further develop the requirements for agricultural assessments found under Section 19.510, MCC.			✓
7.1.1.h Provide incentives for landowners to preserve and protect agricultural lands from development through the use of TDR/PDR, tax credits, easement programs, or similar means.			✓
7.1.1.i Promote the use of U.S.D.A. Farm and Ranch Lands Protection Program grants to fund the acquisition of conservation easements on eligible agricultural lands.			✓
7.1.1.j Require all major developments adjacent to agricultural lands to provide an appropriate and site-specific agricultural protection buffer as part of a required site plan.			✓
7.1.1.k Support and promote the viability of Maui's agricultural businesses through property tax incentives and other programs and subsidies.			✓
7.1.1.l Encourage future community plan efforts to identify lands within the County Agricultural zoning district that are primarily being used for large-lot residential or rural use and consider such lands for reclassification to an appropriate County Rural zone.			✓
Objective:			
7.1.2 Reduction of the island's dependence on off-island agricultural products and expansion of export capacity.			✓
Policies:			
7.1.2.a Coordinate with the agricultural community, associations/community groups, agricultural landowners, and the State to designate IALs.			✓
7.1.2.b Support an incentive package for productive Agricultural Lands which aims to ensure agricultural viability for small- and commercial-scale agricultural producers.			✓
7.1.2.c Actively look to acquire land and provide infrastructure to expand the agricultural park and establish new agricultural parks.			✓
7.1.2.d Support the designation of a research and development area within agricultural parks to help farmers stay attuned to new technology and research.			✓
7.1.2.e Support local cooperative extension services to facilitate timely technology transfer opportunities.			✓
7.1.2.f Support plans and programs to develop additional sources of water for irrigation purposes.			✓
7.1.2.g Consider appropriate subdivision requirements (gravel roads, above-ground utilities, etc.) in those subdivisions creating Agricultural Parks where lots are limited to agricultural production with no dwellings.			✓
7.1.2.h Support the recommendations, policies, and actions contained within the Maui Agricultural Development Plan, July 2009, when consistent with the MIP.			✓

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7.1.2.i Allow water and tax discounts for legitimate farming operations on rural and agricultural land.			✓
7.1.2.j Give priority in delivery and use of agricultural water and agricultural land within County agricultural parks to cultivation of food crops for local consumption.			✓
7.1.2.k Support programs that control pests and diseases that affect agriculture.			✓
7.1.2.l Support the development of training and apprenticeship programs to encourage an adequate supply of agricultural workers.			✓
Objective:			
7.1.3 Support and facilitate connectivity between communities.			✓
Policies:			
7.1.3.a Evaluate the impact of gated communities on interconnectivity.			✓
7.1.3.b Discourage land use and urban design that impedes interconnectivity between adjacent communities.			✓
Analysis: **The proposed action does not have direct or indirect relationships to the goal for agriculture. As previously discussed, the proposed project will be developed on lands designated for agriculture use. Although designated for agriculture, the lands have not been in cultivation for several years. In the context of the amount of viable agriculture lands on the island of Maui, implementation of the proposed action is not considered to adversely affect agricultural productivity on Maui. In addition, it is noted that the proposed action will be located adjacent to existing, similarly scaled residential subdivisions.**			
RURAL AREAS			
Goal:			
7.2 Maui will have a rural landscape and lifestyle where natural systems, cultural resources and farm lands are protected and development enhances and compliments the viability and character of rural communities.			✓
Objective:			
7.2.1 Reduce the proliferation and impact of residential development outside of urban, small town, and rural growth boundaries.			✓
Policies:			
7.2.1.a Focus development to areas inside urban, small town, and rural growth boundaries to preserve natural, cultural, and agricultural resources.			✓
7.2.1.b Encourage cluster development with a mandatory buffer requirement/clear edge at the interface of country towns, agricultural uses, and surrounding rural landscapes.			✓
7.2.1.c Encourage or require, where appropriate, CSDs and the use of green spaces/natural separations to protect the character of rural landscapes.			✓
7.2.1.d Encourage basic goods/services in business country towns.			✓
7.2.1.e Allow for mixed uses, including residential uses, within Business Country Town Districts.			✓
7.2.1.f Encourage the use of alternative stormwater management techniques that minimize land disturbance and preserve natural drainage features.			✓

