February 23, 2022

Mary Alice Evans, Director
Office of Planning and Sustainable Development
Environmental Review Program
State of Hawai‘i
235 South Beretania Street, Room 702
Honolulu, Hawai‘i 96813

Subject: Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i
Publication of the Draft Environmental Assessment and Anticipated Finding of No Significant Impact

Dear Ms. Evans,

The Hawaii Health Systems Corporation (HHSC), on behalf of the Hilo Medical Center (HMC), hereby submits the Draft Environmental Assessment and Anticipated Finiding of No Significant Impact (DEA-AFNSI) for the HMC Expansion project for publication in the next available edition of the Environmental Notice. The proposed project involves Tax Map Key (3)2-3-027:002 in Hilo, South Hilo District on the Island of Hawai‘i.

In addition to this letter, we have also submitted the electronic version of the Environmental Review Program Publication Form and a searchable PDF-formatted copy of the DEA-AFNSI through the online submission platform.

If you have any questions, please call Bryan Esmeralda of Munekiyo Hiraga, project consultant, at (808) 983-1233 or via email at planning@munekiyohiraga.com.

Sincerely,

Dan Brinkman
East Hawaii Region CEO
Hawaii Health Systems Corporation

CC: Mari Horike, Hilo Medical Center
Andrew Tang, Bowers + Kubota
Bryan Esmeralda, Munekiyo Hiraga

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Friday, February 25, 2022 2:34:02 PM

Action Name

Proposed Hilo Medical Center Expansion

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

South Hilo, Hawaiʻi

Tax Map Key(s) (TMK(s))

(3)2-3-027:002

Action type

Agency

Other required permits and approvals

Chapter 6E, HRS Historic Preservation Compliance, Plan Approval, Construction Permits

Proposing/determining agency

Hawaiʻi Health Systems Corporation/Hilo Medical Center

Agency contact name

Mari Horike

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Map It

Was this submittal prepared by a consultant?

Yes

Consultant

Munekiyo HIraga

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Suite 104
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United States
Map It

Action summary

The proposed action involves the expansion of the Hilo Medical Center (HMC) which will be implemented in two phases. The Phase 1 addition will be located in a two-story structure above the current physician and visitor parking and will house an ICU containing an expansion of up to 18 beds. The Phase 2 addition will consist of a three-story structure also located above the existing visitor parking. One (1) floor of Phase 2's three-story building will be dedicated to a 12-bed Family Birthing Center containing six (6) Labor, Delivery, Recovery, Postpartum (LDRP) rooms, three (3) isolation LDRP rooms, and three (3) patient rooms for postpartum or antepartum patients. The additional floor has not yet been programmed for use. Both additions will connect to the existing HMC building via enclosed pedestrian bridges. In addition, the proposed action involves the redesign of the current physician and visitor parking areas to accommodate the expansion phases as well as utility connections.

Reasons supporting determination

Refer to Chapter VII, Significance Criteria, of the Draft Environmental Assessment.

Attached documents (signed agency letter & EA/EIS)

- Bowers_Hilo-Medical-Ctr_HI-Health-Systems_AFNSI_Letter.2.23.22.pdf
- Bowers_Hilo-Medical-Ctr_Draft-EA_March-2022.pdf

Action location map

- Bowers_Hilo-Medical-Ctr_TMKs_shape.shp.zip

Authorized individual

Bryan Esmeralda

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

Draft Environmental Assessment

PROPOSED HILO MEDICAL CENTER EXPANSION

Prepared for:

Hawai‘i Health Systems Corporation

Approving Agency:

Hawai‘i Health Systems Corporation

March 2022

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by Munekiyo Hiraga

MUNEKIYO HIRAGA

Planning. Project Management. Sustainable Solutions.

Draft Environmental Assessment

PROPOSED HILO MEDICAL CENTER EXPANSION

Prepared for:

Hawai‘i Health Systems Corporation

Approving Agency:

Hawai‘i Health Systems Corporation

March 2022

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MUNEKIYO HIRAGA

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List of Acronyms

AFNSI	Anticipated Finding of No Significant Impact
ALISH	Agricultural Lands of Importance to the State of Hawaiʻi
APRN	Advanced Practice Registered Nurse
BMPs	Best Management Practices
CIA	Cultural Impact Assessment
CO2 EQ	Carbon dioxide equivalent
DOE	Department of Education
EA	Environmental Assessment
EPA	Environmental Protection Agency
ER	Emergency Room
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FLIGHT	Facility Level Information on Greenhouse Gases Tool
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gases
HAR	Hawaiʻi Administrative Rules
HCDP	Hilo Community Development Plan
HCZMP	Hawaiʻi Coastal Zone Management Program
HDOT	State of Hawaiʻi, Department of Transportation
HELCO	Hawaiian Electric Light Company
HHSC	Hawaiʻi Health Systems Corporation
HMC	Hilo Medical Center
HoC	Hilo Silty Clay Loam, 0-10 percent slopes
HoD	Hilo Silty Clay Loam, 10-20 percent slopes
HRS	Hawaiʻi Revised Statutes
HTCO	Hawaiian Telcom
ICU	Intensive Care Unit
LDRP	Labor, Delivery, Recovery, Postpartum
LEED	Leadership in Energy and Environmental Design
LOS	Level of Service
LRFI	Literature Review and Field Inspection
LSB	Land Study Bureau
LUC	Land Use Commission
LUPAG	Land Use Pattern Allocation Guide
mph	Miles per hour
OR	Operating Room
RB	Rough Broken Land
s.f.	square feet
SHPD	State Historic Preservation Division
TDFM	Traffic Demand Forecasting Model
TIAR	Traffic Impact Assessment Report
TMK	Tax Map Key
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey

Executive Summary

Project Name:	Hilo Medical Center Expansion
Type of Document:	Draft Environmental Assessment
Legal Authority:	Chapter 343, Hawaiʻi Revised Statutes Title 11, Chapter 200.1, Hawaiʻi Administrative Rules
Anticipated Determination:	Anticipated Finding of No Significant Impact (AFNSI)
Applicable Environmental Assessment review "Trigger":	Use of State Lands and State Funds
Location:	Island of Hawaiʻi TMK No. (3)2-3-027:002
Landowner:	State of Hawaiʻi
Proposing Agency:	Hilo Medical Center 1190 Waiānuenue Avenue Hilo, Hawaiʻi 96720 Contact: Mari Horike, Administrative Services Officer Phone (808) 932-3124
Approving Agency:	Hawaiʻi Health Systems Corporation 3675 Kīlauea Avenue Honolulu, Hawaiʻi 96816
Consultant:	Munekiyo Hiraga 305 High Street, Suite 104 Wailuku, Hawaiʻi 96793 Contact: Bryan K. Esmeralda, AICP, Senior Associate Phone: (808) 983-1233
Project Summary:	The Hawaiʻi Health Systems Corporation (HHSC) is proposing the expansion and redesign of the Hilo Medical Center (HMC) to better serve the growing East Hawaiʻi community. The facility currently occupies 249,886 square feet (s.f.) and serves as Hawaiʻi island's leading provider of inpatient and outpatient care, offering a full range of services and programs on the 20-acre campus. The HMC is licensed for 166 beds for

acute care and 45 beds for long-term care and is one of three (3) hospitals in HHSC's East Hawai'i Region. HMC's existing facility was initially constructed in 1984 and is located at 1190 Waiānuenue Avenue in Hilo, Hawai'i, TMK (3)2-3-027:002 on State owned land.

The expansion of the Hilo Medical Center is consistent with HHSC's mission to provide accessible, high-quality, and cost-effective healthcare to Hawai'i's communities. The current facility has not been expanded since it opened its doors in 1985 and the onset of the COVID-19 pandemic highlighted the urgent need for increased Intensive Care Unit (ICU) capacity as the ICU beds are routinely occupied.

The proposed expansion will be executed in two (2) phases. The proposed Phase 1 addition will be located in a two-story structure above the current physician and visitor parking and will add approximately 18,900 s.f. to Hilo Medical Center's existing 249,886 s.f. The Phase 1 addition will house an ICU containing an expansion of up to 18 beds. This addition will connect to the existing hospital building via enclosed walkways to the second floor. Two (2) enclosed stairwells will provide additional access. Redesign of the current physician and visitor ground floor parking is also included as part of Phase 1. Air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components will be included in rooftop and ground floor mechanical and electrical spaces.

Phase 2 will consist of an approximately 43,000 s.f., three-story addition located above the existing visitor parking with two (2) pedestrian bridges/walkways connecting to the Phase 1 addition. One (1) floor of Phase 2's three-story building will be dedicated to a 12-bed Family Birthing Center containing six (6) Labor, Delivery, Recovery, Postpartum (LDRP) rooms, three (3) isolation LDRP rooms, and three (3) patient rooms for postpartum or antepartum patients. This Family Birthing Center will also include an Operating Room (OR) for caesarean delivery. With this addition, the current LDRP space can be repurposed for other programs as needed. The other floor of the Phase 2 expansion will be reserved for additional future programs to be determined by the HMC. Similar to Phase 1, air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components will be included in rooftop and ground floor mechanical and electrical spaces, but

will not affect the mechanical and electrical functioning of the Phase 1 addition. Phase 2 will also involve the redesign of the physician and visitor parking below the structure.

As the proposed action involves State land and funds, compliance with the environmental review requirements of Hawai‘i Revised Statutes (HRS), Chapter 343 is triggered. Accordingly, this Environmental Assessment (EA) has been prepared to evaluate the technical characteristics and potential environmental impacts of the proposed project, as well as to advance findings and mitigative measures relative to the project. HHSC shall serve as the approving agency for the EA.

PROJECT OVERVIEW

I. PROJECT OVERVIEW

A. PROJECT LOCATION, EXISTING USES, AND LAND OWNERSHIP

The Hawaiʻi Health Systems Corporation (HHSC) is proposing the expansion and redesign of the Hilo Medical Center (HMC) to better serve the growing East Hawaiʻi community. The facility currently occupies 249,886 square feet (s.f.) and serves as Hawaiʻi island's leading provider of inpatient and outpatient care, offering a full range of services and programs on the 20-acre campus. The HMC is licensed for 166 beds for acute care and 45 beds for long-term care and is one of three (3) hospitals in HHSC's East Hawaiʻi Region.

The existing HMC facility was initially constructed in 1984 and is located at 1190 Waiānuenue Avenue in Hilo, Hawaiʻi, TMK (3)2-3-027:002 on State owned land. Parking lots for physician and visitor parking are located onsite, right next to the HMC. Additional parking lots for employee, patient and visitor parking is located across of Waiānuenue Avenue. See **Figure 1** and **Figure 2**. Hilo is the population and commerce center for Hawaiʻi island, and the principal seat of the County of Hawaiʻi government.

B. PROJECT NEED AND PROPOSED ACTION

The expansion of the HMC is consistent with the HHSC's mission to provide accessible, high-quality, and cost-effective healthcare to Hawaiʻi's communities. The current facility has not been expanded since it opened its doors in 1985, however, the increase in hospital admissions and Emergency Room (ER) visits have increased over the years, indicating a need for increased hospital capacity. According to HHSC's annual reports, the HMC admitted 7,373 patients and had 36,854 ER visits in 2010. In 2020, 8,211 patients were admitted (10.2 percent increase from 2010), and there were 46,041 ER visits (10 percent increase from 2010). In 2020, 73 percent of all acute care discharges and 84 percent of all emergency department visits in Hawaiʻi County occurred at an HHSC facility. Additionally, the HMC has the second busiest ER in the State, only after The Queen's Medical Center on Oʻahu. The onset of the COVID-19 pandemic highlighted the urgent need for additional Intensive Care Unit (ICU) capacity as the ICU beds are routinely occupied (Hawaiʻi Health Systems Corporation 2010, 2020).

The proposed expansion will be executed in two (2) phases. The proposed Phase 1 addition will be located in a two-story structure above the current physician parking and will add approximately 18,900 s.f. to the HMC's existing 249,886 s.f. The Phase 1 addition will house an ICU containing an expansion of up to 18 beds. This addition will connect to the existing hospital building via enclosed walkways to the second floor. Two (2) enclosed stairwells will provide additional access. The parking lot beneath Phase 1 will be

Figure 1

Hilo Medical Center Expansion

Regional Location Map

0 2,500 Feet
1,250 5,000

Prepared for: Hawai'i Health Systems Corporation

MUNEKIYO HIRAGA

Bowers\Hilo MC\Figures\Regional Location Map

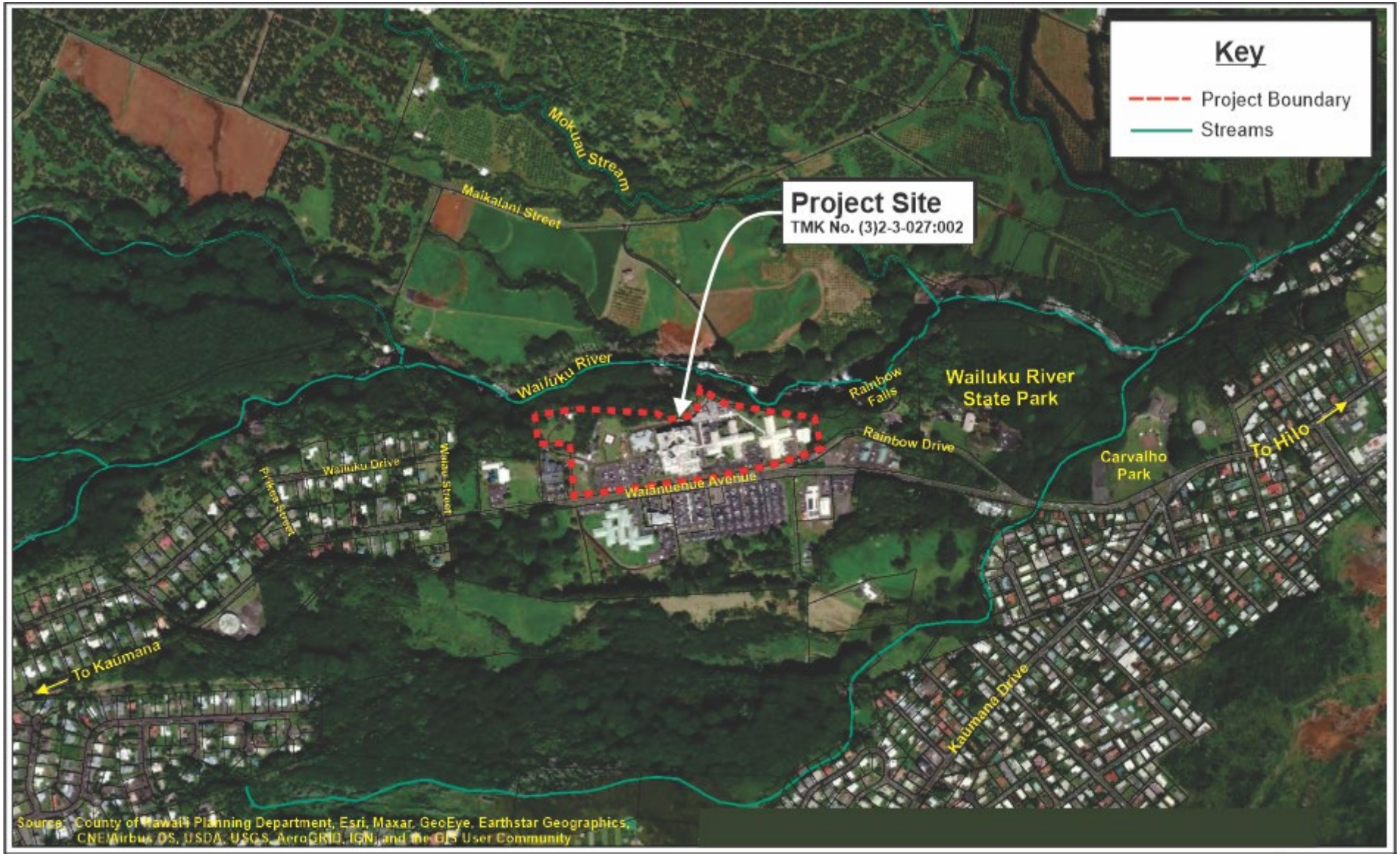


Figure 2

Hilo Medical Center Expansion

Project Area Map

0 250 500 1000 Feet

Prepared for: Hawai'i Health Systems Corporation

MUNEKIYO HIRAGA

Bowers/Hilo MC\figures\Project Area Map

redesigned to accommodate the expansion. There are currently 70 parking stalls underlying the proposed Phase 1 area. The Phase 1 expansion construction will result in a slight decrease in parking stalls to allow for building columns. Upon completion of Phase 1, there will be 61 parking stalls underlying the expansion area. Air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components will be included in rooftop and ground floor mechanical and electrical spaces.

Phase 2 will consist of an approximately 43,000 s.f., three-story addition located above the existing visitor parking with two (2) pedestrian bridges/walkways connecting to the Phase 1 addition. One (1) floor of Phase 2's three-story building will be dedicated to a 12-bed Family Birthing Center containing six (6) Labor, Delivery, Recovery, Postpartum (LDRP) rooms, three (3) isolation LDRP rooms and three (3) patient rooms for postpartum or antepartum patients. This Family Birthing Center will also include an Operating Room (OR) for caesarean delivery. With this addition, the current LDRP space can be repurposed for other programs as needed. The other floor of the Phase 2 expansion will be reserved for additional future programs to be determined by the HMC. Similar to Phase 1, air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components will be included in rooftop and ground floor mechanical and electrical spaces, but will not affect the mechanical and electrical functioning of the Phase 1 addition. Phase 2 will also involve the redesign of the visitor parking below the structure. There are currently 122 parking stalls in the Phase 2 area, however, at this time Phase 2 parking design has not yet been finalized.

The HMC has approximately 1,051 parking stalls across the entire campus and is generally below capacity. An internal parking lot study conducted by the HMC during a week-long period from 8:00 a.m. through 3:00 p.m. in October of 2020 revealed that an average of 72 visitor stalls were unoccupied in the parking area below the future Phase 1 and Phase 2 expansions. There is an additional 492 parking stalls located across Waiānuenue Avenue in the lower parking lot. During the parking study, an average of 62 parking stalls were unoccupied in the lower parking lot. These stalls are primarily used by hospital employees but can also accommodate patients and visitors. Although there will be a slight decrease in parking stalls onsite as previously mentioned with the development of the proposed project, early consultation with the County of Hawaiʻi, Department of Planning has indicated that the existing parking is sufficient to accommodate the proposed expansion.

It is noted that the proposed Phase 2 expansion building will slightly exceed the height of the existing 56-foot HMC building, while the Phase 1 expansion building will be slightly lower. The Phase 1 expansion building will be 47 feet and 6 inches in height, and the Phase 2 expansion building will be 61 feet and 6 inches in height. It is noted that the original Planned Unit Development permit (PUD-18) for the hospital approved construction of a 4-story, 72-foot tall hospital facility. The height of the proposed Phase 1 and Phase 2

buildings are within this approved height limit. A conceptual site plan and elevation model for Phases 1 and 2 are provided. See **Figure 3** and **Figure 4**.

C. LAND USE REGULATORY CONSIDERATIONS

1. Chapter 343, HRS, Environmental Assessment

As the proposed action involves the use of State lands and funds, compliance with the environmental review requirements of Hawai‘i Revised Statutes (HRS), Chapter 343 is triggered. Accordingly, this Environmental Assessment (EA) has been prepared to evaluate the technical characteristics and potential environmental impacts of the proposed project, as well as to advance findings and mitigative measures relative to the project. The HHSC shall serve as the approving agency for the EA.

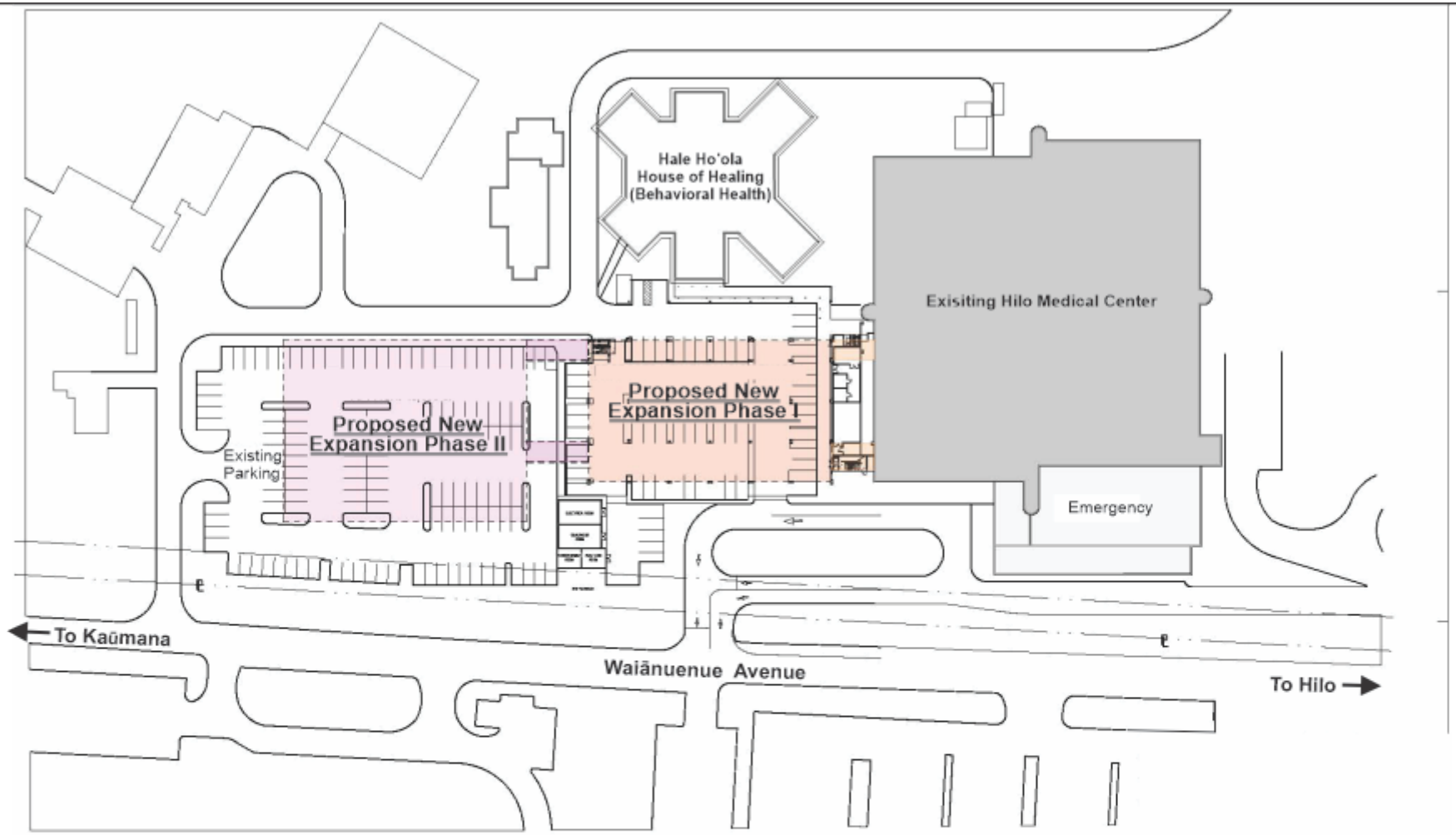
2. Hawai‘i County Code Chapter 25-Zoning

The Hilo Medical Center property is designated “RS-10” by Hawai‘i County zoning. Hospitals are allowed with a Use Permit from the appropriate Planning Commission in “RS” zones; however, it is noted that per Chapter 25-2- 61(b), Hawai‘i County Code, “*any use which received an approval as a conditionally permitted use prior to September 25, 1984, or which received prior approval through the use permit, is considered a legal use of the affected parcel and may be expanded or enlarged without obtaining another use permit, provided such expansion, enlargement, or addition is in full compliance with...the applicable district regulations.*” The existing Hilo Medical Center was approved with a Planned Unit Development permit prior to the requirement of a Use Permit for a hospital and may be enlarged within the same parcel without the need for a new Use Permit.

3. Plan Approval (Hawai‘i County Code, Chapter 25, Division 7)

The HMC is a public use facility and is, therefore, subject to Plan Approval under the Hawai‘i County Code, Chapter 25, Division 7. As such, an application for Plan Approval will be prepared and submitted to the County of Hawai‘i Planning Department for review and approval. The Planning Department will review the project plans to assess its conformance with the County General Plan, zoning regulations and conditions of previous approvals, if applicable.

Other permits that may be required for the proposed project include a Community Noise Permit (as applicable) and Construction Approvals (Demolition/Grading/Building Permits).



Source: Bowers + Kubota

Figure 3

Hilo Medical Center Expansion
Overall Site Plan

NOT TO SCALE

Prepared for: Hawai'i Health Systems Corporation

MUNEKIYO HIRAGA

Bowers\Hilo MC\figures\Overall Site Plan

Source: Bowers + Kubota

Figure 4

Hilo Medical Center Expansion
Conceptual Elevation

Prepared for: Hawai'i Health Systems Corporation

MUNEKIYO HIRAGA

Bowers\Hilo MC\Figures\Overall Site Plan Elevation

D. PROJECT COST AND IMPLEMENTATION SCHEDULE

The project will have an anticipated development timeframe of approximately seven (7) years with an anticipated completion date of Spring 2025 for Phase 1 and anticipated completion date of Spring 2029 for Phase 2. The total estimated construction cost for the proposed project is approximately $90 million (Phase 1: $30 million, Phase 2: $60 million).

DESCRIPTION OF THE EXISTING CONDITIONS, POTENTIAL IMPACTS, AND PROPOSED MITIGATION MEASURES

II

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

A. PHYSICAL ENVIRONMENT

1. Surrounding Land Uses

a. Existing Conditions

The Hawai‘i Health Systems Corporation (HHSC) is proposing the expansion of the Hilo Medical Center (HMC) located in South Hilo, the commercial, industrial, and government center of Hawai‘i County.

Land surrounding the project site is primarily occupied by other medical facilities, as well as residential communities and open conservation land. To the east, and beside the HMC, is the Yukio Okutsu State Veterans Home. To the west of the project site is the Kaiser Permanente Clinic; and south of the project site is Hale Anuenue Restorative Care Center and the Hawai‘i Pacific Oncology Center.

b. Potential Impacts and Proposed Mitigation Measures

The proposed expansion will be implemented on the existing HMC property, making prudent use of the existing previously developed land and infrastructure systems. It is noted Hawai‘i Pacific Oncology Center is being expanded on the 0.5308-acre empty lot immediately adjacent to the existing center and is currently under construction. However, construction of the oncology center is expected to be completed prior to the HMC expansion. The proposed project is not anticipated to have adverse impacts upon surrounding land uses.

2. Climate

a. Existing Conditions

The island of Hawai‘i is characterized by a semi-tropical climate containing a multitude of individual microclimates.

Hilo is located on the island’s eastern shore. Rainfall in Hilo is plentiful; in 2020, average annual rainfall at the Hilo Airport was approximately 121 inches. Average high temperatures are in the mid-80s, while average low temperatures are in the mid-60s (State of Hawai‘i Data Book, 2020).

b. Potential Impacts and Proposed Mitigation Measures

The proposed action involves the expansion of the HMC above the site's existing parking areas, and redesign of the affected parking areas to accommodate the proposed expansion. The proposed action is not anticipated to affect climatic conditions in the area.

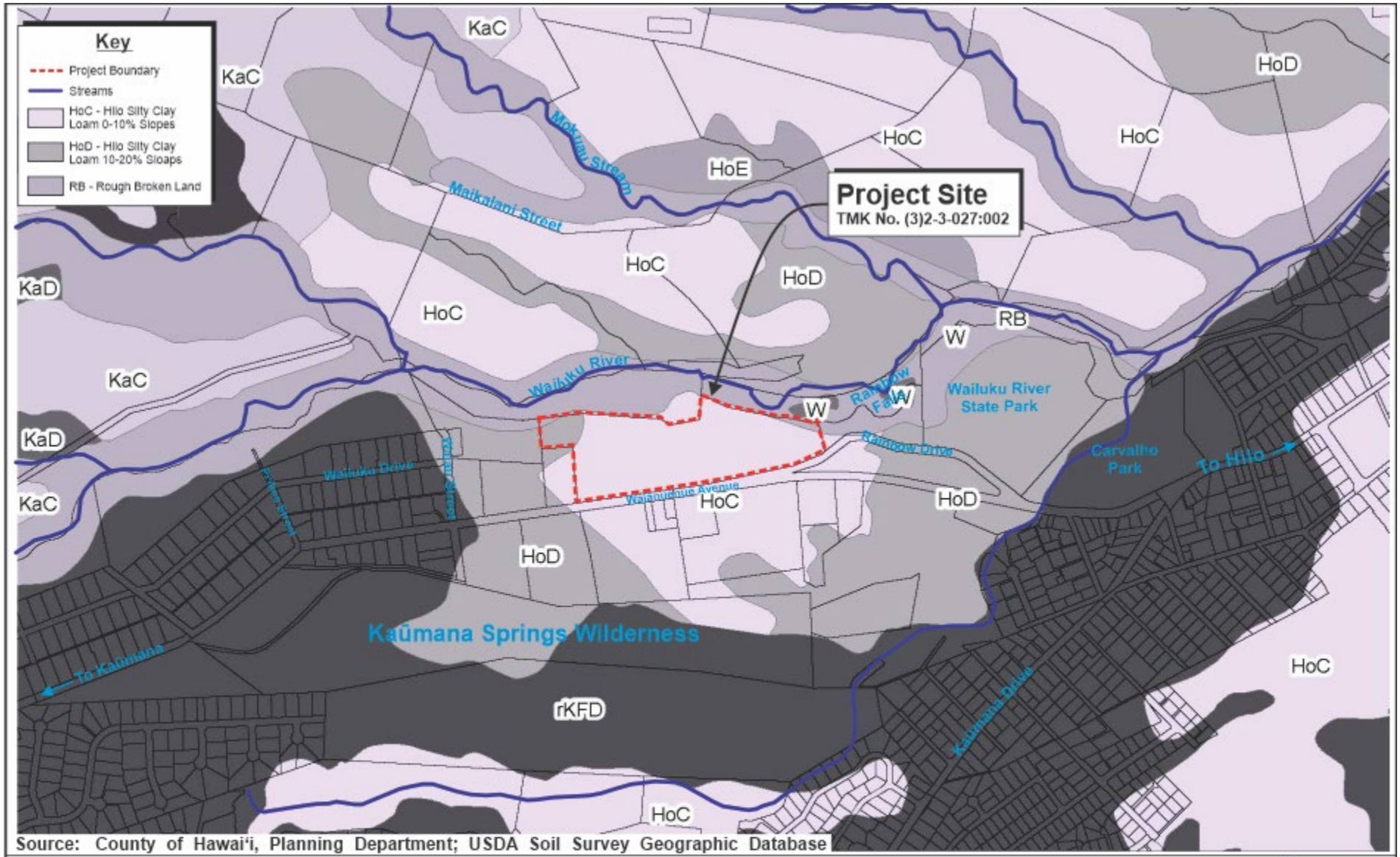
3. Topography and Soils

a. Existing Conditions

The soil type underlying the project site is Hilo Silty Clay Loam, 0-10 percent slopes (HoC). See **Figure 5**. According to the U.S. Department of Agriculture, Soil Conservation Service, 1973 Soil Survey for the Island of Hawai'i, HoC, is well-drained silty clay that is formed of volcanic ash layers that is low-lying on the Windward side of Mauna Kea. The elevation of this soil type ranges from near sea level to 800 feet, and with an annual rainfall of 120 to 180 inches. Hilo Silty Clay soils can be used for sugarcane, truck crops, orchards, and pasture. HoC runoff is slow with rapid permeability and slight erosion hazard. A portion of the project parcel is situated on Hilo Silty Clay Loam, 10 to 20 percent slopes (HoD) and small portions of the parcel closest to the Wailuku River are situated on Rough Broken Land (RB), however, the proposed expansion will be solely constructed upon HoC. HoD is similar to HoC, but is steeper. RB is a very steep, miscellaneous land type with an elevation ranging from near sea level to 3,000 feet and annual rainfall of 50 or more inches. RB is primarily found in gulches. Scattered waterfalls can be found on RB along with stone and rock outcrops. This land can be used for pasture, woodland, wildlife habitat, and recreation areas. There is medium runoff with a slight to moderate erosion hazard (U.S. Department of Agriculture, Soil Conservation Service, 1973).

b. Potential Impacts and Proposed Mitigation Measures

The underlying soils at the project site are well-drained with a slight erosion hazard. As a previously disturbed and developed site, and due to the project's design to be elevated above the existing parking areas, the amount of cut and fill required for implementation of the project is anticipated to be minimal. Nonetheless, to prevent soil erosion during site work, the contractor will implement construction industry standard Best Management Practices (BMPs), which may include, but are not be limited to sequencing construction to minimize exposure time of cleared surface area, installing and maintaining temporary sediment basins, temporary diversion berms and swales to intercept runoff, silt fences, dust fences, and



Source: County of Hawai'i, Planning Department; USDA Soil Survey Geographic Database

Figure 5

Hilo Medical Center Expansion

Soil Classification Map

0 250 500 1000 Feet

Prepared for: Hawai'i Health Systems Corporation

MUNEKIYO HIRAGA

Bowers\Hilo MC\figures\Soil Classification Map

slope protection. All earthwork and grading activity will conform to the standards of Chapter 10, Erosion and Sedimentary Control of the Hawai‘i County Code and runoff generated from the project will be disposed of onsite. With the implementation of the aforementioned mitigation measures, the proposed project is not anticipated to have a significant adverse impact on topography and soils.

4. Agriculture

a. Existing Conditions

In 1977, the State Department of Agriculture developed a classification system to identify Agricultural Lands of Importance to the State of Hawai‘i (ALISH). The classification system is based primarily, though not exclusively, upon the soil characteristics of the lands. The three (3) classes of ALISH lands are: “Prime”, “Unique”, and “Other” important agricultural land, with all remaining lands designated “Unclassified”.

When utilized with modern farming methods, “Prime” agricultural lands have a soil quality, growing season, and moisture supply necessary to produce sustained crop yields economically. “Unique” agricultural lands possess a combination of soil quality, growing season, and moisture supply to produce sustained high yields of a specific crop. “Other” important agricultural lands include those that have not been rated as “Prime” or “Unique”, but are of statewide or local importance for agricultural use. The project site is not classified under the ALISH system. There are no “Prime”, “Unique”, or “Other” important agricultural lands within the immediate vicinity of the project area.

The University of Hawai‘i, Land Study Bureau (LSB) developed the Overall Productivity Rating, which classified soils according to five (5) levels, with “A” representing the class of highest productivity soils and “E” representing the lowest. Due to its urbanized nature, the project area is not classified by the LSB.

b. Potential Impacts and Proposed Mitigation Measures

The project area is an urbanized area and there are no existing agricultural activities occurring onsite. Given the foregoing, the proposed project is not anticipated to present significant adverse impacts on agriculture.

5. Flood, Tsunami, and Sea Level Rise Hazards

a. Existing Conditions

As indicated by the Federal Emergency Management Agency's Flood Insurance Rate Map (FIRM) for the area, the project site is located within Flood Zone X (unshaded), which is an area of minimal flood hazard, determined to be outside the 0.2 percent annual chance flood. See **Figure 6**. In addition, the project site is located outside of the tsunami evacuation zone.

A 3.2-foot rise in sea level is projected for the Hawaiian Islands by the mid-to-latter half of the 21st century based on the findings of the *Hawai'i Sea Level Rise Vulnerability and Adaptation Report* that was prepared in 2017 by the Hawai'i Climate Change Mitigation and Adaptation Commission. It is noted that the project site is located inland and outside of the projected 3.2-foot sea level rise exposure area.

b. Potential Impacts and Proposed Mitigation Measures

There are no restrictions on development located in areas designated as Flood Zone X (unshaded). Given that the project site is located within Flood Zone X (unshaded) and outside of the projected 3.2-foot sea level rise exposure area, and tsunami evacuation zone, no significant adverse impacts with regards to floods, tsunamis, and sea level rise hazards are anticipated.

6. Earthquake Hazards

a. Existing Conditions

Thousands of earthquakes occur every year beneath the Island of Hawai'i. Earthquakes in Hawai'i are closely linked to the volcanoes that shaped the island. Numerous small earthquakes usually accompany eruptions and magma movement within Hawai'i's active volcanoes. Other tectonic earthquakes, which include the largest ones, occur in areas of structural weakness at the base of Hawai'i's volcanoes or deep beneath the island (USGS Hawaiian Volcano Observatory, Earthquakes).

A majority of the most destructive earthquakes recorded since 1868 have occurred on the Island of Hawai'i. Several destructive earthquakes have hit the East Hawai'i. A 7.7 magnitude earthquake in 1975 and a 6.1 magnitude earthquake in 1989, with its epicenter in Puna, caused extensive damage with both generating tsunamis. Most recently in 2018, a 6.9 magnitude

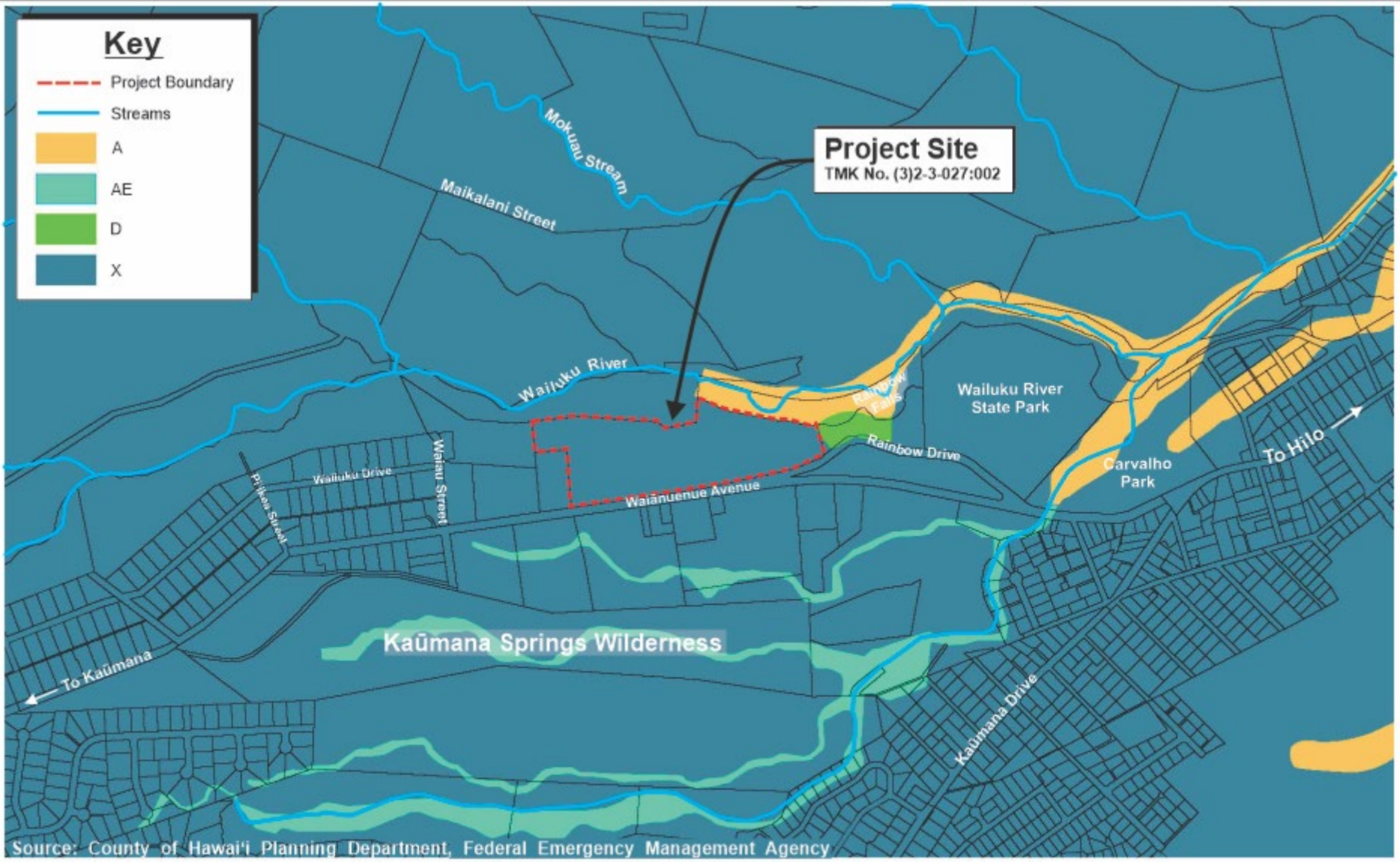


Figure 6

Hilo Medical Center Expansion
Flood Hazard Zones Map

0 250 500 1000 Feet

Prepared for: Hawai'i Health Systems Corporation

MUNEKIYO HIRAGA

Bowers\Hilo MC\figures\Flood Zone Map

earthquake, with its epicenter in Puna, was the largest earthquake to strike Hawai‘i since 1975. Destructive earthquakes have also been felt in the Volcano District and on the west side of the island in Kona and Hualālai. (USGS Hawaiian Volcano Observatory, Earthquakes in Hawaii: What You Need to Know).

b. Potential Impacts and Proposed Mitigation Measures

The proposed expansion will be designed and constructed in compliance with the seismic design standards in the County of Hawai‘i building code, as well as other applicable County, State, and Federal building standards. As such, significant adverse impacts with regards to earthquake hazards are not anticipated at either project area.

7. Volcanic Hazards

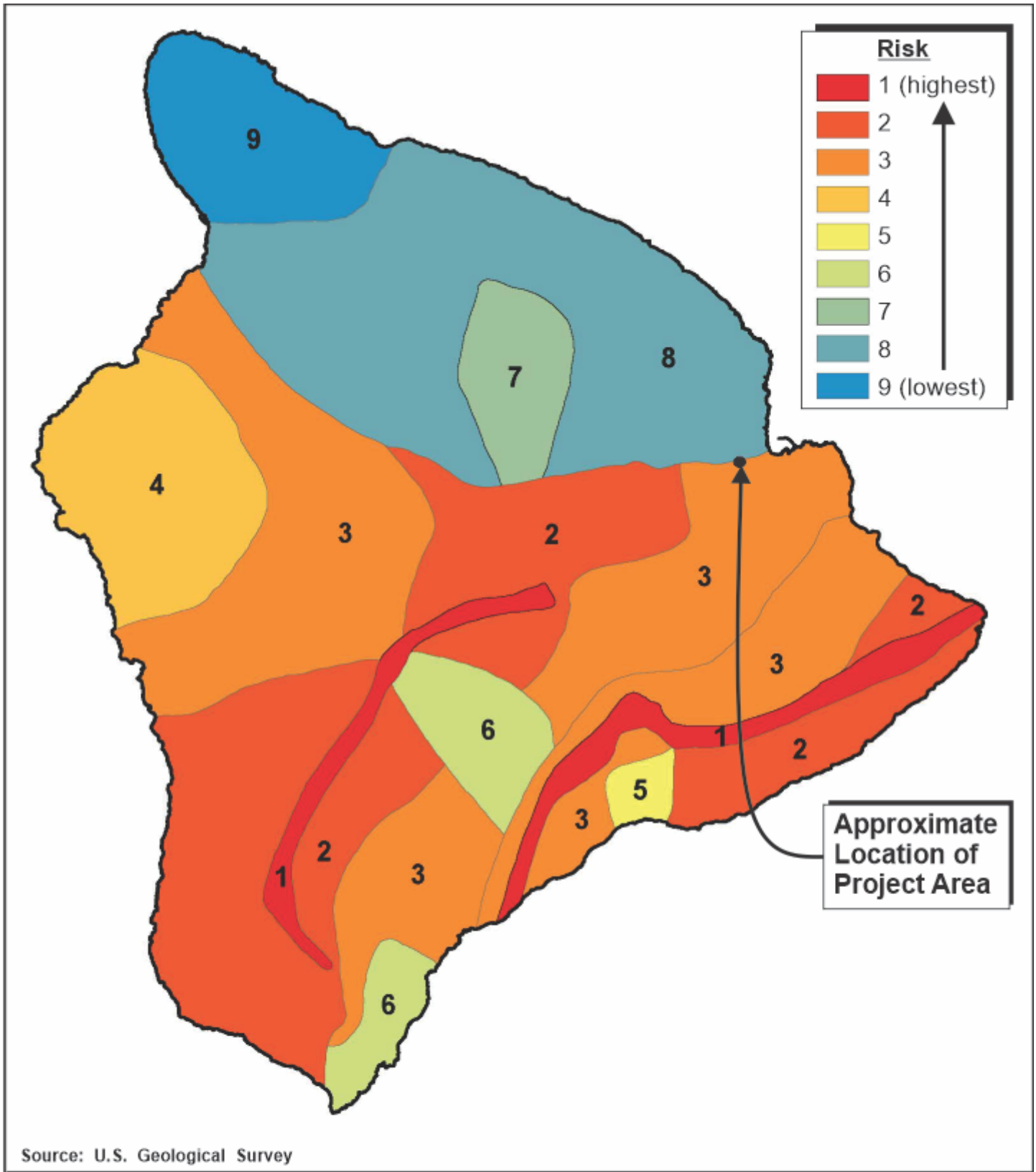
a. Existing Conditions

The proposed project area is located on the lower slopes of Mauna Kea, one (1) of five (5) shield volcanoes comprising the Island of Hawai‘i.

The U.S. Geological Survey (USGS) published maps showing lava flow hazard zones on the island of Hawai‘i. Hazard zones from lava flows are primarily based on the location and frequency of historic and prehistoric eruptions. Although other direct hazards from eruptions, such as tephra fallout and ground cracking and settling, are not specifically considered in the hazard map, those hazards tend to be highest in the areas of the highest hazard from lava flows. The current map, which was revised in 1992, divides the island into zones that are ranked from 1 to 9 based on the probability of coverage by lava flows. Zone 9 represents the lowest lava flow hazard while Zone 1 represents the highest. The project area is located within Zone 3. See **Figure 7** (USGS, 1992).

b. Potential Impacts and Proposed Mitigation Measures

Taking into account the lava flow risks associated with the Hilo Medical Center’s proximity to active volcanoes, the HHSC has established emergency and civil defense procedures in the event of an emergency or civil defense action.



Source: U.S. Geological Survey

Figure 7 Hilo Medical Center Expansion
Lava Flow Hazard Map

0 3.75 7.5 15 Miles

Prepared for: Hawai'i Health Systems Corporation

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Bowers\Hilo MC\Figures\Lava Flow Hazard Map

8. Flora and Fauna

a. Existing Conditions

The vegetation of the project area was most likely rain forest dominated by the native ʻŌhiʻa (*Metrosideros polymorpha*) and Koa (*Acacia koa*) trees prior to human settlement. Due to sugar cane cultivation, other agricultural activity and urban development, the current vegetation of the project region is primarily non-native grasses, weeds, and ornamental plants. Species that may be seen in the project area include the croton (*Codiaeum variegatum*) and ti (*Cordyline fruticosa*) plants (Geometrician Associates, 2020). There are no known endangered or threatened plant species in the project area, and none that are a conservation concern.

Related to fauna, the project area is not known to contain habitat area, or areas for native fauna species such as the Hawaiian hawk (*Buteo solitarius*) or the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), to nest, breed, or inhabit. However, it is noted that threatened and endangered sea birds may transit the site, or come in and land on the ground or structures occasionally. Research of other environmental review documents in the area revealed that the federally threatened Newell's Shearwater (*Puffinus auricularis newelli*) or ʻaʻo, and the federally endangered Hawaiian Petrel (*Pterodroma phaeopygia sandwichensis*) or ʻuaʻu, and a species of concern, the Band-rumped storm petrel (*Oceanodrama castro*), may fly over the project area. In addition, other species which are not listed under the Endangered Species Act, but are protected under the Migratory Bird Treaty Act may transit the area while traveling to or from their high-elevation nesting areas. The threatened Newell's Shearwater was formerly common on Hawaiʻi Island, and is known to nest high in the mountains on the windward side under thick vegetation. The endangered Hawaiian Petrel nests at high elevations and burrows or excavates four (4) to six (6) feet or more in lithosols characterized by boulders and erosional debris found in association with bedrock, and can be found under rocky outcrops, lava tubes, or other suitable burrows (Hoʻokuleana, 2019 and Geometrician Associates, 2020).

b. Potential Impacts and Proposed Mitigation Measures

As discussed above, the flora and fauna observed within the project area is mostly represented by non-native species that are of no environmental or conservation concern. The proposed action will take place on an existing parking facility that has previously been graded and landscaped.

The proposed action does not involve work which would disrupt existing vegetation in the area.

In addition, construction will be limited to daylight hours, as practicable. Should nighttime construction work occur during the construction phase, BMPs such as shielding lights will be implemented to reduce the potential for impacts to nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures. In addition, all exterior structural lighting associated with the proposed project will be shielded and downward facing so as to reduce the potential for impacts to nocturnally flying sea birds. Finally, nighttime construction during the seabird fledgling period, September 15 through December 15, will be avoided as practicable.

With implementation of the above-noted mitigation measures, significant adverse impacts to flora and fauna species in the vicinity of the project area is not anticipated.

9. Streams, Wetlands, and Reservoirs

a. Existing Conditions

The Wailuku River is a perennial stream located approximately 0.20 mile north of the project site and is separated by HMC facilities which include the Behavioral Health Unit, the West Wing office building and the heliport. It is the State's longest stream, running 28 miles long, and carrying approximately 270 million gallons of water from the slopes of Mauna Kea to Hilo Bay daily (National Park Service 2021). There are no reservoirs within the vicinity of the project area.

According to the U.S. Fish and Wildlife Service (USFWS), National Wetlands Inventory, there are no wetlands within the project site or immediate vicinity.

b. Potential Impacts and Mitigation Measures

The proposed project is located on an existing facility in the midst of similar developments and is separated from the Wailuku River by other facilities within the HMC complex. Appropriate BMPs will be used during construction and applicable drainage detention and water quality measures provided for the long-term habitation of the site. Based on the foregoing, significant adverse impacts to the Wailuku River are not anticipated.

10. Archaeological and Historical Resources

a. Existing Conditions

An archaeological Literature Review and Field Inspection (LRFI) was completed by Cultural Surveys Hawaiʻi for the proposed project and was submitted to the State Historic Preservation Division (SHPD) for review. See **Appendix "C"**. Previous archaeological assessments and studies were reviewed to identify potential historic properties and archaeological resources within and near the project area. In addition, a pedestrian field inspection was completed in June of 2021.

The project site is located within the Piʻihonua ahupuaʻa (traditional land division). Piʻihonua can be translated as "land incline" or "ascending earth" and home to the demigod Kana (son of the goddess Hina). The project area is classified as being within the pre-Contact and early post-Contact agricultural zone where dryland taro, bananas, kukui, pandanas, and mountain apples were cultivated. The Wailuku River flows behind the project site and is involved in several well-known, traditional tales associated with the Piʻihonua ahupuaʻa which included the battle of Maui, the moʻo (lizard) Kuna, and the tale of Hiʻiakaikapoliopele and the Wailuku Bridge. In addition to its historic and cultural significance, the Wailuku River has been valued for its many waterfalls and scenic beauty.

Hilo was once ruled by descendants of chief ʻUmi from about A.D. 1600 to 1620 and later ruled by Kamehameha. Following Kamehameha's death, the ahupuaʻa of Piʻihonua, Punahoa, and Waiākea were given to his son Liholiho (Kamehameha II) and would later be distributed amongst aliʻi. Following the Māhele (division of Hawaiian lands) of 1848, the Piʻihonua ahupuaʻa was designated as Crown Land owned by the Hawaiian Government. Following the Māhele and into the first half of the 20th century, agriculture and particularly sugar dominated the economy in Hilo. Lands in Piʻihonua were privately sold and housing projects were developed along Waiānuenue Avenue.

The Hawaiian Government opened the first public hospital in Hilo in the late 1890s, which was located a little over a mile away from the present HMC site below Hilo High School. It was later relocated below Ānuenue Falls next to the current HMC property in the early 1900s. In 1951, the Puʻumaile Tuberculosis Hospital opened in its place, later being combined with the Hilo Memorial Hospital in 1955 and was renamed the Hilo Hospital. In 1983, an earthquake damaged the Hilo Hospital and the present HMC facility was constructed immediately to the west.

The “Old Hilo Hospital” buildings next to the HMC are still present and a historic site according to SHPD records. It is currently the Keolahou emergency shelter operated by HOPE Services Hawaiʻi. The other SHPD-documented historic site closest to the project site is a Portuguese oven that is preserved within the HMC parking lot across from Waiānuenue Avenue and the HMC facility. Other historic properties in the vicinity of the project area documented by other archaeological studies include a stone mound, another Portuguese oven, several rock walls, and a cultural deposit which are also located outside of the project site. No known historic properties exist within the affected project area. See **Figure 8**.

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

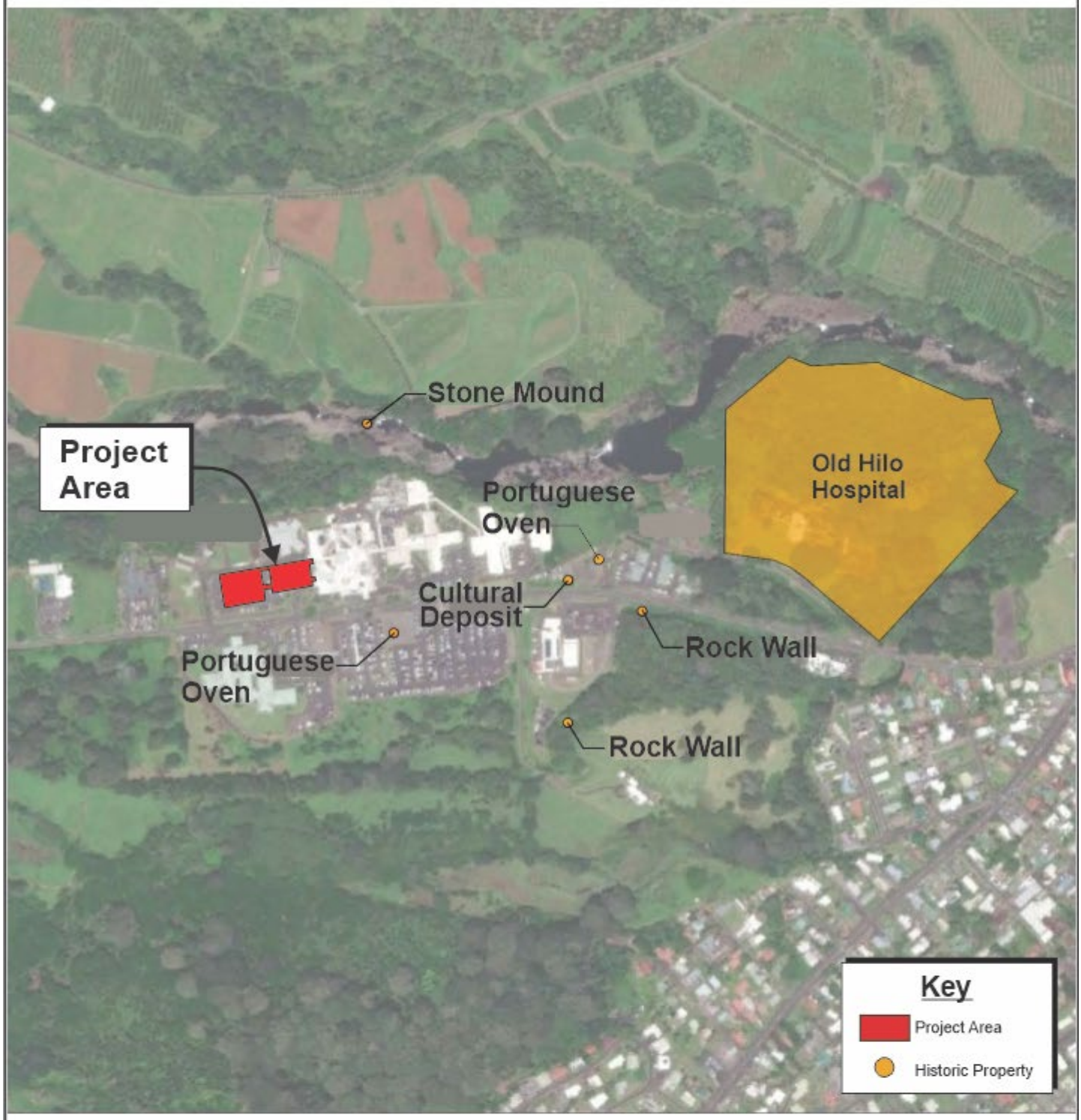
The field inspection conducted confirmed that the project area has been completely altered by previous development, existing roadways, and parking lots. The field inspection also confirmed a lack of surface archaeological features within the project area. Based on the extensive prior ground disturbance within the project area, it is very unlikely that intact historic cultural deposits will be encountered within the project area.

Due to the lack of historic properties within the affected project area and due to previous extensive ground disturbance, the proposed action is not anticipated to result in significant adverse impacts to archaeological or historic resources. The SHPD was consulted and concurred with the HHSCs determination that no historic properties will be affected by the proposed project via letter dated September 24, 2021. See **Appendix “C-1”**.

11. <u>Cultural Resources</u>

a. <u>Existing Conditions</u>

A Cultural Impact Assessment (CIA) was prepared for the proposed project by Cultural Surveys Hawaiʻi to identify the possibility of previous and/or currently conducted traditional cultural practices and resources procured within the project area and to assess the potential for impacts to these cultural resources from the proposed action, and offer mitigation measures to minimize potential impacts to cultural resources, practices, and beliefs. See **Appendix “D**”. The CIA was informed by archival and documentary research of traditional and historical accounts of Hilo and the ahupuaʻa of Piʻihonua, in which the project is located. Traditional accounts indicate that the upland rainforest of Piʻihonua was known for its use by bird catchers who would gather feathers used in making royal garments. The area



Source: Cultural Surveys Hawai'i, Inc.

Figure 8 Hilo Medical Center Expansion
Previously Documented Historic Properties

Prepared for: Hawai'i Health Systems Corporation

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Bowers\Hilo MC\Figures\Historic Properties

surrounding Hilo Bay was densely populated pre-contact, and the number of heiaus (traditional shrines or temples) located in Hilo suggest the importance of the area as a political center of the island.

The CIA process also involved outreach to Native Hawaiian organizations, cultural practitioners, and lineal descendants of the project area in efforts to gather information on knowledge of traditional cultural practices, legends, stories or chants that have occurred or presently occur in the Piʻihonua ahupuaʻa. However, several rounds of outreach attempts yielded no substantive responses regarding the project's impacts on cultural resources.

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

Based on the research conducted and results of cultural consultation, the CIA recommends the following mitigation measures to promote and preserve traditional cultural practices and resources:

1. 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 Hawaiʻi Administrative Rules (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.

2. 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 reinternment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance.

With implementation of the aforementioned mitigation measures, the proposed project is not anticipated to negatively impact traditional or cultural resources in the project area. Refer to **Appendix "D"**.

12. Beach and Mountain Access

a. Existing Conditions

The proposed project site will be located on a previously developed hospital facility located mauka of Hilo. No beach or mountain access trails are located in the vicinity of the project area.

b. Potential Impacts and Proposed Mitigation Measures

The proposed project will not impact any coastal access or mountain access trails, as no such resources are located within the project area.

13. Air Quality

a. Existing Conditions

Ambient air quality conditions on the island of Hawaiʻi are unique due to the natural volcanic air pollution that occurs. Sulfur dioxide emissions from Kīlauea Volcano convert into particulate sulfate, producing a volcanic haze (vog). Kīlauea Volcano last erupted in 1983, and although not currently erupting, Kīlauea still emits volcanic pollution. During the winter months, when winds turn southerly, vog can travel to Hilo, however, the air quality is generally clear throughout the year. (State of Hawaiʻi 2020 Ambient Air Monitoring Network 5-Year Assessment)

In addition to volcanic air pollution, other potential sources of air pollution include traffic along area roadways.

b. Potential Impacts and Proposed Mitigation Measures

During construction associated with the implementation of the proposed project, there may be short-term impacts to air quality, however, these impacts will be mitigated through the use of BMPs such as the use of dust screens and water sprinkling. On a long-term basis, significant adverse impacts to air quality are not anticipated as a result of the proposed project.

14. Greenhouse Gas Considerations

a. Existing Conditions

Greenhouse gases (GHG) (carbon dioxide, methane, nitrous oxide, and fluorinated gases) trap heat in the earth's atmosphere. In the context of climate and ocean warming, increases in levels of atmospheric GHG have

been attributed to human activity (IPCC, 2021). Within the State of Hawai‘i, the energy sector (including fossil fuel burning to produce electricity, transportation, waste incineration, and natural gas systems) is identified as the source of approximately 89 percent of GHG emissions. Other sources of GHG emissions include industrial facilities, agriculture and forestry, and waste treatment, such as landfills, composting, and wastewater treatment (State of Hawai‘i, Department of Health, 2021).

The Federal Greenhouse Gas Reporting Program (40 CFR Part 98) requires mandatory reporting of GHG emissions from sources that emit 25,000 metric tons or more of carbon dioxide equivalent (CO2 EQ) per year in the United States. Categories of use that are generally associated with this level of reporting include power plants, petroleum, and natural gas systems, refineries, and other heavy manufacturing processes. According to the Environmental Protection Agency’s (EPA) Facility Level Information on Greenhouse Gases Tool (FLIGHT), there were two (2) facilities in Hilo operating at or above the 25,000 metric tons of CO2 EQ reporting threshold in 2020. These facilities include the Hawai‘i Electric Light Company (HELCO) Kanoelehua Hill Generating Station and the South Hilo Sanitary Landfill.

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

The proposed action involves the construction of additional structures to expand the HMC and the redesign of parking. In the context of the GHG Reporting Program (25,000 metric tons of CO2 EQ), the relative effects of GHG emissions from the project are not considered significant.

The proposed action will involve short-term consumption of fuel for construction equipment, vehicles, and machinery during the demolition and construction periods. This usage is not anticipated to be substantial or excessive within the context of the action’s benefits over the lifetime of the project. After the project is completed, operation of the expansion buildings are anticipated to result in an increase in energy consumption. However, green building techniques and energy efficient design will be implemented in order to meet Leadership in Energy and Environmental Design (LEED) Silver criteria, as is required for new State buildings. Use of the proposed facilities may also result in increased motor vehicle traffic in the project area. Statewide, vehicle-related fuel consumption for commercial, industrial, and residential sectors is a less significant contributor to total GHG emissions than emissions attributable to electricity consumption, and this contribution is anticipated to continue to decrease due to ongoing

reduction in vehicle emission standards as well as increased utilization of hybrid and electric vehicles.

Furthermore, the State of Hawai‘i has set a renewable energy portfolio standard of 100 percent by the year 2045 (Section 269-92, HRS) to minimize dependence on fossil fuel combustion, and has declared a policy to reduce GHG emissions to 1990 levels by the year 2020 (Act 234, Session Laws of Hawai‘i, 2007). In efforts to reduce emissions, Chapter 11-60.1 of the HAR was amended to place a cap on facilities with potential sources of GHG emissions at or above 100,000 tons per year. The State is on track to meet these goals and emission inventory reports conducted by ICF International, Inc., the University of Hawai‘i and the State of Hawai‘i, Department of Health project that Hawai‘i’s GHG emissions in 2017 (excluding aviation emissions) were lower than the net GHG emissions in 1990 which indicates a reduction of GHG emissions statewide (State of Hawai‘i Department of Health, 2021).

Given the foregoing analysis, the proposed action is not anticipated to create significant direct and indirect foreseeable GHG emissions. In addition, the proposed action does not fall within the threshold of mandatory GHG reporting.

15. Noise

a. Existing Conditions

Noise levels around the project area are moderate with primary background noise generated from intermittent ambulance sirens, motor vehicles on nearby roadways, facility operations and other miscellaneous construction activity that may occur in the surrounding area. The occasional landing and taking off of helicopters from the heliport on the HMC property may also result in the intermittent increase in noise in the surrounding area.

b. Potential Impacts and Mitigation Measures

Ambient noise conditions will be temporarily impacted by construction activities associated with implementation of the proposed project. Heavy construction equipment, such as bulldozers, front-end loaders, and material-transport vehicles, will likely be the dominant sources of noise during the construction period and will be temporary in nature. In this context, BMPs will be employed to minimize noise impacts from construction equipment and activity. Further, a Community Noise Permit will be obtained, as needed, from the State of Hawai‘i, Department of Health for applicable construction activities.

The HMC expansion will be part of the existing hospital operations and upon completion of construction, the project is not anticipated to generate significant new noise sources. There are no other significant noise generators associated with the project; therefore, no long-term significant adverse impacts are anticipated as a result of the proposed project.

16. Scenic and Open Space Resources

a. Existing Conditions

The scenic and open space resources of South Hilo are centered around Mauna Kea and Mauna Loa, Hilo Bay, and the various waterfalls and ponds throughout the area. As previously mentioned, the HMC is located at the foot of Mauna Kea and is situated below the Wailuku River. Along the Wailuku River is the Wailuku River State Park, Rainbow Falls, or Waiānuenue, and Boiling Pots, or Peʻepeʻe Falls, which are considered natural beauty sites of South Hilo, according to the Hawaiʻi County General Plan. Wailuku River State park is approximately 0.4 miles from the project site and Rainbow Falls is approximately 0.2 miles from the project site. Boiling Pots is approximately 1.3 miles west of the project site.

b. Potential Impacts and Proposed Mitigation Measures

The proposed Phase 2 expansion building will slightly exceed the height of the existing 56-foot HMC building, while the Phase 1 expansion building will be slightly lower. The Phase 1 expansion building will be 47 feet and 6 inches in height and the Phase 2 expansion building will be 61 feet and 6 inches in height. Although the proposed new structures will slightly exceed the height of the existing HMC structure, it is noted that the proposed Phase 1 and Phase 2 structures will not exceed the allowable 72-foot height limit established for the hospital by the Planned Unit Development permit obtained for its development. In addition, the structures will be set back within the property, away from Waiānuenue Avenue. Given the existing use of the project site as a hospital facility and its proximity to other facilities of similar use and scale, the proposed action is deemed appropriate and significant adverse impacts to the visual character of the area are not anticipated. Although in proximity to areas of natural beauty, the proposed expansion will not impede views of the scenic and open space resources or lookout points.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Regional Setting

a. Existing Conditions

From a regional perspective, the project site is located approximately two (2) miles mauka of Hilo Town on the lower slopes of Mauna Kea in the Piʻihonua ahupuaʻa. Hilo Town serves as the commercial and governmental center of the region and overlooks Hilo Bay and the Hilo Bayfront Beach Park. Downtown Hilo hosts the infamous Hilo Farmer's Market and features historic storefronts, shops, art galleries, museums, and restaurants. Kūhiō Bay, an extension of Hilo Bay, is home to Hilo Harbor, which is the major distribution center for Hawaiʻi Island. Additionally, the HMC is located approximately 2.8 miles from the University of Hawaiʻi at Hilo and approximately 3.3 miles from the Hilo International Airport. The project site is surrounded by other medical facilities of the same nature as the proposed project, along with residential developments and the Wailuku River State Park.

b. Potential Impacts and Proposed Mitigation Measures

The proposed action will enhance the use of the existing HMC facility which is located in the population center of East Hawaiʻi and is complementary of other such uses in the surrounding area. As such, the proposed action will not result in significant adverse impacts upon the regional setting in Hilo.

2. Population and Demography

a. Existing Conditions

The population of Hawaiʻi County has exhibited strong growth over the past several decades. The resident population for the County in 2010 was 185,079, an increase of 24.5 percent since 2000. 2020 Census results indicate that the County's population grew to 200,629 which is an 8.4 percent increase from 2010 (U.S. Census Bureau, 2020).

Population growth in Hawaiʻi County is expected to continue to outpace statewide growth over the next 20 years. According to population projections prepared by the State Department of Business, Economic Development, and Tourism, Hawaiʻi County's population is anticipated to reach 235,601 by 2030 and 260,935 by 2040 (Hawaiʻi State Data Book, 2020).

In terms of racial demographics, Hawai‘i County has a significant Asian and Pacific Islander population. According to the 2020 U.S. Census, 19.7 percent of Hawai‘i County residents identified as Asian and 14 percent of the population identified as Native Hawaiian or Pacific Islander, with 29.5 percent identifying as Two or More Races (U.S. Census Bureau, 2020).

b. Potential Impacts and Mitigation Measures

The proposed action aims to expand hospital facilities to better accommodate East Hawai‘i residents while preparing for anticipated population growth and is not considered to be a direct population generator.

3. Economy and Labor Force

a. Existing Conditions

In 2019, there were 70,700 non-agricultural wage and salary jobs in Hawai‘i County, of which 14,500, 21 percent, were in the Leisure and Hospitality Industry. Government jobs and jobs in the private goods and services industry also comprised an equally substantial share of the County’s employment base. In 2019, jobs in Government accounted for 21 percent and jobs in the Trade, Transportation, and Utilities industry also accounted for 21 percent of all non-agricultural wage and salary jobs (State of Hawai‘i, Department of Labor and Industrial Relations, 2019). Agriculture, and specifically, sugar, was once the primary industry of Hawai‘i County, peaking in the 1970s and 1980s. Hāmākua Sugar Mill was the last sugar mill on the island ceasing operations in 1990. In conjunction with decline of the sugar industry was the increase in the tourism and visitor industry. Although not as significant, Hawai‘i County’s agricultural production today includes coffee, macadamia nuts, papaya, and ornamental plants.

Hawai‘i’s economy through 2019 was strong, with record-setting visitor arrivals and low unemployment. However, the COVID-19 pandemic is having far reaching impacts on the economy on Hawai‘i Island, in Hawai‘i, and across the nation and world. Stay-at-home regulations and travel quarantines aimed to curb the spread of the COVID-19 virus in Hawai‘i have caused many businesses to shut down or drastically reduce operations. Unemployment claims have soared. By the end of April 2020, unemployment in the State reached 21.9 percent, compared to just 2.1 percent the month prior in March of 2020. The unemployment rate of Hawai‘i County also peaked in April of 2020, with a 22 percent unemployment rate. As the State has slowly reopened, and as vaccination rates have gone up, the unemployment rate has gradually decreased. By December 2021, the State and Hawai‘i County unemployment rate

decreased to 4.9 percent each. However, current unemployment rates are still greater than pre-pandemic conditions (Department of Labor and Industrial Relations, 2021).

b. Potential Impacts and Proposed Mitigation Measures

In the short-term, the development of the project will generate positive economic impacts associated with construction-related spending and employment. In the long term, the proposed action represents a potential increase in health sector jobs and jobs related to facility maintenance through the hospital expansion.

C. PUBLIC SERVICES

1. Police

a. Existing Conditions

The Hawaiʻi Police Department provides police and public safety services on the island of Hawaiʻi. The island is divided into eight (8) operational and patrol districts. The South Hilo district police station is located approximately two (2) miles southwest of the HMC.

b. Potential Impacts and Proposed Mitigation Measures

Development of the proposed project is not anticipated to extend the existing police service area for either police station. Therefore, significant adverse impacts on police and public safety services are not anticipated as a result of the proposed project.

2. Fire

a. Existing Conditions

Fire protection and related emergency services are provided by the Hawaiʻi County Fire Department which include onsite fire hydrants. The Hilo Fire Station is located approximately two (2) miles east of the HMC.

b. Potential Impacts and Proposed Mitigation Measures

The development of the project is not anticipated to extend the existing service area for fire protection and related emergency services. There are two (2) existing fire hydrants that will need to be relocated to accommodate the expansion. These fire hydrants will connect to the existing 8-inch

waterline on the property, which will also be relocated to accommodate the new development.

3. Medical Facilities

a. Existing Conditions

The HMC is the largest hospital in Hawaiʻi County with 1,200 employees, including 250 community physicians, physician assistants, and Advanced Practice Registered Nurses (APRN). The facility is currently licensed for 166 beds for acute care and 45 beds for long-term care with nine (9) outpatient clinics offering primary and specialty care. The HMC is one (1) of three (3) hospitals in HHSC's East Hawaiʻi Region. Hale Hoʻola Hāmākua and Kaʻū Hospital are the other hospitals in HHSC's East Hawaiʻi Region, with Hale Hoʻola Hāmākua serving the rural communities of Hāmākua, North Hilo, and South Kohala. Kaʻū Hospital serves the southeastern Kaʻū district of East Hawaiʻi (HHSC 2020).

In addition to these major health care facilities, there are multiple privately operated medical and dental services available in Hilo, including Kaiser Permanente, Primary Care Clinic of Hawaiʻi, East Hawaii Health Clinic, and Queen's Health Care Center-Hilo.

b. Potential Impacts and Proposed Mitigation Measures

The development of the proposed project will expand medical services for the East Hawaiʻi region thereby improving the availability and range of resources for East Hawaiʻi residents. The project will have a positive impact on medical services for East Hawaiʻi residents.

4. Educational Facilities

a. Existing Conditions

The HMC is located within the Department of Education's (DOE) Hilo Complex of the Hilo-Waiākea Complex Area. This complex includes the following schools: deSilva Elementary (Grades Kindergarten to 6th), Haʻaheo Elementary (Grades Kindergarten to 6th), Hilo High (Grades 9th to 12th), Hilo Intermediate (Grades 7th and 8th), Hilo Union Elementary (Grades Kindergarten to 6th), Kalanianaʻole Elementary and Intermediate (Grades Kindergarten to 8th), Kapiʻolani Elementary (Grades Kindergarten to 6th), Kaʻūmana Elementary (Grades Kindergarten to 6th), Keaukaha Elementary (Grades Kindergarten to 6th) and the Connections, Ka ʻUmeke Kaʻeo, and Ke Ana Laʻahana Public Charter Schools.

b. Potential Impacts and Proposed Mitigation Measures

The proposed action is not a direct population-generator and, as such, it is not anticipated to require the provision of additional educational facilities or programs.

5. Recreational Facilities

a. Existing Conditions

Hawai‘i Island offers a number of recreational opportunities for residents and visitors alike. In addition to resort recreational complexes, activities such as snorkeling, SCUBA diving, fishing, biking, and hiking are available. There are also a number of State and County parks islandwide which provide for recreational activities. In close proximity to the HMC is the Wailuku River State Park, which extends along the Wailuku River.

b. Potential Impacts and Proposed Mitigation Measures

The proposed action will be implemented within the boundaries of the existing HMC site and is not anticipated to adversely impact recreational facilities.

6. Solid Waste Disposal

a. Existing Conditions

The County’s Department of Environmental Management, Solid Waste Division, operates and maintains all solid waste collection and disposal facilities in the County of Hawai‘i. This includes two (2) landfills, 21 transfer stations, and island-wide hauling operations in accordance with local, State, and Federal regulations.

b. Potential Impacts and Proposed Mitigation Measures

During construction, waste materials will be generated from site preparation and building construction activities. Construction waste materials that cannot be recycled or reused will be properly disposed of at County disposal facilities.

D. INFRASTRUCTURE

1. Roadways

a. Existing Conditions

A Traffic Impact Analysis Report (TIAR) was prepared by Austin, Tsutsumi & Associates, Inc. for the proposed project in December 2021. See **Appendix "E"**. The proposed expansion and existing HMC facility are serviced by existing roadways and driveways. The HMC campus is situated on either side of Waiānuenue Avenue and their various parking lots are accessible via six (6) intersection accesses. Due to the rural nature of the area there are no raised sidewalks or dedicated bicycle lanes. The following roadways in the vicinity of the project were studied in the TIAR.

i. Waiānuenue Avenue

Waiānuenue Avenue is generally an east-west, two-way, two (2) lane, and undivided County roadway with a posted speed limit of 35 miles per hour (mph) within the study area. Waiānuenue Avenue serves the Hilo area, beginning to the east in downtown Hilo at its intersection with Mamālahoa Highway, continues further west passing adjacent to the Hilo Medical Center and continuing near a small residential subdivision as Pi‘ihonua Road. There are currently two (2) mid-block crosswalks between Waiānuenue Avenue which primarily accomodate pedestrian activity between the HMC and adjacent parking lots.

ii. Rainbow Drive

Rainbow Drive is generally an east-west, two-way, two (2) lane, undivided roadway with a posted speed limit of 20 mph. Rainbow Drive is a loop road, less than 0.5-mile long and begins and ends at intersections with Waiānuenue Avenue. It provides access to Rainbow Falls Park.

iii. Pu‘u Hina Street

Pu‘u Hina Street is generally a north-south, two-way, two (2) lane, undivided roadway with a posted speed limit of 25 mph. Pu‘u Hina Street serves a mostly residential area, beginning to the north at its intersection with Wainānuenue Avenue and extends to the south at its intersection with Ka‘ūmana Drive.

iv. Ka‘ūmana Drive

Ka‘ūmana Drive is generally a northeast-southwest, two-way, two (2) lane, undivided County roadway with a posted speed limit of 25 mph within the study area. Ka‘ūmana Drive serves as a collector road in the Hilo area, beginning to the northeast at its intersection with Waiānuenue Avenue and extending to the southwest at its intersection with Saddle Road.

v. Lele Street

Lele Street is a short, northbound, one-way, two-lane, roadway with no posted speed limit. Lele Street begins to the south at its intersection with Punahele Street and terminates to the north at its intersection with Ka‘ūmana Drive.

vi. Hualilili Street

Hualilili Street is generally an east-west, two-way, two-lane, undivided roadway with no posted speed limit. Hualilili Street provides access to a residential neighborhood, as well as a 7-Eleven, beginning to the west at its intersection with Ka‘ūmana Drive and terminating to the east in a dead end.

vii. Punahele Street

Punahele Street is generally a north-south, two-way, two (2) lane, undivided roadway with a posted speed limit of 25 mph. Punahele Street provides access to a residential neighborhood, beginning to the north at its intersection with Ka‘ūmana Drive and terminating to the south at its intersection with Halai Street.

It is noted that at the time of the traffic counts in August 2021, the westbound lane along Waiānuenue Avenue is used as an additional eastbound travel lane to service heavy traffic generated by the nearby Hilo Union Elementary School, Hilo Intermediate and Hilo High School between 7:15 a.m. to 8:00 a.m. on school days. All vehicular traffic along Waiānuenue Avenue during this period is restricted to only eastbound flows from Kamehameha Avenue to Komohana Street. For approximately five (5) signal cycles between 7:30 a.m. and 7:45 a.m., northbound queues were observed to briefly spill back along Komohana Street from its intersection with Waiānuenue Avenue to Punahele Street, resulting in queue spillback on Punahele Street.

The TIAR included a Level of Service (LOS) analysis for various intersections surrounding the project area. LOS is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions (LOS A) to congested conditions (LOS F). Based on traffic count data gathered, the TIAR states that the morning peak traffic hour is between 7:00 a.m. and 8:00 a.m., while the afternoon peak hour is between 3:15 p.m. and 4:15 p.m. Refer to **Appendix "E"**. Methods from the Highway Capacity Manual 6th Edition were used to calculate volume-to-capacity (v/c) ratios, delays, and corresponding LOS that were used in this study. As part of the TIAR, an intersection analysis was conducted, and LOS determined for the following intersections in the vicinity of the project area:

1) Waiānuenue Avenue/HMC and Yukio Okutso State Veterans Home (YOSVH) Driveways 1-6

2) Waiānuenue Avenue/Rainbow Drive

3) Waiānuenue Avenue/Puuhina Street

4) Waiānuenue Avenue/Kaumana Drive/Lele Street

5) Waiānuenue Avenue/Komohana Street

6) Kaʻūmana Drive/Puʻu Hina Street/Hualilili Sreet

7) Komohana Street/Punahele Street

Adjustments were made in the form of additional trips added to the August 2021 traffic counts to account for historically recorded higher traffic count data from years 2008, 2016 and 2020, and the temporary closure of the HMC Oncology Center driveway. With the adjustments, all study intersections operated at LOS C or better during peak traffic hours.

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

The proposed HMC expansion, existing facility and various parking areas will continue to be accessed from the existing six (6) driveways. Using the Trip Generation Manual, 11th Edition published by the Institute of Transportation Engineers, the TIAR projected the vehicular trips anticipated to be generated by the build-out of the proposed project phases based on the HMC's existing and future use as a Hospital and Nursing Home and existing traffic patterns. Traffic projections were assessed for base years 2025 and 2029 to coincide with the build out of Phase 1 and Phase 2, respectively. In addition to the anticipated traffic increases from the defacto growth rate and Phase 1 and Phase 2 of the proposed

expansion, the following in-progress and planned developments were factored in to base year traffic projections.

1) Wailani Master Planned Development
2) Hale Ola O Mohouli Affordable Housing Project
3) County of Hawaiʻi Fire Administration Support Complex
4) Hilo Hillside Phase II (56 single-family homes)
5) Puainako Heights (40 single-family homes)
6) Kaiaulu O Kapiolani Apartments (64 multi-family residential units)
7) East Hawaiʻi Oncology Center Expansion

The project is anticipated to generate 57 total vehicular trips during the morning peak hour and 59 total vehicular trips during the evening peak hour. Refer to **Appendix "E"**.

The TIAR noted that upon completion of the project, all study intersections are forecasted to operate at LOS similar to base year conditions. All intersections are anticipated to operate adequately at LOS D or better, with the exception of the westbound lane at the intersection of Punahele Street and Komohana Street, which is expected to continue to operate at LOS F during morning peak hour and LOS E during evening peak hour. Phase 1 is anticipated to increase traffic by one (1) to two (2) percent, or an increase of approximately five (5) to 15 vehicles per hour and direction, from Base Year 2025 conditions. Phase 2 is anticipated to increase traffic by two (2) to three (3) percent, or an increase of approximately 10 to 35 vehicles per hour and direction, from Base Year 2029.

The proposed project is projected to have a minimal impact on the overall roadway network and traffic patterns for base years 2025 and 2029. As such, no roadway improvements were recommended.

2. Water System

a. Existing Conditions

The HMC facility contains an existing 8-inch water main located within an existing waterline easement that connects to the County DWS system waterline along Waiānuenue Avenue. This 8-inch water main provides domestic water to the entire medical center and connects to a 16-inch water

main along Waiānuenue Avenue. A portion of the water main underlies the parking areas of the proposed expansion area. The existing 16-inch waterline is equipped to provide 2,000 gallons per minute for fire protection as required by the DWS Water System Standards. See **Appendix "B".**

b. Potential Impacts and Proposed Mitigation Measures

In order to construct the Phase 1 expansion, the existing 8-inch water main will need to be rerouted so that the County DWS can access the water main. Water demand calculations prepared for the project estimate that Phase 1 will utilize a maximum of 3,600 gallons per day and will require a flow of 95.4 gallons per minute. Coordination will be undertaken with the County DWS to ensure there is sufficient water supply to accommodate the proposed project and to determine if any water system improvements are required. Phase 2 water demand calculations have not yet been determined but will be prepared to meet the approval of the DWS. The existing onsite waterlines will also be positioned so as to not be located under the Phase 2 expansion area. Refer to **Appendix "B"**.

3. Wastewater System

a. Existing Conditions

There is existing sewer piping that serves the current HMC facility, Below the existing parking areas of the proposed expansion is a 6-inch sewerline that serves the existing HMC facility and connects to the County's 10-inch sewer main that is located within Waiānuenue Avenue. This sewerline currently services the Hale Hoʻola Behavioral Health building north of the project site and additional adjacent facilities to the northeast of the proposed Phase 1 expansion. Refer to **Appendix "B"**.

b. Potential Impacts and Proposed Mitigation Measures

Portions of the existing 6-inch sewer main will need to be relocated to construct both phases. Once relocated, the sewer main will connect to the County's 10-inch sewer main within Waiānuenue Avenue.

An estimated wastewater flow, maximum daily flow average flow and velocity will be calculated for the proposed project. Coordination will be undertaken with the County DEM to ensure there is sufficient wastewater system capacity to accommodate the proposed project in accordance with the requirements established by the City and County of Honolulu Wastewater System Design Standards, July 2017. Refer to **Appendix "B"**.

4. Drainage System

a. Existing Conditions

The HMC parking area contains subsurface drainage piping and inlet structures. Rainfall runoff from the asphalt parking area and driveways are conveyed to an existing drainage system located on the southern border of the HMC property, adjacent to Waiānuenue Avenue. There are currently no drywells or shallow drain sumps being utilized on property. Refer to **Appendix "B"**.

b. Potential Impacts and Proposed Mitigation Measures

Drainage calculations as shown in the Preliminary Engineering Report (PER) estimate that rainfall runoff from the Phase 1 expansion will result in an increase in runoff flow of 0.145 cubic feet per second. As such, a shallow drain sump is recommended to address additional generated runoff. The PER also recommends existing subsurface drainage piping and surface drainage inlet structures will be relocated to accommodate the expansion. Drainage calculations for Phase 2 will be completed upon finalization of Phase 2 plans, however, it is anticipated that the increase in runoff flow from Phase 2 will be similar to the Phase 1 flow increase and will be accommodated using the existing and Phase 1 proposed drainage improvements. Refer to **Appendix "B"**.

5. Electrical, Telephone, and Cable TV Service

a. Existing Conditions

Hawaiʻi Electric Light Company (HELCO), Hawaiian Telcom (HTCO), and Spectrum provide service on Hawaiʻi Island. The existing facilities serving the project areas include aerial cables attached to joint overhead pole lines along roadways.

b. Potential Impacts and Proposed Mitigation Measures

Electric and communications systems for the project will be developed in accordance with the specifications and standards of HELCO, HTCO, and Spectrum.

E. CUMULATIVE AND SECONDARY IMPACTS

Cumulative impacts are defined by Title 11, Chapter 200, Hawaiʻi Administrative Rules (HAR), Environmental Impact Statement Rules as:

> *The impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

"Secondary impacts" or "indirect effects" from the proposed action are defined by Title 11, Chapter 200, HAR as:

> *Effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems including ecosystems.*

The context for analyzing cumulative and secondary impacts is defined by actions within the "*reasonably foreseeable future*".

With implementation of the proposed project, a two-story structure and a three-story structure will be constructed over the current physician and visitor parking areas to expand the HMC. Included in the expansion is the redesign of the parking areas. Air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components will be included in the additions. Although the expansion requires the provision of basic infrastructure, these requirements are not considered significant as the HMC facility is currently connected to basic infrastructure services. Adequate supply of utility resources shall be confirmed prior to project construction. It is noted that separate to the proposed action, the HMC has proposed a two-story, 17,295 square foot building on approximately 0.5 acre of vacant land next to the existing Hawaiʻi Pacific Oncology Center located directly across the street from the current HMC facility. A separate EA was prepared for the Hawaiʻi Pacific Oncology Center Expansion and the Final EA and Finding of No Significant Impact (FONSI) determination were published in the March 23, 2020 edition of the Environmental Review Program's (ERP) (formerly known as the Office of Environmental Quality Control) Environmental Notice bulletin. Short-term and temporary impacts from construction activity are anticipated, however, the oncology center addition is expected to be completed prior to the start of construction of the HMC expansion. As such, cumulative construction-related impacts are not expected. The proposed project, in addition to the Hawaiʻi Pacific Oncology Center's expansion, is not anticipated to result in significant long-term environmental or socioeconomic impacts.

The proposed action is limited to the expansion of an existing hospital facility. The proposed project will stand on its own and is not reliant upon or a trigger for any other development. The cumulative and secondary impacts of the proposed project, together with other reasonably foreseeable actions, may include increased infrastructure demands, but this will not have a considerable effect on the environment. The engineering and traffic

reports prepared for the proposed project have assessed potential impacts and designed infrastructure systems in the context of future planned regional growth.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

III

III. RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

This chapter discusses the relationship between the proposed action and State and County land use plans, policies, and controls.

A. STATE LAND USE DISTRICTS

Chapter 205, Hawai‘i Revised Statutes (HRS), relating to the State Land Use Commission (LUC), establishes four (4) major land use districts in which all lands in the State are placed. These districts are designated as “Urban”, “Rural”, “Agricultural”, and “Conservation”. The project site is located within the “Urban” district. See **Figure 9.** State Land Use District Map. The proposed action is consistent with the provisions of this district.

B. HAWAI‘I STATE PLAN

Chapter 226, 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. Part II of the State Plan covers its administrative structure and implementation process.

The overall theme of the Hawai‘i State Plan is governed by the following general principles.

1. Individual and family self-sufficiency

2. Social and economic mobility

3. Community or social well-being

In consonance with the foregoing principles, the Hawai‘i State Plan identifies three (3) clarifying goals:

1. A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai‘i'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.

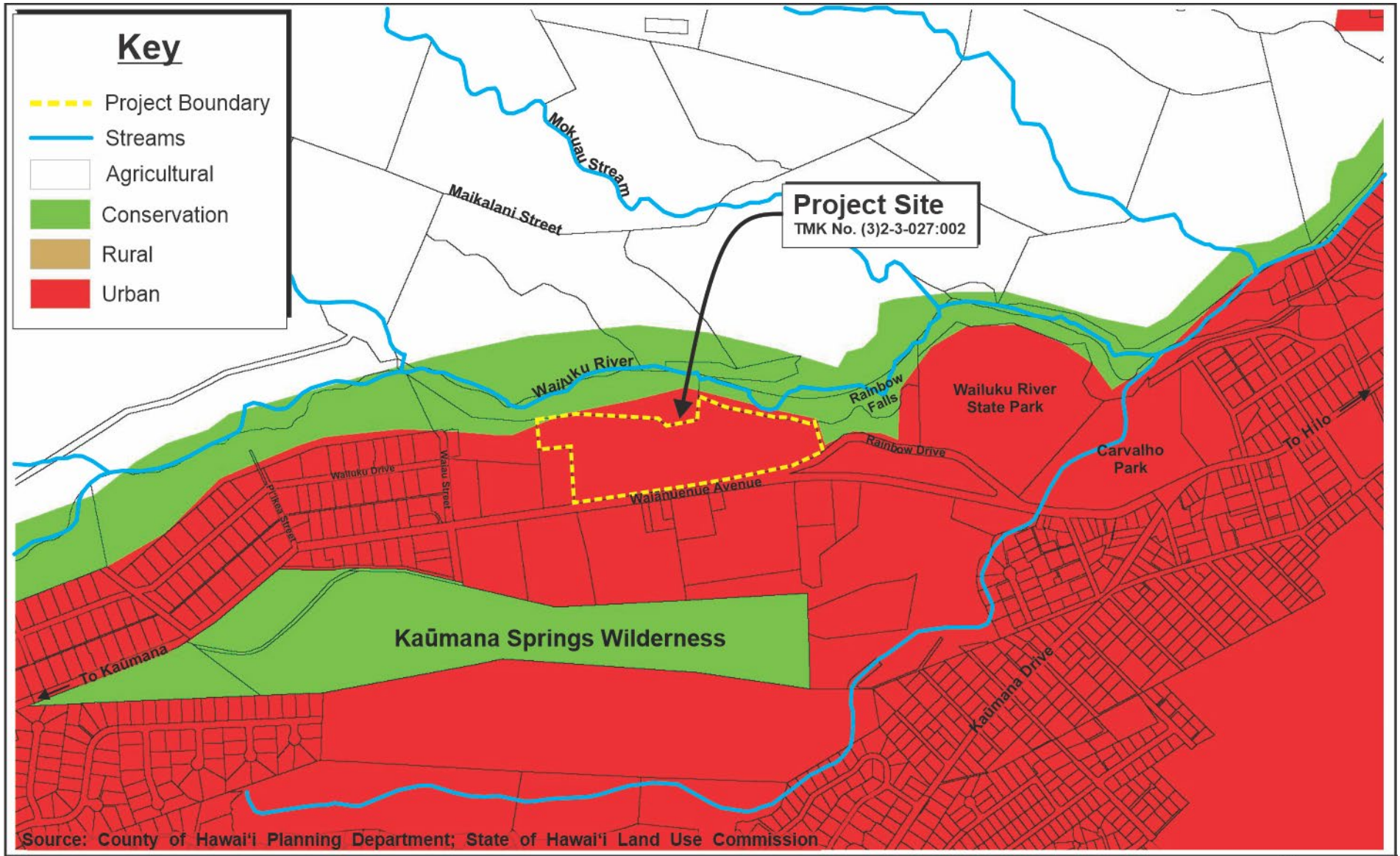

Figure 9

Hilo Medical Center Expansion

State Land Use District Map

0 250 500 1000 Feet

Prepared for: Hawai'i Health Systems Corporation

MUNEKIYO HIRAGA

Bowers\Hilo MC\Figures\SLUD Map

4. Physical, social, and economic well-being, for individuals and families in Hawai‘i, that nourishes a sense of community responsibility, of caring, and of participation in community life.

This section of the environmental assessment examines the applicability of the proposed action as it relates to the objectives, policies, and priority guidelines of the Hawai‘i State Plan, as set forth in HRS Sections 226-5 through 226-27.

Table 1 below summarizes the relationship between the proposed action and the goals of the Hawai‘i State Plan. The relationship between the action and the goals are categorized into the following groups.

1. **Directly applicable**: the action and its potential effects directly advances or promotes the objective, policy or priority guideline.

2. **Indirectly applicable**: the action and its potential effects indirectly supports or advances the objective, policy or priority guideline.

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.

In general, a proposed action's applicability to 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. The analysis and summarized below focuses on key elements of the proposed action's relationship to the Hawai‘i State Plan. Detailed discussion on the applicability of the proposed action to each goal and related objectives, policies, and implementing actions of the Hawai‘i State Plan is provided in **Appendix “F”**.

Table 1. Hawai‘i State Plan, Chapters 226-1 to 226-27 Proposed Hilo Medical Center Expansion Project

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 to expand the Hilo Medical Center (HMC) increases health care infrastructure to service current and future East Hawai‘i residents, ensuring adequate provision of health care facilities.			
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.		✓	
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.		✓	
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.			✓
(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.			✓

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
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.			✓
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.			✓
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.	✓		
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.			✓
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.		✓	
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.		✓	
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.		✓	

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
(2) Greater public awareness and appreciation of Hawaii's environmental resources.			✓
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.	✓		
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:			
(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.		✓	
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.	✓		
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 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.			✓
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 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.			✓

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
Chapter 226-18.5 Objectives and policies for facility systems – – telecommunications.			
Objectives: 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.			✓
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.			✓
(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.			✓
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.			✓
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.			✓
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.			✓

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
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.			✓
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.			✓
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.		✓	
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.			✓
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 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.		✓	

The proposed action will most directly impact the objectives and policies for the fulfilment of basic individual health needs by increasing hospital capacity to better accommodate the growing and aging population of East Hawai‘i. Investment in the health care sector and facility expansion is directly and indirectly applicable to the objectives and policies for the economy and diversifying Hawai‘i's economic base. The proposed action will have

short-term and long-term impacts on the economy through construction-related activity and through encouraging job growth in the health care sector.

The Environmental Assessment (EA) being prepared represents the Applicant's commitment to ensure that natural resources such as the coastal environment are not impacted by demolition or construction activities. The commitment to utilizing Best Management Practices (BMPs) also ensures compatibility between land-based and water-based functions, resources, and ecological systems during the construction phase. The EA process involves analyzing the project's impact on a number of natural and socio-economic resource parameters and forwarding measures aimed at mitigating any potential impacts.

Furthermore, the proposed project will be implemented in a developed area in proximity to existing infrastructure and services, directly and indirectly impacting the objectives and policies for facility systems. Through the expansion of an existing facility and by building above a previously developed parking area, the proposed action makes prudent use of resources and ensures the project site has adequate access to facility systems.

The proposed action does not directly or indirectly impact objectives and policies related to areas such as agriculture, the visitor industry, the information industry, telecommunication systems, housing, education, social services, leisure, culture, or public safety.

Priority Guidelines

"Priority guidelines" means those guidelines which shall take precedence when addressing areas of statewide concern. This section addresses applicability criteria to the priority guidelines set forth in HRS 226-103.

Priority guidelines of the Hawaiʻi State Plan covers the economy, population growth and land resources, crime and criminal justice, affordable housing, quality education, sustainability, and climate change adaptation.

Table 2 below summarizes the relationship between the proposed action and the priority guidelines of the Hawaiʻi State Plan. More detailed discussion is presented in **Appendix "F"**.

Table 2. Relationship Between the Proposed Hilo Medical Center Expansion Project and the Priority Guidelines of the Hawai‘i State Plan

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
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	✓		
(b) Priority guidelines to promote the economic health and quality of the visitor industry			✓
(c) Priority guidelines to promote the continued viability of the sugar and pineapple industries			✓
(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture			✓
(e) Priority guidelines for water use and development			✓
(f) Priority guidelines for energy use and development			✓
(g) Priority guidelines to promote the development of the information industry			✓
Chapter 226-104: Population growth and land resources priority guidelines.			
(a) Priority guidelines to effect desired statewide growth and distribution:		✓	
(b) Priority guidelines for regional growth distribution and land resource utilization		✓	
Chapter 226-105: Crime and criminal justice.			
Priority guidelines in the area of crime and criminal justice			✓
Chapter 226-106: Affordable housing.			
Priority guidelines for the provision of affordable housing			✓
Chapter 226-107: Quality education.			
Priority guidelines to promote quality education			✓
CHAPTER 226-108: Sustainability			
Priority guidelines and principles to promote sustainability shall include		✓	
CHAPTER 226-109: Climate change adaptation			
Priority guidelines and principles to promote climate change adaptation shall include		✓	

Similar to its relationship to the objectives and policies of the Hawai‘i State Plan, the proposed action is most supportive of the economic development priority guidelines as the action presents increased job opportunities both during construction and during the operational phase. The proposed project also indirectly supports the land resources

priority guidelines as the project will be implemented in a developed area in proximity to existing infrastructure.

C. STATE FUNCTIONAL PLANS

A key element of the Statewide Planning System is the Functional Plans which set forth the policies, statewide guidelines, and priorities within a specific field of activity. There are 13 Functional Plans which have been developed by the State agency primarily responsible for a given functional area. Together with the County General Plans, the State Functional Plans establish more specific strategies for implementation. In particular, State Functional Plans provide for the following:

- Identify major Statewide priority concerns
- Define current strategies for each functional area
- Identify major relationships among functional areas
- Provide direction and strategies for departmental policies, programs, and priorities
- Provide a guide for the allocation of resources
- Coordinate State and County roles and responsibilities in the implementation of the Hawaiʻi State Plan

Thirteen (13) Functional Plans have been prepared by State agencies. **Table 3** provides an assessment of the relationship between the proposed action and each of the 13 Functional Plans.