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7.2.1.g Encourage green belts, open space buffers, and riparian zones to minimize conflicts between agriculture and residential uses.			✓
7.2.1.h Evaluate the impact of gated communities on inter-connectivity.			✓
Objective:			
7.2.2 More appropriate service/infrastructure standards to enhance and protect the island's rural character and natural systems.			✓
Policies:			
7.2.2.a Minimize impermeable surfaces within rural areas.			✓
7.2.2.b Protect and support the character, economic viability, and historic integrity of Maui's small towns.			✓
7.2.2.c Use infrastructure, public service, and design standards that are appropriate to rural areas.			✓
7.2.2.d Discourage land use and urban design that impede interconnectivity between adjacent communities.			✓
***Analysis:* As previously noted, the property is under the jurisdiction of the DHHL, which has vested authority to develop its lands at its discretion, according to DHHL's plans and policies for Maui. Nevertheless, the proposed project does not involve lands within the rural designation. As such, the proposed project is not directly or indirectly applicable with these policies.**			
URBAN AREAS			
Goal:			
7.3 Maui will have livable human-scale urban communities, an efficient and sustainable land use pattern, and sufficient housing and services for Maui residents.		✓	
Objective:			
7.3.1 Facilitate and support a more compact, efficient, human-scale urban development pattern.		✓	
Policies:			
7. 3.1.a Ensure higher-density compact urban communities, infill, and redevelopment of underutilized urban lots within Urban Growth Boundaries.		✓	
7.3.1.b Maintain a distinct separation between communities, such as but not limited to, Wailuku and Waikapū; Wailuku and Waihe'e; Pukalani and Makawao; Pukalani and Kula; Makawao and Hāli'imaile; Lahaina and Kā'anapali; Kīhei and Mā'alaea; and Mā'alaea and Waikapū, to protect the character and identity of Maui's communities.			✓
7.3.1.c Strengthen evaluation requirements for new urban expansion, new towns, and major urban infill projects within urban growth areas. Tailor submittal requirements to reflect the impact or scale of different projects.			✓
7.3.1.d Ensure future amendments to urban growth boundaries achieve the following: (1) provide a beneficial extension of the existing community; (2) are in areas where it is cost-effective to provide and operate infrastructure/public service facilities; and (3) do not promote automobile-oriented land use patterns.			✓

Maui Island Plan Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable	DA	IA	NA
7.3.1.e Evaluate the impact of gated communities on inter-connectivity.			✓
7.3.1.f Encourage the development and implementation of neighborhood design standards that are environmentally friendly, such as LEED for Neighborhood Development (LEED – ND) standards.			✓
7.3.1.g Discourage future pyramid zoning within the industrial zoning districts, while allowing accessory commercial uses and grandfathering existing uses.			✓
7.3.1.h Promote agriculture by encouraging community gardening, community-supported agricultural programs, and farmers markets within and adjacent to urban areas.			✓
7.3.1.i Discourage land use and urban design that impedes inter-connectivity between adjacent communities.			✓
Objective:			
7.3.2 Facilitate more self-sufficient and sustainable communities.			✓
Policies:			
7.3.2.a When developing new communities, provide sufficient lands for commercial, appropriate industrial, educational, spiritual, and non-profit uses to serve the daily needs of community residents.			✓
7.3.2.b Site community facilities such as schools, parks, libraries, and community centers within walking and biking distance of residences.			✓
7.3.2.c Facilitate self-sufficient communities and shorten commutes by:		✓	
(1) Directing residential development to job-rich areas;		✓	
(2) Allowing for appropriate commercial development and community services to shorten commutes; and			✓
(3) Allowing home occupations or home-based businesses that are compatible with surrounding neighborhoods and lifestyles.			✓
7.3.2.d Ensure, where appropriate, that affordable employee housing and multi-modal transportation opportunities are located near major employment centers.		✓	
7.3.2.e Discourage the establishment of bedroom communities where long commutes are required to employment centers.			✓
7.3.2.f Facilitate the development of housing by focusing projects in locations where land and infrastructure costs facilitate the development of affordably-priced housing.		✓	
7.3.2.g Provide incentives to facilitate the development of multifamily housing.			✓
7.3.2.h Encourage the placement of rental housing projects in the same areas as for-sale housing to facilitate mixed-income communities.			✓
7.3.2.i Develop communities that provide sufficient parks, schools, libraries, and other essential public facilities and services to serve resident needs.			✓
7.3.2.j Promote agriculture by encouraging community gardening, edible landscaping, community-supported agricultural programs, and farmers markets within and adjacent to urban areas.			✓

Maui Island Plan Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable	DA	IA	NA
Objective:			
7.3.3 Strengthen the island's sense of place.			✓
Policies:			
7.3.3.a Protect and enhance the unique architectural and landscape characteristics of each community.			✓
7.3.3.b Encourage Hawaiian architecture and tropical building designs.			✓
7.3.3.c Support the continued revitalization of historic country towns, Wailuku Town, and Kahului's commercial core and harbor-front without displacing traditional, cultural, recreational and customary uses.			✓
7.3.3.d Strongly encourage the preservation of buildings, structures, and sites of historic significance.			✓
7.3.3.e Require community input through Design Workshops for major new urban expansion, new towns, and major urban infill projects.			✓
7.3.3.f Require design enhancement, landscaping, and integration of park and rides, bicycle parking areas, and mass-transit infrastructure to mitigate the effect of parking lots and structured parking on the urban landscape.			✓
7.3.3.g Ensure that safe and attractive public spaces (e.g., plazas, parks, town/village squares) are provided throughout the island's urban areas.			✓
Objective:			
7.3.4 Strengthen planning and management for the visitor industry to protect resident quality of life and enhance the visitor experience.			✓
Policies:			
7.3.4.a Discourage the conversion of hotel units to timeshares and fractional ownership.			✓
7.3.4.b Monitor and manage the amount of, and impacts from, timeshares and fractional ownership.			✓
7.3.4.c Manage short-term rentals and bed-and-breakfast homes through a permitting and regulatory process in accordance with adopted ordinances and community plan policies.			✓
7.3.4.d Limit large-scale resort development to the four existing resort destination areas of Wailea, Mākena, Kapalua and Kā'anapali. "Large Scale Resort" is defined as complexes that include multiple accommodation facilities, activity businesses, retail complexes, and other amenities.			✓
Objective:			
7.3.5 Ensure that Maui's planning and development review process becomes more transparent, efficient, and innovative.		✓	
Policies:			
7.3.5.a Encourage greater community involvement in land use planning and decision making.		✓	
7.3.5.b Establish a predictable and timely development review process that facilitates the approval of projects that meet planning and regulatory requirements.			✓

Maui Island Plan Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable	DA	IA	NA
7.3.5.c Increase inter-agency coordination between the Department of Planning and all State and County agencies responsible for infrastructure and public facilities provision, particularly as it relates to the mitigation of long-term cumulative impacts resulting from development projects.		✓	
7.3.5.d Provide greater certainty and transparency in the development review process.			✓
7.3.5.e Expand and maintain land use and geographic information system databases for improved decisions, and make data and products available to the public.			✓
Analysis: **The proposed project has and continues to seek community involvement and input in the land use planning process. Ongoing coordination with various State and County agencies ensures that the proposed action accounts for and mitigates, to the extent possible, potential long-term cumulative impacts resulting from the residential subdivision.**			
CHAPTER 8 – DIRECTED GROWTH PLAN			
URBAN AND SMALL TOWN GROWTH AREA			
Goal:			
8.1 Maui will have well-serviced, complete, and vibrant urban communities and traditional small towns through sound planning and clearly defined development expectations.		✓	
Policies:			
8.1.a The County, with public input, will be responsible for designating new growth areas where infrastructure and public facilities will be provided, consistent with the policies of the MIP and in accordance with State and County infrastructure plans.		✓	
8.1.b Amendments to a UGB or STB shall be reviewed as a MIP amendment. A UGB or STB shall only be expanded if the island-wide inventory (maintained by the Department of Planning) of existing land uses (residential, commercial, industrial) indicates that additional urban density land is necessary to provide for the needs of the projected population growth within ten years of that inventory; or, during the decennial update of the MIP.			✓
8.1.c Community plans shall provide for urban density land use designations only within UGBs and Small Towns. The County may only support and approve State Urban Land Use Designations for areas within UGBs, STBs, and Rural Villages.			✓
8.1.d The unique character and function of existing small towns shall be protected to retain and preserve their sense of place.			✓
8.1.e New development shall be consistent with the UGBs, STBs, and all other applicable policies of the MIP. New urban-density development shall not be allowed outside of a UGB or STB.		✓	
8.1.f The County, as a condition of development approval, shall require developers of privately owned infrastructure systems to provide financial insurance (bonding, etc.) for the operation and maintenance of these systems.			✓
8.1.g The County shall implement a zoning program to comprehensively redistrict and rezone lands within UGBs according to updated community plan policies and map designations.			✓