Table 3. Relationship Between the Proposed Hilo Medical Center Expansion Project and the State Functional Plans

	State Functional Plan	State Coordinating Agency	Purpose	Analysis
1	Agriculture Functional Plan (1991)	Department of Agriculture	Continued viability of agriculture throughout the State	The proposed action will be located in an urban area and, as such, is not anticipated to contravene the objectives and policies of this functional plan.
2	Conservation Lands State Functional Plan (1991)	Department of Land and Natural Resources	Addresses issues of population and economic growth and its strain on current natural resources; broadening public use of natural resources while protecting lands and shorelines from overuse; additionally, promotes the aquaculture industry	The proposed project will not utilize any State Conservation lands. The proposed action is not anticipated to contravene the objectives and policies of this functional plan.
3	Education State Functional Plan (1989)	Department of Education	Improvements to Hawai‘i’s educational curriculum, quality of educational staff, and access to adequate facilities	The proposed action is not anticipated to contravene the objectives and policies of this functional plan.
4	Employment State Functional Plan (1990)	Department of Labor and Industrial Relations	Improve the qualifications, productivity, and effectiveness of the State’s workforce through better education and training of workers as well as efficient planning of economic development, employment opportunities, and training activities	The proposed action will result in the creation of construction jobs throughout the development period. The expanded HMC additionally fosters expanded job opportunities in the health care sector which helps to diversify the current economy. The proposed action is not anticipated to contravene the objectives and policies of this functional plan.
5	Energy State Functional Plan (1991)	Department of Business, Economic Development and Tourism	Lessen the reliance on petroleum and other fossil fuels in favor of alternative sources of energy so as to keep up with the State’s increasing energy demands while also becoming a more sustainable island state; achieving dependable, efficient, and economical statewide energy systems	The proposed action is not anticipated to contravene the objectives and policies of this functional plan.

	State Functional Plan	State Coordinating Agency	Purpose	Analysis
6	Health State Functional Plan (1989)	Department of Health	Improve health care system by providing for those who don't have access to private health care providers; increasing preventative health measures; addressing 'quality of care' elements in private and public sectors to cut increasing costs	The proposed action will improve and expand health care facilities and allow residents greater access to health care services, including those who do not have access to private health care. The HMC is operated under Hawai'i Health Systems Corporation (HHSC), which is the "safety net" for neighbor island health care, meaning services are provided to all regardless of the ability to pay for services received.
7	Higher Education Functional Plan (1984)	University of Hawai'i	Prepare Hawai'i's citizens for the demands of an increasingly complex world through providing technical and intellectual tools	The proposed action is not anticipated to contravene the objectives and policies of this functional plan
8	Historic Preservation State Functional Plan (1991)	Department of Land and Natural Resources	Preservation of historic properties, records, artifacts and oral histories; provide public with information/education on the ethnic and cultural heritages and history of Hawai'i	The proposed action is not anticipated to contravene the objectives and policies of this functional plan. An archaeological Literature Review and Field Inspection (LRFI) conducted for this project surveyed the project site for historic properties and it was determined that no historic properties would be affected by the proposed project. Refer to **Appendix "C"**. The SHPD was consulted and concurred with the "no historic properties affected" determination supported by the LRFI. Refer to **Appendix "C-1"**. In addition, a Cultural Impact Assessment (CIA) was prepared for this project and included consultation with cultural informants. Based on the research conducted and results of cultural consultation, the CIA recommends informing construction workers and project personnel of the possibility of inadvertent cultural finds during

	State Functional Plan	State Coordinating Agency	Purpose	Analysis
				construction and the procedures for reporting and preserving inadvertent cultural finds or iwi kūpuna (ancestral remains). Through following all recommended mitigation measures, traditional and cultural practices are not anticipated to be adversely impacted by the proposed undertaking. Refer to **Appendix "D"**.
9	Affordable Housing State Functional Plan (2017)	Hawai‘i Housing Finance and Development Corporation	Based largely on joint public/private efforts to finance, build, and maintain an adequate supply of affordable housing. It will be a working tool to guide the State, the counties, as well as the private sector in meeting the overall goal that every Hawai‘i resident will have the opportunity to live in a safe, decent and affordable home.	The proposed action is not anticipated to contravene the objectives and policies of this functional plan.
10	Human Services State Functional Plan (1989)	Department of Human Services	Refining support systems for families and individuals by improving elderly care, increasing preventative measures to combat child/spousal abuse and neglect; providing means for 'self-sufficiency'	The proposed action is not anticipated to contravene the objectives and policies of this functional plan.
11	Recreation State Functional Plan (1991)	Department of Land and Natural Resources	Manage the use of recreational resources via addressing issues: (1) ocean and shoreline recreation, (2) mauka, urban, and other recreation opportunities, (3) public access to shoreline and upland recreation areas, (4) resource conservation and management, (5) management of recreation programs/facilities/areas, and (6) wetlands protection and management	The proposed action is not anticipated to contravene the objectives and policies of this functional plan.

	State Functional Plan	State Coordinating Agency	Purpose	Analysis
12	Tourism State Functional Plan (1991)	Department of Business, Economic Development and Tourism	Balance tourism/economic growth with environmental and community concerns; development that is cognizant of the limited land and water resources of the islands; maintaining friendly relations between tourists and community members; development of a productive workforce and enhancement of career and employment opportunities in the visitor industry	The proposed action is not anticipated to contravene the objectives and policies of this functional plan.
13	Transportation State Functional Plan (1991)	Department of Transportation	Development of a safer, more efficient transportation system that also is consistent with planned physical and economic growth of the state; construction of facility and infrastructure improvements; develop a transportation system balanced with new alternatives; pursue land use initiatives which help reduce travel demand	The proposed action is not anticipated to contravene the objectives and policies of this functional plan. A Traffic Impact Analysis Report (TIAR) was prepared for the project and it was determined that the project is anticipated to have minimal impacts to traffic for Base Year Conditions of 2025 and 2029 and no roadway improvements were recommended. Refer to **Appendix "E"**.

D. HAWAI‘I COUNTY GENERAL PLAN

The County of Hawai‘i’s General Plan is the policy document for the long-range comprehensive development of the island of Hawai‘i. Adopted in 2005, the General Plan provides direction for future growth of the County and offers policy statements that embody expressed goals for present and future generations. The purpose of the General Plan is to:

- *Guide the pattern of future development in this County based on long-term goals;*
- *Identify the visions, values, and priorities important to the people of this County;*
- *Provide the framework for regulatory decisions, capital improvement priorities, acquisition strategies, and other pertinent government programs within the County organization and coordinated with State and Federal programs.*
- *Improve the physical environment of the County as a setting for human activities; to make it more functional, beautiful, healthful, interesting, and efficient.*
- *Promote and safeguard the public interest and the interest of the County as a whole.*
- *Facilitate the democratic determination of community policies concerning the utilization of its natural, man-made, and human resources.*
- *Effect political and technical coordination in community improvement and development.*
- *Inject long-range considerations into the determination of short-range actions and implementation.*
- *It is noted that the County Department of Planning is currently working to update the General Plan. The Draft General Plan 2040 is currently being updated to incorporate comments received from the initial public review period. The recommended plan is under review by the Planning Commission and is expected to be reviewed by the County Council in Fall 2021.*

The proposed project is consistent with the General Plan. The intent of the General Plan for the project area is further translated through the Hilo Community Development Plan (HCDP). A detailed assessment of the project’s consistency with the HCDP is included in Section “E” of this chapter.

1. Land Use Pattern Allocation Guide (LUPAG)

The Land Use Element of the General Plan establishes a broad, flexible land use pattern intended to guide the future direction and quality of future development in a coordinated and rational matter. The project area is designated "Low Density Urban" by the Land Use Pattern Allocation Guide (LUPAG) Map. See **Figure 10.** Land Use Pattern Allocation Guide Map. The General Plan designates "Low Density Urban" land as residential, up to six (6) units per acre, with ancillary community and public uses, and neighborhood and convenience-type commercial uses.

2. Goals and Policies

The following section discusses goals and policies of the Hawai'i County General Plan which have relevance to the proposed project:

ECONOMIC

Goals:

(b) Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawai'i.

(c) Strive for diversity and stability in the economic system.

(d) Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural and social environment.

(f) Strive for diversification of the economy by strengthening existing industries and attracting new endeavors.

(h) Promote and develop the island of Hawaii into a unique scientific and cultural model, where economic gains are in balance with social and physical amenities. Development should be reviewed on the basis of total impact on the residents of the County, not only in terms of immediate short run economic benefits.

Policies:

(d) Require a study of the cultural, social and physical impacts of large developments prior to approval.

(l) Identify and encourage primary industries that are consistent with the social, physical, and economic goals of the residents of the County.

(x) Encourage the health/wellness industry.

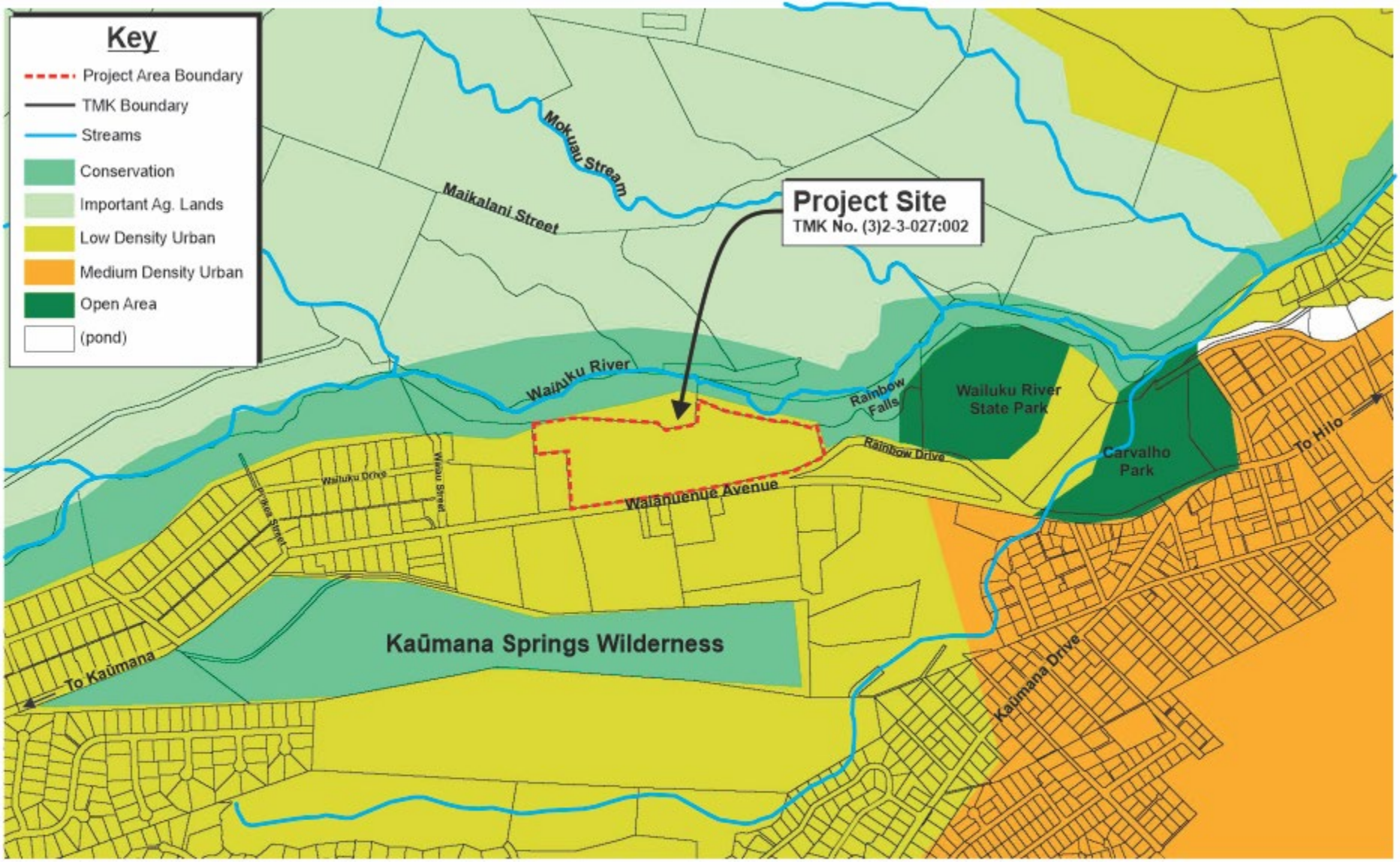

Figure 10

Hilo Medical Center Expansion

Land Use Pattern Allocation Guide Map

0 250 500 1000 Feet

Prepared for: Hawaiʻi Health Systems Corporation

MUNEKIYO HIRAGA

Bowers\Hilo MC\figures\LUPAG Map

(y) Encourage new industries that provide favorable benefit-cost relationships to the people of the County. Benefit-cost relationships include more than fiscal considerations.

Analysis: The proposed project seeks to expand the HMC with the construction of a two-story and three-story additions to include an 18-bed Intensive Care Unit (ICU) and a 12-bed Family Birthing Center. The expansion will support the goals of the economy in the construction phase, through construction-related activity, and also has long-term impacts on the economy in the operational phase through encouraging growth in the health care sector consistent with East Hawai‘i’s growing and aging population. The health care sector is not a dominant industry in Hawai‘i County and, therefore, the proposed project supports the goal to diversify the economy. Furthermore, the Coronavirus (COVID-19) pandemic has brought concerns of hospital capacity to the forefront. The proposed expansion will better prepare the HMC to accommodate the community in times of crisis.

ENVIRONMENTAL QUALITY

Goals:

(c) Control pollution

Policies:

(d) Encourage the concept of recycling agricultural, industrial, and municipal waste material.

Analysis: As practicable, all construction-related waste will be recycled to prevent an influx of waste in the island’s landfills.

FLOODING AND OTHER NATURAL HAZARDS

Goals:

(b) Prevent damage to man-made improvements

(c) Control pollution

(d) Prevent damage from inundation

Policies:

(g) Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.

(j) The County and the private sector shall be responsible for maintaining and improving existing drainage systems and constructing new drainage facilities.

(q) Consider natural hazards in all land use planning and permitting.

Analysis: Development of the project will comply with all County, State, and Federal regulations related to runoff, as applicable. The project will not be implemented within a flood hazard zone. In addition, this EA assesses the potential impact of natural hazards on the proposed action.

HISTORIC SITES

Goals:

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai‘i.

Policies:

(c) Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.

(g) Collect and distribute historic sites information of public interest and keep an inventory of sites.

Analysis: The Applicant will comply with all applicable State regulations related to historic preservation. An archaeological LRFI report and a CIA conducted as part of the environmental review process demonstrates an effort to preserve Hawai‘i’s historic sites and structures and protect Hawai‘i’s ethnic and cultural heritage. The SHPD has been consulted and concurred with the “no historic properties affected” determination supported by the LRFI. The CIA recommends mitigation measures of informing construction workers and project personnel of the possibility of inadvertent cultural finds during construction and the procedures for reporting and preserving inadvertent cultural finds or iwi kūpuna (ancestral remains). By following the recommended mitigation measures, historic sites are not expected to be adversely impacted by the proposed undertaking.

PUBLIC FACILITIES

Goals:

(a) Encourage the provision of public facilities that effectively service community and visitor needs and seek ways of improving public service through better and more functional facilities in keeping with the environmental and aesthetic concerns of the community.

Policies:

(a) Continue to seek ways of improving public service through the coordination of service and maximizing the use of personnel and facilities.

(b) Coordinate with appropriate State agencies for the provision of public facilities to serve the needs of the community

Analysis: The proposed project supports the goals and policies for the provision and improvement of public facilities, through hospital expansion and improvements that will serve East Hawai‘i residents. The HMC is managed by the HHSC, which is a State agency.

PUBLIC FACILITIES – HEALTH AND SANITATION

Policies:

(f) Continue to encourage programs such as recycling to reduce the flow of refuse deposited in landfills.

Analysis: As practicable, all construction-related waste will be recycled to prevent an influx of waste in the island's landfills.

PUBLIC UTILITIES

Goals:

(b) Maximize efficiency and economy in the provision of public utility services.

Analysis: The proposed project will be developed in a developed area making prudent use of existing utilities and infrastructure.

LAND USE – OVERVIEW

Goals:

(a) Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural, and physical environments of the County.

Policies:

(a) Zone urban- types of uses in areas with ease of access to community services and employment centers and with adequate public utilities and facilities.

(b) Promote and encourage the rehabilitation and use of urban areas that are serviced by basic community facilities and utilities.

(j) Encourage urban development within existing zoned areas already served by basic infrastructure, or close to such areas, instead of scattered development.

Analysis: The proposed project will be implemented in a developed urban area, and will expand the existing HMC, which is already serviced by basic infrastructure.

E. COMMUNITY DEVELOPMENT PLANS

The County of Hawaiʻi General Plan Section 15.1 calls for the preparation of community development plans *"to translate the broad General Plan statements to specific actions as they apply to specific geographical areas."*

1. Hilo Community Development Plan

The current HCDP was adopted in May 1975 for the Hilo planning area, which consists of approximately 56 square miles on the east side of Hawaiʻi Island. Although this plan is outdated, there have been more recent community planning efforts for various areas and improvements in Hilo including a Downtown Hilo Multimodal Master Plan, an Envision Downtown Hilo plan, and a Complete Streets plan.

The proposed action involves the expansion of the HMC, which is supportive of the HCDP's objectives for economic growth and land use. It is noted that the HCDP gives "special considerations" for adequate "improvements to medical facilities" and acknowledges the importance of adequate parking. The proposed action will provide adequate hospital capacity for the Hilo Community. The Phase 1 and Phase 2 expansion phases will be constructed above the existing upper parking lot next to the HMC facility. The project's proposed improvements include the reconfiguration of this existing paved parking lot to accommodate the expansion phases and required infrastructure connections. Although there will be a slight decrease in parking stalls onsite with the development of the proposed project, early consultation with the County of Hawaiʻi, Department of Planning has indicated that the existing parking is sufficient to accommodate the proposed expansion. The proposed project is complementary of existing uses at the HMC, and does not contravene any goals or policies of the HCDP.

F. COUNTY ZONING

The County of Hawaiʻi Zoning Code represents a more detailed framework for land use management. The Zoning Code is the legal instrument that regulates the use of land and implements the General Plan. It establishes various types of zoning districts and allowable uses and development standards for each. The Zoning Code should be consistent with

the LUPAG. It is noted that the Hilo Medical Center property is designated "RS-10" by Hawai'i County zoning. Hospitals are allowed with a Use Permit from the appropriate Planning Commission in "RS" zones; however, it is noted that per Chapter 25-2- 61(b), Hawai'i County Code, "*any use which received an approval as a conditionally permitted use prior to September 25, 1984, or which received prior approval through the use permit, is considered a legal use of the affected parcel and may be expanded or enlarged without obtaining another use permit, provided such expansion, enlargement, or addition is in full compliance with...the applicable district regulations.*" The existing HMC was approved with a Planned Unit Development permit prior to the requirement of a Use Permit for a hospital and pursuant to the above, may be enlarged without obtaining a new Use Permit.

Although a Use Permit is not required, the HMC is a public use facility and is subject to Plan Approval pursuant to Chapter 25-2-71 of the Hawai'i County Code. As such, an application for Plan Approval for this project will be submitted to the County Planning Department in conformance with application requirements of Section Chapter 25-2-72 of the Hawai'i County Code.

G. HAWAI'I COASTAL ZONE MANAGEMENT PROGRAM

The State of Hawai'i Coastal Zone Management Program (HCZMP), as formalized in Chapter 205A, HRS, establishes objectives and policies for the preservation, protection, and restoration of natural resources of Hawai'i's coastal zone. Although the proposed improvements are not within the County of Hawai'i's Special Management Area, the applicability of coastal zone management considerations applies to all lands in the State of Hawai'i and, as such, has been reviewed and assessed as follows.

1. Recreational Resources

Objective:

Provide coastal recreational opportunities accessible to the public.

Policies:

a. Improve coordination and funding of coastal recreational planning and management; and

b. Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

i. Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

ii. Requiring restoration of coastal resources that have significant recreational and ecosystem value, including but not limited to coral reefs, surfing sites, fishponds, sand

beaches, and coastal dunes when these resources will be unavoidably damaged by development; or requiring monetary compensation to the State for recreation when restoration is not feasible or desirable;

iii. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

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

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

vi. Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

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

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

Response: The project site is located inland and away from the coastline. The proposed action is not anticipated to impact coastal recreational opportunities or affect existing public access to and along the shoreline.

2. Historic Resources

Objective:

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

Policies:

a. Identify and analyze significant archaeological resources;

b. Maximize information retention through preservation of remains and artifacts or salvage operations; and

c. Support state goals for protection, restoration, interpretation, and display of historic resources.

Response: An Archaeological LFRI report and a CIA conducted as part of the environmental review process demonstrates an effort to preserve Hawai‘i’s natural and historical resources and protect Hawai‘i’s ethnic and cultural heritage. As previously mentioned, the SHPD has been consulted and has concurred with the HHSCs determination that the proposed project would not affect historical properties. Due to the developed nature of the area and through implementation of recommended mitigation measures, cultural and historic resources are not expected to be adversely impacted by the proposed hospital expansion.

3. Scenic and Open Space Resources

Objective:

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

Policies:

a. Identify valued scenic resources in the coastal zone management area;

b. Ensure that new developments are compatible with their visual environment by designing and locating those developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

c. Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

d. Encourage those developments that are not coastal dependent to locate in inland areas.

Response: As indicated previously, the project is located inland and not on or near the shoreline. The proposed project is not anticipated to adversely impact coastal scenic and open space resources.

4. Coastal Ecosystems

Objective:

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

Policies:

a. *Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*

b. *Improve the technical basis for natural resource management;*

c. *Preserve valuable coastal ecosystems of significant biological or economic importance, including reefs, beaches, and dunes;*

d. *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and*

e. *Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.*

Response: The proposed project is located inland, away from coastal ecosystems and is, therefore, not anticipated to have adverse impacts on coastal/shoreline resources, including reefs, beaches, dunes, and marine resources. Appropriate BMPs will be utilized to ensure that construction runoff is appropriately detained, minimizing any impact on coastal waters.

5. Economic Uses

Objective:

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

Policies:

a. *Concentrate coastal dependent development in appropriate areas;*

b. *Ensure that coastal dependent development and coastal related development are located, designed, and constructed to minimize exposure to coastal hazards and adverse social, visual, and environmental impacts in the coastal zone management area; and*

c. *Direct the location and expansion of coastal development to areas designated and used for that development and permit reasonable long-term growth at those areas, and permit coastal development outside of designated areas when:*

   i. *Use of designated locations is not feasible;*

ii. Adverse environmental effects and risks from coastal hazards are minimized; and

iii. The development is important to the State's economy.

Response: The proposed project is not a coastal dependent or related development and is located inland from the shoreline. The proposed project will include facility improvements that stimulate the economy through construction activity and through investment in the health care sector.

6. Coastal Hazards

Objective:

Reduce hazard to life and property from coastal hazards.

Policies:

a. Develop and communicate adequate information about the risks of coastal hazards;

b. Control development, including planning and zoning control, in areas subject to coastal hazards;

c. Ensure that developments comply with requirements of the National Flood Insurance Program; and

d. Prevent coastal flooding from inland projects.

Response: The proposed project will be implemented in Flood Zone X (unshaded), an area of minimal flood hazard. In addition, the proposed project is located outside of the tsunami evacuation zone and projected sea level rise exposure area.

7. Managing Development

Objective:

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

Policies:

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

b. Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

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

Response: Public input will be solicited in coordination with the processing of the EA, pursuant to the Chapter 343, HRS environmental documentation review process. All aspects of the project will be conducted in accordance with applicable Federal, State, and County standards.

8. Public Participation

Objective:

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

Policies:

a. Promote public involvement in coastal zone management processes;

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

c. Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Response: The EA for the project will be processed in accordance with Chapter 343, HRS, and opportunity for comment by agencies and the public will be provided.

9. Beach and Coastal Dune Protection

Objectives:

A. Protect beaches and coastal dunes for:

(i) Public use and recreation;
(ii) The benefit of coastal ecosystems; and
(iii) Use as natural buffers against coastal hazards.

B. Coordinate and fund beach management and protection.

Policies:

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

b. *Prohibit construction of private shoreline hardening structures including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities; and*

c. *Minimize the construction of public shoreline hardening structures including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities.*

d. *Minimize grading of and damage to coastal dunes;*

e. *Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and*

f. *Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor*

Response: The project site is located inland, away from the shoreline and is not anticipated to impact coastal and shoreline processes.

10. Marine and Coastal Resources

Objective:

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

Policies:

a. *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*

b. *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;*

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

d. Promote research, study, and understanding of ocean and coastal processes, impacts of climate change and sea level rise, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how coastal development activities relate to and impact ocean and coastal resources; and

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

Response: The project is located inland, away from the ocean and is, therefore, not anticipated to have an impact on marine or coastal resources.

ALTERNATIVES ANALYSIS

IV

IV. ALTERNATIVES ANALYSIS

A. PREFERRED ALTERNATIVE

The proposed expansion redesign described in Chapter I of this Environmental Assessment (EA) represents the preferred alternative. The preferred alternative will provide the Hilo Medical Center (HMC) with the additional capacity necessary to continue to provide high-quality, accessible healthcare to the Hilo community and greater East Hawaiʻi region. The current HMC facility has not been expanded since its construction in 1985. The preferred alternative makes prudent use of land by expanding an existing facility nearby facilities of similar use and in proximity to existing infrastructure systems. As such, the preferred alternative is deemed the most appropriate given the growing Hilo and East Hawaiʻi population.

B. DEFERRED AND NO ACTION ALTERNATIVES

The deferred and no action alternatives are contrary to HHSC's plans to expand the HMC and contrary to their mission to service the East Hawaiʻi community. The deferred or no-alternative action will not expand the HMC and will continue to result in the need for additional hospitals or hospital capacity in the future. With these reasons in mind, the deferred and no action alternatives are not considered appropriate. HHSC's current commitment to planning, design, and construction allows for the project to proceed at this time.

C. SITE PLAN ALTERNATIVES

A number of design alternatives for the proposed expansion were considered by the Applicant and the design team. The preferred alternative was selected based on site constraints, HMC program needs, and funding availability. An alternative initially considered by HMC involved constructing the Phase 1 expansion as a three-story structure, similar to the Phase 2 expansion to allow for more flexibility in planning for future program space. The preferred alternative utilizes available space within the existing HMC site without needing to acquire land.

SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

V

V. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

An assessment of construction-related and post construction-related impacts on the physical and socio-economic environment, including a Cultural Impact Assessment (CIA), archaeological consultation, and Traffic Impact Analysis Report (TIAR) were carried out as part of the environmental assessment documentation process. The proposed development may result in limited, unavoidable construction-related impacts on the environment, as described in Chapter II.

In the short term, construction activities associated with the proposed action will have a temporary impact on air quality from dust generation and discharge of exhaust from construction equipment during demolition construction, and any ground altering activities. Appropriate Best Management Practices (BMPs) will be incorporated to mitigate adverse construction-related impacts, including but not limited to, watering of exposed surfaces, installing dust screens, and regular maintenance of construction equipment.

Implementation of the proposed project will also generate unavoidable short-term noise impacts. The use of properly maintained construction equipment will mitigate noise impacts caused by equipment. The incorporation of State Department of Health construction noise limits and curfew times are measures to mitigate noise impacts caused by construction activities.

As discussed previously, the project areas are not known to contain habitat area, or areas for native fauna species to nest, breed, or inhabit. Similarly, the proposed action does not involve work which would disrupt any existing vegetation in the area. As such, significant adverse impacts to flora and fauna species in the project vicinity are not anticipated. Furthermore, implementation of the proposed project is not anticipated to significantly increase traffic in the Hilo region such that roadway improvements are required. An archaeological Literature Review and Field Inspection (LRFI) report prepared for the proposed action indicated that due to the developed nature of the project site, impacts to archaeological historical sites are not anticipated and as such, mitigation was not recommended. The LRFI was submitted to the State Historic Preservation Division (SHPD) for review and the SHPD concurred that no historical properties are affected by the proposed project. The CIA consultation process did not yield responses from cultural informants or lineal descendants regarding ongoing cultural practices in the project area. However, the CIA recommends mitigation measures in the form of informing construction workers and project personnel of the possibility of inadvertent cultural finds during construction and the required procedures for reporting and preserving inadvertent cultural finds or iwi kūpuna (ancestral remains). By following the recommended mitigation measures, the proposed project is not expected to adversely impact cultural practices.

In addition, it is noted that the proposed project, as with any development project, will result in irreversible and unavoidable environmental effects, specifically in regards to any ground-altering activities. However, as the project will be constructed on previously graded and altered land, significant impacts from ground-altering activities are not anticipated.

By employing the above-noted mitigation measures, the proposed action is not anticipated to create any significant, long-term adverse environmental effects.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

VI

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed action is anticipated to result in the irreversible and irretrievable commitment of fiscal and land resources. Other resource commitments include energy, labor, water, and material resources. This commitment, however, is considered appropriate insofar as the proposed action seeks to expand the existing Hilo Medical Center (HMC) to improve health care services provided to the East Hawaiʻi community.

SIGNIFICANCE CRITERIA ASSESSMENT

VII

VII. SIGNIFICANCE CRITERIA ASSESSMENT

The “Significance Criteria”, Section 13 of the Department of Health Administrative Rules, Title 11, Chapter 200.1, “Environmental Impact Statement Rules”, were reviewed and analyzed to determine whether the proposed project could present significant adverse impacts to the environment. The following criteria and preliminary analysis are provided:

1. Irrevocably commit a natural, cultural, or historic resource.

An archaeological Literature Review and Field Inspection (LRFI) report prepared for the proposed action indicated that due to the developed nature of the project site, impacts to archaeological historical sites are not anticipated and as such, mitigation was not recommended. The LRFI was submitted to the State Historic Preservation Division (SHPD) for review and consultation. The SHPD concurred that no historical properties would be affected by the proposed project.

A Cultural Impact Assessment (CIA) was prepared for the proposed project to assess the potential for impacts to these cultural resources from the proposed action, and offer mitigation measures to minimize potential adverse impacts. Outreach efforts to Native Hawaiian Organizations, cultural informants, and lineal descendants did not garner information on the traditional or cultural practices in the project area. The CIA has recommended that project construction workers and all project personnel be informed of the possibility of inadvertent cultural finds, including human remains and be educated on the proper procedures for reporting and preserving any inadvertent cultural finds.

In light of the LRFI and CIA findings and through implementation of the foregoing mitigation measures, the proposed action is not anticipated to irrevocably commit a natural, cultural, or historic resource.

2. Curtail the range of beneficial uses of the environment.

The proposed action is limited to an expansion of the Hilo Medical Center’s (HMC) existing facility within the previously developed project site. The proposed action will not curtail the range of beneficial uses of the environment.

3. Conflict with the State’s environmental policies or long-term environmental goals established by law.

The proposed action does not conflict with the policies and guidelines of Chapter 344, Hawaiʻi Revised Statutes (HRS). An environmental assessment (EA) has been carried out to ensure the proposed project will not have significant adverse impacts on the environmental resources. While this project may cause limited adverse impacts related to construction, based on the analysis conducted in this EA, the adverse impacts are not anticipated to be significant.

Where mitigation measures are required due to potential impacts attributed to the project, the Hawai‘i Health Systems Corporation (HHSC) will implement those applicable measures to further reduce adverse impacts.

4. **Have a substantial effect on the economic welfare, social welfare, or cultural practices of the community and State.**

The proposed project will generate positive economic impacts associated with construction-related spending and employment during the implementation of the project. In addition, the proposed action presents increased employment opportunities and health care services for Hilo residents.

5. **Have a substantial adverse effect on public health.**

The proposed project will have a positive impact on public health in East Hawai‘i by expanding facilities at the HMC and increasing the capacity of the Intensive Care Unit and Family Birthing Center.

6. **Involve adverse secondary impacts, such as population changes or effects on public facilities.**

The proposed project is not expected to result in substantial secondary impacts. The proposed project is not considered to be a direct population generator. The HMC is currently connected to basic infrastructure such as water, sewer, and electrical facilities. The proposed new additions will be constructed to also connect to those existing facilities.

7. **Involve a substantial degradation of environmental quality.**

Aside from the short-term impacts related to dust and noise generated during the demolition and construction phases, there will not be a substantial degradation of environmental quality. Potential dust and noise impacts associated with demolition and construction activities will be mitigated through implementation of BMPs.

8. **Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions.**

The proposed action is limited to the expansion of an existing hospital facility. The proposed project will stand on its own and is not reliant upon or a trigger for any other development. The cumulative and impacts of the proposed project, together with other reasonably foreseeable actions, may include increased infrastructure demands, but this will not have a considerable effect on the environment. The engineering and traffic reports prepared for the proposed project have assessed potential impacts and designed infrastructure systems in the context of future planned regional growth. Given the foregoing, the proposed project is not anticipated to cumulatively have considerable effect upon the environment, nor does it involve a commitment for larger actions.

9. **Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.**

As discussed previously, the project areas are not known to contain habitat area, or areas for native fauna species to nest, breed, or inhabit. Similarly, the proposed action does not involve work which would disrupt any existing vegetation in the area. As such, significant adverse impacts to flora and fauna species are not anticipated.

10. **Have a substantial adverse effect on air or water quality or ambient noise levels.**

The proposed construction activities will result in short-term air quality and noise impacts. BMPs will be implemented to mitigate these impacts to acceptable levels. No long-term impacts on air, water, or ambient noise levels are anticipated after construction has been completed.

11. **Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water or coastal waters.**

The HMC is located in Flood Zone X, areas of minimal flood hazard and outside of the projected 3.2-foot sea level rise exposure area and tsunami evacuation zone. As such, the project site is not likely to be affected or suffer damage from being located in an environmentally sensitive area.

12. **Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.**

The proposed expansion will not exceed the height limits set by the permit approvals obtained for establishment of the hospital. In addition, the proposed project will be implemented amongst other similar health care facilities and will not obstruct scenic vistas or view planes as identified by the Hawai‘i County General Plan or the Hilo Community Development Plan.

13. **Require substantial energy consumption or emit substantial greenhouse gasses.**

The proposed project will involve a commitment of fuel for construction equipment, vehicles, and machinery during the site preparation and construction phases. In addition, the proposed action represents an expansion of an existing use that may require additional energy consumption. It is noted that the proposed project will utilize green building techniques and energy efficient design and will meet Leadership in Energy and Environmental Design (LEED) Silver criteria, as is required for new State buildings. Given the project benefits, any net increase in consumption of energy is not considered to be significantly adverse and non-substantial greenhouse gas emissions are anticipated to result from implementation of the proposed project.

Based on the foregoing findings, the project is not expected to generate any significant adverse impacts. Accordingly, the proposed project is anticipated to result in an Anticipated Finding of No Significant Impact (AFNSI).

LIST OF PERMITS AND APPROVALS

VIII

VIII. LIST OF PERMITS AND APPROVALS

The following permits and approvals will be required prior to the implementation of the proposed Hilo Medical Center (HMC) expansion project:

State of Hawai‘i

1. Environmental Assessment Finding of No Significant Impact (FONSI) (Chapter 343, Hawai‘i Revised Statutes (HRS))

2. HRS, Chapter 6E Historic Preservation Compliance

3. Community Noise Permits, as applicable (Hawai‘i Administrative Rules, Chapter 11-46, Community Noise Control)

County of Hawai‘i

1. Plan Approval (Hawai‘i County Code, Chapter 25, Division 7)

2. Construction Approvals (Grading/Building Permits) (Hawai‘i County Code, Chapter 5)

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

IX

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

The following agencies, organizations, community groups and individuals were consulted during the preparation of the Draft Environmental Assessment:

FEDERAL AGENCIES

1. National Marine Fisheries Service,
   Pacific Islands Regional Office
   1845 Wasp Boulevard, Building 176
   Honolulu, HI 96818

2. Michelle Bogardus, Island Team Leader
   U. S. Fish and Wildlife Service
   300 Ala Moana Blvd., Rm. 3-122
   Honolulu, HI 96850

STATE AGENCIES

3. Laura Acasio, Senator
   Hawai‘i State Senate
   Hawai‘i State Capitol, Room 221
   415 S. Beretania Street
   Honolulu, HI 96813

4. Mark M. Nakashima, Representative
   House of Representatives
   Hawai‘i State Capitol, Room 432
   415 S. Beretania Street
   Honolulu, HI 96813

5. Jade Butay, Director
   State of Hawai‘i
   Department of Transportation
   869 Punchbowl Street
   Honolulu, HI 96813

6. Sylvia Hussey, Chief Executive Officer
   State of Hawai'i
   Office of Hawaiian Affairs
   560 N. Nimitz Highway, Suite 200
   Honolulu, HI 96817

7. William Aila, Jr., Chair
   State of Hawai‘i
   Department of Hawaiian Home Lands
   P.O. Box 1879
   Honolulu, HI 96805

8. Elizabeth Char, Director
   State of Hawai‘i
   Department of Health
   1250 Punchbowl St., Room 325
   Honolulu, HI 96813

9. State of Hawai‘i
   Department of Health
   Environmental Health Administration
   P.O. Box 3378
   Honolulu, HI 96801

10. Curt Otaguro, Comptroller
    State of Hawai‘i
    Department of Accounting and General Services
    1151 Punchbowl Street, #426
    Honolulu, HI 96813

11. Suzanne Case, Chairperson
    State of Hawai‘i
    Department of Land and Natural Resources
    P. O. Box 621
    Honolulu, HI 96809

12. Mary Alice Evans, Director
    State of Hawai‘i
    Office of Planning
    P. O. Box 2359
    Honolulu, HI 96804

COUNTY AGENCIES/ORGANIZATIONS

13. Ramzi Mansour, Director
County of Hawai‘i
Department of Environmental Management
25 Aupuni Street
Hilo, HI 96720

14. Douglass Shipman Adams, Director
County of Hawai‘i
Department of Research and Development
25 Aupuni Street
Hilo, HI 96720

15. Maurice Messina, Director
County of Hawai‘i
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, HI 96720

16. Steven Ikaika Rodenhurst, P.E., Director
County of Hawai‘i
Department of Public Works
101 Pauahi Street, Suite 7
Hilo, HI 96720

17. Keith Okamoto, Manager-Chief Engineer
County of Hawai‘i
Department of Water Supply
345 Keuanao‘a Street, Suite 20
Hilo, HI 96720

18. Kazuo Todd, Chief
County of Hawai‘i
Fire Department
25 Aupuni Street, Suite 2501
Hilo, HI 96720

19. Zendo Kern, Director
County of Hawai‘i
Planning Department
101 Pauahi Street, Suite 3
Hilo, HI 96720

20. Paul K. Ferreira, Chief
County of Hawai‘i
Police Department
349 Kapi‘olani Street
Hilo, HI 96720

21. Aaron Chung, Councilmember
Hawai‘i County Council
25 Aupuni Street, Room 1402
Hilo, HI 96720

22. Hawaiian Telcom
64-1030 Mamalahoa Hwy.
Waimea, HI 96743

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

In Reply Refer To:
01EPIF00-2021-TA-0438

August 16, 2021

Emily Murai
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, Hawai‘i 96793

Subject: Technical Assistance for the Proposed Hilo Medical Center Expansion, Island of Hawai‘i

Dear Emily Murai:

Thank you for your recent correspondence requesting technical assistance on species biology, habitat, or life requisite requirements. The Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) appreciates your efforts to avoid or minimize effects to protected species associated with your proposed actions. We provide the following information for your consideration under the authorities of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq.*), as amended.

Due to significant workload constraints, PIFWO is currently unable to specifically address your information request. The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. Based on your project location and description, we have noted the species most likely to occur within the vicinity of the project area, in the ‘**Occurs In or Near Project Area’** column. Please note this list is not comprehensive and should only be used for general guidance. We have added to the PIFWO website, located at https://www.fws.gov/pacificislands/promo.cfm?id=177175840 recommended conservation measures intended to avoid or minimize adverse effects to these federally protected species and best management practices to minimize and avoid sedimentation and erosion impacts to water quality. If your project occurs on the island of Hawai‘i, we have also enclosed our biosecurity protocol for activities in or near natural areas.

If you are representing a federal action agency, please request an official species list following the instructions at our PIFWO https://www.fws.gov/pacificislands/articles.cfm?id=149489558. You can find out if your project occurs in or near designated critical habitat here: https://ecos.fws.gov/ipac/.

Under section 7 of the ESA, it is the Federal agency's (or their non-Federal designee) responsibility to make the determination of whether or not the proposed project "may affect" federally listed species or designated critical habitat. A "may affect, not likely to adversely affect" determination is appropriate when effects to federally listed species are expected to be discountable (i.e., unlikely to occur), insignificant (minimal in size), or completely beneficial. This conclusion requires written concurrence from the Service. If a "may affect, likely to adversely affect" determination is made, then the Federal agency must initiate formal consultation with the Service. Projects that are determined to have "no effect" on federally listed species and/or critical habitat do not require additional coordination or consultation.

Implementing the avoidance, minimization, or conservation measures for the species that may occur in your project area will normally enable you to make a "may affect, not likely to adversely affect" determination for your project. If it is determined that the proposed project may affect federally listed species, we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. If the proposed project is funded, authorized, or permitted by a Federal agency, then that agency should consult with us pursuant to section 7(a)(2) of the ESA. If no Federal agency is involved with the proposed project, the applicant should apply for an incidental take permit under section 10(a)(1)(B) of the ESA. A section 10 permit application must include a habitat conservation plan that identifies the effects of the action on listed species and their habitats and defines measures to minimize and mitigate those adverse effects.

We appreciate your efforts to conserve endangered species. We regret that we cannot provide you with more specific protected species information for your project site. If you have questions that are not answered by the information on our website, you can contact PIFWO at (808) 792-9400 and ask to speak to the lead biologist for the island where your project is located.

Sincerely,

CHELSIE JAVAR-SALAS

Digitally signed by CHELSIE JAVAR-SALAS
Date: 2021.08.16 14:30:36 -10'00'

Island Team Manager
Pacific Islands Fish and Wildlife Office

Enclosures (2)

cc: Pacific Islands Fish and Wildlife Office Administrative Staff

The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. For your guidance, we have marked species that may occur in the vicinity of your project, this list is not comprehensive and should only be used for general guidance.

Enclosure 1. Federal Status of Animal Species

Scientific Name	**Common Name / Hawaiian Name**	**Federal Status**	**May Occur In Project Area**
Mammals			
Lasiurus cinereus semotus	Hawaiian hoary bat/‘ōpe‘ape‘a	E	☒
Reptiles			
Chelonia mydas	green sea turtle/honu - Central North Pacific distinct population segment (DPS)	T	☐
Eretmochelys imbricata	hawksbill sea turtle/ honu ‘ea or ‘ea	E	☐
Birds			
Anas wyvilliana	Hawaiian duck/koloa	E	☐
Branta sandvicensis	Hawaiian goose/nēnē	T	☒
Fulica alai	Hawaiian coot/‘alae ke‘oke‘o	E	☐
Gallinula galeata sandvicensis	Hawaiian gallinule/‘alae ‘ula	E	☐
Himantopus mexicanus knudseni	Hawaiian stilt/ae‘o	E	☐
Oceanodroma castro	band-rumped storm-petrel Hawai‘i DPS/‘akē‘akē	E	☒
Pterodroma sandwichensis	Hawaiian petrel/‘ua‘u	E	☒
Puffinus auricularis newelli	Newell’s shearwater/‘a‘o	T	☒
Ardenna pacificus	wedge-tailed shearwater/‘ua‘u kani	MBTA	☐
Buteo solitarius	Hawaiian hawk/‘io	MBTA	☒
Gygis alba	white tern/manu-o-kū	MBTA	☐
Insects			
Manduca blackburni	Blackburn’s sphinx moth	E	☒
Megalagrion pacificum	Pacific Hawaiian damselfly	E	☐
Megalagrion xanthomelas	orangeblack Hawaiian damselfly	E	☐
Megalagrion nigrohamatum nigrolineatum	blackline Hawaiian damselfly	E	☐

Enclosure 2. Federal Status of Plant Species

Plants				
Scientific Name	**Common Name or Hawaiian Name**	**Federal Status**	**Locations**	**May Occur In Project Area**
Abutilon menziesii	koʻoloaʻula	E	O, L, M, H	☐
Achyranthes splendens var. *rotundata*	ʻewa hinahina	E	O	☐
Bonamia menziesii	no common name	E	K, O, L, M, H	☐
Canavalia pubescens	ʻāwikiwiki	E	Ni, K, L, M	☐
Colubrina oppositifolia	kauila	E	O, M, H	☐
Cyperus trachysanthos	puʻukaʻa	E	K, O	☐
Gouania hillebrandii	no common name	E	Mo, M	☐
Hibiscus brackenridgei	maʻo hau hele	E	O, Mo, L, M, H	☐
Ischaemum byrone	Hilo ischaemum	E	K, O, Mo, M, H	☐
Isodendrion pyrifolium	wahine noho kula	E	O, H	☐
Marsilea villosa	ʻihiʻihi	E	Ni, O, Mo	☐
Mezoneuron kavaiense	uhiuhi	E	O, H	☐
Nothocestrum breviflorum	ʻaiea	E	H	☐
Panicum fauriei var. *carteri*	Carter's panicgrass	E	Molokini Islet (O), Mo	☐
Panicum niihauense	lauʻehu	E	K	☐
Peucedanum sandwicense	makou	E	K, O, Mo, M	☐
Pleomele (Chrysodracon) hawaiiensis	halapepe	E	H	☐
Portulaca sclerocarpa	ʻihi	E	L, H	☐
Portulaca villosa	ʻihi	E	Le, Ka, Ni, O, Mo, M, L, H, Nihoa	☐
Pritchardia affinis (maideniana)	loulu	E	H	☐
Pseudognaphalium sandwicensium var. *molokaiense*	ʻenaʻena	E	Mo, M	☐
Scaevola coriacea	dwarf naupaka	E	Mo, M	☐
Schenkia (*Centaurium*) *sebaeoides*	ʻāwiwi	E	K, O, Mo, L, M	☐
Sesbania tomentosa	ʻōhai	E	Ni, Ka, K, O, Mo, M, L, H, Necker, Nihoa	☐
Tetramolopium rockii	no common name	T	Mo	☐
Vigna o-wahuensis	no common name	E	Mo, M, L, H, Ka	☐

Location key: O=Oʻahu, K=Kauaʻi, M=Maui, H=island of Hawaiʻi, L=Lānaʻi, Mo=Molokaʻi, Ka=Kahoʻolawe, Ni=Niʻihau, Le=Lehua

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VICE PRESIDENT

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SENIOR ADVISOR

March 4, 2022

Chelsie Javar-Salas, Island Team Manager
United States Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i; Reference: 01EPIF00-2021-TA-0438

Dear Ms. Javar-Salas:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 16, 2021, regarding the proposed Hilo Medical Center Expansion. We offer the following information in response to the comments received.

Comment:

Due to significant workload constraints, PIFWO is currently unable to specifically address your information request. The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. Based on your project location and description, we have noted the species most likely to occur within the vicinity of the project area, in the 'Occurs In or Near Project Area' column. Please note this list is not comprehensive and should only be used for general guidance.

Response: We thank you for the information provided on protected species most likely to occur within the project vicinity. This information will be incorporated into the Draft EA.

Comment:

We have added to the PIFWO website, located at https://www.fws.gov/pacificislands/promo.cfm?id=177175840 recommended conservation measures intended to avoid or minimize adverse effects to these federally protected species and best management practices to minimize and avoid sedimentation and erosion impacts to water quality. If your project occurs on the island of Hawai'i, we have also enclosed our biosecurity protocol for activities in or near natural areas.

Response: We have consulted the PIFWO website regarding recommended conservation measures to avoid or minimize adverse effects to federally protected species and Best Management Practices (BMPs) to minimize and avoid sedimentation and erosion impacts to water quality. As such, the following conservation measures and BMPs will be forwarded to the project team for incorporation into the project as applicable to avoid or minimize adverse effects to protected species most likely to occur in the project area and to avoid or minimize sedimentation and erosion impacts to water quality.

Hawaiian hoary bat or 'Ōpe'ape'a (Lasiurus cinereus semotus)

- *Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).*
- *Do not use barbed wire for fencing.*

Hawaiian goose or nēnē (Branta sandvicensis)

- *Do not approach, feed, or disturb nēnē.*
- *If nēnē are observed loafing or foraging within the project area during the breeding season (September through April), halt work and have a biologist familiar with the nesting behavior of nēnē survey for nests in and around the project area prior to the resumption of any work. Repeat surveys after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest).*
- *Cease all work immediately and contact the Service for further guidance if a nest is discovered within a radius of 150 feet of proposed work, or a previously undiscovered nest is found within said radius after work begins.*

- *In areas where nēnē are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.*

Hawaiian petrel or ‘ua‘u (Pterodroma sandwichensis), Band-Rumped Storm-Petrel (Oceanodroma castro), and the threatened Newell’s shearwater or ‘a‘o (Puffinus auricularis newelli).

- *Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary.*

- *Install automatic motion sensor switches and timer controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.*

- *Avoid nighttime construction during the seabird fledging period, September 15 through December 15.*

- *It is noted that the proposed project does not involve the construction of a tower or antennae and is not located near a known seabird colony.*

Hawaiian hawk or ‘io (Buteo solitarius)

- *If work must be conducted during the March 1 through September 30 ‘io breeding season, have a biologist familiar with the species conduct a nest search of the project footprint and surrounding areas immediately prior to the start of construction activities.*

- *Pre-disturbance surveys for ‘io are only valid for 14 days. If disturbance for the specific location does not occur within 14 days of the survey, conduct another survey.*

- *No clearing of vegetation or construction activities should occur within 1,600 feet of any active ‘io nest during the breeding season until the young have fledged.*

- *Regardless of the time of year, no trimming or cutting trees containing a ‘io nest is allowed, as nests may be re-used during consecutive breeding seasons.*

Blackburn's sphnix moth (Manduca blackburni)

- *Remove any tree tobacco less than 3 feet tall.*
- *Monitor the site every 4-6 weeks for new tree tobacco growth before, during and after the proposed ground-disturbing activity.*
- *Monitoring for tree tobacco can be completed by any staff, such as groundskeeper or regular maintenance crew, provided with picture placards of tree tobacco at different life stages.*

Avoidance, Minimization, and Conservation Measures for Threatened and Endangered Plant Species in Hawaii

- *All activities, including site surveys, risk introduction of nonnative species into project areas. Specific attention needs to be made to ensure that all equipment, personnel and supplies are properly checked and are free of contamination (weed seeds, organic matter, or other contaminants) before entering project areas.*
- *It is noted that the proposed project will be implemented on an existing developed property surrounded by facilities of similar use, which will help minimize potential adverse effects to protected plant species.*

Recommended Standard Water Quality Best Management Practices

1. *Turbidity and siltation from project-related work shall be minimized and contained within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.*
2. *Dredging/filling in the marine environment shall be scheduled to avoid coral spawning and recruitment periods and sea turtle nesting and hatching periods.*
3. *Dredging and filling in the marine/aquatic environment shall be designed to avoid or minimize the loss special aquatic site habitat (beaches, coral reefs, wetlands, etc.) and the function of such habitat shall be replaced.*

4. *All project-related materials and equipment (dredges, barges, backhoes, etc.) to be placed in the water shall be cleaned of pollutants prior to use.*

5. *No project-related materials (fill, revetment rock, pipe, etc.) should be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands, etc.) or on beach habitats.*

6. *All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.*

7. *No contamination (trash or debris disposal, non-native species introductions, attraction of non-native pests, etc.) of adjacent habitats (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests, etc.) shall result from project-related activities. This shall be accomplished by implementing a litter-control plan and developing a Hazard Analysis and Critical Control Point Plan (HACCP - see http://www.haccp-nrm.org/Wizard/default.asp) to prevent attraction and introduction of non-native species.*

8. *Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate the clean-up of accidental petroleum releases.*

9. *Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.*

10. *Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric etc.) after exposure and stabilized as soon as practicable (with native or non-invasive vegetation matting, hydroseeding, etc.).*

Comment:

If you are representing a federal action agency, please request an official species list following the instructions at our PIFWO https://www.fws.gov/pacificislands/articles.cfm?id=149489558. You can find out if your project occurs in or near designated critical habitat here: https://ecos.fws.gov/ipac/.

Response: The applicant for the project is the Hawai‘i Health Systems Corporation, which is not a federal agency.

Comment:

Under section 7 of the ESA, it is the Federal agency's (or their non-Federal designee) responsibility to make the determination of whether or not the proposed project "may affect" federally listed species or designated critical habitat. A "may affect, not likely to adversely affect" determination is appropriate when effects to federally listed species are expected to be discountable (i.e., unlikely to occur), insignificant (minimal in size), or completely beneficial. This conclusion requires written concurrence from the Service. If a "may affect, likely to adversely affect" determination is made, then the Federal agency must initiate formal consultation with the Service. Projects that are determined to have "no effect" on federally listed species and/or critical habitat do not require additional coordination or consultation.

Response: We acknowledge that if the project is represented by a federal action agency, per section 7 of the Endangered Species Act (ESA), the Federal Agency or designee shall determine how the proposed project is anticipated to effect federally listed species or critical habitats and shall consult with the USFWS for concurrence. As mentioned previously, the proposed project is not represented by a federal agency.

Comment:

Implementing the avoidance, minimization, or conservation measures for the species that may occur in your project area will normally enable you to make a "may affect, not likely to adversely affect" determination for your project. If it is determined that the proposed project may affect federally listed species, we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. If the proposed project is funded, authorized, or permitted by a Federal agency, then that

agency should consult with us pursuant to section 7(a)(2) of the ESA. If no Federal agency is involved with the proposed project, the applicant should apply for an incidental take permit under section 10(a)(1)(B) of the ESA. A section 10 permit application must include a habitat conservation plan that identifies the effects of the action on listed species and their habitats and defines measures to minimize and mitigate those adverse effects.

Response: We acknowledge that if it is determined that the proposed project may affect federally listed species, the USFWS will be contacted for assistance with ESA compliance as soon as possible.

Thank you for your participation in the Chapter 343, Hawai‘i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft Environmental Assessment being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawai‘i Health Systems Corporation
Andrew Tang, Bowers + Kubota
K:\DATA\Bowers\Hilo MC\Applications\ECL\ECL Comments and Responses\USFWS.docx

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

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

IN REPLY REFER TO:
DIR 0755
STP 8.3236

August 9, 2021

VIA EMAIL: planning@munekiyohiraga.com

Ms. Emily Murai
Associate
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Ms. Murai:

Subject: Early Consultation for Chapter 343, Hawaii Revised Statutes
Hilo Medical Center Expansion
Hilo, Hawaii
Tax Map Key: (3) 2-3-027: 002

Thank you for your letter dated July 28, 2021 requesting the State of Hawaii Department of Transportation's (HDOT) early review and comments on the proposed expansion of the Hilo Medical Center. HDOT understands the project will be completed in two phases with Phase 1 adding approximately 18,900 square feet of space to expand the Intensive Care Unit up to 18 beds. A redesign of the current physician and visitor ground floor parking, as well as supporting utility and miscellaneous infrastructure will be included in Phase 1. Phase 2 will include a 43,000 square foot, three-story addition above the existing visitor parking. Like Phase 1, Phase 2 will also include supporting utility improvements, as well a redesign of the physician and visitor parking below the new structure.

Access to the site is via Waianuenue Avenue (County jurisdiction), with the nearest roadway under HDOT jurisdiction being approximately 2 miles east at Hilo Bayfront Highway (State Route 19).

HDOT has the following comments:

Airports Division (HDOT-A)

The proposed expansion area at the Hilo Medical Center is approximately 3.6 miles from the end of Runway 8 and 3.4 miles from the end of Runway 3 at Hilo International Airport. All projects within 5 miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at the following link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf.

Highways Division (HDOT-HWY)

1. No direct or indirect adverse impact to State highways is anticipated. There are numerous Hilo Medical Center access routes in the region, many of which would not include State highways.

2. The Traffic Impact discussion within the Draft Environmental Assessment should include the following:

    a. Jurisdiction of roadways in the vicinity.

    b. Location of existing and proposed site access driveways.

    c. Observations regarding existing traffic conditions in the vicinity of the site, including bicycle and pedestrian routes and location of transit stops.

    d. Project description, including operations and the two construction phases hours of operation, as well as estimated number of vehicle trips to/from the site during peak traffic hours.

    e. Assessment of the project's potential direct, secondary, and cumulative impacts to State roadways.

    If the qualitative traffic assessment suggests a potential for adverse impact to State highways, include a traffic impact assessment report prepared by a licensed Professional Engineer.

3. The HDOT supports travel demand management and safe community interconnectivity for bicyclists and pedestrians. We recommend the project design and operations management plan incorporate these principles to reduce roadway traffic during peak hours and encourage alternative means of transportation.

4. An HDOT-HWY permit is required to transport oversized and/or overweight vehicles and loads on HDOT roadways.

If there are any questions, please contact Mr. Blayne Nikaido of the HDOT Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

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

March 4, 2022

Jade T. Butay, Director
State of Hawai'i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813-5097

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai'i Island, Hawai'i

Dear Mr. Butay:

On behalf of the Hawai'i Health Systems Corporation, thank you for your letter dated August 9, 2021, regarding the proposed Hilo Medical Center (HMC) Expansion. We offer the following information in response to the comments received.

Airports Division (HDOT-A)

Comment:

The proposed expansion area at the Hilo Medical Center is approximately 3.6 miles from the end of Runway 8 and 3.4 miles from the end of Runway 3 at Hilo International Airport. All projects within 5 miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits.

Response: As the proposed project site is within five (5) miles of the Hilo International Airport the TAM will be reviewed for guidance regarding permits that may be required for the proposed project.

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

Highways Division (HDOT-HWY)

Comment:

No direct or indirect adverse impact to State highways is anticipated. There are numerous Hilo Medical Center access routes in the region, many of which would not include State highways.

Response: We acknowledge that no direct or indirect adverse impacts to State highways are anticipated and that there are numerous access routes to the project site that are not State highways.

Comment:

The Traffic Impact discussion within the Draft Environmental Assessment should include the following:

a. Jurisdiction of roadways in the vicinity.

b. Location of existing and proposed site access driveways.

c. Observations regarding existing traffic conditions in the vicinity of the site, including bicycle and pedestrian routes and location of transit stops.

d. Project description, including operations and the two construction phases hours of operation, as well as estimated number of vehicle trips to/from the site during peak traffic hours.

e. Assessment of the project's potential direct, secondary, and cumulative impacts to State roadways.

If the qualitative traffic assessment suggests a potential for adverse impact to State highways, include a traffic impact assessment report prepared by a licensed Professional Engineer.

Response: The traffic impact discussion in the Draft Environmental Assessment (EA) will address the above referenced comments. We note that a Traffic Impact Analysis Report (TIAR) will be prepared for this project and will be appended to and discussed in the Draft EA.

Comment:

The HDOT supports travel demand management and safe community interconnectivity for bicyclists and pedestrians. We recommend the project design and operations management plan incorporate these principles to reduce roadway traffic during peak hours and encourage alternative means of transportation.

Response: The County of Hawaiʻi Mass Transit Agency operates the Hele-On bus service with routes within Hilo and throughout the island. Route 102 travels from Downtown Hilo to Kaūmana and has a bus stop at the HMC along Waiānuenue Avenue. There are currently no designated bike lanes along Waiānuenue Avenue fronting the facility and no work is planned within the Right-of-Way. Parking lots across the street from the HMC are equipped with crosswalks connecting the parking lots to the HMC facility on Waiānuenue Avenue.

Comment:

An HDOT-HWY permit is required to transport oversized and/or overweight vehicles and loads on HDOT roadways.

Response: An HDOT-HWY permit will be obtained if oversized or overweight vehicles and loads will be transported on HDOT roadways.

The comments referenced above have been forwarded to the project team for review and incorporation into this project.

Thank you for your participation in the Chapter 343, Hawaiʻi Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft EA being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawaiʻi Health Systems Corporation
Andrew Tang, Bowers + Kubota
Tyler Fujiwara, Austin Tsutsumi & Associates
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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 16, 2021 Ref.:PO-21-232

Emily Murai, Associate
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, Hawai'i 96793
planning@munekiyohiraga.com

Aloha Ms. Murai:

Subject: Chapter 343, Hawai'i Revised Statutes Early Consultation Request for the Proposed Hilo Medical Center Expansion

The Department of Hawaiian Home Lands acknowledges receiving the request for comments on the above-cited project. After reviewing the materials submitted, due to its lack of proximity to Hawaiian Home Lands, we do not anticipate any impacts to our lands or beneficiaries from the project.

However, we highly encourage all agencies to consult with Hawaiian Homestead community associations and other (N)native Hawaiian organizations when preparing environmental assessments in order to better assess potential impacts to cultural and natural resources, access and other rights of Native Hawaiians.

Mahalo for the opportunity to provide comments. If you have any questions, please call Andrew H. Choy, Acting Planning Program Manager at (808)620-9481, or contact via email at andrew.h.choy@hawaii.gov.

Me ke aloha,

William J. Ailā, Jr., Chairman
Hawaiian Homes Commission

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

March 4, 2022

William J. Ailā Jr., Chairman
Hawaiian Homes Commission
State of Hawai‘i
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawai‘i 96805

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i; Ref.: PO-21-232

Dear Mr. Ailā:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 16, 2021, regarding the proposed Hilo Medical Center Expansion. We offer the following information in response to the comments received.

Comment:

After reviewing the materials submitted, due to its lack of proximity to Hawaiian Home Lands, we do not anticipate any impacts to our lands or beneficiaries from the project.

Response: We acknowledge that due to the project's lack of proximity to Hawaiian Home Lands, impacts to Hawaiian Home Lands and beneficiaries are not anticipated.

Comment:

However, we highly encourage all agencies to consult with Hawaiian Homestead community associations and other (N)native Hawaiian organizations when preparing environmental assessments in order to better assess potential impacts to cultural and natural resources, access and other rights of Native Hawaiians.

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

Response: A Cultural Impact Assessment (CIA) has been conducted for this project and will be included in the Draft EA. The CIA involves identifying and consulting with kūpuna, kamaʻāina, cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations and community groups with expertise of cultural resources, practices and beliefs of the affected project area to better assess potential impacts to cultural and natural resources and traditional cultural practices.

Thank you for your participation in the Chapter 343, Hawaiʻi Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft Environmental Assessment being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawaiʻi Health Systems Corporation
Andrew Tang, Bowers + Kubota
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DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 26, 2021

Munekiyo Hiraga
Attn: Ms. Emily Murai, Associate
305 High Street, Suite 104
Wailuku, Hawaii 96793

via email: planning@munekiyohiraga.com

Dear Ms. Murai:

SUBJECT: Early Consultation Request for Comments for the Proposed **Hilo Medical Center Expansion** located at 1190 Waianuenue Avenue, Hilo, Island of Hawaii; TMK: (3) 2-3-027:002 on behalf of Hawaii Health Systems Corporation

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

At this time, enclosed are comments from the (a) Engineering Division and (b) Land Division-Hawaii District on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 2, 2021

MEMORANDUM

FROM:

~~TO~~: **DLNR Agencies**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division (DLNR.ENGR@hawaii.gov)
_X_Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District (gordon.c.heit@hawaii.gov)

TO:

~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Early Consultation Request for Comments for the Proposed **Hilo Medical Center Expansion**
LOCATION: 1190 Waianuenue Avenue, Hilo, Island of Hawaii; TMK: (3) 2-3-027:002
APPLICANT: Munekiyo Hiraga on behalf of Hawaii Health Systems Corporation

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **August 26, 2021** (extension was granted by consultant).

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

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

Signed: _____
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Aug 10, 2021

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Early Consultation Request for Comments for the Proposed Hilo Medical Center Expansion
Location: 1190 Waianuenue Avenue, Hilo, Island of Hawaii
TMK(s): (3) 2-3-027:002
Applicant: Munekiyo Hiraga on behalf of Hawaii Health Systems Corporation

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: Aug 10, 2021

8/18/21

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 2, 2021

MEMORANDUM

TO: **DLNR Agencies**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division (DLNR.ENGR@hawaii.gov)
_X_Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District (gordon.c.heit@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Early Consultation Request for Comments for the Proposed **Hilo Medical Center Expansion**
LOCATION: 1190 Waianuenue Avenue, Hilo, Island of Hawaii; TMK: (3) 2-3-027:002
APPLICANT: Munekiyo Hiraga on behalf of Hawaii Health Systems Corporation

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **August 26, 2021** (extension was granted by consultant).

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

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

Signed: _____
Print Name: GORDON C. HEIT
Division: Land Division
Date: 8/19/21

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 27, 2021

Munekiyo Hiraga
Attn: Ms. Emily Murai, Associate
305 High Street, Suite 104
Wailuku, Hawaii 96793

via email: planning@munekiyohiraga.com

Dear Ms. Murai:

SUBJECT: Early Consultation Request for Comments for the Proposed **Hilo Medical Center Expansion** located at 1190 Waianuenue Avenue, Hilo, Island of Hawaii; TMK: (3) 2-3-027:002 on behalf of Hawaii Health Systems Corporation

Thank you for the opportunity to review and comment on the subject matter. In addition to our previous comments dated August 26, 2021, enclosed are comments from the Division of Forestry & Wildlife on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 2, 2021

MEMORANDUM

TO: **DLNR Agencies**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division (DLNR.ENGR@hawaii.gov)
_X_ Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_ Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_ Land Division – Hawaii District (gordon.c.heit@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Early Consultation Request for Comments for the Proposed **Hilo Medical Center Expansion**
LOCATION: 1190 Waianuenue Avenue, Hilo, Island of Hawaii; TMK: (3) 2-3-027:002
APPLICANT: Munekiyo Hiraga on behalf of Hawaii Health Systems Corporation

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **August 26, 2021** (extension was granted by consultant).

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(☑) Comments are attached.

Signed: [signature]
Print Name: DAVID G. SMITH, Administrator
Division: Division of Forestry and Wildlife
Date: Aug 26, 2021

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

August 24, 2021

MEMORANDUM *Log no. 3268*

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: DAVID G. SMITH, Administrator
Division of Forestry and Wildlife

SUBJECT: Division of Forestry and Wildlife Comments for the Early Consultation Request for Comments for the Proposed Hilo Medical Center Expansion

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your inquiry regarding the early consultation for the proposed expansion and redesign of the Hilo Medical Center in Hilo on the Island of Hawai‘i, TMK: (3) 2-3-027:002. The proposed project consists of adding approximately 18,900 square feet to an existing two-story strucuture; adding an approximately 43,000 square foot, three-story addition located above the existing visitor parking with two pedestrian bridges / walkways; and redesigning the physician and visitor parking below the structure.

DOFAW strongly recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain invasive fungal pathogens (e.g. Rapid ‘Ōhi‘a Death), vertebrate and invertebrate pests (e.g. Little Fire Ants), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Big Island Invasive Species Committee at (808) 933-3340 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid ‘Ōhi‘a Death and other harmful fungal pathogens.

To prevent the spread of Rapid ‘Ōhi‘a Death (ROD), if ‘ōhi‘a trees are present and will be removed, trimmed, or potentially injured DOFAW requests that the information and guidance at the following website be reviewed and followed: https://cms.ctahr.hawaii.edu/rod.

The State listed Hawaiian Hawk or ‘Io (*Buteo solitarius*) is known to occur in the project vicinity. DOFAW recommends surveying the area to ensure no Hawaiian Hawk nests are present if trees are to be cut. ‘Io nests might be present during the breeding season from March to September.

The State listed Hawaiian Hoary Bat or ʻŌpeʻapeʻa (*Lasiurus cinereus semotus*) has the potential to occur in the vicinity of the project area and may roost in nearby trees. If any site clearing is required this should be timed to avoid disturbance during the bat birthing and pup rearing season (June 1 through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed without consulting DOFAW.

We note that artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in collision with manmade artifacts or grounding of birds. For nighttime lighting that might be required, DOFAW recommends that all lights be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea. For illustrations and guidance related to seabird-friendly light styles that also protect the dark, starry skies of Hawaiʻi please visit: https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Goose or Nēnē (*Branta sandvicensis*), have the potential to occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact the Hawai'i Branch DOFAW Office at (808) 974-4221.

We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Paul Radley, Protected Species Habitat Conservation Planning Coordinator at (808) 587-0010 or paul.m.radley@hawaii.gov.

Sincerely,

DAVID G. SMITH
Administrator

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

March 4, 2022

Mr. Russell Tsuji, Land Administrator
State of Hawai'i
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawai'i 96809

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai'i Island, Hawai'i

Dear Mr. Tsuji:

On behalf of the Hawai'i Health System's Corporation, thank you for your letters dated August 26, 2021 and August 27, 2021, regarding the proposed Hilo Medical Center Expansion. We offer the following information in response to the comments received.

ENGINEERING DIVISION

Comment:

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

Response: The proposed development is outside of the Special Flood Hazard Area. However, we acknowledge that the 44CFR reflects the minimum standards established by the NFIP and that local flood ordinances may require higher and more restrictive standards that would take precedence of the NFIP's minimum standards.

Comment:

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

Response: According to the FHAT, the proposed project is located within Flood Zone X (unshaded), in an area of minimal flooding outside of the Special Flood Hazard Area.

Comment:

If there are any questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- *Oahu: City and County of Honolulu, Department of Planning and Permitting (808)768-8098*
- *Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327*
- *Maui/Molokai/Lanai: County of Maui, Department of Planning (808) 270-7253*
- *Kauai: County of Kauai, Department of Public Works (808) 241-4896*

Response: The proposed project is located on Hawaiʻi Island and, therefore, the County of Hawaiʻi, Department of Public Works will be contacted should there be questions regarding local flood ordinances.

LAND DIVISION:

Comment:

We have no comments.

Response: We acknowledge that the Land Division does not have comments on the proposed project at this time.

DIVISION OF FORESTRY AND WILDLIFE (DOFAW)

Comment:

DOFAW strongly recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain invasive fungal pathogens (e.g. Rapid ʻŌhiʻa Death), vertebrate and invertebrate pests (e.g. Little Fire Ants), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Big Island Invasive Species Committee at (808) 933-3340 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid ʻŌhiʻa Death and other harmful fungal pathogens.

Response: Thank you for the recommended mitigation measures for minimizing movement of plant or soil material between worksites. This information will be provided to the project contractor to be followed as applicable.

Comment:

To prevent the spread of Rapid ʻŌhiʻa Death (ROD), if ʻōhiʻa trees are present and will be removed, trimmed, or potentially injured DOFAW requests that the information and guidance at the following website be reviewed and followed: https://cms.ctahr.hawaii.edu/rod.

Response: There are no ʻōhiʻa trees present in the project vicinity.

Comment:

The State listed Hawaiian Hawk or ʻIo (Buteo solitarius) is known to occur in the project vicinity. DOFAW recommends surveying the area to ensure no Hawaiian Hawk nests are present if trees are to be cut. ʻIo nests might be present during the breeding season from March to September.

Response: We acknowledge that the Hawaiian Hawk or ʻIo (*Buteo solitarius*) is known to occur in the project vicinity and appreciate the recommendation to survey the project area if trees will be cut. We note that tree removal will be limited to relocation of palm trees within the existing developed parking lot.

Comment:

The State listed Hawaiian Hoary Bat or ʻŌpeʻapeʻa (Lasiurus cinereus semotus) has the potential to occur in the vicinity of the project area and may roost in nearby trees. If any site clearing is required this should be timed to avoid disturbance during the bat birthing and pup rearing season (June 1 through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed without consulting DOFAW.

Response: We acknowledge that the Hawaiian Hoary Bat or ʻŌpeʻapeʻa (*Lasiurus cinereus semotus*) has the potential to occur in the vicinity of the project area and may roost in nearby trees. We note the recommendation that site clearing be avoided during the bat birthing and pup rearing season from June 1 through September 15. However, the proposed project will be constructed on an existing parking lot and will not involve site clearing of woody plants greater than 15 feet tall.

Comment:

We note that artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in collision with manmade artifacts or grounding of birds. For nighttime lighting that might be required, DOFAW recommends that all lights be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea. For illustrations and guidance related to seabird-friendly light styles that also protect the dark, starry skies of Hawai`i please visit: https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf

Response: Thank you for the information regarding seabird friendly lighting. This has been passed along to the project team. Outdoor lighting will be shielded and nighttime work will be avoided outdoors, as practicable.

Comment:

State listed waterbirds such as the Hawaiian Duck (Anas wyvilliana), Hawaiian Stilt (Himantopus mexicanus knudseni), Hawaiian Coot (Fulica alai), and Hawaiian Goose or Nēnē (Branta sandvicensis), have the potential to occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is

discovered at any point, please contact the Hawai'i Branch DOFAW Office at (808) 974-4221.

Response: We acknowledge that waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Goose or Nēnē (*Branta sandvicensis*), have the potential to occur in the vicinity of the proposed project site. This comment has been shared with the Applicant. Should any of these species be present during construction activities, the bird(s) will not be approached and all activities within 100 feet of these species should cease until the bird(s) leave on their own accord. If waterbird nests are discovered, the Hawai'i DOFAW branch will be contacted.

Comment:

Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Paul Radley, Protected Species Habitat Conservation Planning Coordinator at (808) 587-0010 or paul.m.radley@hawaii.gov.

Response: We confirm that should the scope of the project change significantly, the DOFAW will be contacted.

We note that the above mentioned comments and recommendations have been forwarded to the engineering and design team for review and incorporation into the project as applicable.

Thank you for your participation in the Chapter 343, Hawai'i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft Environmental Assessment being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawai'i Health Systems Corporation
Andrew Tang, Bowers + Kubota
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DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTEWATER DIVISION

COUNTY OF HAWAI'I – 108 RAILROAD AVENUE – HILO, HI 96720-4252
HILO (808) 961-8512 FAX (808) 961-8644

August 11, 2021

Emily Mura, Associate
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, HI 96793
planning@munekiyohiraga.com

Subject: **TMK (3)2-3-027-002**
Proposed Hilo Medical Center Expansion

Dear Ms. Mura:

County sewer service is dependant on available capacity at the time of permit plan review. Available capacity is determined in accordance with the requirements of City and County of Honolulu (C&C) Wastewater System Design Standards, July 2017, Volume 1, Chapters 1 and 2. Please provide a sewer study and engineering design plans in support of your request for service to that addresses estimated flows (estimated, average flow, and design peak) flow and velocities, in accordance with applicable standards and requirements.

Should you have any questions or comments regarding available capacity or plan review, please contact me at (808) 961-8587 (amelia.kajiyama@hawaiicounty.gov) or you may contact Christopher Laude at (808) 961-8279 (christopher.laude@hawaiicounty.gov).

Sincerely,

S. Amelia Kajiyama

Susan (Amelia) Kajiyama, Civil Engineer III
cc: Christopher Laude, P.E., Civil Engineer V

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

Michael T. Munekiyo AICP
SENIOR ADVISOR

March 4, 2022

Susan (Amelia) Kajiyama, Civil Engineer III
County of Hawai‘i
Department of Environmental Management
Wastewater Division
108 Railroad Avenue
Hilo, Hawai‘i 96720-4252

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i

Dear Ms. Kajiyama:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 11, 2021, regarding the proposed Hilo Medical Center Expansion. We offer the following information in response to the comments received.

Comment:

County sewer service is dependant on available capacity at the time of permit plan review. Available capacity is determined in accordance with the requirements of City and County of Honolulu (C&C) Wastewater System Design Standards, July 2017, Volume 1, Chapters 1 and 2. Please provide a sewer study and engineering design plans in support of your request for service to that addresses estimated flows (estimated, average flow, and design peak) flow and velocities, in accordance with applicable standards and requirements.

Response: We acknowledge that County sewer service is dependent on available capacity at the time of permit plan review and that available capacity is determined by the requirements of the C&C Wastewater System Design Standards. We further acknowledge your request for a sewer study and engineering design plans to support a request for service. The comments referenced above have been forwarded to the project’s engineering team

for review and incorporation into this project. It is noted that the Draft EA will include a Preliminary Engineering and Drainage Report (PEDR), which will address wastewater demand generated by the project and any required infrastructure upgrades needed to service the project. The PEDR will be appended to and discussed in the Draft EA.

Thank you for your participation in the Chapter 343, Hawai‘i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft EA being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawai‘i Health Systems Corporation
Andrew Tang, Bowers + Kubota
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Mitchell D. Roth
Mayor

Douglass S. Adams
Director

Dr. Sulma Gandhi
Deputy Director

County of Hawai'i

DEPARTMENT OF RESEARCH AND DEVELOPMENT
25 Aupuni Street, Room 1301 • Hilo, Hawai'i 96720-4252
(808) 961-8366 • Fax (808) 935-1205
E-mail: chresdev@co.hawaii.hi.us

August 11, 2021

Sent via email to planning@munekiyohiraga.com

Emily Murai, Associate
Munekiyo Hiraga
350 High Street, Suite 104
Wailuku HI 96793

Dear Emily Murai,

Thank you for the opportunity to review and comment on the proposed Hilo Medical Center Expansion. On behalf of myself and the Department of Research & Development, we are extremely excited about the proposal. Hilo Medical Center is a key component of the quality of life in Hilo and East Hawai'i. With the increase in our population, as evidenced by Census 2020 results, the need for expanded ICU and birthing space is incredibly important. We look forward to the expansion occurring as quickly as possible.

In addition, the leadership of the East Hawai'i Region gives me great confidence in supporting this expansion. Allow me to point out that I am a director on the corporate board of the Hawai'i Health Systems Corporation, but that in my current role as a county official, this is exactly the direction the hospital should be going in its capital expenditures.

Very Respectfully,

Douglass S. Adams
Director

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

March 4, 2022

Douglass S. Adams, Director
County of Hawai‘i
Department of Research and Development
25 Aupuni Street, Room 1301
Hilo, Hawai‘i 96720-4252

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i

Dear Mr. Adams:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 11, 2021, regarding the proposed Hilo Medical Center Expansion. We acknowledge that the County of Hawai‘i Department of Research and Development is in support of the proposed project and views the expansion as important to the quality of life in Hilo and East Hawai‘i.

Thank you for your participation in the Chapter 343, Hawai‘i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft Environmental Assessment being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
CC: Mari Horike, Hawai‘i Health Systems Corporation
Andrew Tang, Bowers + Kubota
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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

Mitchell D. Roth
Mayor

Lee E. Lord
Managing Director

Steven Ikaika Rodenhurst, P.E.
Director

Stephen M. Pause, P.E.
Deputy Director

County of Hawai'i
DEPARTMENT OF PUBLIC WORKS
Aupuni Center
101 Pauahi Street, Suite 7 · Hilo, Hawai'i 96720-4224
(808) 961-8321 · Fax (808) 961-8630
public_works@hawaiicounty.gov

August 2, 2021

Munekiyo Hiraga
Attn: Emily Murai, Associate
305 High Street, Suite 104
Wailuku, HI 96793
(via email to planing@munekiyohiraga.com)

SUBJECT: EARLY CONSULTATION REQUEST, PREPARATION OF A DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED HILO MEDICAL CENTER EXPANSION
SOUTH HILO, ISLAND OF HAWAII, HAWAII
TMK: (3) 2-3-027:002

We have reviewed the request for consultation for a Draft Environmental Assessment dated July 28, 2021, and have the following comments:

1. All development generated runoff shall be disposed of on-site and shall not be directed toward adjacent properties. A drainage study shall be prepared by a licensed civil engineer and the recommended drainage system shall be constructed meeting the approval of the Department of Public Works.

2. All earthwork and grading activity shall conform to Chapter 10, Erosion and Sedimentary Control, of the Hawaii County Code.

3. All driveway connections and construction within Waianuenue Avenue Right-of-Way shall conform to Chapter 22, County Streets, of the Hawaii County Code. Access to Waianuenue Avenue, including the provision of adequate sight distances, shall meet with the approval of the Department of Public Works, Engineering Division.

4. The proposed work on the subject parcel, as shown on the overall site plan (figure 3), is in an area designated as Flood Zone X on the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA). Zone X is an area determined to be outside the 500-year floodplain.

Should there be any questions concerning this matter, please contact Bryce Harada of our Engineering Division at (808) 961-8042.

FOR:
ALAN K. THOMPSON, Division Chief
Engineering Division

BH

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

Michael T. Munekiyo AICP
SENIOR ADVISOR

March 4, 2022

Alan K. Thompson, P.E., Division Chief
County of Hawai‘i
Department of Public Works
Engineering Division
101 Pauahi Street, Suite 7
Hilo, Hawai‘i 96720-4224

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i

Dear Mr. Thompson:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 2, 2021, regarding the proposed Hilo Medical Center Expansion. We offer the following information in response to the comments received.

Comment:

All development generated runoff shall be disposed of on-site and shall not be directed toward adjacent properties. A drainage study shall be prepared by a licensed civil engineer and the recommended drainage system shall be constructed meeting the approval of the Department of Public Works.

Response: We confirm that all generated runoff from the project shall be disposed of on-site and that a drainage study shall be prepared by a licensed civil engineer to meet the approval of the Department of Public Works (DPW). It its noted that the Draft Environmental Assessment (EA) will include a Preliminary Engineering and Drainage Report (PEDR) which will address runoff generated by the project and required drainage system improvements needed to service the project. The PEDR will be appended to and discussed in the Draft EA.

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

Comment:

All earthwork and grading activity shall conform to Chapter 10, Erosion and Sedimentary Control, of the Hawaii County Code.

Response: We confirm that all grading activity will conform to Chapter 10, Erosion and Sedimentary Control of the Hawaiʻi County Code.

Comment:

All driveway connections and construction within Waianuenue Avenue Right-of-Way shall conform to Chapter 22, County Streets, of the Hawaii County Code. Access to Waianuenue Avenue, including the provision of adequate sight distances, shall meet with the approval of the Department of Public Works, Engineering Division.

Response: The current proposed project plans does not involve the construction of permanent driveways or work within the Waiānuenue Avenue Right-of-Way (ROW). It is noted that Phase 1 will involve the use of a temporary construction access driveway connecting the project property to Waiānuenue Avenue, however, there will be no public access. Once construction is complete the access driveway will be restored to previous conditions. Should driveways be constructed or should work be conducted within the right-of-way, all driveways connections and construction will conform to the Chapter 22 of the Hawaiʻi County Code.

Comment:

The proposed work on the subject parcel, as shown on the overall site plan (figure 3), is in an area designated as Flood Zone X on the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA). Zone X is an area determined to be outside the 500-year floodplain.

Response: Thank you for confirming that the proposed project site is designated as Flood Zone X, outside of the 500-year floodplain.

The comments referenced above have been forwarded to the project's engineering team for review and incorporation into this project.

Thank you for your participation in the Chapter 343, Hawai‘i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft EA being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawai‘i Health Systems Corporation
Andrew Tang, Bowers + Kubota
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SEP - 8 2021

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

August 27, 2021

Ms. Emily Y.K. Murai
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, HI 96793

Dear Ms. Murai:

Subject: **Pre-Environmental Assessment Consultation for the Proposed Hilo Medical Center Expansion**
Tax Map Key 2-3-027:002

This is in response to your Pre-Environmental Assessment Consultation letter dated July 28, 2021.

Please be informed that there is an existing 16-inch waterline along Waiānuenue Avenue fronting the subject parcel.

We request that an estimated maximum daily water usage calculation for the project, prepared by a professional engineer licensed in the State of Hawai'i, be submitted for review and approval. The water usage calculations should include the estimated peak flow in gallons per minute and the total estimated maximum daily water usage in gallons per day.

Based on the water usage calculation provided, the Department will determine if additional water can be made available. If water is available, we will determine a water commitment deposit amount, facilities charges due, and any water system improvements required for final approval.

Construction plans showing the proposed water system improvements must also be submitted for review and approval.

Please be informed that the existing 16-inch waterline within the roadway is adequate to provide 2,000 gallons per minute for fire protection, as required per the Department's Water System Standards.

Any meter(s) serving the proposed project will require the installation of a reduced principle type backflow prevention assembly within five (5) feet of the meter on private property. The Department must inspect and approve the installation prior to commencement of water service.

Should there be any questions, please contact Mr. Ryan Quitoriano of our Water Resources and Planning Branch at 961-8070, extension 256.

Sincerely yours,

Keith K. Okamoto, P.E.
Manager-Chief Engineer

RQ:dfg

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

March 4, 2022

Mr. Keith Okamoto, P.E. Manager-Chief Engineer
County of Hawai‘i
Department of Water Supply
345 Kekūnaō‘a Street, Suite 20
Hilo, Hawai‘i 96720

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i

Dear Mr. Okamoto:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 27, 2021, regarding the proposed Hilo Medical Center Expansion. We offer the following information in response to the comments received.

Comment:

Please be informed that there is an existing 16-inch waterline along Waiānuenue Avenue.

Response: We acknowledge that there is an existing 16-inch waterline along Waiānuenue Avenue.

Comment:

We request that an estimated maximum daily water usage calculation for the project, prepared by a professional engineer licensed in the State of Hawai‘i, be submitted for review and approval. The water usage calculations should include the estimated peak flow in gallons per minute and the total estimated maximum daily water usage in gallons per day.

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

Response: An estimated maximum daily water usage calculation with an estimated peak flow in gallons per minute for the proposed project will be prepared by a professional engineer licensed in the State of Hawai‘i and will be submitted to the Department of Water Supply (DWS) for review and approval. The Draft Environmental Assessment (EA) will include a Preliminary Engineering and Drainage Report (PEDR), which will address estimated water demand for the project and any required infrastructure improvements needed to service the project. The PEDR will be appended to and discussed in the Draft EA.

Comment:

Based on water usage calculation provided, the Department will determine if additional water can be made available. If water is available, we will determine a water commitment deposit amount, facilities charges due, and any water system improvements required for final approval.

Response: We acknowledge that the DWS will determine if water is available based on the water usage calculations provided and that if water is available, the DWS will determine a water commitment deposit amount, facilities charges due, and any water system improvements that are required for final approval.

Comment:

Construction plans showing the proposed water system improvements must also be submitted for review and approval.

Response: Construction plans showing the proposed water system improvements will be submitted to the DWS for review and approval.

Comment:

Please be informed that the existing 16-inch waterline within the roadway is adequate to provide 2,000 gallons per minute for fire protection, as required per the Department's Water System Standards.

Response: We acknowledge that the existing 16-inch waterline along Waiānuenue Avenue is equipped to provide 2,000 gallons per minute for fire protection as required by the DWS Water System Standards.

Comment:

> *Any meter(s) serving the proposed project will require the installation of a reduced principle type backflow prevention assembly within five (5) feet of the meter on private property. The Department must inspect and approve the installation prior to commencement of water service.*

Response: It is anticipated that a new water meter will be needed for each phase of the expansion. As such, a back flow prevention assembly shall be provided to address cross-connection issues with approval from the DWS.

We note that the above referenced comments have been forwarded to the project's engineering team for consideration and incorporation into the proposed project.

Thank you for your participation in the Chapter 343, Hawai'i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft EA being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawai'i Health Systems Corporation
Andrew Tang, Bowers + Kubota
K:\DATA\Bowers\Hilo MC\Applications\ECL\ECL Comments and Responses\DWS.docx

Mitchell D. Roth
Mayor

Lee E. Lord
Managing Director

Kazuo S.K.L. Todd
Fire Chief

Eric H. Moller
Deputy Fire Chief

County of Hawai'i
HAWAI'I FIRE DEPARTMENT
25 Aupuni Street • Suite 2501 • Hilo, Hawai'i 96720
(808) 932-2900 • Fax (808) 932-2928

August 6, 2021

Emily Murai, Associate
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, Hawai'i 96793
Email: planning@munekiyohiraga.com

Dear Ms Murai:

SUBJECT: Draft Environmental Assessment
Chapter 343, Hawai'i Revised Statutes Early Consultation Request for the Proposed Hilo Medical Center Expansion
TMK (3) 2-3-027:002

We are in receipt of your letter dated July 28, 2021 in regards to a Draft Environmental Assessment finding of no significant Impact for the above listed subject. The Hawai'i Fire Department has no comments or issues.

If you should have any questions, please feel free to contact my office at (808) 932-2911.

Mahalo,

KAZUO S.K.L TODD
Fire Chief

KV/ds

Hawai'i County is an Equal Opportunity Provider and Employer.

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Tessa Munekiyo Ng AICP
VICE PRESIDENT

Michael T. Munekiyo AICP
SENIOR ADVISOR

March 4, 2022

Kazo Todd, Chief
County of Hawai‘i
Fire Department
25 Aupuni Street, Suite 2501
Hilo, Hawai‘i 96720

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i

Dear Chief Todd:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 6, 2021, regarding the proposed Hilo Medical Center Expansion. We acknowledge that the Hawai‘i Fire Department has no comments to provide at this time.

Thank you for your participation in the Chapter 343, Hawai‘i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft Environmental Assessment being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
CC: Mari Horike, Hawai‘i Health Systems Corporation
Andrew Tang, Bowers + Kubota
K:\DATA\Bowers\Hilo MC\Applications\ECL\ECL Comments and Responses\HFD.docx

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

Mitchell D. Roth
Mayor

Lee E. Lord
Managing Director

West Hawai'i Office
74-5044 Ane Keohokālole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i
PLANNING DEPARTMENT

Zendo Kern
Director

Jeffrey W. Darrow
Deputy Director

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

August 17, 2021

Ms. Emily Murai
Munekiyo Hiraga
735 Bishop Street, Suite 321
Honolulu, HI 96813

Dear Ms. Murai,

Subject: Chapter 343, Hawai`i Revised Statutes Early Consultation Request
Applicant: Hawai`i Health Systems Corporation (HHSC)
Project: Proposed Hilo Medical Facility Expansion
TMK: (3) 2-3-027:002

Thank you for including us in the consultation process for expansions on the Hilo Medical Center property. We note the Land Use Pattern Allocation Guide (LUPAG) designation from the 2005 General Plan is Low Density Urban (LDU). One objective of the Hilo Community Development Plan (1975) gives 'special considerations' for adequate 'improvements to medical facilities' and acknowledges the importance of adequate parking.

The Zoning of the parcel is RS-10 (Zoning Code). Currently, 'hospitals' are allowed with a Use Permit from the appropriate Planning Commission in " RS" zones; however, per Chapter 25-2-61(b), Hawaii County Code, "any use which received an approval as a conditionally permitted use prior to September 25, 1984, or which received prior approval through the use permit, is considered a legal use of the affected parcel and may be expanded or enlarged without obtaining another use permit, provided such expansion, enlargement, or addition is in full compliance with this chapter and the applicable district regulations."

Our records indicate the earliest records of Plan Approval for the Hospital being permit PLA 582, in 1972 and PLA 509 in 1973. Therefore, the County Planning Department considers this a legally nonconforming conditional use on this RS-10 parcel. Full compliance with Chapter 25 and applicable district regulations will be reviewed during Plan Approval; an application for site 'Plan Approval' will be required per Chapter 25, HCC.

Finally, a Planned Unit Development permit (PUD-18) was approved with effective date of October 15, 1980, to allow construction of 4-story, 72 feet high Hilo Hospital Care Facility

(Acute Care), a conditionally permitted use with the RS zoned district. An EIS (1980) was also completed for the Acute Care Facility. Depending on particulars of the final design, an amendment to the existing PUD may be necessary.

We hope this provides some guidance and welcome any further consultation with you on the matter as the 343 process progresses.

Sincerely,

ZENDO KERN
Planning Director

KS:rl
\\coh01\planning\public\wpwin60\CH343\2021\Hilo Medical Center\PreConsultEA_HHSC_MedCenter_081221.doc

cc: Dan Brinkman, Hawai`i Health Systems Corporation
Hae-Dong Lee, Bowers + Kubota

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VICE PRESIDENT
Tessa Munekiyo Ng AICP
VICE PRESIDENT

Michael T. Munekiyo AICP
SENIOR ADVISOR

March 4, 2022

Zendo Kern, Director
County of Hawai‘i
Planning Department
Aupuni Center
101 Pauahi Street, Suite 3
Hilo, Hawai‘i 96720

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai‘i Island, Hawai‘i

Dear Mr. Kern:

On behalf of the Hawai‘i Health Systems Corporation, thank you for your letter dated August 17, 2021, regarding the proposed Hilo Medical Center Expansion. We offer the following information in response to the comments received.

Comment:

We note the Land Use Pattern Allocation Guide (LUPAG) designation from the 2005 General Plan is Low Density Urban (LDU).

Response: Thank you for confirming that the Land Use Pattern Allocation Guide (LUPAG) from the 2005 Hawai‘i County General Plan designates the Hilo Medical Center (HMC) property as Low Density Urban (LDU). The General Plan designates LDU land as “residential”, up to six (6) units per acre, with ancillary community and public uses, and neighborhood and convenience-type commercial uses. The HMC is a public hospital that serves the surrounding residential community and is in consonance with the LDU designation.

Comment:

One objective of the Hilo Community Plan (1975) gives ‘special considerations’ for adequate ‘improvements to medical facilities’ and acknowledges the importance of adequate parking.

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Oahu: 735 Bishop Street, Suite 412 • Honolulu, Hawaii 96813 • Tel: 808.983.1233
www.munekiyohiraga.com

Response: We acknowledge that 1975 Hilo Community Development Plan (HCDP) gives 'special considerations' for adequate 'improvements to medical facilities' and acknowledges the importance of adequate parking. The proposed project will expand the HMC to provide adequate hospital capacity for the Hilo community. Both Phase 1 and Phase 2 will be constructed above the existing upper parking lot next to the HMC facility. The project's proposed improvements include the reconstruction of this existing paved parking lot to accommodate a new parking lot below and surrounding the expansion phases. It does not contravene any goals or objectives of the 1975 HCDP.

Comment:

The Zoning of the parcel is RS-10 (Zoning Code). Currently, 'hospitals' are allowed with a Use Permit from the appropriate Planning Commission in "RS" zones; however, per Chapter 25-2-61(b), Hawaii County Code, "any use which received an approval as a conditionally permitted use prior to September 25, 1984, or which received prior approval through the use permit, is considered a legal use of the affected parcel and may be expanded or enlarged without obtaining another use permit, provided such expansion, enlargement, or addition is in full compliance with this chapter and the applicable district regulations."

Response: We acknowledge that the proposed project parcel is designated RS-10 by the Hawai'i County Code and that hospitals are allowed with a Use Permit from the appropriate planning commission. We further acknowledge that per Chapter 25-2-61(b), Hawai'i County Code, "any use which received an approval as a conditionally permitted use prior to September 25, 1984, or which received prior approval through the use permit, is considered a legal use of the affected parcel and may be expanded or enlarged without obtaining another use permit, provided such expansion, enlargement, or addition is in full compliance with this chapter and the applicable district regulations."

Comment:

Our records indicate the earliest records of Plan Approval for the Hospital being permit PLA 582, in 1972 and PLA 509 in 1973. Therefore, the County Planning Department considers this a legally nonconforming conditional use on this RS-10 parcel. Full compliance with Chapter 25 and applicable district regulations will be reviewed during Plan Approval, an application for site 'Plan Approval' will be required per Chapter 25, HCC.

Response: Thank you for confirming that the HMC is considered a legally nonconforming conditional use within the RS-10 zone by the Planning Department. We also acknowledge that the proposed project must comply with Chapter 25 of the Hawaiʻi County Code and applicable district regulations, which will be reviewed during site "Plan Approval".

Comment:

Finally, a Planned Unit Development permit (PUD-19) was approved with effective date of October 15, 1980, to allow construction of a 4-story, 72 feet high Hilo Hospital Care Facility (Acute Care), a conditionally permitted use with the RS zoned district. An EIS (1980) was also completed for the Acute Care Facility. Depending on particulars of the final design, an amendment to the existing PUD may be necessary.

Response: We acknowledge that a PUD was approved to allow for construction of a four (4) story, 72 feet high Acute Care Facility in 1980 which involved the preparation of an EIS. We further acknowledge that an amendment to the existing PUD may be required based on specifications of the final design plan. The Applicant will continue working with the Department of Planning to determine any applicable permitting requirements.

Thank you for your participation in the Chapter 343, Hawaiʻi Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft Environmental Assessment being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
Cc: Mari Horike, Hawaiʻi Health Systems Corporation
Andrew Tang, Bowers + Kubota
K:\DATA\Bowers\Hilo MC\Applications\ECL\ECL Comments and Responses\Planning.docx

AUG 11 2021

Mitchell D. Roth
Mayor

Paul K. Ferreira
Police Chief

Kenneth Bugado Jr.
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT
349 Kapi`olani Street • Hilo, Hawai`i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

August 5, 2021

Ms. Emily Y. K. Murai, Associate
Munekiyo Hiraga
305 High Street, Suite 104
Wailuku, HI 96793

Dear Ms. Murai:

SUBJECT: CHAPTER 343, HAWAII REVISED STATUTES, EARLY CONSULTATION REQUEST FOR THE PROPOSED HILO MEDICAL CENTER EXPANSION

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or public safety concerns.

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact Captain Sandor Finkey of the Hilo Patrol Division at 961-2214 or via email at sandor.finkey@hawaiicounty.gov.

Sincerely,

JAMES B. O'CONNOR
ASSISTANT POLICE CHIEF
AREA I OPERATIONS

SF:lli/21HQ0783

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VICE PRESIDENT
Michael T. Munekiyo AICP
SENIOR ADVISOR

March 4, 2022

James B. O'Connor, Assistant Police Chief
County of Hawai'i
Police Department
349 Kapi'olani Street
Hilo, Hawai'i 96720-3998

SUBJECT: Response to Early Consultation Comments Regarding the Proposed Hilo Medical Center Expansion; Hilo, Hawai'i Island, Hawai'i

Dear Assistant Chief O'Connor:

On behalf of the Hawai'i Health Systems Corporation, thank you for your letter dated August 5, 2021, regarding the proposed Hilo Medical Center Expansion. We acknowledge that the Hawai'i County Police Department does not anticipate that this project will significantly impact traffic or public safety concerns.

Thank you for your participation in the Chapter 343, Hawai'i Revised Statutes environmental review process. A copy of your letter and this response will be included in the Draft Environmental Assessment being prepared for this project. Should you have any questions or require additional information, please feel free to contact me at (808) 983-1233.