Maui Island Plan Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable		DA	IA	NA
8.1.h	The County will seek to focus capital improvements (schools, libraries, roads, and other infrastructure and public facilities) within the UGBs and STBs in accordance with the MIP.			✓
8.1.i	The County will promote (through incentives, financial participation, expedited project review, infrastructure/public facilities support, etc.) appropriate urban infill, redevelopment and the efficient use of buildable land within UGBs to avoid the need to expand the UGBs.			✓
8.1.j	The MIP's UGBs and STBs shall not be construed or implemented to prohibit the construction of a single-family dwelling on any existing parcel where otherwise permitted by law.			✓
Analysis: **The proposed project is located within the Urban Growth Boundary of the County of Maui's MIP. The project is in consonance with the related UGB objective and policies of the MIP.**				
RURAL GROWTH AREA				
Goal:				
8.2	Maui will maintain opportunities for agriculture and rural communities through sound planning and clearly defined development expectations.			✓
Policies:				
8.2.a	Amendments to a RGB shall be reviewed as an MIP amendment. A RGB shall only be expanded if an island-wide inventory of existing land uses (residential, commercial, industrial) indicates that additional lands are necessary to provide for the needs of the projected population growth within ten years of that inventory; or, during the decennial update of the MIP.			✓
8.2.b	New development shall be consistent with RGB and all other applicable policies and requirements of the MIP. Public, quasi-public, civic, and limited commercial or industrial uses may be allowed in the RGB when the proposed uses demonstrate a public need and are consistent with the Community Plan and zoning.			✓
8.2.c	Environmental protection and compatibility will be a top priority in rural growth areas.			✓
8.2.d	All development within rural growth areas should avoid encroachment upon prime agricultural land.			✓
8.2.e	Rural growth areas include Rural Residential Areas and Rural Villages. Rural residential areas may be designated when they are located in association with or on the border of urban growth areas or Small Towns; and/or when they provide for complete, self-sufficient rural communities with a range of uses to be developed at densities that do not require urban infrastructure.			✓
8.2.f	Community plans shall provide for rural density land use designations only within RGBs; provided that limited community plan urban designations may be allowed within Rural Villages. New rural growth areas shall not be located where urban expansion may ultimately become necessary or desirable. New rural-density development shall not be allowed outside of a RGB.			✓
8.2.g	New rural growth areas intended to be complete, self-sufficient rural communities must be located a significant distance from existing urban areas, distinctly separated by agricultural or open lands.			✓

Maui Island Plan Goals, Objectives and Policies Key: DA = Directly Applicable, IA = Indirectly Applicable, NA = Not Applicable		DA	IA	NA
8.2.h	Urban-scale infrastructure and public facilities shall not be provided in rural areas except as described in the defined Level-of-Service (LOS) standards. There should be no expectations of urban services in rural areas.			✓
8.2.i	Urban development standards shall not be required within RGBs except in fulfillment of Federal law.			✓
8.2.j	The unique character and function of existing small towns and rural communities shall be protected to retain and preserve their sense of place.			✓
8.2.k	Preserve rural landscapes in which natural systems, cultural resources, and agricultural lands are protected and development compliments rural character and contributes to the viability of communities and small towns.			✓
8.2.l	The MIP's RGBs shall not be construed or implemented to prohibit the construction of a single family dwelling on any existing parcel where otherwise permitted by law.			✓
8.2.m	The County shall implement a zoning program to comprehensively redistrict and rezone lands within RGBs, and to implement community plan policies and map designations.			✓
8.2.n	At the time of zoning from agricultural to rural, Council will consider prohibiting restrictions on agricultural activity.			✓
Analysis: **The proposed project is located within the Urban Growth Boundary of the County of Maui's MIP. The proposed project does not involve lands in the Rural Growth Area. As such the proposed project is not applicable to the goal and policies related to Rural Growth Area.**				
PROTECTED AREA POLICY				
8.3.a	The Protected Areas in Diagrams E-1, NW-1, N-1, NE-1, S-1, SE-1, and WC-1 should be concurrently reviewed with Table 8-2 and with any proposed land uses that may result in an adverse impact on a Protected Area. The County Council and the Administration should be notified if a Protected Area may be compromised by a development proposal.			✓
Analysis: **The proposed project does not involve any lands that are located in the Protected Area Diagrams. As such, the proposed project is not applicable to the Protected Area Policy.**				

DEPARTMENT OF HAWAIIAN HOME LANDS LETTER TO DEPARTMENT OF PLANNING DATED AUGUST 29, 2022

APPENDIX

J

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT. GOVERNOR
STATE OF HAWAII

WILLIAM J. AILA, JR
CHAIRMAN
HAWAIIAN HOMES COMMISSION

TYLER I. GOMES
DEPUTY TO THE CHAIRMAN

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

August 29, 2022

Michele Chouteau McLean, AICP, Director
Department of Planning
County of Maui
2200 Main Street, Suite 315
Wailuku, Hawai'i 96793

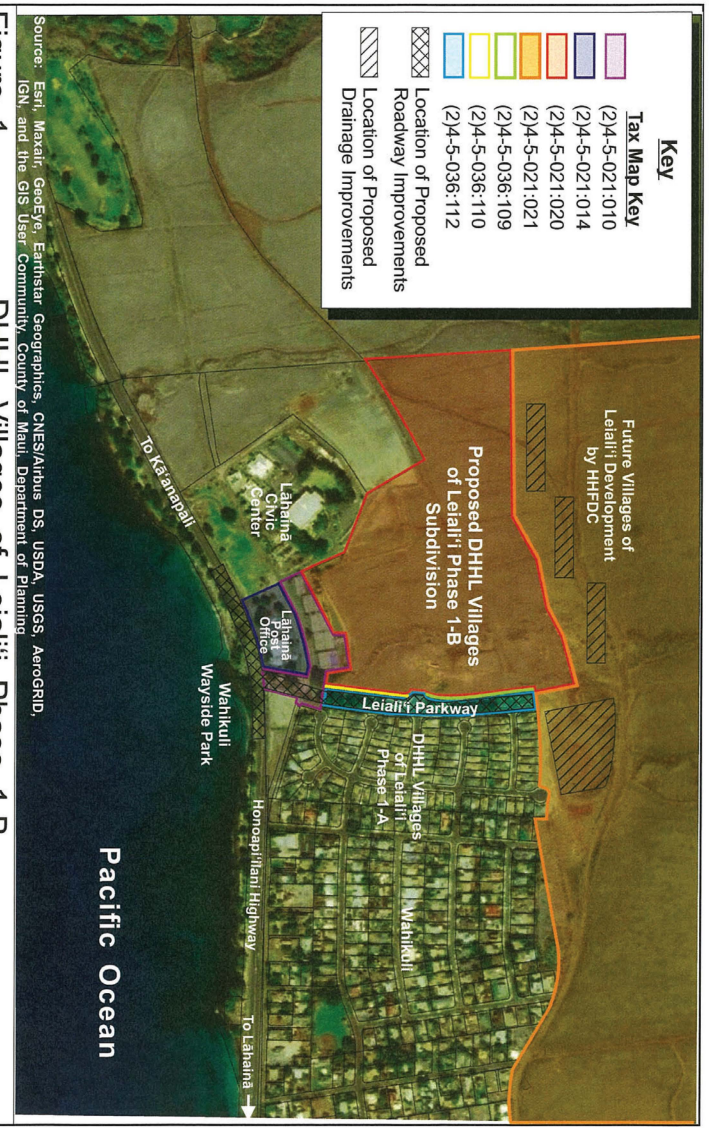
Subject: **Department of Hawaiian Home Lands Special Management Area and Shoreline Setback Area Permitting; Villages of Leiali'i, Village 1-B Subdivision and Offsite Improvements; Lahaina, Maui, Hawai'i**

Dear Ms. McLean:

The State of Hawai'i, Department of Hawaiian Home Lands (DHHL) proposes to develop the Villages of Leiali'i, Village 1-B (Village 1-B) subdivision on lands identified by Tax Map Key (TMK) (2)4-5-021:020, an approximately 51-acre area of land owned by DHHL located north of Leiali'i Parkway and the existing DHHL Villages of Leiali'i Village 1-A (Village 1-A) subdivision in Lahaina, Maui. (See **Figure 1**.)

Both Village 1-A and Village 1-B were acquired by DHHL from the Housing Finance and Development Corporation (HFDC), predecessor to the current Hawai'i Housing Finance and Development Corporation (HHFDC), in the early 2000's. It is noted that HHFDC currently owns the lands mauka of Village 1-A and Village 1-B, and has plans to develop a separate master planned community on its lands in the future. Village 1-B, as currently planned, will consist of a mix of single-family lots and multi-family units, which together will total approximately 250 units. (See **Figure 2**.) Access to the subdivision will be provided from Leiali'i Parkway. The new housing units will be made available to DHHL native Hawaiian beneficiaries currently on the waitlist for a residential lease on Maui.

In order to develop the proposed subdivision, certain offsite improvements are required, and will also be developed as part of the proposed action. These improvements include the development of two (2) new offsite retention basins mauka of Village 1-B; adjustment of the outlet drainage pipes in the existing retention basin mauka of Village 1-A and enlargement of the basin; grading and development of drainage interceptor ditches mauka of Village 1-B; extension of three



Source: Austin, Tsutsumi & Associates, Inc.

Figure 2 DHHL Villages of Leiali'i Phase 1-B
Conceptual Subdivision Site Plan

NOT TO SCALE

Prepared for: State of Hawai'i, Department of Hawaiian Home Lands

MUNEKIYO HIRAGA

ATA/231 DHHL Vill of Leiali Ph 1B P:\ENMTTN\Application\Figures\Conceptual Subd Site

(3) existing 48-inch culverts makai of Village 1-A; and roadway improvements to existing portions of Leiali'i Parkway and Honoapi'lani Highway.

It is noted that a portion of the proposed Village 1-B subdivision, a portion of the offsite drainage improvements, and the majority of the roadway improvements are located within the Special Management Area (SMA) for the island of Maui. (See **Figure 3**.) Furthermore, a portion of the proposed roadway improvements on Honoapi'ilani Highway, which is limited to restriping, is also located within the shoreline setback area.