Very truly yours,

Emily Y. K. Murai
Associate

EYKM:ab
CC: Mari Horike, Hawai'i Health Systems Corporation
Andrew Tang, Bowers + Kubota
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www.munekiyohiraga.com

REFERENCES

X

X. REFERENCES

County of Hawai‘i, Chapter 25 Zoning, Hawai‘i County Code.

County of Hawai‘i, County of Hawai‘i General Plan, February 2005.

County of Hawai‘i, Department of Research and Development, 2015 County of Hawai‘i Databook, http://records.co.hawaii.hi.us/Weblink8/Browse.aspx?startid=27952&dbid=1, accessed April 2021.

County of Hawai‘i, Hilo Community Development Plan, 1975.

County of Hawai‘i, Island of Hawai‘i TMK Parcels 002E, [GIS polygon shapefile], Created by Geographic Decision Systems International and County of Hawai‘i, (2010), Retrieved from http://Hawaii.gov/dbedt/gis/download.htm.

County of Hawai‘i, Planning Department, Hawai‘i County Zoning, [GIS polygon shapefile], Created by County of Hawai‘i, Planning Department using ArcInfo 7.2.1, (2010), Retrieved from http://Hawaii.gov/dbedt/gis/download.htm.

County of Hawai‘i, Special Management Areas, [GIS polygon shapefile], Digitized by Office of Planning using ArcInfo 7.1.1 from County blueline maps, (2009), Retrieved from http://Hawaii.gov/dbedt/gis/download.htm.

Environmental Protection Agency, Greenhouse Gas Reporting Data, https://ghgdata.epa.gov/ghgp/main.do, accessed November 2021.

Federal Emergency Management Agency, “Flood Hazard Areas-State of Hawai‘i”, [GIS shapefile], Digitized by State Office of Planning using ArcInfo 4, 5, and 6 from State Land Use Commission’s 1:24,000 mylar maps, (2010), Retrieved from http://hawaii.gov/dbedt/gis/download.htm.

Federal Emergency Management Agency, Earthquake Hazard Maps, https://www.fema.gov/emergency-managers/risk-management/earthquake/hazard-maps, accessed November 2021.

Geometrician Associates LLC, Final Environmental Assessment: Hilo Medical Center Hawai‘i Pacific Oncology Center Addition And Rural & Telehealth Center Unit, March 2020.

Hawai‘i Climate Change Mitigation and Adaptation Commission, “Sea Level Rise Exposure Area”, [GIS Shapefile], Digitized by State Office of Planning using ArcInfo 7.1.2 from Department of Agriculture’s 7.5 minute quadrangles, Retrieved from http://hawaii.gov/dbedt/gis/download.htm.

Hawai‘i Climate Change Mitigation and Adaptation Commission, Sea Level Rise Vulnerability and Adaptation Report, December 2017.

Hawai‘i County General Plan, 2005 Land Use Plan Allocation Guide, [GIS polygon shapefile], Digitized by Office of Planning using ArcInfo. (2007), Retrieved from http://Hawaii.gov/dbedt/gis/download.htm.

Hawai‘i Health Systems Corporation, HHSC Annual Report 2020, 2010, https://www.hhsc.org/about-us/hhsc-reports/, accessed November 2021.

Hawai‘i Health Systems Corporation, HHSC Annual Report, 2010 https://www.hhsc.org/about-us/hhsc-reports/, accessed November 2021.

Ho‘okuleana LLC, Final Environmental Assessment: Marine Science Center at Kawaihae Sail Boat Harbor - South, August 2019.

IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (MassonDelmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)). Cambridge University Press. In Press.

Juvik, S.P. and J.O. Juvik, eds., Atlas of Hawai‘i, 3rd Edition, Honolulu, Hawai‘i: University of Hawai‘i Press, 1998.

National Park Service, National Rivers Inventory, https://www.nps.gov/subjects/rivers/hawaii.htm, accessed November 2021.

Pacific Disaster Center, Tsunami Evacuation Zones, [GIS polygon shapefile], Digitized by Pacific Disaster Center using Arc View version 3.0a from State of Hawai‘i Civil Defense Tsunami Evacuation Zone proof maps, (1998), Retrieved from http://Hawaii.gov/dbedt/gis/download.htm.

State Land Use Commission, State Land Use District Boundaries, [GIS polygon shapefile], Digitized by Office of Planning using ArcInfo 4, 5, and 6 from State Land Use Commission’s 1:24,000 mylar maps, (2010), Retrieved from http://Hawaii.gov/dbedt/gis/download.htm.

State of Hawai‘i, Coastal Zone Management, Chapter 205-A, Hawai‘i Revised Statutes.

State of Hawai‘i, Department of Agriculture, Agriculture Functional Plan, 1991.

State of Hawai‘i, Department of Business, Economic Development, and Tourism, 2019 State of Hawaii Databook, http://dbedt.hawaii.gov/economic/databook/db2019/.

State of Hawai‘i, Department of Business, Economic Development, and Tourism, 2020 Census Data, https://census.hawaii.gov/census_2020/data/, accessed September 2021.

State of Hawai‘i, Department of Business, Economic Development, and Tourism, Energy State Functional Plan, 1991.

State of Hawai‘i, Department of Business, Economic Development, and Tourism, Population and Economic Projections for the State of Hawai‘i to 2040, March 2012.

State of Hawai‘i, Department of Business, Economic Development, and Tourism, Tourism State Functional Plan, 1991.

State of Hawai‘i, Department of Education, Education State Functional Plan, 1989.

State of Hawai‘i, Department of Health, Clean Air Branch, “Hawaii Greenhouse Gas Emissions Report for 2017, Final Report”, April 2021.

State of Hawai‘i, Department of Health, Health State Functional Plan, 1989.

State of Hawai‘i, Department of Health, State of Hawai‘i 2020 Ambient Air Monitoring Network 5-Year Assessment, July 2020.

State of Hawai‘i, Department of Human Services, Human Services State Functional Plan, 1989.

State of Hawai‘i, Department of Labor and Industrial Relations, Employment State Functional Plan, 1990.

State of Hawai‘i, Department of Labor and Industrial Relations, Current Employment Statistics, https://www.hirenethawaii.com/gsipub/index.asp?docid=727, accessed July 2021.

State of Hawai‘i, Department of Labor and Industrial Relations, Local Area Unemployment Statistics, http://www.hiwi.org/gsipub/index.asp?docid=417, accessed October 2021.

State of Hawai‘i, Department of Land and Natural Resources, Conservation Lands State Functional Plan, 1991.

State of Hawai‘i, Department of Land and Natural Resources, Historic Preservation Functional Plan, 1991.

State of Hawai‘i, Department of Land and Natural Resources, Recreation State Functional Plan, 1991.

State of Hawai‘i, Department of Transportation, Transportation State Functional Plan, 1991.

State of Hawai‘i, Environmental Impact Statement, Chapter 343, Hawai‘i Revised Statutes.

State of Hawai‘i Hawai‘i Housing Finance and Development Corporation, Affordable Housing State Functional Plan, 2017.

State of Hawai‘i, Hawai‘i State Planning Act, Chapter 226, Hawai‘i Revised Statutes.

State of Hawai‘i, University of Hawai‘i, Higher Education Functional Plan, 1984.

U.S. Census Bureau, 2010 Census Redistricting Data, QT-PI – Race, Hispanic or Latino, Age, and Housing Occupancy: 2010, 2010.

U.S. Department of Agriculture, Natural Resources Conservation Service. Soil Survey Geographic (SSURGO) Database for Hawai‘i County, Hawai‘i, http://websoilsurvey.nrcs.usda.gov, accessed December 2015.

U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of the Island of Hawai‘i, State of Hawai‘i, 1973.

U.S. Department of Agriculture, Soil Survey Geographic database for Island of Hawai‘i, [GIS Shapefile], Digitized by State Office of Planning using ArcInfo 7.1.2 from Department of Agriculture's 7.5 minute quadrangles, Retrieved from http://hawaii.gov/dbedt/gis/download.htm.

U.S. Fish and Wildlife Service, National Wetlands Inventory, https://www.fws.gov/wetlands/data/mapper.html, accessed November 2021.

U.S. Geological Survey, Earthquakes in Hawaii: What You Need to Know, https://volcanoes.usgs.gov/vsc/file_mngr/file-164/PPT_EQ%20in%20Hawaii_2015-2019.pdf, updated September 2019, accessed March 2021.

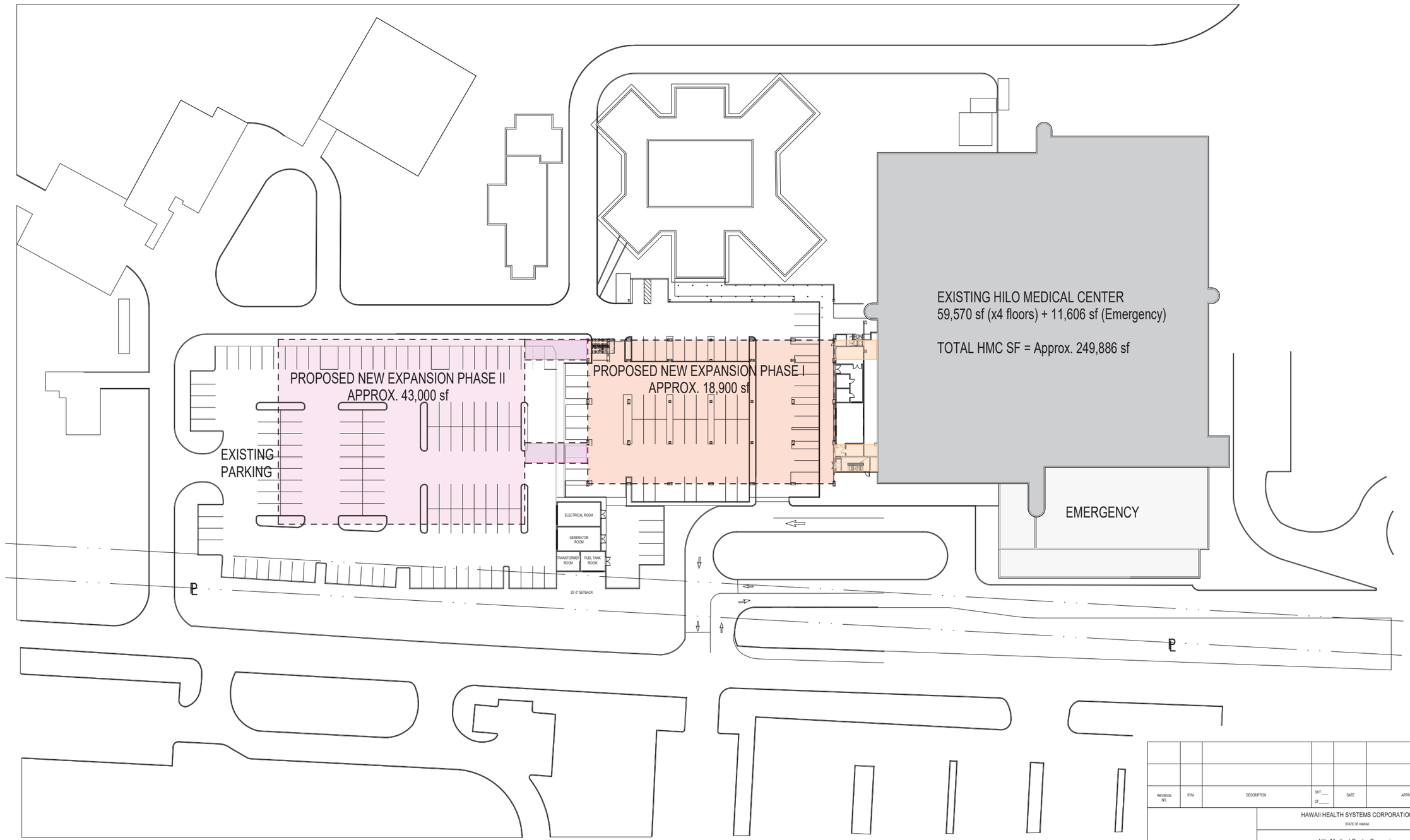
U.S. Geological Survey, Hawaiian Volcano Observatory, Earthquakes, http://hvo.wr.usgs.gov/earthquakes/, published June 18, 2001, accessed March 2021.

U.S. Geological Survey, Earthquake Catalog, https://earthquake.usgs.gov/earthquakes/map, accessed November 2021.

U.S. Geological Survey, Lava Flow Hazard Zone Map, http://pubs.usgs.gov/ mf/1992/2193/, published 1992, accessed March 2021.

PRELIMINARY DEVELOPMENT PLANS

APPENDIX A



1 OVERALL SITE PLAN
1/32" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT.____ OF____	DATE	APPROVED

HAWAII HEALTH SYSTEMS CORPORATION
STATE OF HAWAII

Hilo Medical Center Expansion

HILO HAWAII HAWAII

OVERALL SITE PLAN

BOWERS + KUBOTA CONSULTING
Project Management + Planning + Architectural/Engineering Design + Construction Management

DRAWING NO. A0.01

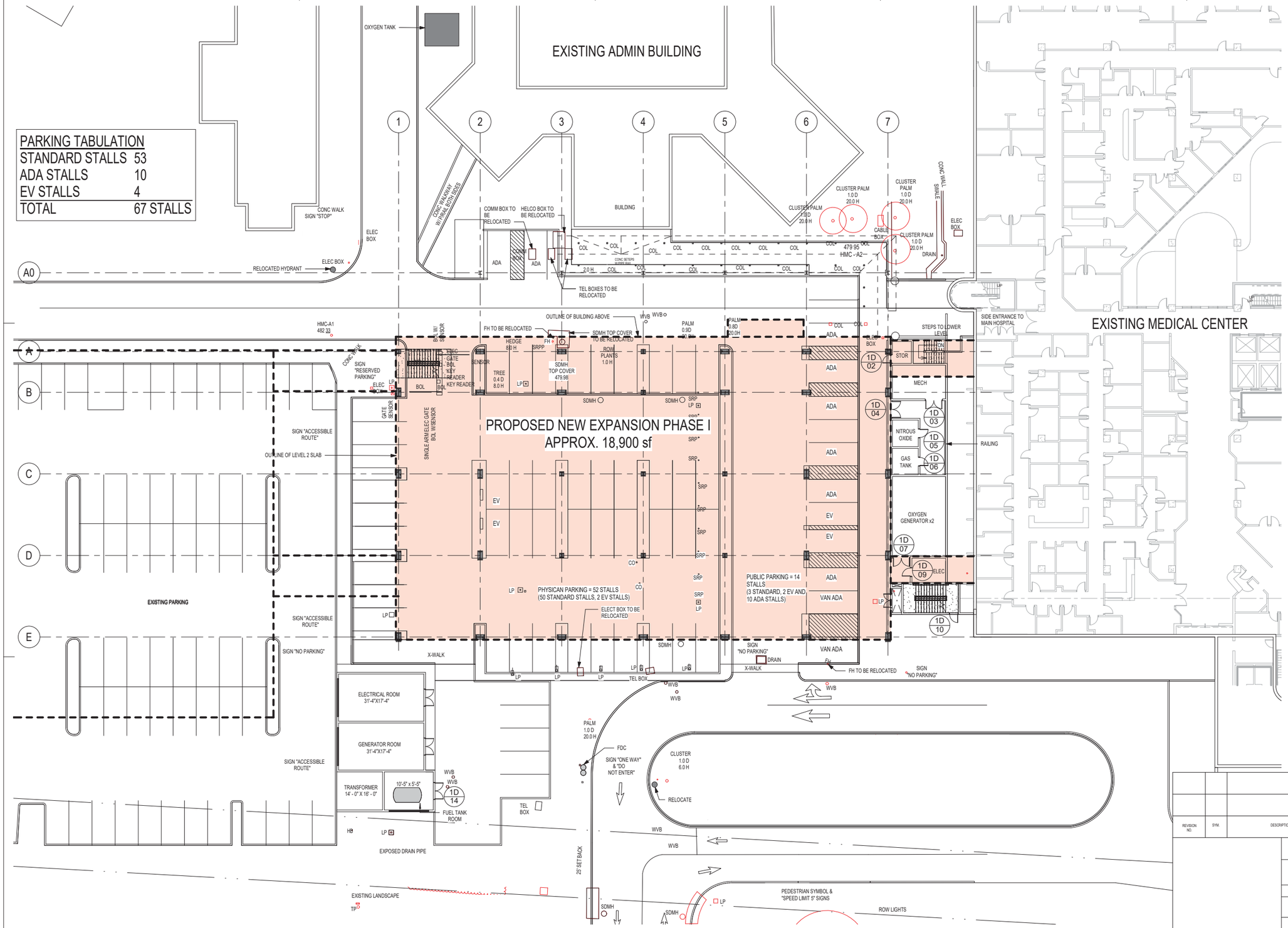
DESIGN BY: Designer	CHECKED BY: Checker	HHSC JOB NO.
DRAWN BY: Author	APPROVED BY: Approver	DATE
SCALE: 1/32" = 1'-0"		

SHEET ____ OF ____ SHTS.

THE WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. ("OBSERVATION OF CONSTRUCTION" SHALL BE DEFINED IN CHAPTER 115, HAWAII ADMINISTRATIVE RULES FOR PROFESSIONAL ENGINEERS, SURVEYORS AND LANDSCAPE ARCHITECTS STATE OF HAWAII, SUBCHAPTER 1, SECTION 16-115-2 DEFINITIONS, EFFECTIVE 6/29/94.)

FUTURE PROGRAM SPACE
LDRP
1
2
3
4
5
6
7
PENTHOUSE
42'-0"
ROOF
30'-0"
SECOND FLOOR
14'-0"
FIRST FLOOR
0"
EXPANSION PHASE II
EXPANSION PHASE I
EXISTING HMC

PARKING TABULATION	
STANDARD STALLS	53
ADA STALLS	10
EV STALLS	4
TOTAL	67 STALLS



1 SITE PLAN - PHASE I
1/16" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT.___ OF___	DATE	APPROVED

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HAWAII HEALTH SYSTEMS CORPORATION
STATE OF HAWAII

Hilo Medical Center Expansion

HILO HAWAII HAWAII

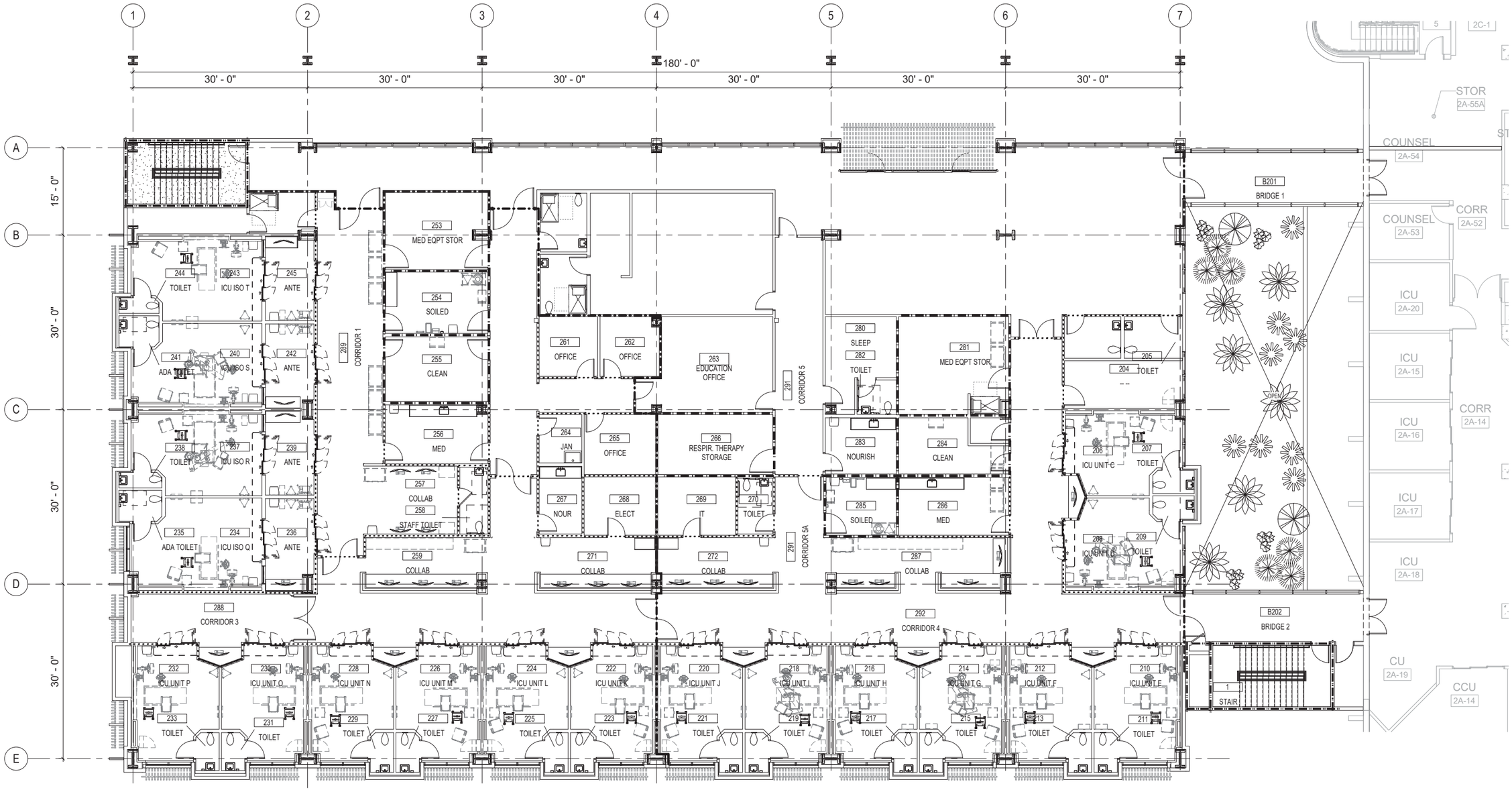
SITE PLAN

BOWERS + KUBOTA CONSULTING
Project Management • Planning • Architectural/Engineering Design • Construction Management

DRAWING NO. A0.02

DESIGN BY: Designer	CHECKED BY: Checker	HHSC JOB NO.
DRAWN BY: Author	APPROVED BY: Approver	DATE
SCALE: 1/16" = 1'-0"		

SHEET ___ OF ___ SHTS.



1 PHASE I - ICU SECOND FLOOR PLAN

1/8" = 1'-0"

LEGEND:

- 1 HOUR FIRE RATED WALL
- 2 HOUR FIRE RATED WALL
- SMOKE PARITION
- SMOKE BARRIER WITH 1 HOUR FIRE RATING
- GYPSUM BOARD FRAMED PARTITION REFER TO WALL TYPES

NORTH

0 4' 8' 16'

Scale: 1/8" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT.____ OF____	DATE	APPROVED

THE WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" SHALL BE DEFINED IN CHAPTER 115, HAWAII ADMINISTRATIVE RULES FOR PROFESSIONAL ENGINEERS, SURVEYORS AND LANDSCAPE ARCHITECTS STATE OF HAWAII, SUBCHAPTER 1, SECTION 16-115-2 DEFINITIONS, EFFECTIVE 8/29/94.)

HAWAII HEALTH SYSTEMS CORPORATION

STATE OF HAWAII

Hilo Medical Center Expansion

HILO HAWAII HAWAII

OVERALL SECOND FLOOR PLAN - ICU

BOWERS + KUBOTA CONSULTING

Project Management + Planning + Architectural/Engineering Design + Construction Management

DRAWING NO. A1.02

DESIGN BY: Designer	CHECKED BY: Checker	HHSC JOB NO.
DRAWN BY: Author	APPROVED BY: Approver	DATE
SCALE: As indicated		

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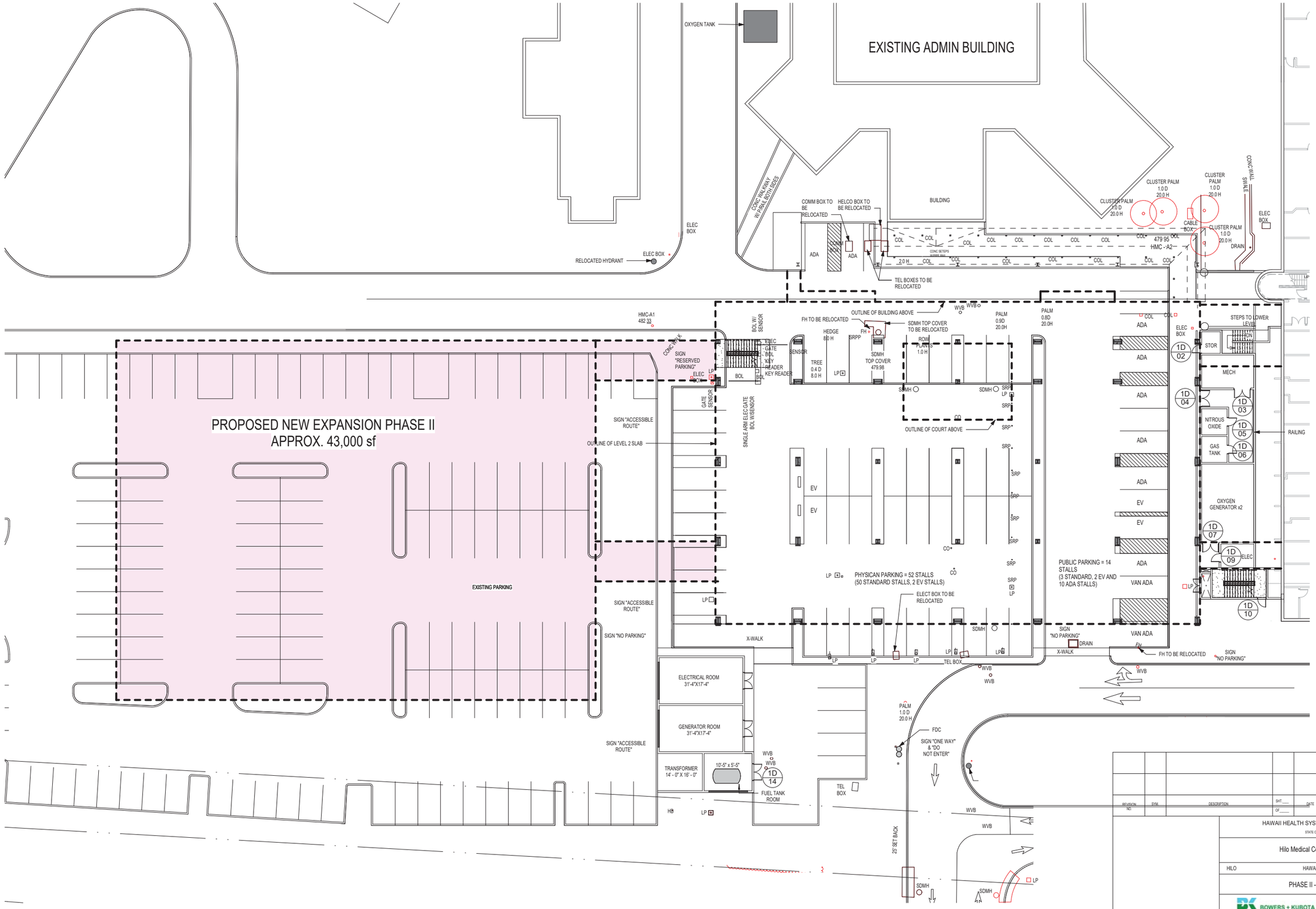

1 SITE PLAN - PHASE II
1/16" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT.___ OF___	DATE	APPROVED

HAWAII HEALTH SYSTEMS CORPORATION
STATE OF HAWAII

Hilo Medical Center Expansion

HILO HAWAII HAWAII

PHASE II - SITE PLAN

BOWERS + KUBOTA CONSULTING
Project Management + Planning + Architectural/Engineering Design + Construction Management

DRAWING NO. A0.02X

DESIGN BY: Designer | CHECKED BY: Checker | HHSC JOB NO.
DRAWN BY: Author | APPROVED BY: Approver | DATE | SHEET
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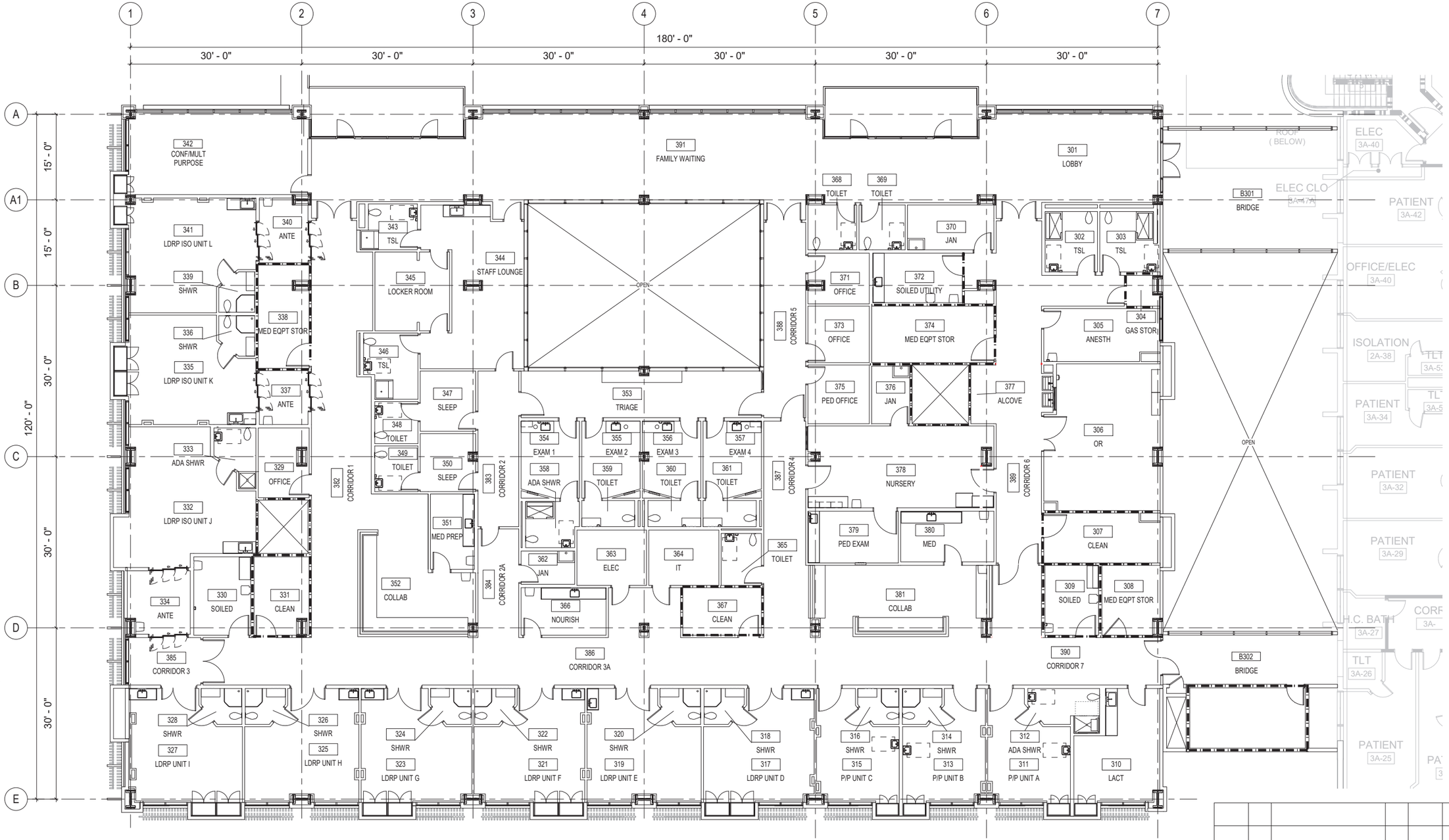


1 PHASE II - FAMILY BIRTHING CENTER 2F
1/8" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT.___ OF___	DATE	APPROVED

THE WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. ("OBSERVATION OF CONSTRUCTION" SHALL BE DEFINED IN CHAPTER 115, HAWAII ADMINISTRATIVE RULES FOR PROFESSIONAL ENGINEERS, SURVEYORS AND LANDSCAPE ARCHITECTS STATE OF HAWAII, SUBCHAPTER 1, SECTION 16-115-2 DEFINITIONS, EFFECTIVE 8/29/94.)

HAWAII HEALTH SYSTEMS CORPORATION
STATE OF HAWAII

Hilo Medical Center Expansion

HILO HAWAII HAWAII

FAMILY BIRTHING CENTER (2F)

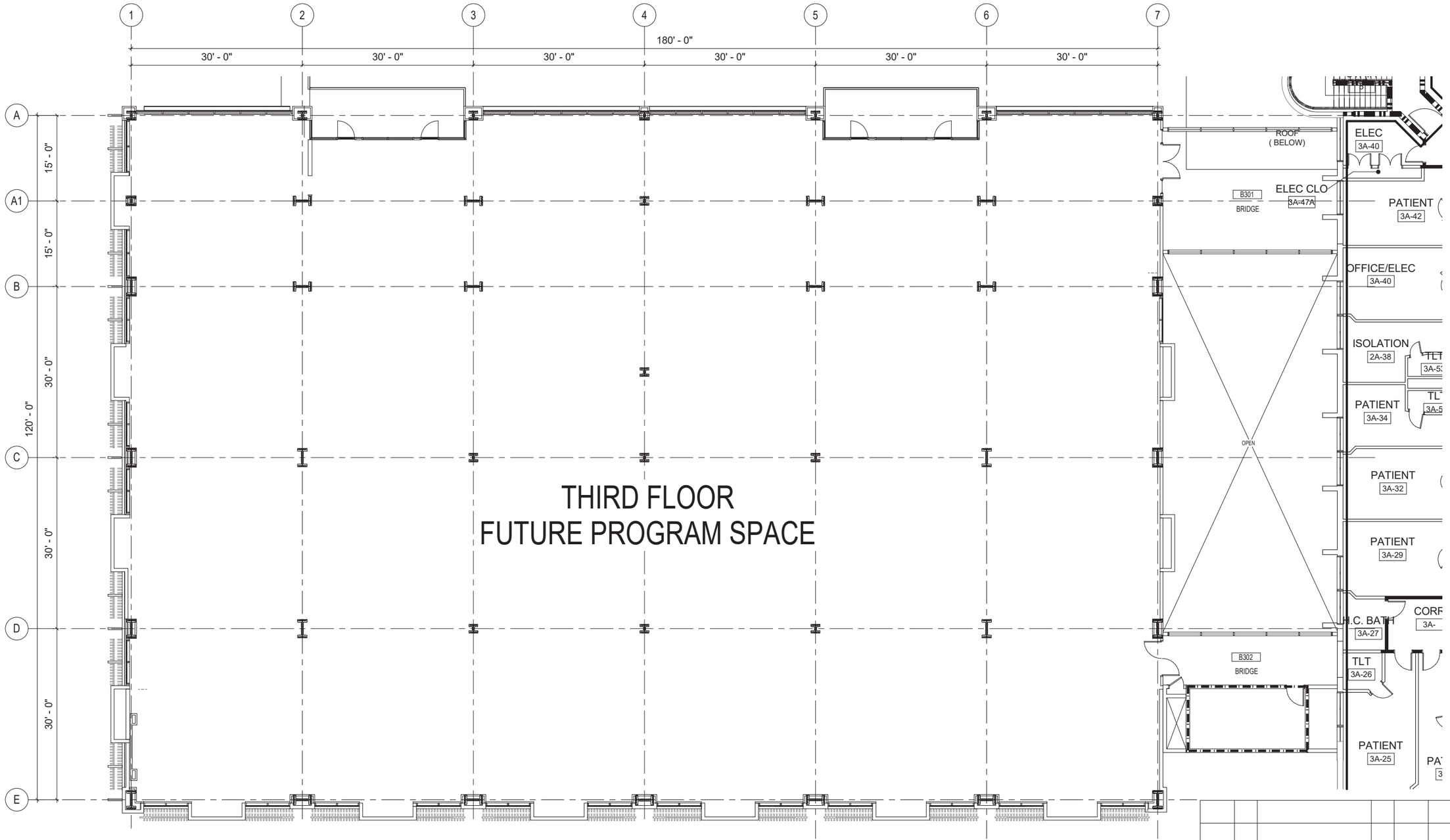
BOWERS + KUBOTA CONSULTING
Project Management + Planning + Architectural/Engineering Design + Construction Management

DRAWING NO. A1.03

DESIGN BY: Designer	CHECKED BY: Checker	HHSC JOB NO.	
DRAWN BY: Author	APPROVED BY: Approver	DATE	SHEET
SCALE: 1/8" = 1'-0"			OF_____SHTS.

NORTH

0 2' 4' 8'
1/4" = 1'-0"



1 PHASE II - FUTURE PROGRAM SPACE 3F
1/8" = 1'-0"

REVISION NO.	SYM.	DESCRIPTION	SHT.____ OF____	DATE	APPROVED

NORTH

0 4' 8' 16'
Scale: 1/8" = 1'-0"

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HAWAII HEALTH SYSTEMS CORPORATION
STATE OF HAWAII

Hilo Medical Center Expansion

HILO HAWAII HAWAII

FUTURE PROGRAM SPACE (3F)

BOWERS + KUBOTA CONSULTING
Project Management + Planning + Architectural/Engineering Design + Construction Management

DRAWING NO. A1.02

DESIGN BY: Designer	CHECKED BY: Checker	HHSC JOB NO.
DRAWN BY: Author	APPROVED BY: Approver	DATE
SCALE: 1/8" = 1'-0"		

SHEET OF_____SHTS.

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

APPENDIX

B

Hilo Medical Center Hospital Expansion

1190 Waianuenue Avenue
Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Project Engineering Report

Prepared by: **Okahara and Associates, Inc.**
200 Kohola Street
Hilo, Hawai`i 96720

November 2021

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Executive Summary

1.1. Introduction

Hawai'i Health Systems Corporation (HHSC) proposes to construct an expansion of the existing Hilo Medical Center Facility, located within the south Hilo District of of Hawai`i Island (ref. Figure 1). The proposed expansion will consist of two (2) phases (ref. Figure 2).

The Phase 1 expansion will consist of a two level building with an Intensive Care Unit within the second level structure suspended over the existing east physician and visitor parking area via concrete columns. The Phase 1 building will connect to the second floor of the existing main Hospital building via two enclosed walkways (ref. Figure 3). The existing east physician and visitor parking will be redesigned to accommodate the new support columns.

The Phase 2 expansion will consist of a three level building, with the upper two levels suspended over the existing west employee and visitor parking area via concrete columns. The upper two levels will house various programs and treatment areas. The Phase 2 building will connect to the second floor of the Phase 1 building via two enclosed walkways (ref. Figure 3). The existing west employee/visitor parking area will be redesigned to accommodate the new support columns.

1.2. Report Purpose/Objective

The goal of this Project Engineering Report (PER) is to gather, identify and document pertinent project site utility infrastructure information to assist and define the design parameters of the project from which an appropriate civil engineering solution can be developed.

This report defines the proposed improvements to the site's existing wet utility infrastructures, such as water, fire protection, wastewater, and drainage, in order to accommodate the required new utility connections to support each expansion phase. The information presented in this report is primarily focused on the site's civil infrastructure aspects of the proposed expansions, and does not address the architectural, mechanical, electrical, and landscape aspects of the proposed expansions.

1.3. Summary of Recommendations

The following recommendations were determined for the proposed expansions.

- General - Existing subsurface utilities and surface utility structures located within the areas impacted by each expansion phase should be relocated to accommodate conflicts respective to each phase. Utility relocations for Phase 1 will be more extensive than in Phase 2.
- General - Utility realignments under Phase 1 of the expansion should consider the possibility of accommodating future utility connections from Phase 2 and anticipate possible conflicts with building elements of the Phase 2 expansion.
- Drainage - The anticipated increase in rainfall runoff generated by each phase will be minimal. Any drainage runoff in excess of existing quantities shall not be allowed to discharge offsite, but instead will be handled on-site utilizing shallow drain sumps and/or drywells.

- Wastewater - A sewer system study shall be prepared for each expansion phase to verify the ability of the existing on-site sewer mains located within each expansion phase to accommodate the respective wastewater flows generated by each phase.
- Wastewater - Pending results of each respective sewer study, increasing the size of the existing sewer mains shall be incorporated into the respective designs for each expansion phase.
- Wastewater - Reroute existing sewer lines within each respective expansion phase location (i.e. parking lots) to address conflicts with the new column footings and other building structural elements, and to accommodate new sewer connections from each new expansion phase.
- Wastewater - Collect all wastewater generated by each expansion and discharge into the existing 10-inch sewer main along Waianuenue Avenue.
- Potable Water - Relocate a portion of the existing 8-inch water main to accommodate the new column footings and subsurface structural elements of Phase 1. Provide a 15-foot-wide waterline utility easement in favor of the County of Hawaii, Department of Water Supply to facilitate future waterline maintenance and repairs by the County.
- Potable Water - Provide a new metered water service lateral for domestic water requirements for each expansion phase.
- Fire Protection - Provide new fire hydrant supply piping connections for each expansion phase. Expansion designs shall determine the proper relocation of existing hydrants that are in conflict with elements of each expansion phase. If appropriate, additional fire hydrants shall be provided in each expansion phase.
- Fire Protection - Provide new fire sprinkler supply piping connection for each expansion phase.
- Propane Gas - Provide new on-site propane gas storage tanks to serve the water heating and/or meal preparation fuel requirements of each expansion phase.
- Propane Gas - Siting and sizing of propane gas storage should consider a consolidated location to service each expansion phase.
- Site Improvements - Redesign parking space layouts for each phased expansion, with consideration for accessibility to the front entrance of the main hospital building.

2. Civil Design Resources

2.1. Standards and References

- Standard Specifications for Public Works Construction, September 1986, as amended.
- Standard Details for Public Works Construction, September 1984, as amended.
- Water System Standards, State of Hawaii, 2002, as amended.
- Wastewater System Design Standards, City and County of Honolulu, July 2017 (adopted by County of Hawaii, Department of Environmental Management, Wastewater Division.
- Storm Drainage Standards, County of Hawaii, Department of Public Works, October 1970.
- Hawaii County Code, Chapter 10 - Erosion and Sedimentation Control
- Hawaii County Code, Chapter 26 - Fire
- Chapter 11-55, HAR for National Pollutant Discharge Elimination System Permit (NPDES)

3. Existing Site Utilities and Conditions

3.1. Rainfall Runoff Drainage

The Phase 1 expansion building's proposed location will be within the existing east physician/visitor asphalt parking area. The area includes existing subsurface drainage piping and drainage catch basins that collect and convey the vast majority of rainfall runoff from the asphalt parking area and adjacent driveways into an on-site piped drainage system located along the southern boundary of the property adjacent to Waianuenue Avenue. A small portion of the rainfall runoff generated by the existing parking lot surface flows and discharges into an existing drainage swale located on the southern boundary of the site along Waianuenue Avenue, which connects to the previously noted piped drainage system (ref. Figure 4). There are no existing drywells or shallow drain sumps being utilized to contain rainfall runoff within the proposed Phase 1 expansion location.

The Phase 2 expansion building's proposed location will be within the existing employee and visitor's asphalt parking area, located west of the Phase 1 building (ref. Figure 2). The rainfall runoff generated by the west employee/visitor parking area surface flows towards the southern boundary of the site and discharges into the same drainage swale noted previously along Waianuenue Avenue (ref. Figure 4). Rainfall runoff from the west employee/visitor parking area (Phase 2) does not flow thru to the east physician/visitor parking area (Phase 1). There are no existing drywells, shallow drain sumps or subsurface drainage piping being utilized to contain or convey runoff within the proposed Phase 2 expansion location.

3.2. Wastewater

Within the existing east physician/visitor parking lot area of the Phase 1 expansion, there are two existing sewer systems, an existing 6-inch sewer main that serves the existing on-site facilities located northwest of the parking lot. An existing 4-inch sewer lateral receives wastewater generated by the Hale Ho'ola Behavioral Health building located north of the proposed Phase 1 expansion location. The 4-inch sewer lateral connects to the 6-inch sewer main. The 6-inch sewer main connects to the County's 10-inch sewer main via an existing sewer manhole that is located within the County's Waianuenue Avenue right-of-way along the southern border of the hospital property (ref. Figure 5).

Within the existing west employee/visitor parking lot area of the Phase 2 expansion, there is an existing 6-inch sewer main that serves the existing on-site facilities located north of the parking lot. This 6-inch sewer main connects to the County's 10-inch sewer main via an existing sewer manhole that is located within the County's Waianuenue Avenue right-of-way along the southern border of the hospital property (ref. Figure 5).

3.3. Potable Water

There is an existing 8-inch water main within the hospital's property that is supplied by an existing 16-inch water main located within the County's Waianuenue Avenue right-of-way along the southern border of the Hospital property. The 8-inch water main travels in a loop within the

hospital's property, along with several branch lines interconnected to the 8-inch water main. There are several metered water service lateral connections to this 8-inch main within the hospital's property that provide domestic water to the various on-site medical center facilities. Within the proposed Phase 1 expansion location, a portion of the 8-inch water main is located within the existing east physician/visitor parking lot (ref. Figure 6).

3.4. Fire Protection Water Supply

Existing fire protection services, such as fire hydrants and fire sprinklers that serve the various medical center facilities, are supplied by the existing 8-inch water main that is noted in paragraph 3.3 - Potable Water.

3.5. Propane Gas Supply

The medical center utilizes propane gas to support it's hot water, laundry, and food preparation requirements. The propane gas is stored on-site using propane storage tanks located on the northern portion of the hospital property. There are no existing propane gas storage tanks within close proximity to the proposed Phase 1 and Phase 2 expansions. The local propane gas vendor does not have any gas mains in the immediate vicinity of the hospital property.

3.6. Site Improvements

The location within the hospital property that is proposed for the new Phase 1 and Phase 2 expansions consists primarily of existing asphalt parking spaces, concrete curbs, walkways, and curbed planter areas. The existing east physician/visitor parking (Phase 1) and west employee/visitor parking (Phase 2) areas include several standard and van-accessible parking spaces and associated accessible aisles and signage.

4. General Wet Utility Design

4.1. Project Goal

A primary objective of the civil utility design is to facilitate new utility connections for the proposed Phase 1 and Phase 2 expansions to the available existing utility infrastructures serving the hospital property. The proposed building designs for each phase of the expansion incorporates column spread footings throughout their respective footprints. Conflicts between the new footings and existing subsurface utilities shall be addressed by relocation of affected utilities.

4.2. Rainfall Runoff Drainage

A pre-construction and post-construction drainage analysis was conducted to determine the ability of the existing drainage infrastructure to accommodate the Phase 1 expansion (see Attachment 1). The analysis resulted in an increase in runoff flow of 0.145 cubic feet per second (cfs). Installation of a shallow drain sump is proposed to address the increase in runoff generated by the Phase 1 expansion improvements. The results of a similar analysis of the Phase 2 expansion would be addressed in the same context, in which any excess rainfall runoff generated by the Phase 2 expansion improvements will not be discharged offsite, but be contained on-site and suitable subsurface drain structures, such as drain sumps or drywells shall be utilized.

The current proposed designs for both phases of the expansion incorporates raised structures with paved parking areas located at grade under each new building structure. This design approach allows the existing rainfall runoff patterns and quantities associated with the existing paved parking areas to continue and discharge as per the existing site conditions. The site grading and subsurface drainage system designs for each parking area and the surrounding areas impacted by the expansions shall incorporate elements to ensure that existing rainfall runoff surface flows shall be maintained thru each expansion phase and discharge offsite as per existing conditions.

The existing subsurface drainage piping and inlet structures located within the Phase 1 expansion's footprint should be removed and relocated in order to accommodate the expansion's foundation footings. Existing drainage piping and structures not impacted by the new column footings will remain and reconnected to the new drainage system. A new subsurface drainage system will collect and convey the existing rainfall runoff surface flows into the existing drainage system adjacent to Waianuenue Avenue. The downspouts from the new Phase 1 expansion building will be collected below grade and connected to the new subsurface drainage piping. New drainage inlet structures are to be provided to address surface rainfall runoff from areas beyond the northern footprint of the Phase 1 expansion building. Surface runoff from the reconstructed asphalt parking lot under the Phase 1 expansion building shall be addressed by regrading the parking lot to convey runoff into the existing drainage system along the southern boundary of the site.

There are no existing subsurface drainage piping and structures located within the proposed Phase 2 expansion footprint. A new subsurface drainage system will collect and convey the existing rainfall runoff surface flows into the existing drainage system adjacent to Waianuenue Avenue. The downspouts from the new Phase 2 expansion building will be collected below grade and connected to the new subsurface drainage piping. New drainage inlet structures are to be provided to address surface rainfall runoff from areas beyond the northern footprint of the Phase 2 expansion building. Surface runoff from the reconstructed asphalt parking lot under the Phase 2 expansion building shall be addressed by regrading the parking lot to convey runoff into the existing drainage system along the southern boundary of the site.

4.3. Wastewater

Portions of the existing 6-inch sewer main within the Phase 1 expansion's footprint should be removed and rerouted to address conflicts with the expansion's Phase 1 foundation footings. Portions of that 6-inch sewer main located outside the of the new Phase 1 building footprint will remain. The wastewater generated by the new Phase 1 expansion shall be collected and connected to the rerouted 6-inch sewer main. A sewer system analysis shall be prepared to ensure the existing 6-inch sewer main has the capacity to adequately convey the combined existing and additional Phase 1 wastewater flows to the County's 10-inch sewer main. Pending results of the sewer system analysis, increasing the size of the 6-inch sewer main may be needed and if so warranted, shall be incorporated into the Phase 1 expansion design.

The existing 6-inch sewer main that is adjacent to the proposed Phase 2 expansion location may not be in conflict with elements of the new Phase 2 expansion's building (ref. Figure 2 and Figure 5). The wastewater generated by the new Phase 2 expansion shall be collected and connected to the existing 6-inch sewer main. A sewer system analysis shall be prepared to ensure the existing 6-inch sewer main has the capacity to adequately convey the combined existing and additional Phase 2 wastewater flows to the County's 10-inch sewer main. Pending results of the sewer system analysis, increasing the size of the 6-inch sewer main may be needed and if so warranted, shall be incorporated into the Phase 2 expansion design.

4.4. Potable Water

The County of Hawaii, Department of Water Supply (DWS) will not accept leaving the existing 8-inch water main under the new Phase 1 expansion building. As such, a portion of the existing 8-inch water main is to be removed and realigned to be outside of the new Phase 1 expansion's building footprint, in order to facilitate adequate future access by DWS for maintenance and repairs of the 8-inch water main. The existing waterline easement in favor of the DWS will be revised to match the new alignment. The 8-inch waterline relocation addresses the County's issue of future access to the water main, as well as addresses potential conflicts with the new Phase 1 building's foundations.

With the standalone configuration of the Phase 1 expansion building, and the estimated water demands (ref. Attachment 2), a new metered potable water service lateral connection shall be provided to supply the domestic water and landscaping demands of the new Phase 1 expansion. A backflow preventer assembly shall be provided to address cross-connection issues. The Water demand calculations shall be submitted to the DWS for review and approval for the new metered domestic water connection. The new metered water service lateral connection shall be made from the existing 8-inch water main located within the hospital's property.

The domestic water requirements of the proposed Phase 2 expansion building can be addressed in the same context as in Phase 1. A water demand analysis shall be prepared, similar in scope and content as was prepared for Phase 1. A new metered potable water service lateral connection shall be provided to supply the domestic water and landscaping demands of the Phase 2 expansion. A backflow preventer assembly shall be provided to address cross-connection issues. The Water demand calculations shall be submitted to the DWS for review and approval for the new metered domestic water connection. The new metered water service lateral connection shall be made from the existing 6-inch water main within the hospital's property, located north of the existing west employee/visitor parking area (ref. Figure 6).

4.5. Fire Protection

The existing 8-inch waterline to be relocated as noted in paragraph 4.4 - Potable Water, also provides the water supply to the existing fire hydrants in the immediate area of the expansion buildings. Existing fire hydrants that are in conflict with the proposed expansion improvements shall be relocated. Appurtenant hydrant water supply connections shall be incorporated into the respective expansion designs to accommodate the relocated fire hydrants. If additional fire

hydrants are deemed necessary, new fire hydrants and the associated water supply connections shall be incorporated into the respective expansion designs.

A new 6-inch water line will be provided to supply the fire sprinkler system for each expansion's building facility requirements. The 6-inch fire sprinkler supply piping will be connected to the existing water mains within the hospital's property. An associated Detector Check meter assembly shall be provided for each sprinkler supply connection.

5. Propane Gas

5.1. Propane Gas Supply

The location of the existing propane gas storage tanks within the hospital property would require an extensive installation of subsurface gas piping to provide gas services to each of the expansion buildings. Locating a gas propane storage tank area, appropriately sized for the services required, within close proximity of the expansion buildings would address the issue of installing an extensive system of subsurface gas piping within the hospital property. With consideration to the proximity of the Phase 1 and Phase 2 expansion building to each other, a consolidated propane storage tank area should be considered during the Phase 1 expansion design.

6. General Site Improvements

6.1. Site Improvements

The existing east physicians/visitor paved parking lot and the west employee/visitor parking lot will be reconstructed to accommodate a new parking lot and a new circulation pattern under and around each expansion building. New construction of the parking areas shall include features such as raised concrete curbed islands and walkways, concrete curbs, concrete wheel stops, new asphalt pavement, new concrete pavement for accessible stalls, stall and pavement striping and signage. Existing utility boxes and other at-grade utility features that are to remain shall be adjusted to accommodate the finish grades of the new paved parking lots.

7. Civil Engineering Permits

7.1. National Pollutant Discharge Elimination System (NPDES) Permit for Stormwater. It is assumed that the area of disturbance, including for construction staging, will surpass one acre in area. This permit is administered by the State of Hawaii Department of Health Clean Water Branch.

7.2. Grading Permit. This permit is required for earthwork disturbance of one acre or more or 100 cubic yards or more. It is assumed that this project will exceed 100 cubic yards in earthwork, which include excavation for fine grading, trench excavation, and structural excavation. This permit is administered by the County of Hawaii Department of Public Works, Engineering Division. It also requires approval by the State Historic Preservation Division of the State Land and Natural Resources Department.

Attachment 1

Phase 1 Drainage Calculations

Project Description

This project involves construction of a new two-story hospital expansion building that will be constructed over the existing parking lot located immediately west of the existing hospital structure. This work includes constructing a new building with a roof drainage collection system to convey rooftop runoff through vertical downspouts and horizontal buried drain lines that will connect to the existing drain line currently used by the hospital facility.

Soil Condition

The existing soil at the site is classified as Hilo Silty Clay Loam (HoC) by USGS. HoC is characterized by a dark brown silty clay loam layer, typically more than five feet deep and underlain by bedrock. Infiltration rate of HoC is rapid, with low runoff potential.

Existing Condition

The existing parking lot drains into four inlet boxes or catch basins, which is collected by buried drainpipe and conveyed to an existing 42" drainpipe running along the north side of Waianuenue Avenue. See Attachment 2 – Pre-Construction Site Plan.

Proposed Condition

The proposed construction will take all of rainfall runoff from the new building's roof surface and convey it to the existing 42" drainpipe using new downspouts and a buried pipe network. See Attachment 3 – Post-Construction Site Plan. There is no plan to reuse the roof runoff. There will be some removal of grassed area, which is shown in light blue on Attachment 2. This area totals 0.049 acres and is estimated to generate an increase of flow shown below.

The existing runoff was not calculated since in general the existing surface is mostly impervious, which is the same as for the roof of the new building. For the purposes of this drainage calculation, the change in the runoff is only due to the replacement of the grassed area of the parking lot islands with the new pavement or rooftop.

See the following Drainage Summary table for a review of the pre and post construction runoff quantities for the grassed areas being replaced by roof or pavement. See Attachment 4 – Drainage Calculations, for use of plates from the County Drainage Standards.

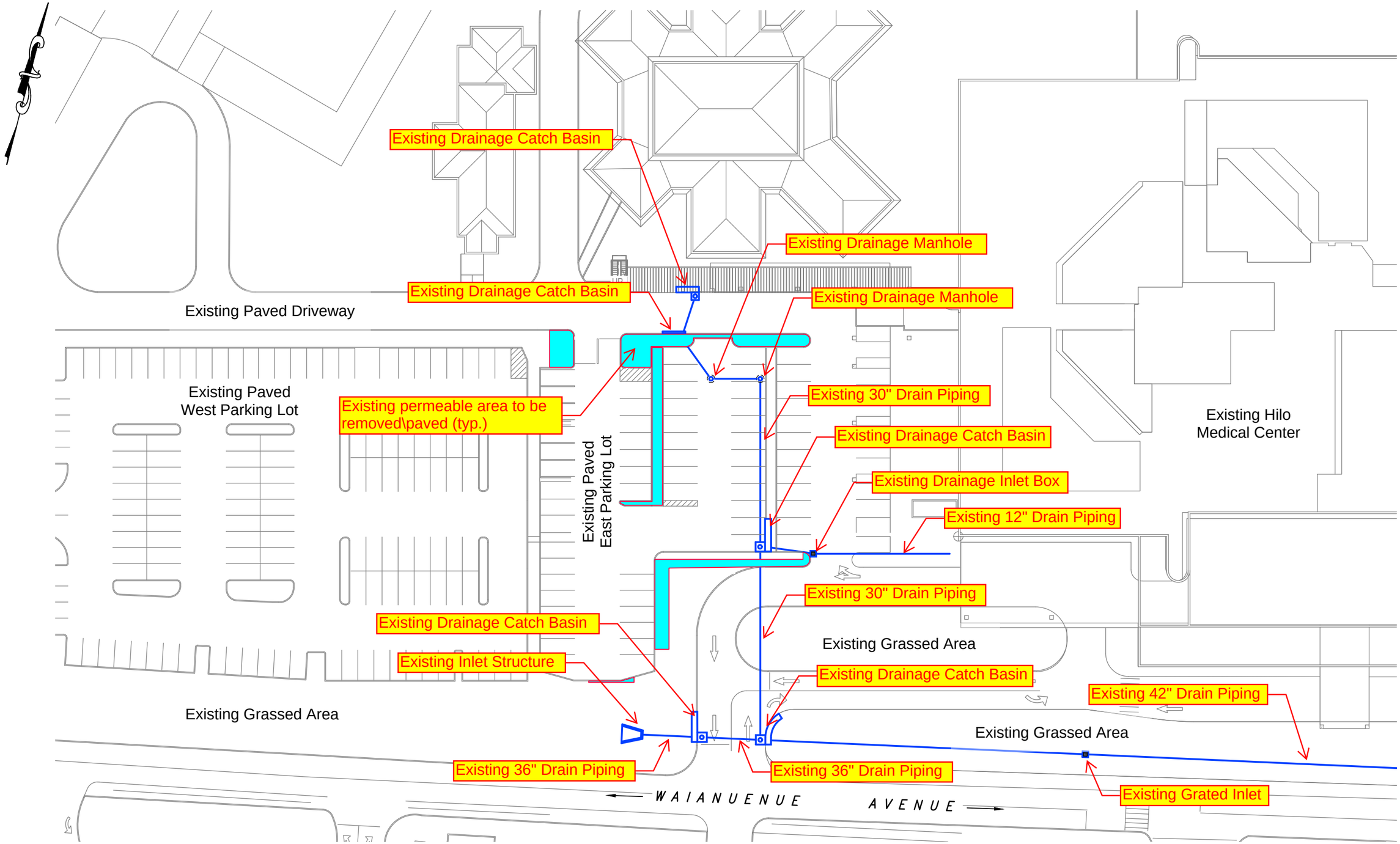
DRAINAGE SUMMARY

Pre and Post Construction

	Grassed Area (Pre-Construction)	Paved Area (Post-Construction)	
Tc (mins)	5	5	
$C_{Pervious}$	0.68	0.90	
Intensity (In/hr.)	13.5	13.5	
Pervious Area (acres)	0.049	0.049	
Q (cfs)	0.450	0.595	$\triangle Q = 0.145$

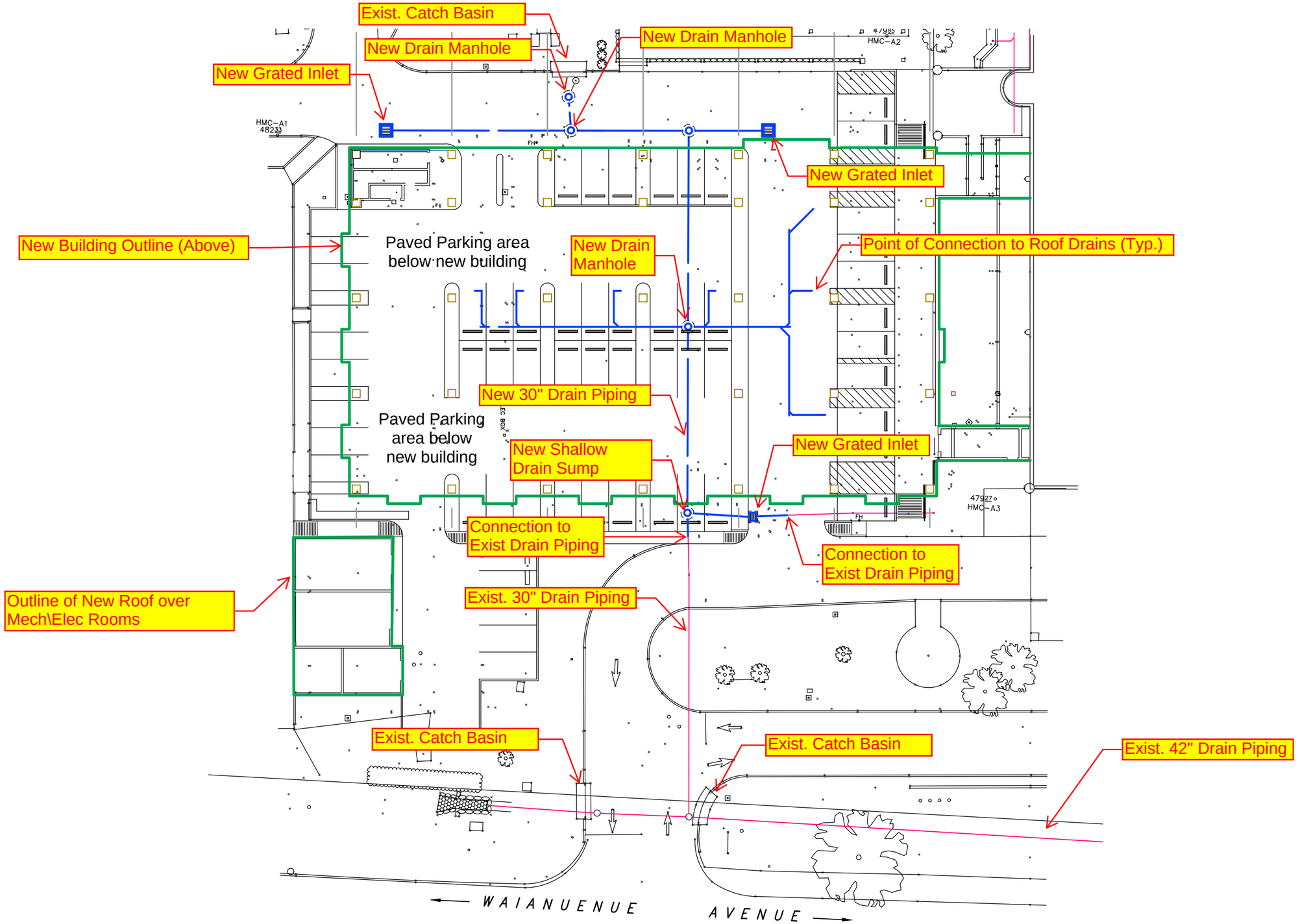
Summary

This project will generate a total increase in runoff of **0.145 cfs**. Installation of the proposed shallow drain sump will handle the increase in runoff generated by the replacement of grassed surface with paved or roof surface. It will be placed to intake more than the 0.145 cfs.



HILO MEDICAL CENTER HOSPITAL EXPANSION - PHASE 1
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure A1 - Pre-Construction Site Plan



HILO MEDICAL CENTER HOSPITAL EXPANSION - PHASE 1
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure A2 - Post-Construction Site Plan

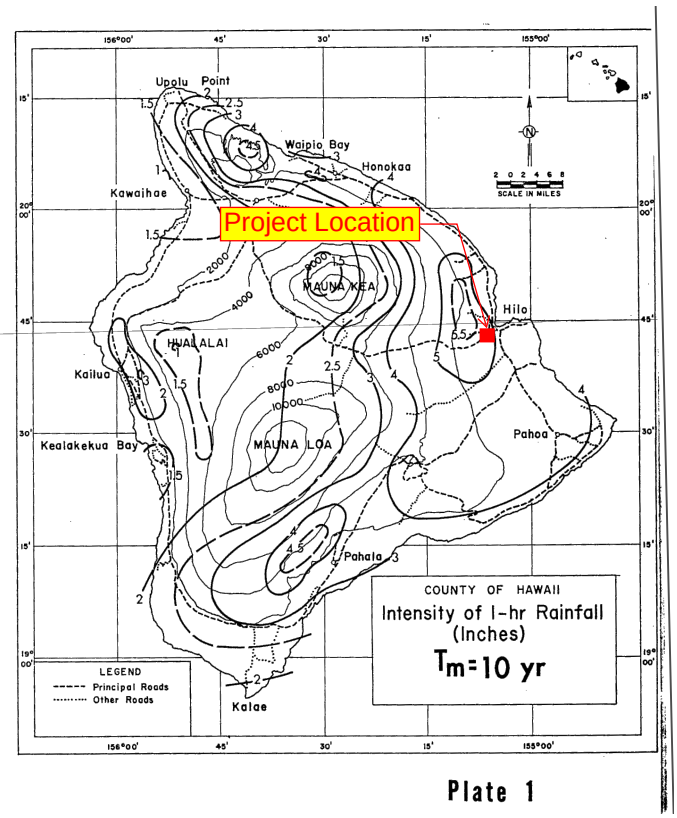


Plate 1

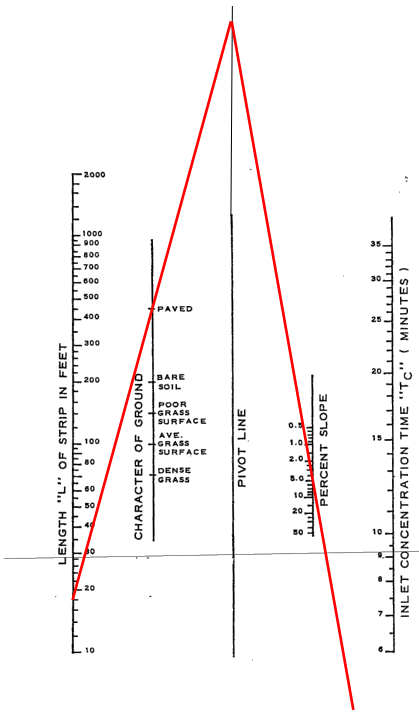
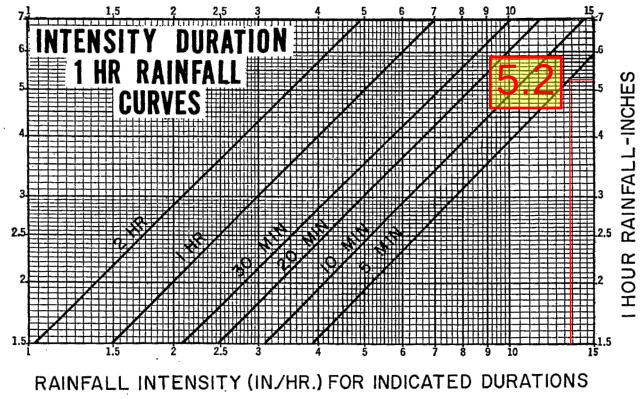


Plate 3

Overland Flow Chart

Tc < 5

Plate 4



I = 13.5

C_{PRE} = .20 + 0 + .03 + .45 = 0.68

C_{POST} = 0.90

Table 1

GUIDE FOR THE DETERMINATION OF RUNOFF COEFFICIENTS FOR BUILT-UP AREAS*

WATERSHED CHARACTERISTICS	EXTREME	HIGH	MODERATE	LOW
INFILTRATION	NEGLIGIBLE 0.20	SLOW 0.14	MEDIUM 0.07	HIGH 0.0
RELIEF	STEEP (> 25%) 0.08	HILLY (15-25%) 0.06	ROLLING (5-15%) 0.03	FLAT (0-5%) 0.0
VEGETAL COVER	NONE 0.07	POOR (< 10%) 0.05	GOOD (10-50%) 0.03	HIGH (50-90%) 0.0
DEVELOPMENT TYPE	INDUSTRIAL & BUSINESS 0.55	HOTEL-APARTMENT 0.45	RESIDENTIAL 0.40	AGRICULTURAL 0.15

*NOTE: The design coefficient "c" must result from a total of the values for all four watershed characteristics of the site.

HILO MEDICAL CENTER HOSPITAL EXPANSION - PHASE 1
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure A3
Drainage Calculations

Attachment 2

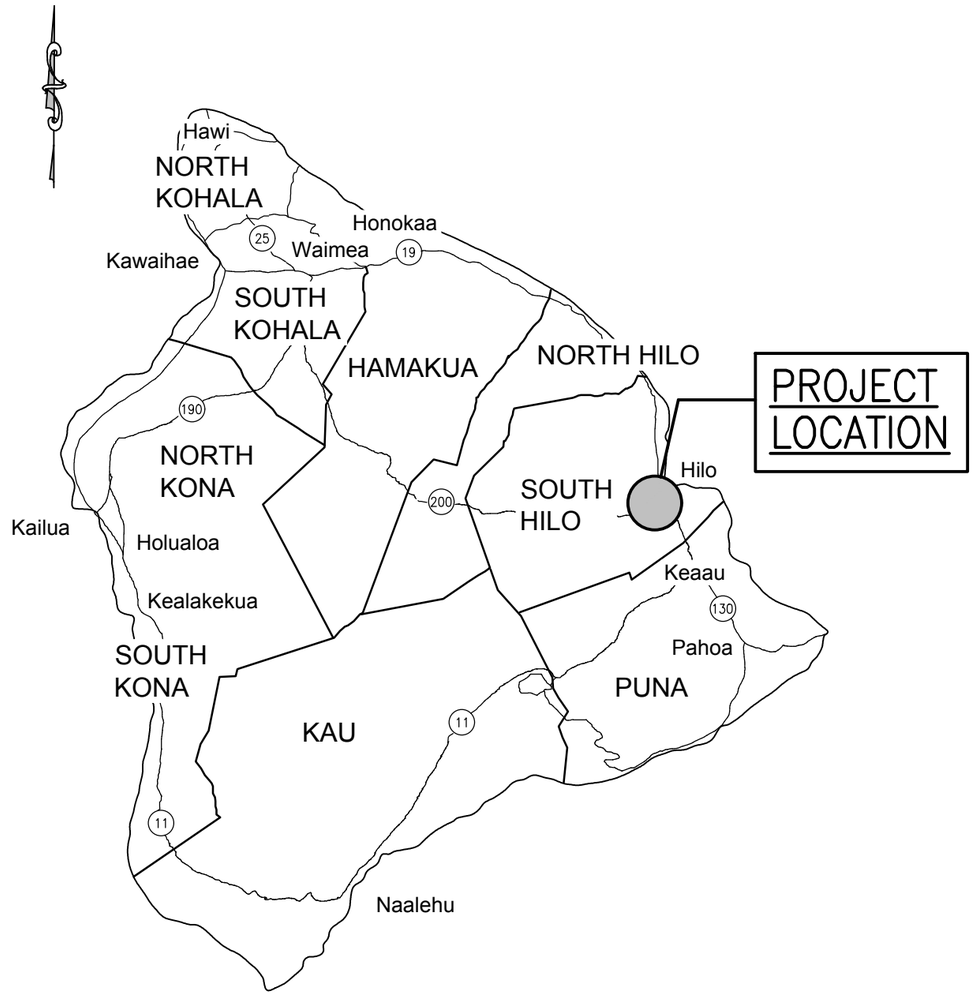
Phase 1 Water Demand Calculations

Project: 20043 HMC Expansion - Redesign Phase 1
Name: yxy
Date: 9/10/2021
Title: Water Demand Calcs

Domestic Water System

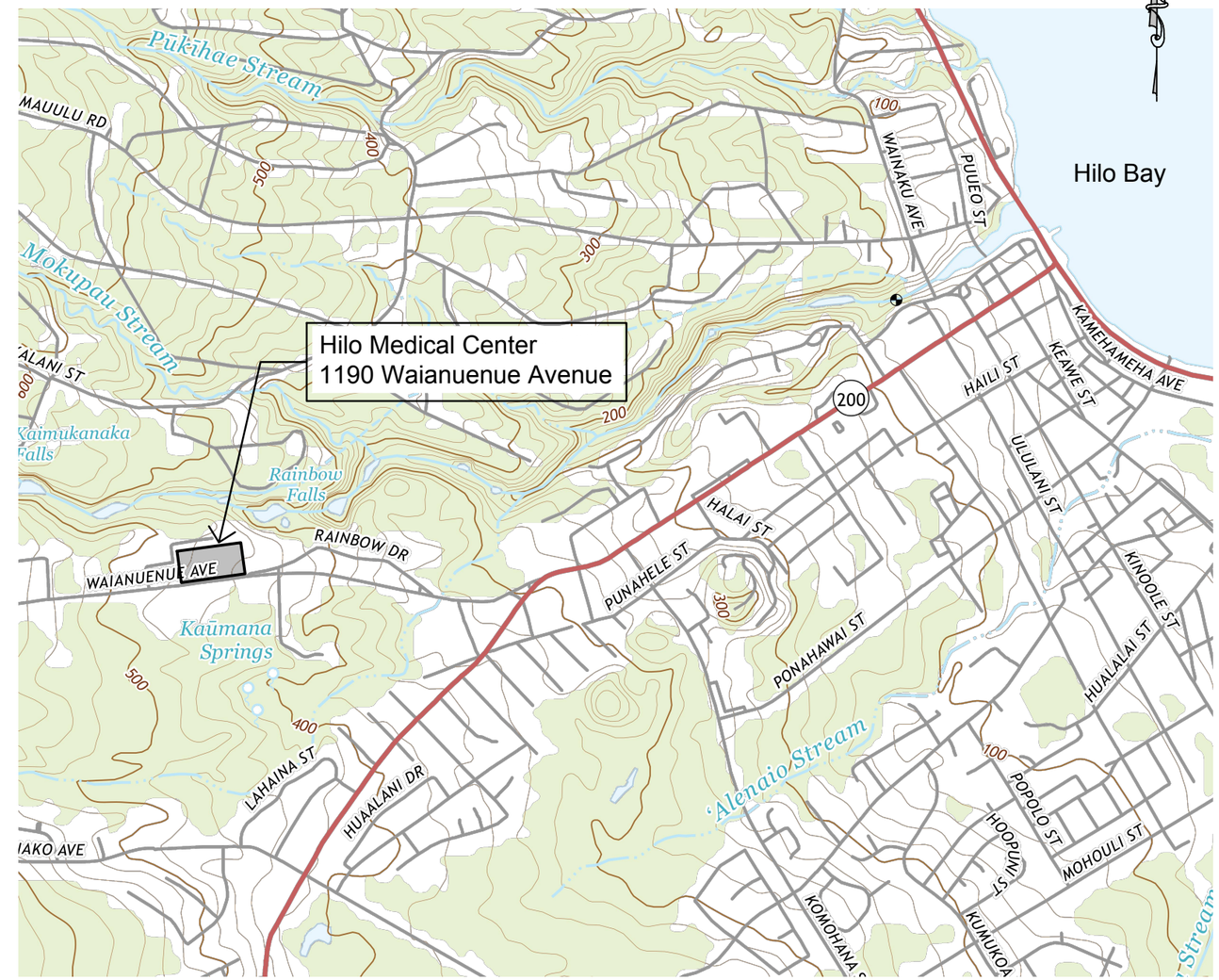
Floor	Fixture	#	FU/fixture	FU	Remark
2nd	SK	35	1.5	52.5	Sink
	LAV	25	1	25	Lavatory
	WC	25	5	125	Water closet (Flush Valve)
	SHO	4	2	8	Shower
	MS	1	1.5	1.5	Mop sink
	HB	1	2.5	2.5	Hose bib
	Add HB	2	1	2	Additional hose bib
	EWC	1	0.5	0.5	
			SUM	217	FU
				95.4	GPM
				3,600	GPD

Figures



ISLAND OF HAWAI`I

NOT TO SCALE

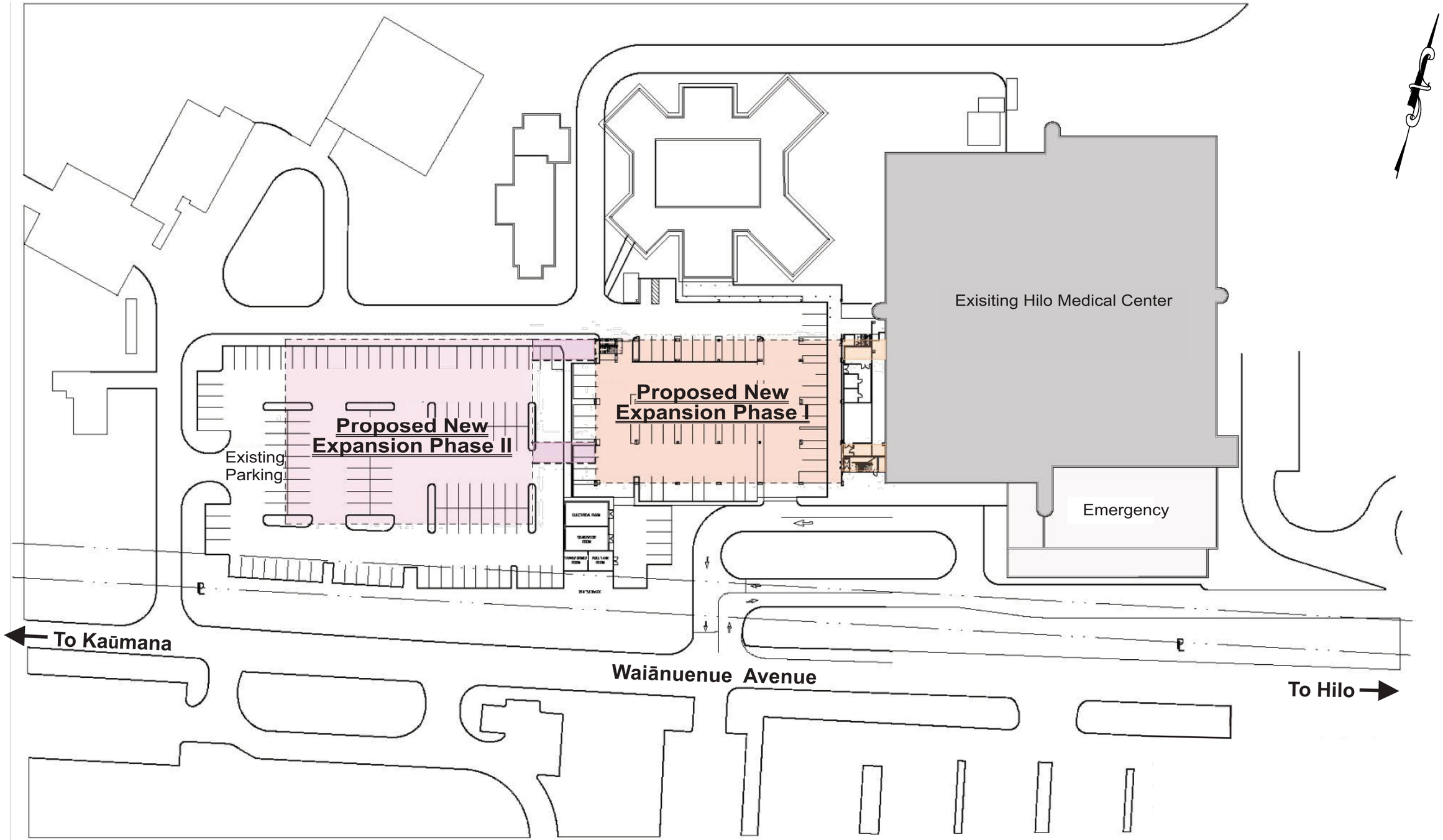


LOCATION MAP

NOT TO SCALE

HILO MEDICAL CENTER HOSPITAL EXPANSION
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure 1 - Location Map

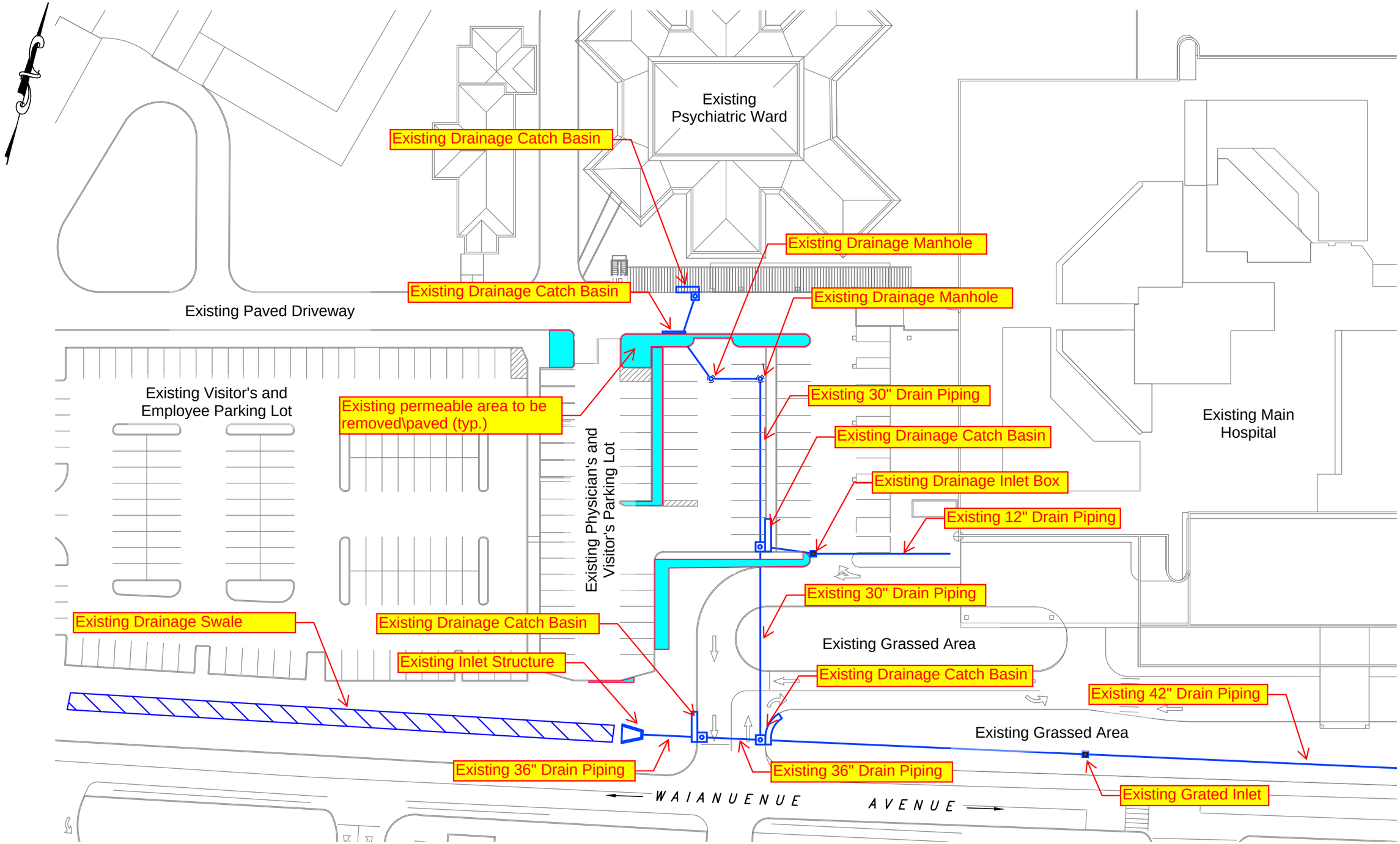


HILO MEDICAL CENTER HOSPITAL EXPANSION
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure 2 - Proposed Expansion Site Plan

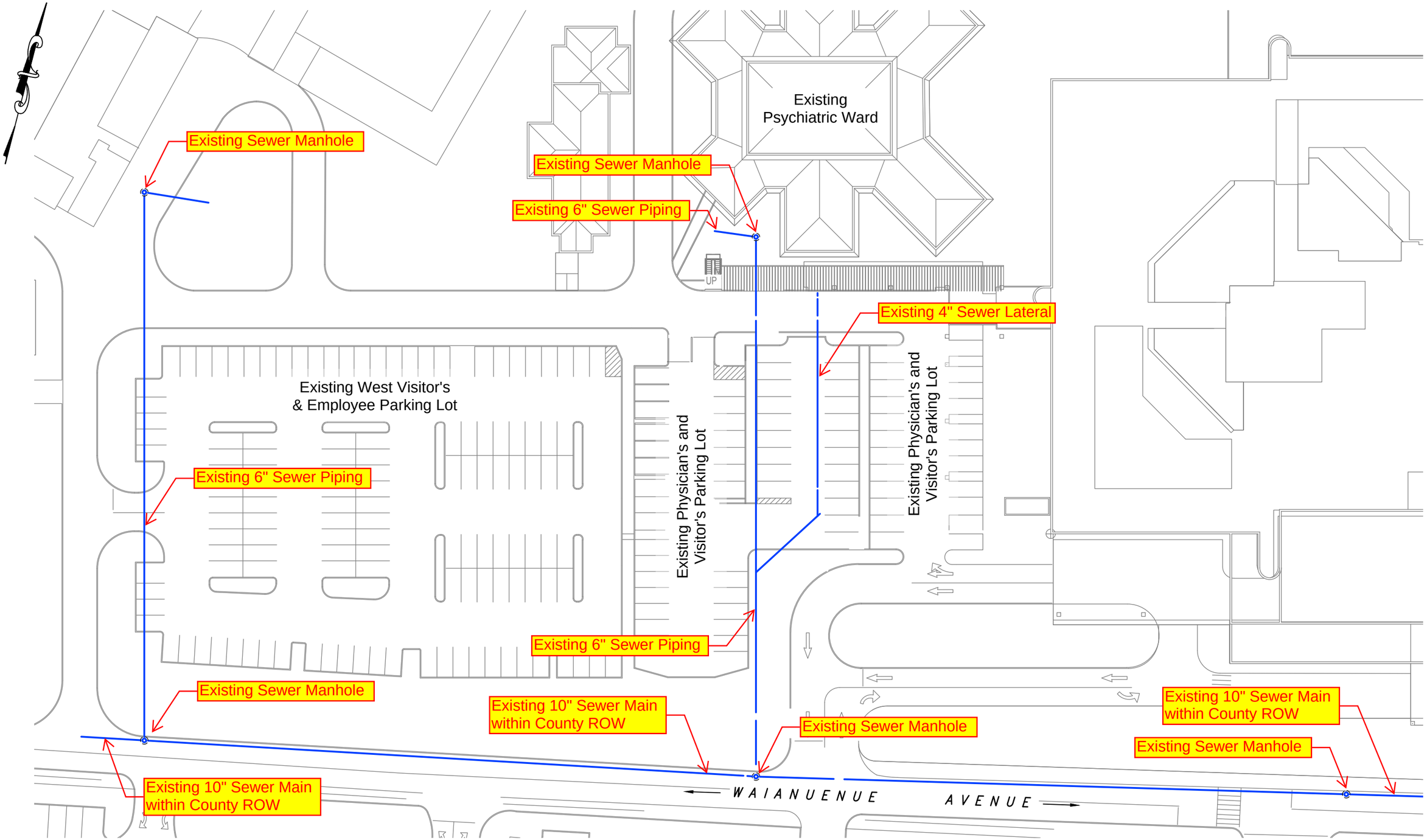
HILO MEDICAL CENTER HOSPITAL EXPANSION
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure 3 - Expansion Exterior Elevations



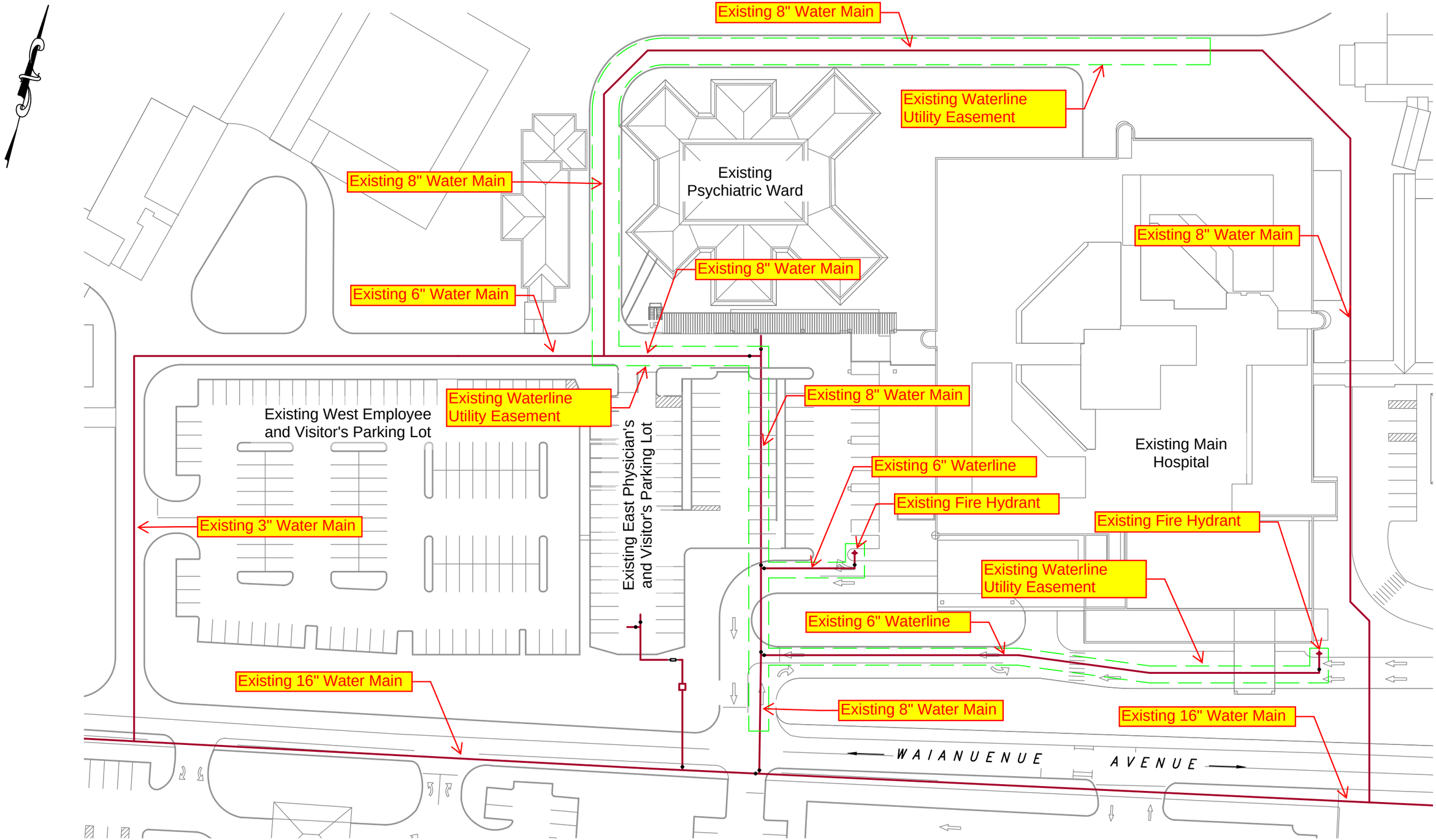
HILO MEDICAL CENTER HOSPITAL EXPANSION - PHASE 1
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure 4 - Existing Drainage Infrastructure



HILO MEDICAL CENTER HOSPITAL EXPANSION - PHASE 1
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure 5 - Existing Sewer Infrastructure



HILO MEDICAL CENTER HOSPITAL EXPANSION - PHASE 1
1190 Waianuenue Avenue, Hilo, Hawai`i 96720
TMK: (3) 2-3-027:002

Figure 6 - Existing Water Supply Infrastructure

LITERATURE REVIEW AND FIELD INSPECTION REPORT

APPENDIX

C

Final
Archaeological Literature Review and Field Inspection for the Hilo Medical Center Hospital Expansion Project, Pi‘ihonua Ahupua‘a, South Hilo District, Hawai‘i Island TMK: [3] 2-3-027:002 por.

Prepared for
Munekiyo Hiraga
on behalf of the
Hawaii Health Systems Corporation

Prepared by
Olivier M. Bautista, B.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: PIIHONUA 4)

August 2021

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Reference	Archaeological Literature Review and Field Inspection for the Hilo Medical Center Hospital Expansion Project, Pi‘ihonua Ahupua‘a, South Hilo District, Hawai‘i Island, TMK: [3] 2-3-027:002 por. (Bautista and Hammatt 2021)
Date	August 2021
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: PIIHONUA 4
Investigation Permit Number	CSH completed the field inspection under archaeological fieldwork permit number 21-10, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) §13-13-282.
Agencies	SHPD
Project Proponent and Land Jurisdiction	State of Hawai‘i: Hawaii Health Systems Corporation (HHSC)
Project Funding	State of Hawai‘i
Planning Consultant for the Project	Bryan Esmeralda Senior Associate Munekiyo Hiraga 305 High Street, Suite 104 Wailuku, HI 96793 Office: (808) 244-2015 Fax: (808) 244-8729 Email: bryan@munekiyohiraga.com
Project Location	The Hilo Medical Center Hospital (HMC) expansion project area is located at 1190 Waiānuenue Avenue in the town of Hilo on Hawai‘i Island. The expansion project area is situated within a portion of TMK: [3] 2-3-027:002. The project area is entirely within the existing HMC physician and visitor parking areas located just upslope of the hospital facilities. The project area is depicted on portions of the 1995 Hilo U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle on Hawai‘i Island (Figure 1), a tax map plat (Figure 2), and a 2016 aerial photograph (Figure 3).
Project Description and Related Disturbance	Plans are to construct two new expansions to the HMC. The HMC Expansion Phase 1 project is to add approximately 18,900 square feet (sq ft) to the existing 249,886-sq-ft facility, which will be situated above the current location of the physician and visitor parking (Figure 4). The addition will be a separate structure spread over one floor and connected to the existing building via pedestrian bridges/walkways and will require the redesigning of the existing ground floor physician and visitor parking. The expansion space is programmed for an 18-bed Intensive Care Unit with two enclosed stair shafts as means of egress and life safety requirements. Rooftop and ground floor mechanical and

	electrical spaces to include air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components. The HMC Expansion Phase 2 project is to add approximately 43,000 sq ft connecting to Phase 1 with two pedestrian bridges/walkways (see Figure 4). The Phase 2 addition, which will be situated above the existing visitor parking, will be a three-story building with one floor dedicated to a Family Birthing Center and the other for additional future programs to provide HMC flexibility in constructing either a two-story or three-story building. The 12-bed Family Birthing Center will be located on the second floor of the Phase 2 addition and is comprised of nine labor, delivery, recovery and postpartum (LDRP) rooms as well as three patient rooms that can be used for either post-partum or ante-partum patients. There will also be an operating room for cesarean delivery which is designed for the performance of surgical deliveries and infant resuscitation/stabilization. Similar to Phase 1, the rooftop and ground floor mechanical and electrical spaces will include air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components. The Phase 2 addition will be self-supporting from a mechanical and electrical services standpoint in that the existing central plant will remain unencumbered by the addition (see Figure 3). Generally, project-related ground disturbance would include the demolition of the existing parking lot surfaces for excavation associated with structural footings and utilities. Excavation to a depth of up to 7 ft is indicated.
Project Area Geographic Extent	The project area comprises a 1.1-acre (0.4451-hectare) portion of the overall 20.5-acre (8.296-hectare) parcel, TMK: [3] 2-3-027:002.
Historic Preservation Regulatory Context	As a state (HHSC) project on state (HHSC) lands, this project is subject to Hawai‘i State historic preservation review legislation under Hawai‘i Revised Statutes [HRS] §6E-8 and HAR §13-275.
Document Purpose	This investigation was conducted—through historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that archaeological historic properties may be affected by the project. This document is intended to facilitate the project’s planning and support the project’s historic preservation review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey (AIS) investigation, per HAR §13-276. This information may also be used to support consultation with the SHPD regarding the project’s necessary historic preservation review steps pursuant to HAR §13-275.

Natural Environnent	The project area is situated in the *ahupua‘a* (traditional land division) of Pi‘ihonua, which is an integral part of the Hilo Watershed. Streams, waterfalls, ponds, and other water features are abundant in this area, supporting lush and varied forest ecosystems where development has not occurred. The Hilo Forest Reserve borders Pi‘ihonua Ahupua‘a to the south, and comprises its westernmost reaches. The project area within the HMC complex is situated at approximately 146 m (480 ft) above mean sea level (amsl) and approximately 3 km inland of Hilo Bay. The Wailuku River gulch bounds the HMC property to the north. The HMC property is fully developed and as such the natural terrain has been impacted. The general topography of the area is moderately sloped toward Hilo Bay to the east. Vegetation within the HMC property is dominated by maintained lawns and ornamental trees and shrubs. According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Sato et al. (1973), the project area is underlain by Hilo silty clay loam, 0 to 10% slopes (HoC) (Figure 5). Hilo series soils are described as > […] well-drained silty clay loams. These soils formed in a series of volcanic ash that gives them a banded appearance […] The natural vegetation consists of hilograss, Californiagrass, guava, ohia, and tree fern […] Hilo soils are used for sugarcane, truck crops, orchards, and pasture. [Sato et al. 1973:17]
Background 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 Hawaiian Mission Children’s Society Library and Archives, 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 database (Waihona ‘Aina 2021). This research provided the environmental, cultural, historic, and archaeological background for the project area.
Background Research Summary	<u>Traditional Background</u> The project is situated in the *ahupua‘a* of Pi‘ihonua. This place name is translated as “land incline” (Pukui et al. 1976:184) or “ascending earth” (Maly 1996:A-4). According to cultural researcher Kepā Maly (in Walker and Rosendahl 1996:A-4), the land division is named for *ali‘i* (chief) Pi‘ihonua-a-ka-Lani. The Wailuku River (literally, “water of

	destruction”; Pukui et al. 1976:225) is the basis of the most well-known *mo‘olelo* (story) associated with Pi‘ihonua Auhpua‘a, including the tale of the battle of Maui (son of the goddess Hina) and the *mo‘o* (lizard) Kuna (Curtis 1985:37–40), and that of Hi‘iakaikapoliopele and the Wailuku Bridge (Pukui and Curtis 1996:39–40). Pi‘ihonua was also home to the demigod Kana, another son of Hina (Beckwith 1976:464). The project area is within McEldowney’s (1979:64) pre-Contact and early post-Contact upland agricultural zone, characterized by scattered agricultural features and some temporary residences. The main cultivated plants in the upland agricultural zone were dry land taro and bananas, with groves of *kukui*, pandanus, and mountain apples. Handy and Handy (1972:538–539) note taro cuttings “were stuck into the ground on the shores and islets for many miles along the course of the Wailuku River far up into the forest zone.” Settlement was primarily focused at the coast around Hilo Bay. The districts of Hilo and Hāmākua were once ruled by the descendants of paramount chief ‘Umi, who ruled from about A.D. 1600–1620 (Cordy 2000:464). Later, once Kamehameha I had consolidated his rule over Hawai‘i Island, he planned to invade the neighboring islands. Kelly et al. (1981:8) note “[…] An important part of his preparation was the building of war canoes, and for this Hilo seems to have become his headquarters for considerable periods of time.” When Captain George Vancouver, in his ships the *Discovery* and the *Chatham*, visited Hawai‘i in 1793, they first met up with Kamehameha at Hilo Bay, as he was at that time residing at Waiākea to preside over the Makahiki festival (Menzies 1920:140–141). In 1795, Kamehameha sailed from Hawai‘i to O‘ahu for further conquests. According to John Papa ‘Ī‘ī (1959:15), Kamehameha had to quickly return to the island of Hawai‘i to quell a rebellion. Namakehā, a Maui Chief living in Ka‘ū, fomented a rebellion amongst the people of Ka‘ū, Puna, and Hilo. In 1796 Kamehameha returned to Hawai‘i and defeated Namakehā in a battle at Kaipalaoa, (‘Ī‘ī 1959:15–16). Kaipalaoa, which literally means “whale sea” (Pukui et al. 1976:70), was an ancient surfing area in Pi‘ihonua at what is now the base of Waiānuenue Avenue. Namakehā’s body was sacrificed by Kamehameha on the *heiau* (pre-Christian place of worship) of Kaipalaoa (Kamakau 1992:174). It has been theorized this *heiau* is the same as that called “Pinao” (Desha 2000:450). After Kamehameha’s death, the Hilo *ahupua‘a* of Pi‘ihonua, Punahoa, and Waiākea, were given to his son Liholiho (Kamehameha II), heir to the kingdom. When Liholiho was born in 1797, “he was taken to the heiau of Kapailaoa, and the sacred rite of the cutting of his navel cord was performed by the kahuna” (Kamakau 1961:220). <u>Early Historic Period</u>

The early historic period in Hilo was characterized by the establishment of foreign missionaries in the town under the protection of the government (Kelly et al. 1981:29), and development of the port and associated commerce at Hilo Bay. While foreign ships presumably exported sandalwood from Hilo Bay in the early 1800s (Kelly et al. 1981:25), the earliest foreign-born merchants in Hilo town catered to the victualing of whaling ships beginning in the mid-1820s (Kelly et al. 1981:35). One of the more notable foreign merchants in Hilo was the Bostonian Benjamin Pitman; his son joined him in the business and married the chiefess Kino‘ole-o-Liliha, daughter of high chief Ho‘olulu, an uncle of Kamehameha I (Lyman 1906:68–69; Pitman 1931). The first sugar mill on the island of Hawai‘i was established by several Chinese entrepreneurs on Pitman lands in Hilo (Lyman 1906:70–71).

In 1825 the HMS *Blonde* arrived in Hawai‘i to return the bodies of Liholiho and Kamāmalu following their death in London from measles.

> The [ship’s] officers described the Wailuku river as being a convenient watering place for ships replenishing at Hilo Bay[…], and mentioned the waterfalls in the river and the water sports enjoyed there. [Kelly et al. 1981:33]

The Wailuku River and its notable falls would be remarked on nearly 40 years later by Isabella Bird, and continue to be a prominent tourist attraction today. Bird penned the following description of her journey in 1873 via horseback from Hilo town to Ānuenue Falls (also known as Rainbow Falls) on the Wailuku River; these famous falls are situated approximately 400 m northeast of the project area:

> The track is only a scramble among rocks and holes, concealed by grass and ferns, and we had to cross a stream, full of great holes, several times. The Fall itself is very pretty, 110 feet in one descent, with a cavernous shrine behind the water, filled with ferns. There were large ferns all around the Fall, and a jungle of luxuriant tropical shrubs of many kinds.
>
> […] Near the Anuenue Fall we stopped at a native house, outside which a woman, in a rose colored chemise, was stringing roses for a necklace, while her husband pounded the kalo root on a board. His only clothing was a malo. A narrow strip of cloth wound around the lions, and passed between the legs. [Bird 2007:42-43]

<u>The Māhele of 1848</u>

The Organic Acts of 1845 and 1846 initiated the process of the Māhele (the division of Hawaiian lands), which introduced private property into

	Hawaiian society. In 1848, the crown (Hawaiian government) and the *ali‘i* (royalty) received their land titles. Subsequently in the Māhele, Land Commission Awards (LCAs) for *kuleana* parcels were awarded to commoners and others who could prove residency on and use of the parcels they claimed. Pi‘ihonua had been passed among *ali‘i* from the time of Kamehameha I; during the Māhele Kalaeokekoi returned it in commutation for lands elsewhere and it was retained as Crown Land (Soehren 2019). No *kuleana* claims or awards have been identified in proximity to the project area, within Pi‘ihonua. *Kuleana* awards tend to be clustered in areas of permanent settlement, which at this time continued to be closer to the bay. <u>Mid- to Late 1800s</u> Coffee was grown in Hilo during the latter half of the nineteenth century, but ultimately could not compete with the Kona plantations (Cordy 1977:4) and the prevalence of commercial sugar cultivation increased. By the 1830s sugar was being grown on small plantations throughout Hilo, including a plantation in Pi‘ihonua operated in 1843 by Aina (Dorrance and Morgan 2000:13). Shifting export markets prevented the widescale development of commercial sugar until the 1876 Reciprocity Treaty allowed for duty-free importation of sugar into the United States (Dorrance and Morgan 2000:21). In 1880 Claus Spreckels, known as the “Sugar King,” entered into a partnership with William Irwin to form the Hilo Sugar Company. In addition to planting newly purchased parcels with cane they also absorbed other existing plantations, reaching a maximum of 4,800 acres; some of the land was leased to individual sugarcane growers living in the Hilo area (Dorrance and Morgan 2000:102–103). The Waiakea Sugar Company and Hawaii Mill Company are also known to have had plantations in upland Hilo. According to Kelly et al. (1981:127), “The [Hawaii Mill Company] land was generally of poor quality and located mostly in Pi‘ihonua, along the Wailuku River. Debts drove it out of business by 1920, when Hilo Sugar took it over.” The extensive sugarcane production in the Hilo area meant an influx of workers, and camps sprang up along plantation roads. Some of these camps were essentially small villages, complete with schools and shops of their own. The first public hospital in Hilo was constructed in the 1890s at the site of the current Hilo District Annex Offices below Hilo High School, approximately 2 km northeast of the project area. <u>1900s</u> Sugar continued to serve as a major economic driver in Hilo throughout the first half of the twentieth century. In 1903 the Hilo Railroad Company constructed a spur accessing the Hawaii Mill Company plantation in Pi‘ihonua (Kelly et al. 1981:287). A 1914 USGS map (Figure 6) indicates the project area lands remained undeveloped;

	Waiānuenue Avenue is shown along with a few unnamed trails to the south and scatters of structures to the southeast. A 1922 map (Figure 7) indicates the majority of development clustered within “Hilo City” adjacent to the bay, though a “Piihonua Village” survey station reflects the presence of upland sugarcane settlement. Figure 7 identifies the Hilo Sugar Company’s Wainaku Mill on the coast east of the project area, along with other plantation villages, roadways and trails, major cane flumes, and routes of the plantation railroad in Hilo. A 1928 map (Figure 8) also depicts the various sugar mills and camps situated throughout the greater Hilo area in relation to the project area (situated along an unmarked route correlating to Waiānuenue Avenue) and other points of interest. In the early 1900s the government began to sell plots of land to private owners (Hawaiian Legislature 1917:384). In Pi‘ihonua, three series of “Piihonua House Lots” were developed along Waiānuenue Avenue; a 1924 map (Figure 9) depicts the project area situated between the second and third series of Pi‘ihonua House Lots. During this time frame Hilo’s hospital, called Hilo Memorial, was moved to a new facility situated just below Rainbow Falls (see Figure 9), “constructed in the Italian Renaissance palace architectural style” (McNarie 2016). According to McNarie (2016), “The [Hilo Memorial] hospital continued to expand in the 1930s and 40s with the additions of a maternity ward, solarium, isolation ward, and ‘Ward B,’[…]” but then the buildings fell into decline. <u>Mid-1950s to Present</u> In 1951 the Pu‘umaile Tuberculosis Hospital was opened on the present HMC property, and only a few years later in 1955 “Pu‘umaile was combined with the Hilo Memorial Hospital to establish Hilo Hospital (now Hilo Medical Center)” (Young 2017) in a brand-new facility there. A portion of the 1963 USGS map (Figure 10) depicts the relatively new hospital facility and a residential area (Pi‘ihonua House Lots, Second Series) to the west as the only major developments in the project area vicinity. A 1977 orthophoto (Figure 11) indicates development of a few additional modest structures in the lands surrounding the hospital parcel. An earthquake in November 1983 damaged the hospital facility and as a result the present HMC facility was constructed immediately west on the same parcel in 1985. The facility has remained essentially unchanged since that time, and expansion is needed to provide increased capacity in the future (Salmons 2021). The areas surrounding the HMC property have undergone additional development for various medical, extended care, and community facilities (see Figure 3).

Prior Archaeological Studies Summary	Eight previous archaeological studies have been identified in the vicinity of HMC and the current project area. These studies are presented on Figure 12 and summarized in Table 1. Archaeological sites situated within 600 m of the current project area, documented by these prior investigations or in paperwork filed at the SHPD offices, are shown in Figure 13 and described in Table 2. Notably, the current project area is shown in relation to the site of the old Hilo Hospital (State Inventory of Historic Places [SIHP] # 50-10-35-07450) at TMK: [3] 2-3-26:008, adjacent to Rainbow Falls. In 1978, the Bernice Pauahi Bishop Museum conducted an archaeological reconnaissance survey of 117 acres for a proposed Kaumana Springs Wilderness Park located between Waiānuenue and Ainako avenues, approximately 300 m south of the current project area (Sinoto 1978; see Figure 12). Six major clusters of features were documented within the interior portion of the study area that had not been previously impacted by historic agricultural activity. These features included stone terraces, mounds, platforms, alignments, stone reinforced stream banks, walls, *‘auwai* (irrigation ditches), *ahu* (cairns), and enclosures presumably associated with pre-Contact agriculture and historic ranching. No portable artifacts were encountered. Sinoto (1978) comments on the distribution of the feature clusters: > Although the clusters of sites appear as discrete, spatially isolated units, the sited areas are probably continuous and could be considered as components of a single extensive complex. The apparent discontinuity of sites as described in this report is primarily the result of the physical limitations imposed on the survey by dense vegetation cover. The false staghorn fern (Dicranopteris linearis) and wilelaiki (Schinus terebinthifolius Raddi), in particular, were often impenetrable and prevented continuous transects. Thus, more sites may be present within those areas that are densely vegetated […] Also, since the past alteration of land is clearly evident in the peripheral areas, additional, associated sites may already have been destroyed. [Sinoto 1978:3] Rechtman and Clark (2005:9) note the complex of feature clusters was later assigned as SIHP # 50-10-34-18696 (not shown on Figure 13). While the 1978 report assessed a low potential for further research, it recommended incorporation of the documented sites into the park for “public interpretation” (Sinoto 1978:4). In 1992 Archaeological Consultants of Hawaii, Inc. conducted an AIS of 482.04 acres located on the opposite (northern) side of Wailuku Stream from the current project area (Kennedy 1992; see Figure 12).

	The majority of the study area was found to be covered in sugarcane; signs of other prior disturbance associated with the Clem Akina Park and Amauulu Camp, a Japanese plantation camp, were also noted. Some other plantation-related infrastructure, such as wooden cane flume remnants, was observed but not recorded. A stone mound located near the northern bank of the Wailuku was assessed as a possible early historic burial and assigned as SIHP # 50-10-35-18074 (see Figure 13 and Table 2). Because the site was within a conservation zone unlikely to be impacted by development, it was not tested for function to avoid unnecessary disturbance. Also in 1992, Scientific Consulting Services (SCS) conducted an AIS of a 12-acre parcel situated approximately 500 m southeast of the current project area (Spear 1992; see Figure 12). The AIS identified two historic-era stacked stone walls, which were assigned as SIHP #s 50-10-35-18443 and -18444 (see Figure 13 and Table 2). The report concluded the SIHP # -18443 wall was likely associated with cattle ranching, and SIHP # -18444, situated along a stream channel, was used for water control associated with sugarcane cultivation or cattle ranching. No further work was recommended. The following year SCS conducted an AIS of an approximately 9.5-acre area located across Waiānuenue Avenue from the current project area (Spear 1993a; see Figure 12). The survey found no evidence of significant archaeological features. Except for a narrow and shallow drainage feature, the ground surface was very flat, implying potential prior ground disturbance. Later in 1993, SCS carried out an AIS of approximately 5 acres located 450 m east of the current project area (Spear 1993b; see Figure 12). The survey identified two historic-era sites: SIHP #s 50-10-35-19036, a remnant Portuguese oven and associated historic artifacts; and -19037, a historic dump site (see Figure 13 and Table 2). Glass bottles found in association “with the oven suggest that it functioned around 1900” (Spear 1993b:15). The historic artifacts found within the dump site suggest deposition during the early 1900s, and any association with the oven is unclear. The sites were recommended for no further work. In 1996 Paul H. Rosendahl Ph.D., Inc. (PHRI) conducted an archaeological assessment of seven potential locations throughout Hilo for a proposed Judiciary Complex, organized as Sites A–G (Walker and Rosendahl 1996); of these seven sites, one (Site F, 42.3 acres) is in proximity to the current project area (see Figure 12). Based on past use of the 42.3-acre Site F for historic-era sugarcane cultivation, PHRI surveyed only 11% (approximately 4.6 acres) of the site, minimally overlapping with the Spear (1992) study area (see Figure 12). While a

	handful of historic properties were documented within other project sites, none were encountered in Site F. In 2004 Rechtman Consulting, LLC (RC) conducted an archaeological survey in support of a determination of project affect for a proposed expansion of the HMC facility located across Waiānuenue Avenue from the current project area (Rechtman 2004; see Figure 12). The study area overlapped a portion of the area previously surveyed by Walker and Rosendahl (1996). Signs of prior ground disturbance were observed throughout the study area, and no historic properties were encountered. Most recently, in 2005 RC conducted an archaeological survey in support of a determination of project affect for a proposed expansion to the Arc of Hilo facility located across Waiānuenue Avenue from the current project area (Clark and Rechtman 2005; see Figure 12). The property has been previously bulldozed and developed, and no historic properties were encountered.
Fieldwork Effort and Findings	The field inspection was completed on 3 June 2021 by CSH Project Director Olivier M. Bautista, B.A., under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. The field inspection required 1 person-day to complete and included 100% pedestrian sweeps of the project area. Photographs were taken of the project area and greater HMC property. The field inspection confirmed the ground surface throughout the project area has been completely altered by prior development of the existing HMC asphalt parking lot (Figure 14 through Figure 20). No archaeological features were observed on the ground surface within the project area. A building potentially associated with the former (pre-1985) HMC facility was observed north of the project area beyond the hospital helipad (Figure 21).
Potential for Project Effect on Historic Properties	Background research did not find evidence of any known historic properties within the project area. The closest known historic property is a historic-era Portuguese oven situated across Waiānuenue Avenue. The field inspection confirmed a lack of surface archaeological features within the project area and documented extensive prior ground disturbance associated with development of the modern HMC parking lot. Potential for intact subsurface pre-Contact or historic cultural deposits within the project area is considered very low based on these findings.
Recommendations	While extensive project-related ground disturbance is indicated, the potential for encountering subsurface archaeological remains is very low, based on the extensive prior ground disturbance. Further archaeological study is not recommended.

	Consultation with the SHPD should be sought out for concurrence with this recommendation; and to obtain any further determinations of historic preservation requirements for the project.

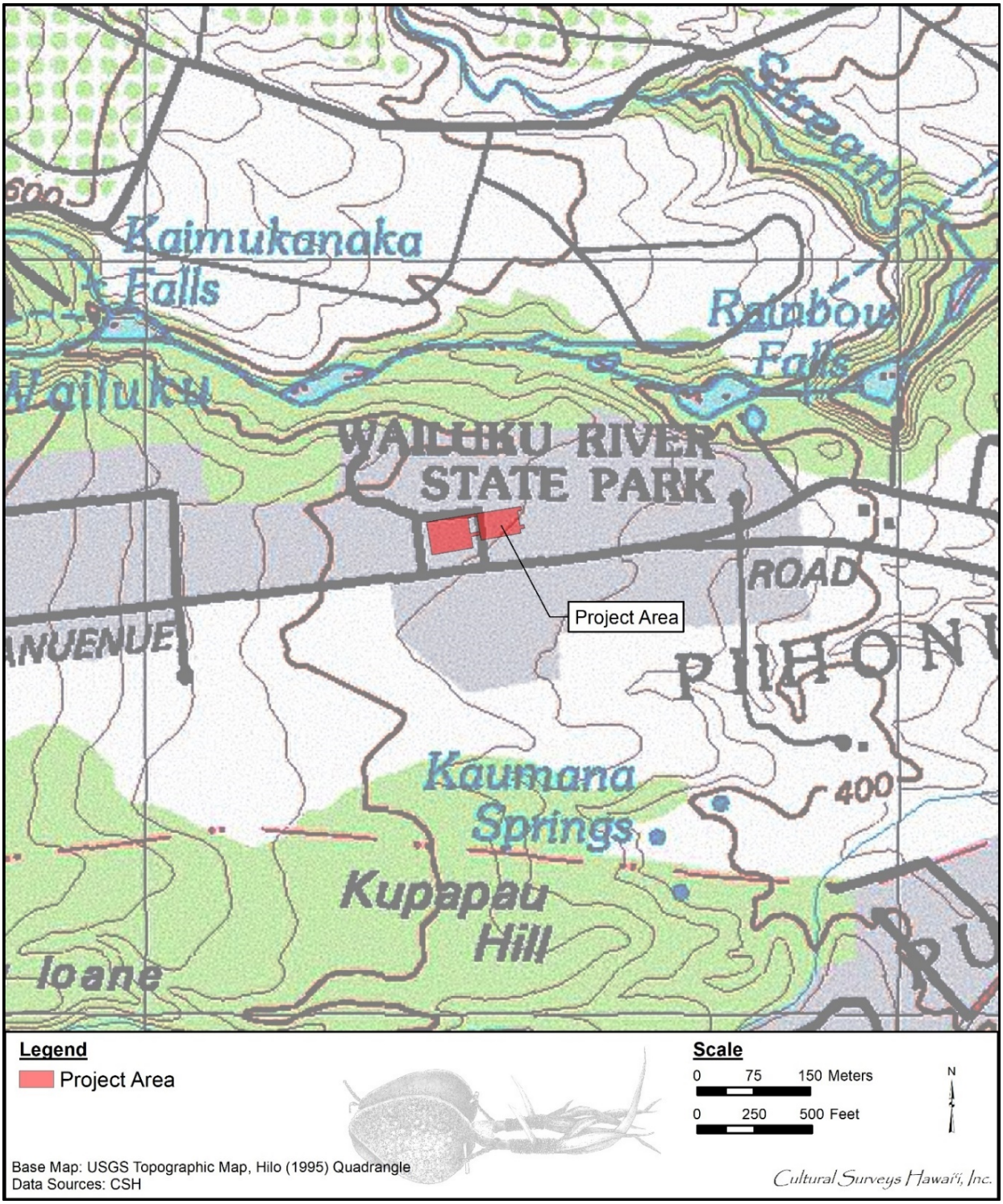

Figure 1. Portion of the 1995 Hilo USGS 7.5-minute topographic quadrangle showing the location of the project area

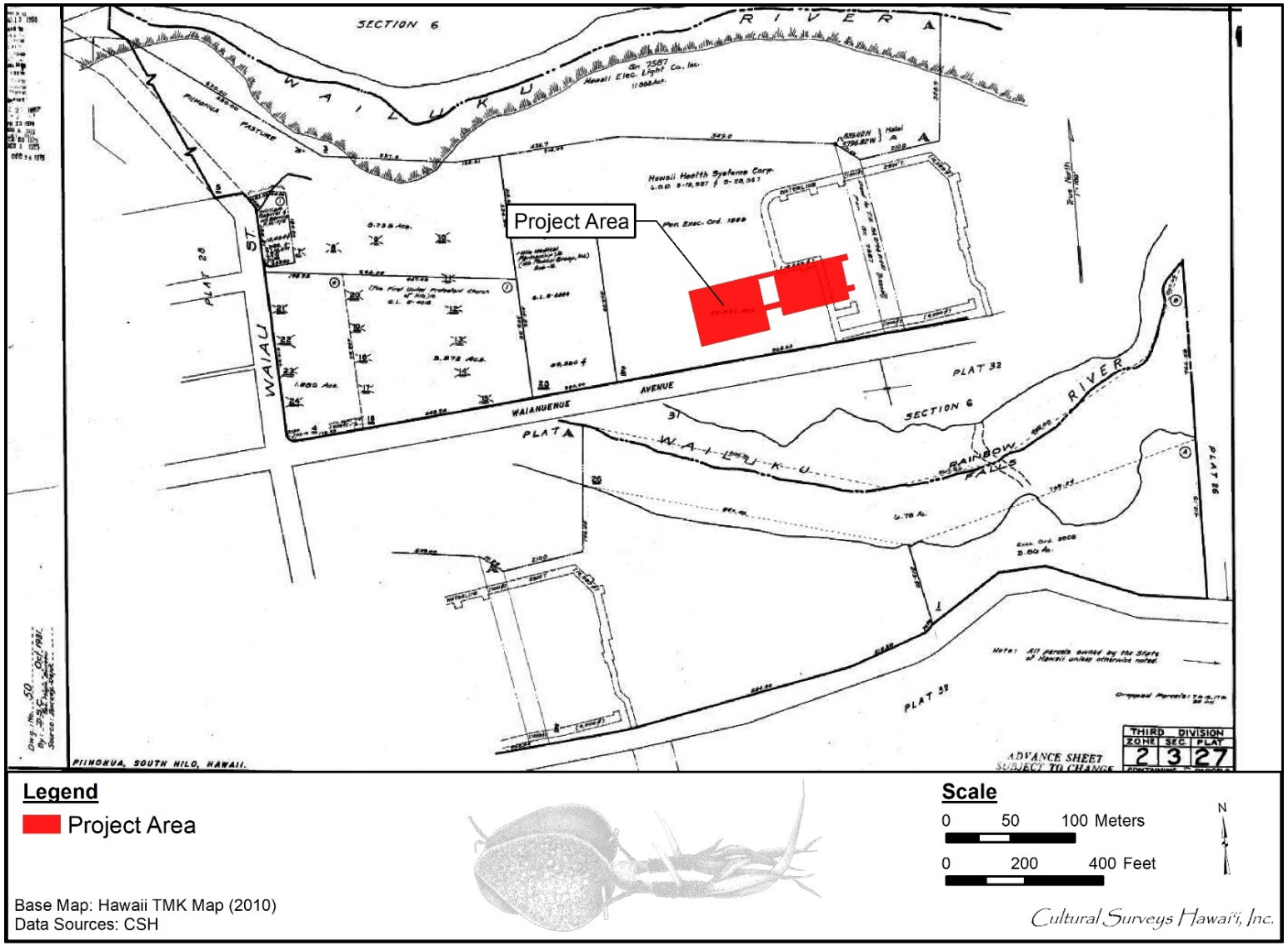

Figure 2. Tax Map Key (TMK) [3] 2-3-27 showing the project area within the Hilo Hospital (Hawai‘i TMK Service 2010)

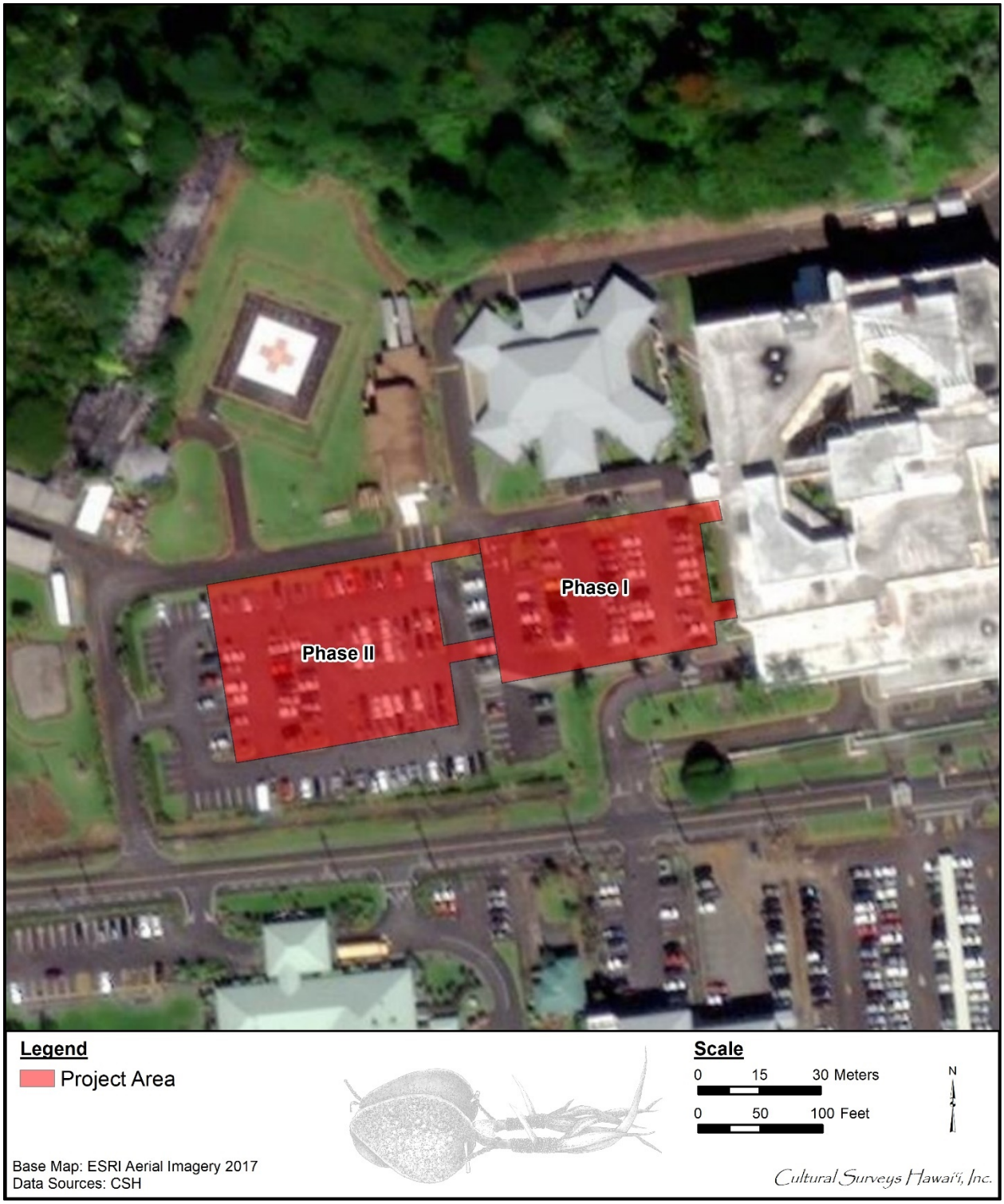

Figure 3. Aerial photograph (ESRI 2017) showing the Phase I and Phase II portions of the HMC expansion project area

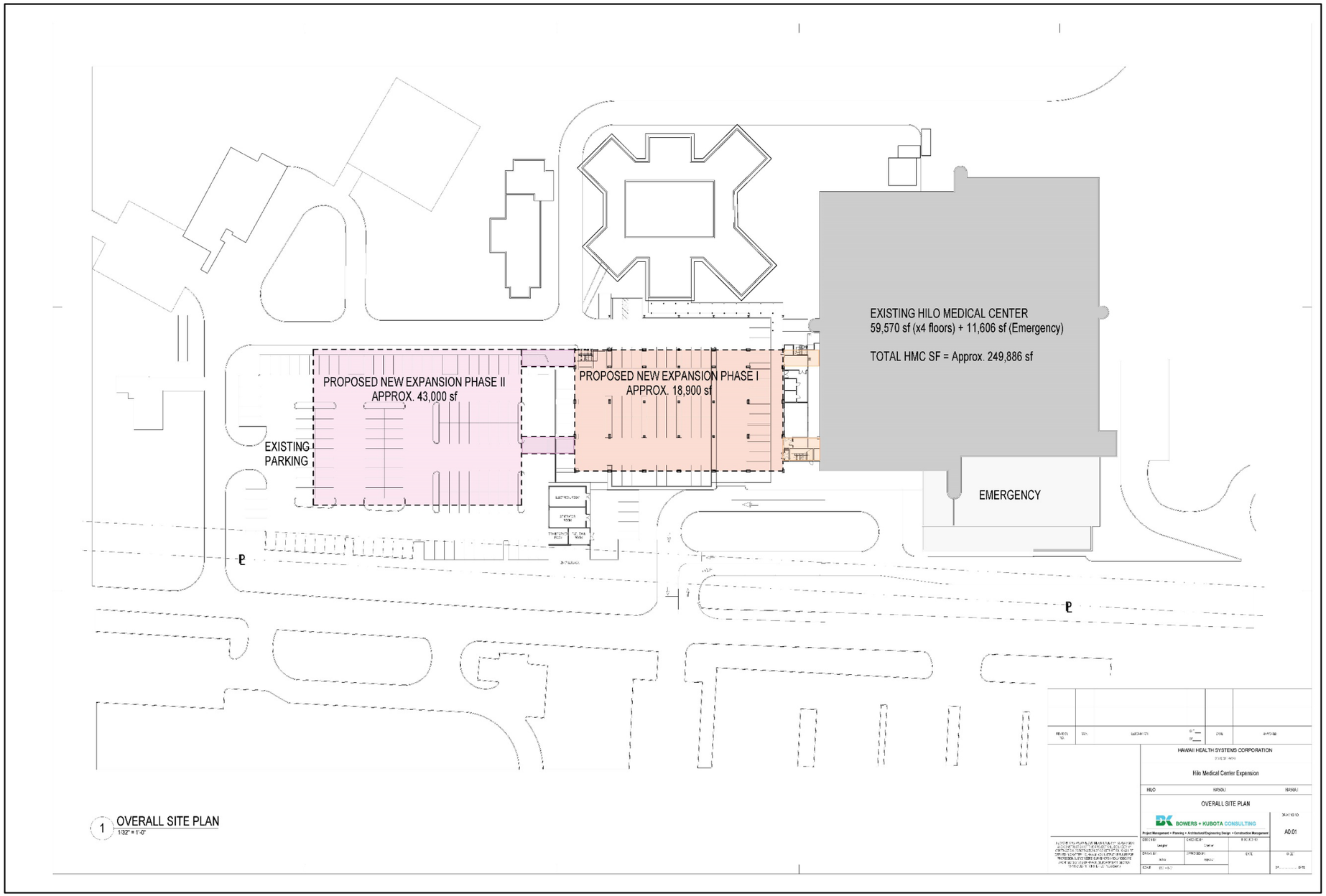

Figure 4. Overall project site plan (courtesy of client) showing Phase I and Phase II of the HMC expansion

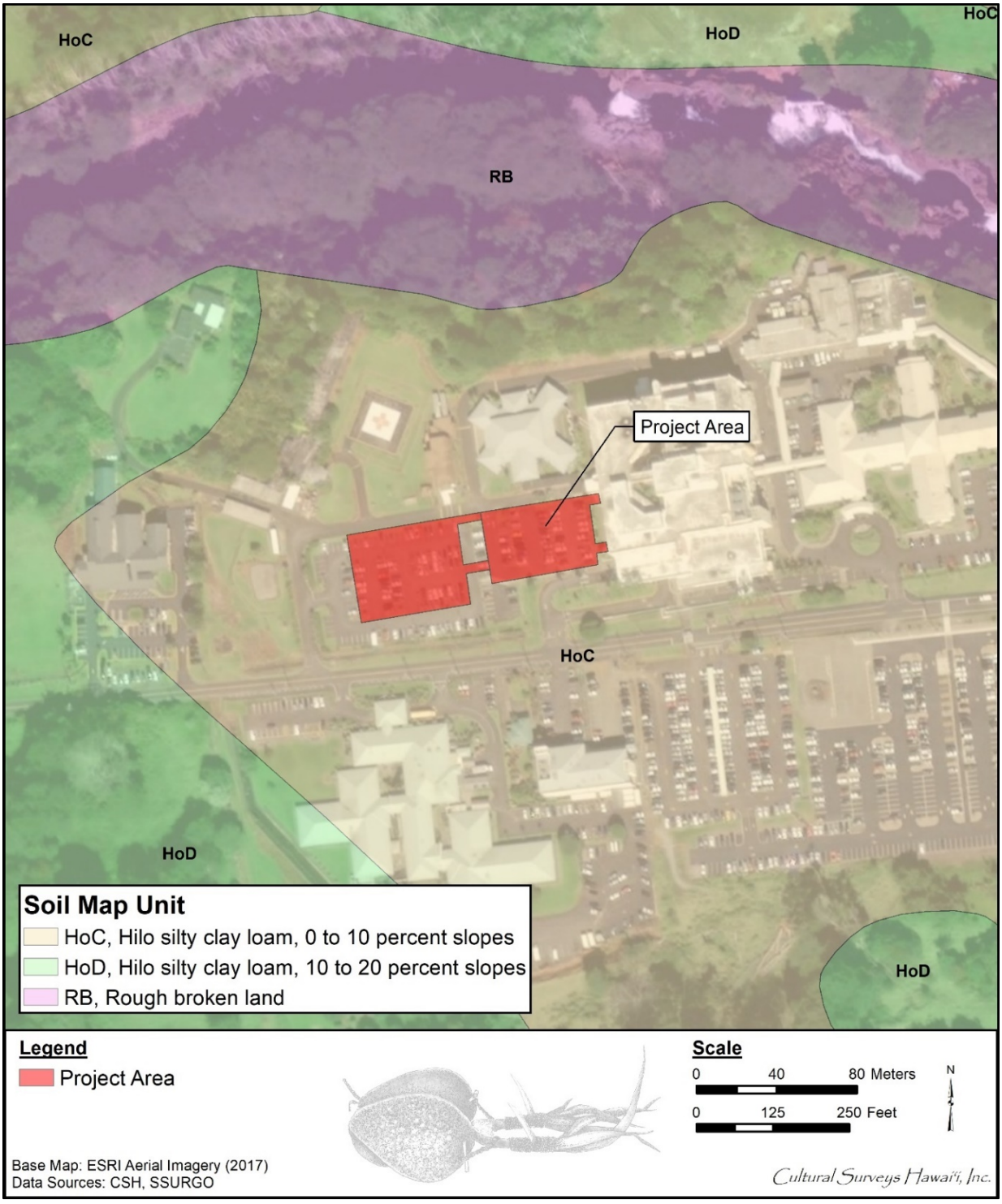

Figure 5. Overlay of *Soil Survey of the Island of Hawaii* (Sato et al. 1973), indicating soil and land types within project area and the surrounding hospital (USDA SSURGO 2001)

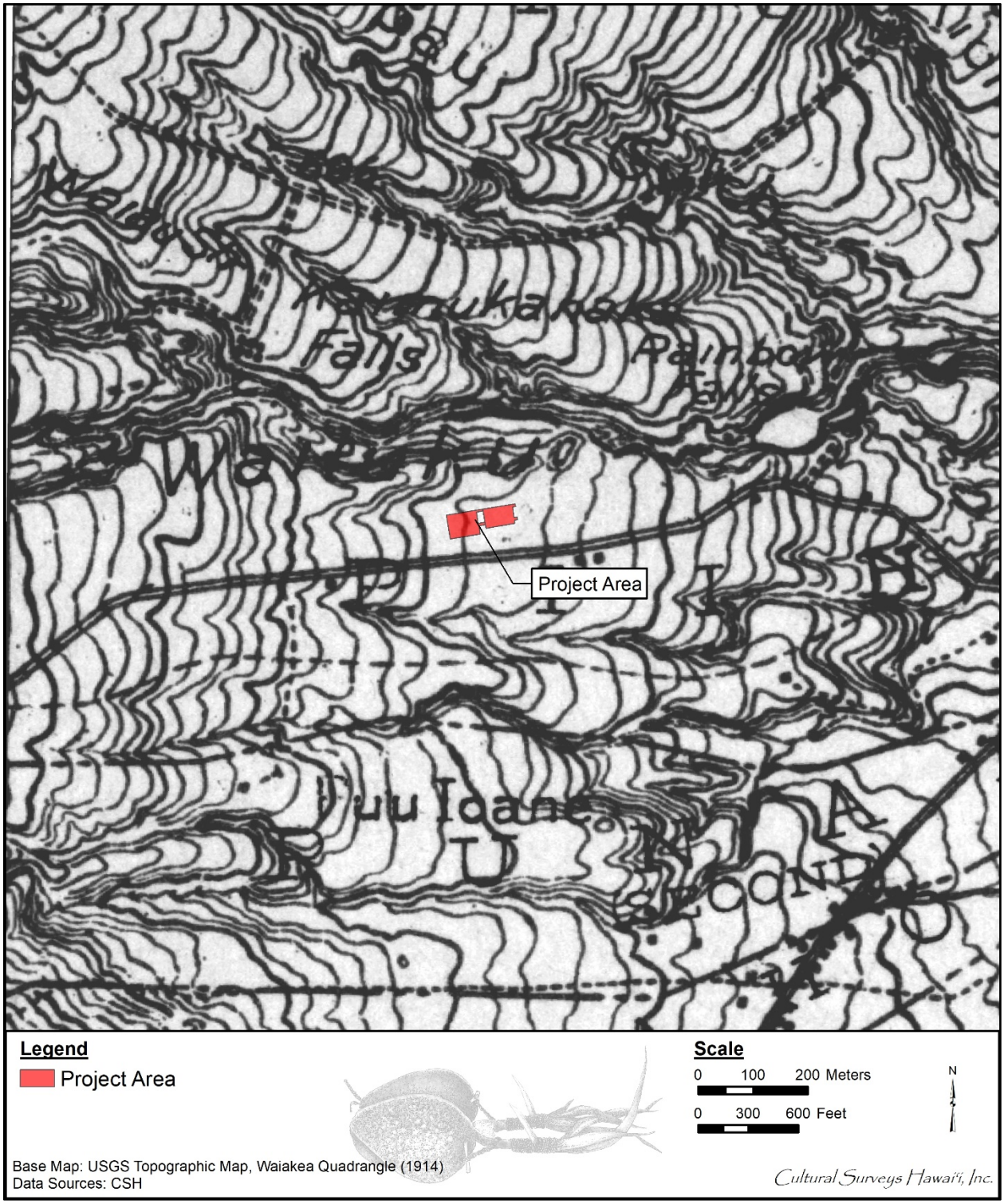

Figure 6. Portion of the 1914 Waiakea USGS 7.5-minute topographic quadrangle showing the project area along a route correlating to Waiānuenue Avenue and a general lack of development in the vicinity

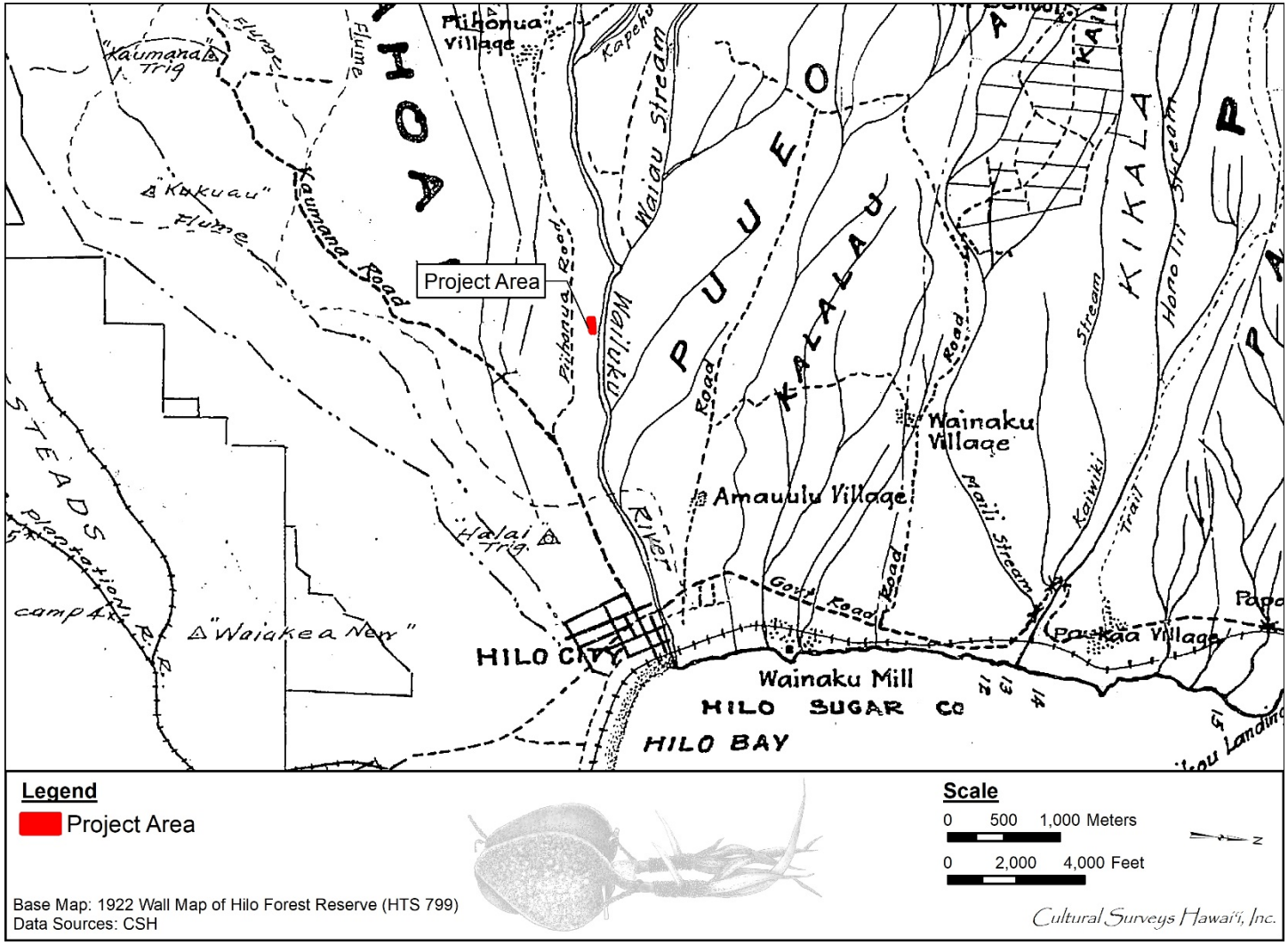

Figure 7. Portion of the 1922 Wall map of Hilo Forest Reserve (HTS Plat 799) showing the project area in relation to Hilo City, sugar plantation mills and villages, roads, trails, and the railroad

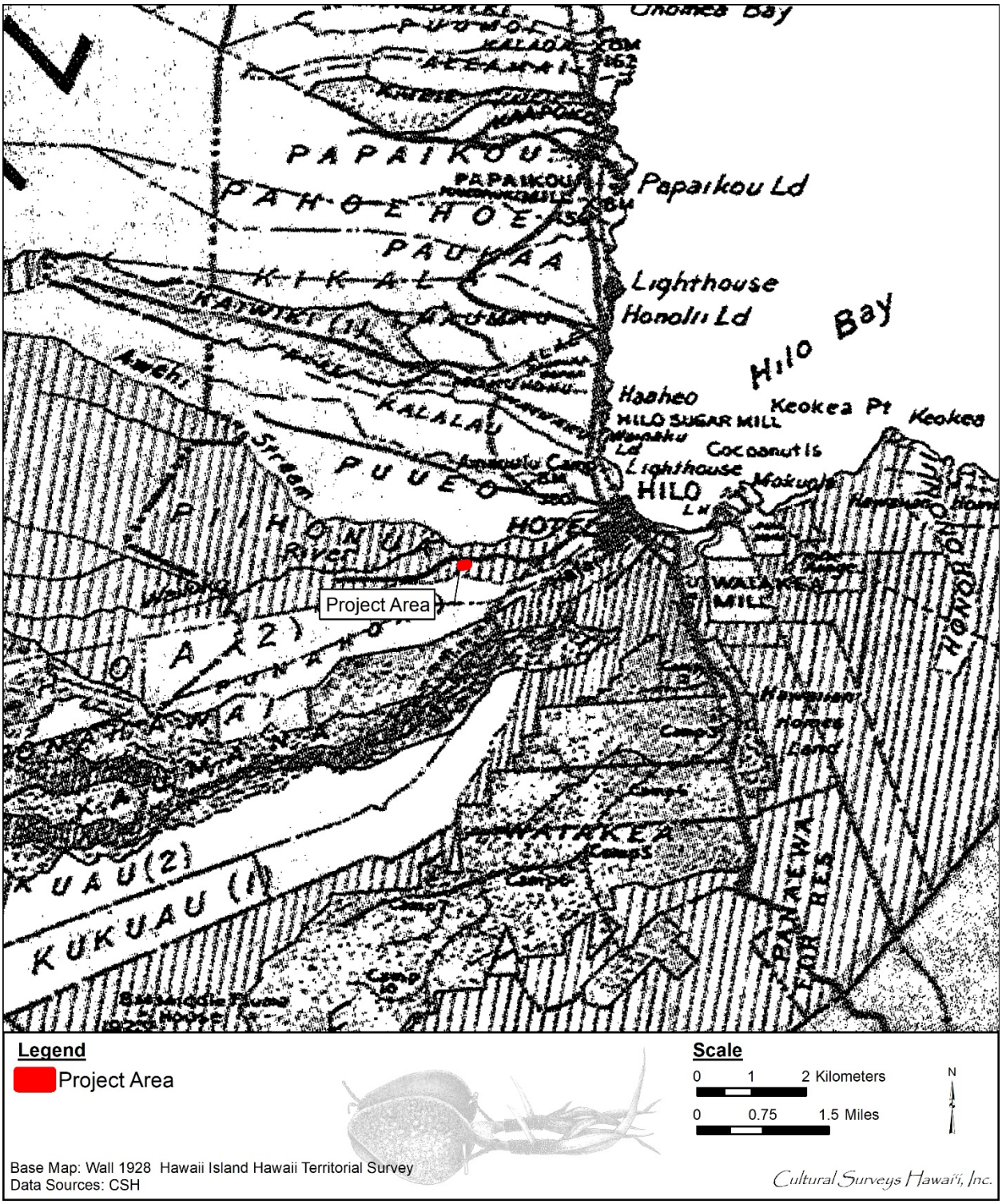

Figure 8. Portion of the 1928 Wall map of Hawaii Island showing the project area in relation to sugar mills and camps

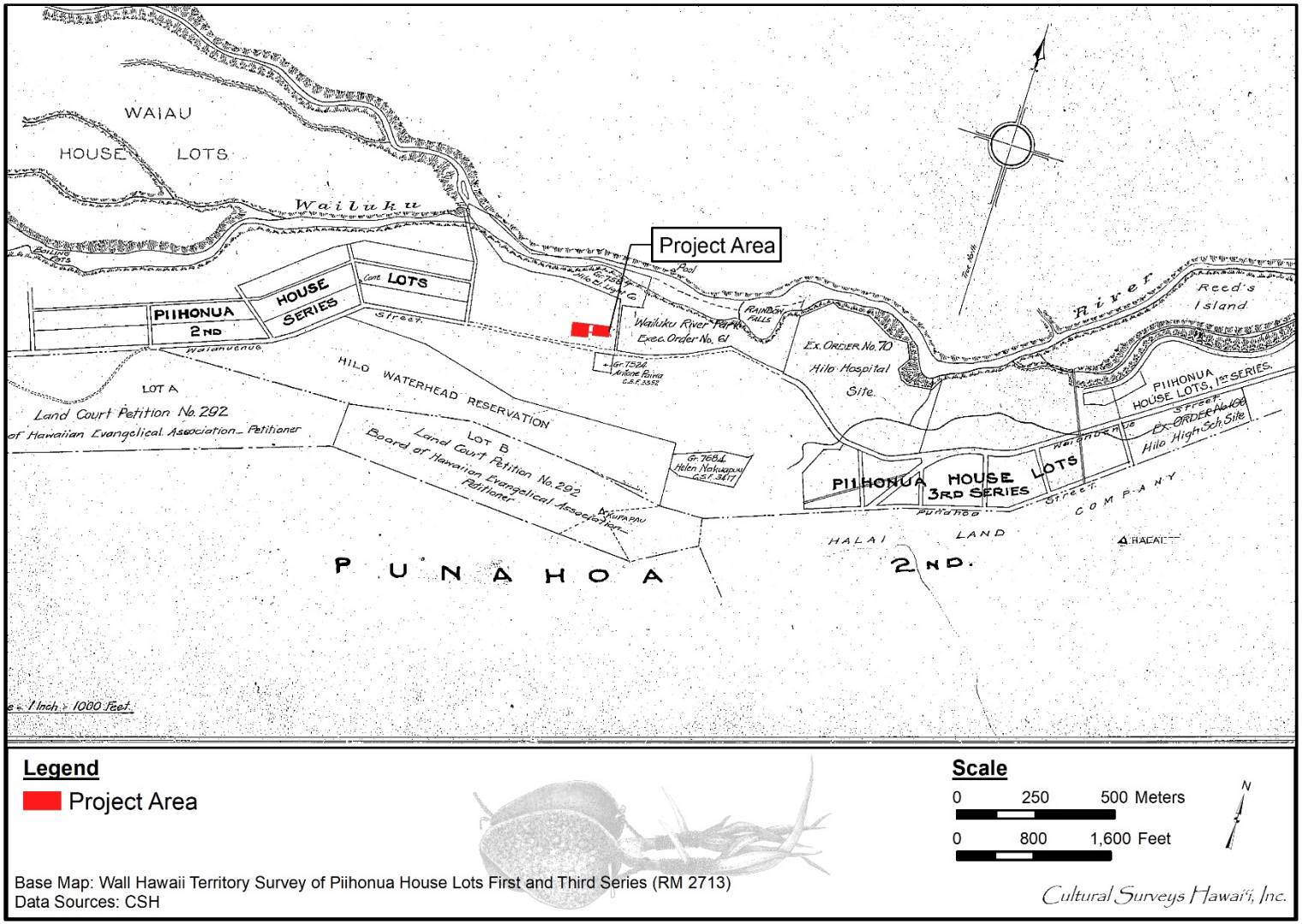

Figure 9. Portion of the 1924 Wall map of Piihonua House Lots showing the location of the project area; note the “Hilo Hospital Site” east of Rainbow Falls and the project area

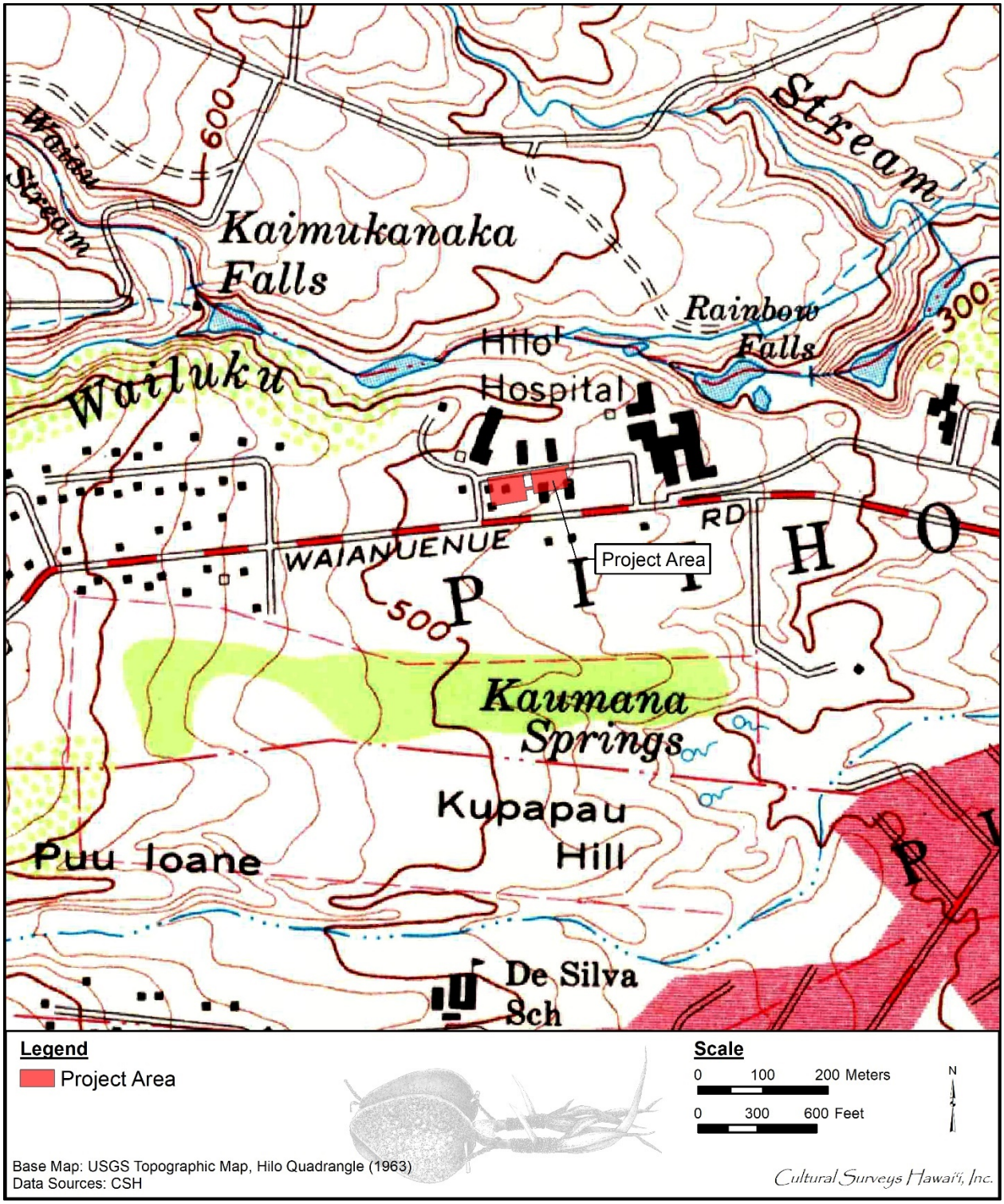

Figure 10. Portion of the 1963 Hilo USGS 7.5-minute topographic quadrangle showing the project area within the bounds of the relatively new Hilo Hospital facility, and a residential area to the west

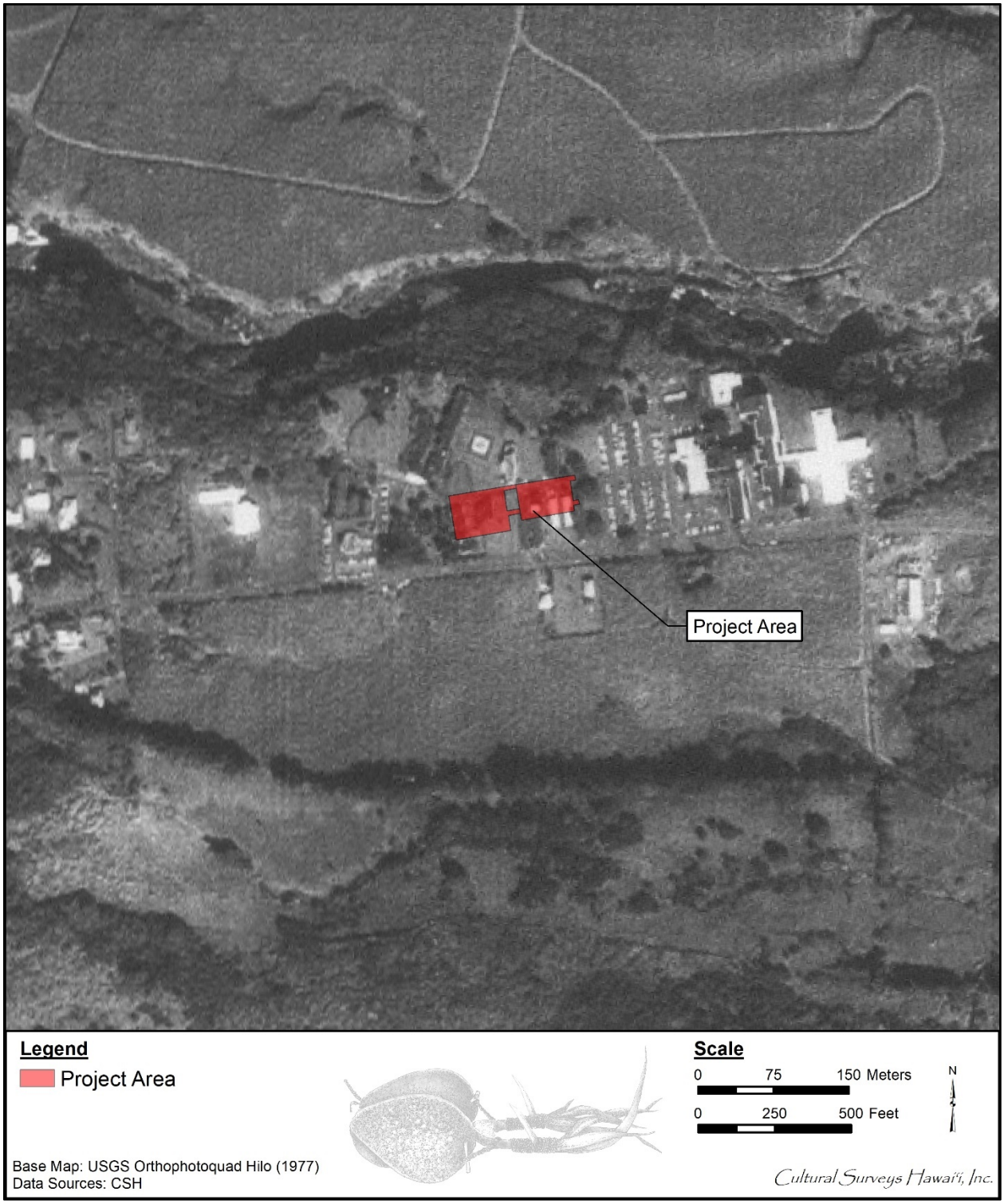

Figure 11. 1977 USGS Orthophoto showing developments in the vicinity of the project area

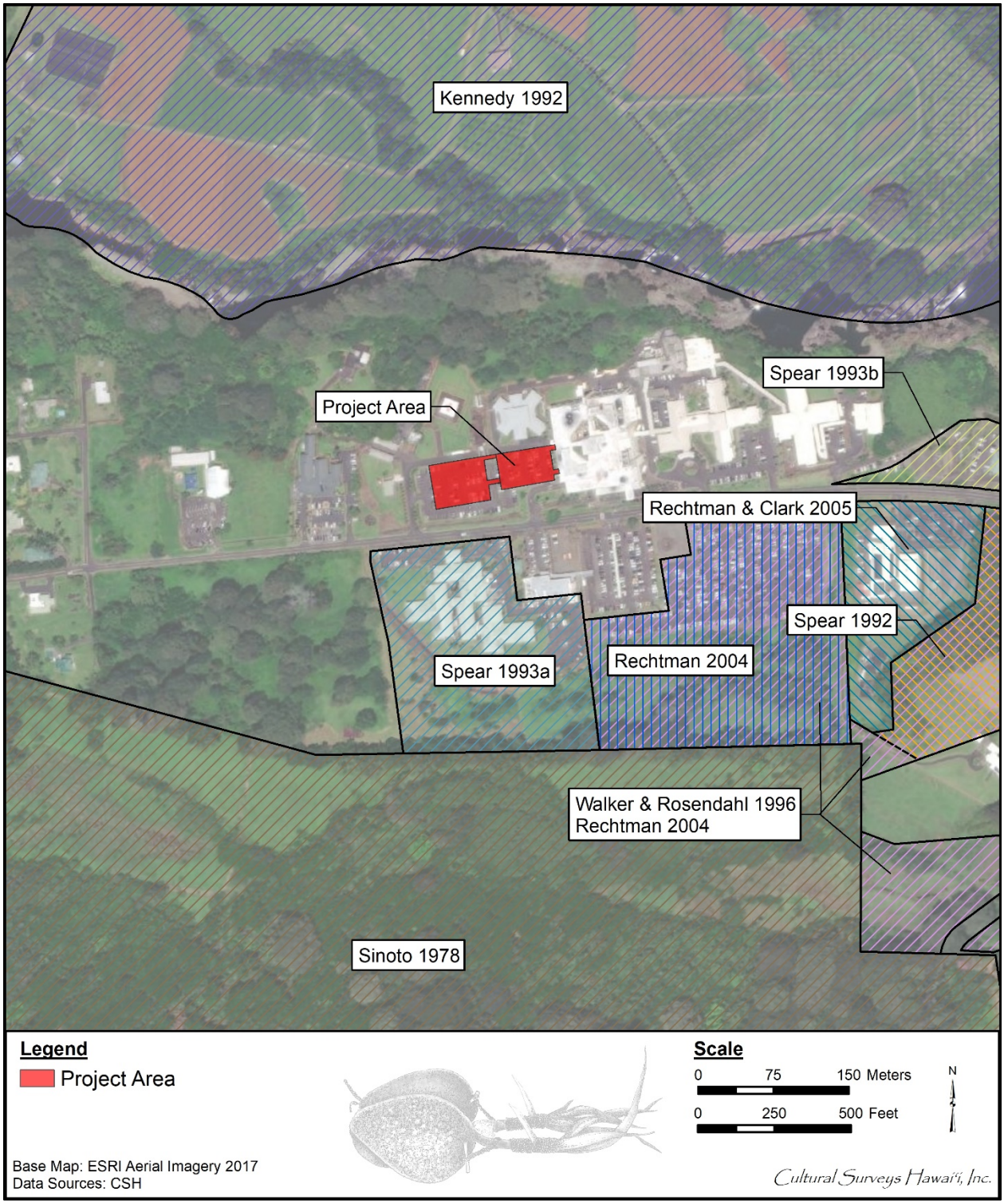

Figure 12. Aerial imagery (ESRI 2017) showing the location of previous archaeological studies in the vicinity of the HMC Expansion project area

Table 1. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results (site numbers prefixed SIHP # 50-10-35 unless otherwise noted)
Sinoto 1978	Archaeological reconnaissance survey	Approx. 117 acres in Kaumana area of Hilo	Documented six clusters of features (later assigned collectively as SIHP # 50-10-34-18696) including stone terraces, mounds, platforms, alignments, stone reinforced stream banks, walls, *‘auwai, ahu,* and enclosures; interpreted as a single site complex of pre-Contact agricultural and historic ranching features
Kennedy 1992	Archaeological inventory survey	482.4 acres in Pu‘u‘eo, TMKs: [3] 2-6-008: 026, 027, 028, 029, 031, 032, 033, 035, 036, 037, 038, 039; 2-6-029:009, 010, 011, 012, 014, 015	Documented a single stone mound assessed as a possible burial (SIHP # -18074); mound not tested due to its location in a conservation zone and to avoid unnecessary disturbance
Spear 1992	Archaeological inventory survey	Approx. 12 acres in Pi‘ihonua, TMK: [3] 2-3-032:001B	Documented two historic-era sites: SIHP # -18443, stone cattle ranching wall; and SIHP # -18444, retaining wall for water control associated with sugarcane cultivation or cattle ranching
Spear 1993a	Archaeological inventory survey	Approx. 9.5 acres in Pi‘ihonua, TMKs: [3] 2-3-031:001 and 2-3-032:001	No historic properties identified
Spear 1993b	Archaeological inventory survey	Approx. 5 acres in Pi‘ihonua, TMK: [3] 2-3-032:004	Documented two historic-era sites: SIHP #s -19036 (remnant Portuguese oven) and -19037 (historic dump site)
Walker and Rosendahl 1996	Archaeological assessment study	Seven discrete locations in Pōnahawai, Pi‘ihonua, and Waiākea, TMKs: [3] 2-2-015:033; 2-3-032:001; 2-3-036:003; 2-4-001:012; 2-4-049:018, 019; 2-4-057:001 2-6-015:001, 002; 2-6-016:002; (current project area in proximity to Site F, approx.. 42.3 acres at TMK: [3] 2-3-032:001)	Documented four previously identified historic properties (SIHP #s -19431 through -19434) and one newly identified historic property (SIHP # -21133), all located outside Site F and well away from current project area

Reference	Type of Study	Location	Results (site numbers prefixed SIHP # 50-10-35 unless otherwise noted)
Rechtman 2004	Determination of no historic properties affected	Approx. 4 acres in Pi‘ihonua, TMK: [3] 2-3-032:001 por.	No historic properties identified
Rechtman and Clark 2005	Determination of no historic properties affected	Approx. 5.4 acres in Pi‘ihonua, TMKs: [3] 2-3-032:006, 007, 008	No historic properties identified

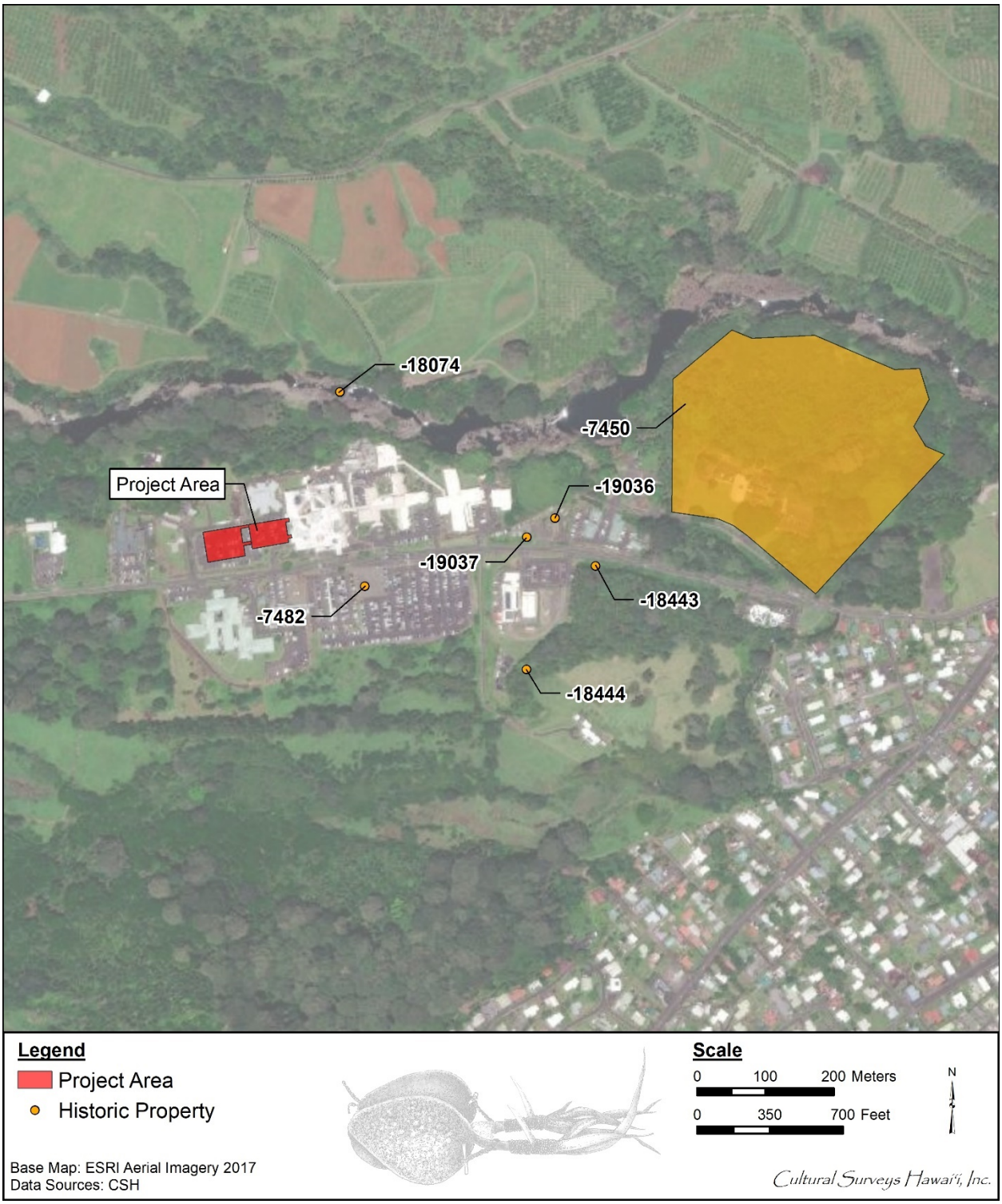

Figure 13. Aerial imagery (ESRI 2017) showing the location of previously documented historic properties in the vicinity of the HMC Expansion project area

Table 2. Previously documented historic properties within 600 m of the project area

SIHP # (50-10-35)	Site Type/ Name	Site Function	Site Age	Previous Documentation	Condition/Notes
-7450	Old Hilo Hospital	Hospital	Historic	SHPD Records	Buildings are still present; current condition and use unknown
-7482	Portuguese oven	Food production	Historic	SHPD Records	Preserved within HMC parking lot across Waiānuenue Ave from project area
-18074	Stone mound	Possible burial	Possible early historic	Kennedy 1992	Unknown; likely intact
-18443	Wall	Agriculture	Historic	Spear 1992	Unknown; likely intact
-18444	Wall	Agriculture	Historic	Spear 1992	Unknown; likely intact
-19036	Portuguese oven	Food production	Historic	Spear 1993b	Unknown; parcel exhibits signs of development
-19037	Cultural deposit	Trash dump	Historic	Spear 1993b	Unknown; parcel exhibits signs of development

Figure 14. Photo overlooking the project area (within the existing HMC parking lot) with the hospital facility visible in the background; view to east

Figure 15. Photo overlooking the project area (within the existing HMC parking lot) with the hospital facility visible in the background; view to northeast

Figure 16. Photo overlooking the project area (within the existing HMC parking lot) with the hospital facility visible in the background; view to northeast

Figure 17. Photo overlooking the project area (within the existing HMC parking lot) with the hospital facility visible in the background; view to east

Figure 18. Photo overlooking the project area (within the existing HMC parking lot) with the hospital facility visible in the background and to the right; view to north

Figure 19. Photo overlooking the project area (within the existing HMC parking lot); view to west

Figure 20. Photo overlooking the project area (within the existing HMC parking lot) with Waiānuenue Avenue and the Hale Ānuenue Restorative Care Center visible in background; view to south

Figure 21. Photo of the hospital helipad (center) and a building (background left) possibly belonging to the old Hilo Hospital located adjacent to but outside the current project area; view to north

References Cited

Beckwith, Martha
1976 *Hawaiian Mythology*. University of Hawaii Press, Honolulu.

Bird, Isabella L.
2007 *Six Months in the Sandwich Islands: Among Hawai‘i’s Palm Groves, Coral Reefs, and Volcanoes*. Introduction by Glen Grant. First printing 1881 by G.P. Putnam’s Sons, New York. Mutual Publishing, Honolulu.

Clark, Matthew R. and Robert Rechtman
2005 *Request for SHPO Concurrence with a Determination of No Historic Properties Affected Pursuant to the National Environmental Policy Act and in Compliance with Section 106 of the National Historic Preservation Act, Arc of Hilo Property (TMKs: 3-2-3-32: 6, 7 and 8) Piihonua Ahupuaa, South Hilo District, Island of Hawaii*. Rechtman Consulting, Kea‘au, Hawai‘i.

Cordy, Ross
1977 *Cultural Reconnaissance Report for Pohoiki Bay Navigation Improvements, Pohoiki Bay, Hawaii (TMK 1-3-08:3), U.S. Army Engineer Division.* U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu.
2000 *Exalted Sits the Chief. The Ancient History of Hawai‘i Island*. Mutual Publishing, Honolulu.

Curtis, Caroline
1985 *Tales of the Menehune*. Revised edition. Kamehameha Schools Press, Honolulu.

Desha, Stephen
2000 *Kamehameha and His Warrior Kekūhaupi‘o*. Kamehameha Schools Press, Honolulu.

Dorrance, William H. and Francis S. Morgan
2000 *Sugar Islands: the 165-Year Story of Sugar in Hawai‘i*. Mutual Publishing, Honolulu.

ESRI
2017 World Imagery. Esri, Redlands, California. Available online at www.arcgisonline.com/maps/World_Imagery.

Handy, E.S. Craighill, and Elizabeth G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin 233, Bernice Pauahi Bishop Museum, Honolulu.

Hawaiian Legislature
1917 *Senate Journal*. Hawaiian Gazette Company, Ltd., Honolulu.

Hawai‘i TMK Service
2010 Hawai‘i Tax Map Key TMK: [3] 2-3-027. TMK Service, Honolulu.

‘Ī‘ī, John Papa
1959 *Fragments of Hawaiian History*. Mary Kawena Pukui, translator. Bishop Museum Press, Honolulu.

Kamakau, Samuel M.
1992 *Ruling Chiefs of Hawaii.* Revised edition. Kamehameha Schools Press, Honolulu.

Kelly, Marion, Barry Nakamura, and Dorothy B. Barrere
1981 *Hilo Bay: A Chronological History, Land and Water Use in the Hilo Bay Area, Island of Hawai‘i.* Bernice Pauahi Bishop Museum, Honolulu.

Kennedy, Joseph
1992 *Archaeological Inventory Final Report for TMK:2-6-08:26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, and 39; and TMK:2-6-29:09, 10, 11, 12, 14, and 15; Located at Puueo on the Island of Hawaii*. Archaeological Consultants of Hawai‘i, Inc., Hale‘iwa, Hawai‘i.

Lyman, Henry M.
1906 *Hawaiian Yesterdays. Chapters from a Boy's Life in the Islands in the Early Days*. A.C. McClurg & Company, Chicago.

McEldowney, Holly
1979 *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawai‘i*. Department of Anthropology, Bernice Pauahi Bishop Museum, Honolulu.

McNarie, Alan
2016 The Old Hilo Hospital: Ghosts, Peace Corps, and Adult Care. *Ke‘ola Magazine*, January-February 2016. Electronic document, https://keolamagazine.com/then-now/the-old-hilo-hospital/.

Menzies, Archibald
1920 *Hawaii Nei 128 Years Ago*. W.F. Wilson, editor. New Freedom Press, Honolulu.

Pitman, Almira
1931 *After Fifty Years: An Appreciation, and a Record of a Unique Incident*. Privately printed. Plimpton Press, Norwood.

Pukui, Mary Kawena, and Caroline Curtis
1996 *Hawaii Island Legends: Pikoi, Pele and Others*. Kamehameha Schools Press, Honolulu.

Pukui, Mary K., Samuel H. Elbert, and Esther Mookini
1976 *Place Names of Hawaii.* Revised and expanded edition. University of Hawaii Press, Honolulu.

Rechtman, Robert
2004 *Letter report: No Historic Properties Affected Determination for Hilo Hospital Expansion, Pi‘ihonua Ahupua‘a, South Hilo District, Island of Hawai‘i, TMK: [3] 2-3-032:001 por.* Rechtman Consulting, LLC, Kea‘au, Hawai‘i.

Rechtman, Robert B. and Matthew R. Clark
2005 *Preservation Plan for a Section of the Mamalahoa Trail (SIHP Site 50-10-27-2) (TMK:3-7-3-9:24, 34) ‘O‘oma 1st Ahupua‘a North Kona District Island of Hawai‘i.* Rechtman Consulting, Kea‘au, Hawai‘i.

Salmons, Stephanie

2021 Planning for the future; Proposed capital improvements measure includes bond funding for HMC expansion project. *Hawaii Tribune Herald*, 31 January 2021. Electronic document, https://www.hawaiitribune-herald.com/2021/01/31/hawaii-news/planning-for-the-future-proposed-capital-improvements-measure-includes-bond-funding-for-hmc-expansion-project/.

Sato, H., Warren Ikeda, Robert Paeth, Richard Smythe, and Minoru Takehiro, Jr.

1973 *Soil Survey of the Island of Hawai‘i*. U.S. Department of Agriculture and University of Hawai‘i Agricultural Experiment Station.

Sinoto, Aki

1978 *Archaeological Reconnaissance Survey of Proposed Kaumana Springs Wilderness Park, Hilo, Island of Hawaii.* Bishop Museum Press, Honolulu.

Soehren, Lloyd

2019 *A Catalog of Hawaiian Place Names*. *Compiled for the Records of the Boundary Commission and The Board Commissioners to Quiet Land Titles of the Kingdom of Hawai‘i*. Collected and annotated by Lloyd J. Soehren. Online at the Ulukau Website, http://ulukau.org/cgi-bin/hpn?l=en.

Spear, Robert L.

1992 *An Archaeological Inventory Survey for the H.C.E.O.C. Project, Hilo, Island of Hawai‘i (TMK: 2-3-32:1B)*. Scientific Consultant Services, Inc., Kāne‘ohe, Hawai‘i.

1993a *An Archaeological Inventory Survey for the Hilo Health Care Center, Island of Hawai‘i (TMK: 2-3-31:1).* Scientific Consultant Services, Inc., Kāne‘ohe, Hawai‘i.

1993b *An Inventory Survey of the H.C.E.O.C. (Option II) Parcel Piihonua Ahupua‘a, South Hilo District Hilo, Island of Hawai‘i (TMK:2-3-32:4)*. Scientific Consultant Services, Inc., Kāne‘ohe, Hawai‘i.

USDA (U.S. Department of Agriculture)

2001 Soil Survey Geographic (SSURGO) database. U.S. Department of Agriculture, Natural Resources Conservation Service. Fort Worth, Texas. http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/.

USGS (U.S. Geological Survey)

1914 Waiakea USGS 7.5-minute series topographic quadrangle. USGS Information Services, Denver.

1963 Hilo USGS 7.5-minute series topographic quadrangle. USGS Information Services, Denver.

1977 Orthophoto, Hilo, Hawai‘i. USGS Information Services, Denver.

1995 Hilo USGS 7.5-minute series topographic quadrangle. USGS Information Services, Denver.

Waihona ‘Aina

2021 *The Māhele Database.* Electronic document, http://waihona.com.

Walker, Alan T. and Paul H. Rosendahl

1996 *Archaeological Assessment Study, Hilo Judiciary Complex Project, Lands of Wainaku, Pōnahawai, Pi‘ihonua, and Waiākea, South Hilo District, Island of Hawai‘i (TMK: 2-6-15:1,2; 2-6-16:2; 2-4-49:18,19; 2-2-15:33; 2-4-1:12; 2-3-36:3; 2-3-32:1; 2-4-57:1)*. Paul H. Rosendahl, Ph.D., Inc, Hilo, Hawai‘i.

Wall, Walter E.

1922 Hilo Forest Reserve. Hawai‘i Territory Survey (HTS) Map 799. Hawai‘i Land Survey Division, State of Hawai‘i, Department of Accounting and General Services, Honolulu. Available online at http://dags.Hawai‘i.gov/survey/search.php.

1924 Piihonua House Lots, First and Third Series. Tracing of Registered Map 2713. Hawai‘i Land Survey Division, State of Hawai‘i, Department of Accounting and General Services, Honolulu. Available online at http://dags.Hawai‘i.gov/survey/search.php.

1928 Hawaii Island. Hawai‘i Land Survey Division, State of Hawai‘i, Department of Accounting and General Services, Honolulu. Available online at http://dags.Hawai‘i.gov/survey/search.php.

Young, Peter T.

2017 *Images of Old Hawaii: Pu‘umaile Home*. Published 14 April 2017. Electronic document, http://imagesofoldhawaii.com/puumaile-home/.

STATE HISTORIC PRESERVATION DIVISION CHAPTER 6E DETERMINATION LETTER

APPENDIX C-1

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

September 24, 2021

IN REPLY REFER TO:
Project No. 2021PR01111
Doc No. 2109SN12
Archaeology

Kimberly A. Shimabuku, Director
Hawaii Health Systems
Hilo Medical Center
1190 Waiāhuehue Ave.
Hilo, HI 96720
Email: kshimabuku@hhsc.org

Dear Ms. Shimabuku:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
Request for Consultation and Concurrence with the Project Effect Determination
County of Hawaii Grading Permit Application
Hilo Medical Center Expansion Project
Pi'ihōnua Ahupua'a, South Hilo District, Island of Hawai'i
TMK: (3) 2-3-027:002 por.

This letter provides the State Historic Preservation Division's (SHPD's) comments on the Hawaii Health Systems Corporation (HHSC), an agency of the State of Hawaii, is proposing project titled *Hilo Medical Center Hospital Expansion Project*. The SHPD received submittal material via HICRIS between August 18 and September 14, 2021 (Submission Nos. 2021PR00989.001 through 2021PR00989.003). The proposed project area is a 1.1-acre portion of the 20.5-acre parcel. The project submittal includes:

[X] A letter dated August 30, 2021 from the HHSC initiating consultation of the current project and a request for concurrence with the HHSC's project effect determination of "no historic properties affected;"
[X] SHPD HRS 6E Submittal Forms and attachments, permit sets, photographs, TMK plat maps, construction plans of the project area;
[X] County of Hawaii Grading Permit Application;
[X] Project plans and photos; and
[X} An archaeological literature review and field inspection (LRFI) titled, *Archaeological Literature Review and Field Inspection for the Hilo Medical Center Hospital Expansion Project, Pi'ihonua Ahupua'a, South Hilo District, Hawai'i Island, TMK: [3] 2-3-027:002 por.* (Bautista and Hammatt 2021).

Project Description
The Hilo Medical Center (HMC) proposes to construct two new expansions to the center. The HMC Expansion Phase 1 project component will add ~18,900 sq. ft. of space to the existing 249,886-sq.-ft. facility. The new addition will be a separate structure situated above the current location of the physician and visitor parking. The addition. It will be connected to the existing building via pedestrian bridges/walkways and will require the redesigning of the existing ground floor physician and visitor parking. The HMC Expansion Phase 2 project component will add ~43,000 sq. ft., connecting to Phase 1 with two pedestrian bridges/walkways. The Phase 2 addition, which will be situated above the existing visitor parking, will be a three-story building. The proposed ground disturbing activities will include demolition of the existing parking lot surfaces for excavations associated with structural footings and utilities, with maximum excavations to 7 ft. below current grade.

Cultural Surveys Hawaii, Inc. (CSH) conducted a literature review and field inspection (Bautista and Hammatt 2021) in support of the current project. The LRFI and SHPD's records indicate that no archaeological inventory survey has been conducted within with project area, which has been extensively disturbed by prior agricultural activities and modern development, including the HMC facility. The LRFI identified no archaeological surface features and based on the extent of the prior ground disturbance, the potential for intact subsurface archaeological features is low.

Determination
Based on the information provided, the **SHPD concurs** with the HHSC's HRS 6E-8 project effect determination of "No historic properties affected." No additional historic preservation requirements are required for the current project. Pursuant to HAR §13-275-7(e), when the SHPD agrees that the action will not affect any significant historic properties, this is the SHPD's written concurrence and historic preservation review ends. The HRS 6E historic preservation review process is ended.

The SHPD hereby notifies the HHSC that the HRS 6E historic preservation review process is ended, and the permit issuance process may proceed.

Please note on relevant construction plans: In the unlikely event that subsurface historic resources, including human skeletal remains, structural remains, cultural deposits, artifacts, sand deposits, or sink holes are identified during the demolition and/or construction work, cease work in the immediate vicinity of the find, protect the find from additional disturbance, and contact the State Historic Preservation Division, at (808) 933-7651.

Please contact Sean Nāleimaile, Hawaii Island Lead Archaeologist, at sean.p.naleimaile@hawaii.gov or at (808) 933-7651, for any questions regarding this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc. Bryan Esmerelda, bryan@munekiyohiraga.com
Tessa Munekiyo Ng, tessa@munekiyohiraga.com
Emily Muraikiyo, emily@muekiyohiraga.com
Sarah Wilkinson, swilkinson@culturalsurveys.com
Cultural Surveys Hawaii, cshsubmittals@culturalsurveys.com

CULTURAL IMPACT ASSESSMENT REPORT

APPENDIX

D

FINAL
Cultural Impact Assessment for the Hilo Medical Center Hospital Expansion Project, Pi‘ihonua Ahupua‘a, South Hilo District, Hawai‘i Island
TMK: [3] 2-3-027:002 por.

Prepared for
Munekiyo Hiraga
on behalf of the
Hawaii Health Systems Corporation

Prepared by
Chantellee Konohia Spencer, B.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: PIIHONUA 5)

February 2022

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Management Summary

Reference	Cultural Impact Assessment for the Hilo Medical Center Hospital Expansion Project, Pi‘ihonua Ahupua‘a, South Hilo District, Hawai‘i Island, TMK: [3] 2-3-027:002 por. (Spencer and Hammatt 2021)
Date	February 2022
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: PIIHONUA 5
Agencies	State of Hawai‘i, Department of Health, Office of Environmental Quality Control (DOH-OEQC)
Land Jurisdiction	State of Hawai‘i: Hawaii Health Systems Corporation (HHSC)
Project Location	The Hilo Medical Center Hospital (HMC) expansion project area is within the existing HMC physicians and visitor parking areas located at 1190 Waianuenue Avenue in the town of Hilo on Hawai‘i Island. The expansion project area is situated entirely within TMK: [3] 2-3-027:002 por. The project area is depicted within the HMC on portions of the 1995 Hilo U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles on Hawai‘i Island, a tax map plat, and a 2016 aerial photograph.
Project Description	Plans are to construct two new expansions to the HMC. The HMC Expansion Phase 1 project is to add approximately 18,900 square feet (sq ft) to the existing 249,886 sq ft Hilo Medical Center which will be situated above the current location of the physician and visitor parking. The addition will be a separate structure, spread over one floor and connected to the existing building via pedestrian bridges/walkways and will require the redesigning of the existing ground floor physician and visitor parking. The expansion space is programmed for an 18-bed Intensive Care Unit with two enclosed stair shafts as means of egress and life safety requirements. Rooftop and ground floor mechanical and electrical spaces will include air handling units, domestic hot water, electrical rooms, medical gas and miscellaneous infrastructure components. The HMC Expansion Phase 2 project is to add approximately 43,000 sq ft connecting to Phase 1 with two pedestrian bridges/walkways. The Phase 2 addition, which will be situated above the existing visitor parking, will be a three-story building with one floor dedicated to a Family Birthing Center and the other for additional future programs to provide HMC flexibility of constructing either a two- or three-story building. The 12-bed Family Birthing Center will be located on the second floor of the Phase 2 addition and is comprised of nine labor, delivery, recovery, and postpartum (LDRP) rooms (six LDRP and three isolation LDRP) as well as three patient rooms that can be used for either

	postpartum or antepartum patients. There will also be an operating room (OR) for Cesarean delivery which is designed for the performance of surgical deliveries and infant resuscitation / stabilization. Similar to Phase 1, the rooftop and ground floor mechanical and electrical spaces will include air handling units, domestic hot water, electrical rooms, medical gas and miscellaneous infrastructure components. The Phase 2 addition will be self-supporting from a mechanical and electrical services standpoint in that the existing central plant will remain unencumbered by the addition. Related ground disturbance would include the demolition of the existing parking lot surface and excavation to a depth of 7 ft.
Project Acreage	The HMC project area comprises a 1.1-acre (0.4451-hectare) portion of the overall 20.5-acre (8.296-hectare) Hilo Medical Center complex.
Document Purpose	This cultural impact assessment (CIA) was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Environmental Review Program’s (formerly the Office of Environmental Quality Control) *Guidelines for Assessing Cultural Impacts*) which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i Significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6. 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). The document will likely also support the project’s historic preservation review.
Results of Background Research	Background research for this project yielded the following results presented in approximately chronological order: 1. The project area is situated in the *ahupua‘a* (traditional land division) of Pi‘ihonua, which is an integral part of the Hilo Watershed. Streams, waterfalls, ponds, and other water features are abundant in this area, supporting lush and varied forest ecosystems where development has not occurred. 2. The lower forest was used to gather resources such as wood, bird feathers, fiber, and some food crops. The upland rainforest was used mainly by bird catchers to collect feathers and to gather other resources not available at the lower elevations. In the post-

	Contact era, the forest areas were also used for the collection of resources that could be sold as trade items to foreigners, such as sandalwood and *pulu. Pulu* is the soft substance at the base of *hāpu‘u* ferns, which was shipped to California to be used for furniture and mattress stuffing (Baxley 1865:596). 3. In the pre-Contact period, the area around Hilo Bay was densely inhabited 4. Handy (1940:125) describes the *kanu kipi* (Hilo name for mound taro patches; Pukui and Elbert 1971:143) method as planting taro on mounds (*kipi*) built on the bottom of the marshy lands along Hilo Bay. 5. The districts of Hilo and Hāmākua were once ruled by the descendants of paramount chief ‘Umi, who ruled from about AD 1600–1620 (Cordy 2000:464). He was married to the daughter of Kulukulua, chief of Hilo. 6. According to Kelly et al. (1981:3), the lands fronting Hilo were portioned off into named land sections, consisting of the *ahupua‘a* of Pu‘u‘eo, Pi‘ihonua, Punahoa, Ponahawai, Kūkūau and Waiākea although it is not known when or by what chief. It is assumed that this had been accomplished by the late sixteenth or early seventeenth century. 7. In April 1822, members of the London Missionary Society came to Hawai‘i via Tahiti, among them a Tahitian convert named Auna. He was the first missionary to preach in Hilo (Kelly et al. 1981:26). The delegates from the society were hosted by Queen Ka‘ahumanu and her husband Kaumuali‘i, who were making a tour of the Islands. 8. The pioneer company of missionaries, sponsored by the American Board of Commissioners for Foreign Missions in New England, arrived in Hawai‘i in 1820 aboard the brig *Thaddeus*. With the consent of Liholiho (Kamehameha II) and his chiefs, a missionary couple from the first company of missionaries, Samuel and Nancy Ruggles, and Joseph and Martha Goodrich, a couple from the second company of missionaries, which arrived in the island in 1823, were allowed to set up a new mission in Hilo on the island of Hawai‘i. 9. The Reverend David Beldon Lyman and his wife Sarah Joiner Lyman were members of the Fifth Company of missionaries. They arrived in Hilo, Hawai‘i in 1832 and were stationed at Hilo until their deaths. They were joined in 1835 by Reverend Titus Coan, who converted hundreds of natives during “The Great Revival.” In the 1830s, the Reverend Lyman founded the Hilo Boarding School for Hawaiian Native Boys, which was built about half the way between the coast and the Hāla‘i Hills.

Results of Community Consultation	CSH attempted to contact Native 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 16 individuals or groups but they garnered little to no interest from community members.
Identification of Cultural Practices	Community consultation yielded no responses or input.
Identification of Impacts to Cultural Practices	Community consultation yielded no responses or input.
Impacts and Recommendations	Based on the results of community consultation and CSH's expertise in conducting cultural impact assessments, the following actions are recommended to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups: 1. 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. 2. 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 Background

At the request of Munekiyo Hiraga on behalf of the Hawaii Health Systems Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) is conducting a cultural impact assessment (CIA) for the Hilo Medical Center Expansion Project, Pi‘ihonua Ahupua‘a, South Hilo District, Hawai‘i Island, TMK: [3] 2-3-027:002 por. The project area is depicted within the HMC on portions of the 1995 Hilo U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2016 aerial photograph (Figure 3). Hawaii Health Systems Corporation is proposing a new addition to the current Hilo Medical Center to be conducted in two phases:

Phase 1 Scope:

The HMC Expansion Phase 1 project is to add approximately 18,900 square feet (sq ft) to the existing 249,886 sq ft Hilo Medical Center which will be situated above the current location of the physician and visitor parking. The addition will be a separate structure, spread over one floor and connected to the existing building via pedestrian bridges/walkways and will require the redesigning of the existing ground floor physician and visitor parking. The expansion space is programmed for an 18-bed Intensive Care Unit with two enclosed stair shafts as means of egress and life safety requirements. Rooftop and ground floor mechanical and electrical spaces will include air handling units, domestic hot water, electrical rooms, medical, gas and miscellaneous infrastructure components.

Phase 2 Scope:

The HMC Expansion Phase 2 project is to add approximately 43,000 sq ft connecting to Phase 1 with two pedestrian bridges/walkways. The Phase 2 addition, which will be situated above the existing visitor parking, will be a three-story building with one floor dedicated to a Family Birthing Center and the other floors for additional future programs to be determined by HMC.

The 12-bed Family Birthing Center will be located on the second floor of the Phase 2 addition and is comprised of nine labor, delivery, recovery, and postpartum (LDRP) rooms (six LDRP and three isolation LDRP) as well as three patient rooms that can be used for either postpartum or antepartum patients. There will also be an operating room (OR) for Cesarean delivery which is designed for the performance of surgical deliveries and infant resuscitation / stabilization.

Similar to Phase 1, the rooftop and ground floor mechanical and electrical spaces will include air handling units, domestic hot water, electrical rooms, medical gas, and miscellaneous infrastructure components. The Phase 2 addition will be self-supporting from a mechanical and electrical services standpoint in that the existing central plant will remain unencumbered by the addition.