The mission of DHHL is to effectively manage the Hawaiian Home Lands trust and to develop and deliver land to native Hawaiians. The Hawaiian Homes Commission Act (HHCA), codified within the constitution of the State of Hawai'i, vests onto DHHL the authority to use its lands at its discretion. Specifically, HHCA Section 204 states, *"all available lands shall immediately assume the status of Hawaiian home lands and be under the control of the department to be used and disposed of in accordance with the provisions of this Act"*.

We note that on October 23, 1987, the State of Hawai'i, Department of the Attorney General (AG) issued a memorandum regarding the applicability of SMA permit requirements on Hawaiian home lands. (See **Exhibit A**.)

Additionally, we note that the County of Maui, Department of Planning (Department) has issued SMA exemptions for DHHL projects in the past, specifically for the development of the Wai'ehu Kou subdivisions. (See **Exhibit B**.)

In light of the above, this letter is being provided to inform the Department that DHHL is not subject to "Chapter 202, Special Management Area Rules for the Maui Planning Commission Special Management Area Permitting" for the development of the portions of the Village 1-B subdivision and Leali'i Parkway improvements located on DHHL lands and identified by TMKs (2)4-5-021:020 and (2)4-5-036:109-110.

We note that a portion of the offsite roadway improvements within the SMA and shoreline setback area being proposed as part of the subject project will be located on lands not owned by DHHL. As such, DHHL will comply with SMA and shoreline setback area permitting requirements for the proposed roadway improvements occurring on lands owned by the State of Hawai'i and HHFDC.

Although DHHL is not subject to SMA and shoreline rules on lands that it owns, DHHL has determined that the project does not contravene the objectives and policies of the Hawai'i Coastal Zone Management Program as established by Chapter 205A, HRS. The proposed improvements located in the SMA are not anticipated to impact coastal resources. Appropriate

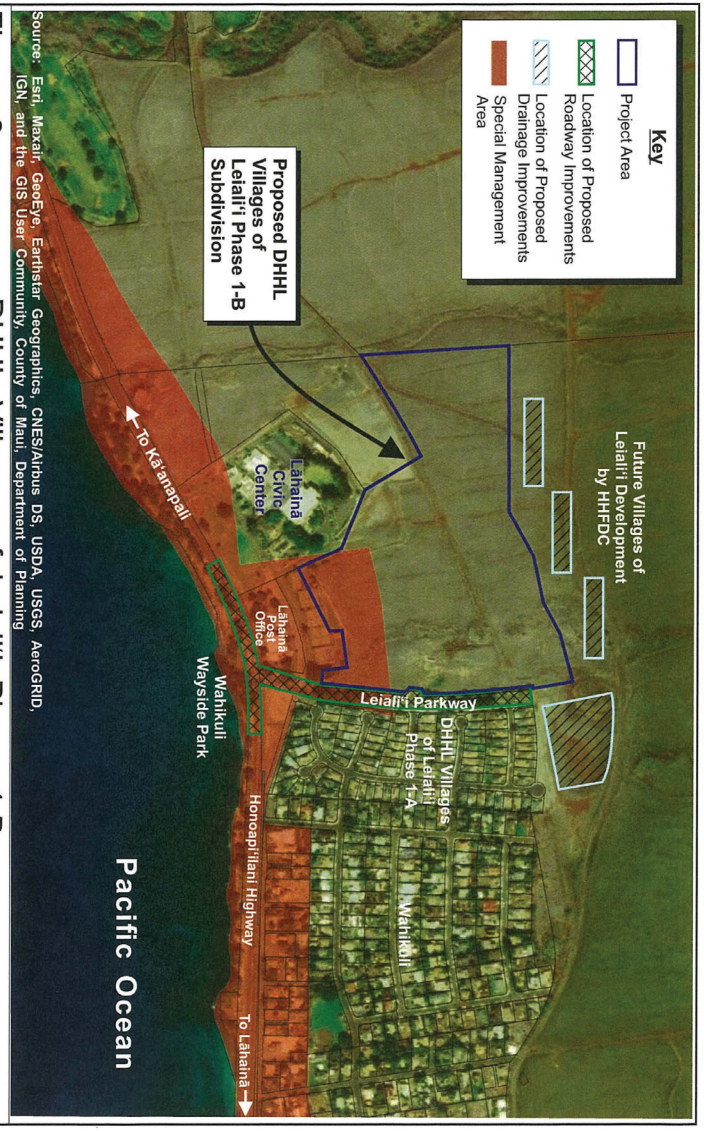
Best Management Practices and temporary erosion control measures will be utilized to ensure that construction runoff is appropriately detained, minimizing any impact on coastal waters.

Should you have any questions, or require additional information, please feel free to call Stewart Matsunaga, Acting Administrator, Land Development Division at (808) 620-9283.