1.2 Document Purpose

The purpose of this CIA is to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the

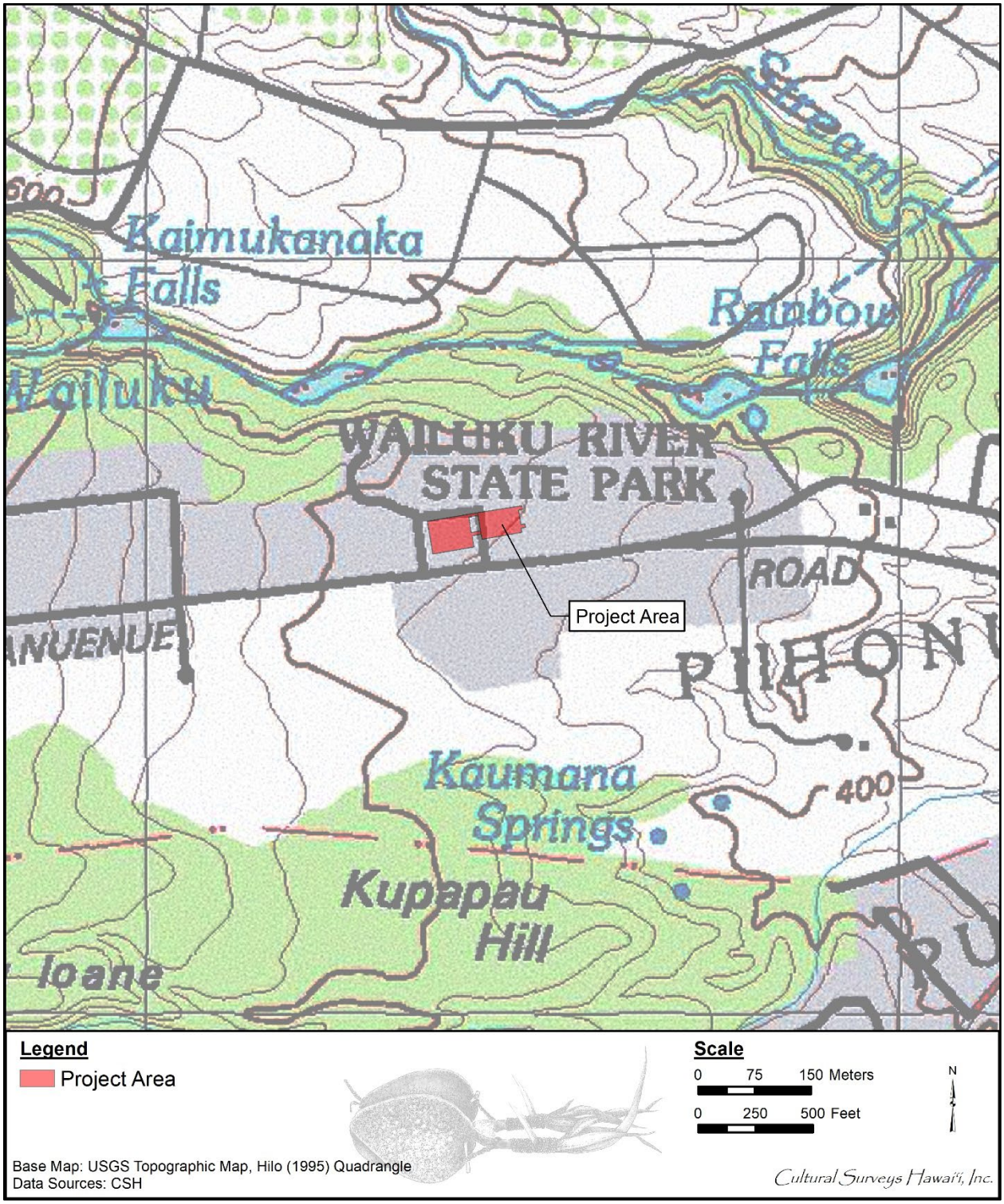

Figure 1. Portion of the 1995 Hilo USGS 7.5-minute topographic quadrangle showing the project area

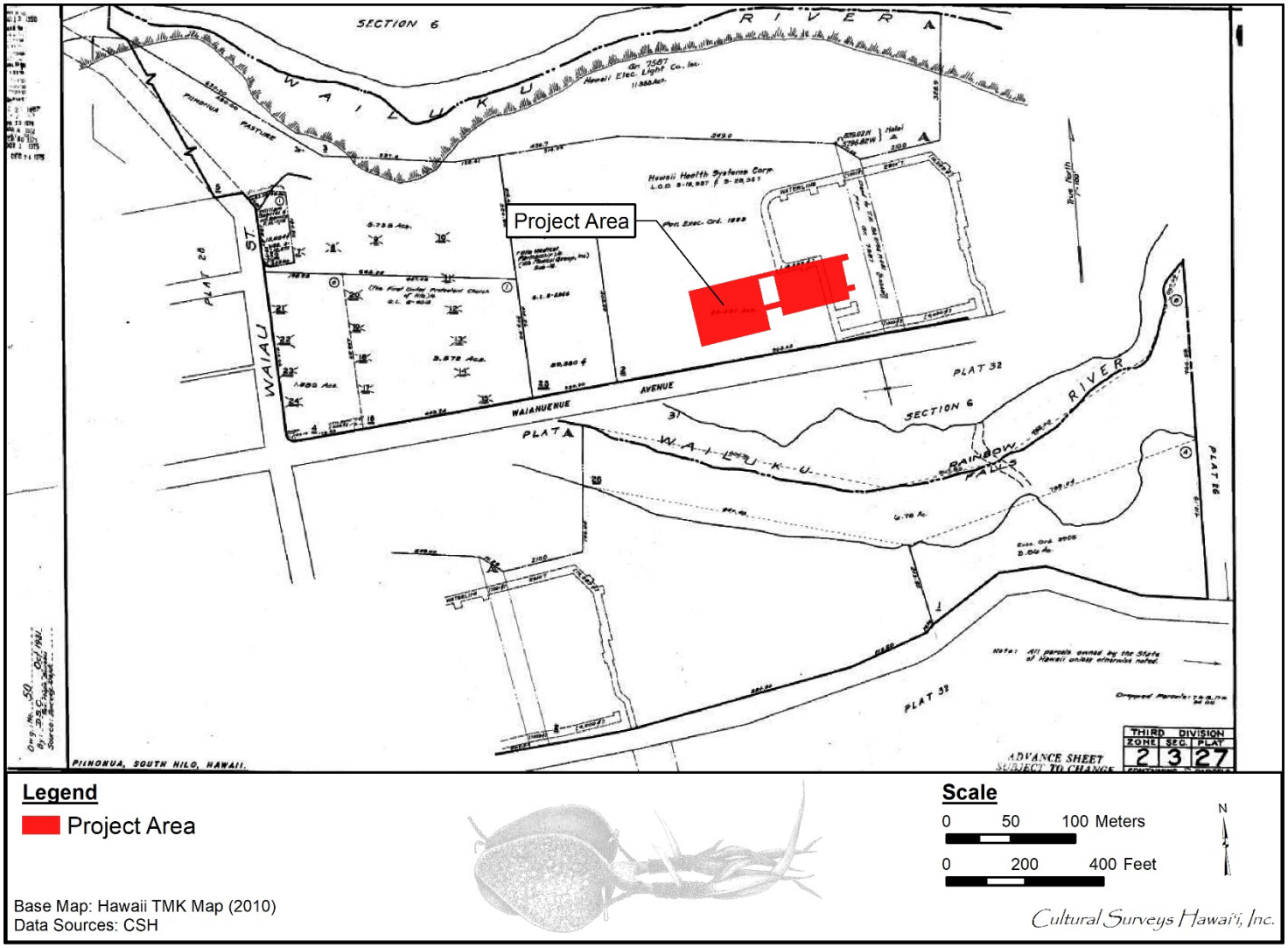

Figure 2. Tax Map Key (TMK) [3] 2-3-27 showing the project area within the Hilo Hospital (Hawai‘i TMK Service 2010)

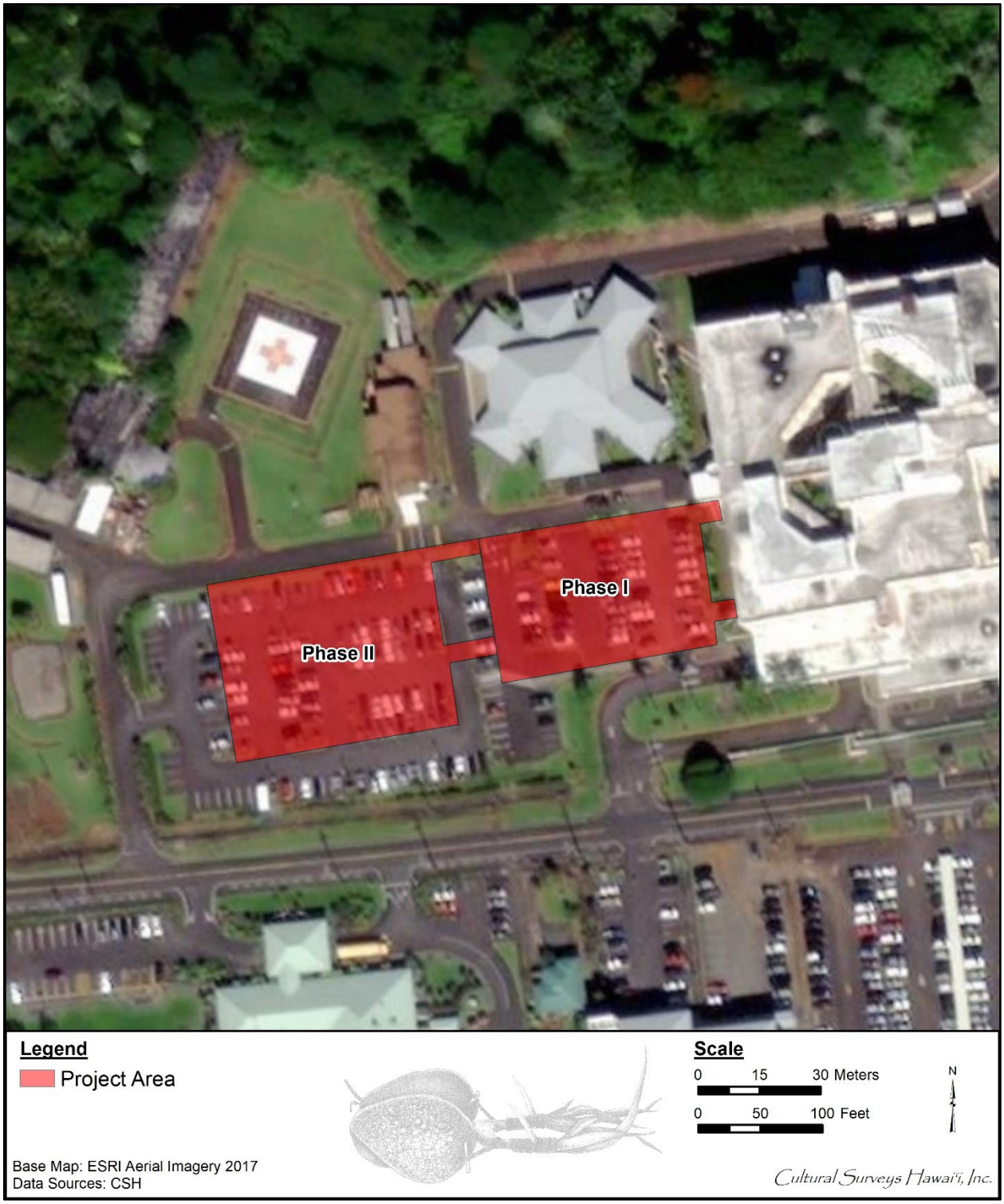

Figure 3. Aerial photograph showing the location of the project area (ESRI 2017)

proposed project's potential effect on cultural beliefs, practices, and resources. Through document research, this report provides information compiled to date pertinent to the assessment of the proposed project's potential impacts to cultural beliefs, practices, and resources (pursuant to the Environmental Review Program's (formerly the Office of Environmental Quality Control) *Guidelines for Assessing Cultural Impacts*) which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i Significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-284-6.

1. 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.
2. 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.

1.3 Natural Environment

The project area is situated in the *ahupua‘a* (traditional land division) of Pi‘ihonua, which is an integral part of the Hilo Watershed. Streams, waterfalls, ponds, and other water features are abundant in this area, supporting lush and varied forest ecosystems where development has not occurred. The Hilo Forest Reserve borders Pi‘ihonua Ahupua‘a to the south, and comprises its westernmost reaches.

The project area within the HMC complex is situated at approximately 146 m (480 ft) above mean sea level (amsl) and approximately 3 km inland of Hilo Bay. The Wailuku River gulch bounds the HMC property to the north. The HMC property is fully developed and as such the natural terrain has been impacted. The general topography of the area is moderately sloped toward Hilo Bay to the east. Vegetation within the HMC property is dominated by maintained lawns and ornamental trees and shrubs.

1.3.1 *Ka Lepo* (Soil)

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Sato et al. (1973), the project area is underlain by Hilo silty clay loam, 0 to 10% slopes (HoC) (Figure 4). Hilo series soils are described as

> […] well-drained silty clay loams. These soils formed in a series of volcanic ash that gives them a banded appearance […] The natural vegetation consists of hilograss, Californiagrass, guava, ohia, and tree fern […] Hilo soils are used for sugarcane, truck crops, orchards, and pasture. [Sato et al. 1973:17]

1.3.2 *Ka Makani* (Wind)

There are many terms that can differentiate types of *makani* (wind). There are general terms that describe the intensity or direction of the wind, relating the wind to a story, or to the

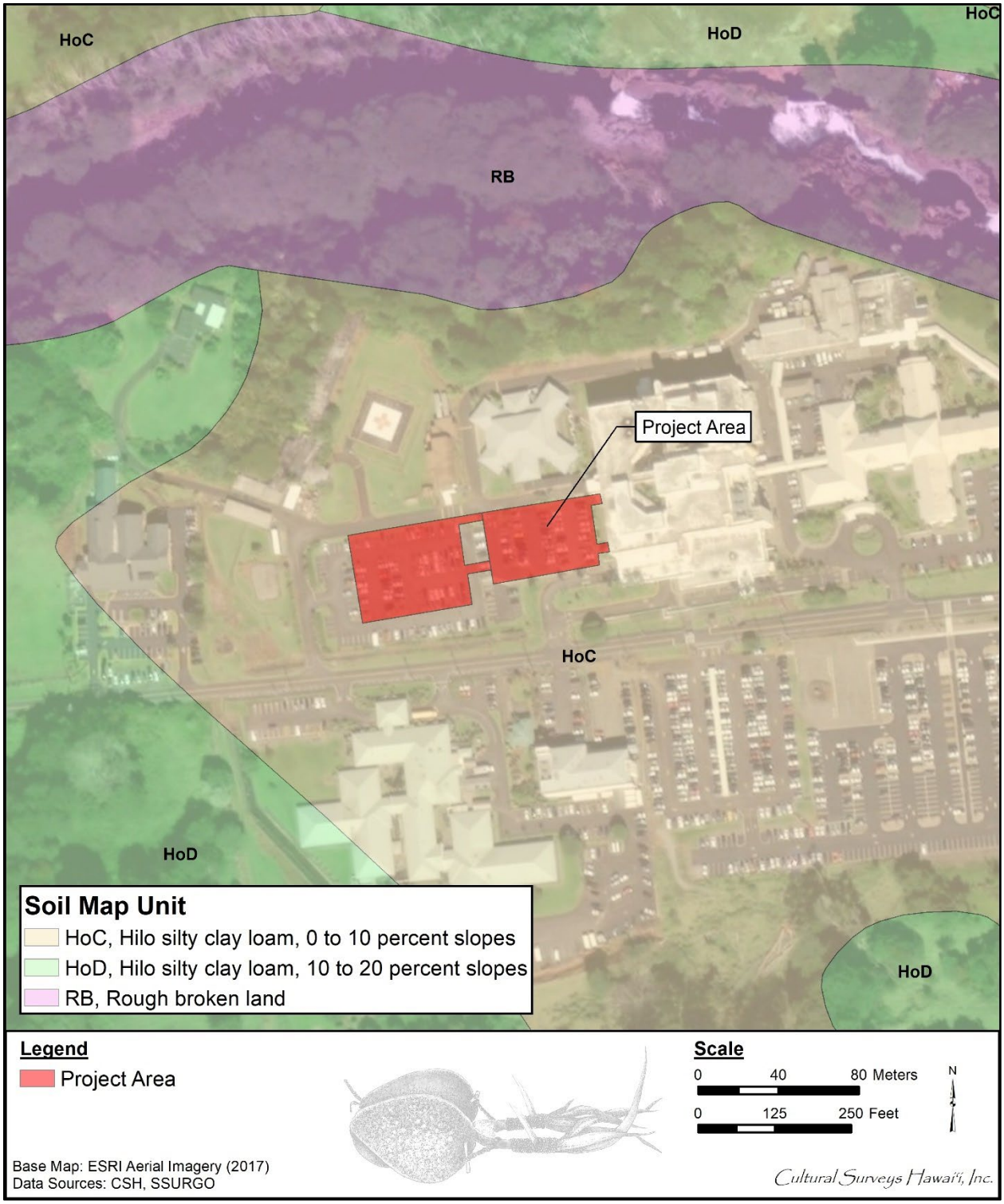

Figure 4. Overlay of the *Soil Survey of the State of Hawaii* (Sato et al. 1973), indicating soil and land types within and surrounding the project area (USDA SSURGO 2001)

landscape. 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 Wind Gourd of La‘amaomao tells the story of Pāka‘a and his son Kuapāka‘a who are descendants of the wind goddess La‘amaomao. With their possession of her special wind gourd, they could control and call forth the winds of Hawai‘i. A portion of Pāka‘a’s chant is listed below and recounts the various winds associated with the South Hilo region:

O ke kumu o ka ino o Hilo	[…] The source of the storms of Hilo,
Kea no ia o ka makani, o ka ua kea	Is the kind of wind called the ua kea,
Ke ooki la i ka hu-a o ka hale moku	Shearing off the edges of a hale and breaking it up,
He Kepia ko Hilo pali ku	Kēpia is of Hilo of the upright cliffs,
He Uluau ko Waiakea	Uluau is of Waiākea, [...]
[Nakuina 1902:53]	[Nakuina 1990:49]

1.3.3 *Ka 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).

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). 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]

Hilo was no exception to this naming practice. The subsections below list rains closely associated with Pi‘ihonua and some from the larger Hilo area. The subsections include the historical context from which these excerpts were gathered.

1.3.3.1 Alanilehua

A rain of Hilo, Hawai‘i. The following section was taken from an article on current events in 1862. Thomas Spencer, also known as Poonahoahoa, was a Hilo staff member of Ka Nupepa Kuokoa (Akana and Gonzalez 1025:2).

> Poonahoahoa – Ua hiki mai nei ko kākou hoa o ka ‘iu o ka lā o ka wā i hala, ma Honolulu nei; a ua maika‘i nō ho‘i kona ola, i ka nokea paha e ka ua Alanilehua, a me ka ‘ai i ka momona o ka ‘āina ua nui ‘o Hilo.
>
> *Poonahoahoa – Our friend from the height of the sun of bygone days has arrived here in Honolulu. His health is good, probably from the constant Alanilehua rain and from eating the richness of the land of much rain, Hilo.* [Akana and Gonzalez 2015:2]

1.3.3.2 ‘Āpuakea

A rain of Hilo, Hawai‘i. The following lines are taken from a *kanikau* or lament for S.P. Koko by his wife (Akana and Gonzalez 2015:5).

> Homa Hilo i ka ua ‘Āpuakea
>
> He ua ‘Āpuakea hehi i ka moana
>
> Hehi ihola i ke kai o Pi‘ihonua
>
> *Hilo is disappointed in the ‘Āpuakea rain*
>
> *An ‘Āpuakea rain that treads upon the ocean*
>
> *Treading upon the sea of Pi‘ihonua*
>
> [Akana and Gonzalez 2015:5]

1.3.3.3 ‘Awa‘awa

A rain of Hilo, Hawai‘i. The following lines are taken from the *mele inoa* or name chant for Kamehameha I, from the song “Hole Waimea” (Akana and Gonzalez 2015:18)

> Kū aku i ka pahu, kū a ka ‘awa‘awa
>
> Hanane‘e ke kīkala o ko Hilo kini
>
> Ho‘i lu‘ulu‘u i ke one o Hanakahi
>
> *Hit by the thrusts, hit by the bitter cold [‘awa‘awa]*
>
> *The hips of Hilo‘s throngs sag*
>
> *As they return burdened to the sands of Hanakahi*

[Akana and Gonzalez 2015:18]

1.3.3.4 Hālaulani

A rain of Hilo, Hawai‘i. The following section was found in the obituary for E.J.W. Keawehunahala (Akana and Gonzalez 2015:32).

> I ke ahiahi, ‘o ia ka lā 2 o Iulai, o ia makahiki nō, kau lākou i luna o Keōua moku, a holo akula, pau ka ‘ike ‘ana iā Hilo ‘āina ua Hālaulani; ‘ekolu pō, ‘elua ao i ka ‘ōpu o ka moana.
>
> *In the evening of July 2 of that year, they boarded the ship* Keōua *and sailed off. Hilo, land of the Hālaulani rain, could no longer be seen. They were in the belly of the ocean for three nights and two days.*
>
> [Akana and Gonzalez 2015:32]

The following section was taken from a *mele ‘uhane* or lament written for Kealohapauole:

> Aloha ka wailele ‘o Waiānuenue, wai ‘au a ka ‘uhane, wai he‘e o ka pu‘e no ke kino ē
>
> I honi au i ka hala moani ke ‘ala, ‘awe‘awe me he ua Hālaulani lā ē
>
> *Beloved is the waterfall Waiānuenue, bathing water of the spirit, surfing water for the body to ride to the mouth of the stream*
>
> *I smell the wind-blown perfume of the hala, spreading like fingers of the Hālaulani rain* [Akana and Gonzalez 2015:32]

1.3.3.5 Hehilau‘ulu

A rain associated with Pi‘ihonua, Hawai‘i. *Hehi lau ‘ulu* means “to tread upon ‘ulu leaves” (Akana and Gonzalez 2015:36). The following lines are from a *mele* by Kamalālāwalu as her former partner departed with a new lover (Akana and Gonzalez 2015:36):

> Auē ku‘u hoa pili ‘o ke kāne ē!
>
> Ku‘u hoa o ka hale wai anu o Hilo
>
> No Hilo ho‘i au, no ka ipu a Kulukulu‘ā
>
> No ke one holu i Waiolama
>
> No ka ua Hehilau‘ulu o Pi‘ihonua
>
> *Oh, my intimate companion, my husband!*
>
> *My companion of the cold, watery house of Hilo*
>
> *I am from Hilo, from the gourd of Chief Kulukulu‘ā*
>
> *From the shifting sands at Waiolama*
>
> *From the Hehilau‘ulu rain of Pi‘ihonua*
>
> [Akana and Gonzalez 2015:36]

Section 2 Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli* (chants), *mele*, traditional *mo‘olelo* (stories), 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 2021), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2020).

2.2 Community Consultation

2.2.1 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.

2.2.2 “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* (insight) and *mana‘o* (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) providing missing details for *mo‘olelo*.

CSH seeks *kōkua* (assistance) and guidance in 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.

2.2.3 Interview Completion

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 them 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 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 Traditional Accounts

3.1 *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, 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*, 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 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 Pi‘ihonua

3.1.1.1 The Legend of Kana and the Rescue of Hina

The demi-god Kana is associated with the place name “Pi‘ihonua.” “The Legend of Kana” describes Kana’s upbringing in Pi‘ihonua and the rescue of his kidnapped mother Hina. Martha Beckwith summarizes Fornander’s version of this legend in her book *Hawaiian Mythology:*

> The firstborn of Hakalanileo and Hina is born in the form of a rope and brought up by his grandmother Uli in the uplands of Pi‘ihonua back of Hilo in a house called Halau-ololo. As the child grows, the house has to be lengthened from mountain to sea in order to contain him. The chief Kapepe‘ekauila sails over on the hill Haupu to the island of Mokuola off Hilo bay. Hina climbs upon the hill to take a look about and is borne off to Molokai to become the wife of the Molokai chief. Her husband appeals to his son Niheu, who sends him to Kana, at the sight of whose eyes the father flees terrified. Kana joins the war party, but twice the weight of his hand sinks canoes prepared by all the canoe builders of Hawaii. Finally Uli digs up the canoe Kau-mai-elieli in the uplands of Paliuli. In vain the prophet Moi, brother of Nuakea, warns the Molokai chief of defeat. [Beckwith 1976:464]

Kana and his brother Niheu manage to save their mother when, ultimately, Kana breaks apart the hill Hā‘upu at sea.

3.1.2 The Wailuku River

The Wailuku River is the most substantial waterway within Pi‘ihonua Ahupua‘a. This perennial stream is an integral part of the Hilo Watershed system. In times of heavy rain this river becomes a raging, destructive force, hence its name: Wailuku literally means “water of destruction” (Pukui et al. 1974:225).

3.1.2.1 The Battle of the Wailuku River

This legend recounts the battle between the demi-god Maui and the *mo‘o* (lizard) Kuna. Some of the most widely recognized features along the Wailuku River are said to have been created during this battle.

> Hina, the mother of Māui, lived in a cave behind the falls of the Wailuku River on Hawai‘i. There she and her women made *kapa*, chanting as they worked. Now Hina had an enemy, a giant lizard, or *mo‘o*, whose name was Kuna Mo‘o. He liked to trouble Hina. He rolled rocks and logs into the river above the falls, thinking their crash would hurt or frighten the women.
>
> Instead he heard Hina’s laughing call, ‘Aloha, O Kuna Mo‘o! Your rocks and logs make a fine drum to keep time to our chanting.’
>
> The great *mo‘o* snapped his jaws in anger. ‘Their chanting shall end!’ he promised as he climbed the mountain.
>
> It was night when he returned, pushing a huge rock. All was quiet in the cave. The women slept and would not hear the noise that he must make. He rolled the great rock into the river below the falls to make a dam. The water could not flow past

the rock. Kuna Mo‘o watched it grow deeper and deeper until it began to flow back into the cave. ‘They will all drown!’ he chuckled. ‘They will drown as they sleep.’

Then he heard a sharp cry, ‘Awake, Hina! Awake! The water rises in our cave.’

A moment later he heard the voice of Hina, strong and clear, calling to her mighty son:

‘O Māui, fisher of islands,
O Maui, slower of sun,
Listen!
It is Hina who calls,
Hina, your mother,
Shut in the cave at night,
Made prisoner here by the *mo‘o*,
While water pours into our cave.
Come quickly, O Māui my son.
Come in your swift canoe.
Come with your mighty war club
And save us from this Kuna Mo‘o.’

The *mo‘o* chuckled again. ‘She calls for her son,’ he muttered, ‘But Māui is far away. He cannot hear her call.’

Māui did hear, faintly, as in a dream. He sprang from sleep. Had someone called? He looked about the night sky and saw a small, bright, fleecy cloud above Hawai‘i. ‘My mother’s cloud!’ he thought. ‘Hina is in trouble and calls for help.’ He leapt down the side of Mount Haleakalā with mighty strides. He sprang into his canoe and dug his paddle in the sea.

He reached Hilo. One look at the river told him what had happened. No water flowed. The river had been dammed, and Hina and her women were in danger.

Up the river Māui hurried. He reached the rock which stopped the water’s flow. There was no time to move it. With his club Māui struck the bank and made a water-way around the rock.

Once more the water flowed toward the ocean, and Māui heard his mother and her women chanting his praise. But he did not stop to listen, for he also heard the sound of the *mo‘o* above. The great lizard was fleeing to a hiding place. Māui followed. When he found the *mo‘o*, he struck until the earth trembled. Kuna Mo‘o rushed out, seeking another place to hide. Still Māui followed. Again and again the earth trembled with the blows of his mighty club. The *mo‘o* hid in a deep pool where Māui could not reach him. The hero poured red-hot lava into the pool and

> hurled in hot rocks. The water boiled, and Kuna Mo‘o fled again, this time down stream. Above the falls he turned to fight. He sprang at Māui, snapping his jaws. Māui dodged and struck, and the *mo‘o* tumbled over the falls.
>
> As Māui leapt down the cliff he heard the women chanting prayers—prayers for his victory. He found Kuna Mo‘o weak, but still snapping his ugly jaws. Again and again Māui struck until his enemy was dead.
>
> The giant lizard still lies where he fell, a great rock in the Wailuku River. He is beaten by stones and logs and flooded by water just as he tried to beat Hina and drown her in the flood.
>
> As for the deep pool above, though Māui no longer pours in red-hot lava, the waters of the ‘boiling pots’ still bubble and boil as if remembering his mighty battle with Kuna Mo‘o. [Curtis 1985:37-40]

To this day the bubbling, boiling pools described in this legend are referred to as the Boiling Pots. Not mentioned in this version of the legend is the name of the pool above Rainbow Falls which was the home of Kuna, called Wai-kuna, literally meaning “eel water” (Pukui et al. 1974:224). Ka-puka-a-Māui, literally “the hole made by Maui” (Pukui et al. 1974:90), was the first place that Kuna tried to hide from Maui during the battle:

> Kuna heard the crash of the club against the stones of the river bank and fled up the river to his home in the hidden caves by the pools in the river bed. Maui rushed up the river to punish Kuna-mo-o for the trouble he had caused Hina. When he came to the place where the dragon was hidden under deep waters, he took his magic spear and thrust it through the dirt and lava rocks along one side of the river, making a long hole, through which the waters rushed, revealing Kunamo-o’s hiding place. This place of the spear thrust is known among the Hawaiians as Ka puka a Maui, ‘the door made by Maui.’ It is also known as ‘The natural bridge of the Wailuku river.’ [Westervelt 1910:XIII]

One other place along the Wailuku River, downstream from the site of the battle, is still a well-known feature associated with this legend. When Maui, who was at Haleakalā, heard Hina call him, he rushed to his canoe:

> Down the mountain he leaped to his magic canoe. Pushing it into the sea with two mighty strokes of his paddle he crossed the sea to the mouth of the Wailuku river. Here even to the present day lies a long double rock, surrounded by the waters of the bay, which the natives call Ka waa o Maui, ‘The canoe of Maui.’ It represents to Hawaiian thought the magic canoe with which Maui always sailed over the ocean more swiftly than any winds could carry him. [Westervelt 1910:XIII]

3.1.2.2 Hi‘iakaikapoleopele and the Wailuku Bridge (from “How Hawai‘i was Made Safe Again”)

In the legend of Hi‘iakaikapoleopele, favorite sister of the volcano goddess Pele, Hi‘iaka and her companions traveled around Hawai‘i Island, along coastal and inland trails. After saving the chiefess Punahoa at Hilo Bay, Hi‘iaka and her companions stopped to ask an old couple if they were on the right trail to Hilo:

> ‘Yes, follow that trail,’ the old people answered. ‘Soon you will come to the Wailuku River. Two logs make a bridge over the river. But do not cross until you have made offering to the gods who guard the bridge.’
>
> ‘Gods?’ asked Hi‘iaka.
>
> ‘Yes, two powerful gods live there in a cave. The logs belong to them. When we want to cross we lay food on the logs—vegetable food or fish. If the gods are pleased they hold the logs firm and we cross safely.’
>
> ‘We have no food,’ Hi‘iaka said. ‘We shall make no offering. What then?’
>
> ‘Then do not try to cross, for the gods will turn these logs beneath your feet and you will fall into the raging river. You will be dashed to death upon the rocks.’
>
> Hi‘iaka said no more and the three walked on. Soon they came to the river and the bridge of logs.
>
> ‘Here is Hi‘iaka!’ called a voice from a great cave. ‘She is one of our family—a goddess.’
>
> ‘She may be one of our family,’ said another voice, ‘but I am hungry. Let her pay to cross. Bring an offering of food, O Hi‘iaka. Make offering to the gods for a safe crossing.’
>
> ‘Gods!’ shouted Hi‘iaka angrily. ‘You are no gods! We have no food for you!’
>
> By this time people had gathered on each side of the river. ‘They are indeed gods!’ these people cried. ‘We never try to cross without making an offering.’
>
> ‘I’ll show you they are no gods!’ shouted Hi‘iaka as she whirled her *pā‘ū* [woman’s skirt]. The people saw two frightened figures rushing away to hide in a cave far up the river. Hi‘iaka followed them and the two dashed out to find another hiding place. The *pā‘ū* of the goddess flashed and the figures were turned to stone.
>
> Hi‘iaka returned to the people. ‘The crossing is safe,’ she said.
>
> Thankfully people followed the three companions into the village. They set food before them and hung sweet smelling *lei* about their necks. ‘We have long feared those evil ones,’ they said. ‘Now you have given us safe crossing.’ [Pukui and Curtis 1996:39–40]

3.2 *Nā Wahi Pana* (Storied Places)

Wahi pana are legendary or storied places of an area. These legendary or storied places may include a variety of natural or human-made structures. Oftentimes dating to the pre-Contact period, most *wahi pana* are in some way connected to a particular *mo‘olelo*, however, a *wahi pana* may exist without a connection to any particular story. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

> Natural places have mana, 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, holua 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*, and man-made structures such as fishponds. In this way, the *wahi pana* of Kailua tangibly link the *kama‘āina* of Kailua 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* 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* (waterway or ditch), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (rock, 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).

3.2.1 *Nā Inoa ‘Āina a me nā Wahi Pana* (Place Names and Storied Places)

Pi‘ihonua literally means “land incline” (Pukui et al. 1974:184). The boundaries of Pi‘ihonua Ahupua‘a are Hilo Bay on the *makai* (seaward) side, Punahoa Ahupua‘a on the south, and Pu‘u‘eo Ahupua‘a on the north.

The following table lists and describes traditional place names in Pi‘ihonua.

Table 1. Place names and *wahi pana* of Hilo

Traditional Name	Type	Description
‘A‘ale	*kahawai* (stream)	Rises at 2,180 ft, joins Awehi Stream at 1,290 ft elev. to form Waiau Stream
‘Āwehi	*kahawai*	Rises at about 8,470 ft, joins Aale Stream to form Waiau Stream at 1,290 ft elev. The Piihonua/ Puu Eo boundary follows this stream to the end of Puu Eo at Waihiloa Fall, elev. about 2,270 ft.
Halehaleakalani	*palena* (boundary), *āhua*	“...the boundary between Piihonua and Waiakea runs mauka [inland] to Halehaleakalani, an ahua in the lava flow where the bird catchers used to meet the ones who carried up the food”; between Kapilinui and lower Mawae
Hawai‘i	*wailele* (waterfall)	Elev. about 1,780 ft on the Wailuku River

Traditional Name	Type	Description
Ho‘okelekele	*kahawai*	Rises at about 2,060 ft, enters Kalohewahewa Stream at 1,415 ft elev.
Huia	*nalu* (surf)	A surf at Piihonua
‘Iowai	*kahawai*	Claim no. 3994 by Haumu is bounded on the north by Iowai Stream
Ka‘elekalua	*palena, kauhale*	The Piihonua boundary runs from Mawae along Humuula “to Kaelekalua, an old kauhale, where trees are growing. The boundary runs makai of the old kauhale and the tall trees belong to Piihonua”; “...small ohia trees where we used to catch birds...”
Kaimukanaka	*wailele*	Elev. about 510 ft on Waiau Stream, just above its junction with the Wailuku River
Kaipalaoa	*heiau*	“Near armory site, Hilo; of pookanaka class; the heiau [pre-Christian place of worship] at which Umi’s life was threatened, and the place where Kamehameha is said to have proclaimed his ‘Mamalahoa’ law. Destroyed in the time of Kuakini’s governorshp of Hawaii” (Thrum); “Probably located just west of Isabelle Point. The native name of this point is Kaipalaoa” (Stokes); Here Liholio’s navel cord was ceremonially cut in 1797 (Kamakau)
Kaipalaoa	*lae, nalu*	The boundary between Piihonua and Punahoa commences at Kaipalaoa (BCT); now known as Cocoanut Point; “The native name of Isabelle Point [q.v.] is Kaipalaoa” (Stokes); Isabel and Kaipalaoa points are separated by only about three hundred feet.
Kalaeokahilikū	*palena, pu‘u*	The Piihonua/Waiakea boundary runs “to a pile of stones on a small hill or ahua at place named Kahiliku” (BC); “Kalaeokahiliku a grove of koa and ohia trees, the boundary runs long the edge of the woods, the tall trees being on Piihonua and the short ones on Humuula.”
Kalapalapaiki	*palena, wahi*	The Piihonua/Kaumana boundary “runs mauka to Kalapalapanui thence to Kalapalapaiki on the lava flow”

Traditional Name	Type	Description
Kalapalapanui	*palena, o‘io‘ina*	From Kapulu “the boundary between Waiakea and Kaumana runs mauka to Kalapalapanui, an oioina and place where we used to catch birds.” The Piihonua/Kaumana boundary “runs mauka to Kalapalapanui thence to Kalapalapaiki on the lava flow…”
Kalepeamoa	*pōhaku*	At the end of Reed’s Island, at the junction of the Wailuku River and Waikapu Stream
Kalohewahewa	*kahawai*	Rises at about 3,860 ft, enters the Wailuku River at 1,210 ft elev.
Kamokuloulu	*palena, kauhale*	The Piihonua/Paukaa boundary runs *makai* from Puuhaohailele “to Kamokuloulu, a kauhale among palm trees”
Kapehu	*pūnāwai*	Elev. 2,060 ft
Kapehu	*kahawai*	Rises at 3,130 ft, enters the Wailuku River at about 870 ft elev.
Kāpiliiki	*palena, kīpuka*	The Piihonua/Kaumana boundary runs “to Kapiliiki and thence to Kapilinui, these places are islands in the lava covered so thickly with trees and uluhi [*sic*; *uluhe*] that it is impossible to go through them (hence their name)”
Kāpilinui	*palena, kīpuka*	The Piihonua/Kaumana boundary runs “to Kapiliiki and thence to Kapilinui, these places are islands in the lava covered so thickly with trees and uluhi [*sic*; *uluhe*] that it is impossible to go through them (hence their names)”; “…this is the mauka end of Kaumana and where Piihonua and Waiakea join…”
Kapiliwaleokahalu	*palena, pu‘u*	The Piihonua/Kaumana boundary run “to Piliwaleokahalu, an ahua in the [1855] lava flow which is in sight of Kilohana”
Kapukaamāui	*wahi pana*	“Natural bridge, Wai-luku River, Hilo, Hawai‘i, where Māui thrust his spear through the lava rocks to reveal Kuna’s hiding place”
Kapu‘ulehu	*palena, pu‘u*	The Piihonua/Paukaa boundary runs *makai* from Kalapapainui “to Kapuulehu, a hill on the edge of the gulch”
Kaūmana Springs	*pūnāwai*	Three springs at 400 to 420 ft elev.
Kauwehu	*wailele*	Elev. about 1,200 ft on the Kalohewahewa Stream

Traditional Name	Type	Description
Kawala Gulch	*kahawai*	The Piihonua/Puueo boundary runs up Awehi gulch “to the junction of Kawala with the Awehi gulch, thence along that gulch to Namahana.”
Kawauwai	*palena, kauhale*	“Kaumana joins Piihonua at Kawauwai where bird catchers used to live, said place was destroyed by the lava flow of 1855.”
Kilohana	*palena, pu‘u*	“…an ahua in the center of the [1855] lava flow from which you can see to shore” between Naunuapaakea and Kapiliwaleokahalu on the Piihonua/Kaumana boundary
Kipi	*kahawai*	Rises at about 2,425 ft, enters Kapehu Stream at about 1,755 ft elev.
Koakanini	*wailele*	Elev. about 1,455 ft on the Wailuku River
Koloiki	*wahi*	Old name for Reed’s Island
Kulaniapia	*wailele*	Elev. 880 ft on Waiau Stream
Lae	*palena, wahi*	The Piihonua/Humuula boundary runs to “Lai [*sic*; Lae] a point of the woods covered with koa and ohia makai o A[a]huwela. A hill at the foot of the mountain which you can see from Waiakea” (p.21); the northwest corner of Piihonua. (BC) elev. about 6,580 ft
Laualu	*kahawai*	Rises at about 2,490 ft, enters Kapehu Stream at 1,530 ft elev.
Lau‘iole	*wailele*	Elev. about 1,320 ft on the Wailuku River
Lelekoa‘e	*wailele*	Elev. about 1,120 ft on Waiau Stream
Luaoanapapa	*palena, ana*	The Piihonua/Waiakea boundary runs “to Luaoanapapa a cave where people used to sleep, on the Hilo side of the [1855] lava flow; here Humuula cuts these other lands off.”
Make	*wailele*	In the Wailuku River
Māwae	*palena, wahi*	The Piihonua/Waiakea boundary runs “to a pile of stones at lower Mawae near a small island in the lava flow [of 1855]” (BC); elev. 5,243 ft
Mokupane	*lae*	Also known as Isabel or Isabelle Point (q.v.)
Nāhaleo‘ele‘ele	*palena, pu‘u*	The Piihonua/Ponahawai boundary runs *mauka* on the Puna side of the 1855 lava flow “to Nahaleoeleele, a hill; this hill is at the mauka corner of Ponahawai and the junction of Kaumana with Piihonua and close to the Kona side of the lava flow of 1855” (p.12)

Traditional Name	Type	Description
Nahuina	*palena, wahi*	“Kukuau ends at Nahuina” (p.25); “...to Nahuina which is the junction of Kaumana and Piihonua roads....it is on the old lava flow called Poohina, the flow of 1852 has flowed over it, there Kukuau is cut off by Kaumana and Waiakea. The ohia of this place is scrubby being on the aa, below it is tall.”
Nakakauila	*kahawai*	Rises at 1,040 ft, enters Wailuku River at about 890 ft elev.
Namahana	*palena, wahi*	The Piihonua/Puueo boundary runs up the Kawala gulch to Namahana, “thence across land to Nahuina the mauka corner of Alae.”
Nāmau‘uopa‘ao	*wahi*	Also known as “Maui’s canoe” in the Wailuku River
Nāunuapa‘akea	*palena, kipuka*	“...a small island in the [1855] lava flow, covered by trees” between Kalapalapaiki and Kilohana on the Piihonua/Kaumana boundary
Nukupahu	*kahawai*	Rises in Waipahoehoe Gulch at about 7,615 ft, enters Kalohewahewa Stream at 1,850 ft elev.; also called Puakala gulch (BC 53), or Kapuakala gulch (BCT), a portion of the Piihonua/Paukaa boundary
Pāho‘okolokolo	*wahi*	Shown on sketch of LCAw 11046B, at NW corner of Piihonua and Pitman streets; TMK 2313:25
Pakaluahine	*kahawai*	Rises at about 1,650 ft, enters the Wailuku River at 990 ft elev.
Papakolea	*palena, wahi*	The Piihonua/Puueo boundary runs down the center of the Awehi gulch “to Papakolea, the Amau[u] Plantation water head”; between Lelekoae and Waihiloa falls
Pāpio	*heiau*	“Piihonua, back in the forest; a heiau for canoe builders and bird catchers”
Pe‘epe‘e	*wailele*	Elev. about 840 ft on the Wailuku River
Pi‘ikea	*wahi*	Perhaps an ili along the Wailuku River

Traditional Name	Type	Description
Pinao	*heiau*	"...a large boulder known as Pinao, which is said by old natives to have been the stone on which Keawemauhili was sacrificed. It was formerly a part of the heiau of Kaipalaoa..." (Thrum); "The west corner of Pleasant (now Ululani) and Waianuenue Streets bears 272-29, 255 feet. The heiau is entirely destroyed" (Stokes)
Poakana	*wailele*	Elev. about 2,040 ft on the Wailuku River
Puakala	*kahawai*	An alternate name for Nukupahu Gulch, a portion of the Piihonua/Paukaa boundary (BC); the Piihonua/Humuula boundary runs "along mauka edge of woods to the Kapuakala gulch, the first gulch on the Hamakua side of Lae, to the south corner of Paukaa" (BCT); the boundary currently follows the gulch only a short way; Cf. Pua Akala
Pukamaui	*wailele*	Two falls on the Wailuku River, the upper one at about 1,320 ft and the lower one at about 1,240 ft elev.
Pu‘u Haoha‘ilele	*palena, kauhale*	The Piihonua/Paukaa boundary runs *makai* from Kapuulehu "to Puuhaohailele, kauhale kaawili manu"; quad uncertain
Pu‘u Iki	*palena, pu‘u*	"Punahoa 2 bounds Piihonua from the sea shore to a place in the woods called Puuiki" (p.26); "Piihonua joins Ponahawai at Puuiki, at the mauka corner of Punahoa. Puuiki is a hill with banana trees growing on it, situated on the Puna side of the lava flow of 1855" (p.12)
Pu‘u Loa	*pu‘u*	Elev. 1,060+ ft
Pu‘u ‘Ō‘ō	*wahi*	Ranch building at about 6,300 ft elev.; named after a nearby cinder cone
Wa‘akauhi	*pōhaku*	"A rock [at the mouth of the Wailuku River] called wa‘a-Kauhi (canoe [of] Kauhi [a Maui chief]) is said to be the petrified canoe of the demigod Māui."
Wai‘a‘ama	*kahawai*	Rises at about 7,680 ft, enters the Wailuku River at 4,610 ft elev.; written "Waiama" in LCAw 72, 197
Wai‘ale	*wailele*	Elev. about 960 ft on the Wailuku River

Traditional Name	Type	Description
Waiānuenue	*wailele*	This is the Hawaiian name for Rainbow Falls. “The cave under the falls was said to be the home of Hina, mother of [the demigod] Māui.”
Waiau	*kahawai*	Begins at junction of Aale and Awehi streams, elev. 1,290 ft, enters the Wailuku River at about 470 ft elev. at Waiele; the Piihonua/Puu Eo boundary follows Waiau Stream, then the Awehi Stream to above Waihiloa Falls. The name Waiau is not used in Boundary Commission testimony for the lower portion of Awehi Stream.
Wai‘ele	*palena, wahi*	The Piihonua/Puueo boundary runs down Awehi to Wailuku junction at Waiele (p.286)
Waihīloa	*palena, wailele*	The *mauka* corner of Puu Eo (BC 49); elev. 2,270 ft on Awehi Stream; misspelt “Wahiloa” on USGS
Waikapu	*kahawai*	The stream which bounds Reed’s Island on the south, with Wailuku River on the north
Waikē	*palena, wahi*	The Piihonua/Paukaa boundary runs “into the Honolii [stream] and along the land of Paukaa to which the water in the gulch belongs [...] to a place in the Honolii gulch called Waike at the head of the government land of Kaiwiki.” The *mauka* corner of Kaiwiki; elev. about 2,822 ft; written “Waikee” in BCT
Waike‘e	*kahawai*	The Piihonua/Humuula boundary crosses “Waikeeiki and thence to Waikeenui, two small kahawai branches of the Wailuku” between Puu Oo and Laumaia.
Waikoloa	*loko*	About ten small ponds widely scattered around 5,200 ft elev.
Waikuna	*wahi pana*	“Pool in the Wai-luku River above Rainbow Falls, Hilo, Hawai‘i, believed the home of Kuna (freshwater eel), a mo‘o who tried to kill Māui's mother, Hina, who lived in a cave below the falls.” See PEM for rest of story; TMK 2327
Wailoa	*wailele*	Elev. about 1,600 ft on the Wailuku River
Wailuku	*kahawai*	Rises at 11,080 ft; boundary between Piihonua and Puu Eo below its junction with Waiau Stream

Traditional Name	Type	Description
Waipāhoehoe	*ana, kahawai*	Rises at about 10,830 ft, enters the Wailuku River at 3,445 ft elev. The Humuula/Piihonua boundary runs “along the edge of the woods to Waipahoehoe, a cave in the kahawai” (BCT).

.

3.3 *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 the 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 within these Hawaiian expressions or proverbs are 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. The following proverbs concerning Pi‘ihonua and the larger town of Hilo come from Mary Kawena Pukui's *‘Ōlelo No‘eau* (Pukui 1983).

3.3.1 *‘Ōlelo No‘eau* #1534

The following *‘ōlelo no‘eau* mentions Wailuku Stream of Hilo.

> Ka papa kāhulihuli o Wailuku.
>
> *The unstable plank of Wailuku.*
>
> Said of an unstable person or situation. First uttered by Hi‘iaka when she compared the physical condition of the chief ‘Olepau to the weak plank that spanned Wailuku Stream in Hilo. [Pukui 1983:166]

3.3.2 *‘Ōlelo No‘eau* #1552

The following *‘ōlelo no‘eau* speaks of the adbundant breadfruit found in Pi‘ihonua:

> Ka ua hehi ‘ulu o Pi‘ihonua.
>
> *The rain that treads on the breadfruit leaves of Pi‘ihonua.*

Refers to Pi‘ihonua. [Pukui 1983:167]

3.3.3 *‘Ōlelo No‘eau* #1562

The following *‘ōlelo no‘eau* mentions the Kanielehua rain of Hilo.

Ka ua Kanilehua o Hilo.

The Kanilehua rain of Hilo.

Hilo, where the rain moistens the *lehua* blossoms. [Pukui 1983:168]

3.3.4 *‘Ōlelo No‘eau* #1658

The following *‘ōlelo no‘eau* mentions the Wailuku.

Ka wai lumaluma‘i kanaka o Wailuku.

The water of Wailuku where men were drowned.

Refers to Wailuku, Hilo, where victims were drowned to be offered in sacrifice at a nearby *heiau.* [Pukui 1983:179]

3.3.5 *‘Ōlelo No‘eau* #2596

The following *‘ōlelo no‘eau* speaks of the strong winds of Hilo called forth by La‘amaomao:

Pā mai, pā mai ka makani o Hilo ; waiho aku i ka ipu iki, hō mai i ka ipu nui.

Blow, blow O winds of Hilo, put away the small containers and give us the large one.

La‘amaomao, the god of wind, was said to have a wind container called Ipu-a-La‘amaomao. When one desires more wind to make the surf roll high, or a kite sail aloft, he makes this appeal. [Pukui 1983:285]

3.3.6 *‘Ōlelo No‘eau* #2609

The following *‘ōlelo no‘eau* references the streams of Hilo:

Pau ke aho i ke kahawai lau o Hilo.

One‘s strength is exhausted in crossing the many streams of Hilo.

Said of or by one who is weary with effort. First uttered by Hi‘iaka in a chant when she found herself weary after a battle with the lizard god Pana‘ewa. [Pukui 1983:287]

3.3.7 *‘Ōlelo No‘eau* #2612

The following *‘ōlelo no‘eau* highlights the blackened skies of Hilo.

Pāuli hiwa ka lani o Hilo.

Black with rainclouds is the sky of Hilo.

Sometimes said in humor when a dark-skinned person is seen. [Pukui 1983:287]

3.3.8 *‘Ōlelo No‘eau* #2631

The following *‘ōlelo no‘eau* mentions Ha‘akua, an area near the mouth of Wailuku River.

Piha ‘ōpala ke one o Ha‘akua.

The sand of Ha‘akua is filled with rubbish.

Said of one who is untidy, or who talks nonsense. Ha‘akua is under the Pu‘ueo end of the railroad bridge that spans the Wailuku River in Hilo, Hawai‘i. [Pukui 1983:289]

3.3.9 *‘Ōlelo No‘eau* #2679

The following *‘ōlelo no‘eau* references the rain of Hilo.

Pō Hilo i ka ua Kanilehua.

Hilo is darkened by the Kanilehua rain.

Said of one who is weighted by sorrow and grief. [Pukui 1983:293]

3.3.10 *‘Ōlelo No‘eau* #2737

The following *‘ōlelo no‘eau* mentions the Kanilehua rain of Hilo.

Pulu ‘elo i ka ua Kanilehua.

Drenched in the Kanilehua rain.

Drenched by the rain or thoroughly drunk. [Pukui 1983:300]

3.3.11 *‘Ōlelo No‘eau* #2835

The following *‘ōlelo no‘eau* references the Wailuku River from the story of Hi‘iakaikapoliopele.

Ua noi ke ao ua ‘ole.

Asked a rainless cloud.

Asked a favor of a hard person who refused to grant it. First uttered by Hi‘iaka, who asked two surly lizard gods to permit her and her friends to cross Wailuku River in Hilo. The request was refused and battle was offered instead. [Pukui 1983:311]

3.4 *Nā Mele* (Songs)

The following section draws from the Hawaiian art of *mele*, poetic song intended to create two styles of meaning:

> 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.
>
> 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]

A number of *mele* mention Hilo. These particular *mele* may also be classified as *mele wahi pana* (songs for legendary or historic places). *Mele wahi pana* 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]

3.4.1 Kimo Henderson Hula

The *mele* presented below was written by Helen Desha Beamer and was composed for James Kimo Henderson. *“Kimo o ka uka ‘iu‘iu,”* James of the Highlands, a reference to his birthplace of Scotland. Moanike‘ala was the name of his home in Pi‘ihonua and Leimakani the name of his wife (Huapala, n.d.).

Aia i ka uka o Pi‘ihonua	In the uplands of Pi‘ihonua
Ke kīhāpai pua ulumāhiehie	A flower garden in beautiful array
I laila au la ‘ike i ka nani	There I see the beauty
O nā pua ‘ala a he nui wale	Of the fragrant flowers in great profusion
Ho‘ohihi nā manu o ke kuahiwi	The birds of the forest are attracted here
Nā ‘i‘iwi maka pōlena	The yello eyed ‘i‘iwi
I ka ‘ono i ka wai o nā pua	At the sweet nectar of the flowers
O Moanike‘ala i ka uluwehiwehi	Of Moanike‘ala’s beautiful gardens

Mahalo iā ‘oe e ka hoa aloha	Thank you dear friend
I ka ho‘okipa e nā malihini	For gracious hospitality to visitors
Eia kō lei poina ‘ole	Here is your unforgettable, beloved
O Leimakani lei onaona	Leimakani, a lei so fragrant
Ha‘ina ‘ia mai ana ka puana	The story is told
Moanike‘ala i ka uluwehiwehi	Moanike‘ala, beautifully verdant
Hea aku mākou e ō mai ‘oe	We call, you answer
Kimo o ka uka ‘iu‘iu he inoa	Jim of the highlands, your song
	[Huapala, n.d]

Section 4 Historical Accounts

4.1 Pre-Contact to Early Post-Contact Period

Relevant to the present project are the geographic and ecological zone classifications for early historic-period land use, which are presented in the report. These five zone classifications (McEldowney 1979:64) are listed below:

I.	Coastal Settlement	20-50 ft in elevation	0-1.5 miles inland
II.	Upland Agricultural	50-1,500 ft in elevation	1.5-4.5 miles inland
III.	Lower Forest	1,500-2,500 ft in elevation	
IV.	Rainforest	2,599-5,500 ft in elevation	
V.	Subalpine/ Montane	Over 5,500 ft in elevation	

The coastal settlement zone contained both temporary and permanent habitations, with associated garden plots. The gardens were bordered by banana plants, sugarcane and *wauke.* Dry land taro, sweet potatoes and other vegetables were grown within the gardens. Groves of breadfruit and coconuts were interspersed between the houses and the gardens. Wetland taro was grown along the streams, along the coastal fishponds, and in the swampy land near the coast. The upland agricultural zone contained scattered agricultural features and some temporary residences. The main cultivated plants were dry land taro and bananas, with groves of *kukui*, *pandanus*, and mountain apples. The current project area is entirely within the lower bounds of the upland agricultural zone.

The lower forest was used to gather resources such as wood, bird feathers, fiber, and some food crops. The upland rainforest was used mainly by bird catchers to collect feathers and to gather other resources not available at the lower elevations. In the post-Contact era, the forest areas were also used for the collection of resources that could be sold as trade items to foreigners, such as sandalwood and *pulu. Pulu* is the soft substance at the base of *hāpu‘u* ferns, which was shipped to California to be used for furniture and mattress stuffing (Baxley 1865:596). In the sub-alpine zone, trails from one district to another are the major features.

The settlement pattern of the South Hilo area is best summed by Handy and Handy (1972) in their study on the traditional agricultural patterns of the Hawaiians.

> The population of Hilo was anciently as now concentrated mostly around and out from Hilo Bay, which is still the island’s principal port. […] In lava-strewn South Hilo there were no streams whose valleys or banks were capable of being developed in terraces, but [taro] cuttings were stuck into the ground on the shores and islets for many miles along the course of the Wailuku River far up into the forest zone. […] on the lava–strewn plain of Waiakea and the slopes between Waiakea and the Wailuku River, dry taro was formerly planted wherever there was enough soil. [Handy and Handy 1972:538–539]

In the pre-Contact period, the area around Hilo Bay was densely inhabited. Ross Cordy (2000) describes the settlement pattern of this area:

> Here [Hilo Bay] houses and heiau were concentrated in clusters near the sandy shore amidst groves of breadfruit, bananas and coconuts, and houses were also scattered inland for 3-6 miles. Dryland fields of kalo [taro] and sweet potatoes were around these houses and extended slightly farther inland. Kipikipi wet kalo fields and fishponds were along the Waimoa and Wailoa streams near the coastal houses. [Cordy 2000:45]

Handy (1940:125) describes the *kanu kipi* (Hilo name for mound taro patches; Pukui and Elbert 1971:143) method as planting taro on mounds (*kipi*) built on the bottom of the marshy lands along Hilo Bay. Handy also notes dry taro was planted along the fern-forest zone in the uplands above the bay.

The districts of Hilo and Hāmākua were once ruled by the descendants of paramount chief ‘Umi, who ruled from about AD 1600–1620 (Cordy 2000:464). He was married to the daughter of Kulukulua, chief of Hilo. After being held captive by his father-in-law in Hilo:

> […] ‘Umi and his companions returned to Hamakua and went down to Waipi‘o. There he conferred with his chiefs and his father’s old war leaders. It was decided to make war on the chiefs of Hilo and to go without delay by way of Mauna Kea. From back of Ka‘umana they were to descend to Hilo. It was shorter to go by way of the mountain to the trail of Poli‘au and Poli‘ahu’s spring at the top of Mauna Kea, and then down toward Hilo. It was an ancient trail used by those of Hamakua, Kohala, and Waimea to go to Hilo. They made ready to go with their fighting parties to Mauna Kea, descended back of Hilo, and encamped just above the stream of Waianuenue without the knowledge of Hilo’s people that war was coming from the upland. Hilo’s chiefs were unprepared.
>
> A certain fisherman of Pu‘ueo was at sea, catching nehu fish, and he noticed that the water in the ocean was dirty. He was surprised and guessed that there was war in the mountain, and it was that which caused the water to be so dirty. […] He did not stop to dry his nets, but cooked taro and some nehu fish, picked up his war spear, draped his cape of ti leaves over his back, and departed for the upland. The name of this man was Nau.
>
> When Nau arrived away up in the upland of Ka‘umana, he remained at a narrow pass, and the other side of it was the camp [of ‘Umi]. He sat on a flat stone beside the stream and after opening his bundle of nehu fish, ate some with the cooked taro (kuala) […] The spot in which he sat was comfortable and was in a depression. When someone on the other side reached out to go through, he was stabbed with a spear and fell over the cliff, dead. [Kamakau 1992:16, 17]

Nau kept the invading force at bay, killing 40 men, but at last one of ‘Umi’s warriors jumped over the cliff and killed the fishermen. There was no one to warn the people of Hilo about the invading army, and ‘Umi’s men were able to surround the chief’s house and destroy the chief and his men.

Many notable chiefs lived near Hilo Bay, including the chief Keawe-hano, who lived in Punahoa when Kahekili ruled Maui and Kahahana (1773–1785) ruled O‘ahu (Cordy 2002:19). There was one warrior named Kapohu was loyal to both chiefs. Kahekili had built a chief’s

house on Maui; only chiefs that paid their taxes in feather capes and bird feathers could enter this house. To gain the favor of the Maui king, Kapohu and his friend, Ka-‘akakai, traveled to Hawai‘i to obtain bird feathers. They landed at Kohala, and then split, one traveling around the island by way of Hāmākua and one by way of ‘Ōla‘a in Puna. Ka-‘akakai reached the Hilo area first and made friends with the Hilo chief Keawe-hano, living at the beach of Punahoa, opposite the surfing areas of Huia in Pi‘ihonua and Hikanui at Punahoa (Kamakau 1992:130). When Kapohu reached Punahoa, he saw the chief and his friend sitting outside a house, each wearing a feather helmet, necklace, and feather cape. Kapohu chanted to the chief, and the chief asked him to enter, to the dismay of his friend, Ka-‘akakai (Kamakau 1992:129–131). While entering, Kapohu chanted,

A Kahuku i Ola‘a	From Kahuku to Ola‘a [I have traveled],
Ka uka i Pana‘ewa,	To the uplands of Pana‘ewa
Ka uka o Haili,	To the uplands of Haili
Kapili manu e,	To catch birds with lime,
Kawili manu e,	To catch birds with snares,
Kololio manu e,	To catch birds with lines,
Wiliwili manu e,	To twist the neck of birds,
O ka hulu o ka manu,	For their feathers,
‘Ahu‘ula mai no,	[Give me] a feather cape,
Mahiloe mai no,	[Give me] a feather helmet,
Hulikua mai no	[Give me] a feather necklace.

[Original Hawaiian text from *Ka Nupepa Ku‘oko‘a,* 16 March 1867; translation in Kamakau 1961:131]

To these words Keawe-hano responded, ‘Here is your feather necklace, here is your feather helmet, but the cape you two shall share!’ No sooner had he uttered the word share (*mahele*) than Ka-pohu reached for a corner of the feather cape that Ka-‘akakai was wearing and drew it over his own shoulders, leaving Ka-‘akakai without any. [Kamakau 1992:131]

This story emphasizes the importance of feather collecting in the Hilo area. Soehren’s list of place names in Pi‘ihonua Ahupua‘a mentions a *heiau* (temple) called Papio (Ulukau 2014). According to Thrum, this *heiau* was located “back in the forest,” and was “a *heiau* for canoe builders and bird catchers” (Thrum 1908:40). The tale also identifies the name of a noted surfing area, called Huia, off the Pi‘ihonua shore.

Early Hawaiian scholars began collecting and writing about Hawai‘i’s history in the mid-1800s. John Papa ‘Ī‘ī describes events that occurred in the Hilo region during the life of Kamehameha I:

> Alapai, ruler of Hawaii [from 1730–1754] and great uncle of Kamehameha, and his wife Keaka took charge of him [Kamehameha]. Some years later, Alapai and his chiefs went to Waiolama in Hilo, where Keoua Kupuapaikalani, the father of

> Kamehameha, was taken sick and died. Before Keoua died he sent for Kalaniopuu, his older half brother and the chief of Kau, to come and see him. Keoua told Kalaniopuu that he would prosper through Kamehameha's great strength and asked him to take care of the youth, who would have no father to care for him. Keoua warned Kalaniopuu, saying, 'Take heed, for Alapai has no regard for you or me, whom he has reared.' After this conversation, Keoua allowed his brother to go, and Kalaniopuu left that night for Puaaloa [situated in the *ahupua‘a* of Waiākea, in the area called Pana‘ewa].
>
> As Kalaniopuu neared Kalanakamaa [in Waiākea], he heard the death wails for Keoua and hastened on toward Kalepolepo [between Mohouli and Kāwili] where he had left his warriors. There they were attacked by Alapai's men, who had followed Kalaniopuu from Hilo. First the warriors from the lowland gained, then those from the upland […] Kalaniopuu continued his journey, and at midnight reached Puaaloa, where he arranged for the coming battle. The next day all went as he had planned; his forward armies led the enemy into the forest of Paieie, where there was only a narrow trail, branchy on either side and full of undergrowth. There his men in ambush arose up against the enemy warriors, and his rear armies closed in behind them […]
>
> When news reached Alapai that his warriors had been destroyed, he sent another company of warriors to meet Kalaniopuu at Mokaulele on the outer road, which was an ancient road, known from the time of remote antiquity. [Ī‘ī 1959:3-4]

According to Kelly et al. (1981:3), the lands fronting Hilo were portioned off into named land sections, consisting of the *ahupua‘a* of Pu‘u‘eo, Pi‘ihonua, Punahoa, Ponahawai, Kūkūau and Waiākea although it is not known when or by what chief. It is assumed that this had been accomplished by the late sixteenth or early seventeenth century.

Samuel Kamakau recorded the events occurring in Hilo during the life of Kamehameha I, and he identified the location of the death of Keōua, father of Kamehameha:

> […] Keoua, called Ka-lani-kupu-a-pa-i-ka-lani-nui, fell ill of a lingering sickness at Pi‘opi‘o [the site of the present Kamehameha Statue in Hilo, see present Figure 11] adjoining Wailoa in Waiakea and died there in 1752. […] His older brother Ka-lani-opuu was with his kahu [guardian-attendant] Pua, above Kalepolepo at the time. [Kamakau 1992:75]

Following the death of Kalani‘ōpu‘u in 1782, the island of Hawai‘i was to be ruled by Kīwala‘ō, Kalani‘ōpu‘u's son. The god Kūka‘ilimoku was given to Kamehameha I. Disagreement arose about the division and redistribution of land in the Hilo District. The *ahupua‘a* of Waiākea and Ponahawai were among the contested lands:

> Keoua Kuahu-‘ula heard that the land was being divided. He was a twin son of Ka-lani-‘opu‘u, his twin brother being Keoua Pe‘e-‘ale. The beautiful chiefess Kane-kapo-lei was their mother. Keoua was a handsome man, tall and broad of body, with fine features: a distinguished looking figure with strands of hair so long that they hung down his back. That day about nine o'clock he came to the ruling chief, Kiwala‘o, and said, 'Are Ola‘a and Kea‘au ours?' The chief

> answered, ‘They have been given away; they are not ours.’ ‘How about Waiakea and Ponahawai?’ ‘They have been given away; they are not ours.’ [Kamakau 1992:119–120]

After the death of Kīwala‘ō, the island of Hawai‘i was controlled by three chiefs: Keawema‘uhili controlled Hilo and Hāmākua; Kēoua-kū‘ahu‘ula controlled and resided in Ka‘ū; and Kamehameha controlled Kohala and Kona. Kēoua divided the lands of Hilo District between his chiefs and warriors, and “the fat Mullet of Waiakea and Pi‘opi‘o became theirs” (Kamakau 1992:152).

Keawema‘uhili ruled out of Hilo Bay as chief of the Hilo District, dating back to the reign of his brother Kalani‘ōpu‘u. It is likely that the center of rule was at Waiākea Ahupua‘a in Hilo Bay. It was probably the same center of court used by previous rulers and by Kamehameha after unification of the island in 1791.

Once Kamehameha had full control of Hawai‘i Island, Kamehameha planned to invade the neighboring islands. Kelly et al. (1981:8) believes that “[…] An important part of his preparation was the building of war canoes, and for this Hilo seems to have become his headquarters for considerable periods of time.”

When Captain George Vancouver, in his ships the *Discovery* and the *Chatham*, visited Hawai‘i in 1793, they first met up with Kamehameha at Hilo Bay, as he was at that time residing at Waiākea to preside over the Makahiki festival (Menzies 1920:140–141). In 1795, Kamehameha sailed from Hawai‘i to O‘ahu for further conquests. According to John Papa ‘Ī‘ī (1959:15), Kamehameha had to quickly return to the island of Hawai‘i to quell a rebellion. Namakehā, a Maui Chief living in Ka‘ū, fomented a rebellion amongst the people of Ka‘ū, Puna, and Hilo. In 1796, Kamehameha returned to Hawai‘i and defeated Namakehā in a battle at Kaipalaoa (‘Ī‘ī 1959:15–16). Kaipalaoa, which literally means “whale sea” (Pukui et al. 1974:70), was an ancient surfing area in Pi‘ihonua at what is now the base of Waiānuenue Avenue. Namakehā’s body was sacrificed by Kamehameha on the *heiau* of Kaipalaoa (Kamakau 1992:174). It has been theorized that the correct name of this *heiau* is “Pinao” (Desha 2000:450). This was the name of the *heiau* where the famous Naha stone was situated. Pinao literally translates as “dragonfly” (Pukui et al. 1974:185).

After Kamehameha’s death, the lands of Hilo, which include Pi‘ihonua, Punahoa, and Waiākea, were given to his son Liholiho (Kamehameha II), heir to the kingdom. When Liholiho was born in 1797, “he was taken to the heiau of Kapailaoa, and the sacred rite of the cutting of his navel cord was performed by the kahuna” (Kamakau 1961:220). The *‘ili kūpono* of Pi‘opi‘o was granted to his most favored wife Ka‘ahumanu. His chief advisors, John Young and Isaac Davis, were given Kūkūau ‘Ekahi and Kūkūau ‘Elua (the *ahupua‘a* adjacent to the southern border of Ponahawai). Another favored wife, Kaheiheimalie, was given the *ahupua‘a* of Pu‘ueo. Kamehameha gave Ponahawai Ahupua‘a to his warrior chief Keawe-a-heulu (Kelly et al. 1981:11).

4.1.1 Missionary Accounts of Hilo

In April 1822, members of the London Missionary Society came to Hawai‘i via Tahiti, among them a Tahitian convert named Auna. He was the first missionary to preach in Hilo (Kelly et al. 1981:26). The delegates from the society were hosted by Queen Ka‘ahumanu and her husband

Kaumuali‘i, who were making a tour of the Islands. The delegates landed in Hilo Bay on 28 May 1822. Auna recorded in his diary the following observation of Hilo.

> Tues. 28th […] we went on shore at a place called Nukukamanau [Ka-nuku-o-ka-manu], by the side of a very large and rapid stream of water. The place appeared well covered with trees and there was a great deal of taro under cultivation. The houses were thick, and the people very many[…] [Auna, in Kelly et al. 1981:27]

The Reverend Ellis, with three American missionaries, returned to Hilo in July and August of 1823 during a walking/canoe tour of the island. Ellis' party was in Hilo for five days in August, staying in a house at Waiākea provided for them by the *konohiki* (land steward), Ma‘alo. They preached at Waiākea, Ponahawai, and Pu‘u‘eo to more or less responsive audiences (Ellis 1963: 213–229). In Waiākea at the east end of Hilo Bay, Rev. Ellis recorded his impressions of South Hilo:

> The face of the country in the vicinity of Waiakea is the most beautiful we have yet seen […]
>
> The light and fertile soil is formed by decomposed lava, with a considerable portion of vegetable mould. The whole is covered with luxuriant vegetation, and the greater part of it formed into plantations, where plantains, bananas, sugar-cane, taro, potatoes, and melons, grow to the greatest perfection. […]
>
> We thought the people generally industrious; for in several of the less fertile parts of the district we saw small pieces of lava thrown up in heaps, and potato vines growing very well in the midst of them, though we could scarcely perceive a particle of soil. [Ellis 1963:238–239]

The pioneer company of missionaries, sponsored by the American Board of Commissioners for Foreign Missions in New England, arrived in Hawai‘i in 1820 aboard the brig *Thaddeus*. With the consent of Liholiho (Kamehameha II) and his chiefs, a missionary couple from the first company of missionaries, Samuel and Nancy Ruggles, and Joseph and Martha Goodrich, a couple from the second company of missionaries, which arrived in the island in 1823, were allowed to set up a new mission in Hilo on the island of Hawai‘i. Hiram Bingham, pastor of Kawaiaha‘o Church in Honolulu relates the first days of this new mission:

> […] the mission took a station there [Hilo] in the early part of 1824. To accomplish this at some sacrifice, Mr. and Mrs. Ruggles, freely leaving Kauai, where they had happily labored three years, and Mr. and Mrs. Goodrich, of the reinforcement, were associated and employed to commence the new station at Waiakea, central for the large districts of Hilo and Puna, which extend along the seaboard about eighty miles. They embarked from Honolulu about the middle of January, on board the schooner *Waterwitch*, a vessel of thirty tons, owned by J. Hunnewell, Esq., who kindly volunteered to accompany them, and navigate the vessel for them. They were accompanied by Dr. and Mrs. Blatchley, for a temporary stay, by Messrs. Ellis and Chamberlain, on a missionary excursion, and Mr. and Mrs. Ely, bound to Kona. […]
>
> They anchored in Hilo bay about sun-set, and landed before dark with a few necessary articles. They at once prepared their lodging in a large thatched

> building, seventy feet by thirty, designed as a shelter for canoes, timber, and other articles, and, by order of the chiefs at Oahu, appropriated to their use. It was without floor, partitions, or windows; and though the canoes were removed, a large pile of long timber still occupied the central part of the building, near the rude posts that supported the ridge-pole. […]
>
> The next day, the duties of preaching and public worship engaged their attention. To favor this, Kaahumanu had offered the use of another building of similar structure. It was well filled by the people and missionary company, to whom Mr. Ellis preached. In the midst of the service, a large pet hog, black and fat, asserting equal or superior right to occupancy, marched in, swinging her head armed with huge tusks. The native crowd, not daring to resist her, gave way, forcing the preacher and his friends from their position. The murmurs of surprise and apprehension among the natives rose to boisterous shouting, and the congregation, retreating through the great doors at each end, left the hall of audience to the persecuting beast, whose rights were regarded, by high and low, as superior to those of the people, having been tabued, and often fed from the mouth of a native. Her feeder, more bold or skilful than the rest, approached the animal, and by repeated, gentle passes of the fingers on her bristly back, composed her to a sort of mesmeric sleep, more easily than leviathan is tamed. The congregation then resumed their places, and the preacher was allowed to finish his discourse. This hog was a tabu, pet of Queen Kaahumanu, and bore her name. [Bingham 1847:207–208]

The mission did not prosper at first and the natives seemed indifferent to the sermons of Ruggles and Goodrich. This changed in late 1824, when the high chiefess Kapi‘olani came to Hilo to help the missionaries. Mr. Goodrich met her party at the Kīlauea Volcano, where Kapi‘olani descended into the crater, defying the priest of Pele. She returned with Goodrich to Hilo and stayed for ten days. After that, the missionaries had greater success in converting the Hawaiians to Christianity (Kamakau 1992:379–385). In 1825, Ka‘ahumanu visited the mission, and gave the land of Punahoa 2 for the use of the mission (Kelly et al. 1981:36). The ownership of this land was confirmed in 1849 during the Māhele and listed as Land Commission Award 387. The missionaries used this land to raise goats and cultivate vegetables so they could furnish their own food. Goodrich also experimented with making sugar and molasses from sugarcane at his own small mill (Goodrich 1829 in Kelly et al. 1981:36).

Other visitors to the mission included Kamehameha III, who visited several times between 1828 and 1830, and Kuakini, governor of Hawai‘i, in 1829. Kuakini helped the missionaries build a church near the coast and helped plan for a saw mill at the forest edge. This saw mill was erected by a group of foreigners who also sold beef, from the wild cattle in the mountains, to the missionaries (Lyman 1970:59).

The Reverend David Beldon Lyman and his wife Sarah Joiner Lyman were members of the Fifth Company of missionaries. They arrived in Hilo, Hawai‘i in 1832 and were stationed at Hilo until their deaths. They were joined in 1835 by Reverend Titus Coan, who converted hundreds of natives during “The Great Revival.” In the 1830s, the Reverend Lyman founded the Hilo Boarding School for Hawaiian Native Boys, which was built about half the way between the

coast and the Hāla‘i Hills. Henry Lyman, the son of Reverend David Lyman, remembered the Hilo Boarding School.

> […] a large thatched building of native construction was erected for the accommodation of the boarding school. Its pupils numbered thirty-five [in 1836] of the brightest Hawaiian boys, chosen from the different primary schools over the whole island. They lived in the big schoolhouse where they were taught by my parents; but their mornings and evenings were spent in manual labor on a little farm nearby, where they raised the vegetables that formed the greater part of their daily food. [Lyman 1906:21–22]

4.1.2 Early Foreign Visitors to Hilo Bay

In 1824, the English ship HMS *Blonde* traveled to Hawai‘i to return the bodies of Liholiho and Kamāmalu, the king and his wife, who had died on a visit to London. On a tour of the Islands, the *Blonde* anchored in Hilo Bay, which was then renamed Byron Bay for the ship’s commander, Lord Byron. The ship’s company stayed at the village of Waiākea for about three weeks. On their departure, Lord Byron noted,

> Byron Bay will, no doubt, become the site of the capital of Hawaii. The fertility of the district of Hido [*sic*] […] the excellent water and abundant fish-pools which surround it, the easy access it had to the sandal-wood districts, and also to the sulphur, which will doubtless soon become an object of commerce, and the facilities it affords for refitting vessels, render it a place of great importance. [Byron 1826:192–193]

Another member of the expedition, Charles Stewart, noted the upland agricultural area, the zone the project area is located within, was open grassland, with interspersed houses and gardens.

> For the first four miles the country was open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, pandanus, and plane tree. We then came to a wood, about four miles in length. [Stewart 1970:369]

Captain Charles Wilkes, of the U.S. Exploring Expedition, stopped at the Hawaiian Islands between 9 December 1840 and 5 March 1841. One of the goals of this scientific expedition was to ascend to the top of Mauna Loa to observe the volcano. To carry out this goal, they anchored at Hilo Bay, which Wilkes described as follows:

> The scene which the island presents as viewed from the anchorage in Hilo Bay is both novel and splendid: the shores are studded with extensive groves of cocoa-nut and bread-fruit trees, interspersed with plantations of sugar-cane; through them, numerous streams are seen hurrying to the ocean; to these succeeds a belt some miles in width, free from woods, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their character from the vegetation of the tropics to that of polar regions; and above all tower the snow-capped summits of the mountains. [Wilkes 1849:143]

4.1.3 Early Foreign Residents and Merchants, 1790-1880

In the late 1700s and early 1800s, ships involved in the trade between the fur outposts of the Northwest coast and the markets of China and the Far East stopped in the Hawaiian Islands to get food, fresh water, salt, and other supplies needed for the long voyage ahead. This limited exchange began to change when sandalwood was discovered on the forest slopes of the islands, in 1790 or earlier (Kuykendall 1938:85). Soon sandalwood became an important export item for the island, gathered by the people for the great chiefs to pay off their debts to foreign traders. Ellis saw one of these early sandalwood expeditions returning from the mountain above Hilo in 1823 under the *konohiki* Ma‘alo. Presumably the sandalwood would have been transferred to a ship anchored off Hilo Bay at Waiākea.

> During the same journey we overtook Maaro, the chief of Waiakea, and three or four hundred people, returning with sandal wood, which they had been cutting in the mountains. Each man carried two or three pieces, from four to six feet long, and about three inches in diameter. […]
>
> It is sold by weight, and the merchants, who exchange for it articles of European or Chinese manufacture, take it to the Canton market, where it is bought by the Chinese for the purpose of preparing incense to burn in their idol temples. [Ellis 1963:214–215]

Supplying foreign ships with food and water continued when whaling ships began to visit the Islands. The earliest foreign-born merchants of Hilo town were established to cater to this trade. Sometime after the Wilkes expedition in 1838, Henry Lyman was out walking with his father, the missionary David Lyman, and met some interesting early residents of Hilo:

> Here we were welcomed by a short, stout, gray-headed old gentleman, whose kindly features were handsomely set off by an elegant pair of white mutton-chop whiskers. This was Mr. Benjamin P. [Pitman], formerly a resident of Boston, who, years before, left his home to seek a fortune among the merchants of Canton. For some reason, after a time he ceased writing to his family; and his wife, naturally growing anxious, sent their only son, Benjamin, Jr., to find out what had become of his father. Arriving in the Orient, he learned that his parent had gone to the Sandwich Islands; and accordingly he followed him thither. There he discovered the old gentleman, but was unable to dislodge him from the tropical paradise in which he was established. The young man, being only nineteen or twenty years old, also soon yielded to the charm of the place, forgetting the maternal home, and marrying a handsome young Hawaiian princess, who made for him an excellent wife and mother of his children. The father and son, not long before the visit of Commodore Wilkes, opened a little shop for the sale of general merchandise; and having the haole field to themselves were very successful in trade. [Lyman 1906:68–69]

Samuel Hill traveled to Hawai‘i on the whaler *Josephine* in 1848 (Judd 1929:39), and stopped in Hilo to make an expedition to Kīlauea Volcano. On the way back, he noted the landscape on the lower slopes in back of the town. This would have been within the upland agricultural zone, possibly within or near the project area.

> […] it was not until near sunset that we discovered any signs of our approach to the little port of Hilo, when we came suddenly upon a piece of meadow land, on which were feeding several head of cattle, with letters marked upon their skins, which as plainly revealed the fact of their captivity as it assured us of the near termination of our journey. In another half-hour we opened a view of Byron's bay [Hilo Bay]; after which, we crossed some further meadow land, which brought us to the village of Hilo, seated upon the bay near the shore. The place appeared to consist merely of a few scattered huts, among which it was easy to distinguish the residence of an European; and we rode immediately up to that of Mr. Pitman, to whom I had brought the letter of introduction, and from whom we now met a hearty reception […] [Hill 1856:290]
>
> It [Hilo] consists, at present, of thirty or forty scattered huts, a Protestant church, a small Romish chapel, the dwellings of the missionaries, a school-house, and several houses belonging to Mr. Pitman, by whom all the proper commerce of the place is carried on. [Hill 1856:292]

Benjamin Pitman Jr.'s wife was the chiefess Kino‘ole-o-Liliha, whose father was the high chief Ho‘olulu, an uncle of Kamehameha I. She had extensive lands in ‘Ōla‘a and around Hilo (Pitman 1931). In addition to his wife's lands, Pittman purchased several other large tracts from Kamehameha III in 1846 and became the owner of a large area. Some of this land he rented to several Chinese entrepreneurs, who had come to Hilo to set up sugarcane fields and sugarcane mills. Henry Lyman, walking with his father in the late 1830s also met up with these Chinese on the Pitman lands.

> On another day, walking a little farther, we found the new road extended beyond a dense grove of breadfruit trees to a considerable enclosure where a number of thatched houses had been recently erected. Two or three almond-eyed gentlemen, with long braids of hair coiled about their heads, were persuading a yoke of half-tamed oxen to walk in a circle, dragging after them a beam that rotated three vertical wooden rollers, between which a native boy was insinuating slender stalks of sugar-cane drawn from a pile by his side […] This was the first sugar-mill established on the island of Hawaii. [Lyman 1906:70–71]

Samuel Hill also noted these early Chinese entrepreneurs on Pitman's estate.

> Mr. PITMAN introduced us, during our stay at Hilo, to a fine estate he had himself planted in the rear of the bay, […] We found the estate situated upon elevated ground, between one and two miles from the port, commanding a fine view of the bay and the ocean, and in the midst of a country still rising as it recedes from the shore, and comprehending one of the most fertile districts in the island. It produced chiefly sugar as an article of export, at present; but it was in a fair way of adding the profits of a large coffee plantation. [Hill 1856:303]
>
> Here our attention was arrested by the presence of two of the Chinese who were superintending the works, which led to Mr. Pitman informing us of the plan he had adopted in the management of his estate, and the especial use he was making of the yellow men. […] upon finding his estate wonderfully thriving under their [the Chinese] management, he had determined to go farther than this, and to give

> them a direct interest in its prosperity. […] he let his estate to the same men he had advanced from labourers to be overseers, at a fixed annual rent, from which arrangement he was reaping great benefit. [Hill 1856:305–306]

By 1839, Governor Adams Kuakini established a sugar plantation and constructed a sugar mill on Ponahawai Hill (historic name for Hāla‘i Hill) (Lum 1988:26). Sugarcane was planted on the Puna side of Hāla‘i Hills, within Ponahawai and Punahoa Ahupua‘a, reaching as far down as the present location of Kīlauea Avenue (Kelly et al. 1981:49). Early sugarcane mills in the Hilo area were run by several early Chinese "sugar masters" who settled in Hilo and married Hawaiian women. Peggy Kai (1974:45–53) has identified at least seven Chinese men who resided in Hilo before 1852. The sugar plantation and mill were a fairly small endeavor, but by 1851, about 20,000 pounds of sugar was produced on the 55-acre plantation (Kai 1974:61). The plantation was watered from an *‘auwai* that ran through the Hilo Boarding School grounds (Kai 1974:43).

Pitman left the Islands in 1860 to return to his home in Boston (Merry 2000:156). He sold much of his property, including the Hilo stores and his agricultural land, to a Mr. Thomas Spencer, a former ship's captain. Thrum (1924:123–126) reprints material from a pamphlet on this early Hilo resident, which was probably written by Thomas Spencer himself:

> Thomas Spencer […] Formerly carried on the ship-chandlery business in Honolulu, but is now in Hilo, having lately purchased a large estate at that place of B. Pitman, where he is extensively engaged in the country store line, having three or more stores. Is interested largely in pulu, and according to his own statement is making money fast. Attempted while in Honolulu to make himself popular through being noisy but failed in it and became notorious as a braggart, making a great cry and little wool. [Thrum 1924:123]

Thrum adds additional information on this Hilo sugar plantation:

> Among the lands Spencer acquired from Pitman was a tract under lease to the Chinese and planted to cane, known as the Amauulu plantation [in Pu‘ueo Ahupua‘a, north of Pi‘ihonua]. This eventually came under Spencer's control and gradually won him away from merchandising. Just when he withdrew from the store is not definite, but probably about 1870. […]
>
> On devoting himself to the sugar business, the old style system of Chinese mill and boiling-house work was done away with, grinding then being done by an overshot water wheel-and a new and modern plant of Watson's Scotch sugar machinery installed. Very naturally the name changed to Spencer's Plantation. [Thrum 1924:123–124]

4.1.4 The Māhele (1848)

The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—that introduced private property into Hawaiian society. In 1848, the Crown and the *ali‘i* received their land titles. *Kuleana* awards to commoners for individual parcels within the *ahupua‘a* were subsequently granted in 1850. The Crown Lands were considered the private lands of the monarch, and many lands were sold or mortgaged during the reigns of Kamehameha III and IV to settle debts to foreigners. To end this practice, the Crown Lands were

made inalienable in 1865, and their dispensation was regulated by a Board of Commissioners of Crown Lands, which effectively put them under the administrative control of foreign-born residents (Kame‘eleihiwa 1992:310). Before the passage of the Act of 3 January 1865, which made Crown Lands inalienable, Kamehameha III and his successors did as they pleased with the Crown Lands, selling, leasing, and mortgaging them at will (Chinen 1958:27).

In 1850, the Privy Council passed resolutions that affirmed the rights of the commoners or native tenants. To apply for fee-simple title to their lands, native tenants were required to file their claim with the Land Commission within the specified time period of February 1846 and 14 February 1848. The Kuleana Act of 1850 confirmed and protected the rights of native tenants. Under this act, the claimant was required to have two witnesses who could testify they knew the claimant and the boundaries of the land, knew that the claimant had lived on the land for a minimum of two years, and knew that no one had challenged the claim. The land also had to be surveyed.

Not everyone who was eligible to apply for *kuleana* lands did so and, likewise, not all claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. Out of the potential 2,500,000 acres of Crown and Government Lands, less than 30,000 acres of land were awarded to the Native Hawaiian tenants (Chinen 1958:31). It is through records for Land Commission Awards (LCAs) generated during the Māhele that the first specific documentation of life in Hawai‘i, as it had evolved up to the mid-nineteenth century come to light. Although many Hawaiians did not submit or follow through on claims for their lands, the distribution of LCAs can provide insight into patterns of residence and agriculture. Many of these patterns probably had existed for centuries past.

No *kuleana* LCAs were awarded to commoners in the vicinity of the project area suggesting that indigenous Hawaiian land use within the project area may have been limited.

4.1.5 Coffee Cultivation in Hilo

The first coffee trees in the Islands were planted by Don Paulo Marin on his O‘ahu estate in 1817. An attempt to grow the trees on a plantation was made by Mr. John Wilkinson in 1825 in Mānoa. Other early plantations were at Kona and Hilo on the island of Hawai‘i. Thrum (1876:46-47) comments on the successful growth by “[…] the Rev. Mr. Goodrich [the missionary] planting the first slips in Hilo, which grew luxuriantly in Hilo. This planting was probably near Goodrich’s house near Hilo town. It was soon decided, however, that coffee grew better at higher elevation. Thrum (1876:48) reports that at Hilo in 1847, a “Dr. Maxwell and Mr. Miller, officers of the U.S.S. *Cyane*, leased of the government 100 acres of the best land for fifty years for the purpose of establishing a coffee plantation, and were to commend operations within six months, but of any after result we have no information.” Another early coffee grower in Hilo was Mr. Pitman, who wrote a letter to the agricultural society in 1852 about the coffee blight of that year that was destroying the crop.

Samuel Hill, after observing Pitman’s sugarcane lands and mill in his 1848 visit, also toured his coffee plantings:

> From the sugar works we proceeded, still rising, towards the more elevated ground of the coffee plantation. Arrived here, we found ourselves at an elevation

> which on one side commanded a noble view of the sea beyond the bays with a portion of the coast, and on the other, the mountainous land in the interior of the island. A broad way conducted through an extensive plantation, sown with 22,000 young coffee trees, and producing a considerable number of breadfruit, and tall and fine tamarind, trees. The greater part of the coffee trees were very young, and were rearing beneath the broad leaves of the hardier plantain, which protected them from the too-scorching rays of the sun. [Hill 1856:317]
>
> The government began to sell land to homesteaders in the 1880s, and coffee was grown on many of these homesteads. However, the coffee industry of Hilo could not compete with similar growers in the Kona region, and coffee operations in Hilo declined between 1905 and 1937. These independent homesteaders would soon be swallowed by larger companies, who uprooted the coffee trees to plant the new king crop, sugar. [Cordy 1977:4]

4.1.6 Large-Scale Sugar Cultivation

In 1880, Claus Spreckels, known as the “Sugar King,” entered into a partnership with William Irwin to form the Hilo Sugar Company. They bought a number of small parcels near Hilo, including lands in Punahoa and at the base of Mauna Kea. In 1884, they added the lands of Spencer’s Plantation and the Wainaku Plantation to their own. At its greatest extent, the plantation was 4,800 acres in size; some of the land was leased to individual sugarcane growers living in the Hilo area (Dorrance and Morgan 2000:102–103).

Sugarcane plantations belonging to other companies were also present in the Hilo area around the turn of the century. The Waiakea Sugar Company and Hawaii Mill Company are known to have had plantations in upland Hilo. The extensive sugarcane production in the Hilo area meant an influx of workers, and camps sprung up off of plantation roads. Some of these camps were essentially small villages, complete with schools and shops of their own. In addition, the government began to sell plots of land to private owners (Hawaiian Legislature 1917:384). These plots were classified as “Pi‘ihonua house lots,” and six of the eight Land Grants existing at the current project area were noted as being such.

In 1910, C. Brewer & Company became the agent for the Hilo Sugar Company. After World War II, the residential areas of Hilo began to further expand, and in 1965, C. Brewer & Company sold the sugarcane fields around Hilo, and merged their remaining agricultural lands with the Onomea Sugar Company to form the Mauna Kea Sugar Company. Production of sugarcane in the Hilo area ended in 1994, when the Hilo Coast Processing Company, a subsequent company of several merged plantations, shut down (Dorrance and Morgan 2000:104–105).

4.1.7 The Hilo Forest Reserve

The following information can be found on the Hawai‘i State Department of Forestry website:

> The Forest Reserve System was created by the Territorial Government of Hawai‘i through Act 44 on April 25, 1903. With Hawaii’s increase in population, expanding ranching industry, and extensive agricultural production of sugarcane and later pineapple, early territorial foresters recognized the need to protect mauka (upland) forests to provide the necessary water requirements for the lowland agriculture demands and surrounding communities.

> With its inception, the Forest Reserve System (FRS) represented a public-private partnership to protect and enhance important forested mauka lands for their abundance of public benefits and values. Though this original partnership has evolved over the decades, today the tradition is carried on by the Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) for public Forest Reserve lands. [Hawai‘i State Department of Forestry 2021]

Shortly after the inception of the Forest Reserve System, the Hilo Forest Reserve was created. The commercial success of coffee and sugar in the late nineteenth century in Hilo had some looking at the forest itself as a potential source of capital. It was quickly decided that a timber industry would do extensive damage to the Hilo watershed. A report of the Division of Forestry in 1906 argued that the forest of Pi‘ihonua “protects one of the most important springs in the territory—the Wailuku River,” recommending that the forest not be lumbered (Division of Forestry 1906:19–20). The report goes on to explain,

> […] the water from this reserve is of great importance to all the plantations along the coast, being at present used for the most part for fluming cane to the mill. From the character of the country many of the streams could be utilized for the production of power. This will be an important consideration when the Hilo District comes to be developed, as it is sometime bound to be. The object of the Hilo Forest Reserve is to protect the sources of this important water supply. [Division of Forestry 1906:25]

Section 5 Previous Archaeological Research

5.1 Previous Archaeological Research

Eight previous archaeological studies have been identified in the vicinity of HMC and the current project area. These studies are presented on Figure 5 and summarized in Table 2. Archaeological sites situated within 600 m of the current project area, documented by these prior investigations or in paperwork filed at the SHPD offices, are shown in Figure 6 and described in Table 3. Notably, the current project area is shown in relation to the site of the old Hilo Hospital (State Inventory of Historic Places [SIHP] # 50-10-35-07450) at TMK: [3] 2-3-26:008, adjacent to Rainbow Falls.

Table 2. Previous archaeological studies in the vicinity of the area

Reference	Type of Study	Location	Results (site numbers prefixed SIHP # 50-10-35 unless otherwise noted)
Sinoto 1978	Archaeological reconnaissance survey	Approx. 117 acres in Kaumana area of Hilo	Documented six clusters of features (later assigned collectively as SIHP # 50-10-34-18696) including stone terraces, mounds, platforms, alignments, stone reinforced stream banks, walls, *‘auwai, ahu* (cairn), and enclosures; interpreted as a single site complex of pre-Contact agricultural and historic ranching features
Kennedy 1992	Archaeological inventory survey	482.4 acres in Pu‘u‘eo, TMKs: [3] 2-6-008: 026, 027, 028, 029, 031, 032, 033, 035, 036, 037, 038, 039; 2-6-029:009, 010, 011, 012, 014, 015	Documented a single stone mound assessed as a possible burial (SIHP # -18074); mound not tested due to its location in a conservation zone and to avoid unnecessary disturbance
Spear 1992	Archaeological inventory survey	Approx. 12 acres in Pi‘ihonua, TMK: [3] 2-3-032:001B	Documented two historic-era sites: SIHP # -18443, stone cattle ranching wall; and SIHP # -18444, retaining wall for water control associated with sugarcane cultivation or cattle ranching
Spear 1993a	Archaeological inventory survey	Approx. 9.5 acres in Pi‘ihonua, TMKs: [3] 2-3-031:001 and 2-3-032:001	No historic properties identified
Spear 1993b	Archaeological inventory survey	Approx. 5 acres in Pi‘ihonua, TMK: [3] 2-3-032:004	Documented two historic-era sites: SIHP #s -19036 (remnant Portuguese oven) and -19037 (historic dump site)

Reference	Type of Study	Location	Results (site numbers prefixed SIHP # 50-10-35 unless otherwise noted)
Walker and Rosendahl 1996	Archaeological assessment study	Seven discrete locations in Pōnahawai, Pi‘ihonua, and Waiākea, TMKs: [3] 2-2-015:033; 2-3-032:001; 2-3-036:003; 2-4-001:012; 2-4-049:018, 019; 2-4-057:001; 2-6-015:001, 002; 2-6-016:002; (current project area in proximity to Site F, approx. 42.3 acres at TMK: [3] 2-3-032:001)	Documented four previously identified historic properties (SIHP #s -19431 through -19434) and one newly identified historic property (SIHP # -21133), all located outside Site F and well away from current project area
Rechtman 2004	Determination of no historic properties affected	Approx. 4 acres in Pi‘ihonua, TMK: [3] 2-3-032:001 por.	No historic properties identified
Rechtman and Clark 2005	Determination of no historic properties affected	Approx. 5.4 acres in Pi‘ihonua, TMKs: [3] 2-3-032:006, 007, 008	No historic properties identified

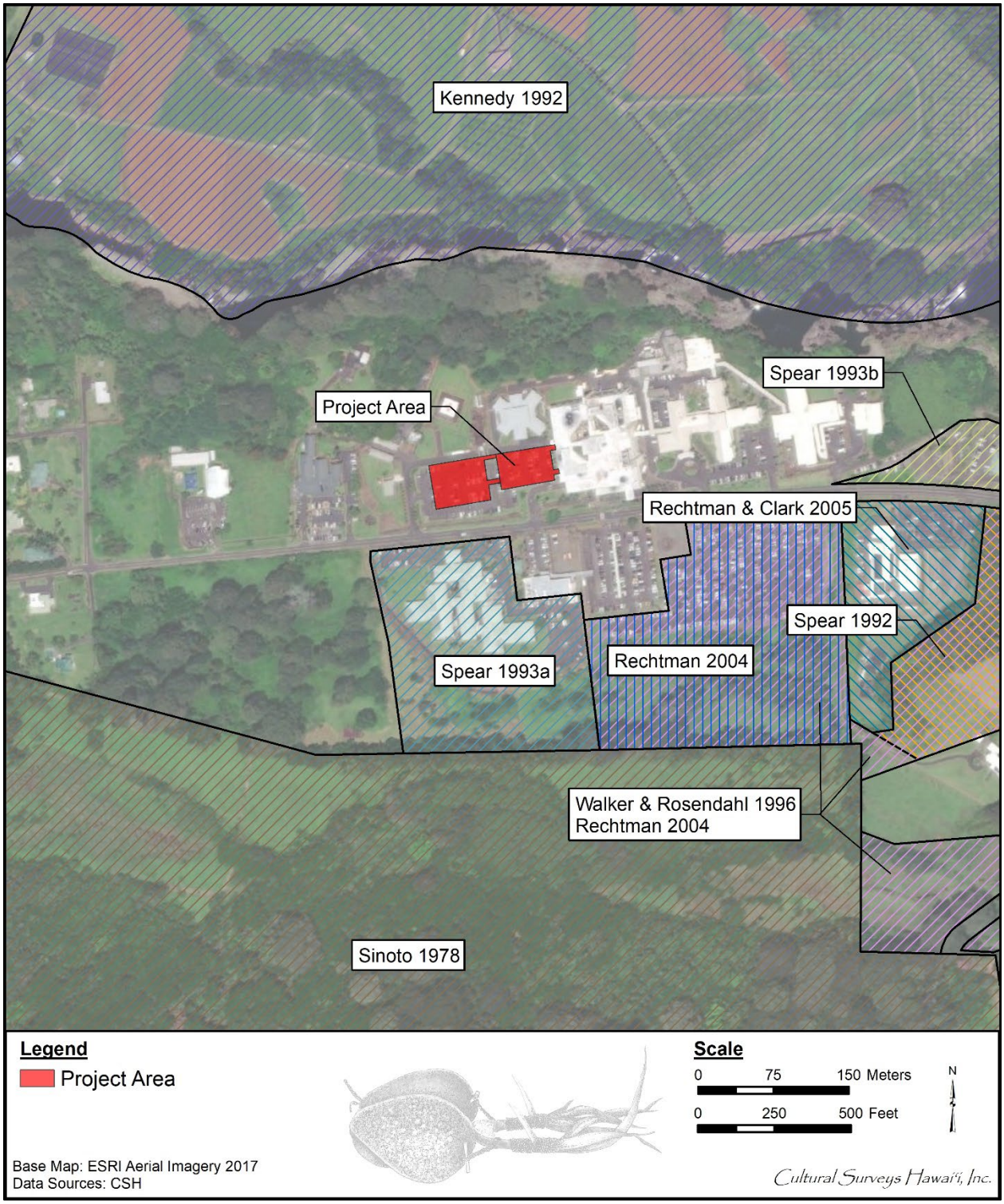

Figure 5. Aerial imagery (ESRI 2017) showing the location of previous archaeological studies in the vicinity of the HMC Expansion project area

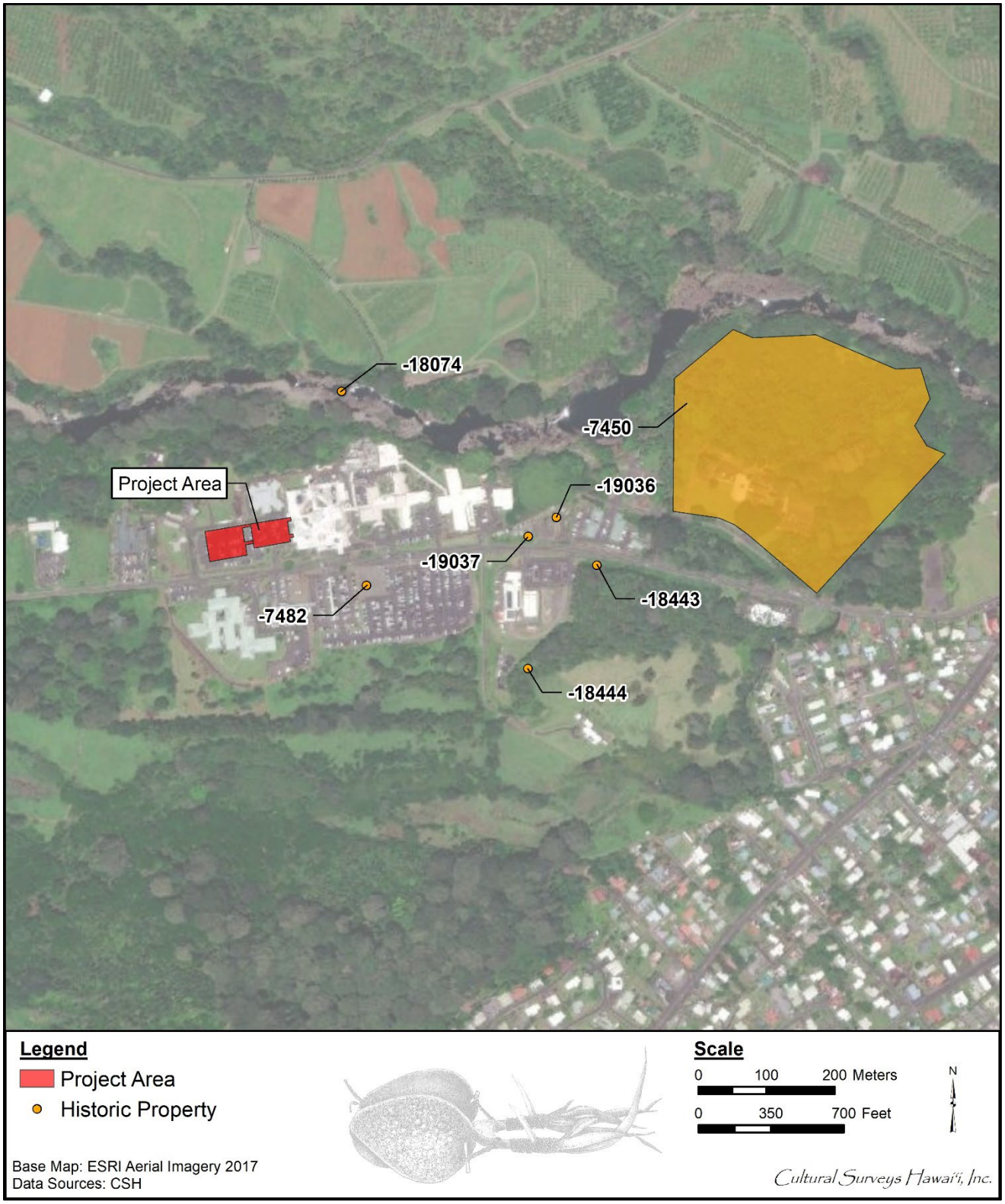

Figure 6. Aerial imagery (ESRI 2017) showing the location of previously documented historic properties in the vicinity of the HMC Expansion project area

Table 3. Previously documented historic properties within 600 m of the project area

SIHP # (50-10-35)	Site Type/ Name	Site Function	Site Age	Previous Documentation	Condition/Notes
-7450	Old Hilo Hospital	Hospital	Historic	SHPD Records	Buildings still present; current condition and use unknown
-7482	Portuguese oven	Food production	Historic	SHPD Records	Preserved within HMC parking lot across Waiānuenue Ave from project area
-18074	Stone mound	Possible burial	Possible early historic	Kennedy 1992	Unknown; likely intact
-18443	Wall	Agriculture	Historic	Spear 1992	Unknown; likely intact
-18444	Wall	Agriculture	Historic	Spear 1992	Unknown; likely intact
-19036	Portuguese oven	Food production	Historic	Spear 1993b	Unknown; parcel exhibits signs of development
-19037	Cultural deposit	Trash dump	Historic	Spear 1993b	Unknown; parcel exhibits signs of development

In 1978, the Bernice Pauahi Bishop Museum conducted an archaeological reconnaissance survey of 117 acres for a proposed Kaumana Springs Wilderness Park located between Waiānuenue and Ainako avenues, approximately 300 m south of the current project area (Sinoto 1978. Six major clusters of features were documented within the interior portion of the study area that had not been previously impacted by historic agricultural activity. These features included stone terraces, mounds, platforms, alignments, stone reinforced stream banks, walls, *‘auwai*, *ahu*, and enclosures presumably associated with pre-Contact agriculture and historic ranching. No portable artifacts were encountered. Sinoto (1978) comments on the distribution of the feature clusters:

> Although the clusters of sites appear as discrete, spatially isolated units, the sited areas are probably continuous and could be considered as components of a single extensive complex. The apparent discontinuity of sites as described in this report is primarily the result of the physical limitations imposed on the survey by dense vegetation cover. The false staghorn fern (Dicranopteris linearis) and wilelaiki (Schinus terebinthifolius Raddi), in particular, were often impenetrable and prevented continuous transects. Thus, more sites may be present within those areas that are densely vegetated […] Also, since the past alteration of land is clearly evident in the peripheral areas, additional, associated sites may already have been destroyed. [Sinoto 1978:3]

Rechtman and Clark (2005:9) note the complex of feature clusters was later assigned as SIHP # 50-10-34-18696. While the 1978 report assessed a low potential for further research, it recommended incorporation of the documented sites into the park for “public interpretation” (Sinoto 1978:4).

In 1992 Archaeological Consultants of Hawaii, Inc. conducted an archaeological inventory survey (AIS) of 482.04 acres located on the opposite (northern) side of Wailuku Stream from the current project area (Kennedy 1992).

The majority of the study area was found to be covered in sugarcane; signs of other prior disturbance associated with the Clem Akina Park and Amauulu Camp, a Japanese plantation camp, were also noted. Some other plantation-related infrastructure, such as wooden cane flume remnants, was observed but not recorded. A stone mound located near the northern bank of the Wailuku was assessed as a possible early historic burial and assigned as SIHP # 50-10-35-18074 (see Table 2). Because the site was within a conservation zone unlikely to be impacted by development, it was not tested for function to avoid unnecessary disturbance.

Also in 1992, Scientific Consulting Services (SCS) conducted an AIS of a 12-acre parcel situated approximately 500 m southeast of the current project area (Spear 1992). The AIS identified two historic-era stacked stone walls, which were assigned as SIHP #s -18443 and -18444 (see Table 2). The report concluded the SIHP # -18443 wall was likely associated with cattle ranching, and SIHP # -18444, situated along a stream channel, was used for water control associated with sugarcane cultivation or cattle ranching. No further work was recommended.

The following year SCS conducted an AIS of an approximately 9.5-acre area located across Waiānuenue Avenue from the current project area (Spear 1993a). The survey found no evidence of significant archaeological features. Except for a narrow and shallow drainage feature, the ground surface was very flat, implying potential prior ground disturbance.

Later in 1993, SCS carried out an AIS of approximately 5 acres located 450 m east of the current project area (Spear 1993b). The survey identified two historic-era sites: SIHP #s -19036, a remnant Portuguese oven and associated historic artifacts; and -19037, a historic dump site (see Table 2). Glass bottles found in association “with the oven suggest that it functioned around 1900” (Spear 1993b:15). The historic artifacts found within the dump site suggest deposition during the early 1900s, and any association with the oven is unclear. The sites were recommended for no further work.

In 1996 Paul H. Rosendahl Ph.D., Inc. (PHRI) conducted an archaeological assessment of seven potential locations throughout Hilo for a proposed Judiciary Complex, organized as Sites A–G (Walker and Rosendahl 1996); of these seven sites, one (Site F, 42.3 acres) is in proximity to the current project area. Based on past use of the 42.3-acre Site F for historic-era sugarcane cultivation, PHRI surveyed only 11% (approximately 4.6 acres) of the site, minimally overlapping with the Spear (1992) study area. While a handful of historic properties were documented within other project sites, none were encountered in Site F.

In 2004 Rechtman Consulting, LLC (RC) conducted an archaeological survey in support of a determination of project affect for a proposed expansion of the HMC facility located across Waiānuenue Avenue from the current project area (Rechtman 2004). The study area overlapped a portion of the area previously surveyed by Walker and Rosendahl (1996). Signs of prior ground

disturbance were observed throughout the study area, and no historic properties were encountered.

Most recently, in 2005 RC conducted an archaeological survey in support of a determination of project affect for a proposed expansion to the Arc of Hilo facility located across Waiānuenue Avenue from the current project area (Clark and Rechtman 2005). The property has been previously bulldozed and developed, and no historic properties were encountered.

Section 6 Community Consultation

6.1 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 Pi‘ihonua and the broader area of Hilo. CSH initiated its outreach effort in August 2021 through letters, emails, and/or telephone calls. To date, consultation efforts have yielded no results.

6.2 Community Contact Letter

Letters (Figure 7, Figure 8, and Figure 9) along with a map, an aerial photograph, and floor plans of the project were emailed with the following text:

> 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 Pi‘ihonua 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
>
> At the request of Munekiyo Hiraga on behalf of the Hawaii Health Systems Corporation, CSH is conducting a cultural impact assessment (CIA) for the Hilo Medical Center Expansion Project, Pi‘ihonua Ahupua‘a, South Hilo District, Hawai‘i Island, TMK: [3] 2-3-027:002 por. The location and boundaries of the proposed project are delineated on a map (Figure 1) and aerial photo (Figure 2) attached to this invitation. Hawaii Health Systems Corporation is proposing a new addition to the current Hilo Medical Center to be conducted in two (2) phases:
>
> Phase 1 Scope:
>
> The HMC Expansion Phase 1 project is approximately 18,900 SF to the existing 249,886 SF Hilo Medical Center which will be situated above the current location of the physician and visitor parking. The addition will be a separate structure, spread over 1 floor and connected to the existing building via pedestrian bridges/walkways and will require the redesigning of the existing ground floor physician and visitor parking. The expansion space is programmed for an 18-bed Intensive Care Unit with 2 enclosed stair shafts as means of egress and life safety requirements. Rooftop and ground floor mechanical and electrical spaces to include air handling units, domestic hot water, electrical rooms, medical, gas and miscellaneous infrastructure components.

PIIHONUA 5 - CIA for the Hilo Medical Center Expansion Project

Aloha mai kākou Name of Recipient,

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 Pi‘ihonua 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

At the request of Munekiyo Hiraga on behalf of the Hawaii Health Systems Corporation, CSH is conducting a cultural impact assessment (CIA) for the Hilo Medical Center Expansion Project, Pi‘ihonua Ahupua‘a, South Hilo District, Hawai‘i Island, TMK: [3] 2-3-027:002 por. The location and boundaries of the proposed project are delineated on a map (Figure 1) and aerial photo (Figure 2) attached to this invitation. Hawaii Health Systems Corporation is proposing a new addition to the current Hilo Medical Center to be conducted in two (2) phases:

Phase 1 Scope:

The HMC Expansion Phase 1 project is approximately 18,900 SF to the existing 249,886 SF Hilo Medical Center which will be situated above the current location of the physician and visitor parking. The addition will be a separate structure, spread over 1 floor and connected to the existing building via pedestrian bridges/walkways and will require the redesigning of the existing ground floor physician and visitor parking. The expansion space is programmed for an 18-bed Intensive Care Unit with 2 enclosed stair shafts as means of egress and life safety requirements. Rooftop and ground floor mechanical and electrical spaces to include air handling units, domestic hot water, electrical rooms, medical, gas and miscellaneous infrastructure components.

Phase 2 Scope:

The HMC Expansion Phase 2 project is approximately 43,000 SF connecting to Phase 1 with two pedestrian bridges/walkways. The Phase 2 addition, which will be situated above the existing visitor parking, will be a 3-story building with one floor dedicated to Family Birthing Center and the other floors for additional future programs to be determined by HMC.

The 12-bed Family Birthing Center will be located on the second floor of the Phase 2 addition and is comprised of 9 LDRP Rooms (6 LDRP and 3 isolation LDRP) as well as 3 patient Rooms that can be used for either Post-partum or Ante-Partum patients. There will also be an OR for Cesarean delivery which is designed for the performance of surgical deliveries and infant resuscitation / stabilization.

Similar to Phase 1, the rooftop and ground floor mechanical and electrical spaces to include air handling units, domestic hot water, electrical rooms, medical gas and miscellaneous infrastructure components. The Phase 2 addition will be self-supporting from a mechanical and electrical services standpoint that the existing central plant will remain un-encumbered by the addition.

Figure 7. Community consultation letter, page one

PIIHONUA 5 - CIA for the Hilo Medical Center Expansion Project

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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 Pi‘ihonua Ahupua‘a. This is accomplished through consultation and background research using previously written documents, studies, and interviews. This information will be used to assess potential impacts by the proposed project to the specific identified resources, practices, and beliefs in the project area and throughout Pi‘ihonua 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 Pi‘ihonua Ahupua‘a
- Your specific traditional cultural practice and its connection to the proposed project area and Pi‘ihonua 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 Pi‘ihonua Ahupua‘a
- Referrals to other *kūpuna*, *kama‘āīna*, and traditional cultural practitioners knowledgeable about the proposed project area and Pi‘ihonua 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 Pi‘ihonua Ahupua‘a
- Your knowledge of cultural sites and *wahi pana* (storied places) within the proposed project area and Pi‘ihonua 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 Pi‘ihonua 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 part of the public record; they will be available for future access through the Office of Environmental Quality Control

Figure 8. Community consultation letter, page two

PIIHONUA 5 - CIA for the Hilo Medical Center Expansion Project

Page 3

(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 Pi‘ihonua 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 CSH Cultural Researcher Chantellee Spencer by email at cspencer@culturalsurveys.com or phone at (808) 965-6478

Mahalo nui loa for your time and attention to this request for consultation.

Yours with much aloha and appreciation,

Chantellee Konohia Spencer

CSH Cultural Researcher

Figure 9. Community consultation letter, page three

Phase 2 Scope:

The HMC Expansion Phase 2 project is approximately 43,000 SF connecting to Phase 1 with two pedestrian bridges/walkways. The Phase 2 addition, which will be situated above the existing visitor parking, will be a 3-story building with one floor dedicated to Family Birthing Center and the other floors for additional future programs to be determined by HMC.

The 12-bed Family Birthing Center will be located on the second floor of the Phase 2 addition and is comprised of 9 LDRP Rooms (6 LDRP and 3 isolation LDRP) as well as 3 patient Rooms that can be used for either Post-partum or Ante-Partum patients. There will also be an OR for Cesarean delivery which is designed for the performance of surgical deliveries and infant resuscitation / stabilization.

Similar to Phase 1, the rooftop and ground floor mechanical and electrical spaces to include air handling units, domestic hot water, electrical rooms, medical gas and miscellaneous infrastructure components. The Phase 2 addition will be self-supporting from a mechanical and electrical services standpoint that the existing central plant will remain un-encumbered by the addition.

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 Pi‘ihonua Ahupua‘a. This is accomplished through consultation and background research using previously written documents, studies, and interviews. This information will be used to assess potential impacts by the proposed project to the specific identified resources, practices, and beliefs in the project area and throughout Pi‘ihonua 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 Pi‘ihonua Ahupua‘a
- Your specific traditional cultural practice and its connection to the proposed project area and Pi‘ihonua 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 Pi‘ihonua Ahupua‘a

- Referrals to other *kūpuna*, *kama‘āīna*, and traditional cultural practitioners knowledgeable about the proposed project area and Pi‘ihonua 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 Pi‘ihonua Ahupua‘a
- Your knowledge of cultural sites and *wahi pana* (storied places) within the proposed project area and Pi‘ihonua 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 Pi‘ihonua 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 part of the public record; they 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 Pi‘ihonua 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 CSH Cultural Researcher Chantellee Spencer by email at cspencer@culturalsurveys.com or phone at (808) 965-6478.

In most cases, two or three attempts were made to contact individuals, organizations, and agencies. Community outreach letters were sent to 16 individuals or groups with few showing interest.

6.3 Community Contact 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 contact table

Name	Affiliation	Notes
‘Aha Pūnana Leo		Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 September 2021
Anthony, ‘Iliahi	*Hula* dancer, cultural practitioner; *lauhala* weaver	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 September 2021
Farden, Hailama	President, Association of Hawaiian Civic Clubs (AHCC)	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 September 2021
Feiteira, Blossom	President, Association of Hawaiians for Homestead Lands	Letter and figures sent via email 27 September 2021 Second round letter and figures sent via email 27 October 2021
Fergerstrom, Hanalei	Spokesperson, Na Kupuna Moku o Keawe	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 September 2021
Hussey, Sylvia M.	Chief Executive Officer, Office of Hawaiian Affairs	Letter and figure sent via email 27 September 2021
Kahana‘oi, Kawehi	Cultural practitioner; *kaula hau*	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 September 2021
Ka‘io, Pele	*Kumu Hula*, Unulau	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 September 2021

Name	Affiliation	Notes
Kalima, Iwalani	*Kumu Hula*, Hula Hālau o Kou Lima Nani ‘E	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 September 2021
Kalua, Manaiakalani	*Kumu Hula*, Akaunu	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 26 October 2021
Kanaka‘ole, Kauila	*Hula* dancer, *kama‘āina*	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 26 October 2021
Kodani, Ronald	President, Piihonua Hawaiian Homestead Community Association	Letter and figures sent via email 26 October 2021
Lewis, Joseph Kūhiō	Chief Executive Officer, Council for Native Hawaiian Advancement	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 26 October 2021
Suganuma, La‘akea	President, Royal Hawaiian Academy of Traditional Arts	Letter and figures sent via email 27 October 2021
Trask, Mililani	Convenor, Na Koa Ikaika Ka Lahui Hawaii	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 October 2021
Wong-Wilson, Noe Noe	Executive Director, Lālākea Foundation	Letter and figures sent via email 4 August 2021 Second round letter and figures sent via email 27 October 2021

Section 7 Traditional Cultural Practices

Timothy R. Pauketat succinctly describes the importance of traditions, especially regarding the active manifestation of one's culture or aspects thereof. According to Pauketat,

> People have always had traditions, practiced traditions, resisted traditions, or created traditions […] Power, plurality, and human agency are all a part of how traditions come about. Traditions do not simply exist without people and their struggles involved every step of the way. [Pauketat 2001:1]

It is understood that traditional practices are developed within the group, in this case, within the Hawaiian culture. These traditions are meant to mark or represent aspects of Hawaiian culture that have been practiced since ancient times. As with most human constructs, traditions are evolving and prone to change resulting from multiple influences, including modernization as well as other cultures. It is well known that within Hawai‘i, a "broader 'local' multicultural perspective exists" (Kawelu 2015:3) While this "local" multicultural culture is deservedly celebrated, it must be noted that it has often come into contact with "traditional Hawaiian culture." This contact between cultures and traditions has undoubtedly resulted in numerous cultural entanglements. These cultural entanglements have prompted questions regarding the legitimacy of newly evolved traditional practices. The influences of "local" culture are well noted throughout this section, and understood to represent survivance or "the active sense of presence, the continuance of native stories, not a mere reaction, or a survivable name. Native survivance stories are renunciations of dominance, tragedy and victimry" (Vizenor 1999:vii). Acknowledgement of these "local" influences help to inform nuanced understandings of entanglement and of a "living [Hawaiian] contemporary culture" (Kawelu 2015:3). This section strives to articulate traditional Hawaiian cultural practices as were practiced within the *ahupua‘a* in ancient times, and the aspects of these traditional practices that continue to be practiced today; however, this section also challenges "tropes of authenticity" (Cipolla 2013), and acknowledges the multicultural influences and entanglements that may "change" or "create" a tradition.

This section integrates information from Sections 3–6 in examining cultural resources and practices identified within or in proximity of the project area in the broader context of the encompassing Hilo landscape. Excerpts from interviews are incorporated throughout this section where applicable.

7.1 Religious Practices and Burials

The number of *heiau*, both *po‘okanaka* and *luakini,* might suggest the importance of Hilo as a political center on the East side of Hawai‘i.

7.2 Subsistence and Gathering

Traditional accounts honor Hilo, especially upper Hilo, as a famed gathering place for bird catchers. The *kuleana* of bird catchers were to responsibly and sustainably gather feathers to produce royal garments.

Section 8 Summary and Recommendations

8.1 Results of Background Research

Background research for this study yielded the following results, presented in approximate chronological order:

1. The project area is situated in the *ahupua‘a* of Pi‘ihonua, which is an integral part of the Hilo Watershed. Streams, waterfalls, ponds, and other water features are abundant in this area, supporting lush and varied forest ecosystems where development has not occurred.
2. The lower forest was used to gather resources such as wood, bird feathers, fiber, and some food crops. The upland rainforest was used mainly by bird catchers to collect feathers and to gather other resources not available at the lower elevations. In the post-Contact era, the forest areas were also used for the collection of resources that could be sold as trade items to foreigners, such as sandalwood and *pulu. Pulu* is the soft substance at the base of *hāpu‘u* ferns, which was shipped to California to be used for furniture and mattress stuffing (Baxley 1865:596).
3. In the pre-Contact period, the area around Hilo Bay was densely inhabited.
4. Handy (1940:125) describes the *kanu kipi* (Hilo name for mound taro patches; Pukui and Elbert 1971:143) method as planting taro on mounds (*kipi*) built on the bottom of the marshy lands along Hilo Bay.
5. The districts of Hilo and Hāmākua were once ruled by the descendants of paramount chief ‘Umi, who ruled from about AD 1600–1620 (Cordy 2000:464). He was married to the daughter of Kulukulua, chief of Hilo.
6. According to Kelly et al. (1981:3), the lands fronting Hilo were portioned off into named land sections, consisting of the *ahupua‘a* of Pu‘u‘eo, Pi‘ihonua, Punahoa, Ponahawai, Kūkūau, and Waiākea although it is not known when or by what chief. It is assumed that this had been accomplished by the late sixteenth or early seventeenth century.
7. In April 1822, members of the London Missionary Society came to Hawai‘i via Tahiti, among them a Tahitian convert named Auna. He was the first missionary to preach in Hilo (Kelly et al. 1981:26). The delegates from the society were hosted by Queen Ka‘ahumanu and her husband Kaumuali‘i, who were making a tour of the Islands.
8. The pioneer company of missionaries, sponsored by the American Board of Commissioners for Foreign Missions in New England, arrived in Hawai‘i in 1820 aboard the brig *Thaddeus*. With the consent of Liholiho (Kamehameha II) and his chiefs, a missionary couple from the first company of missionaries, Samuel and Nancy Ruggles, and Joseph and Martha Goodrich, a couple from the second company of missionaries, which arrived in the island in 1823, were allowed to set up a new mission in Hilo on the island of Hawai‘i.
9. The Reverend David Beldon Lyman and his wife Sarah Joiner Lyman were members of the Fifth Company of missionaries. They arrived in Hilo, Hawai‘i in 1832 and were stationed at Hilo until their deaths. They were joined in 1835 by Reverend Titus Coan, who converted hundreds of natives during “The Great Revival.” In the 1830s, the Reverend Lyman founded the Hilo Boarding School for Hawaiian Native Boys, which was built about half the way between the coast and the Hāla‘i Hills.

8.2 Results of Community Consultations

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 16 individuals or groups. Little to no interest from the community has consequently yielded no results for the identification and/or impacts of past, ongoing, and future cultural practices.

8.3 Impacts and Recommendations

Based on the results of community consultation and CSH's expertise in conducting cultural impact assessments, the following actions are recommended to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups:

1. 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.
2. 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.

Section 9 References Cited

Akana, Collette Leimomi and Kiele Gonzalez
2015 *Hanau Ka Ua: Hawaiian Rain Names*. Kamehameha Publishing, Honolulu.

Ava Konohiki
2020 Ancestral Visions of ‘Āina website. Available online at http://www.avakonohiki.org/.

Baxley, H.W.
1865 *What I Saw on the West Coast of South and North America and at the Hawaiian Islands*. D. Appleton and Company, New York.

Beckwith, Martha
1970 *Hawaiian Mythology*. University of Hawaii Press, Honolulu.
1976 *Hawaiian Mythology*. University of Hawaii Press, Honolulu.

Bingham, Hiram
1847 *A Residence of Twenty-One Years in the Sandwich Islands*. Convers, New York.

Byron, Lord George Gordon
1826 *Voyage of the H.M.S. Blonde to the Sandwich Islands, in the years 1824-1825*. J. Murray, London.

Cipolla, Craig N.
2013 Native American Historical Archaeology and the Trope of Authenticity. *Historical Archaeology*. Vol. 47:3:12–22.

Chinen, Jon J.
1958 *The Great Mahele, Hawaii's Land Division of 1848*. University of Hawaii Press, Honolulu.

Clark, Matthew R. and Robert Rechtman
2005 *Request for SHPO Concurrence with a Determination of No Historic Properties Affected Pursuant to the National Environmental Policy Act and in Compliance with Section 106 of the National Historic Preservation Act, Arc of Hilo Property (TMKs: 3-2-3-32: 6, 7 and 8) Piihonua Ahupuaa, South Hilo District, Island of Hawaii*. Rechtman Consulting, Kea‘au, Hawai‘i.

Cordy, Ross
1977 *Cultural Reconnaissance Report for Pohoiki Bay Navigation Improvements, Pohoiki Bay, Hawaii (TMK 1-3-08:3), U.S. Army Engineer Division.* U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu.
2000 *Exalted Sits the Chief. The Ancient History of Hawai‘i Island*. Mutual Publishing, Honolulu.
2002 *The Rise and Fall of the O‘ahu Kingdom.* Mutual Pulishing, Honolulu.

Curtis, Caroline
1985 *Tales of the Menehune*. Revised edition. Kamehameha Schools Press, Honolulu.

Desha, Stephen
2000 *Kamehameha and His Warrior Kekūhaupi‘o*. Kamehameha Schools Press, Honolulu.

Division of Forestry
1906 *Report of the Division of Forestry for the Year Ending December 31, 1905.* Hawaiian Gazette Company, Ltd., Honolulu.

Dorrance, William H. and Francis S. Morgan
2000 *Sugar Islands: the 165-Year Story of Sugar in Hawai‘i*. Mutual Publishing, Honolulu.

Ellis, William
1963 *Journal of William Ellis.* Reprint of London 1827 edition and Honolulu 1917 edition. Advertiser Publishing Company, Ltd., Honolulu.

ESRI
2017 World Imagery. Esri, Redlands, California. Available online at www.arcgisonline.com/maps/World_Imagery.

Giambelluca, Thomas W., Michael A. Nullett, and Thomas A. Schroeder
1986 *Rainfall Atlas of Hawai‘i.* Department of Land and Natural Resources, State Historic Preservation Division, State of Hawai‘i, Honolulu.

Handy, E.S. Craighill
1940 *The Hawaiian Planter*. Bishop Museum Bulletin Volume 1, No. 161. Bernice Pauahi Bishop Museum, Honolulu.

Handy, E.S. Craighill, and Elizabeth G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin 233, Bernice Pauahi Bishop Museum, Honolulu.

Hawaiian Legislature
1917 *Senate Journal*. Hawaiian Gazette Company, Ltd., Honolulu.

Hawai‘i State Department of Forestry
2007 *Hawai‘i Forest Reserve System: Big Island Forest Reserves.* Electronic document, http://www.state.hi.us/dlnr/dofaw/frs/page10.htm (accessed March 2009).

Hawai‘i TMK Service
2010 Hawai‘i Tax Map Key TMK: [3] 2-3-027. TMK Service, Honolulu.

Hill, S.S.
1856 *Travels in the Sandwich and Society Islands*. Chapman and Hall, London.

Huapala.org
n.d. *Kimo Hula*. Available online, http://.huapala.org/Kil/Kimo_Hula.html

Hula Preservation Society
2014 Hula Preservation Society website. Available online, http://hulapreservation.org.

‘Ī‘ī, John Papa
1959 *Fragments of Hawaiian History*. Mary Kawena Pukui, translator. Bishop Museum Press, Honolulu.

Judd, Bernice
1929 *Voyages to Hawaii before 1860; a Study Based on Historical Narratives in the Library of the Hawaiian Mission Children's Society.* Hawaiian Mission Children's Society, Honolulu.

Kai, Peggy
1974 Chinese Settlers in the Village of Hilo before 1852. *Hawaiian Journal of History* 8:39–75.

Kamakau, Samuel M.
1961 *Ruling Chiefs of Hawai‘i.* Kamehameha Schools Press, Honolulu.
1992 *Ruling Chiefs of Hawaii.* Revised edition. Kamehameha Schools Press, Honolulu.

Kame‘eleihiwa, Lilikalā
1992 *Native Land and Foreign Desires: Pehea Lā E Pono Ai?* Bishop Museum Press, Honolulu.

Kawelu, Kathleen L.
2015 *Kuleana and Commitment: Working Toward a Collaborative Hawaiian Archaeology.* University of Hawai‘i Press, Honolulu.

Kelly, Marion, Barry Nakamura, and Dorothy B. Barrere
1981 *Hilo Bay: A Chronological History, Land and Water Use in the Hilo Bay Area, Island of Hawai‘i.* Bernice Pauahi Bishop Museum, Honolulu.

Kennedy, Joseph
1992 *Archaeological Inventory Final Report for TMK:2-6-08:26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, and 39; and TMK:2-6-29:09, 10, 11, 12, 14, and 15; Located at Puueo on the Island of Hawaii*. Archaeological Consultants of Hawai‘i, Inc., Hale‘iwa, Hawai‘i.

Kuykendall, Ralph
1938 *The Hawaiian Kingdom, Volume I: 1778-1884*. University of Hawaii Press, Honolulu.

Landgraf, Anne Kapulani
1994 *Nā Wahi Pana ‘o Ko‘olau Poko*. University of Hawai‘i Press, Honolulu.

Lum, Arlene (editor)
1988 *Sailing for the Sun. The Chinese in Hawaii 1789-1989*. Three Heroes, Honolulu.

Lyman, Henry M.
1906 *Hawaiian Yesterdays. Chapters from a Boy's Life in the Islands in the Early Days*. A.C. McClurg & Company, Chicago.

Lyman, Sarah Joiner
1970 *Sarah Joiner Lyman of Hawaii: Her Own Story. Martha Greer Martin, editor. Revised 1979*. Lyman House Memorial Museum, Hilo, Hawai‘i.

Malo, David
1951 *Hawaiian Antiquities (Moolelo Hawaii)*. Second edition. Nathaniel B. Emerson, translator. Bishop Museum Press, Honolulu.

McEldowney, Holly

1979 *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawai‘i*. Department of Anthropology, Bernice Pauahi Bishop Museum, Honolulu.

McGregor, Davianna Pōmaika‘i

1996 An Introduction to the *Hoa‘aina* and Their Rights. *The Hawaiian Journal of History* 30:1–28.

Menzies, Archibald

1920 *Hawaii Nei 128 Years Ago*. W.F. Wilson, editor. New Freedom Press, Honolulu.

Merry, Sally Engle

2000 *Colonizing Hawaii. The Cultural Power of Law*. Princeton University Press, Princetown, New Jersey.

Nakuina, Moses K.

1902 Ipumakani a Laamaomao. *Moolelo Hawaii o Pakaa a me Ku-a-Pakaa.* Kalamakū Press, Honolulu.

1990 *The Wind Gourd of La‘amaomao*. First edition. Esther T. Mookini and Sarah Nākoa, translators. Kalamakū Press, Honolulu.

Office of Hawaiian Affairs

2015 *Papakilo Database.* Office of Hawaiian Affairs cultural and historical database. Electronic document, http://papakilodatabase.com/main/index.php.

Pauketat, Timothy R.

2001 *The Archaeology of Traditions*. University Press of Florida, Gainesville, Florida.

Pitman, Almira

1931 *After Fifty Years: An Appreciation, and a Record of a Unique Incident*. Privately printed. Plimpton Press, Norwood.

2001 *The Archaeology of Traditions*. University Press of Florida, Gainesville, Florida.

Pukui, Mary K.

1949 Songs (Meles) of Old Ka‘u, Hawaii. *Journal of American Folklore*, July-September:247–258.

1983 *‘Ōlelo No‘eau, Hawaiian Proverbs & Poetical Sayings.* Bishop Museum Special Publication 71. Bishop Museum Press, Honolulu.

1995 *Folktales of Hawaii: He Mau Kaao Hawaii*. Bishop Museum Press, Honolulu.

Pukui, Mary Kawena, and Caroline Curtis

1996 *Hawaii Island Legends: Pikoi, Pele and Others*. Kamehameha Schools Press, Honolulu.

Pukui, Mary K. and Samuel H. Elbert

1971 *Hawaiian Dictionary.* First edition. University of Hawaii Press, Honolulu.

1986 *Hawaiian Dictionary*. Second edition. University of Hawaii Press, Honolulu.

Pukui, Mary Kawena and Laura Green

1995 *Folktales of Hawai‘i. He Mau Ka‘ao Hawai‘i*. Collected and translated by Mary Kawena Pukui with Laura S.S. Green. Bishop Museum Press, Honolulu.

Pukui, Mary K., Samuel H. Elbert, and Esther Mookini

1974 *Place Names of Hawaii*. University of Hawaii Press, Honolulu.

1976 *Place Names of Hawaii.* Revised and expanded edition. University of Hawaii Press, Honolulu.

Rechtman, Robert

2004 *Letter report: No Historic Properties Affected Determination for Hilo Hospital Expansion, Pi‘ihonua Ahupua‘a, South Hilo District, Island of Hawai‘i, TMK: [3] 2-3-032:001 por.* Rechtman Consulting, LLC, Kea‘au, Hawai‘i.

Rechtman, Robert B. and Matthew R. Clark

2005 *Preservation Plan for a Section of the Mamalahoa Trail (SIHP Site 50-10-27-2) (TMK:3-7-3-9:24, 34) ‘O‘oma 1st Ahupua‘a North Kona District Island of Hawai‘i.* Rechtman Consulting, Kea‘au, Hawai‘i.

Sato, H., Warren Ikeda, Robert Paeth, Richard Smythe, and Minoru Takehiro, Jr.

1973 *Soil Survey of the Island of Hawai‘i*. U.S. Department of Agriculture and University of Hawai‘i Agricultural Experiment Station.

Sinoto, Aki

1978 *Archaeological Reconnaissance Survey of Proposed Kaumana Springs Wilderness Park, Hilo, Island of Hawaii.* Bishop Museum Press, Honolulu.

Soehren, Lloyd

2014 *Hawaiian Place Names.* Electronic database, ulukau.org/cgi-bin/hpn?l=haw.

Spear, Robert L.

1992 *An Archaeological Inventory Survey for the H.C.E.O.C. Project, Hilo, Island of Hawai‘i (TMK: 2-3-32:1B)*. Scientific Consultant Services, Inc., Kāne‘ohe, Hawai‘i.

1993a *An Archaeological Inventory Survey for the Hilo Health Care Center, Island of Hawai‘i (TMK: 2-3-31:1).* Scientific Consultant Services, Inc., Kāne‘ohe, Hawai‘i.

1993b *An Inventory Survey of the H.C.E.O.C. (Option II) Parcel Piihonua Ahupua‘a, South Hilo District Hilo, Island of Hawai‘i (TMK:2-3-32:4)*. Scientific Consultant Services, Inc., Kāne‘ohe, Hawai‘i.

Stewart, C.S.

1970 *Journal of a Residence in the Sandwich Islands, During the Years 1823, 1824, and 1825.* University of Hawaii Press for the Friends of the Library of Hawai‘i, Honolulu.

Thrum, Thomas G.

1876 Notes on the History of Coffee Culture in the Hawaiian Islands. *Thrum’s Hawaiian Annual for 1876*. Thos. G. Thrum, Honolulu.

1908 Heiaus and Heiau Sites Throughout the Hawaiian Islands. Omitting Koas, or Places of Offering to Kuula. *Thrum’s Hawaiian Annul for 1980*. Thos. G. Thrum, Honolulu.

1924 *Hawaiian Almanac and Annual for 1925*. Thomas G. Thrum, Honolulu.

Ulukau

2014 *Ulukau: The Hawaiian Electronic Library*. Electronic document, www.ulukau.org.

USDA (U.S. Department of Agriculture)

2001 Soil Survey Geographic (SSURGO) database. U.S. Department of Agriculture, Natural Resources Conservation Service. Fort Worth, Texas. http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/.

USGS (U.S. Geological Survey)

1995 Hilo USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

Vizenor, Gerald

1999 *Manifest Manners: Narratives on Postindian Survivance*. University of Oklahoma Press, Lincoln, Oklahoma.

Waihona ‘Aina

2021 *The Māhele Database.* Electronic document, http://waihona.com.

Walker, Alan T. and Paul H. Rosendahl

1996 *Archaeological Assessment Study, Hilo Judiciary Complex Project, Lands of Wainaku, Pōnahawai, Pi‘ihonua, and Waiākea, South Hilo District, Island of Hawai‘i (TMK: 2-6-15:1,2; 2-6-16:2; 2-4-49:18,19; 2-2-15:33; 2-4-1:12; 2-3-36:3; 2-3-32:1; 2-4-57:1)*. Paul H. Rosendahl, Ph.D., Inc, Hilo, Hawai‘i.

Westervelt, W.D.

1910 *Legends of Ma-ui a Demi God of Polynesia and of His Mother Hina.* Hawaiian Gazette Company, Ltd., Honolulu.

Wilkes, Charles

1849 *Voyage Round The World, Embracing The Principal Events Of The Narrative Of The United States Exploring Expedition.* Geo. W. Gorton, Philadelphia.

TRAFFIC IMPACT ANALYSIS REPORT

APPENDIX E

TRAFFIC IMPACT ANALYSIS REPORT
HILO MEDICAL CENTER EXPANSION
HILO, HAWAII

FINAL DRAFT

December 14, 2021

Prepared for:

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TRAFFIC IMPACT ANALYSIS REPORT
HILO MEDICAL CENTER EXPANSION

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AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1934

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TRAFFIC IMPACT ANALYSIS REPORT

Hilo Medical Center Expansion

Hilo, Island of Hawaii, Hawaii

1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi, and Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the proposed Hilo Medical Center (HMC) Expansion (hereinafter referred to as the "Project") located in Hilo, Hawaii.

1.1 Existing Site Description

The existing HMC Campus encompasses various parcels on approximately 33 acres along Waianuenue Avenue. The existing HMC Campus currently provides the following, which totals approximately 390,800 square feet (SF) of building space:

- HMC Primary Acute Care Facility – 250,581 SF
- HMC Behavioral Health Facility – 13,581 SF
- HMC West Wing – Non-Clinical Offices – 9,365 SF
- HMC Cancer Center – 16,896 SF
- HMC Long-Term Care Facility – 22,284 SF
- Yukio Okutsu State Veterans Home (YOSVH) – 55,554 SF
- Ancillary/Maintenance Buildings – 22,569 SF

Parking for the existing HMC Campus is provided via six (6) intersection accesses off Waianuenue Avenue and are hereinafter identified as the following going from west to east of the HMC site:

- HMC North Parking Lot – West Driveway
- HMC North Parking Lot – East Driveway/HMC Cancer Center Driveway
- HMC South Parking Lot – West Driveway
- YOSVH – West Driveway
- HMC South Parking Lot – West Driveway/YOSVH – East Driveway
- HMC Long-Term Care Facility Driveway

In addition to the above existing uses, HMC is currently constructing a new 17,295 SF Cancer Center Expansion next to the existing HMC Cancer Center Building. Access to this site will be provided by the existing accesses identified above.

1.2 Project Description

The Project proposes to expand the HMC Campus in two (2) phases of development. Vehicular access to the Project will occur via existing driveways identified in this TIAR:

<u>Phase I - Intensive Care Unit (ICU) Expansion/Relocation – Anticipated Completion Year 2025</u>

- The existing ICU space in the HMC Primary Acute Care Facility consists of 11-beds. The existing ICU space operates at or above capacity, prompting this expansion.

- Relocate existing 11-bed ICU space from the HMC Primary Acute Care Facility to a new 18,900 SF,18-bed facility with offices and ancillary uses → Total increase of 7 ICU beds.

- The new 18,900 SF facility will be a single-story building located above the North Parking Lot on the east side of the lot, and connected to the existing HMC Primary Acute Care Facility via two pedestrian bridges/walkways.

- The existing ground level parking lot will be redesigned to accommodate the overhead Phase I ICU Expansion Facility.

- Existing ICU space to be reprogrammed to care for more noncritical patients.

<u>Phase II – Family Birthing Center Expansion/Relocation & Future Program Space – Anticipated Completion Year 2029</u>

Phase II will consist of two (2) new floors, each providing 21,500 SF of space (total 43,000 SF)

- The existing obstetrics unit in the HMC Primary Acute Care Facility consists of a 5-room Labor/Delivery unit and a separate 16-bed Postpartum unit. The existing obstetrics unit adequately provides for current demands.

- Phase II, floor 1 will relocate and consolidate the Labor, Delivery, Recover and Post-Partum (LDRP) rooms into a new 12-bed Family Birthing Center, comprised of 9 LDRP rooms, 3 post-partum patient rooms, and 1 operating room.

- Phase II, floor 2 undetermined, but will consist of 21,500 SF of future programmable hospital space.

- The new combined 43,000 SF Phase II facility will be located above the North Parking Lot on the west side of the lot, and connect to the proposed Phase I ICU Building via two pedestrian bridges/walkways.

- Existing obstetrics unit to be reprogrammed to care for more noncritical patients.

See Figure 1.1 for Location Map and Figure 1.2 for the Project Site Plan.

HILO MEDICAL CENTER
EXPANSION TIAR

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

STUDY INTERSECTIONS

1. WAIANUENUE AVE. & HMC NORTH PARKING LOT (WEST DWY.)
2. WAIANUENUE AVE. & HMC NORTH PARKING LOT (EAST DWY.)
3. WAIANUENUE AVE. & HMC SOUTH PARKING LOT (WEST DWY.)
4. WAIANUENUE AVE. & HMC YUKIO OKUTSU WEST DWY.
5. WAIANUENUE AVE. & HMC YUKIO OKUTSU EAST DWY. & HMC SOUTH PARKING LOT (EAST DWY.)
6. WAIANUENUE AVE. & HMC LONG-TERM CARE DWY.
7. WAIANUENUE AVE. & RAINBOW DR.
8. WAIANUENUE AVE. & PUUHINA ST.
9. WAIANUENUE AVE. & KAUMANA DR. & LELE ST.
10. WAIANUENUE AVE. & KOMOHANA ST.
11. KAUMANA DR. & PUUHINA ST. & PUNAHELE ST. & HUALILILI ST.
12. PUNAHELE ST. & KOMOHANA ST.

FIGURE 1.1

LOCATION MAP

HILO MEDICAL CENTER
EXPANSION TIAR

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

N
NOT TO SCALE

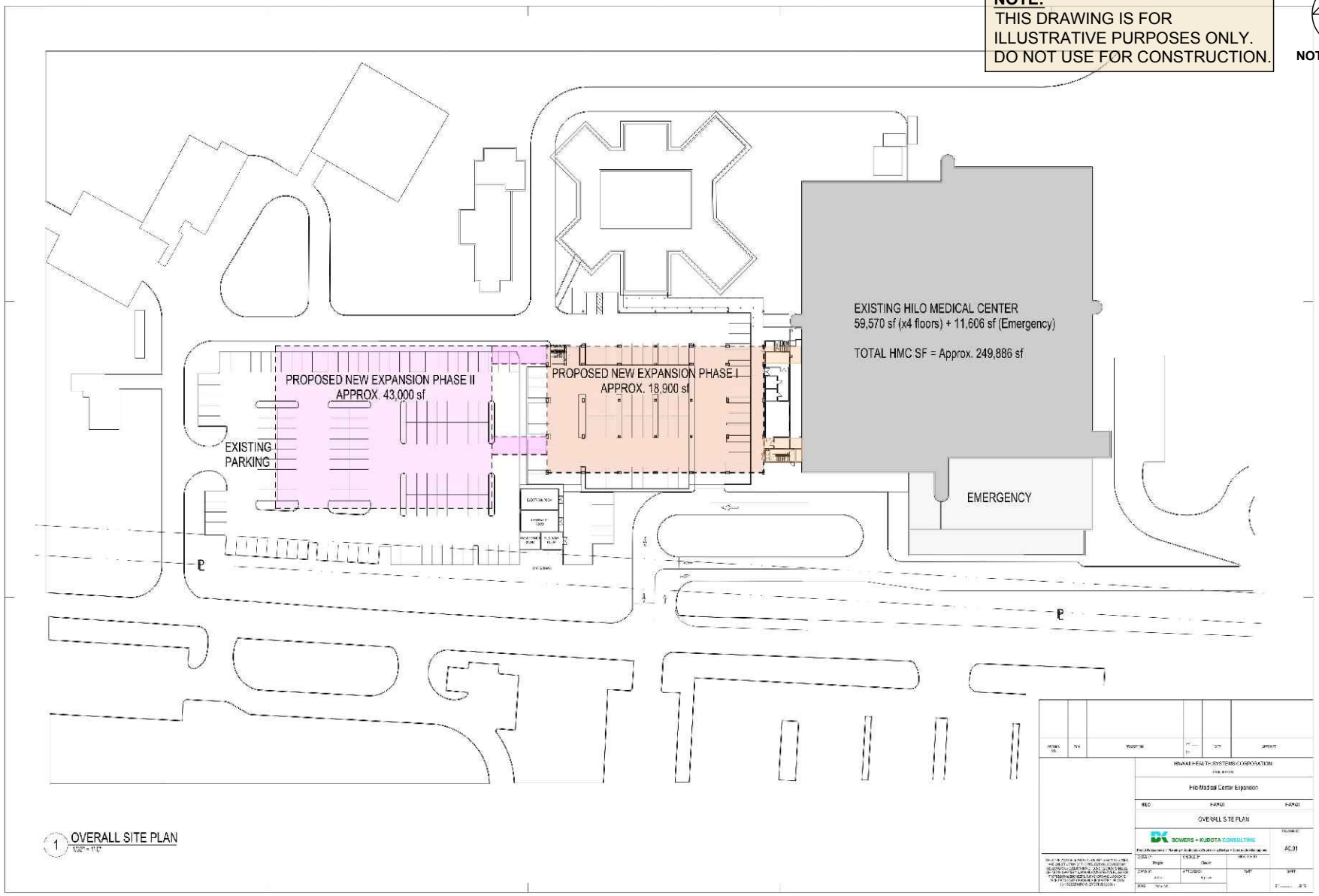

FIGURE 1.2

SITE PLAN

2. METHODOLOGY

2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions during the weekday AM and PM peak hours of traffic within the study area.
- Traffic Projections for Base Year 2025 and 2029 (without the Project), including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate.
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for the Future Year 2025 and 2029 (with Project).
- Provide recommendations for roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by the Project.

2.2 Analysis Methodology

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 (v/c) ratios, delays, and corresponding LOS that were used in this study. See Appendix B for LOS Criteria.

Analysis 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 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:

- Waianuenue Avenue/HMC & YOSVH Driveways 1-6
- Waianuenue Avenue/Rainbow Drive
- Waianuenue Avenue/Puuhina Street
- Waianuenue Avenue/Kaumana Drive/Lele Street
- Waianuenue Avenue/Komohana Street
- Kaumana Drive/Puuhina Street/Hualilili Sreet
- Komohana Street/Punahele Street

3. EXISTING CONDITIONS

3.1 Roadway System

The following are brief descriptions of the existing roadways studied within the vicinity of the Project:

Waianuenue Avenue is generally an east-west, two-way, two lane, undivided County roadway with a posted speed limit of 35 miles per hour (mph) within the study area. Waianuenue Avenue serves the Hilo area, beginning to the east in downtown Hilo at its intersection with Mamalahoa Highway, continues further west passing adjacent to the Hilo Medical Center and continuing near a small residential subdivision as Piihonua Road.

Rainbow Drive is generally an east-west, two-way, two lane, undivided roadway with a posted speed limit of 20 mph. Rainbow Drive is a loop road, less than 0.5-miles long and begins and ends at intersections with Waianuenue Avenue. It provides access to Rainbow Falls Park.

Puuhina Street is generally a north-south, two-way, two lane, undivided roadway with a posted speed limit of 25 mph. Puuhina Street serves a mostly residential area, beginning to the north at its intersection with Waianuenue Avenue and extends to the south at its intersection with Kaumana Drive.

Kaumana Drive is generally a northeast-southwest, two-way, two-lane, undivided County roadway with a posted speed limit of 25 mph within the study area. Kaumana Drive serves as a collector road in the Hilo area, beginning to the northeast at its intersection with Waianuenue Avenue and extending to the southwest at its intersection with Saddle Road.

Lele Street is a short, northbound, one-way, two-lane, roadway with no posted speed limit. Lele Street begins to the south at its intersection with Punahele Street and terminates to the north at its intersection with Kaumana Drive.

Hualilili Street is generally an east-west, two-way, two-lane, undivided roadway with no posted speed limit. Hualilili Street provides access to a residential neighborhood, as well as a 7-Eleven, beginning to the west at its intersection with Kaumana Drive and terminating to the east in a dead end.

Punahele Street is generally a north-south, two-way, two-lane, undivided roadway with a posted speed limit of 25 mph. Punahele Street provides access to a residential neighborhood, beginning to the north at its intersection with Kaumana Drive and terminating to the south at its intersection with Halai Street.

3.2 Existing Multimodal Facilities

3.2.1 Pedestrian Facilities

Due to the rural nature, there are very few raised or separated sidewalks. Wide, walkable shoulders are provided along both sides of Waianuenue Avenue fronting Hilo Medical Center to accommodate pedestrian activity to/from the HMC facility and adjacent parking lots. Sidewalks are provided along both sides of Kaumana Drive in the study area. Marked crosswalks are provided at the Rainbow Drive and Waianuenue intersection, Waianuenue Avenue and Kaumana Drive intersection, and the Kaumana Drive and Puuhina Street intersection. There are also two

(2) mid-block crosswalks along Waianuenue Avenue in front of Hilo Medical Center that service pedestrians walking to/from the HMC facility and the parking lots. Pedestrian facilities are shown in Figure 3.1.

3.2.2 Bicycle Facilities

There are currently no bike accommodations in the study area.

3.2.3 Transit Facilities

Hawaii County operates the Hele-On Bus, which provides 13 different routes in the East Hawaii region. Service is provided Monday through Saturday with limited service on Sundays and holidays. There is one bus route Kaumana (Route 102) that travels through the study area along Waianuenue Avenue and Kaumana Drive. A bus stop is provided fronting the HMC and nearby Kaiser Permanente Medical Center. Transit facilities are shown in Figure 3.1.

3.3 Existing Traffic Volumes

Turning movement counts were collected on Thursday, August 26, 2021. At this time, all DOE schools and UH Hilo were in session however, traffic increases were applied at various intersections based on the following:

- Minor traffic increase primarily on Waianuenue Avenue to account for slightly lower parking occupancy at the time of the August 2021 traffic count, when compared to average parking occupancy from an internal HMC study done over multiple days in 2020. AM(PM) peak hour parking occupancy was approximately 27(30) vehicles less than the average 2020 parking assessment. Therefore, 27 entering AM vehicles and 30 exiting PM vehicles were added to the existing August 2021 counts.

- At the time of the August 2021 traffic count, the HMC Cancer Center Driveway was closed due to construction of the new Cancer Center Expansion Building. Additional in/out turning movement volumes were added to this HMC Cancer Center Driveway based on the 2020 HMC parking assessment. This yielded 13 entering AM peak vehicles and 7-8 entering/exiting PM peak vehicles.

- Based on available historic data (2008 ATA counts, 2016 HDOT counts, 2020 AECOM counts), the following traffic adjustments were made:

    - Add 50(30) eastbound through Kaumana Drive and 0(130) westbound through Kaumana Drive during the AM(PM) peak hours. Increases based on comparison of ATA's 2021 count to 2008 count at the Kaumana Drive/Lele Street intersection. Traffic increases carried over to the Waianuenue Avenue/Komohana Street intersection and increased all turning movements at this intersection.

    - No additional increases along Waianuenue Avenue, fronting HMC, since overall 2021 ATA peak counts were higher than 2016 HDOT counts.

Based on the traffic count data, the weekday AM and PM peak hours of traffic were determined to occur generally between 7:00 AM and 8:00 AM and between 3:15 PM to 4:15 PM, respectively. See the traffic count data provided in Appendix A.

3.4 Existing Observations and Intersection Analysis

Currently, between 7:15 AM to 8:00 AM on school days, the westbound lane along Waianuenue Avenue is used as an additional eastbound travel lane to service heavy traffic generated by the nearby Hilo Union Elementary School, Hilo Intermediate and Hilo High School. All vehicular traffic along Waianuenue Avenue during this period is restricted to only eastbound flows from Kamehameha Avenue to Komohana Street. For about five (5) signal cycles between 7:30 AM and 7:45 AM, northbound queues were observed to briefly spill back along Komohana Street from its intersection with Waianuenue Avenue to Punahele Street. Northbound flows quickly dissipated, but Punahele Street queued for a brief 10-minute period from the queue spillback.

Traffic throughout the remaining study network was observed to generally flow smoothly along the study corridors, with no significant queues. All vehicles at the study intersections were generally able to clear within one signal cycle.

Fronting the existing HMC site, two (2) marked pedestrian crosswalks are provided at the HMC South Parking Lot – West Driveway and the YOSVH West Driveway. Approximately 120-150 pedestrians cross at the HMC South Parking Lot – West Driveway crosswalk and approximately 60 pedestrians cross at the YOSVH West Driveway during each of the peak hours. Due to relatively low vehicular volumes and low speeds, there were no observed vehicle-pedestrian conflicts.

All movements at the Study Intersections were observed to operate at LOS C or better during the AM and PM peak hours of traffic.

Figure 3.2 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.

HILO MEDICAL CENTER
EXPANSION TIAR

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FIGURE 3.1

EXISTING PEDESTRIAN, BICYCLE AND TRANSIT FACILITIES

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FIGURE 3.2.1

EXISTING CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 1

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FIGURE 3.2.2

EXISTING CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 2

TABLE 3.1: LOS SUMMARY TABLE
EXISTING CONDITIONS

Intersection	Existing 2019 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: HMC North Parking Lot - West Dwy & Waianuenue Ave						
EB LT	7.6	0.01	A	7.7	0.00	A
WB LT	7.6	0.01	A	7.5	0.01	A
SB LT/RT	11.0	0.05	B	11.3	0.12	B
OVERALL	1.4	-	-	2.2	-	-
2: HMC Cancer Center Dwy/HMC North Parking Lot - East Dwy & Waianuenue Ave						
NB LT/TH/RT	0.0	0.00	A	9.9	0.01	A
EB LT	7.7	0.00	A	7.7	0.00	A
WB LT	7.6	0.01	A	7.7	0.01	A
SB LT/TH/RT	12.3	0.04	B	12.9	0.10	B
OVERALL	0.8	-	-	1.5	-	-
3: HMC South Parking Lot - West Dwy & Waianuenue Ave						
NB LT/RT	9.9	0.09	A	10.9	0.12	B
WB LT	7.8	0.06	A	7.9	0.02	A
OVERALL	2.1	-	-	1.7	-	-
4: Waianuenue Ave & YOSVH - West Dwy						
EB LT	8.0	0.00	A	7.8	0.00	A
SB LT/RT	12.8	0.05	B	13.2	0.06	B
OVERALL	0.6	-	-	0.6	-	-
5: HMC South Parking Lot - West Dwy/YOSVH - East Dwy & Waianuenue Ave						
NB LT/TH/RT	9.7	0.01	A	13.3	0.32	B
WB LT	8.1	0.11	A	8.1	0.00	A
SB LT/TH/RT	17.2	0.01	C	20.4	0.05	C
OVERALL	1.7	-	-	3.5	-	-
6: Waianuenue Ave & HMC Long-Term Care Facility Dwy						
NB LT/TH/RT	9.6	0.00	A	0.0	0.00	A
EB LT	8.4	0.01	A	7.7	0.01	A
WB LT	7.8	0.00	A	8.6	0.00	A
SB LT/TH/RT	14.5	0.05	B	14.2	0.14	B
OVERALL	0.5	-	-	1.0	-	-
7: Waianuenue Ave & Rainbow Dr.						
EB LT	8.6	0.00	A	7.9	0.00	A
SB LT/RT	15.9	0.05	C	18.8	0.17	C
OVERALL	0.3	-	-	1.0	-	-
8: Puuhina St & Waianuenue Ave						
NB LT/RT	17.2	0.20	C	18.3	0.08	C
WB LT	7.9	0.01	A	9.0	0.01	A
OVERALL	1.5	-	-	0.6	-	-
9: Kaumana Dr & Waianuenue Ave/Lele St						
NB LT	30.7	0.39	C	32.3	0.08	C
NB TH	10.4	0.55	B	11.3	0.21	B
EB LT	16.6	0.37	B	19.8	0.57	B
EB LT/TH/RT	15.4	0.15	B	18.2	0.44	B
WB LT	23.3	0.03	C	0.0	0.00	A
WB TH/RT	25.0	0.14	C	32.9	0.12	C
SB TH	12.0	0.28	B	19.2	0.63	B
OVERALL	12.9	-	B	18.1	-	B

TABLE 3.1: LOS SUMMARY TABLE
EXISTING CONDITIONS CONT'D

Intersection	Existing 2019 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
10: Komohana St & Waianuenue Ave						
NB LT	16.7	0.8	B	11.4	0.6	B
NB RT	9.9	0.3	A	9.2	0.1	A
EB TH	20.0	0.8	C	8.9	0.5	A
EB RT	12.0	0.1	B	8.0	0.3	A
WB LT/TH	11.8	0.1	B	9.1	0.5	A
OVERALL	15.3	-	B	9.2	-	A
11: Kaumana Dr & Puuhina St/Hualilili St. & Punahele St						
NB LT	7.6	0.04	A	8.1	0.01	A
EB RT	9.0	0.01	A	10.5	0.01	B
WB LT/TH/RT	15.7	0.14	C	15.1	0.08	C
SB LT	8.8	0.02	A	7.8	0.02	A
OVERALL	1.9	-	-	1.4	-	-
12: Punahele St & Komohana St						
NB LT	7.7	0.02	A	8.6	0.03	A
EB TH/RT	14.7	0.39	B	16.9	0.28	C
WB LT/TH/RT	23.1	0.54	C	22.1	0.16	C
SB LT	9.9	0.02	A	8.4	0.00	A
OVERALL	5.5	-	-	2.6	-	-

4. BASE YEAR 2025 & 2029 TRAFFIC CONDITIONS

The Base Years 2025 and 2029 was selected to reflect the anticipated completion years for Phase I and Phase II of the Project, respectively. Both the Base Year 2025 and 2029 scenarios represent the traffic conditions within the study area without the Project. Traffic projections were formulated by applying a defacto growth rate to the existing traffic count volumes as well as trips generated by known future developments in the vicinity of the Project.

4.1 De Facto Growth Rate

Background traffic growth in the study area was determined based on the HDOT Island of Hawaii 2035 Travel Demand Forecasting Model (TDFM). The forecasting model uses population forecasts from the Hawaii County General Plan to distribute households and vehicular trips across predetermined Traffic Analysis Zones (TAZs) based upon existing TAZ household distributions. Based on the TDFM, a conservative annual ambient growth rate of 1.2% was applied to the through movements along Waianuenue Avenue, Kaumana Drive and Komohana Street.

4.2 Background Developments

In addition to redevelopment accounted for in the de facto growth rates, traffic projections from all known background projects in the vicinity of the Project at the time of this study were added to the existing roadway network to account for intersection turning movements. Trips from the following developments were added to the existing AM and PM peak hour volumes to reflect Base Year conditions. See Figure 4.1 for the location of the background developments and Table 4.1 for anticipated trips generated by the background developments.

Wailani Development – This project is a master planned community bordered by Komohana Street to the east and Mohouli Street to the west. The project proposes a maximum of 420,000 square feet of combined retail space, medical-office space and business/tech park space, 208 single-family residential units, 324 multi-family residential units and 296 senior housing residential units. A 2009 TIAR was completed for this development, but since land use allocations have changed, new trips were generated based on the current plan, as shown in Table 4.1. purposes of this TIAR, ultimate build-out is anticipated to occur over a 10-year period to Year 2031.

Hale Ola O Mohouli Affordable Residential Project – This project is located north of Mohouli Street and just east of its intersection with Kukuau Street. The project proposes to construct 90 affordable residential units and is expected to be completed by 2025. A TIAR for the Hale Ola O Mohouli Affordable Residential Project was completed by AECOM dated November 2020.

County of Hawaii Fire Administration Support Complex – The project proposes to construct a Fire Administration Support Complex on 5.0 acres of land adjacent and to the east of the proposed Hale Ola O Mohouli Affordable Residential Project. A TIAR for the County of Hawaii Fire Administration Support Complex was completed by M&E Pacific, Inc dated February 2008.

Hilo Hillside Phase II – This project is located along the Puainako Street Extension, east of Puainako Heights. Phase I of the development includes 56 single-family homes, the majority of which were constructed and occupied at the time of data collection. Phase II proposes to construct an additional 56 single-family homes.

Puainako Heights – This project is located along the Puainako Street Extension, east of Wilder Road. The project proposes to construct 49 single family homes under Phase 1A and 1B. The remaining phases of the project do not currently have a timeframe for completion.

Kaiaulu O Kapiolani Apartments – This project proposed to construct 64 affordable multi-family residential units bordered by Kukuau Street, Kapiolani Street and Kupukupu Street.

HMC Cancer Center Expansion – At the time of the traffic count, HMC was constructing the new 17,295 SF Cancer Center Expansion building adjacent to the existing HMC Cancer Center.

Table 4.1: Base Year Background Development Trip Generation

Background Development	AM			PM		
	Enter	Exit	Total	Enter	Exit	Total
Wailani Development	511	368	879	777	917	1,694
Hale Ola O Mohouli Affordable Residential Project	10	38	48	44	24	68
County of Hawaii Fire Administration Support Complex	51	6	57	23	50	73
Hilo Hillside Phase II	11	34	45	34	20	54
Puainako Heights Phase I	10	30	40	30	17	47
Kaiaulu O Kapiolani Apartments	7	25	32	25	15	40
HMC Cancer Center	9	4	13	5	9	14
Total	**609**	**505**	**1,114**	**938**	**1052**	**1,990**

Notes:

1. Majority of trips shown in Table 3.1 will not travel through the study area due to the location of each background development and forecast trip distribution throughout the Hilo region.

4.3 Base Year 2025 & 2029 Analysis

For Base Year 2025, traffic will increase over existing conditions; Waianuenue Avenue 12% (25-30 vehicles/hour/direction), Kaumana Drive 5-7% (10-45 vehicles/hour/direction) and Komohana Street 10 to 16% (60-100 vehicles/hour/direction). All intersections are still anticipated to operate with similar levels of service as existing conditions.

For Base Year 2029, traffic will increase by an additional 5-10% from Base Year 2025 conditions. All intersections are anticipated to operate with similar levels of service as Base Year 2025 conditions.

Under Base Year 2025 and 2029 conditions, most movements at the study intersections are expected to continue operating similar to existing conditions during the AM and PM peak hours of traffic. All movements will operate adequately at LOS D or better with most vehicular delays only increasing by 1-2 seconds and select movements increasing by as much as 7 seconds at all

of the study intersections, with the exception of the westbound approach along Punahele Street at its intersection with Komohana Street, which worsens from LOS C(C) to LOS E(D) for Base Year 2025 and LOS F(E) for Base Year 2029 during the AM(PM) peak hours of traffic. This westbound approach will continue to service a relatively low left-turn volume between 15-30 vehicles per peak hour and the approach will still operate below capacity.

Figure 4.2 and 4.3 shows the Base Year 2025 and 2029 lane configuration, traffic volumes, and LOS for each study intersection, respectively. Table 4.2 summarizes the Base Year 2025 and Base Year 2029 LOS at the study intersections. LOS worksheets are provided in Appendix C

HILO MEDICAL CENTER EXPANSION TIAR

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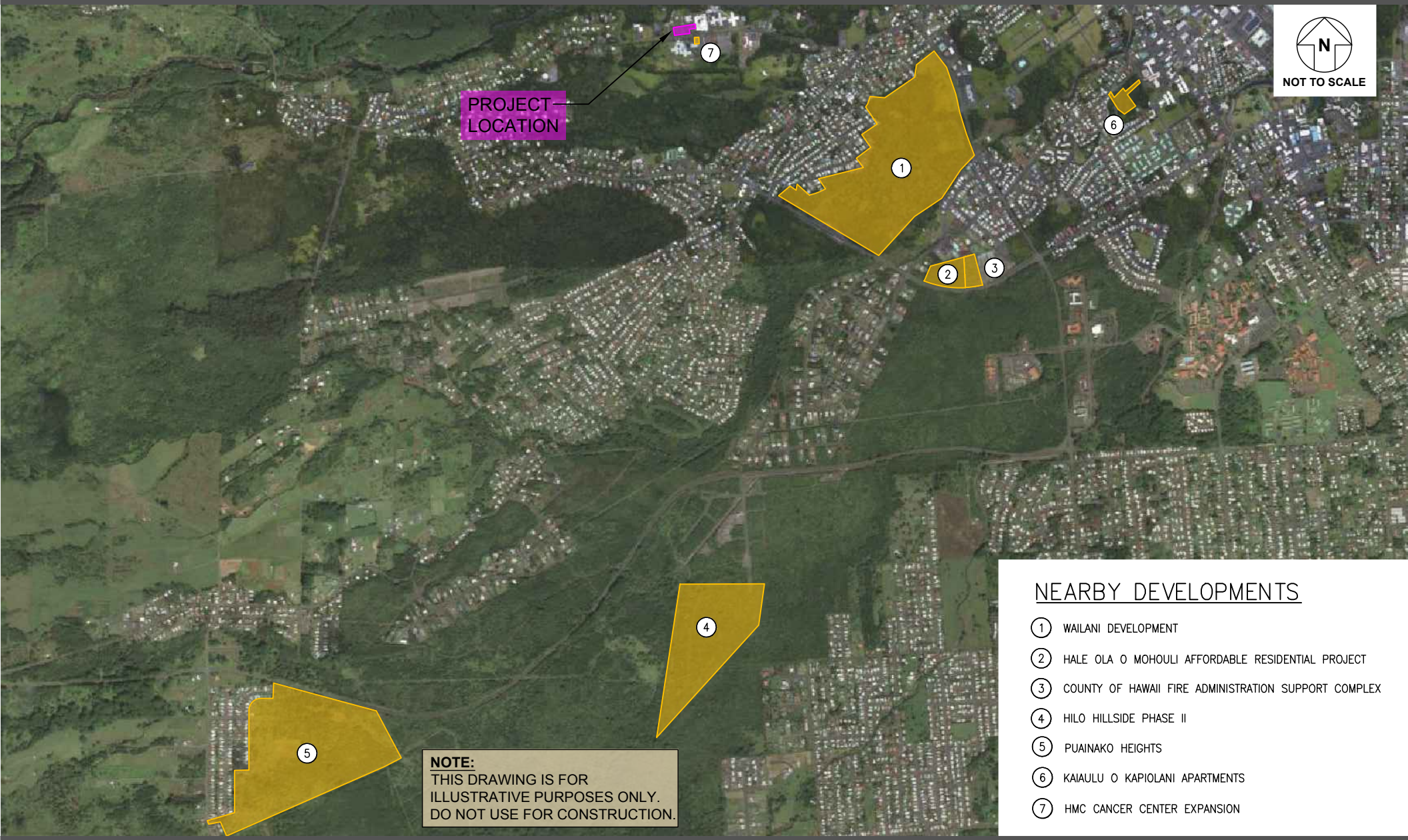

FIGURE 4.1

BACKGROUND PROJECTS

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FIGURE 4.2.1

BASE YEAR 2025 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 1

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FIGURE 4.2.2

BASE YEAR 2025 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 2

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EXPANSION TIAR

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FIGURE 4.3.1

BASE YEAR 2029 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 1

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EXPANSION TIAR

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FIGURE 4.3.2

BASE YEAR 2029 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 2

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TABLE 4.2: LOS SUMMARY TABLE
EXISTING CONDITIONS, BASE YEAR 2025 AND BASE YEAR 2029

Intersection	Existing 2019 Conditions						Base Year 2025						Base Year 2029					
	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: HMC North Parking Lot - West Dwy & Waianuenue Ave																		
EB LT	7.6	0.01	A	7.7	0.00	A	7.7	0.01	A	7.7	0.01	A	7.7	0.01	A	7.8	0.01	A
WB LT	7.6	0.01	A	7.5	0.01	A	7.6	0.01	A	7.5	0.01	A	7.6	0.01	A	7.6	0.01	A
SB LT/RT	11.0	0.05	B	11.3	0.12	B	11.3	0.06	B	11.8	0.14	B	11.6	0.07	B	12.3	0.16	B
OVERALL	1.4	-	-	2.2	-	-	1.4	-	-	2.3	-	-	1.4	-	-	2.4	-	-
2: HMC Cancer Center Dwy/HMC North Parking Lot - East Dwy & Waianuenue Ave																		
NB LT/TH/RT	0.0	0.00	A	9.9	0.01	A	9.3	0.00	A	10.0	0.02	B	9.5	0.00	A	10.1	0.02	B
EB LT	7.7	0.00	A	7.7	0.00	A	7.8	0.00	A	7.8	0.01	A	7.8	0.00	A	7.9	0.01	A
WB LT	7.6	0.01	A	7.7	0.01	A	7.7	0.01	A	7.8	0.01	A	7.7	0.01	A	7.8	0.01	A
SB LT/TH/RT	12.3	0.04	B	12.9	0.10	B	12.9	0.05	B	13.8	0.12	B	13.5	0.07	B	14.6	0.14	B
OVERALL	0.8	-	-	1.5	-	-	0.9	-	-	1.7	-	-	1.0	-	-	1.7	-	-
3: HMC South Parking Lot - West Dwy & Waianuenue Ave																		
NB LT/RT	9.9	0.09	A	10.9	0.12	B	10.2	0.10	B	11.2	0.13	B	10.5	0.12	B	11.6	0.15	B
WB LT	7.8	0.06	A	7.9	0.02	A	7.9	0.07	A	7.9	0.02	A	8.0	0.07	A	8.0	0.02	A
OVERALL	2.1	-	-	1.7	-	-	2.2	-	-	1.8	-	-	2.3	-	-	1.8	-	-
4: Waianuenue Ave & YOSVH - West Dwy																		
EB LT	8.0	0.00	A	7.8	0.00	A	8.1	0.00	A	7.9	0.00	A	8.1	0.00	A	8.0	0.00	A
SB LT/RT	12.8	0.05	B	13.2	0.06	B	13.4	0.06	B	14.1	0.07	B	14.1	0.06	B	14.9	0.07	B
OVERALL	0.6	-	-	0.6	-	-	0.5	-	-	0.5	-	-	0.5	-	-	0.5	-	-
5: HMC South Parking Lot - West Dwy/YOSVH - East Dwy & Waianuenue Ave																		
NB LT/TH/RT	9.7	0.01	A	13.3	0.32	B	10.0	0.01	B	14.2	0.37	B	10.1	0.02	B	15.3	0.41	C
WB LT	8.1	0.11	A	8.1	0.00	A	8.3	0.13	A	8.1	0.00	A	8.4	0.14	A	8.2	0.00	A
SB LT/TH/RT	17.2	0.01	C	20.4	0.05	C	18.9	0.01	C	23.5	0.06	C	20.7	0.01	C	27.1	0.07	D
OVERALL	1.7	-	-	3.5	-	-	1.7	-	-	3.7	-	-	1.8	-	-	3.9	-	-
6: Waianuenue Ave & HMC Long-Term Care Facility Dwy																		
NB LT/TH/RT	9.6	0.00	A	0.0	0.00	A	9.8	0.00	A	0.0	0.00	A	10.0	0.00	B	0.0	0.00	A
EB LT	8.4	0.01	A	7.7	0.01	A	8.6	0.01	A	7.8	0.01	A	8.7	0.01	A	7.9	0.01	A
WB LT	7.8	0.00	A	8.6	0.00	A	7.8	0.00	A	8.8	0.00	A	7.9	0.00	A	8.9	0.00	A
SB LT/TH/RT	14.5	0.05	B	14.2	0.14	B	15.6	0.05	C	15.5	0.15	C	16.7	0.06	C	16.8	0.17	C
OVERALL	0.5	-	-	1.0	-	-	0.5	-	-	1.0	-	-	0.5	-	-	1.0	-	-
7: Waianuenue Ave & Rainbow Dr.																		
EB LT	8.6	0.00	A	7.9	0.00	A	8.8	0.00	A	8.0	0.01	A	8.9	0.00	A	8.1	0.01	A
SB LT/RT	15.9	0.05	C	18.8	0.17	C	17.2	0.05	C	20.9	0.19	C	18.4	0.06	C	23.1	0.21	C
OVERALL	0.3	-	-	1.0	-	-	0.3	-	-	1.1	-	-	0.3	-	-	1.1	-	-
8: Puuhina St & Waianuenue Ave																		
NB LT/RT	17.2	0.20	C	18.3	0.08	C	18.9	0.22	C	20.0	0.09	C	20.7	0.24	C	21.7	0.10	C
WB LT	7.9	0.01	A	9.0	0.01	A	7.9	0.01	A	9.1	0.02	A	8.0	0.01	A	9.3	0.02	A
OVERALL	1.5	-	-	0.6	-	-	1.5	-	-	0.6	-	-	1.5	-	-	0.6	-	-

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TABLE 4.2: LOS SUMMARY TABLE
EXISTING CONDITIONS, BASE YEAR 2025 AND BASE YEAR 2029 CONT'D

Intersection	Existing 2019 Conditions						Base Year 2025						Base Year 2029					
	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
9: Kaumana Dr & Waianuenue Ave/Lele St																		
NB LT	30.7	0.39	C	32.3	0.08	C	36.1	0.48	D	33.1	0.12	C	40.9	0.52	D	34.0	0.16	C
NB TH	10.4	0.55	B	11.3	0.21	B	11.2	0.59	B	11.5	0.24	B	12.9	0.64	B	11.7	0.27	B
EB LT	16.6	0.37	B	19.8	0.57	B	17.6	0.40	B	21.2	0.63	C	19.3	0.43	B	22.4	0.67	C
EB LT/TH/RT	15.4	0.15	B	18.2	0.44	B	16.4	0.19	B	18.5	0.48	B	17.9	0.23	B	19.1	0.53	B
WB LT	23.3	0.03	C	0.0	0.00	A	24.9	0.03	C	0.0	0.00	A	26.2	0.02	C	0.0	0.00	A
WB TH/RT	25.0	0.14	C	32.9	0.12	C	26.9	0.15	C	32.9	0.12	C	26.7	0.08	C	32.9	0.12	C
SB TH	12.0	0.28	B	19.2	0.63	B	12.0	0.28	B	20.7	0.68	C	12.7	0.28	B	22.6	0.74	C
OVERALL	12.9	-	B	18.1	-	B	13.7	-	B	19.0	-	B	15.2	-	B	20.1	-	C
10: Komohana St & Waianuenue Ave																		
NB LT	16.7	0.76	B	11.4	0.55	B	22.1	0.84	C	13.2	0.57	B	30.8	0.91	C	14.6	0.61	B
NB RT	9.9	0.31	A	9.2	0.11	A	10.9	0.38	B	10.6	0.14	B	11.8	0.44	B	11.2	0.17	B
EB TH	20.0	0.76	C	8.9	0.46	A	20.1	0.76	C	9.4	0.46	A	20.2	0.77	C	11.9	0.50	B
EB RT	12.0	0.14	B	8.0	0.26	A	12.0	0.18	B	8.5	0.29	A	11.9	0.21	B	10.8	0.32	B
WB LT/TH	11.8	0.09	B	9.1	0.48	A	11.6	0.10	B	10.1	0.54	B	11.4	0.10	B	13.9	0.64	B
OVERALL	15.3	-	B	9.2	-	A	17.0	-	B	10.2	-	B	19.9	-	B	12.7	-	B
11: Kaumana Dr & Puuhina St/Hualilili St. & Punahele St																		
NB LT	7.6	0.04	A	8.1	0.01	A	7.6	0.04	A	8.2	0.01	A	7.6	0.04	A	8.3	0.02	A
EB RT	9.0	0.01	A	10.5	0.01	B	9.0	0.01	A	10.8	0.01	B	9.1	0.01	A	11.1	0.02	B
WB LT/TH/RT	15.7	0.14	C	15.1	0.08	C	16.9	0.15	C	16.0	0.09	C	18.2	0.16	C	17.0	0.10	C
SB LT	8.8	0.02	A	7.8	0.02	A	9.0	0.03	A	7.8	0.02	A	9.2	0.03	A	7.9	0.02	A
OVERALL	1.9	-	-	1.4	-	-	1.8	-	-	1.4	-	-	1.8	-	-	1.3	-	-
12: Punahele St & Komohana St																		
NB LT	7.7	0.02	A	8.6	0.03	A	7.9	0.02	A	8.9	0.03	A	8.1	0.02	A	9.2	0.03	A
EB TH/RT	14.7	0.39	B	16.9	0.28	C	17.6	0.46	C	20.9	0.35	C	20.8	0.52	C	25.5	0.41	D
WB LT/TH/RT	23.1	0.54	C	22.1	0.16	C	43.8	0.74	E	32.2	0.23	D	70.4	0.88	F	46.0	0.32	E
SB LT	9.9	0.02	A	8.4	0.00	A	10.4	0.03	B	8.8	0.00	A	10.8	0.03	B	9.0	0.00	A
OVERALL	5.5	-	-	2.6	-	-	8.0	-	-	2.8	-	-	10.8	-	-	3.2	-	-

5. FUTURE YEAR 2025 & 2029 TRAFFIC CONDITIONS

The Future Years 2025 and 2029 were selected to reflect the anticipated completion years for Phase I and Phase II of the Project, respectively.

5.1 Project Description

The Project proposes to expand the HMC campus in two (2) phases of development. Vehicular access to the Project will occur via existing driveways identified in this TIAR.

Phase I - Intensive Care Unit (ICU) Expansion/Relocation – Year 2025

- The existing ICU space in the HMC Primary Acute Care Facility consists of 11-beds. The existing ICU space operates at or above capacity, prompting this expansion.
- Relocate existing 11-bed ICU space from the HMC Primary Acute Care Facility to a new 18,900 SF,18-bed facility with offices and ancillary uses → Total increase of 7 ICU beds.
- The new 18,900 SF facility will be a single-story building located above the North Parking Lot on the east side of the lot, and connect to the existing HMC Primary Acute Care Facility via two pedestrian bridges/walkways.
- The existing ground level parking lot will be redesigned to accommodate the overhead Phase I ICU Expansion Facility.
- Existing ICU space to be reprogrammed to care for more noncritical patients.

Phase II – Family Birthing Center Expansion/Relocation & Future Program Space – Year 2029

Phase II will consist of two (2) new floors, each providing 21,500 SF of space (total 43,000 SF)

- The existing obstetrics unit in the HMC Primary Acute Care Facility consists of a 5-room Labor/Delivery unit and a separate 16-bed Postpartum unit. The existing obstetrics unit adequately provides for current demands.
- Phase II, floor 1 will relocate and consolidate the Labor, Delivery, Recover and Post-Partum (LDRP) rooms into a new 12-bed Family Birthing Center, comprised of 9 LDRP rooms, 3 post-partum patient rooms, and 1 operating room.
- Phase II, floor 2 undetermined, but will consist of 21,500 SF of future programmable hospital space.
- The new combined 43,000 SF Phase II facility will be located above the North Parking Lot on the west side of the lot, and connect to the proposed Phase I ICU Building via two pedestrian bridges/walkways.
- Existing obstetrics unit to be reprogrammed to care for more noncritical patients.

5.2 Trip Generation & Distribution

The ITE Trip Generation Manual, 11th Edition was used to estimate the number of vehicular trips generated by the Project. ITE rates were selected based on the Project's existing and proposed land use descriptions for Hospital (ITE 610) and Nursing Home (ITE 620). The independent variables used in this TIAR was a combination of square footage of gross floor area (SF GFA) and beds. The Trip Generation formula for Hospital (610) and Nursing Home (ITE 620) using the SF GFA variable, results in a trip projection that is parabolic and not linear. Forecast Project trips do not increase proportionately based on SF GFA increases. As a result, this TIAR employed the following method:

1. Calculate the cumulative total trips generated by the entire HMC site, inclusive of existing facilities, future Cancer Center Expansion and future Project Phases I and II.
2. Calculate the total trips generated by the existing HMC site, inclusive of existing facilities and the future Cancer Center Expansion. This calculation excludes future Project Phases I and II.
3. Subtract above item [2] from item [1] to determine the total remaining trips generated by the Project Phases I and II – 61,900 SF GFA increase.
4. Include additional trips generated by the 7-bed increase for the Project Phase I ICU space. Project increases ICU beds from 11 existing to 18 future total beds.

The Project is increasing the overall hospital by 61,900 SF GFA, therefore only the Hospital (ITE 610) fitted curve formula was used to forecast additional traffic generated by the Project. The existing HMC ICU space and Labor, Delivery and Postpartum rooms currently provide for the existing community. Therefore, this relocation should not in itself add new vehicular trips to the roadway network. However, since the Phase I ICU expansion/relocation and Phase II LDRP expansion/relocation would free up the existing spaces they occupy, it could be reprogrammed to service new hospital uses in addition to the Project's Phase II, 2nd floor expansion. As a result, the above method is justifiable to forecast the Project's 61,900 SF GFA expansion of generally undetermined future hospital uses. While the ICU bed increase from 11 existing to 18 future beds should not necessarily increase vehicular traffic, this TIAR accounted for this 7-bed increase to remain conservative in the Project trip generation projection.

The Project is expected to generate 57(59) new external trips during the AM(PM) peak hours of traffic. Forecast Project trips were distributed based on existing traffic patterns, with about 10% east of Waianuenue Avenue, 10% on Kaumana Drive, 30% west of Waianuenue Avenue and 50% on Komohana Street. Table 5.1 and 5.2 shows the Project trip generation formulas and vehicle trip projections for the Project, respectively. Figures 5.1 shows the Project Trips generated for Years 2025 (Project Phase I) and 2029 (Project Phase II).

Table 5.1 Project Trip Generation Rates

Land Use (ITE Code)	Independent Variable	AM Peak Hour		PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Hospital (610)	1,000 SF GFA	[a]	67%	[b]	35%
Hospital (610)	Beds	1.79	72%	1.69	33%
Nursing Home (620)	1,000 SF GFA	[a]	77%	[b]	41%

[a] Ln(T) = 0.60*Ln(X) + 2.52 [b] Ln(T) = 0.64*Ln(X) + 2.27
[c] Ln(T) = 0.85*Ln(X) – 0.05 [b] Ln(T) = 0.93*Ln(X) – 0.32

Table 5.2: Project Trip Generation

Land Use (ITE Code)	Units	Variable	AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Cumulative HMC Trips With Project (Existing HMC + Cancer Ctr Expansion + Project Phase I & II) [1]								
Hospital (610)	380.9	SF GFA	295	145	440	152	283	435
Nursing Home (620)	89.1	SF GFA	34	10	44	20	28	48
ITE Calculated Vehicle Trips			**329**	**155**	**484**	**172**	**311**	**483**
HMC Trips without Project (Existing + Cancer Ctr Expansion) [2]								
Hospital (610)	319.0	SF GFA	265	131	396	136	252	388
Nursing Home (620)	89.1	SF GFA	34	10	44	20	28	48
ITE Calculated Vehicle Trips			**299**	**141**	**440**	**156**	**280**	**436**
New Project Trips (Project Phase I & II)								
Subtotal Project Trips --> SF GFA Expansion Only (Cum. HMC Trips With Project - HMC Trips Without Project) [3]			***30***	***14***	***44***	***16***	***31***	***47***
Phase I - Hospital (610)	18.9	SF GFA	9	4	13	5	9	14
Phase I: ICU-Bed Increase	7.0	Beds	9	4	13	4	8	12
Phase II - Hospital (610)	43.0	SF GFA	21	10	31	11	22	33
TOTAL New Project Phase I & II Trips [4]			**39**	**18**	**57**	**20**	**39**	**59**

Notes:

1. Cumulative HMC Trips With Project = Existing HMC Hospital (301.7 kSF) + Cancer Ctr Exp (17.925 kSF) + Project (61.9 kSF) + HMC Nursing Homes (YOSVH & HMC Long-Term Care Facility 89.1ksf)
2. HMC Trips without Project = Existing HMC Hospital (301.7 kSF) + Cancer Ctr Exp (17.925 kSF) + HMC Nursing Homes (YOSVH & HMC Long-Term Care Facility 89.1ksf)
3. Project Trips generated by SF GFA Expansion Only = [1] - [2]
4. Total NEW Project Phase I & II Trips = [3] + 7 additional ICU Beds

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FIGURE 5.1.1

PROJECT TRIPS 2025 - 1

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FIGURE 5.1.2

PROJECT TRIPS 2025 - 2

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FIGURE 5.1.3

PROJECT TRIPS 2029 - 1

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FIGURE 5.1.4

PROJECT TRIPS 2029 - 2

5.3 Future Year 2025 & 2029 Analysis

It is anticipated that Project trips will have minimal impacts to the overall roadway network. By Future Year 2025, Phase I of the Project will only increase traffic by 1 to 2% from Base Year 2025 conditions, or as much as 5-15 vehicles/hour/direction. Upon full completion of both Phases I and II of the Project, overall Project traffic will increase Base Year 2029 conditions by only 2 to 3%, or as much as 10-35 vehicles/hour/direction.

All movements will operate adequately at LOS D or better will vehicular delays only increasing by as much as 1-2 second at each of the study intersections from Base Year conditions with the exception of the westbound approach along Punahele Street at its intersection with Komohana Street, which will continue to operate at LOS F(E) for the Future Year 2029 scenario during the AM(PM) peak hours of traffic, consistent with Base Year 2029 conditions. This westbound approach will continue to operate below capacity. Due to minimal increases in traffic, no major impacts are anticipated and no roadway improvements are recommended.

Figure 5.2 illustrates the Future Year 2025 lane configuration, traffic volumes, and LOS for each study intersection. Figure 5.3 illustrates the Future Year 2029 lane configuration, traffic volumes, and LOS for each study intersection. Table 5.3 summarizes the Existing, Base Year and Future Year LOS at the study intersections. LOS worksheets are provided in Appendix C.

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FIGURE 5.2.1

FUTURE YEAR 2025 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 1

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FIGURE 5.2.2

FUTURE YEAR 2025 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 2

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FIGURE 5.3.1

FUTURE YEAR 2029 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 1

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FIGURE 5.3.2

FUTURE YEAR 2029 CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS - 2

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TABLE 5.3: LOS SUMMARY TABLE
EXISTING CONDITIONS, BASE YEARS 2025 AND 2029, AND FUTURE YEARS 2025 AND 2029

	Existing 2019 Conditions						Base Year 2025						Base Year 2029						Future Year 2025						Future Year 2029					
	AM			PM			AM			PM			AM			PM			AM			PM			AM			PM		
Intersection	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: HMC North Parking Lot - West Dwy & Waianuenue Ave																														
EB LT	7.6	0.01	A	7.7	0.00	A	7.7	0.01	A	7.7	0.00	A	7.7	0.01	A	7.7	0.00	A	7.7	0.01	A	7.7	0.01	A	7.7	0.01	A	7.8	0.01	A
WB LT	7.6	0.01	A	7.5	0.01	A	7.6	0.01	A	7.5	0.01	A	7.6	0.01	A	7.6	0.01	A	7.6	0.01	A	7.5	0.01	A	7.6	0.01	A	7.6	0.01	A
SB LT/RT	11.0	0.05	B	11.3	0.12	B	11.3	0.05	B	11.7	0.14	B	11.5	0.06	B	12.0	0.14	B	11.3	0.06	B	11.8	0.14	B	11.6	0.07	B	12.3	0.16	B
OVERALL	1.4	-	-	2.2	-	-	1.4	-	-	2.2	-	-	1.3	-	-	2.2	-	-	1.4	-	-	2.3	-	-	1.4	-	-	2.4	-	-
2: HMC Cancer Center Dwy/HMC North Parking Lot - East Dwy & Waianuenue Ave																														
NB LT/TH/RT	0.0	0.00	A	9.9	0.01	A	9.3	0.00	A	9.9	0.02	A	9.4	0.00	A	10.0	0.02	B	9.3	0.00	A	10.0	0.02	B	9.5	0.00	A	10.1	0.02	B
EB LT	7.7	0.00	A	7.7	0.00	A	7.8	0.00	A	7.8	0.00	A	7.8	0.00	A	7.8	0.00	A	7.8	0.00	A	7.8	0.01	A	7.8	0.00	A	7.9	0.01	A
WB LT	7.6	0.01	A	7.7	0.01	A	7.7	0.01	A	7.8	0.01	A	7.7	0.01	A	7.8	0.01	A	7.7	0.01	A	7.8	0.01	A	7.7	0.01	A	7.8	0.01	A
SB LT/TH/RT	12.3	0.04	B	12.9	0.10	B	12.8	0.05	B	13.6	0.11	B	13.2	0.06	B	14.2	0.12	B	12.9	0.05	B	13.8	0.12	B	13.5	0.07	B	14.6	0.14	B
OVERALL	0.8	-	-	1.5	-	-	0.9	-	-	1.6	-	-	0.9	-	-	1.6	-	-	0.9	-	-	1.7	-	-	1.0	-	-	1.7	-	-
3: HMC South Parking Lot - West Dwy & Waianuenue Ave																														
NB LT/RT	9.9	0.09	A	10.9	0.12	B	10.1	0.09	B	11.1	0.13	B	10.2	0.10	B	11.3	0.14	B	10.2	0.10	B	11.2	0.13	B	10.5	0.12	B	11.6	0.15	B
WB LT	7.8	0.06	A	7.9	0.02	A	7.9	0.06	A	7.9	0.02	A	7.9	0.06	A	8.0	0.02	A	7.9	0.07	A	7.9	0.02	A	8.0	0.07	A	8.0	0.02	A
OVERALL	2.1	-	-	1.7	-	-	2.1	-	-	1.7	-	-	2.1	-	-	1.7	-	-	2.2	-	-	1.8	-	-	2.3	-	-	1.8	-	-
4: Waianuenue Ave & YOSVH - West Dwy																														
EB LT	8.0	0.00	A	7.8	0.00	A	8.0	0.00	A	7.9	0.00	A	8.1	0.00	A	7.9	0.00	A	8.1	0.00	A	7.9	0.00	A	8.1	0.00	A	8.0	0.00	A
SB LT/RT	12.8	0.05	B	13.2	0.06	B	13.2	0.06	B	13.8	0.07	B	13.6	0.06	B	14.3	0.07	B	13.4	0.06	B	14.1	0.07	B	14.1	0.06	B	14.9	0.07	B
OVERALL	0.6	-	-	0.6	-	-	0.5	-	-	0.5	-	-	0.5	-	-	0.5	-	-	0.5	-	-	0.5	-	-	0.5	-	-	0.5	-	-
5: HMC South Parking Lot - West Dwy/YOSVH - East Dwy & Waianuenue Ave																														
NB LT/TH/RT	9.7	0.01	A	13.3	0.32	B	9.9	0.01	A	13.9	0.35	B	10.0	0.01	B	14.3	0.37	B	10.0	0.01	B	14.2	0.37	B	10.1	0.02	B	15.3	0.41	C
WB LT	8.1	0.11	A	8.1	0.00	A	8.2	0.12	A	8.1	0.00	A	8.3	0.13	A	8.2	0.00	A	8.3	0.13	A	8.1	0.00	A	8.4	0.14	A	8.2	0.00	A
SB LT/TH/RT	17.2	0.01	C	20.4	0.05	C	18.2	0.01	C	22.3	0.06	C	19.0	0.01	C	24.0	0.07	C	18.9	0.01	C	23.5	0.06	C	20.7	0.01	C	27.1	0.07	D
OVERALL	1.7	-	-	3.5	-	-	1.7	-	-	3.5	-	-	1.7	-	-	3.6	-	-	1.7	-	-	3.7	-	-	1.8	-	-	3.9	-	-
6: Waianuenue Ave & HMC Long-Term Care Facility Dwy																														
NB LT/TH/RT	9.6	0.00	A	0.0	0.00	A	9.8	0.00	A	0.0	0.00	A	9.9	0.00	A	0.0	0.00	A	9.8	0.00	A	0.0	0.00	A	10.0	0.00	B	0.0	0.00	A
EB LT	8.4	0.01	A	7.7	0.01	A	8.5	0.01	A	7.8	0.01	A	8.6	0.01	A	7.8	0.01	A	8.6	0.01	A	7.8	0.01	A	8.7	0.01	A	7.9	0.01	A
WB LT	7.8	0.00	A	8.6	0.00	A	7.8	0.00	A	8.7	0.00	A	7.9	0.00	A	8.8	0.00	A	7.8	0.00	A	8.8	0.00	A	7.9	0.00	A	8.9	0.00	A
SB LT/TH/RT	14.5	0.05	B	14.2	0.14	B	15.2	0.05	C	15.1	0.15	C	15.8	0.06	C	15.8	0.15	C	15.6	0.05	C	15.5	0.15	C	16.7	0.06	C	16.8	0.17	C
OVERALL	0.5	-	-	1.0	-	-	0.5	-	-	1.0	-	-	0.5	-	-	1.0	-	-	0.5	-	-	1.0	-	-	0.5	-	-	1.0	-	-
7: Waianuenue Ave & Rainbow Dr.																														
EB LT	8.6	0.00	A	7.9	0.00	A	8.7	0.00	A	8.0	0.01	A	8.8	0.00	A	8.1	0.01	A	8.8	0.00	A	8.0	0.01	A	8.9	0.00	A	8.1	0.01	A
SB LT/RT	15.9	0.05	C	18.8	0.17	C	16.7	0.05	C	20.3	0.18	C	17.4	0.05	C	21.5	0.19	C	17.2	0.05	C	20.9	0.19	C	18.4	0.06	C	23.1	0.21	C
OVERALL	0.3	-	-	1.0	-	-	0.3	-	-	1.0	-	-	0.3	-	-	1.1	-	-	0.3	-	-	1.1	-	-	0.3	-	-	1.1	-	-
8: Puuhina St & Waianuenue Ave																														
NB LT/RT	17.2	0.20	C	18.3	0.08	C	18.3	0.21	C	19.5	0.09	C	19.1	0.22	C	20.4	0.10	C	18.9	0.22	C	20.0	0.09	C	20.7	0.24	C	21.7	0.10	C
WB LT	7.9	0.01	A	9.0	0.01	A	7.9	0.01	A	9.1	0.02	A	8.0	0.01	A	9.2	0.02	A	7.9	0.01	A	9.1	0.02	A	8.0	0.01	A	9.3	0.02	A
OVERALL	1.5	-	-	0.6	-	-	1.5	-	-	0.6	-	-	1.5	-	-	0.6	-	-	1.5	-	-	0.6	-	-	1.5	-	-	0.6	-	-
9: Kaumana Dr & Waianuenue Ave/Lele St																														
NB LT	30.7	0.39	C	32.3	0.08	C	33.6	0.42	C	32.3	0.08	C	38.6	0.46	D	32.3	0.08	C	36.1	0.48	D	33.1	0.12	C	40.9	0.52	D	34.0	0.16	C
NB TH	10.4	0.55	B	11.3	0.21	B	11.1	0.59	B	11.5	0.24	B	12.7	0.64	B	11.7	0.27	B	11.2	0.59	B	11.5	0.24	B	12.9	0.64	B	11.7	0.27	B
EB LT	16.6	0.37	B	19.8	0.57	B	17.6	0.39	B	20.5	0.60	C	19.2	0.42	B	21.1	0.62	C	17.6	0.40	B	21.2	0.63	C	19.3	0.43	B	22.4	0.67	C
EB LT/TH/RT	15.4	0.15	B	18.2	0.44	B	16.3	0.18	B	18.5	0.48	B	17.8	0.20	B	18.7	0.50	B	16.4	0.19	B	18.5	0.48	B	17.9	0.23	B	19.1	0.53	B
WB LT	23.3	0.03	C	0.0	0.00	A	24.9	0.03	C	0.0	0.00	A	25.9	0.02	C	0.0	0.00	A	24.9	0.03	C	0.0	0.00	A	26.2	0.02	C	0.0	0.00	A
WB TH/RT	25.0	0.14	C	32.9	0.12	C	26.8	0.15	C	32.9	0.12	C	26.4	0.08	C	32.9	0.12	C	26.9	0.15	C	32.9	0.12	C	26.7	0.08	C	32.9	0.12	C
SB TH	12.0	0.28	B	19.2	0.63	B	12.0	0.28	B	20.7	0.68	C	12.5	0.28	B	22.6	0.74	C	12.0	0.28	B	20.7	0.68	C	12.7	0.28	B	22.6	0.74	C
OVERALL	12.9	-	B	18.1	-	B	13.5	-	B	18.8	-	B	14.8	-	B	19.6	-	B	13.7	-	B	19.0	-	B	15.2	-	B	20.1	-	C
10: Komohana St & Waianuenue Ave																														
NB LT	16.7	0.76	B	11.4	0.55	B	20.1	0.82	C	13.3	0.58	B	24.7	0.87	C	14.4	0.60	B	22.1	0.84	C	13.2	0.57	B	30.8	0.91	C	14.6	0.61	B
NB RT	9.9	0.31	A	9.2	0.11	A	10.8	0.39	B	10.4	0.14	B	11.5	0.42	B	11.0	0.17	B	10.9	0.38	B	10.6	0.14	B	11.8	0.44	B	11.2	0.17	B
EB TH	20.0	0.76	C	8.9	0.46	A	20.2	0.77	C	9.9	0.46	A	20.1	0.77	C	11.4	0.48	B	20.1	0.76	C	9.4	0.46	A	20.2	0.77	C	11.9	0.50	B
EB RT	12.0	0.14	B	8.0	0.26	A	12.0	0.18	B	9.0	0.29	A	12.0	0.21	B	10.4	0.31	B	12.0	0.18	B	8.5	0.29	A	11.9	0.21	B	10.8	0.32	B
WB LT/TH	11.8	0.09	B	9.1	0.48	A	11.6	0.10	B	10.8	0.54	B	11.5	0.10	B	13.3	0.62	B	11.6	0.10	B	10.1	0.54	B	11.4	0.10	B	13.9	0.64	B
OVERALL	15.3	-	B	9.2	-	A	16.4	-	B	10.6	-	B	17.8	-	B	12.3	-	B	17.0	-	B	10.2	-	B	19.9	-	B	12.7	-	B

TABLE 5.3: LOS SUMMARY TABLE
EXISTING CONDITIONS, BASE YEARS 2025 AND 2029, AND FUTURE YEARS 2025 AND 2029 CONT'D

Intersection	Existing 2019 Conditions						Base Year 2025						Base Year 2029						Future Year 2025						Future Year 2029					
	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: Kaumana Dr & Puuhina St/Hualilili St. & Punahele St																														
NB LT	7.6	0.04	A	8.1	0.01	A	7.6	0.04	A	8.2	0.01	A	7.6	0.04	A	8.3	0.02	A	7.6	0.04	A	8.2	0.01	A	7.6	0.04	A	8.3	0.02	A
EB RT	9.0	0.01	A	10.5	0.01	B	9.0	0.01	A	10.8	0.01	B	9.1	0.01	A	11.1	0.01	B	9.0	0.01	A	10.8	0.01	B	9.1	0.01	A	11.1	0.02	B
WB LT/TH/RT	15.7	0.14	C	15.1	0.08	C	16.9	0.15	C	15.9	0.09	C	18.1	0.16	C	16.9	0.10	C	16.9	0.15	C	16.0	0.09	C	18.2	0.16	C	17.0	0.10	C
SB LT	8.8	0.02	A	7.8	0.02	A	9.0	0.02	A	7.8	0.02	A	9.1	0.03	A	7.9	0.02	A	9.0	0.03	A	7.8	0.02	A	9.2	0.03	A	7.9	0.02	A
OVERALL	1.9	-	-	1.4	-	-	1.8	-	-	1.4	-	-	1.8	-	-	1.3	-	-	1.8	-	-	1.4	-	-	1.8	-	-	1.3	-	-
12: Punahele St & Komohana St																														
NB LT	7.7	0.02	A	8.6	0.03	A	7.9	0.02	A	8.9	0.03	A	8.0	0.02	A	9.1	0.03	A	7.9	0.02	A	8.9	0.03	A	8.1	0.02	A	9.2	0.03	A
EB TH/RT	14.7	0.39	B	16.9	0.28	C	17.3	0.45	C	20.5	0.34	C	20.2	0.50	C	24.4	0.40	C	17.6	0.46	C	20.9	0.35	C	20.8	0.52	C	25.5	0.41	D
WB LT/TH/RT	23.1	0.54	C	22.1	0.16	C	41.4	0.72	E	31.6	0.23	D	59.0	0.82	F	43.4	0.30	E	43.8	0.74	E	32.2	0.23	D	70.4	0.88	F	46.0	0.32	E
SB LT	9.9	0.02	A	8.4	0.00	A	10.3	0.03	B	8.7	0.00	A	10.7	0.03	B	9.0	0.00	A	10.4	0.03	B	8.8	0.00	A	10.8	0.03	B	9.0	0.00	A
OVERALL	5.5	-	-	2.6	-	-	7.7	-	-	2.8	-	-	9.6	-	-	3.1	-	-	8.0	-	-	2.8	-	-	10.8	-	-	3.2	-	-

6. CONCLUSION

The existing HMC Campus is located on approximately 33 acres of land along Waianuenue Avenue. The existing HMC Campus is comprised of various buildings and facilities totaling approximately 390,800 SF of building space. HMC is also constructing a new 17,295 SF Cancer Center Expansion next to the existing HMC Cancer Center Building, which will bring the new total campus building floor space to about 408,100 SF. Parking for the HMC Campus is provided via six (6) intersection accesses off Waianuenue Avenue.