Aloha,

William Ailā, Jr., Chairman
HAWAIIAN HOMES COMMISSION

Attachment
CC: Emily Murai, Munekiyo Hiraga
Adrienne Wong, Austin, Tsutsumi & Assoc.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, County of Maui, Department of Planning

Figure 3 DHHL Villages of Leiali'i Phase 1-B Special Management Area

Prepared for: State of Hawai'i, Department of Hawaiian Home Lands

MUNEKIYO HIRAGA

ATA/2371 DHHL Vill of Leiali Ph. 1B PERMITTING\Application\Figures\SMA

EXHIBIT A

STATE OF HAWAII
DEPARTMENT OF THE ATTORNEY GENERAL
STATE CAPITOL
HONOLULU, HAWAII 96813
(808) 548-4740

Oct 5 PM '87
BUSINESS & ECONOMIC DEVELOPMENT

CORINNE K. A. WATANABE
FIRST DEPUTY ATTORNEY GENERAL

34470

October 23, 1987

LEGAL MEMORANDUM

TO: The Honorable Roger A. Ulveling, Director
Department of Business and Economic Development

FROM: John W. Anderson
Deputy Attorney General

SUBJECT: Applicability of County Special Management Area (SMA) permit requirements to Hawaiian Home Lands.

This responds to your September 2, 1987 request for an opinion whether the views expressed in Attorney General's Opinion 72-21 are applicable to county special management area permits prescribed by Part II of Chapter 205A, Hawaii Revised Statutes. We answer the question in the affirmative.

In Attorney General's Opinion 72-21 we held that lands needed or required by the Hawaii Homes Commission for purposes of the Hawaii Homes Commission Act, 1920 (the Act) are not subject to county zoning powers. We held that Section 204 of the Act is controlling with reference to the use of Hawaiian home lands and that section 204 vests control of these lands in the Department of Hawaiian Home Lands.

In our prior opinion we also noted that the Hawaiian Homes Commission Act is made part of the Constitution of the State of Hawaii by section 3, Article XII thereof as a compact with the United States,1/ and that no state statute or county ordinance or county charter provisions can affect such lands unless in conformity with the Act. We said that subjecting Hawaiian home

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1/ The compact to adopt the Act as part of the Constitution of Hawaii is contained in the Admissions Act of March 18, 1959, Pub L. 86-3, 73 Stat 4. The compact also provides in section 4 that the Act will be subject to repeal or amendment only with the consent of the United States, and in no other manner. This latter provision is repeated in section 3, Article XII of the State Constitution.

lands needed for purposes of the Act to county land use regulations would be contrary to the purpose of the Act.2/

The Hawaii Supreme Court recently has recognized the unique status of Hawaiian home lands under the state constitution by noting that "[t]he Department of Hawaiian Home Lands, headed by the Hawaiian Homes Commission, received exclusive control of the Hawaiian home lands by section 204 of the HHCA." Ahuna v. Department of Hawaiian Home Lands, 64 Haw. 327, 338 (1982). (Emphasis added.)3/

There is no apparent reason to alter our prior opinion. We find that county special management area (SMA) permits prescribed in Part II of chapter 205A, Hawaii Revised Statutes, by sections 205A-28 and 205A-29 do not differ in any essential respect from other county land use regulations. The regulations were originally adopted to provide "special interim controls on developments within an area along the shoreline," (Section 1 of Act 176, 1975 Sess. Laws of Hawaii 385) and remain a tool for regulating land use in the State's coastal zone.

Part II of Chapter 205A, Hawaii Revised Statutes is part of the state's coastal zone management program which has been approved by the United States government pursuant to the Coastal Zone Management Act of 1972, Public Law 92-583. However, there is nothing in Public Law 92-583 which would purport to preempt control of Hawaiian home lands in the coastal zone. The law purports only to persuade the states to prepare and implement "management programs to preserve, protect, develop and whenever possible restore the resources of the coastal zone of the United

---

2/ We found, however, that a request of the Hawaiian Homes Commission to rezone a portion of lands held by it from residential to light industrial use was "tantamount to a finding that the Hawaiian home lands in question were no longer needed or required for purposes of the Act," and that such action authorized the county of Hawaii "to exercise zoning powers over such lands...." We noted, however, that "should the Commission subsequently determine that those lands are again needed or required for purposes of the Act, the authority of the County of Hawaii to zone those lands will terminate."

3/ It necessarily follows that the state as well as the counties may not impose land use controls on Hawaiian Home Lands in a manner inconsistent with the Hawaiian Homes Commission Act.

States" by providing "financial incentives to undertake the responsibility for setting up management programs in the coastal zone." The legislative history further states that:

> There is no attempt to diminish state authority through federal preemption. The intent of this legislation is to enhance state authority by encouraging and assisting the states to assume planning and regulatory powers over their coastal zones.