The Project proposes to expand the HMC campus in two (2) phases of development. Vehicular access to the Project will occur via existing driveways identified in this TIAR.

Phase I - Intensive Care Unit (ICU) Expansion/Relocation – Year 2025

- The existing ICU space in the HMC Primary Acute Care Facility consists of 11-beds. The existing ICU space operates at or above capacity, prompting this expansion.

- Relocate existing 11-bed ICU space from the HMC Primary Acute Care Facility to a new 18,900 SF,18-bed facility with offices and ancillary uses → Total increase of 7 ICU beds.

- The new 18,900 SF facility will be a single-story building located above the North Parking Lot on the east side of the lot, and connect to the existing HMC Primary Acute Care Facility via two pedestrian bridges/walkways.

- The existing ground level parking lot will be redesigned to accommodate the overhead Phase I ICU Expansion Facility.

- Existing ICU space to be reprogrammed to care for more noncritical patients.

Phase II – Family Birthing Center Expansion/Relocation & Future Program Space – Year 2029

Phase II will consist of two (2) new floors, each providing 21,500 SF of space (total 43,000 SF)

- The existing obstetrics unit in the HMC Primary Acute Care Facility consists of a 5-room Labor/Delivery unit and a separate 16-bed Postpartum unit. The existing obstetrics unit adequately provides for current demands.

- Phase II, floor 1 will relocate and consolidate the Labor, Delivery, Recover and Post-Partum (LDRP) rooms into a new 12-bed Family Birthing Center, comprised of 9 LDRP rooms, 3 post-partum patient rooms and 1 operating room.

- Phase II, floor 2 undetermined, but will consist of 21,500 SF of future programmable hospital space.

- The new combined 43,000 SF Phase II facility will be located above the North Parking Lot on the west side of the lot, and connect to the proposed Phase I ICU Building via two pedestrian bridges/walkways.

- Existing obstetrics unit to be reprogrammed to care for more noncritical patients

6.1 Existing Conditions

Turning movement counts were collected on Thursday, August 26, 2021. At this time, all DOE schools and UH Hilo were in session however, traffic increases were applied at various intersections based on comparison to historic counts.

Adjustments were made to the 2021 count to account for various discrepancies such as slightly higher parking occupancy compared to average 2020 data, no trips generated at the HMC Cancer Center Driveway (closed at the time of count for construction) and lower volumes compared to historic 2008 and 2016 counts. These adjustments resulted in overall increases of 0-35 vehicles along Waianuenue Avenue (west of Komohana Street), 50-80 vehicles along Waianuenue Avenue (east of Komohana Street), 30-130 vehicles along Kaumana Drive and 30-100 vehicles along Komohana Street.

Currently, between 7:15 AM to 8:00 AM on school days, the westbound lane along Waianuenue Avenue is used as an additional eastbound travel lane to service heavy traffic generated by the nearby Hilo Union Elementary School, Hilo Intermediate and Hilo High School. All vehicular traffic along Waianuenue Avenue during this period is restricted to only eastbound flows from Kamehameha Avenue to Komohana Street. For about five (5) signal cycles between 7:30 AM and 7:45 AM, northbound queues were observed to briefly spill back along Komohana Street from its intersection with Waianuenue Avenue to Punahele Street. Northbound flows quickly dissipated, but Punahele Street queued for a brief 10-minute period from the queue spillback.

Traffic throughout the remaining study network was observed to generally flow smoothly along the study corridors, with no significant queues. All vehicles at the study intersections were generally able to clear within one signal cycle.

Fronting the existing HMC site, two (2) marked pedestrian crosswalks are provided at the HMC South Parking Lot – West Driveway and the YOSVH West Driveway. Approximately 120-150 pedestrians cross at the HMC South Parking Lot – West Driveway crosswalk and approximately 60 pedestrians cross at the YOSVH West Driveway during each of the peak hours. Due to relatively low vehicular volumes and low speeds, there were no observed vehicle-pedestrian conflicts.

6.2 Base Year 2025 and 2029 Traffic Conditions

For Base Year 2025, traffic will increase over existing conditions; Waianuenue Avenue 12% (25-30 vehicles/hour/direction), Kaumana Drive 5-7% (10-45 vehicles/hour/direction) and Komohana Street 10 to 16% (60-100 vehicles/hour/direction). Due to minimal traffic increases, all intersections are anticipated to operate with similar levels of service as existing conditions.

For Base Year 2029, traffic will increase by an additional 5-10% from Base Year 2025 conditions. All intersections are anticipated to operate with similar levels of service as Base Year 2025 conditions. All movements will operate adequately at LOS C or better with vehicular delays only increasing by as much as 6 seconds at each of the study intersections.

Under Base Year 2025 and 2029 conditions, most movements at the study intersections are expected to continue operating similar to existing conditions during the AM and PM peak hours of traffic. All movements will operate adequately at LOS D or better with most vehicular delays only increasing by 1-2 seconds and select movements increasing by as much as 7 seconds at all of the study intersections, with the exception of the westbound approach along Punahele Street at its intersection with Komohana Street, which worsens from LOS C(C) to LOS E(D) for Base

Year 2025 and LOS F(E) for Base Year 2029 during the AM(PM) peak hours of traffic. This westbound approach will continue to service a relatively low left-turn volume between 15-30 vehicles per peak hour and the approach will still operate below capacity.

6.3 Future Year 2025 and 2029 Conditions

The Project proposes to expand the existing HMC Campus by 61,900 SF GFA in two (2) phases of development. The specific uses of the Project are described in greater detail, in Section 5.1. Based on this TIAR's trip generation method described in Section 5.2, the Project is expected to generate 57(59) new external trips during the AM(PM) peak hours of traffic.

It is anticipated that Project trips will have minimal impacts to the overall roadway network. By Future Year 2025, Phase I of the Project will only increase traffic by 1 to 2% from Base Year 2025 conditions, or as much as 5-15 vehicles/hour/direction. Upon full completion of both Phases I and II of the Project, overall Project traffic will increase Base Year 2029 conditions by only 2 to 3%, or as much as 10-35 vehicles/hour/direction.

All movements will operate adequately at LOS D or better will vehicular delays only increasing by as much as 1-2 second at each of the study intersections from Base Year conditions with the exception of the westbound approach along Punahele Street at its intersection with Komohana Street, which will continue to operate at LOS F(E) for the Future Year 2029 scenario during the AM(PM) peak hours of traffic, consistent with Base Year 2029 conditions. This westbound approach will continue to operate below capacity. Due to minimal increases in traffic, no major impacts are anticipated and no roadway improvements are recommended.

7. REFERENCES

1. AECOM, Hale Ola O Mohouli Affordable Residential Traffic Impact Analysis Report, November 2020.

2. Austin, Tsutsumi & Associates, Inc, Kaiaulu O Kapiolani Apartments Traffic Impact Analysis Report, June 21, 2019.

3. Geometrician Associates, LLC, Final Environmental Assessment for Hilo Medical Center Hawaii Pacific Oncology Center Addition and Rural & Telehealth Center Unit, March 2020.

4. Institute of Transportation Engineers, Trip Generation, 11th Edition, 2021.

5. M&E Pacific, Inc., County of Hawaii Fire Administration Support Complex Traffic Impact Analysis Report, February 13, 2008.

6. The American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2011.

7. Transportation Research Board, Highway Capacity Manual, 6th Edition.

APPENDICES

APPENDIX A

TRAFFIC COUNT DATA

Austin Tsutsumi & Associates

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Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : HMC Dwy 1 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 1 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				HALE ANUENUE ENTRANCE NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	4	0	0	0	1	0	9	0	0	0	0	0	0	8	1	0	23
06:15 AM	1	0	1	0	3	0	12	0	0	0	0	0	3	12	0	0	32
06:30 AM	1	0	0	0	4	10	9	0	0	0	0	0	3	19	0	0	46
06:45 AM	4	0	0	0	5	9	6	0	0	0	0	0	1	16	1	0	42
Total	10	0	1	0	13	19	36	0	0	0	0	0	7	55	2	0	143
07:00 AM	1	0	0	0	2	18	9	0	0	0	0	0	3	22	0	0	55
07:15 AM	5	0	3	0	2	26	10	0	0	0	0	1	2	34	1	0	84
07:30 AM	8	0	1	0	6	29	17	0	0	0	0	0	3	47	0	0	111
07:45 AM	9	0	1	0	8	49	17	0	0	0	0	0	4	39	1	0	128
Total	23	0	5	0	18	122	53	0	0	0	0	1	12	142	2	0	378
08:00 AM	10	0	0	0	3	32	19	0	0	0	0	0	0	24	0	0	88
08:15 AM	4	0	1	0	1	23	7	0	0	0	0	0	1	31	1	0	69
08:30 AM	9	0	1	0	0	24	9	0	0	0	0	0	1	19	2	0	65
08:45 AM	8	0	1	0	2	29	12	0	0	0	0	0	2	39	0	0	93
Total	31	0	3	0	6	108	47	0	0	0	0	0	4	113	3	0	315
Grand Total	64	0	9	0	37	249	136	0	0	0	0	1	23	310	7	0	836
Apprch %	87.7	0	12.3	0	8.8	59	32.2	0	0	0	0	100	6.8	91.2	2.1	0	
Total %	7.7	0	1.1	0	4.4	29.8	16.3	0	0	0	0	0.1	2.8	37.1	0.8	0	
Motorcycles	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.4	0.7	0	0	0	0	0	0	0.3	0	0	0.4
Cars & Light Goods	63	0	9	0	37	246	135	0	0	0	0	0	22	308	7	0	827
% Cars & Light Goods	98.4	0	100	0	100	98.8	99.3	0	0	0	0	0	95.7	99.4	100	0	98.9
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Buses	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.1
Articulated Trucks	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Articulated Trucks	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	4.3	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	1	0	0	0	0	1
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0.1

Austin Tsutsumi & Associates

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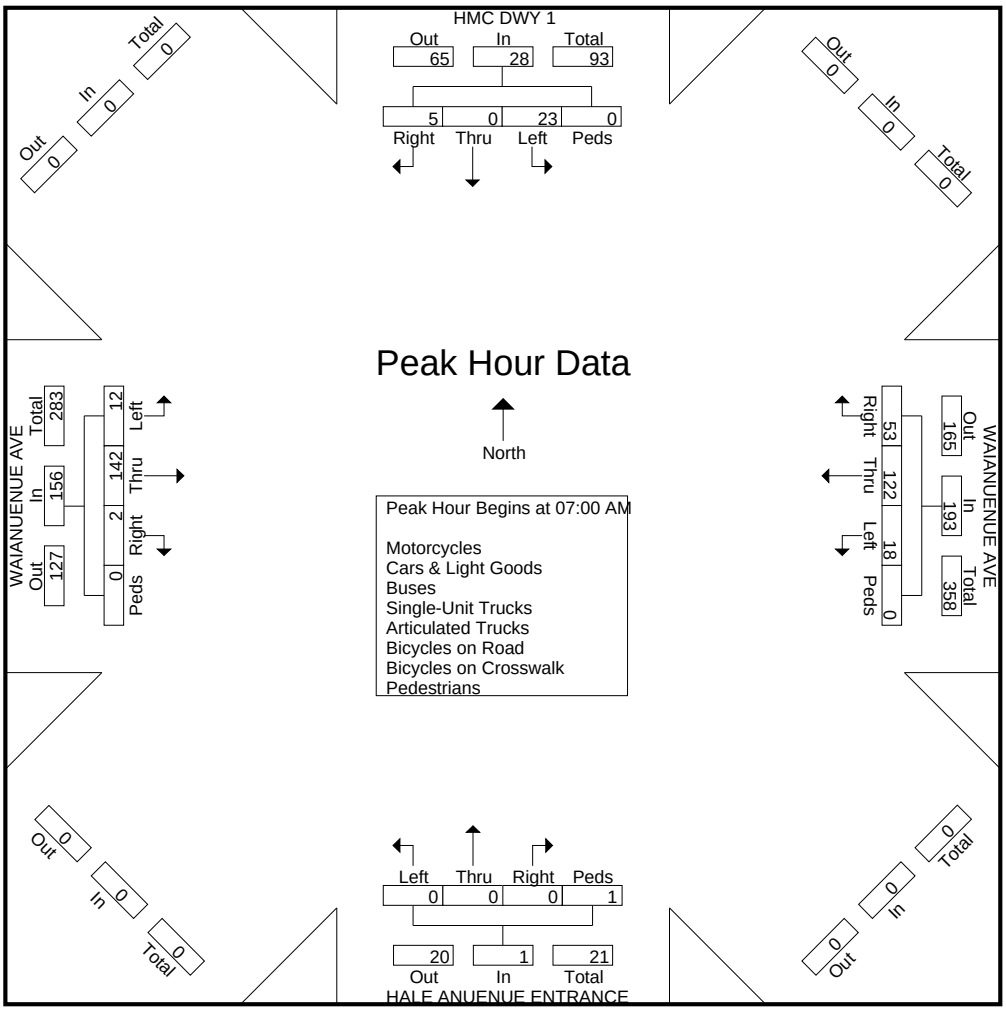
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 2

	HMC DWY 1 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					HALE ANUENUE ENTRANCE NORTHBOUND					WAIANUENUE AVE 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 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	1	0	0	0	1	2	18	9	0	29	0	0	0	0	0	3	22	0	0	25	55
07:15 AM	5	0	**3**	0	8	2	26	10	0	38	0	0	0	**1**	**1**	2	34	**1**	0	37	84
07:30 AM	8	0	1	0	9	6	29	**17**	0	52	0	0	0	0	0	3	**47**	0	0	**50**	111
07:45 AM	**9**	0	1	0	**10**	**8**	**49**	17	0	**74**	0	0	0	0	0	**4**	39	1	0	44	**128**
Total Volume	23	0	5	0	28	18	122	53	0	193	0	0	0	1	1	12	142	2	0	156	378
% App. Total	82.1	0	17.9	0		9.3	63.2	27.5	0		0	0	0	100		7.7	91	1.3	0		
PHF	.639	.000	.417	.000	.700	.563	.622	.779	.000	.652	.000	.000	.000	.250	.250	.750	.755	.500	.000	.780	.738



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	HMC DWY 1 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				HALE ANUENUE ENTRANCE NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	16	0	0	0	3	34	9	0	0	0	0	0	2	31	0	0	95
03:15 PM	13	0	2	0	2	43	7	0	0	0	0	0	1	24	0	0	92
03:30 PM	18	0	0	0	0	55	7	0	0	0	0	0	1	38	0	0	119
03:45 PM	7	0	2	0	2	27	10	0	0	0	0	0	1	31	1	0	81
Total	54	0	4	0	7	159	33	0	0	0	0	0	5	124	1	0	387
04:00 PM	23	0	3	0	2	38	3	0	0	0	0	0	2	37	0	0	108
04:15 PM	11	0	1	0	1	41	6	0	0	0	0	0	3	23	0	0	86
04:30 PM	13	0	3	0	1	35	5	0	0	0	0	0	1	28	0	0	86
04:45 PM	12	0	1	0	1	46	4	0	0	0	0	0	1	22	0	0	87
Total	59	0	8	0	5	160	18	0	0	0	0	0	7	110	0	0	367
05:00 PM	9	0	2	0	0	37	1	0	0	0	0	0	1	33	0	0	83
05:15 PM	7	0	0	0	0	33	2	0	0	0	0	0	0	24	0	0	66
05:30 PM	4	0	1	0	0	18	6	0	0	0	0	0	0	14	0	0	43
05:45 PM	4	0	3	0	0	20	4	0	0	0	0	0	0	15	0	0	46
Total	24	0	6	0	0	108	13	0	0	0	0	0	1	86	0	0	238
Grand Total	137	0	18	0	12	427	64	0	0	0	0	0	13	320	1	0	992
Apprch %	88.4	0	11.6	0	2.4	84.9	12.7	0	0	0	0	0	3.9	95.8	0.3	0	
Total %	13.8	0	1.8	0	1.2	43	6.5	0	0	0	0	0	1.3	32.3	0.1	0	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Motorcycles	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.2
Cars & Light Goods	137	0	17	0	12	421	64	0	0	0	0	0	13	320	1	0	985
% Cars & Light Goods	100	0	94.4	0	100	98.6	100	0	0	0	0	0	100	100	100	0	99.3
Buses	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Buses	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1
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	1	0	0	3	0	0	0	0	0	0	0	0	0	0	4
% Bicycles on Road	0	0	5.6	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0.4
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 : HMC Dwy 1 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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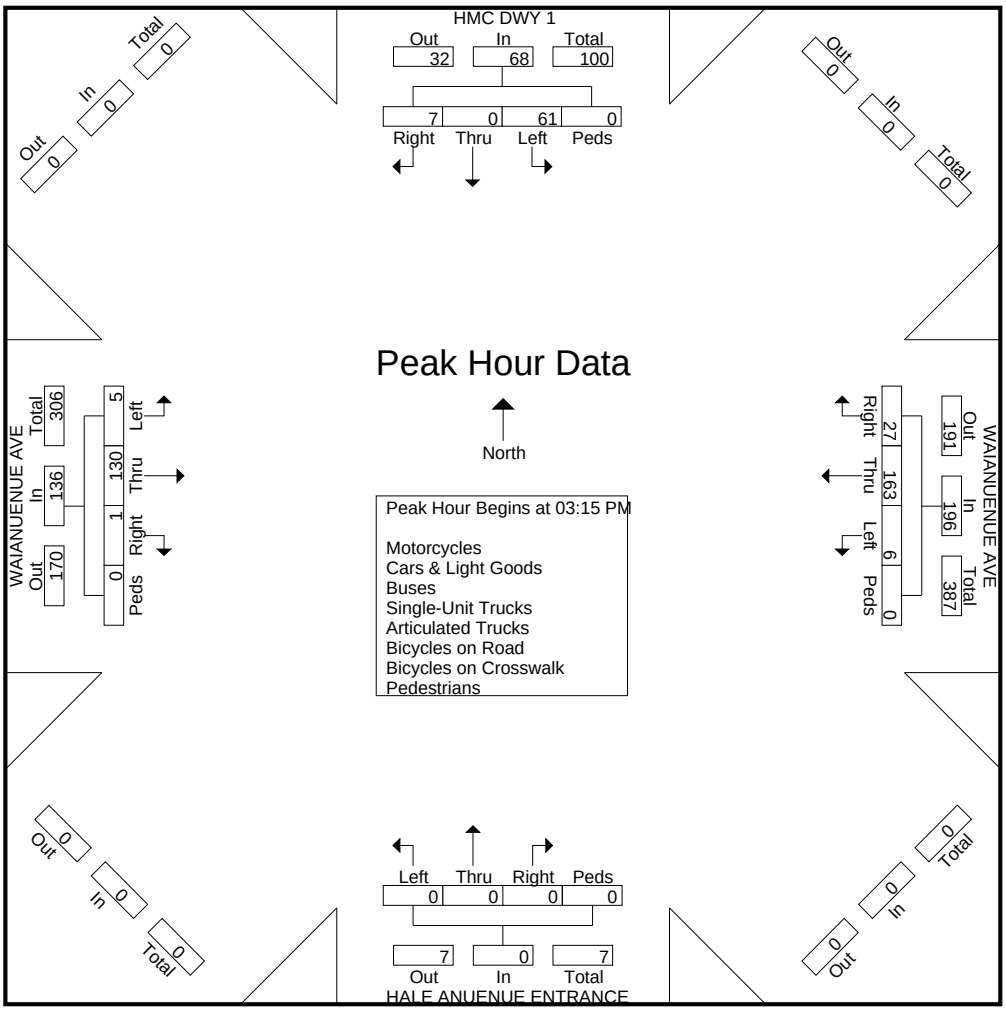
	HMC DWY 1 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					HALE ANUENUE ENTRANCE NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	13	0	2	0	15	**2**	43	7	0	52	0	0	0	0	0	1	24	0	0	25	92
03:30 PM	18	0	0	0	18	0	**55**	7	0	**62**	0	0	0	0	0	1	**38**	0	0	**39**	**119**
03:45 PM	7	0	2	0	9	2	27	**10**	0	39	0	0	0	0	0	1	31	**1**	0	33	81
04:00 PM	**23**	0	**3**	0	**26**	2	38	3	0	43	0	0	0	0	0	**2**	37	0	0	39	108
Total Volume	61	0	7	0	68	6	163	27	0	196	0	0	0	0	0	5	130	1	0	136	400
% App. Total	89.7	0	10.3	0		3.1	83.2	13.8	0		0	0	0	0		3.7	95.6	0.7	0		
PHF	.663	.000	.583	.000	.654	.750	.741	.675	.000	.790	.000	.000	.000	.000	.000	.625	.855	.250	.000	.872	.840



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File Name : HMC Dwy 2_EHHC Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 2 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				EHHC DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	2	0	0	0	0	10	3	0	0	0	0	0	0	13	0	0	28
06:15 AM	6	0	0	0	0	21	6	0	0	0	0	0	1	17	0	1	52
06:30 AM	9	0	2	0	0	22	7	0	0	0	0	0	2	22	0	0	64
06:45 AM	2	0	1	0	1	14	4	0	0	0	0	0	0	20	0	0	42
Total	19	0	3	0	1	67	20	0	0	0	0	0	3	72	0	1	186
07:00 AM	4	0	0	0	0	30	5	0	0	0	0	1	0	25	0	1	66
07:15 AM	4	0	1	0	0	41	5	0	0	0	0	1	3	48	0	0	103
07:30 AM	10	0	0	0	0	61	5	0	0	0	0	0	0	54	0	0	130
07:45 AM	2	0	0	2	0	68	5	0	0	0	0	1	0	45	0	0	123
Total	20	0	1	2	0	200	20	0	0	0	0	3	3	172	0	1	422
08:00 AM	6	0	0	2	1	45	14	0	0	0	0	0	0	32	0	1	101
08:15 AM	4	0	4	0	0	25	7	0	0	0	0	2	1	36	0	3	82
08:30 AM	6	0	1	0	0	35	10	0	0	0	0	1	1	35	0	0	89
08:45 AM	8	0	2	1	0	43	15	0	0	0	0	0	0	43	0	1	113
Total	24	0	7	3	1	148	46	0	0	0	0	3	2	146	0	5	385
Grand Total	63	0	11	5	2	415	86	0	0	0	0	6	8	390	0	7	993
Apprch %	79.7	0	13.9	6.3	0.4	82.5	17.1	0	0	0	0	100	2	96.3	0	1.7	
Total %	6.3	0	1.1	0.5	0.2	41.8	8.7	0	0	0	0	0.6	0.8	39.3	0	0.7	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.3	0	0	0.3
Cars & Light Goods	62	0	11	0	2	410	86	0	0	0	0	0	8	386	0	0	965
% Cars & Light Goods	98.4	0	100	0	100	98.8	100	0	0	0	0	0	100	99	0	0	97.2
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
% Buses	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0.3
Single-Unit Trucks	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4
% Single-Unit Trucks	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0.4
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	5	0	0	0	0	0	0	0	6	0	0	0	7	18
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	100	0	0	0	100	1.8

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File Name : HMC Dwy 2_EHHC Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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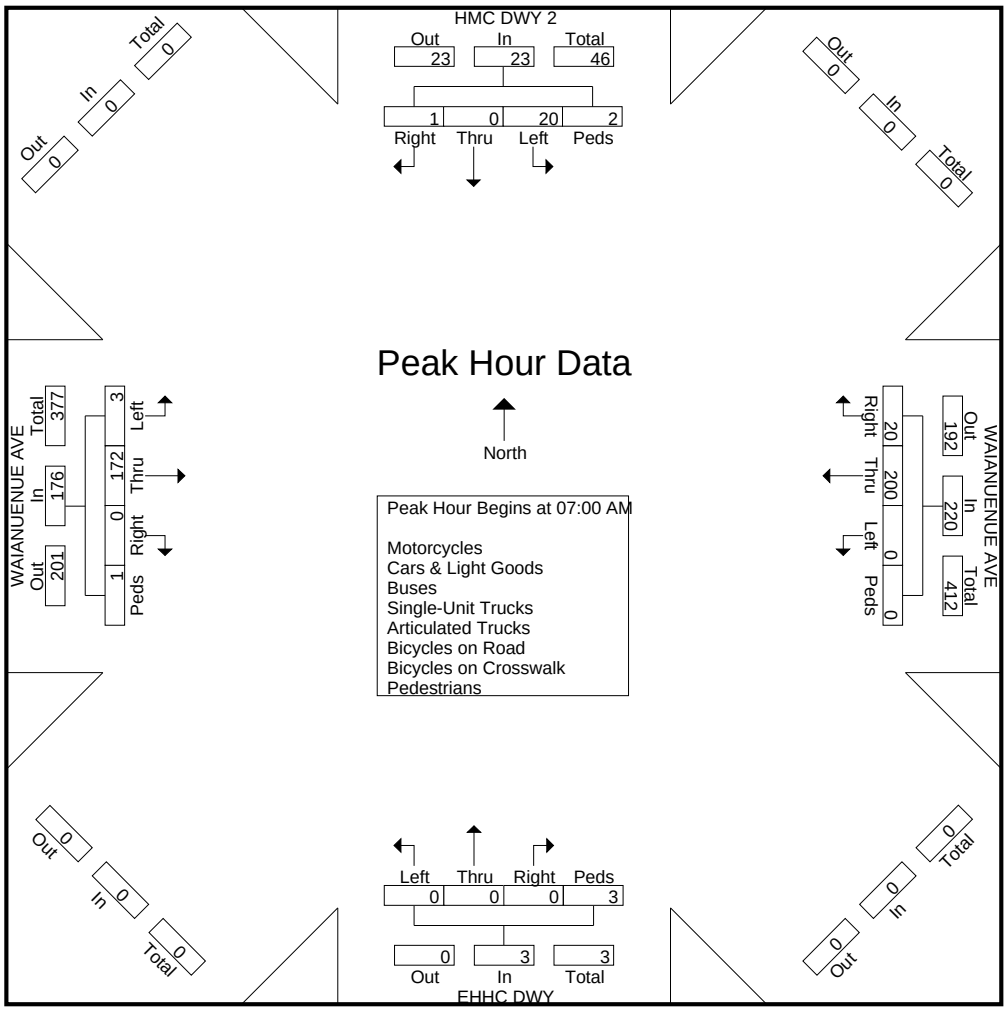
	HMC DWY 2 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					EHHC DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	4	0	0	0	4	0	30	**5**	0	35	0	0	0	**1**	**1**	0	25	0	**1**	26	66
07:15 AM	4	0	**1**	0	5	0	41	5	0	46	0	0	0	1	1	**3**	48	0	0	51	103
07:30 AM	**10**	0	0	0	**10**	0	61	5	0	66	0	0	0	0	0	0	**54**	0	0	**54**	**130**
07:45 AM	2	0	0	**2**	4	0	**68**	5	0	**73**	0	0	0	1	1	0	45	0	0	45	123
Total Volume	20	0	1	2	23	0	200	20	0	220	0	0	0	3	3	3	172	0	1	176	422
% App. Total	87	0	4.3	8.7		0	90.9	9.1	0		0	0	0	100		1.7	97.7	0	0.6		
PHF	.500	.000	.250	.250	.575	.000	.735	1.00	.000	.753	.000	.000	.000	.750	.750	.250	.796	.000	.250	.815	.812



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File Name : HMC Dwy 2_EHHC Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 2 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				EHHC DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	8	0	1	0	0	43	7	0	0	0	0	0	2	45	0	0	106
03:15 PM	10	0	0	0	0	59	5	0	0	0	0	0	1	48	0	0	123
03:30 PM	7	0	2	1	0	48	9	0	0	0	0	0	1	59	0	0	127
03:45 PM	12	0	2	0	0	36	14	1	0	0	0	1	2	41	0	0	109
Total	37	0	5	1	0	186	35	1	0	0	0	1	6	193	0	0	465
04:00 PM	10	0	1	3	0	45	4	0	0	0	0	1	1	61	0	0	126
04:15 PM	5	0	1	2	0	45	5	0	0	0	0	0	1	31	0	0	90
04:30 PM	12	0	1	1	0	39	6	0	0	0	0	0	5	45	0	0	109
04:45 PM	6	0	1	0	0	53	8	0	0	0	0	0	0	39	0	0	107
Total	33	0	4	6	0	182	23	0	0	0	0	1	7	176	0	0	432
05:00 PM	10	0	0	0	0	30	2	0	0	0	0	0	1	43	0	1	87
05:15 PM	5	0	0	0	0	30	2	0	0	0	0	0	2	30	0	0	69
05:30 PM	8	0	0	0	0	24	2	0	0	0	0	0	0	17	0	0	51
05:45 PM	3	0	0	0	0	29	3	0	0	0	0	0	1	18	0	0	54
Total	26	0	0	0	0	113	9	0	0	0	0	0	4	108	0	1	261
Grand Total	96	0	9	7	0	481	67	1	0	0	0	2	17	477	0	1	1158
Apprch %	85.7	0	8	6.2	0	87.6	12.2	0.2	0	0	0	100	3.4	96.4	0	0.2	
Total %	8.3	0	0.8	0.6	0	41.5	5.8	0.1	0	0	0	0.2	1.5	41.2	0	0.1	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Motorcycles	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0.2
Cars & Light Goods	89	0	9	0	0	475	66	0	0	0	0	0	17	477	0	0	1133
% Cars & Light Goods	92.7	0	100	0	0	98.8	98.5	0	0	0	0	0	100	100	0	0	97.8
Buses	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
% Buses	0	0	0	0	0	0.2	1.5	0	0	0	0	0	0	0	0	0	0.2
Single-Unit Trucks	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
% Single-Unit Trucks	6.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
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	3	0	0	0	0	0	0	0	0	0	0	4
% Bicycles on Road	1	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.3
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	7	0	0	0	1	0	0	0	2	0	0	0	1	11
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	100	0.9

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File Name : HMC Dwy 2_EHHC Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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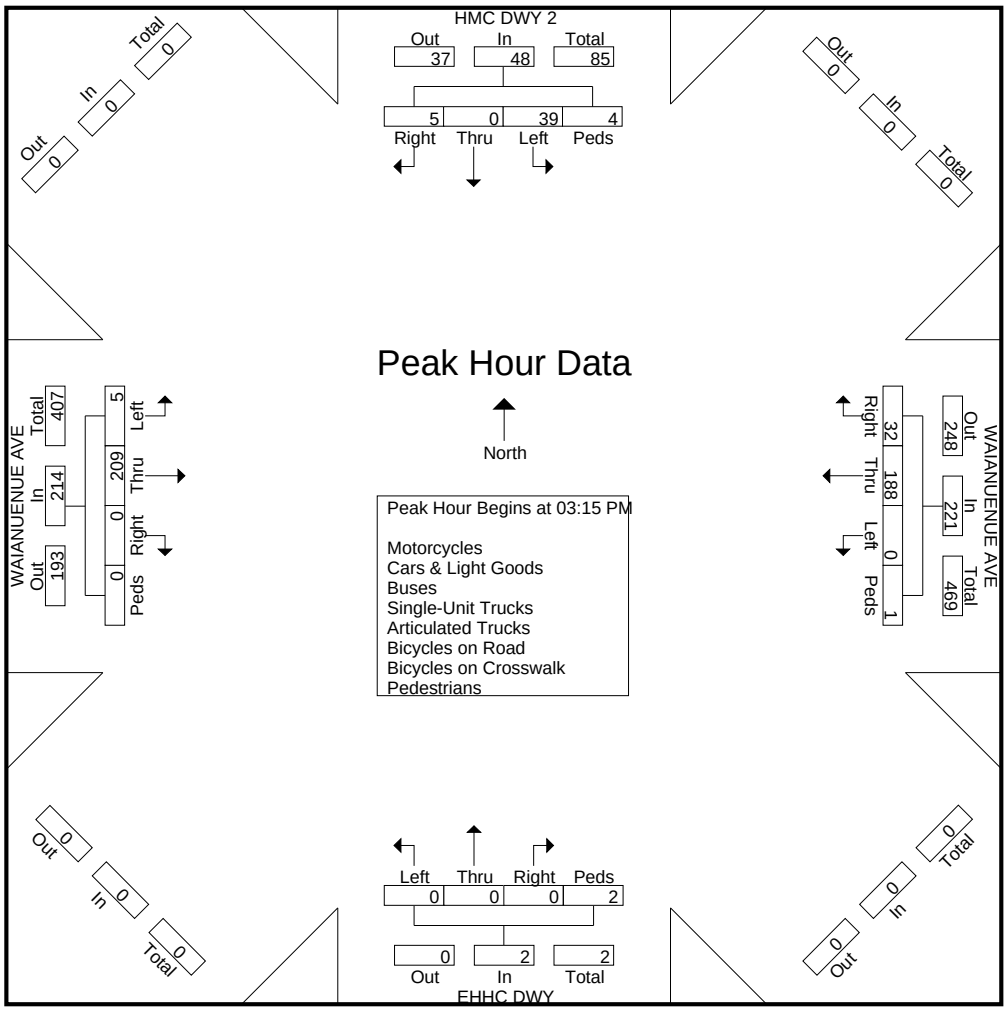
	HMC DWY 2 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					EHHC DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	10	0	0	0	10	0	**59**	5	0	**64**	0	0	0	0	0	1	48	0	0	49	123
03:30 PM	7	0	**2**	1	10	0	48	9	0	57	0	0	0	0	0	1	59	0	0	60	**127**
03:45 PM	**12**	0	2	0	**14**	0	36	**14**	**1**	51	0	0	0	**1**	**1**	**2**	41	0	0	43	109
04:00 PM	10	0	1	**3**	14	0	45	4	0	49	0	0	0	1	1	1	**61**	0	0	**62**	126
Total Volume	39	0	5	4	48	0	188	32	1	221	0	0	0	2	2	5	209	0	0	214	485
% App. Total	81.2	0	10.4	8.3		0	85.1	14.5	0.5		0	0	0	100		2.3	97.7	0	0		
PHF	.813	.000	.625	.333	.857	.000	.797	.571	.250	.863	.000	.000	.000	.500	.500	.625	.857	.000	.000	.863	.955



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File Name : Lower Lot Mauka Parking Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				WAIANUENUE AVE WESTBOUND				HMC LOWER LOT PRKG DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	0	0	0	0	17	13	0	0	0	0	2	0	0	13	2	22	69
06:15 AM	0	0	0	0	21	27	0	0	1	0	1	0	0	20	1	36	107
06:30 AM	0	0	0	0	6	30	0	1	0	0	1	1	0	30	3	42	114
06:45 AM	0	0	0	0	6	19	0	0	2	0	0	0	0	20	3	16	66
Total	0	0	0	0	50	89	0	1	3	0	4	1	0	83	9	116	356
07:00 AM	0	0	0	0	10	36	0	0	0	0	3	7	0	28	1	23	108
07:15 AM	0	0	0	0	17	44	0	0	2	0	22	13	0	40	9	65	212
07:30 AM	0	0	0	0	18	65	0	0	1	0	23	8	0	65	2	37	219
07:45 AM	0	0	0	0	22	74	0	0	0	0	12	5	0	43	4	27	187
Total	0	0	0	0	67	219	0	0	3	0	60	33	0	176	16	152	726
08:00 AM	0	0	0	0	10	58	0	0	2	0	5	2	0	37	2	9	125
08:15 AM	0	0	0	0	10	32	0	1	0	0	2	1	0	36	5	11	98
08:30 AM	0	0	0	0	6	44	0	0	2	0	6	1	0	39	3	8	109
08:45 AM	0	0	0	0	10	56	0	1	2	0	12	1	0	52	1	8	143
Total	0	0	0	0	36	190	0	2	6	0	25	5	0	164	11	36	475
Grand Total	0	0	0	0	153	498	0	3	12	0	89	39	0	423	36	304	1557
Apprch %	0	0	0	0	23.4	76.1	0	0.5	8.6	0	63.6	27.9	0	55.4	4.7	39.8	
Total %	0	0	0	0	9.8	32	0	0.2	0.8	0	5.7	2.5	0	27.2	2.3	19.5	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0.2
Cars & Light Goods	0	0	0	0	152	492	0	0	12	0	87	0	0	417	36	0	1196
% Cars & Light Goods	0	0	0	0	99.3	98.8	0	0	100	0	97.8	0	0	98.6	100	0	76.8
Buses	0	0	0	0	1	2	0	0	0	0	2	0	0	0	0	0	5
% Buses	0	0	0	0	0.7	0.4	0	0	0	0	2.2	0	0	0	0	0	0.3
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0.3
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0.2
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	3	0	0	0	39	0	0	0	304	346
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	100	22.2

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File Name : Lower Lot Mauka Parking Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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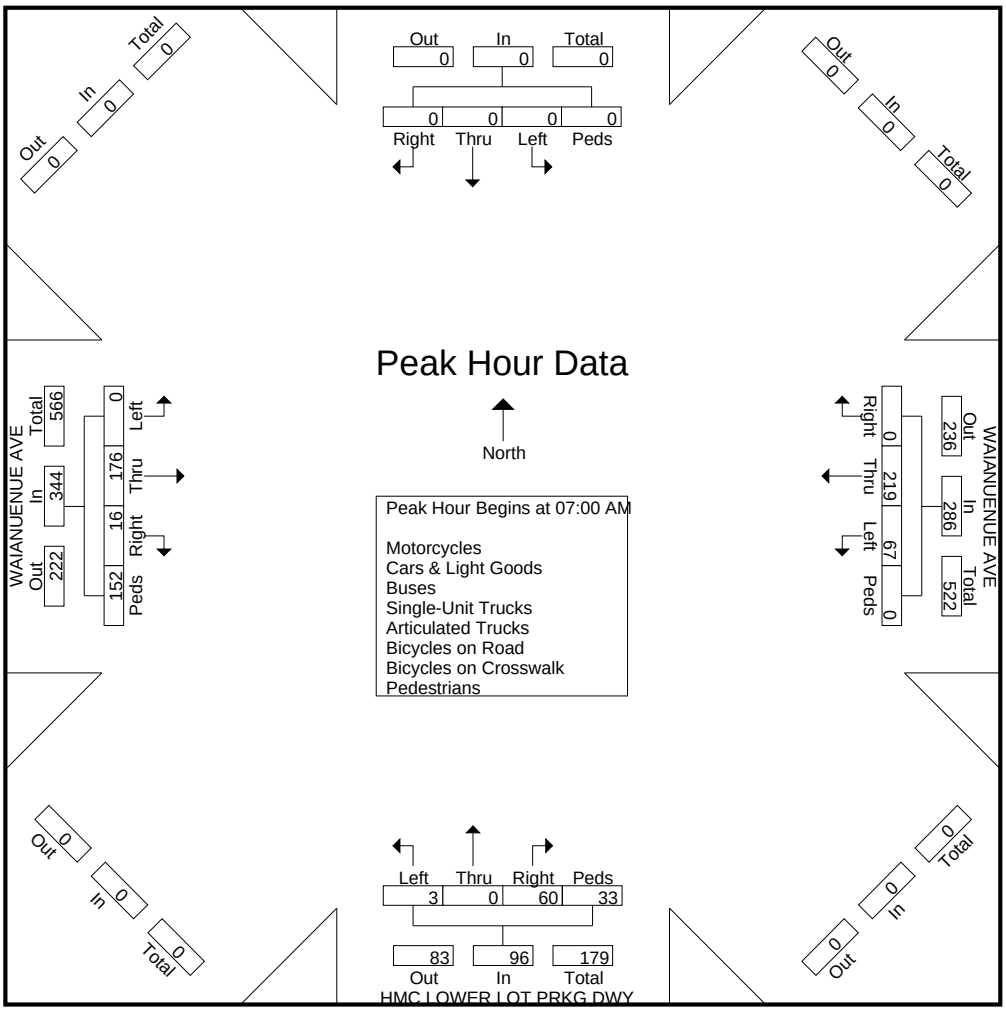
	SOUTHBOUND					WAIANUENUE AVE WESTBOUND					HMC LOWER LOT PRKG DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	10	36	0	0	46	0	0	3	7	10	0	28	1	23	52	108
07:15 AM	0	0	0	0	0	17	44	0	0	61	**2**	0	22	**13**	**37**	0	40	**9**	**65**	**114**	212
07:30 AM	0	0	0	0	0	18	65	0	0	83	1	0	**23**	8	32	0	**65**	2	37	104	**219**
07:45 AM	0	0	0	0	0	**22**	**74**	0	0	**96**	0	0	12	5	17	0	43	4	27	74	187
Total Volume	0	0	0	0	0	67	219	0	0	286	3	0	60	33	96	0	176	16	152	344	726
% App. Total	0	0	0	0		23.4	76.6	0	0		3.1	0	62.5	34.4		0	51.2	4.7	44.2		
PHF	.000	.000	.000	.000	.000	.761	.740	.000	.000	.745	.375	.000	.652	.635	.649	.000	.677	.444	.585	.754	.829



Austin Tsutsumi & Associates

501 Sumner St. STE 521
Honolulu, HI 96817
Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Lower Lot Mauka Parking Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				WAIANUENUE AVE WESTBOUND				HMC LOWER LOT PRKG DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	0	0	0	0	1	47	0	0	1	0	16	6	0	50	1	21	143
03:15 PM	0	0	0	0	6	66	0	0	0	0	12	9	0	59	1	24	177
03:30 PM	0	0	0	0	6	51	0	0	4	0	17	4	0	65	0	28	175
03:45 PM	0	0	0	0	4	46	0	0	4	0	9	3	0	48	1	16	131
Total	0	0	0	0	17	210	0	0	9	0	54	22	0	222	3	89	626
04:00 PM	0	0	0	0	3	47	0	1	2	0	23	7	0	72	0	48	203
04:15 PM	0	0	0	0	2	50	0	0	0	0	6	1	0	36	1	6	102
04:30 PM	0	0	0	0	3	43	0	0	2	0	21	3	0	54	1	26	153
04:45 PM	0	0	0	0	3	60	0	0	1	0	11	0	0	46	0	10	131
Total	0	0	0	0	11	200	0	1	5	0	61	11	0	208	2	90	589
05:00 PM	0	0	0	0	1	31	0	0	1	0	2	1	0	53	0	6	95
05:15 PM	0	0	0	0	1	32	0	0	0	0	3	3	0	35	0	11	85
05:30 PM	0	0	0	0	4	26	0	0	0	0	1	4	0	26	0	10	71
05:45 PM	0	0	0	0	3	32	0	0	0	0	2	2	0	19	1	7	66
Total	0	0	0	0	9	121	0	0	1	0	8	10	0	133	1	34	317
Grand Total	0	0	0	0	37	531	0	1	15	0	123	43	0	563	6	213	1532
Apprch %	0	0	0	0	6.5	93.3	0	0.2	8.3	0	68	23.8	0	72	0.8	27.2	
Total %	0	0	0	0	2.4	34.7	0	0.1	1	0	8	2.8	0	36.7	0.4	13.9	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0.2
Cars & Light Goods	0	0	0	0	37	525	0	0	15	0	123	0	0	554	6	0	1260
% Cars & Light Goods	0	0	0	0	100	98.9	0	0	100	0	100	0	0	98.4	100	0	82.2
Buses	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
% Buses	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0.1
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	0	0	0.4
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	3	0	0	0	0	0	0	0	1	0	0	4
% Bicycles on Road	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0.2	0	0	0.3
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	43	0	0	0	213	257
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	100	16.8

Austin Tsutsumi & Associates

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File Name : Lower Lot Mauka Parking Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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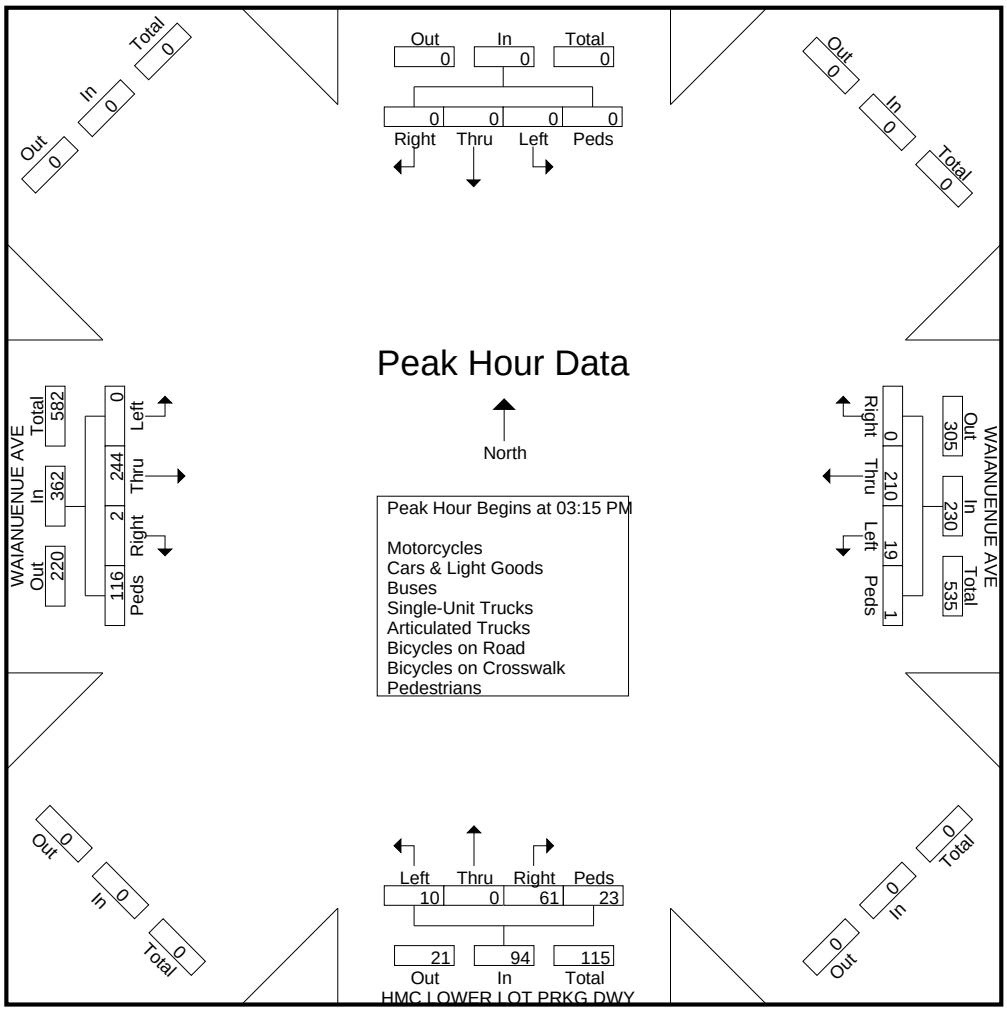
	SOUTHBOUND					WAIANUENUE AVE WESTBOUND					HMC LOWER LOT PRKG DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	0	0	0	0	**6**	**66**	0	0	**72**	0	0	12	**9**	21	0	59	**1**	24	84	177
03:30 PM	0	0	0	0	0	6	51	0	0	57	**4**	0	17	4	25	0	65	0	28	93	175
03:45 PM	0	0	0	0	0	4	46	0	0	50	4	0	9	3	16	0	48	1	16	65	131
04:00 PM	0	0	0	0	0	3	47	0	**1**	51	2	0	**23**	7	**32**	0	**72**	0	**48**	**120**	**203**
Total Volume	0	0	0	0	0	19	210	0	1	230	10	0	61	23	94	0	244	2	116	362	686
% App. Total	0	0	0	0		8.3	91.3	0	0.4		10.6	0	64.9	24.5		0	67.4	0.6	32		
PHF	.000	.000	.000	.000	.000	.792	.795	.000	.250	.799	.625	.000	.663	.639	.734	.000	.847	.500	.604	.754	.845



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File Name : HMC Dwy 3 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 3 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	3	0	0	0	0	29	0	3	0	0	0	0	0	15	0	0	50
06:15 AM	0	0	0	0	0	48	2	7	0	0	0	0	0	20	0	0	77
06:30 AM	11	0	1	0	0	36	4	25	0	0	0	0	0	30	0	1	108
06:45 AM	7	0	0	0	0	24	8	19	0	0	0	0	0	21	0	0	79
Total	21	0	1	0	0	137	14	54	0	0	0	0	0	86	0	1	314
07:00 AM	6	0	0	4	0	46	4	15	0	0	0	0	0	29	0	0	104
07:15 AM	9	0	1	0	0	62	4	17	0	0	0	0	2	60	0	0	155
07:30 AM	1	0	1	0	0	81	2	9	0	0	0	0	1	88	0	0	183
07:45 AM	4	0	2	3	0	93	7	13	0	0	0	0	0	56	0	0	178
Total	20	0	4	7	0	282	17	54	0	0	0	0	3	233	0	0	620
08:00 AM	2	0	1	0	0	71	2	9	0	0	0	0	0	41	0	0	126
08:15 AM	3	0	2	1	0	47	4	5	0	0	0	0	0	39	0	0	101
08:30 AM	1	0	0	0	0	54	5	0	0	0	0	0	1	44	0	0	105
08:45 AM	2	0	1	3	0	64	1	3	0	0	0	0	1	64	0	0	139
Total	8	0	4	4	0	236	12	17	0	0	0	0	2	188	0	0	471
Grand Total	49	0	9	11	0	655	43	125	0	0	0	0	5	507	0	1	1405
Apprch %	71	0	13	15.9	0	79.6	5.2	15.2	0	0	0	0	1	98.8	0	0.2	
Total %	3.5	0	0.6	0.8	0	46.6	3.1	8.9	0	0	0	0	0.4	36.1	0	0.1	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Cars & Light Goods	48	0	8	0	0	647	37	0	0	0	0	0	5	499	0	0	1244
% Cars & Light Goods	98	0	88.9	0	0	98.8	86	0	0	0	0	0	100	98.4	0	0	88.5
Buses	0	0	1	0	0	3	0	0	0	0	0	0	0	1	0	0	5
% Buses	0	0	11.1	0	0	0.5	0	0	0	0	0	0	0	0.2	0	0	0.4
Single-Unit Trucks	1	0	0	0	0	0	6	0	0	0	0	0	0	5	0	0	12
% Single-Unit Trucks	2	0	0	0	0	0	14	0	0	0	0	0	0	1	0	0	0.9
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0.2	0	0	0	0	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	11	0	0	0	125	0	0	0	0	0	0	0	1	137
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0	100	9.8

Austin Tsutsumi & Associates

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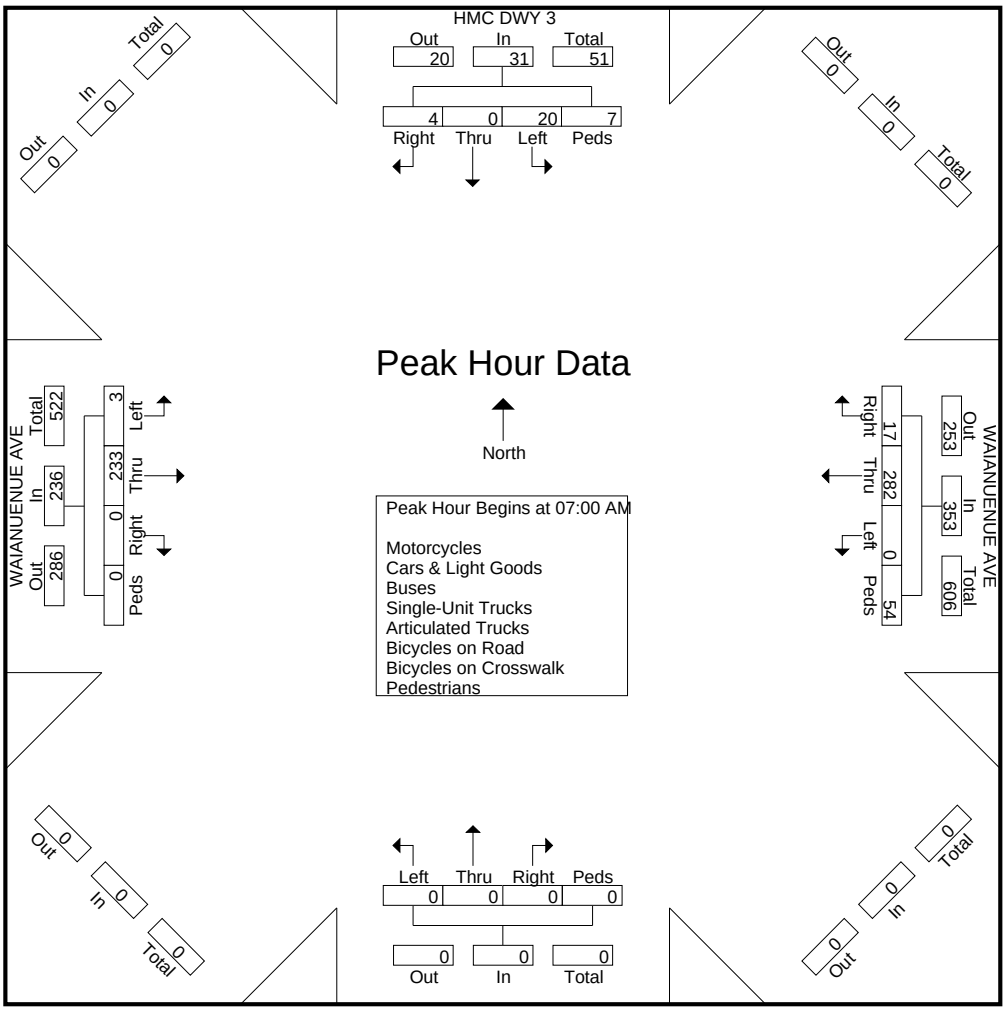
File Name : HMC Dwy 3 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 2

	HMC DWY 3 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					NORTHBOUND					WAIANUENUE AVE 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 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	6	0	0	**4**	**10**	0	46	4	15	65	0	0	0	0	0	0	29	0	0	29	104
07:15 AM	**9**	0	1	0	10	0	62	4	**17**	83	0	0	0	0	0	**2**	60	0	0	62	155
07:30 AM	1	0	1	0	2	0	81	2	9	92	0	0	0	0	0	1	**88**	0	0	**89**	**183**
07:45 AM	4	0	**2**	3	9	0	**93**	**7**	13	**113**	0	0	0	0	0	0	56	0	0	56	178
Total Volume	20	0	4	7	31	0	282	17	54	353	0	0	0	0	0	3	233	0	0	236	620
% App. Total	64.5	0	12.9	22.6		0	79.9	4.8	15.3		0	0	0	0		1.3	98.7	0	0		
PHF	.556	.000	.500	.438	.775	.000	.758	.607	.794	.781	.000	.000	.000	.000	.000	.375	.662	.000	.000	.663	.847



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File Name : HMC Dwy 3 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 3 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	3	0	0	0	0	48	2	3	0	0	0	0	0	67	0	0	123
03:15 PM	2	0	0	0	0	75	2	5	0	0	0	0	0	72	0	0	156
03:30 PM	11	0	1	1	0	54	4	28	0	0	0	0	1	78	0	1	179
03:45 PM	4	0	1	0	0	49	3	5	0	0	0	0	0	64	0	0	126
Total	20	0	2	1	0	226	11	41	0	0	0	0	1	281	0	1	584
04:00 PM	7	0	0	1	0	50	8	20	0	0	0	0	0	93	0	0	179
04:15 PM	3	0	1	0	0	52	1	2	0	0	0	0	1	41	0	0	101
04:30 PM	1	0	1	1	0	44	1	21	0	0	0	0	1	77	0	1	148
04:45 PM	3	0	0	1	0	63	1	1	0	0	0	0	0	57	0	0	126
Total	14	0	2	3	0	209	11	44	0	0	0	0	2	268	0	1	554
05:00 PM	0	0	0	1	0	33	2	7	0	0	0	0	1	54	0	0	98
05:15 PM	2	0	0	0	0	33	1	3	0	0	0	0	0	38	0	0	77
05:30 PM	0	0	0	0	0	30	0	2	0	0	0	0	0	27	0	0	59
05:45 PM	0	0	0	0	0	34	1	1	0	0	0	0	0	20	0	0	56
Total	2	0	0	1	0	130	4	13	0	0	0	0	1	139	0	0	290
Grand Total	36	0	4	5	0	565	26	98	0	0	0	0	4	688	0	2	1428
Apprch %	80	0	8.9	11.1	0	82	3.8	14.2	0	0	0	0	0.6	99.1	0	0.3	
Total %	2.5	0	0.3	0.4	0	39.6	1.8	6.9	0	0	0	0	0.3	48.2	0	0.1	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.1	0	0	0.2
Cars & Light Goods	36	0	3	0	0	559	20	0	0	0	0	0	4	680	0	0	1302
% Cars & Light Goods	100	0	75	0	0	98.9	76.9	0	0	0	0	0	100	98.8	0	0	91.2
Buses	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
% Buses	0	0	25	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1
Single-Unit Trucks	0	0	0	0	0	0	6	0	0	0	0	0	0	6	0	0	12
% Single-Unit Trucks	0	0	0	0	0	0	23.1	0	0	0	0	0	0	0.9	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	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
% Bicycles on Road	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.1	0	0	0.3
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	5	0	0	0	98	0	0	0	0	0	0	0	2	105
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0	100	7.4

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File Name : HMC Dwy 3 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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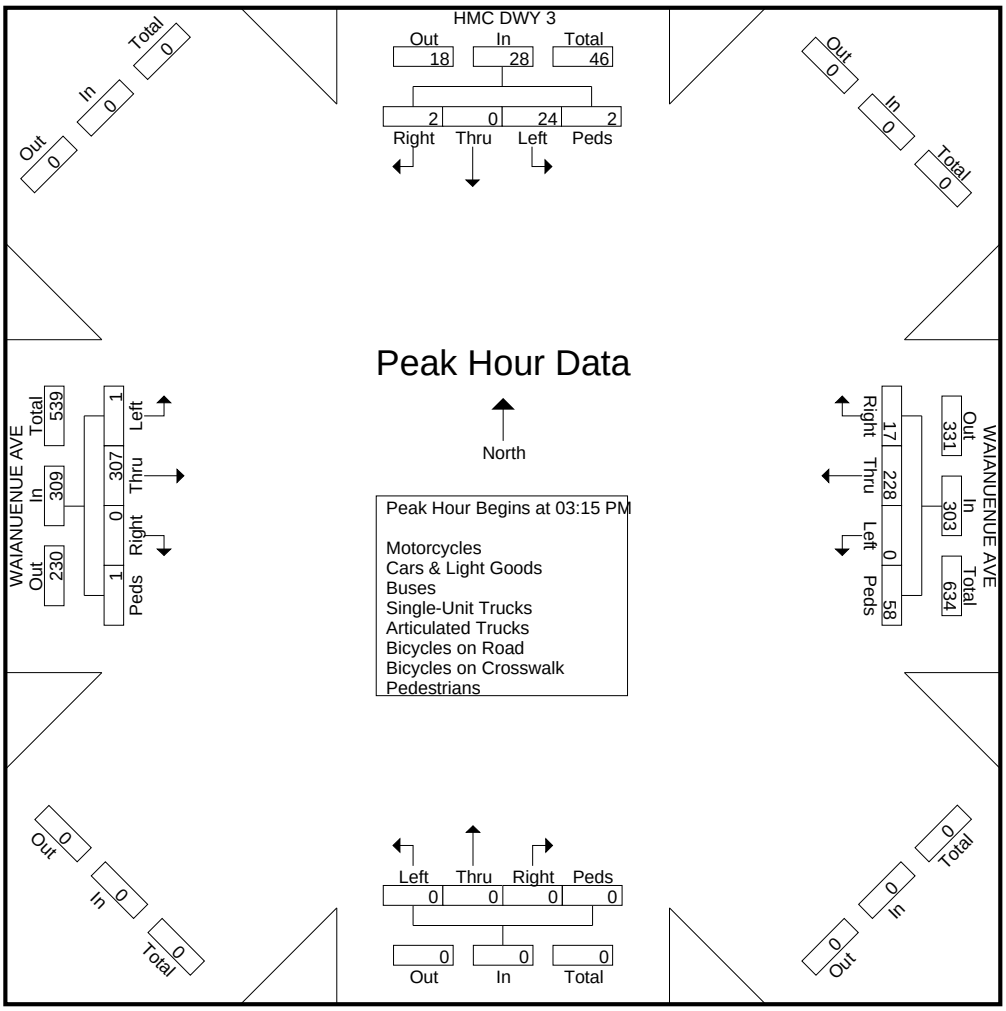
	HMC DWY 3 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	2	0	0	0	2	0	**75**	2	5	82	0	0	0	0	0	0	72	0	0	72	156
03:30 PM	**11**	0	**1**	**1**	**13**	0	54	4	**28**	**86**	0	0	0	0	0	**1**	78	0	**1**	80	**179**
03:45 PM	4	0	1	0	5	0	49	3	5	57	0	0	0	0	0	0	64	0	0	64	126
04:00 PM	7	0	0	1	8	0	50	**8**	20	78	0	0	0	0	0	0	**93**	0	0	**93**	179
Total Volume	24	0	2	2	28	0	228	17	58	303	0	0	0	0	0	1	307	0	1	309	640
% App. Total	85.7	0	7.1	7.1		0	75.2	5.6	19.1		0	0	0	0		0.3	99.4	0	0.3		
PHF	.545	.000	.500	.500	.538	.000	.760	.531	.518	.881	.000	.000	.000	.000	.000	.250	.825	.000	.250	.831	.894



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File Name : HMC Dwy 4_Lower Lot Makai Parking Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 4 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				LOWER LOT MAKAI PRKG DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	1	0	0	0	19	29	1	0	0	1	0	0	0	17	1	0	69
06:15 AM	0	0	0	0	36	50	4	0	0	0	0	0	0	21	0	0	111
06:30 AM	2	0	0	0	71	40	6	5	0	0	0	0	0	35	3	0	162
06:45 AM	0	0	0	1	34	34	6	4	0	0	0	0	0	22	6	2	109
Total	3	0	0	1	160	153	17	9	0	1	0	0	0	95	10	2	451
07:00 AM	0	0	0	3	43	50	1	1	0	0	2	2	0	33	2	1	138
07:15 AM	0	1	1	1	48	65	2	2	0	0	3	2	0	69	0	0	194
07:30 AM	0	1	0	0	20	83	0	0	0	0	3	1	0	86	1	0	195
07:45 AM	0	0	0	1	13	98	3	0	0	0	0	2	0	58	2	0	177
Total	0	2	1	5	124	296	6	3	0	0	8	7	0	246	5	1	704
08:00 AM	0	0	0	0	10	69	1	1	0	0	0	2	0	43	1	0	127
08:15 AM	0	0	0	0	1	45	0	0	1	1	2	1	0	41	1	0	93
08:30 AM	0	0	0	1	1	57	0	0	1	1	1	0	0	44	0	0	106
08:45 AM	0	0	0	1	4	64	1	1	0	0	2	0	0	64	1	0	138
Total	0	0	0	2	16	235	2	2	2	2	5	3	0	192	3	0	464
Grand Total	3	2	1	8	300	684	25	14	2	3	13	10	0	533	18	3	1619
Apprch %	21.4	14.3	7.1	57.1	29.3	66.9	2.4	1.4	7.1	10.7	46.4	35.7	0	96.2	3.2	0.5	
Total %	0.2	0.1	0.1	0.5	18.5	42.2	1.5	0.9	0.1	0.2	0.8	0.6	0	32.9	1.1	0.2	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Cars & Light Goods	3	2	1	0	300	670	25	0	2	3	13	0	0	525	18	0	1562
% Cars & Light Goods	100	100	100	0	100	98	100	0	100	100	100	0	0	98.5	100	0	96.5
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
% Buses	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	6	0	0	0	0	0	0	0	5	0	0	11
% Single-Unit Trucks	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0.9	0	0	0.7
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0.1	0	0	0	0	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	8	0	0	0	14	0	0	0	10	0	0	0	3	35
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	100	2.2

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File Name : HMC Dwy 4_Lower Lot Makai Parking Dwy - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
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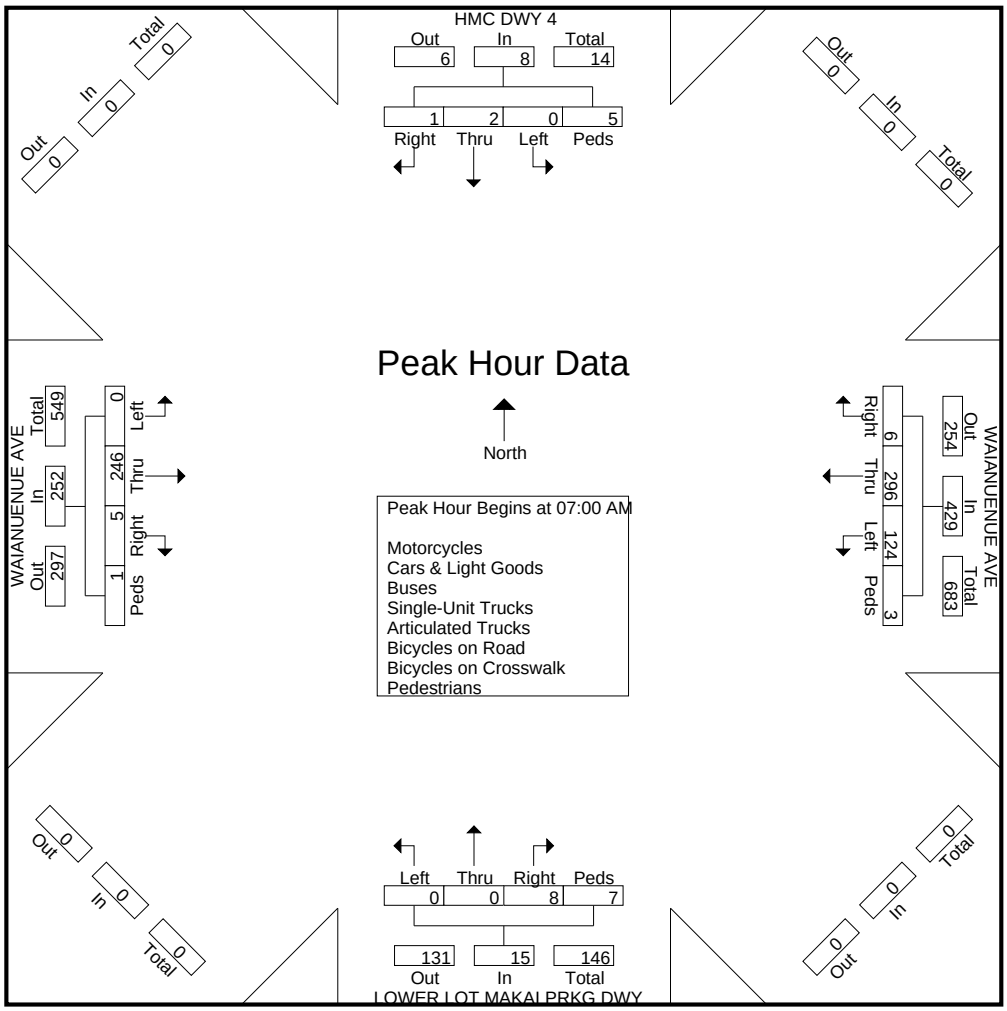
	HMC DWY 4 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					LOWER LOT MAKAI PRKG DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	**3**	**3**	43	50	1	1	95	0	0	2	**2**	4	0	33	**2**	**1**	36	138
07:15 AM	0	**1**	**1**	1	3	**48**	65	2	**2**	**117**	0	0	**3**	2	**5**	0	69	0	0	69	194
07:30 AM	0	1	0	0	1	20	83	0	0	103	0	0	3	1	4	0	**86**	1	0	**87**	**195**
07:45 AM	0	0	0	1	1	13	**98**	**3**	0	114	0	0	0	2	2	0	58	2	0	60	177
Total Volume	0	2	1	5	8	124	296	6	3	429	0	0	8	7	15	0	246	5	1	252	704
% App. Total	0	25	12.5	62.5		28.9	69	1.4	0.7		0	0	53.3	46.7		0	97.6	2	0.4		
PHF	.000	.500	.250	.417	.667	.646	.755	.500	.375	.917	.000	.000	.667	.875	.750	.000	.715	.625	.250	.724	.903



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 4 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				LOWER LOT MAKAI PRKG DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	3	0	0	0	1	49	1	2	1	0	5	1	0	71	0	0	134
03:15 PM	0	0	0	0	0	74	2	1	3	2	25	0	0	73	0	0	180
03:30 PM	5	0	0	2	1	56	1	2	2	0	64	0	0	86	1	5	225
03:45 PM	2	0	0	0	0	51	0	0	1	0	17	0	0	68	0	0	139
Total	10	0	0	2	2	230	4	5	7	2	111	1	0	298	1	5	678
04:00 PM	4	0	1	1	0	56	1	1	2	0	59	1	0	99	1	0	226
04:15 PM	1	0	0	0	1	52	2	0	0	0	21	0	0	44	0	0	121
04:30 PM	4	0	0	0	0	44	0	0	2	0	29	0	0	79	0	0	158
04:45 PM	0	0	0	0	0	61	0	0	2	0	15	0	0	57	1	0	136
Total	9	0	1	1	1	213	3	1	6	0	124	1	0	279	2	0	641
05:00 PM	1	0	0	0	1	36	0	0	1	0	10	1	0	55	0	0	105
05:15 PM	0	0	0	0	0	32	0	0	0	0	8	0	0	40	0	0	80
05:30 PM	0	0	0	0	0	30	0	2	1	0	8	0	0	27	0	0	68
05:45 PM	0	0	0	0	1	34	0	0	0	0	6	0	0	20	0	0	61
Total	1	0	0	0	2	132	0	2	2	0	32	1	0	142	0	0	314
Grand Total	20	0	1	3	5	575	7	8	15	2	267	3	0	719	3	5	1633
Apprch %	83.3	0	4.2	12.5	0.8	96.6	1.2	1.3	5.2	0.7	93	1	0	98.9	0.4	0.7	
Total %	1.2	0	0.1	0.2	0.3	35.2	0.4	0.5	0.9	0.1	16.4	0.2	0	44	0.2	0.3	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.1	0	0	0.2
Cars & Light Goods	20	0	1	0	5	561	7	0	15	2	267	0	0	711	3	0	1592
% Cars & Light Goods	100	0	100	0	100	97.6	100	0	100	100	100	0	0	98.9	100	0	97.5
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Buses	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.1	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	7	0	0	0	0	0	0	0	5	0	0	12
% Single-Unit Trucks	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0.7	0	0	0.7
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	3	0	0	0	0	0	0	0	1	0	0	4
% Bicycles on Road	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.1	0	0	0.2
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	3	0	0	0	8	0	0	0	3	0	0	0	5	19
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	100	1.2

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File Name : HMC Dwy 4_Lower Lot Makai Parking Dwy - Waianuenue Ave
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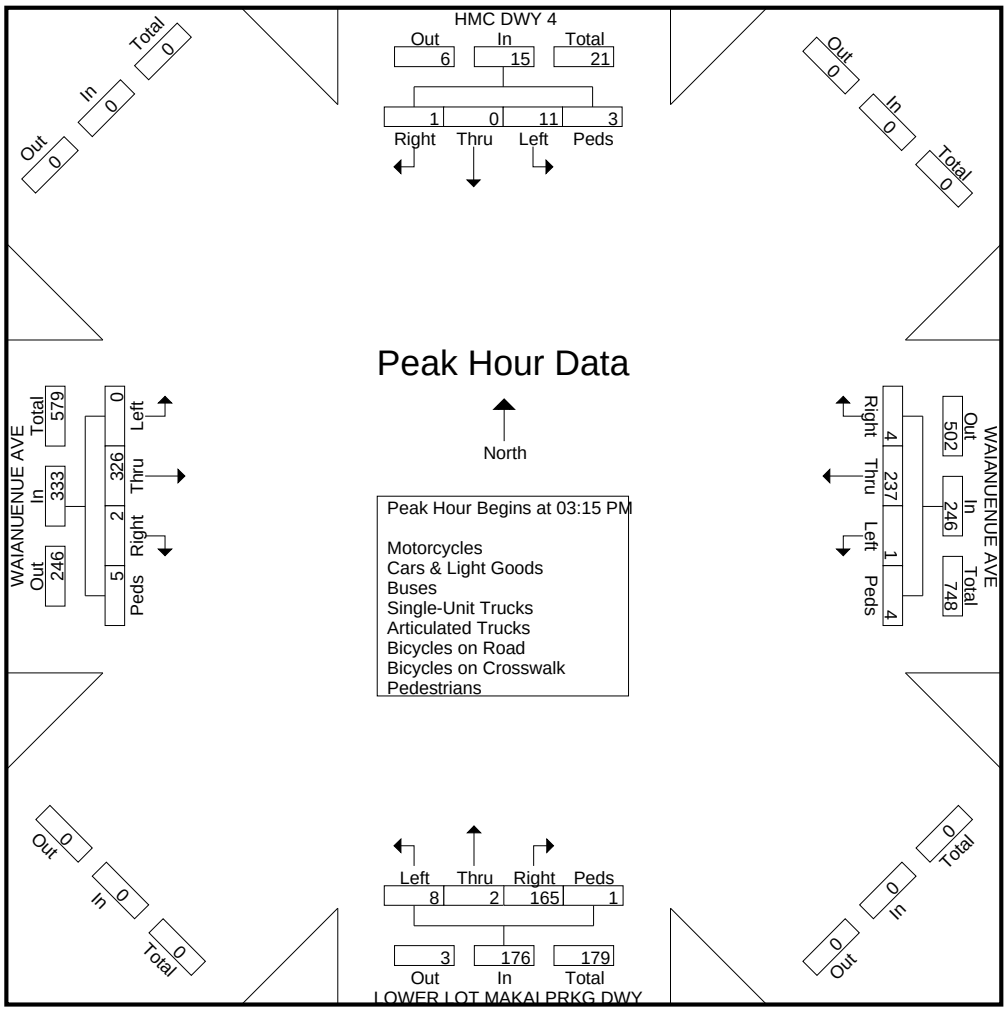
	HMC DWY 4 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					LOWER LOT MAKAI PRKG DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	0	0	0	0	0	**74**	**2**	1	**77**	**3**	**2**	25	0	30	0	73	0	0	73	180
03:30 PM	**5**	0	0	**2**	**7**	**1**	56	1	**2**	60	2	0	**64**	0	**66**	0	86	**1**	**5**	92	225
03:45 PM	2	0	0	0	2	0	51	0	0	51	1	0	17	0	18	0	68	0	0	68	139
04:00 PM	4	0	**1**	1	6	0	56	1	1	58	2	0	59	**1**	62	0	**99**	1	0	**100**	**226**
Total Volume	11	0	1	3	15	1	237	4	4	246	8	2	165	1	176	0	326	2	5	333	770
% App. Total	73.3	0	6.7	20		0.4	96.3	1.6	1.6		4.5	1.1	93.8	0.6		0	97.9	0.6	1.5		
PHF	.550	.000	.250	.375	.536	.250	.801	.500	.500	.799	.667	.250	.645	.250	.667	.000	.823	.500	.250	.833	.852



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File Name : HMC Dwy 5 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 5 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				PRIVATE DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	1	0	1	0	0	48	3	0	0	0	0	0	2	16	0	0	71
06:15 AM	0	0	1	0	0	89	4	0	0	0	0	0	2	19	0	0	115
06:30 AM	1	0	1	1	0	115	9	0	0	0	0	0	1	37	0	0	165
06:45 AM	3	0	0	0	0	75	5	0	0	0	1	0	0	22	1	0	107
Total	5	0	3	1	0	327	21	0	0	0	1	0	5	94	1	0	458
07:00 AM	2	0	2	3	0	92	3	0	0	0	0	2	1	34	0	0	139
07:15 AM	2	0	2	0	0	112	3	0	0	0	1	2	4	68	0	2	196
07:30 AM	1	0	2	0	1	101	3	0	0	0	0	1	4	86	0	0	199
07:45 AM	4	0	3	0	0	112	2	0	0	0	0	2	4	53	0	0	180
Total	9	0	9	3	1	417	11	0	0	0	1	7	13	241	0	2	714
08:00 AM	1	0	0	0	0	80	1	0	0	0	1	0	1	42	0	0	126
08:15 AM	4	0	1	0	1	45	3	0	0	0	0	0	1	44	0	0	99
08:30 AM	3	0	2	0	0	58	2	0	0	0	0	0	0	45	0	0	110
08:45 AM	2	0	0	0	0	66	1	1	0	0	0	0	3	63	0	0	136
Total	10	0	3	0	1	249	7	1	0	0	1	0	5	194	0	0	471
Grand Total	24	0	15	4	2	993	39	1	0	0	3	7	23	529	1	2	1643
Apprch %	55.8	0	34.9	9.3	0.2	95.9	3.8	0.1	0	0	30	70	4.1	95.3	0.2	0.4	
Total %	1.5	0	0.9	0.2	0.1	60.4	2.4	0.1	0	0	0.2	0.4	1.4	32.2	0.1	0.1	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Motorcycles	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1
Cars & Light Goods	24	0	15	0	2	979	39	0	0	0	3	0	23	522	1	0	1608
% Cars & Light Goods	100	0	100	0	100	98.6	100	0	0	0	100	0	100	98.7	100	0	97.9
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
% Buses	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	7	0	0	0	0	0	0	0	5	0	0	12
% Single-Unit Trucks	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0.9	0	0	0.7
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0.2
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	1	0	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	3	0	0	0	1	0	0	0	7	0	0	0	2	13
% Pedestrians	0	0	0	75	0	0	0	100	0	0	0	100	0	0	0	100	0.8

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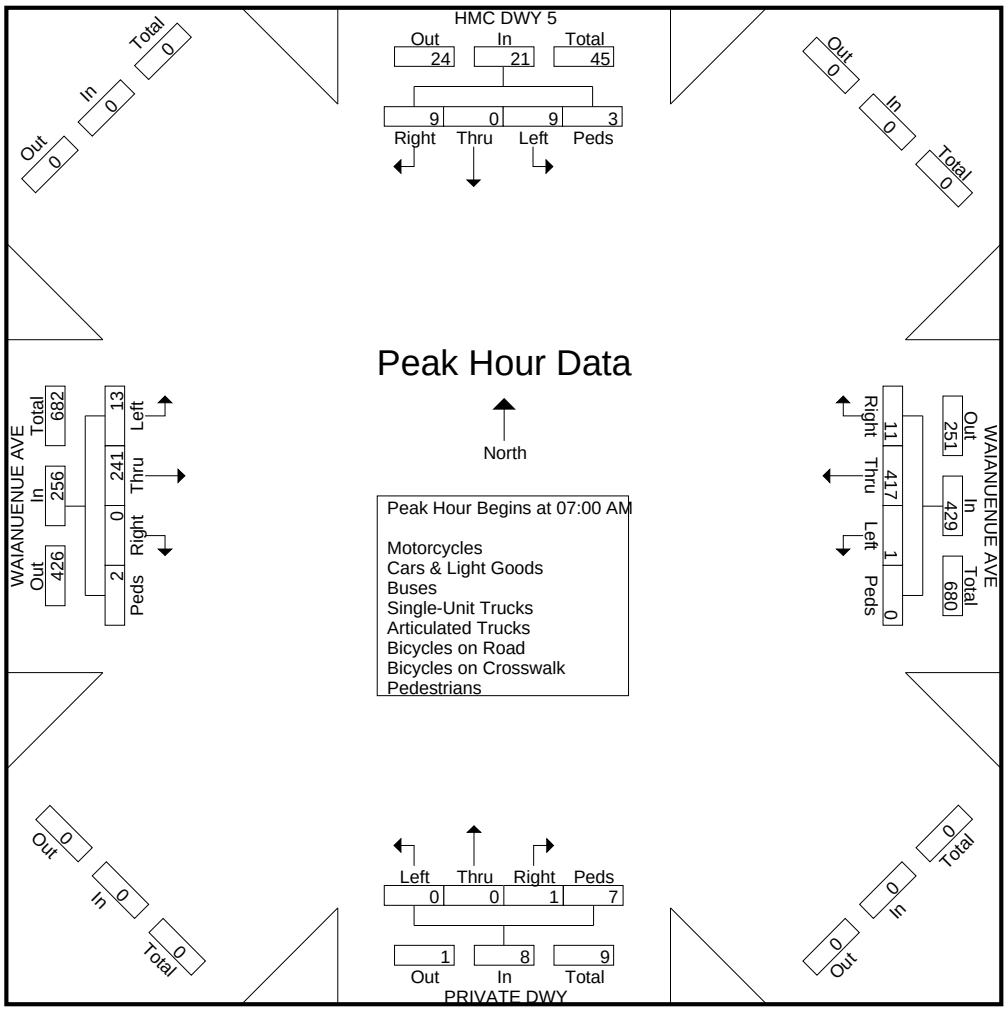
	HMC DWY 5 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					PRIVATE DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	2	0	2	**3**	**7**	0	92	**3**	0	95	0	0	0	**2**	2	1	34	0	0	35	139
07:15 AM	2	0	2	0	4	0	**112**	3	0	**115**	0	0	**1**	2	**3**	**4**	68	0	**2**	74	196
07:30 AM	1	0	2	0	3	**1**	101	3	0	105	0	0	0	1	1	4	**86**	0	0	**90**	**199**
07:45 AM	**4**	0	**3**	0	7	0	112	2	0	114	0	0	0	2	2	4	53	0	0	57	180
Total Volume	9	0	9	3	21	1	417	11	0	429	0	0	1	7	8	13	241	0	2	256	714
% App. Total	42.9	0	42.9	14.3		0.2	97.2	2.6	0		0	0	12.5	87.5		5.1	94.1	0	0.8		
PHF	.563	.000	.750	.250	.750	.250	.931	.917	.000	.933	.000	.000	.250	.875	.667	.813	.701	.000	.250	.711	.897



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	HMC DWY 5 SOUTHBOUND				WAIANUENUE AVE WESTBOUND				PRIVATE DWY NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	6	0	8	0	0	43	1	0	0	0	0	1	1	80	0	0	140
03:15 PM	6	0	11	0	0	65	1	0	0	0	0	0	3	94	0	0	180
03:30 PM	7	0	6	0	0	52	0	0	0	0	0	0	1	156	0	1	223
03:45 PM	6	0	6	0	0	45	1	0	0	0	0	0	1	89	0	0	148
Total	25	0	31	0	0	205	3	0	0	0	0	1	6	419	0	1	691
04:00 PM	5	0	9	1	1	51	1	0	0	0	0	1	2	160	0	0	231
04:15 PM	4	0	8	0	0	47	0	0	0	0	0	0	0	67	0	0	126
04:30 PM	1	0	6	1	0	37	1	0	0	0	0	0	1	110	0	4	161
04:45 PM	1	0	6	0	0	52	1	0	0	0	0	0	0	72	0	0	132
Total	11	0	29	2	1	187	3	0	0	0	0	1	3	409	0	4	650
05:00 PM	2	0	2	0	0	35	0	0	0	0	0	1	1	66	0	0	107
05:15 PM	1	0	1	0	0	32	0	0	0	0	0	0	0	47	0	0	81
05:30 PM	4	0	1	0	0	28	2	0	0	0	0	0	1	36	0	0	72
05:45 PM	5	0	6	0	0	30	1	0	0	0	0	0	0	26	0	0	68
Total	12	0	10	0	0	125	3	0	0	0	0	1	2	175	0	0	328
Grand Total	48	0	70	2	1	517	9	0	0	0	0	3	11	1003	0	5	1669
Apprch %	40	0	58.3	1.7	0.2	98.1	1.7	0	0	0	0	100	1.1	98.4	0	0.5	
Total %	2.9	0	4.2	0.1	0.1	31	0.5	0	0	0	0	0.2	0.7	60.1	0	0.3	
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	0.1	0	0	0.1
Cars & Light Goods	48	0	70	0	1	509	9	0	0	0	0	0	11	995	0	0	1643
% Cars & Light Goods	100	0	100	0	100	98.5	100	0	0	0	0	0	100	99.2	0	0	98.4
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Buses	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0.1
Single-Unit Trucks	0	0	0	0	0	6	0	0	0	0	0	0	0	6	0	0	12
% Single-Unit Trucks	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0.6	0	0	0.7
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	1	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	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	2	0	0	0	0	0	0	0	3	0	0	0	5	10
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	100	0	0	0	100	0.6

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501 Sumner St. STE 521
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File Name : HMC Dwy 5 - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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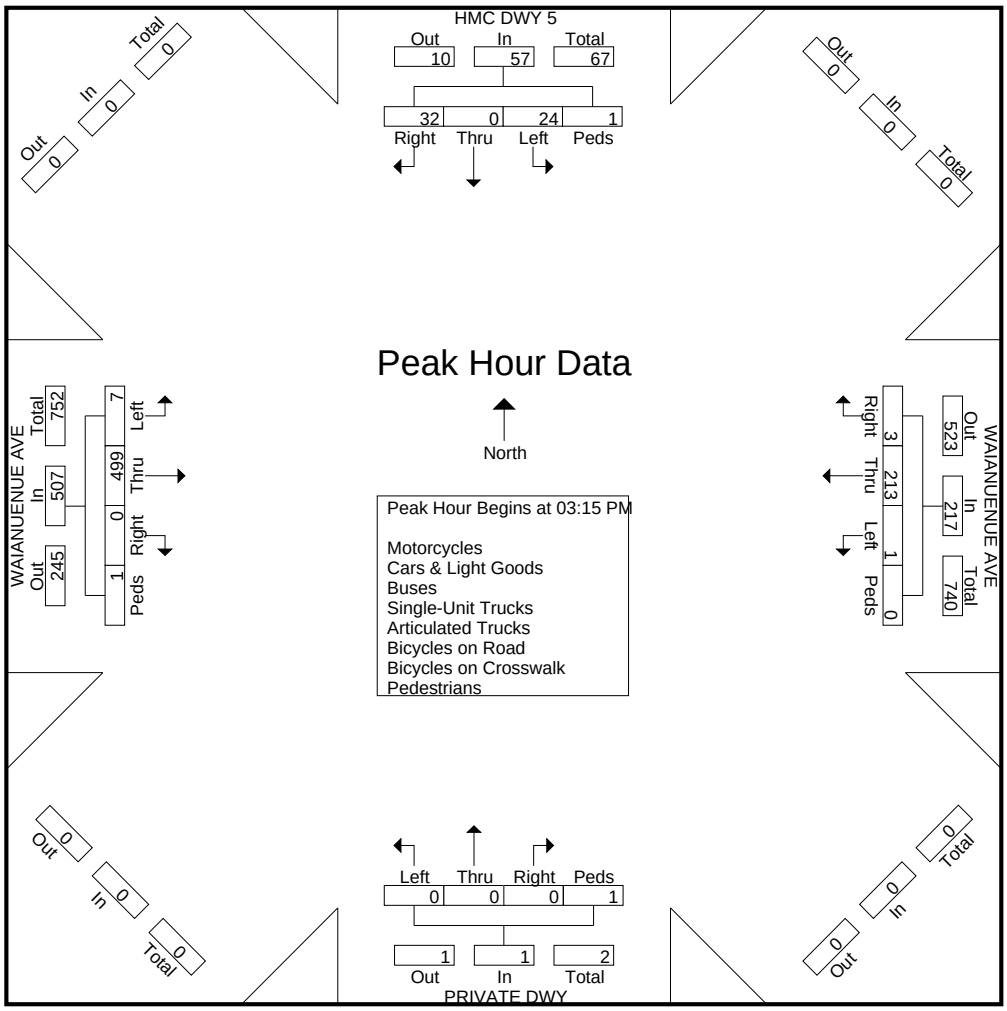
	HMC DWY 5 SOUTHBOUND					WAIANUENUE AVE WESTBOUND					PRIVATE DWY NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	6	0	**11**	0	**17**	0	**65**	**1**	0	**66**	0	0	0	0	0	**3**	94	0	0	97	180
03:30 PM	**7**	0	6	0	13	0	52	0	0	52	0	0	0	0	0	1	156	0	**1**	158	223
03:45 PM	6	0	6	0	12	0	45	1	0	46	0	0	0	0	0	1	89	0	0	90	148
04:00 PM	5	0	9	**1**	15	**1**	51	1	0	53	0	0	0	**1**	**1**	2	**160**	0	0	**162**	**231**
Total Volume	24	0	32	1	57	1	213	3	0	217	0	0	0	1	1	7	499	0	1	507	782
% App. Total	42.1	0	56.1	1.8		0.5	98.2	1.4	0		0	0	0	100		1.4	98.4	0	0.2		
PHF	.857	.000	.727	.250	.838	.250	.819	.750	.000	.822	.000	.000	.000	.250	.250	.583	.780	.000	.250	.782	.846



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File Name : Rainbow Dr - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	RAINBOW AVE SOUTHBOUND				WAIANUENUE AVE WESTBOUND				NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	2	0	0	0	0	54	2	0	0	0	0	0	0	20	0	0	78
06:15 AM	2	0	0	0	0	96	1	0	0	0	0	0	0	20	0	0	119
06:30 AM	1	0	1	1	0	131	3	0	0	0	0	0	0	36	0	0	173
06:45 AM	1	0	0	0	0	87	6	0	0	0	0	0	0	30	0	0	124
Total	6	0	1	1	0	368	12	0	0	0	0	0	0	106	0	0	494
07:00 AM	1	0	0	0	0	102	5	0	0	0	0	0	1	37	0	0	146
07:15 AM	4	0	0	0	0	124	8	0	0	0	0	0	0	69	0	0	205
07:30 AM	6	0	1	1	0	118	11	0	0	0	0	0	0	89	0	1	227
07:45 AM	3	0	0	0	0	116	10	0	0	0	0	0	0	59	0	0	188
Total	14	0	1	1	0	460	34	0	0	0	0	0	1	254	0	1	766
08:00 AM	2	0	1	0	0	87	4	0	0	0	0	0	1	46	0	0	141
08:15 AM	3	0	0	0	0	55	6	0	0	0	0	0	3	46	0	0	113
08:30 AM	9	0	1	0	0	66	9	0	0	0	0	0	2	46	0	0	133
08:45 AM	4	0	0	0	0	69	10	0	0	0	0	0	2	65	0	0	150
Total	18	0	2	0	0	277	29	0	0	0	0	0	8	203	0	0	537
Grand Total	38	0	4	2	0	1105	75	0	0	0	0	0	9	563	0	1	1797
Apprch %	86.4	0	9.1	4.5	0	93.6	6.4	0	0	0	0	0	1.6	98.3	0	0.2	
Total %	2.1	0	0.2	0.1	0	61.5	4.2	0	0	0	0	0	0.5	31.3	0	0.1	
Motorcycles	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	3
% Motorcycles	2.6	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.2
Cars & Light Goods	37	0	3	0	0	1092	74	0	0	0	0	0	9	557	0	0	1772
% Cars & Light Goods	97.4	0	75	0	0	98.8	98.7	0	0	0	0	0	100	98.9	0	0	98.6
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
% Buses	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	6	0	0	0	0	0	0	0	4	0	0	10
% Single-Unit Trucks	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.7	0	0	0.6
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0.2
Bicycles on Road	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
% Bicycles on Road	0	0	25	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
% Pedestrians	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	100	0.1

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File Name : Rainbow Dr - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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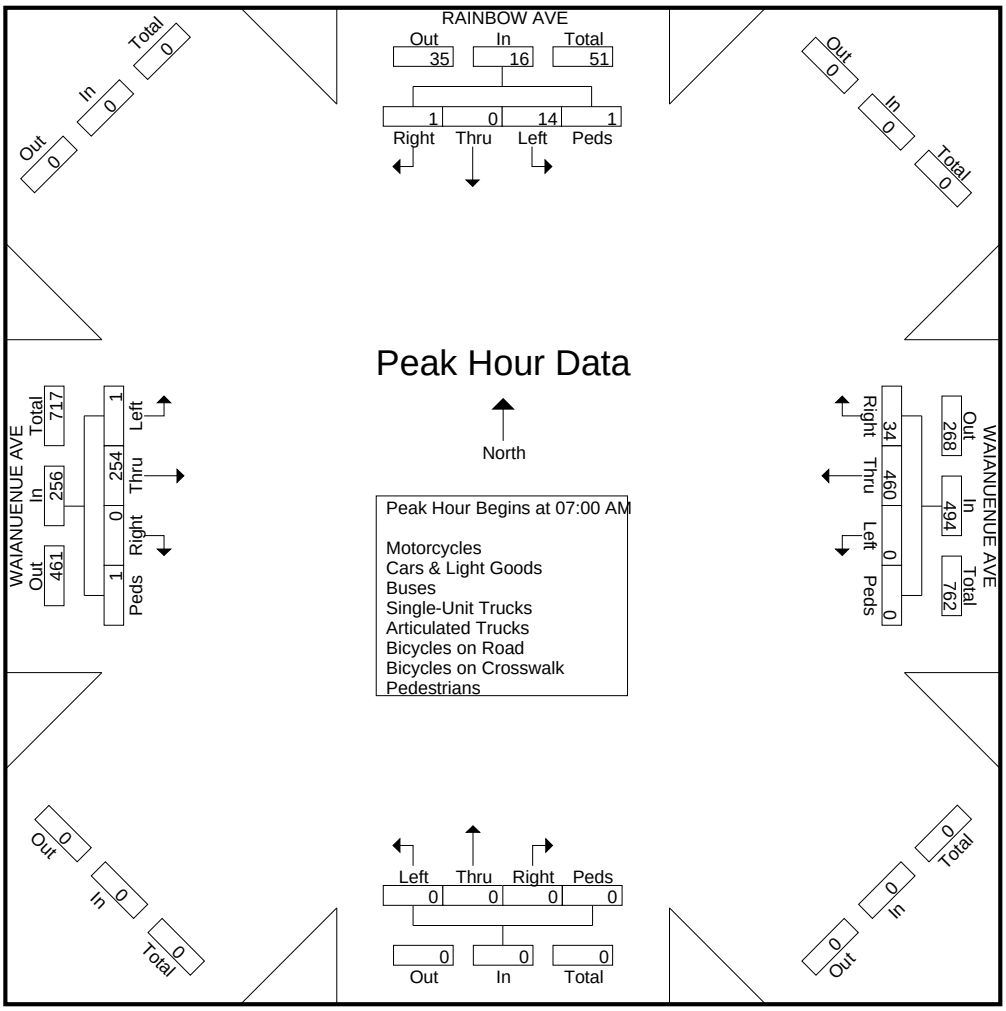
	RAINBOW AVE SOUTHBOUND					WAIANUENUE AVE WESTBOUND					NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	1	0	0	0	1	0	102	5	0	107	0	0	0	0	0	**1**	37	0	0	38	146
07:15 AM	4	0	0	0	4	0	**124**	8	0	**132**	0	0	0	0	0	0	69	0	0	69	205
07:30 AM	**6**	0	**1**	**1**	**8**	0	118	**11**	0	129	0	0	0	0	0	0	**89**	0	**1**	**90**	**227**
07:45 AM	3	0	0	0	3	0	116	10	0	126	0	0	0	0	0	0	59	0	0	59	188
Total Volume	14	0	1	1	16	0	460	34	0	494	0	0	0	0	0	1	254	0	1	256	766
% App. Total	87.5	0	6.2	6.2		0	93.1	6.9	0		0	0	0	0		0.4	99.2	0	0.4		
PHF	.583	.000	.250	.250	.500	.000	.927	.773	.000	.936	.000	.000	.000	.000	.000	.250	.713	.000	.250	.711	.844