S. Rep. No. 753, 1972 U.S. Code Cong. and Admin. News. 92d Congress, Second Session 4776.

Although the Hawaiian Homes Commission may take steps to subject their lands within the coastal zone to county special management area permits and other county land use controls, attempts by the counties or other "authorities" as delineated in section 205A-22 4/ to impose their controls on Hawaiian home lands would be incompatible with the Act.5/

John W. Anderson
Deputy Attorney General

JWA:bnf

APPROVED:

Warren Price, III
Attorney General

4/ "Authority" in section 205A-22 is defined as the county planning commission or the county council, as appropriate.

5/ This opinion in no manner attempts to limit the counties' permit authority in waters adjacent to the Hawaiian home lands.

EXHIBIT B

LINDA LINGLE
GOVERNOR
STATE OF HAWAII

MICAH A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION

BEN HENDERSON
DEPUTY TO THE CHAIRMAN

KAULANA H. PARK
EXECUTIVE ASSISTANT

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

January 25, 2005

The Honorable Milton Arakawa, Director
Department of Public Works and
Environmental Management
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Arakawa,

Subject: Letter of Authorization and
Declaration of Exemptions
Waiehu Kou Residence Lots Phase IV
TMK: (2) 3-2-012:001

This letter serves to authorize WK3 LLC, developer and subsidiary of Dowling Company, Inc., and their engineering consultant, Austin, Tsutsumi & Associates, Inc. to act on behalf of the Department of Hawaiian Home Lands (DHHL) to process the proposed subdivision of the subject parcel.

The subdivision shall be exempt from the underlying County agricultural zoning designation and will be submitted for processing, review and compliance under the R-1 residential standard, 6,000 square-foot minimum lot size.

DHHL is exempting itself from various State of Hawaii and County of Maui subdivision development related statutes and regulations related to the development of Waiehu Kou Phase IV, TMK: (2) 3-2-12:01.

The declaration of exemptions below is intended to facilitate the granting of final subdivision approval to allow for the construction of houses prior to the full construction and completion of the subdivision improvements and to minimize the cost of improvements. The following exemptions are declared:

1. State Land Use Commission District Boundary Amendment
   - Chapter 205, Hawaii Revised Statutes, as Amended
   - State Land Use Commission Rules

2. Title 19, Maui County Code, 1980, as Amended
   - Chapter 19.510 Application and Procedures
   - Section 19.510.040 Change of Zoning

3. Community Plan Amendment
   - Maui County Code, Chapter 2.80
   - Maui County Charter, Section 8-8.4 and 8-8.5

4. Special Management Area Permit Application
   (See attached State Attorney General Memorandum)

5. Subdivision Design Standards
   - Maui County Code 18.16.130, Cul-de Sacs
   - Maui County Code 18.24.010, Filing Fees for Subdivision Plan Review

6. Subdivision Design Standards
   - Maui County Code 18.20.140, Underground Utilities

7. Subdivision Design Standards
   - Maui County Code 19.08.040, Minimum Lot Width of 60 feet

8. Subdivision Design Standards
   - Maui County Code 18.16.220, Minimum Lot Width of 65 feet for corner lots

9. Standard concrete curbs and gutters for interior subdivision roadways.
   - The project will have standard concrete rolled curbs for interior roadways

10. Location of sidewalk next to curb.
    - The project will locate the sidewalks along the road right-of-way boundary. The location along the road right-of-way boundary is similar to constructed road section of the existing Waiehu Kou Phase 1, Phase 2 and Phase 3 subdivisions.

11. All County of Maui Assessments, including but not limited to park, traffic, etc.

12. Subdivision Design Standards
    - Maui County Code 18.16.040, 18.16.050, 18.16.060, Roadway widening and improvements to Halewaiu Road.

13. County of Maui, Department of Water Supply (DWS) Section 2-14
    - In lieu of entering into an agreement with DWS for the repair and replacement of the water system improvements, DHHL, by written letter, will guarantee the improvements for a period of one year after DWS acceptance through the developer and contractor.

14. Maui County Code Articles 18.20.200 & 18.20.210
    - It is DHHL's intent to obtain final subdivision approval prior to completion of the construction in accordance with Maui County Code Section 18.20.190. DHHL however is exempting itself from Articles 18.20.200 and 18.20.210 of the subdivision code and Section 2-13 of the DWS Rules and Regulations, which requires DHHL to enter into an agreement with the County of Maui to complete the improvements and utilities and to further provide a surety bond or other security acceptable to the County of Maui to guarantee that improvements and utilities will be completed. DHHL shall complete all improvement and utilities in accordance with the construction plans approved by the County of Maui.

Should you have any questions, please call me at 586-3801 or Stewart Matsunaga, Project Manager, Land Development Division at 587-6454.

Aloha and mahalo,

Micah A. Kane, Chairman
Hawaiian Homes Commission

Enc.

c: WK3 LLC
Austin, Tsutsumi & Associates, Inc.

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