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File Name : Rainbow Dr - Waianuenue Ave
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Start Date : 8/26/2021
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	RAINBOW AVE SOUTHBOUND				WAIANUENUE AVE WESTBOUND				NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	5	0	0	1	0	49	15	0	0	0	0	0	0	98	0	0	168
03:15 PM	15	0	0	0	0	69	29	0	0	0	0	0	2	104	0	0	219
03:30 PM	10	0	1	0	0	57	15	0	0	0	0	0	0	166	0	0	249
03:45 PM	7	0	0	0	0	52	15	0	0	0	0	0	0	108	0	0	182
Total	37	0	1	1	0	227	74	0	0	0	0	0	2	476	0	0	818
04:00 PM	12	0	3	1	0	45	14	0	0	0	0	0	3	165	0	0	243
04:15 PM	11	0	0	0	0	49	14	0	0	0	0	0	1	77	0	0	152
04:30 PM	18	0	0	1	0	40	10	0	0	0	0	0	0	118	0	0	187
04:45 PM	6	0	0	0	0	52	11	0	0	0	0	0	0	73	0	0	142
Total	47	0	3	2	0	186	49	0	0	0	0	0	4	433	0	0	724
05:00 PM	10	0	0	0	0	34	5	0	0	0	0	0	1	71	0	0	121
05:15 PM	11	0	1	0	0	33	9	0	0	0	0	0	1	51	0	0	106
05:30 PM	4	0	0	0	0	28	5	0	0	0	0	0	1	39	0	0	77
05:45 PM	3	0	1	0	0	30	5	0	0	0	0	0	0	30	0	0	69
Total	28	0	2	0	0	125	24	0	0	0	0	0	3	191	0	0	373
Grand Total	112	0	6	3	0	538	147	0	0	0	0	0	9	1100	0	0	1915
Apprch %	92.6	0	5	2.5	0	78.5	21.5	0	0	0	0	0	0.8	99.2	0	0	
Total %	5.8	0	0.3	0.2	0	28.1	7.7	0	0	0	0	0	0.5	57.4	0	0	
Motorcycles	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0	1.4	0	0	0	0	0	0	0.1	0	0	0.2
Cars & Light Goods	110	0	6	0	0	530	141	0	0	0	0	0	9	1092	0	0	1888
% Cars & Light Goods	98.2	0	100	0	0	98.5	95.9	0	0	0	0	0	100	99.3	0	0	98.6
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
% Buses	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0.1
Single-Unit Trucks	0	0	0	0	0	6	0	0	0	0	0	0	0	6	0	0	12
% Single-Unit Trucks	0	0	0	0	0	1.1	0	0	0	0	0	0	0	0.5	0	0	0.6
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	2	0	0	0	0	0	4	0	0	0	0	0	0	1	0	0	7
% Bicycles on Road	1.8	0	0	0	0	0	2.7	0	0	0	0	0	0	0.1	0	0	0.4
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	3	0	0	0	0	0	0	0	0	0	0	0	0	3
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0.2

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File Name : Rainbow Dr - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
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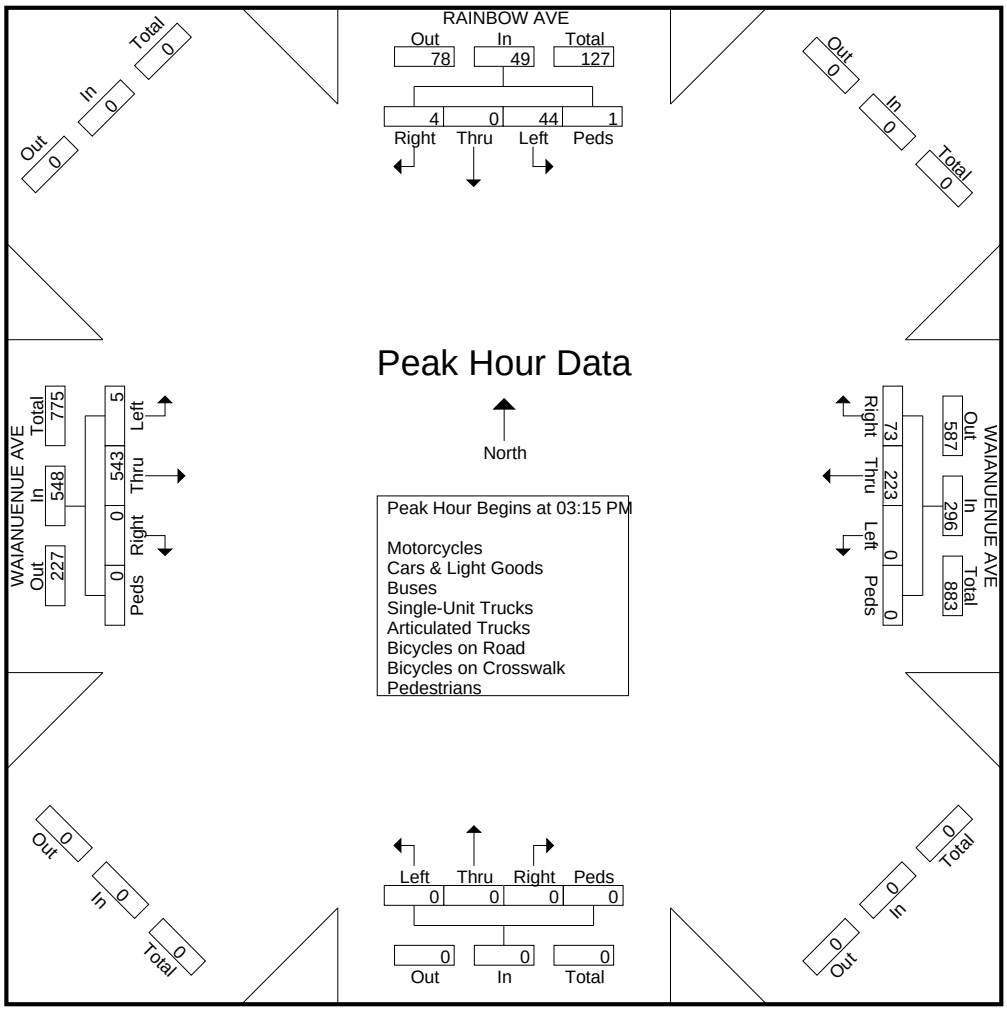
	RAINBOW AVE SOUTHBOUND					WAIANUENUE AVE WESTBOUND					NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	**15**	0	0	0	15	0	**69**	**29**	0	**98**	0	0	0	0	0	2	104	0	0	106	219
03:30 PM	10	0	1	0	11	0	57	15	0	72	0	0	0	0	0	0	**166**	0	0	166	**249**
03:45 PM	7	0	0	0	7	0	52	15	0	67	0	0	0	0	0	0	108	0	0	108	182
04:00 PM	12	0	**3**	**1**	**16**	0	45	14	0	59	0	0	0	0	0	**3**	165	0	0	**168**	243
Total Volume	44	0	4	1	49	0	223	73	0	296	0	0	0	0	0	5	543	0	0	548	893
% App. Total	89.8	0	8.2	2		0	75.3	24.7	0		0	0	0	0		0.9	99.1	0	0		
PHF	.733	.000	.333	.250	.766	.000	.808	.629	.000	.755	.000	.000	.000	.000	.000	.417	.818	.000	.000	.815	.897



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File Name : Puuhina St - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				WAIANUENUE AVE WESTBOUND				PUUHINA ST NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	0	0	0	0	0	51	0	0	6	0	0	0	0	21	0	0	78
06:15 AM	0	0	0	0	0	86	0	0	9	0	0	0	0	14	1	0	110
06:30 AM	0	0	0	0	0	120	0	0	15	0	1	0	0	32	3	0	171
06:45 AM	0	0	0	0	0	75	0	0	17	0	1	0	0	26	6	0	125
Total	0	0	0	0	0	332	0	0	47	0	2	0	0	93	10	0	484
07:00 AM	0	0	0	0	1	102	0	0	5	0	0	0	0	34	6	0	148
07:15 AM	0	0	0	0	3	109	0	2	22	0	1	0	0	64	7	0	208
07:30 AM	0	0	0	0	1	115	0	0	17	0	3	0	0	82	13	0	231
07:45 AM	0	0	0	0	1	105	0	3	17	0	1	0	0	58	6	0	191
Total	0	0	0	0	6	431	0	5	61	0	5	0	0	238	32	0	778
08:00 AM	0	0	0	0	1	75	0	1	15	0	0	0	0	42	7	0	141
08:15 AM	0	0	0	0	0	56	0	0	5	0	0	0	0	46	3	0	110
08:30 AM	0	0	0	0	0	71	0	0	4	0	1	0	0	50	7	0	133
08:45 AM	0	0	0	0	0	74	0	0	5	0	1	0	0	67	5	0	152
Total	0	0	0	0	1	276	0	1	29	0	2	0	0	205	22	0	536
Grand Total	0	0	0	0	7	1039	0	6	137	0	9	0	0	536	64	0	1798
Apprch %	0	0	0	0	0.7	98.8	0	0.6	93.8	0	6.2	0	0	89.3	10.7	0	
Total %	0	0	0	0	0.4	57.8	0	0.3	7.6	0	0.5	0	0	29.8	3.6	0	
Motorcycles	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.1	0	0	0.7	0	0	0	0	0.2	0	0	0.2
Cars & Light Goods	0	0	0	0	7	1027	0	0	136	0	9	0	0	529	64	0	1772
% Cars & Light Goods	0	0	0	0	100	98.8	0	0	99.3	0	100	0	0	98.7	100	0	98.6
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
% Buses	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	6	0	0	0	0	0	0	0	4	0	0	10
% Single-Unit Trucks	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0.7	0	0	0.6
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0.2
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	6	0	0	0	0	0	0	0	0	6
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0.3

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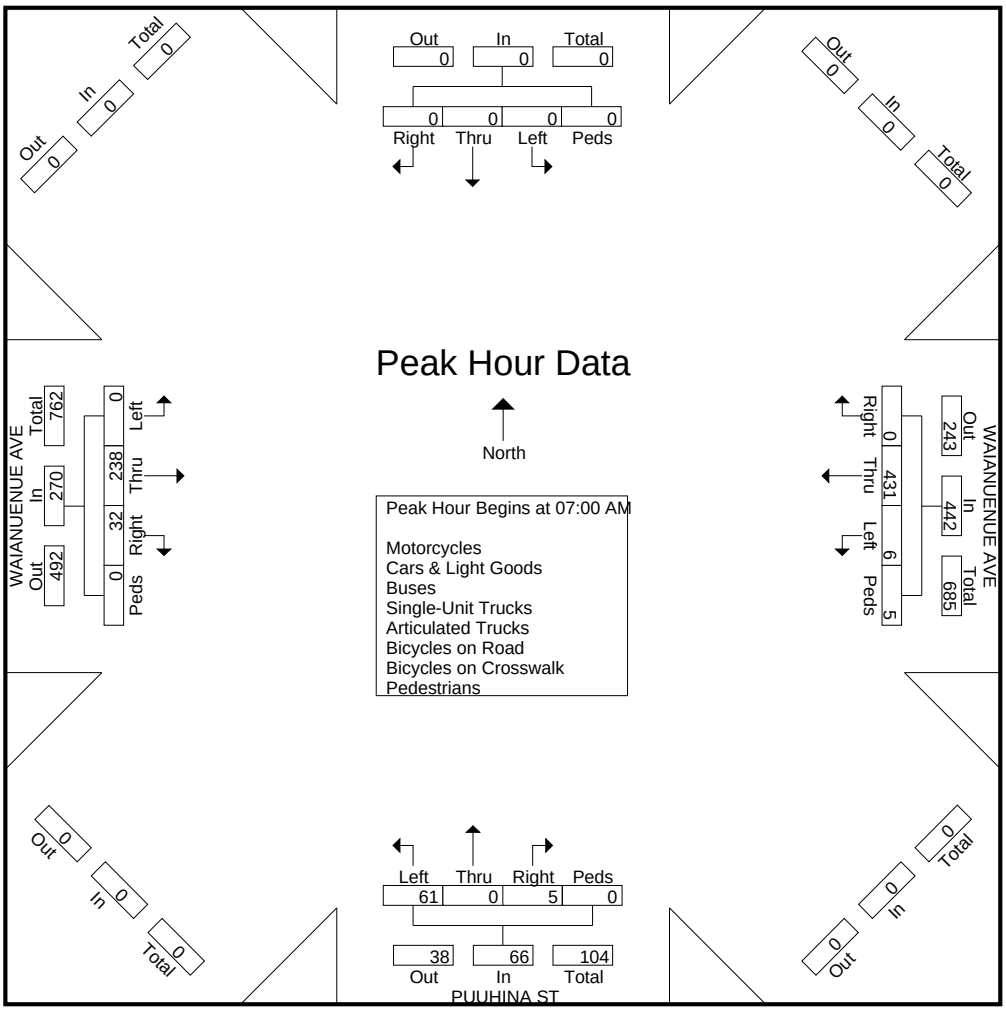
	SOUTHBOUND					WAIANUENUE AVE WESTBOUND					PUUHINA ST NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	1	102	0	0	103	5	0	0	0	5	0	34	6	0	40	148
07:15 AM	0	0	0	0	0	**3**	109	0	2	114	**22**	0	1	0	**23**	0	64	7	0	71	208
07:30 AM	0	0	0	0	0	1	**115**	0	0	**116**	17	0	**3**	0	20	0	**82**	**13**	0	**95**	**231**
07:45 AM	0	0	0	0	0	1	105	0	**3**	109	17	0	1	0	18	0	58	6	0	64	191
Total Volume	0	0	0	0	0	6	431	0	5	442	61	0	5	0	66	0	238	32	0	270	778
% App. Total	0	0	0	0		1.4	97.5	0	1.1		92.4	0	7.6	0		0	88.1	11.9	0		
PHF	.000	.000	.000	.000	.000	.500	.937	.000	.417	.953	.693	.000	.417	.000	.717	.000	.726	.615	.000	.711	.842



Austin Tsutsumi & Associates

501 Sumner St. STE 521
Honolulu, HI 96817
Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Puuhina St - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	SOUTHBOUND				WAIANUENUE AVE WESTBOUND				PUUHINA ST NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	0	0	0	0	0	51	0	0	6	0	0	0	0	21	0	0	78
06:15 AM	0	0	0	0	0	86	0	0	9	0	0	0	0	14	1	0	110
06:30 AM	0	0	0	0	0	120	0	0	15	0	1	0	0	32	3	0	171
06:45 AM	0	0	0	0	0	75	0	0	17	0	1	0	0	26	6	0	125
Total	0	0	0	0	0	332	0	0	47	0	2	0	0	93	10	0	484
07:00 AM	0	0	0	0	1	102	0	0	5	0	0	0	0	34	6	0	148
07:15 AM	0	0	0	0	3	109	0	2	22	0	1	0	0	64	7	0	208
07:30 AM	0	0	0	0	1	115	0	0	17	0	3	0	0	82	13	0	231
07:45 AM	0	0	0	0	1	105	0	3	17	0	1	0	0	58	6	0	191
Total	0	0	0	0	6	431	0	5	61	0	5	0	0	238	32	0	778
08:00 AM	0	0	0	0	1	75	0	1	15	0	0	0	0	42	7	0	141
08:15 AM	0	0	0	0	0	56	0	0	5	0	0	0	0	46	3	0	110
08:30 AM	0	0	0	0	0	71	0	0	4	0	1	0	0	50	7	0	133
08:45 AM	0	0	0	0	0	74	0	0	5	0	1	0	0	67	5	0	152
Total	0	0	0	0	1	276	0	1	29	0	2	0	0	205	22	0	536
Grand Total	0	0	0	0	7	1039	0	6	137	0	9	0	0	536	64	0	1798
Apprch %	0	0	0	0	0.7	98.8	0	0.6	93.8	0	6.2	0	0	89.3	10.7	0	
Total %	0	0	0	0	0.4	57.8	0	0.3	7.6	0	0.5	0	0	29.8	3.6	0	
Motorcycles	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	3
% Motorcycles	0	0	0	0	0	0.1	0	0	0.7	0	0	0	0	0.2	0	0	0.2
Cars & Light Goods	0	0	0	0	7	1027	0	0	136	0	9	0	0	529	64	0	1772
% Cars & Light Goods	0	0	0	0	100	98.8	0	0	99.3	0	100	0	0	98.7	100	0	98.6
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
% Buses	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	6	0	0	0	0	0	0	0	4	0	0	10
% Single-Unit Trucks	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0.7	0	0	0.6
Articulated Trucks	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0.2
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	6	0	0	0	0	0	0	0	0	6
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0.3

Austin Tsutsumi & Associates

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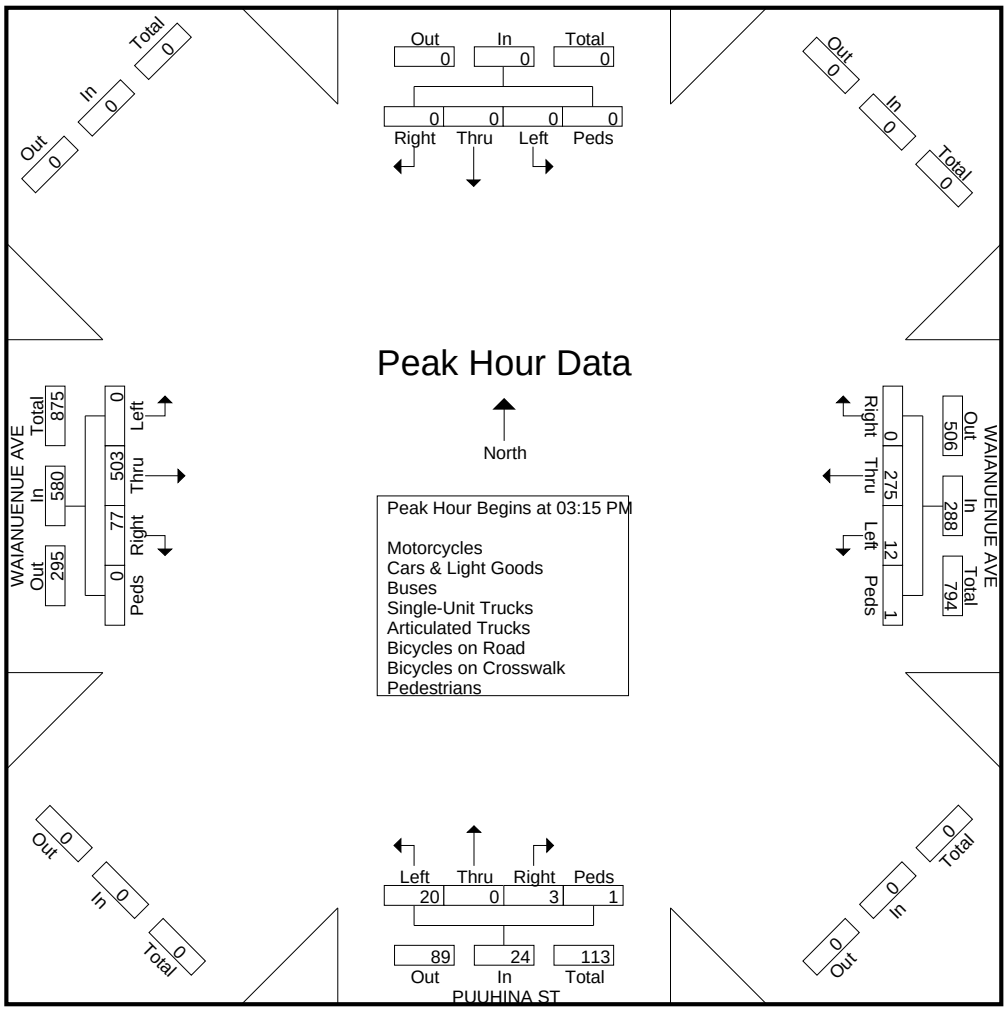
File Name : Puuhina St - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 2

	SOUTHBOUND					WAIANUENUE AVE WESTBOUND					PUUHINA ST NORTHBOUND					WAIANUENUE AVE 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 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	0	0	0	0	**5**	**91**	0	**1**	**97**	5	0	**1**	**1**	7	0	100	17	0	117	221
03:30 PM	0	0	0	0	0	4	65	0	0	69	**7**	0	1	0	**8**	0	**153**	21	0	174	**251**
03:45 PM	0	0	0	0	0	0	62	0	0	62	6	0	0	0	6	0	98	16	0	114	182
04:00 PM	0	0	0	0	0	3	57	0	0	60	2	0	1	0	3	0	152	**23**	0	**175**	238
Total Volume	0	0	0	0	0	12	275	0	1	288	20	0	3	1	24	0	503	77	0	580	892
% App. Total	0	0	0	0		4.2	95.5	0	0.3		83.3	0	12.5	4.2		0	86.7	13.3	0		
PHF	.000	.000	.000	.000	.000	.600	.755	.000	.250	.742	.714	.000	.750	.250	.750	.000	.822	.837	.000	.829	.888



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File Name : Puu Hina St_Hualilili St_Punahele St - Kaumana Dr.ppd
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	PUU HINA ST SOUTHBOUND					KAUMANA DR WESTBOUND					PUNAHELE ST From Southeast					HUALILILI ST NORTHBOUND					KAUMANA DR EASTBOUND					
Start Time	Left	Bear Left	Thru	Right	Peds	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Int. Total
06:00 AM	1	1	0	1	0	0	3	10	0	0	1	0	0	0	1	1	1	2	3	0	5	19	15	0	0	64
06:15 AM	0	3	0	0	0	0	1	15	1	0	0	0	0	1	1	0	2	0	1	2	7	16	15	1	0	66
06:30 AM	0	4	0	1	0	0	0	14	0	0	0	1	0	0	1	2	1	3	2	1	13	20	25	1	0	89
06:45 AM	0	5	0	1	0	0	3	15	1	2	0	1	0	0	3	1	3	6	2	2	13	28	28	0	0	114
Total	1	13	0	3	0	0	7	54	2	2	1	2	0	1	6	4	7	11	8	5	38	83	83	2	0	333
07:00 AM	1	4	0	4	1	0	5	28	0	0	0	1	0	0	2	2	0	4	4	1	5	40	27	1	0	130
07:15 AM	0	0	0	10	0	0	1	24	2	0	0	2	0	0	3	5	3	11	6	2	17	84	36	1	4	211
07:30 AM	1	9	0	11	1	0	6	39	1	2	0	1	1	1	1	2	4	8	2	1	12	124	52	1	0	280
07:45 AM	3	3	0	3	5	0	4	40	1	0	0	0	0	1	2	2	4	3	3	2	14	90	48	0	4	232
Total	5	16	0	28	7	0	16	131	4	2	0	4	1	2	8	11	11	26	15	6	48	338	163	3	8	853
08:00 AM	0	2	0	7	0	1	1	38	0	0	0	0	0	0	0	2	1	2	4	2	14	32	28	1	1	136
08:15 AM	1	0	0	3	0	0	0	26	2	0	0	0	0	0	0	3	2	2	1	0	2	19	23	0	0	84
08:30 AM	1	2	1	6	0	0	0	15	3	0	0	0	0	0	2	3	1	0	3	2	4	23	15	0	0	81
08:45 AM	0	3	0	4	0	0	4	25	0	2	0	0	0	0	2	1	1	4	2	1	5	21	24	1	0	100
Total	2	7	1	20	0	1	5	104	5	2	0	0	0	0	4	9	5	8	10	5	25	95	90	2	1	401
Grand Total	8	36	1	51	7	1	28	289	11	6	1	6	1	3	18	24	23	45	33	16	111	516	336	7	9	1587
Apprch %	7.8	35	1	49.5	6.8	0.3	8.4	86.3	3.3	1.8	3.4	20.7	3.4	10.3	62.1	17	16.3	31.9	23.4	11.3	11.3	52.7	34.3	0.7	0.9	
Total %	0.5	2.3	0.1	3.2	0.4	0.1	1.8	18.2	0.7	0.4	0.1	0.4	0.1	0.2	1.1	1.5	1.4	2.8	2.1	1	7	32.5	21.2	0.4	0.6	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0.2	0	0	0	0.1
Cars & Light Goods																										
% Cars & Light Goods	100	97.2	100	100	0	100	100	97.9	100	0	100	100	100	100	0	100	100	100	100	0	99.1	97.9	99.1	100	0	95.1
Buses	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	7
% Buses	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.3	0	0	0.4
Single-Unit Trucks	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	0	0	10
% Single-Unit Trucks	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	0.3	0	0	0.6
Articulated Trucks	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Articulated Trucks	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Road	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	7	0	0	0	0	6	0	0	0	0	18	0	0	0	0	16	0	0	0	0	9	56
% Pedestrians	0	0	0	0	100	0	0	0	0	100	0	0	0	0	100	0	0	0	0	100	0	0	0	0	100	3.5

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Site Code : 21-204 Hilo Medical Center
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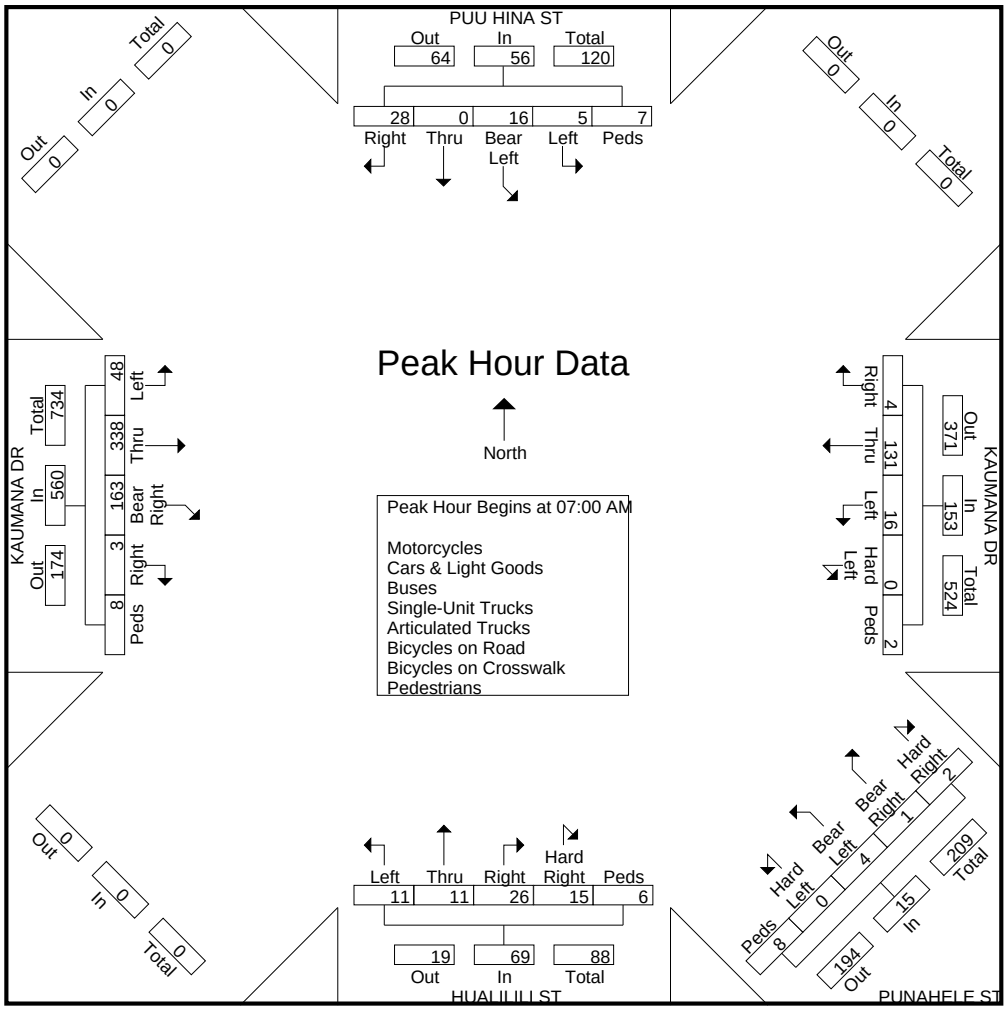
	PUU HINA ST SOUTHBOUND						KAUMANA DR WESTBOUND						PUNAHELE ST From Southeast						HUALILILI ST NORTHBOUND						KAUMANA DR EASTBOUND						
Start Time	Left	Bear Left	Thru	Right	Peds	App. Total	Hard Left	Left	Thru	Right	Peds	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	Peds	App. Total	Left	Thru	Right	Hard Right	Peds	App. Total	Left	Thru	Bear Right	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 07:00 AM																															
07:00 AM	1	4	0	4	1	10	0	5	28	0	0	33	0	1	0	0	2	3	2	0	4	4	1	11	5	40	27	**1**	0	73	130
07:15 AM	0	0	0	10	0	10	0	1	24	**2**	0	27	0	**2**	0	0	**3**	**5**	**5**	3	**11**	**6**	**2**	**27**	**17**	84	36	1	**4**	142	211
07:30 AM	1	**9**	0	**11**	1	**22**	0	**6**	39	1	**2**	**48**	0	1	**1**	**1**	1	4	2	**4**	8	2	1	17	12	**124**	**52**	1	0	**189**	**280**
07:45 AM	**3**	3	0	3	**5**	14	0	4	**40**	1	0	45	0	0	0	1	2	3	2	4	3	3	2	14	14	90	48	0	4	156	232
Total Volume	5	16	0	28	7	56	0	16	131	4	2	153	0	4	1	2	8	15	11	11	26	15	6	69	48	338	163	3	8	560	853
% App. Total	8.9	28.6	0	50	12.5		0	10.5	85.6	2.6	1.3		0	26.7	6.7	13.3	53.3		15.9	15.9	37.7	21.7	8.7		8.6	60.4	29.1	0.5	1.4		
PHF	.417	.444	.000	.636	.350	.636	.000	.667	.819	.500	.250	.797	.000	.500	.250	.500	.667	.750	.550	.688	.591	.625	.750	.639	.706	.681	.784	.750	.500	.741	.762



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File Name : Puu Hina St_Hualilili St_Punahele St - Kaumana Dr.ppd
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	PUU HINA ST SOUTHBOUND					KAUMANA DR WESTBOUND					PUNAHELE ST From Southeast					HUALILILI ST NORTHBOUND					KAUMANA DR EASTBOUND					
Start Time	Left	Bear Left	Thru	Right	Peds	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Int. Total
03:00 PM	1	1	0	9	1	0	4	50	1	1	0	1	0	2	1	3	2	4	1	0	3	24	10	0	1	120
03:15 PM	1	2	0	17	1	0	3	54	4	2	0	0	0	1	0	3	2	2	2	0	3	36	18	1	1	153
03:30 PM	0	0	0	18	0	0	4	64	1	5	0	0	1	2	4	7	2	2	2	1	6	29	21	0	1	170
03:45 PM	0	1	0	16	0	0	2	49	1	0	0	1	0	1	1	4	1	2	5	1	4	26	15	0	0	130
Total	2	4	0	60	2	0	13	217	7	8	0	2	1	6	6	17	7	10	10	2	16	115	64	1	3	573
04:00 PM	1	5	0	20	1	0	7	67	1	1	0	0	0	1	1	5	0	0	3	2	2	29	21	0	0	167
04:15 PM	1	3	0	9	0	0	3	70	4	1	0	0	0	2	2	7	0	4	2	1	2	40	19	0	0	170
04:30 PM	0	2	0	16	0	0	5	66	3	1	0	1	0	1	1	11	2	2	1	1	3	23	25	0	0	164
04:45 PM	1	0	0	9	0	0	6	94	3	3	0	1	0	0	0	5	0	1	2	2	7	33	7	0	0	174
Total	3	10	0	54	1	0	21	297	11	6	0	2	0	4	4	28	2	7	8	6	14	125	72	0	0	675
05:00 PM	1	2	0	13	0	0	4	70	2	1	0	0	0	0	0	2	1	2	3	0	3	38	12	0	0	154
05:15 PM	1	2	0	9	0	0	3	60	0	1	0	0	0	0	0	5	0	2	2	3	1	26	18	0	1	134
05:30 PM	1	1	0	8	2	0	6	51	2	0	1	0	0	0	0	4	1	4	1	2	1	27	11	0	0	123
05:45 PM	2	0	0	2	0	1	2	60	1	0	0	0	0	1	2	3	2	2	3	0	2	25	11	0	0	119
Total	5	5	0	32	2	1	15	241	5	2	1	0	0	1	2	14	4	10	9	5	7	116	52	0	1	530
Grand Total	10	19	0	146	5	1	49	755	23	16	1	4	1	11	12	59	13	27	27	13	37	356	188	1	4	1778
Apprch %	5.6	10.6	0	81.1	2.8	0.1	5.8	89.5	2.7	1.9	3.4	13.8	3.4	37.9	41.4	42.4	9.4	19.4	19.4	9.4	6.3	60.8	32.1	0.2	0.7	
Total %	0.6	1.1	0	8.2	0.3	0.1	2.8	42.5	1.3	0.9	0.1	0.2	0.1	0.6	0.7	3.3	0.7	1.5	1.5	0.7	2.1	20	10.6	0.1	0.2	
Motorcycles	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	6
% Motorcycles	0	0	0	0.7	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0.3
Cars & Light Goods																										
% Cars & Light Goods	100	94.7	0	98.6	0	100	100	99.5	100	0	100	100	0	100	0	100	84.6	100	100	0	100	98.9	98.9	100	0	96.3
Buses	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
% Buses	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0.1
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0.1
Articulated Trucks	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	2	0	0	0	0	0	1	0	0	7
% Bicycles on Road	0	5.3	0	0.7	0	0	0	0.1	0	0	0	0	100	0	0	0	15.4	0	0	0	0	0	0.5	0	0	0.4
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Pedestrians	0	0	0	0	5	0	0	0	0	12	0	0	0	0	12	0	0	0	0	13	0	0	0	0	4	46
% Pedestrians	0	0	0	0	100	0	0	0	0	75	0	0	0	0	100	0	0	0	0	100	0	0	0	0	100	2.6

Austin Tsutsumi & Associates

501 Sumner St. STE 521
Honolulu, HI 96817
Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Puu Hina St_Hualilili St_Punahele St - Kaumana Dr.ppd
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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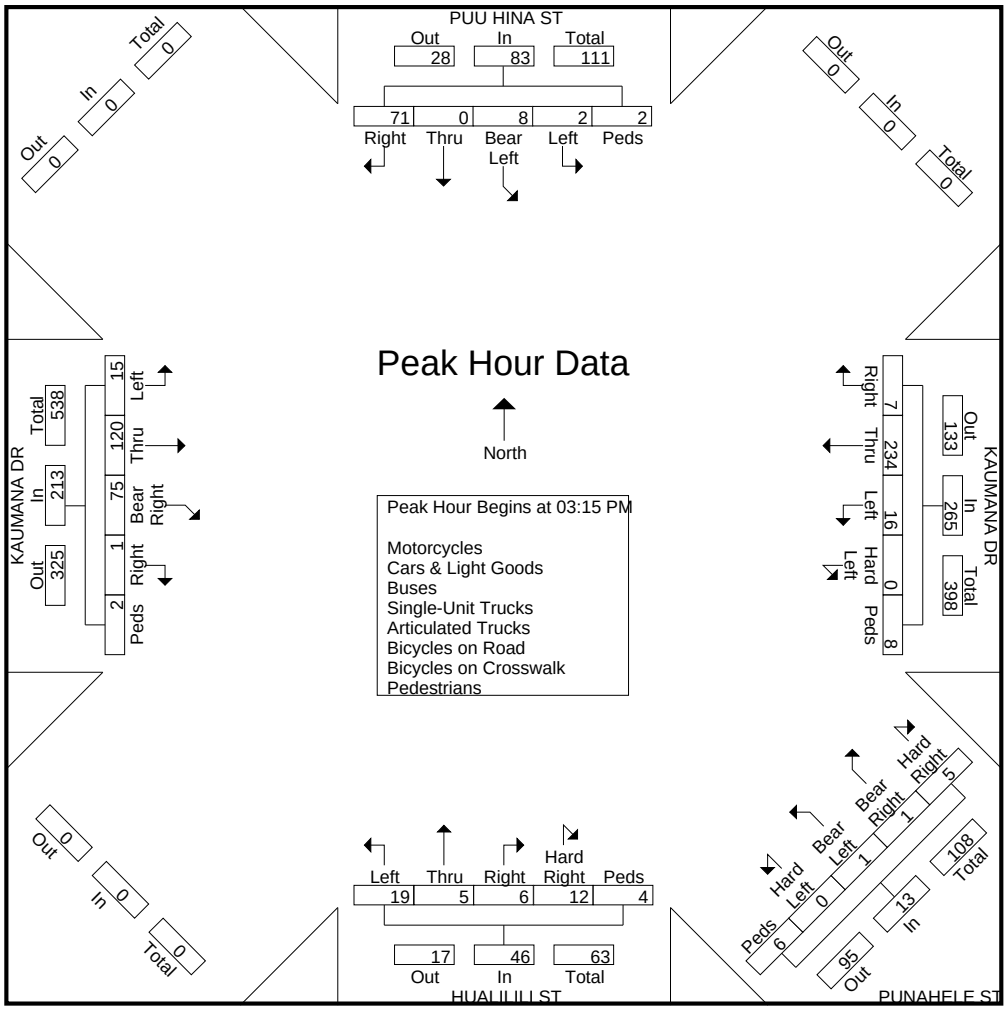
	PUU HINA ST SOUTHBOUND						KAUMANA DR WESTBOUND						PUNAHELE ST From Southeast						HUALILILI ST NORTHBOUND						KAUMANA DR EASTBOUND						
Start Time	Left	Bear Left	Thru	Right	Peds	App. Total	Hard Left	Left	Thru	Right	Peds	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	Peds	App. Total	Left	Thru	Right	Hard Right	Peds	App. Total	Left	Thru	Bear Right	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 PM to 04:00 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 03:15 PM																															
03:15 PM	**1**	2	0	17	**1**	21	0	3	54	**4**	2	63	0	0	0	1	0	1	3	**2**	**2**	2	0	9	3	**36**	18	**1**	**1**	**59**	153
03:30 PM	0	0	0	18	0	18	0	4	64	1	**5**	74	0	0	**1**	**2**	**4**	**7**	**7**	2	2	2	1	**14**	**6**	29	**21**	0	1	57	**170**
03:45 PM	0	1	0	16	0	17	0	2	49	1	0	52	0	**1**	0	1	1	3	4	1	2	**5**	1	13	4	26	15	0	0	45	130
04:00 PM	1	**5**	0	**20**	1	**27**	0	**7**	**67**	1	1	**76**	0	0	0	1	1	2	5	0	0	3	**2**	10	2	29	21	0	0	52	167
Total Volume	2	8	0	71	2	83	0	16	234	7	8	265	0	1	1	5	6	13	19	5	6	12	4	46	15	120	75	1	2	213	620
% App. Total	2.4	9.6	0	85.5	2.4		0	6	88.3	2.6	3		0	7.7	7.7	38.5	46.2		41.3	10.9	13	26.1	8.7		7	56.3	35.2	0.5	0.9		
PHF	.500	.400	.000	.888	.500	.769	.000	.571	.873	.438	.400	.872	.000	.250	.250	.625	.375	.464	.679	.625	.750	.600	.500	.821	.625	.833	.893	.250	.500	.903	.912



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501 Sumner St. STE 521
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Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Lele St - Waianuenue Ave_Kaumana Dr
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	WAIANUENUE AVE SOUTHBOUND				KAUMANA DR WESTBOUND				LELE ST NORTHBOUND				KAUMANA DR EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	20	0	0	0	0	10	0	1	2	0	0	1	0	23	0	0	57
06:15 AM	21	0	0	0	0	17	0	0	0	1	0	1	0	17	0	0	57
06:30 AM	32	0	0	0	0	16	0	0	0	0	0	0	1	22	0	0	71
06:45 AM	28	0	0	0	0	20	0	2	1	0	1	2	0	35	0	0	89
Total	101	0	0	0	0	63	0	3	3	1	1	4	1	97	0	0	274
07:00 AM	36	0	0	0	0	30	0	0	0	0	2	2	3	43	0	0	116
07:15 AM	62	0	2	0	0	31	0	0	0	1	5	3	3	94	0	0	201
07:30 AM	80	0	1	0	0	46	0	0	0	2	2	0	4	133	0	0	268
07:45 AM	60	0	0	3	0	51	0	0	1	1	2	1	2	103	0	0	224
Total	238	0	3	3	0	158	0	0	1	4	11	6	12	373	0	0	809
08:00 AM	41	0	0	0	0	32	0	0	3	1	0	0	1	34	0	0	112
08:15 AM	48	0	1	1	0	26	0	0	2	1	0	0	0	21	0	0	100
08:30 AM	49	0	0	0	0	21	1	0	1	0	2	2	2	25	0	0	103
08:45 AM	71	0	1	0	0	28	0	0	0	0	1	1	2	24	0	0	128
Total	209	0	2	1	0	107	1	0	6	2	3	3	5	104	0	0	443
Grand Total	548	0	5	4	0	328	1	3	10	7	15	13	18	574	0	0	1526
Apprch %	98.4	0	0.9	0.7	0	98.8	0.3	0.9	22.2	15.6	33.3	28.9	3	97	0	0	
Total %	35.9	0	0.3	0.3	0	21.5	0.1	0.2	0.7	0.5	1	0.9	1.2	37.6	0	0	
Motorcycles	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
% Motorcycles	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.1
Cars & Light Goods	540	0	5	0	0	321	1	0	10	7	15	0	18	564	0	0	1481
% Cars & Light Goods	98.5	0	100	0	0	97.9	100	0	100	100	100	0	100	98.3	0	0	97.1
Buses	1	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	7
% Buses	0.2	0	0	0	0	0.6	0	0	0	0	0	0	0	0.7	0	0	0.5
Single-Unit Trucks	4	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	12
% Single-Unit Trucks	0.7	0	0	0	0	1.2	0	0	0	0	0	0	0	0.7	0	0	0.8
Articulated Trucks	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
% Articulated Trucks	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.1
Bicycles on Road	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
% Bicycles on Road	0.2	0	0	0	0	0.3	0	0	0	0	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	4	0	0	0	3	0	0	0	13	0	0	0	0	20
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	0	1.3

Austin Tsutsumi & Associates

501 Sumner St. STE 521
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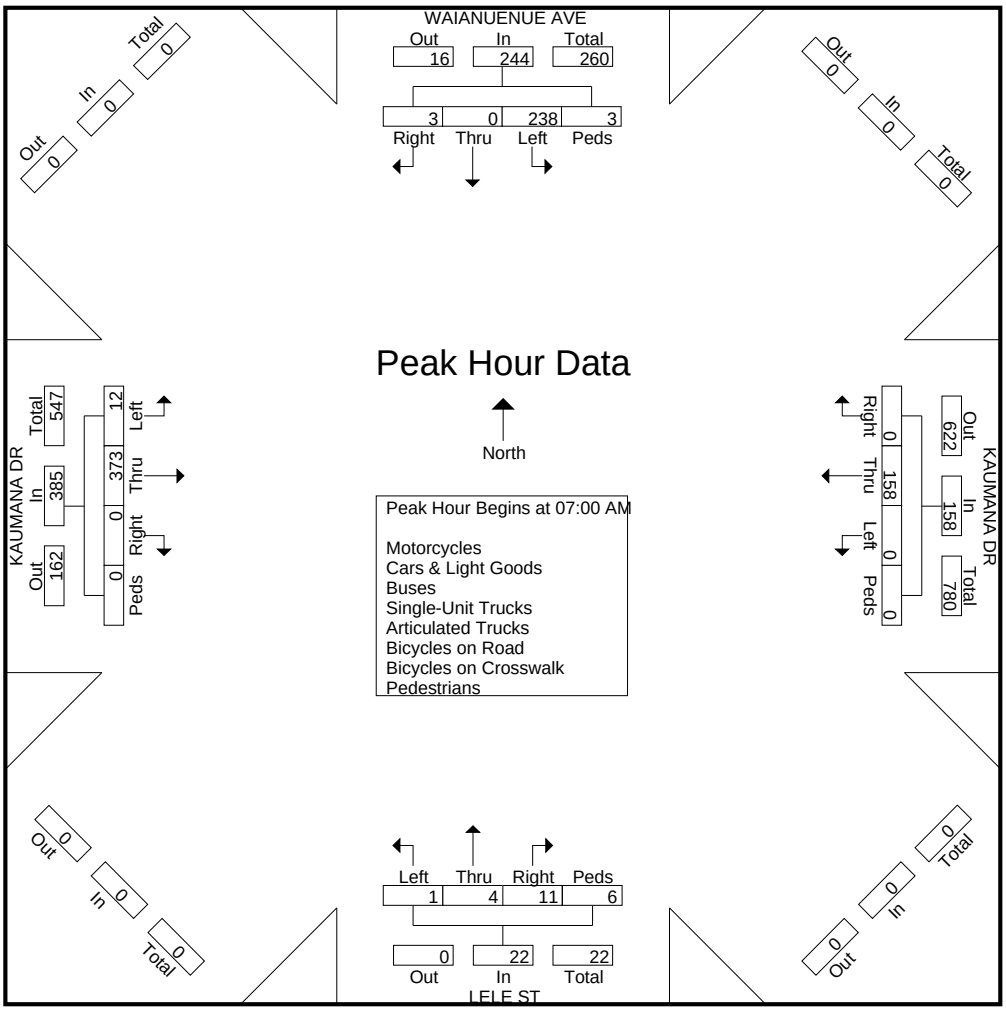
File Name : Lele St - Waianuenue Ave_Kaumana Dr
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 2

	WAIANUENUE AVE SOUTHBOUND					KAUMANA DR WESTBOUND					LELE ST NORTHBOUND					KAUMANA DR 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 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	36	0	0	0	36	0	30	0	0	30	0	0	2	2	4	3	43	0	0	46	116
07:15 AM	62	0	**2**	0	64	0	31	0	0	31	0	1	**5**	**3**	**9**	3	94	0	0	97	201
07:30 AM	**80**	0	1	0	**81**	0	46	0	0	46	0	**2**	2	0	4	**4**	**133**	0	0	**137**	**268**
07:45 AM	60	0	0	**3**	63	0	**51**	0	0	**51**	**1**	1	2	1	5	2	103	0	0	105	224
Total Volume	238	0	3	3	244	0	158	0	0	158	1	4	11	6	22	12	373	0	0	385	809
% App. Total	97.5	0	1.2	1.2		0	100	0	0		4.5	18.2	50	27.3		3.1	96.9	0	0		
PHF	.744	.000	.375	.250	.753	.000	.775	.000	.000	.775	.250	.500	.550	.500	.611	.750	.701	.000	.000	.703	.755



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File Name : Lele St - Waianuenue Ave_Kaumana Dr
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	WAIANUENUE AVE SOUTHBOUND				KAUMANA DR WESTBOUND				LELE ST NORTHBOUND				KAUMANA DR EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	90	0	0	1	0	57	1	0	0	0	0	1	1	33	0	0	184
03:15 PM	99	0	1	0	0	62	0	0	1	0	0	0	2	36	0	0	201
03:30 PM	154	0	2	1	0	61	0	0	4	0	1	3	0	32	0	0	258
03:45 PM	102	0	0	0	0	50	0	2	1	0	1	0	0	28	0	1	185
Total	445	0	3	2	0	230	1	2	6	0	2	4	3	129	0	1	828
04:00 PM	154	0	1	1	0	71	1	1	2	0	1	1	0	30	0	0	263
04:15 PM	80	0	3	0	0	76	0	0	2	0	4	1	2	46	0	1	215
04:30 PM	118	0	0	1	0	84	0	0	2	0	0	2	2	27	0	0	236
04:45 PM	75	0	1	0	0	101	0	2	2	0	3	0	0	35	0	0	219
Total	427	0	5	2	0	332	1	3	8	0	8	4	4	138	0	1	933
05:00 PM	65	0	2	0	0	72	0	0	2	0	0	1	2	39	0	0	183
05:15 PM	53	0	3	0	0	61	0	0	1	0	1	0	1	31	0	2	153
05:30 PM	35	0	0	2	0	58	0	0	3	0	0	1	0	31	0	0	130
05:45 PM	33	0	1	0	0	65	0	1	1	0	0	0	1	30	0	0	132
Total	186	0	6	2	0	256	0	1	7	0	1	2	4	131	0	2	598
Grand Total	1058	0	14	6	0	818	2	6	21	0	11	10	11	398	0	4	2359
Apprch %	98.1	0	1.3	0.6	0	99	0.2	0.7	50	0	26.2	23.8	2.7	96.4	0	1	
Total %	44.8	0	0.6	0.3	0	34.7	0.1	0.3	0.9	0	0.5	0.4	0.5	16.9	0	0.2	
Motorcycles	0	0	0	0	0	3	0	0	0	0	0	0	0	5	0	0	8
% Motorcycles	0	0	0	0	0	0.4	0	0	0	0	0	0	0	1.3	0	0	0.3
Cars & Light Goods	1051	0	14	0	0	813	2	0	21	0	10	0	11	392	0	0	2314
% Cars & Light Goods	99.3	0	100	0	0	99.4	100	0	100	0	90.9	0	100	98.5	0	0	98.1
Buses	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
% Buses	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1
Single-Unit Trucks	6	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	8
% Single-Unit Trucks	0.6	0	0	0	0	0	0	0	0	0	9.1	0	0	0.3	0	0	0.3
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	1	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	33.3	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	6	0	0	0	4	0	0	0	10	0	0	0	4	24
% Pedestrians	0	0	0	100	0	0	0	66.7	0	0	0	100	0	0	0	100	1

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File Name : Lele St - Waianuenue Ave_Kaumana Dr
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
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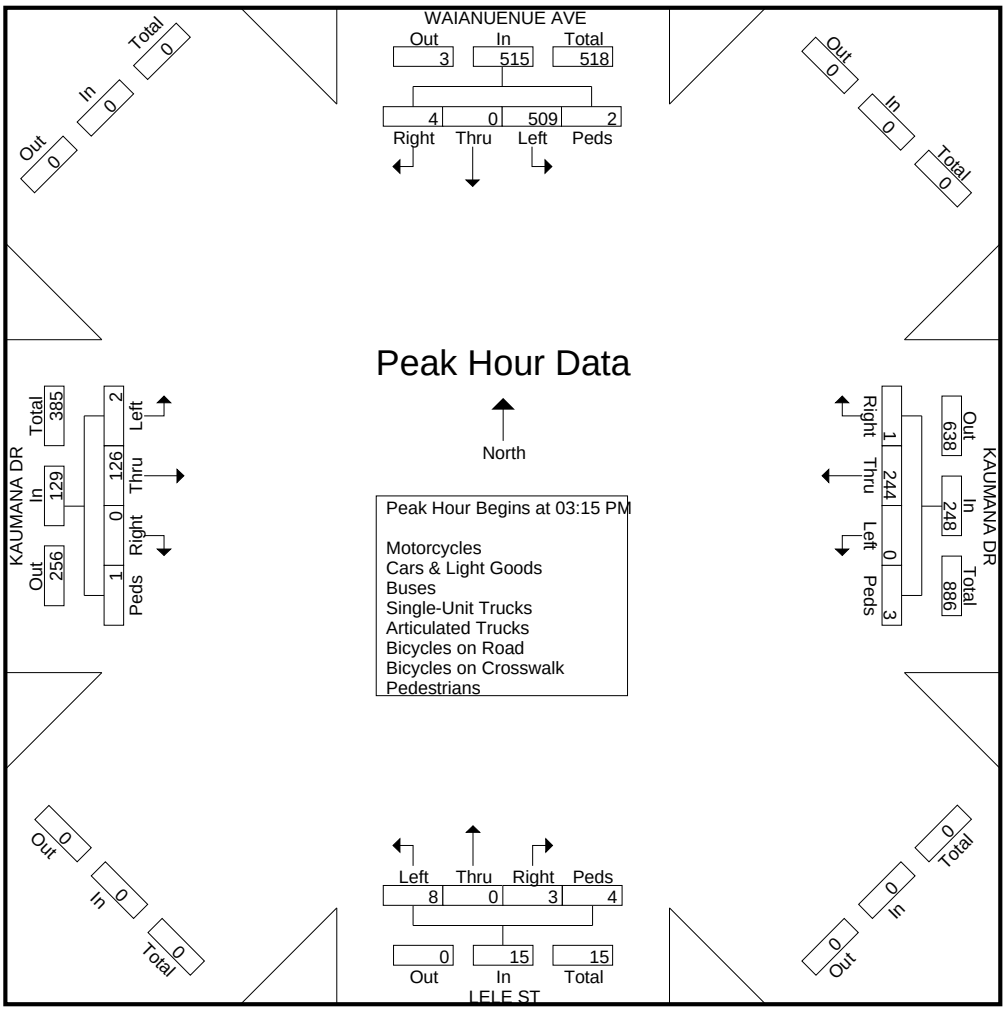
	WAIANUENUE AVE SOUTHBOUND					KAUMANA DR WESTBOUND					LELE ST NORTHBOUND					KAUMANA DR EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 PM to 04:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	99	0	1	0	100	0	62	0	0	62	1	0	0	0	1	**2**	**36**	0	0	**38**	201
03:30 PM	**154**	0	**2**	**1**	**157**	0	61	0	0	61	**4**	0	**1**	**3**	**8**	0	32	0	0	32	258
03:45 PM	102	0	0	0	102	0	50	0	**2**	52	1	0	1	0	2	0	28	0	**1**	29	185
04:00 PM	154	0	1	1	156	0	**71**	**1**	1	**73**	2	0	1	1	4	0	30	0	0	30	**263**
Total Volume	509	0	4	2	515	0	244	1	3	248	8	0	3	4	15	2	126	0	1	129	907
% App. Total	98.8	0	0.8	0.4		0	98.4	0.4	1.2		53.3	0	20	26.7		1.6	97.7	0	0.8		
PHF	.826	.000	.500	.500	.820	.000	.859	.250	.375	.849	.500	.000	.750	.333	.469	.250	.875	.000	.250	.849	.862



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501 Sumner St. STE 521
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File Name : Komohana St - Waianuenue Ave
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	PRIVATE DWY SOUTHBOUND				WAIANUENUE AVE WESTBOUND				KOMOHANA ST NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	0	0	0	1	9	19	0	0	44	0	11	0	0	28	16	0	128
06:15 AM	0	0	0	0	13	29	0	0	75	0	9	1	0	28	13	0	168
06:30 AM	0	0	0	0	9	32	0	0	102	0	22	0	0	30	25	0	220
06:45 AM	1	0	0	0	21	31	0	0	57	0	29	1	0	39	23	0	202
Total	1	0	0	1	52	111	0	0	278	0	71	2	0	125	77	0	718
07:00 AM	0	0	0	0	19	49	0	0	85	0	59	2	0	58	27	0	299
07:15 AM	0	0	0	3	2	5	0	0	140	0	105	0	0	102	46	0	403
07:30 AM	0	0	0	0	1	0	0	0	153	0	112	2	0	152	60	0	480
07:45 AM	1	1	0	4	0	1	0	0	149	0	71	2	0	124	59	0	412
Total	1	1	0	7	22	55	0	0	527	0	347	6	0	436	192	0	1594
08:00 AM	0	0	0	2	23	37	0	1	70	0	22	0	0	47	27	0	229
08:15 AM	0	0	0	0	13	36	0	0	51	0	25	1	0	42	29	0	197
08:30 AM	0	0	0	2	14	38	0	2	57	0	19	1	0	36	37	0	206
08:45 AM	0	0	0	0	17	42	0	2	63	0	29	0	0	47	42	0	242
Total	0	0	0	4	67	153	0	5	241	0	95	2	0	172	135	0	874
Grand Total	2	1	0	12	141	319	0	5	1046	0	513	10	0	733	404	0	3186
Apprch %	13.3	6.7	0	80	30.3	68.6	0	1.1	66.7	0	32.7	0.6	0	64.5	35.5	0	
Total %	0.1	0	0	0.4	4.4	10	0	0.2	32.8	0	16.1	0.3	0	23	12.7	0	
Motorcycles	0	0	0	0	0	1	0	0	0	0	0	0	0	2	2	0	5
% Motorcycles	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.3	0.5	0	0.2
Cars & Light Goods	2	1	0	0	140	309	0	0	1034	0	505	0	0	721	398	0	3110
% Cars & Light Goods	100	100	0	0	99.3	96.9	0	0	98.9	0	98.4	0	0	98.4	98.5	0	97.6
Buses	0	0	0	0	0	2	0	0	3	0	4	0	0	4	1	0	14
% Buses	0	0	0	0	0	0.6	0	0	0.3	0	0.8	0	0	0.5	0.2	0	0.4
Single-Unit Trucks	0	0	0	0	1	5	0	0	8	0	4	0	0	5	3	0	26
% Single-Unit Trucks	0	0	0	0	0.7	1.6	0	0	0.8	0	0.8	0	0	0.7	0.7	0	0.8
Articulated Trucks	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	3
% Articulated Trucks	0	0	0	0	0	0.3	0	0	0.1	0	0	0	0	0.1	0	0	0.1
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	12	0	0	0	3	0	0	0	10	0	0	0	0	25
% Pedestrians	0	0	0	100	0	0	0	60	0	0	0	100	0	0	0	0	0.8

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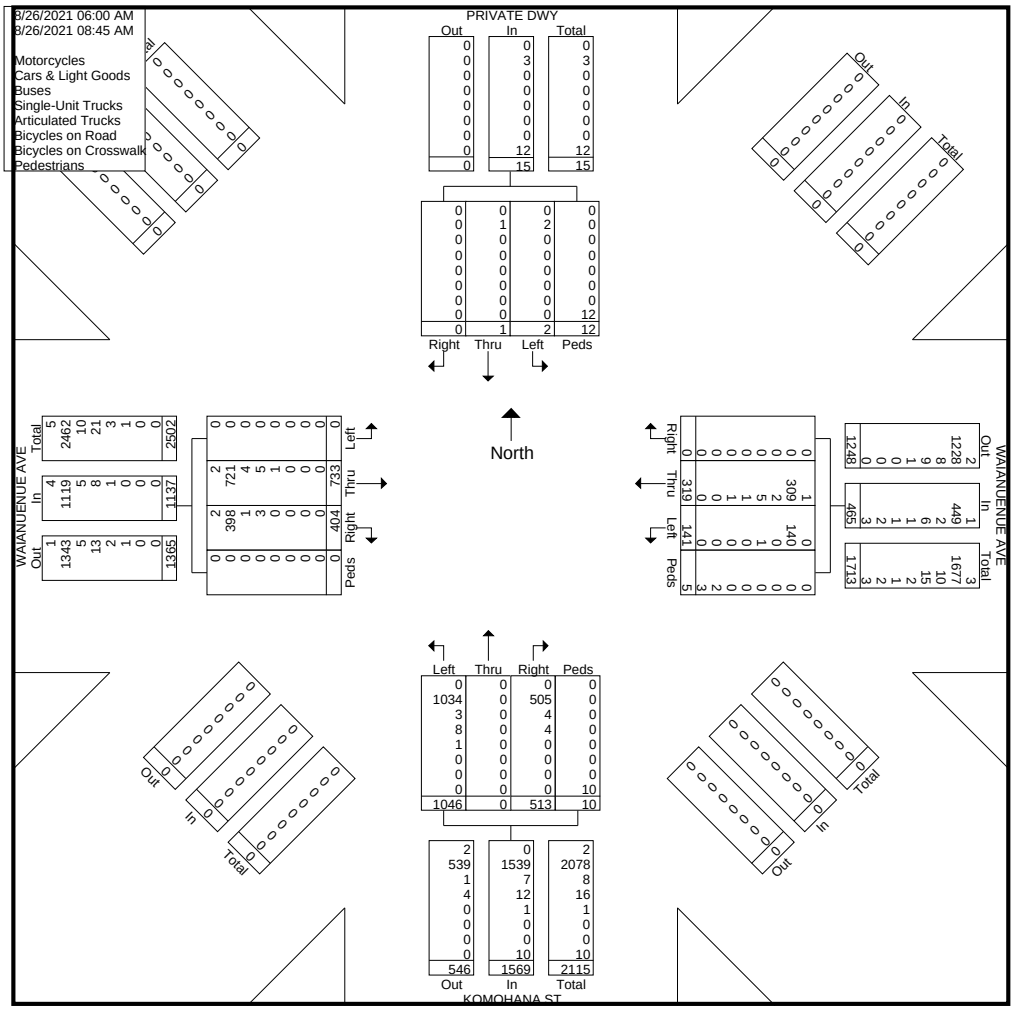
8/26/2021 06:00 AM
8/26/2021 08:45 AM
Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Articulated Trucks
Bicycles on Road
Bicycles on Crosswalk
Pedestrians
PRIVATE DWY
Out In Total
0 0 0
0 3 3
0 0 0
0 0 0
0 0 0
0 0 0
0 0 0
0 12 12
0 15 15
0 0 0 0
0 1 2 0
0 0 0 0
0 0 0 0
0 0 0 0
0 0 0 0
0 0 0 0
0 0 0 12
0 1 2 12
Right Thru Left Peds
North
WAIANUENUE AVE
Out In Total
1 4 5
1343 1119 2462
5 5 10
13 8 21
2 1 3
1 0 1
0 0 0
0 0 0
1365 1137 2502
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
2 2 4
721 721 1442
4 4 8
5 5 10
1 1 2
3 3 6
0 0 0
0 0 0
0 0 0
0 0 0
0 0 0

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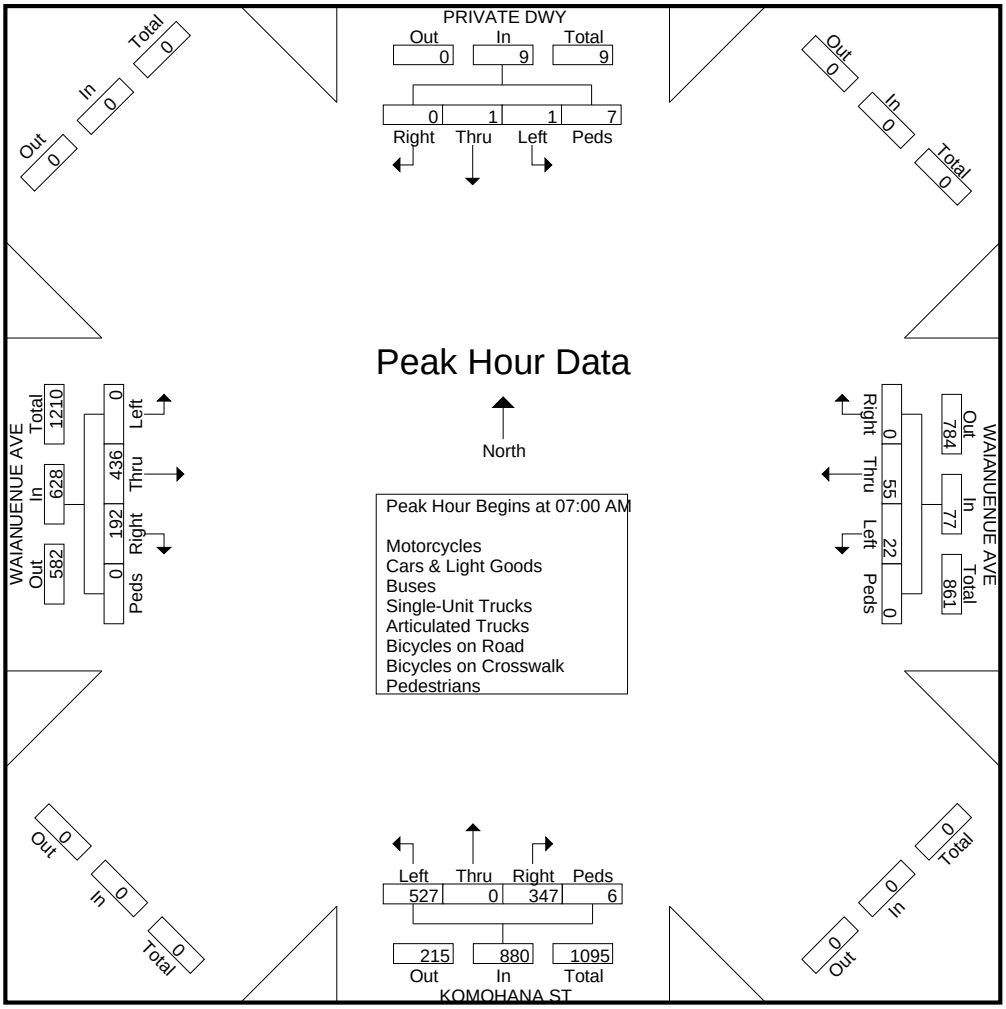
	PRIVATE DWY SOUTHBOUND					WAIANUENUE AVE WESTBOUND					KOMOHANA ST NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	**19**	**49**	0	0	**68**	85	0	59	**2**	146	0	58	27	0	85	299
07:15 AM	0	0	0	3	3	2	5	0	0	7	140	0	105	0	245	0	102	46	0	148	403
07:30 AM	0	0	0	0	0	1	0	0	0	1	**153**	0	**112**	2	**267**	0	**152**	**60**	0	**212**	**480**
07:45 AM	**1**	**1**	0	**4**	**6**	0	1	0	0	1	149	0	71	2	222	0	124	59	0	183	412
Total Volume	1	1	0	7	9	22	55	0	0	77	527	0	347	6	880	0	436	192	0	628	1594
% App. Total	11.1	11.1	0	77.8		28.6	71.4	0	0		59.9	0	39.4	0.7		0	69.4	30.6	0		
PHF	.250	.250	.000	.438	.375	.289	.281	.000	.000	.283	.861	.000	.775	.750	.824	.000	.717	.800	.000	.741	.830



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File Name : Komohana St - Waianuenue Ave
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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	PRIVATE DWY SOUTHBOUND				WAIANUENUE AVE WESTBOUND				KOMOHANA ST NORTHBOUND				WAIANUENUE AVE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	0	0	0	1	23	59	1	0	61	0	26	1	0	61	63	0	296
03:15 PM	0	0	0	0	26	82	0	0	75	0	25	0	0	66	61	0	335
03:30 PM	0	0	0	2	25	77	0	0	58	0	41	0	0	83	110	0	396
03:45 PM	1	0	0	0	37	69	0	0	50	0	32	0	0	63	67	0	319
Total	1	0	0	3	111	287	1	0	244	0	124	1	0	273	301	0	1346
04:00 PM	0	0	0	1	27	78	0	0	55	0	23	0	0	80	104	0	368
04:15 PM	0	1	0	0	23	71	0	0	63	0	30	0	0	71	57	0	316
04:30 PM	0	0	0	1	34	73	0	0	69	2	24	2	0	54	81	0	340
04:45 PM	0	0	0	3	26	95	0	2	62	0	36	0	0	66	56	0	346
Total	0	1	0	5	110	317	0	2	249	2	113	2	0	271	298	0	1370
05:00 PM	0	0	0	0	32	72	0	0	41	0	24	0	0	54	43	0	266
05:15 PM	0	1	0	0	25	54	0	0	46	0	21	0	0	54	35	0	236
05:30 PM	0	0	0	0	22	50	0	0	46	0	19	0	0	37	23	0	197
05:45 PM	0	0	0	0	17	60	0	0	29	0	13	0	0	46	25	0	190
Total	0	1	0	0	96	236	0	0	162	0	77	0	0	191	126	0	889
Grand Total	1	2	0	8	317	840	1	2	655	2	314	3	0	735	725	0	3605
Apprch %	9.1	18.2	0	72.7	27.3	72.4	0.1	0.2	67.2	0.2	32.2	0.3	0	50.3	49.7	0	
Total %	0	0.1	0	0.2	8.8	23.3	0	0.1	18.2	0.1	8.7	0.1	0	20.4	20.1	0	
Motorcycles	0	0	0	0	1	1	0	0	2	0	0	0	0	3	0	0	7
% Motorcycles	0	0	0	0	0.3	0.1	0	0	0.3	0	0	0	0	0.4	0	0	0.2
Cars & Light Goods	1	2	0	0	314	836	1	0	647	2	310	0	0	731	718	0	3562
% Cars & Light Goods	100	100	0	0	99.1	99.5	100	0	98.8	100	98.7	0	0	99.5	99	0	98.8
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
% Buses	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.1	0	0	0.1
Single-Unit Trucks	0	0	0	0	2	0	0	0	6	0	3	0	0	0	7	0	18
% Single-Unit Trucks	0	0	0	0	0.6	0	0	0	0.9	0	1	0	0	0	1	0	0.5
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	7	0	0	0	2	0	0	0	3	0	0	0	0	12
% Pedestrians	0	0	0	87.5	0	0	0	100	0	0	0	100	0	0	0	0	0.3

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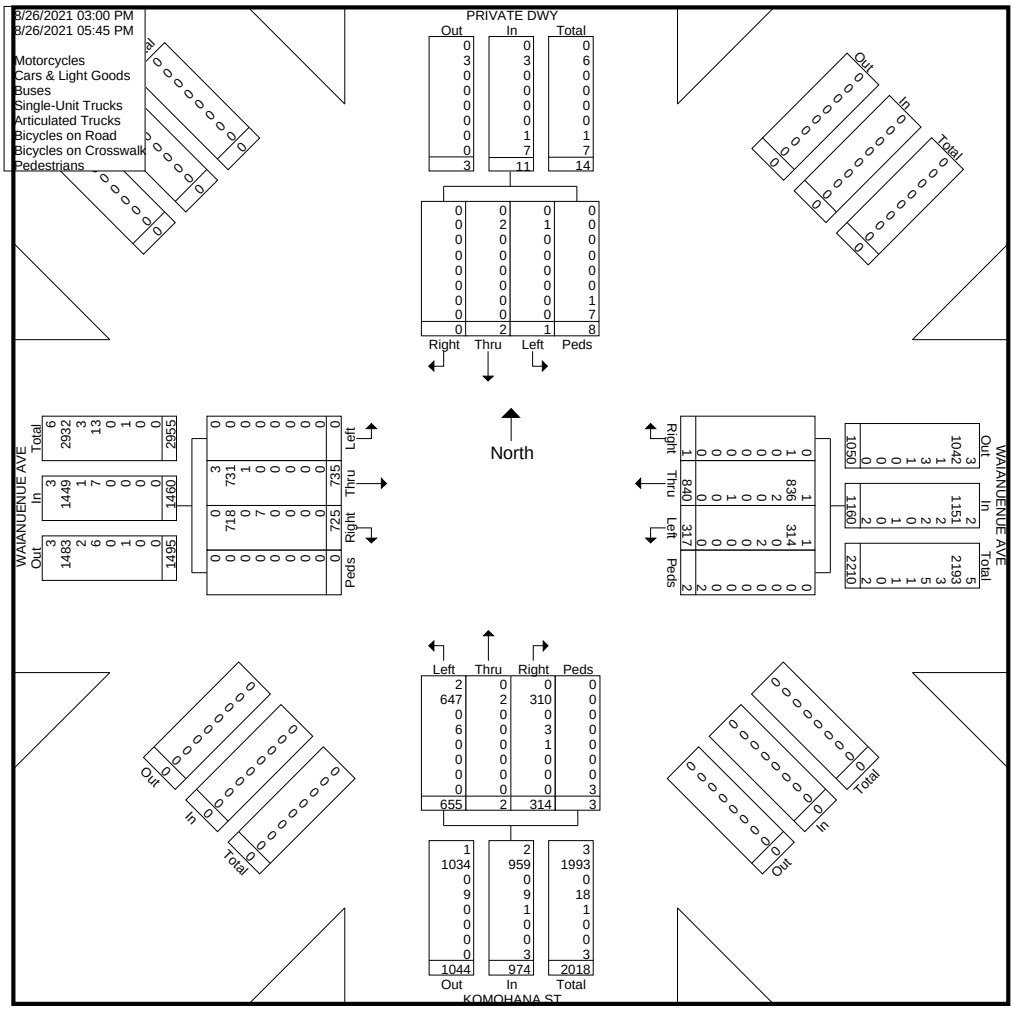

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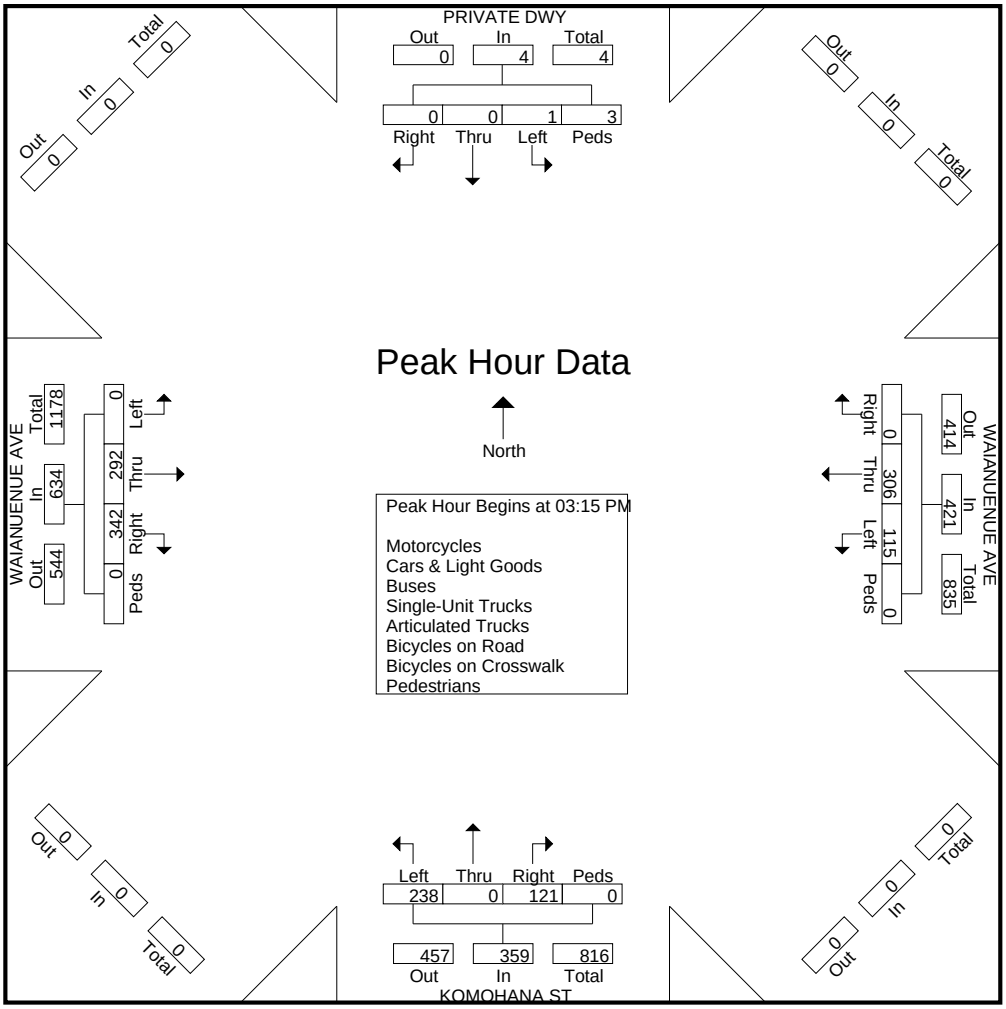
	PRIVATE DWY SOUTHBOUND					WAIANUENUE AVE WESTBOUND					KOMOHANA ST NORTHBOUND					WAIANUENUE AVE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	0	0	0	0	26	**82**	0	0	**108**	**75**	0	25	0	**100**	0	66	61	0	127	335
03:30 PM	0	0	0	**2**	**2**	25	77	0	0	102	58	0	**41**	0	99	0	**83**	**110**	0	**193**	**396**
03:45 PM	**1**	0	0	0	1	**37**	69	0	0	106	50	0	32	0	82	0	63	67	0	130	319
04:00 PM	0	0	0	1	1	27	78	0	0	105	55	0	23	0	78	0	80	104	0	184	368
Total Volume	1	0	0	3	4	115	306	0	0	421	238	0	121	0	359	0	292	342	0	634	1418
% App. Total	25	0	0	75		27.3	72.7	0	0		66.3	0	33.7	0		0	46.1	53.9	0		
PHF	.250	.000	.000	.375	.500	.777	.933	.000	.000	.975	.793	.000	.738	.000	.898	.000	.880	.777	.000	.821	.895



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KOMOHANA ST SOUTHBOUND				PUNAHELE ST WESTBOUND				KOMOHANA ST NORTHBOUND				PUNAHELE ST EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00 AM	0	26	0	0	0	0	2	0	3	56	1	0	0	1	24	0	113
06:15 AM	3	21	1	0	2	0	1	0	0	91	3	0	0	1	18	0	141
06:30 AM	2	33	0	1	4	0	4	0	3	113	10	0	1	3	33	0	207
06:45 AM	3	42	1	0	1	1	3	0	1	89	13	0	2	5	38	0	199
Total	8	122	2	1	7	1	10	0	7	349	27	0	3	10	113	0	660
07:00 AM	1	45	0	1	8	0	13	0	2	132	15	0	0	0	41	0	258
07:15 AM	1	45	1	0	3	3	46	0	3	197	12	0	0	6	41	0	358
07:30 AM	6	51	3	0	6	1	58	1	6	220	13	0	0	6	60	0	431
07:45 AM	9	50	2	0	12	1	56	0	8	151	10	0	0	9	49	0	357
Total	17	191	6	1	29	5	173	1	19	700	50	0	0	21	191	0	1404
08:00 AM	2	49	0	0	7	0	11	0	4	74	9	0	0	3	34	0	193
08:15 AM	1	41	0	0	6	1	6	0	3	77	4	0	0	0	28	0	167
08:30 AM	2	48	0	0	0	0	3	3	1	68	5	0	0	2	18	0	150
08:45 AM	1	59	0	0	2	1	3	1	5	88	10	0	0	2	29	0	201
Total	6	197	0	0	15	2	23	4	13	307	28	0	0	7	109	0	711
Grand Total	31	510	8	2	51	8	206	5	39	1356	105	0	3	38	413	0	2775
Apprch %	5.6	92.6	1.5	0.4	18.9	3	76.3	1.9	2.6	90.4	7	0	0.7	8.4	91	0	
Total %	1.1	18.4	0.3	0.1	1.8	0.3	7.4	0.2	1.4	48.9	3.8	0	0.1	1.4	14.9	0	
Motorcycles	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
% Motorcycles	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Cars & Light Goods	30	504	8	0	50	8	203	0	38	1338	104	0	3	37	410	0	2733
% Cars & Light Goods	96.8	98.8	100	0	98	100	98.5	0	97.4	98.7	99	0	100	97.4	99.3	0	98.5
Buses	0	1	0	0	0	0	1	0	0	6	0	0	0	0	1	0	9
% Buses	0	0.2	0	0	0	0	0.5	0	0	0.4	0	0	0	0	0.2	0	0.3
Single-Unit Trucks	1	3	0	0	1	0	2	0	1	11	1	0	0	0	1	0	21
% Single-Unit Trucks	3.2	0.6	0	0	2	0	1	0	2.6	0.8	1	0	0	0	0.2	0	0.8
Articulated Trucks	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.2	0	0.1
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	2.6	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	5
% Pedestrians	0	0	0	100	0	0	0	60	0	0	0	0	0	0	0	0	0.2

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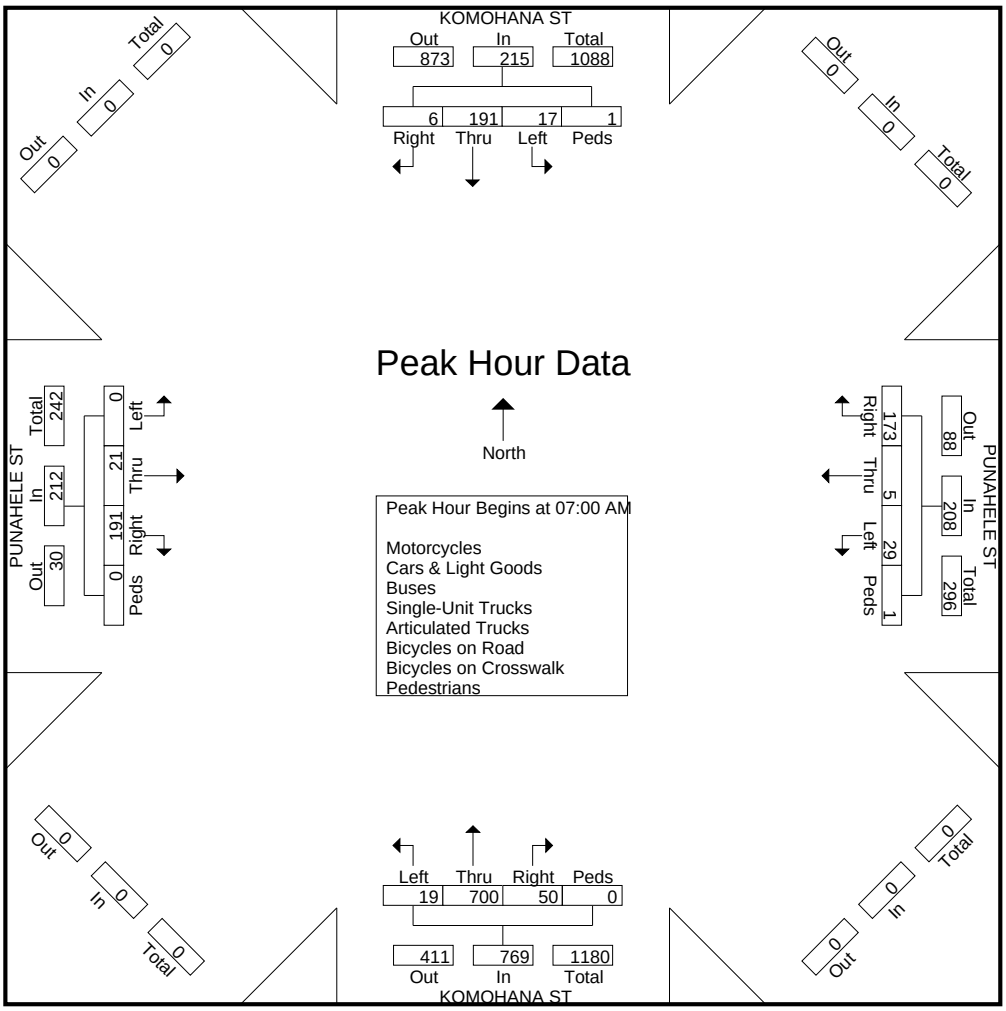
	KOMOHANA ST SOUTHBOUND					PUNAHELE ST WESTBOUND					KOMOHANA ST NORTHBOUND					PUNAHELE ST EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	1	45	0	**1**	47	8	0	13	0	21	2	132	**15**	0	149	0	0	41	0	41	258
07:15 AM	1	45	1	0	47	3	**3**	46	0	52	3	197	12	0	212	0	6	41	0	47	358
07:30 AM	6	**51**	**3**	0	60	6	1	**58**	**1**	66	6	**220**	13	0	**239**	0	6	**60**	0	**66**	**431**
07:45 AM	**9**	50	2	0	**61**	**12**	1	56	0	**69**	**8**	151	10	0	169	0	**9**	49	0	58	357
Total Volume	17	191	6	1	215	29	5	173	1	208	19	700	50	0	769	0	21	191	0	212	1404
% App. Total	7.9	88.8	2.8	0.5		13.9	2.4	83.2	0.5		2.5	91	6.5	0		0	9.9	90.1	0		
PHF	.472	.936	.500	.250	.881	.604	.417	.746	.250	.754	.594	.795	.833	.000	.804	.000	.583	.796	.000	.803	.814



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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KOMOHANA ST SOUTHBOUND				PUNAHELE ST WESTBOUND				KOMOHANA ST NORTHBOUND				PUNAHELE ST EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:00 PM	2	81	0	0	8	2	14	0	8	80	7	0	0	4	12	0	218
03:15 PM	0	87	2	0	4	3	4	2	4	96	9	0	1	7	16	0	235
03:30 PM	1	129	3	0	5	3	2	0	9	91	8	1	0	3	30	0	285
03:45 PM	1	100	0	1	1	0	4	1	4	77	4	0	0	5	19	0	217
Total	4	397	5	1	18	8	24	3	25	344	28	1	1	19	77	0	955
04:00 PM	0	129	3	1	5	1	5	1	11	75	7	0	0	4	24	0	266
04:15 PM	0	89	2	0	4	1	8	0	7	84	1	0	1	2	23	0	222
04:30 PM	2	118	0	0	4	2	9	0	9	81	6	0	1	5	24	0	261
04:45 PM	3	77	0	0	5	0	10	0	16	89	3	0	0	3	8	0	214
Total	5	413	5	1	18	4	32	1	43	329	17	0	2	14	79	0	963
05:00 PM	3	82	0	0	3	0	5	1	2	62	5	0	0	1	21	0	185
05:15 PM	5	58	2	0	3	2	7	0	3	60	5	0	1	4	17	0	167
05:30 PM	1	44	0	0	2	2	3	0	9	63	4	0	1	1	18	0	148
05:45 PM	0	40	1	0	1	2	3	0	8	35	2	0	2	5	14	1	114
Total	9	224	3	0	9	6	18	1	22	220	16	0	4	11	70	1	614
Grand Total	18	1034	13	2	45	18	74	5	90	893	61	1	7	44	226	1	2532
Apprch %	1.7	96.9	1.2	0.2	31.7	12.7	52.1	3.5	8.6	85.5	5.8	0.1	2.5	15.8	81.3	0.4	
Total %	0.7	40.8	0.5	0.1	1.8	0.7	2.9	0.2	3.6	35.3	2.4	0	0.3	1.7	8.9	0	
Motorcycles	0	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	6
% Motorcycles	0	0.3	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0.2
Cars & Light Goods	16	1023	13	0	44	17	73	0	88	882	58	0	7	44	224	0	2489
% Cars & Light Goods	88.9	98.9	100	0	97.8	94.4	98.6	0	97.8	98.8	95.1	0	100	100	99.1	0	98.3
Buses	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
% Buses	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0.1
Single-Unit Trucks	2	7	0	0	1	0	1	0	0	7	1	0	0	0	0	0	19
% Single-Unit Trucks	11.1	0.7	0	0	2.2	0	1.4	0	0	0.8	1.6	0	0	0	0	0	0.8
Articulated Trucks	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	1	0	0	2	0	2	0	0	0	1	0	6
% Bicycles on Road	0	0	0	0	0	5.6	0	0	2.2	0	3.3	0	0	0	0.4	0	0.2
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	5	0	0	0	1	0	0	0	1	9
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	100	0.4

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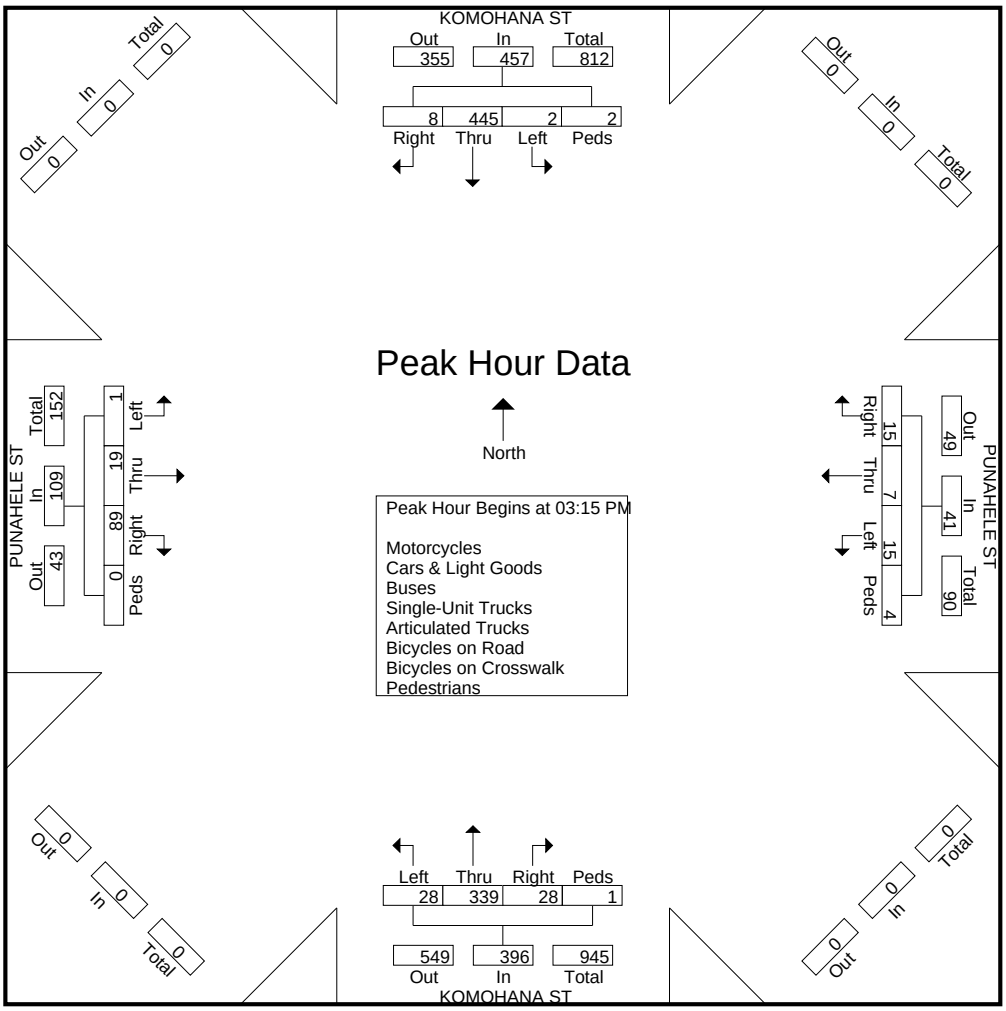
File Name : Komohana St - Punahele St
Site Code : 21-204 Hilo Medical Center
Start Date : 8/26/2021
Page No : 2

	KOMOHANA ST SOUTHBOUND					PUNAHELE ST WESTBOUND					KOMOHANA ST NORTHBOUND					PUNAHELE 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 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	87	2	0	89	4	**3**	4	**2**	**13**	4	**96**	**9**	0	**109**	**1**	**7**	16	0	24	235
03:30 PM	**1**	**129**	**3**	0	**133**	**5**	3	2	0	10	9	91	8	**1**	109	0	3	**30**	0	**33**	**285**
03:45 PM	1	100	0	**1**	102	1	0	4	1	6	4	77	4	0	85	0	5	19	0	24	217
04:00 PM	0	129	3	1	133	5	1	**5**	1	12	**11**	75	7	0	93	0	4	24	0	28	266
Total Volume	2	445	8	2	457	15	7	15	4	41	28	339	28	1	396	1	19	89	0	109	1003
% App. Total	0.4	97.4	1.8	0.4		36.6	17.1	36.6	9.8		7.1	85.6	7.1	0.3		0.9	17.4	81.7	0		
PHF	.500	.862	.667	.500	.859	.750	.583	.750	.500	.788	.636	.883	.778	.250	.908	.250	.679	.742	.000	.826	.880



APPENDIX B

LEVEL OF SERVICE CRITERIA

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

LEVEL OF SERVICE (LOS) CRITERIA

VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 2000)

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 2000)

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

LOS WORKSHEETS

APPENDIX C

LOS WORKSHEETS

Existing Conditions

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	146	2	18	122	58	0	0	0	23	0	5
Future Vol, veh/h	13	146	2	18	122	58	0	0	0	23	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	14	159	2	20	133	63	0	0	0	25	0	5

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	196	0	0	161	0	0	393	394	165
Stage 1	-	-	-	-	-	-	205	205	-
Stage 2	-	-	-	-	-	-	188	189	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1377	-	-	1418	-	-	611	542	879
Stage 1	-	-	-	-	-	-	829	732	-
Stage 2	-	-	-	-	-	-	844	744	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1377	-	-	1418	-	-	595	0	879
Mov Cap-2 Maneuver	-	-	-	-	-	-	595	0	-
Stage 1	-	-	-	-	-	-	820	0	-
Stage 2	-	-	-	-	-	-	830	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0.7	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1377	-	-	1418	-	-	631
HCM Lane V/C Ratio	0.01	-	-	0.014	-	-	0.048
HCM Control Delay (s)	7.6	0	-	7.6	0	-	11
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	174	2	11	205	22	0	0	0	20	0	1
Future Vol, veh/h	3	174	2	11	205	22	0	0	0	20	0	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	3	189	2	12	223	24	0	0	0	22	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	247	0	0	191	0	0	456	467	190	455	456	235
Stage 1	-	-	-	-	-	-	196	196	-	259	259	-
Stage 2	-	-	-	-	-	-	260	271	-	196	197	-
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	1319	-	-	1383	-	-	515	493	852	515	501	804
Stage 1	-	-	-	-	-	-	806	739	-	746	694	-
Stage 2	-	-	-	-	-	-	745	685	-	806	738	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1319	-	-	1383	-	-	509	487	852	510	494	804
Mov Cap-2 Maneuver	-	-	-	-	-	-	509	487	-	510	494	-
Stage 1	-	-	-	-	-	-	804	737	-	744	687	-
Stage 2	-	-	-	-	-	-	737	678	-	804	736	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	0	12.3
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1319	-	-	1383	-	-	519
HCM Lane V/C Ratio	-	0.002	-	-	0.009	-	-	0.044
HCM Control Delay (s)	0	7.7	0	-	7.6	0	-	12.3
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	176	17	73	237	3	60
Future Vol, veh/h	176	17	73	237	3	60
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	191	18	79	258	3	65

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	209	0	616	200
Stage 1	-	-	-	-	200	-
Stage 2	-	-	-	-	416	-
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	-	-	1362	-	454	841
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	666	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1362	-	423	841
Mov Cap-2 Maneuver	-	-	-	-	423	-
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	621	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	803	-	-	1362	-
HCM Lane V/C Ratio	0.085	-	-	0.058	-
HCM Control Delay (s)	9.9	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	233	306	17	20	4
Future Vol, veh/h	3	233	306	17	20	4
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	3	253	333	18	22	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	351	0	-	0	601	342
Stage 1	-	-	-	-	342	-
Stage 2	-	-	-	-	259	-
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	1208	-	-	-	463	701
Stage 1	-	-	-	-	719	-
Stage 2	-	-	-	-	784	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1208	-	-	-	462	701
Mov Cap-2 Maneuver	-	-	-	-	462	-
Stage 1	-	-	-	-	717	-
Stage 2	-	-	-	-	784	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1208	-	-	-	490
HCM Lane V/C Ratio	0.003	-	-	-	0.053
HCM Control Delay (s)	8	0	-	-	12.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	246	5	135	320	6	0	0	8	0	2	1
Future Vol, veh/h	0	246	5	135	320	6	0	0	8	0	2	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	267	5	147	348	7	0	0	9	0	2	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	355	0	0	272	0	0	917	919	270	920	918	352
Stage 1	-	-	-	-	-	-	270	270	-	646	646	-
Stage 2	-	-	-	-	-	-	647	649	-	274	272	-
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	1204	-	-	1291	-	-	253	271	769	251	272	692
Stage 1	-	-	-	-	-	-	736	686	-	460	467	-
Stage 2	-	-	-	-	-	-	460	466	-	732	685	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1204	-	-	1291	-	-	223	233	769	221	233	692
Mov Cap-2 Maneuver	-	-	-	-	-	-	223	233	-	221	233	-
Stage 1	-	-	-	-	-	-	736	686	-	460	401	-
Stage 2	-	-	-	-	-	-	392	400	-	724	685	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	9.7	17.2
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	769	1204	-	-	1291	-	-	299
HCM Lane V/C Ratio	0.011	-	-	-	0.114	-	-	0.011
HCM Control Delay (s)	9.7	0	-	-	8.1	0	-	17.2
HCM Lane LOS	A	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0.4	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	241	0	1	452	11	0	0	1	9	0	9
Future Vol, veh/h	13	241	0	1	452	11	0	0	1	9	0	9
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	14	262	0	1	491	12	0	0	1	10	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	503	0	0	262	0	0	794	795	262	790	789	497
Stage 1	-	-	-	-	-	-	290	290	-	499	499	-
Stage 2	-	-	-	-	-	-	504	505	-	291	290	-
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	1061	-	-	1302	-	-	306	320	777	308	323	573
Stage 1	-	-	-	-	-	-	718	672	-	554	544	-
Stage 2	-	-	-	-	-	-	550	540	-	717	672	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1061	-	-	1302	-	-	297	315	777	304	318	573
Mov Cap-2 Maneuver	-	-	-	-	-	-	297	315	-	304	318	-
Stage 1	-	-	-	-	-	-	707	662	-	546	543	-
Stage 2	-	-	-	-	-	-	540	539	-	705	662	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	9.6	14.5
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	777	1061	-	-	1302	-	-	397
HCM Lane V/C Ratio	0.001	0.013	-	-	0.001	-	-	0.049
HCM Control Delay (s)	9.6	8.4	0	-	7.8	0	-	14.5
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	254	495	34	14	1
Future Vol, veh/h	1	254	495	34	14	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	1	276	538	37	15	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	575	0	-	0	835	557
Stage 1	-	-	-	-	557	-
Stage 2	-	-	-	-	278	-
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	998	-	-	-	338	530
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	769	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	998	-	-	-	338	530
Mov Cap-2 Maneuver	-	-	-	-	338	-
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	769	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	998	-	-	-	346
HCM Lane V/C Ratio	0.001	-	-	-	0.047
HCM Control Delay (s)	8.6	0	-	-	15.9
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	238	32	6	466	61	5
Future Vol, veh/h	238	32	6	466	61	5
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	259	35	7	507	66	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	294	0	798	277
Stage 1	-	-	-	-	277	-
Stage 2	-	-	-	-	521	-
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	-	-	1268	-	355	762
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	596	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1268	-	352	762
Mov Cap-2 Maneuver	-	-	-	-	352	-
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	591	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	17.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	367	-	-	1268	-
HCM Lane V/C Ratio	0.195	-	-	0.005	-
HCM Control Delay (s)	17.2	-	-	7.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	238	0	3	1	4	11	12	423	0	0	158	0
Future Volume (vph)	238	0	3	1	4	11	12	423	0	0	158	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00		1.00	0.89		1.00	1.00			1.00	
Flt Protected	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1681		1770	1653		1770	1863			1863	
Flt Permitted	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1681		1770	1653		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	259	0	3	1	4	12	13	460	0	0	172	0
RTOR Reduction (vph)	0	78	0	0	12	0	0	0	0	0	0	0
Lane Group Flow (vph)	132	52	0	1	4	0	13	460	0	0	172	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	10.2	10.2		0.9	0.9		0.9	21.4			15.8	
Effective Green, g (s)	10.2	10.2		0.9	0.9		0.9	21.4			15.8	
Actuated g/C Ratio	0.21	0.21		0.02	0.02		0.02	0.45			0.33	
Clearance Time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	359	359		33	31		33	835			617	
v/s Ratio Prot	c0.08	0.03		0.00	c0.00		0.01	c0.25			0.09	
v/s Ratio Perm												
v/c Ratio	0.37	0.15		0.03	0.14		0.39	0.55			0.28	
Uniform Delay, d1	16.0	15.2		23.0	23.0		23.1	9.6			11.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.6	0.2		0.4	2.0		7.6	0.8			0.2	
Delay (s)	16.6	15.4		23.3	25.0		30.7	10.4			12.0	
Level of Service	B	B		C	C		C	B			B	
Approach Delay (s)		16.0			24.9			11.0			12.0	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	19.9
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	471	207	22	58	559	392
Future Volume (vph)	471	207	22	58	559	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.99	0.95	1.00
Satd. Flow (prot)	1863	1583		3491	1770	1583
Flt Permitted	1.00	1.00		0.79	0.95	1.00
Satd. Flow (perm)	1863	1583		2797	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	512	225	24	63	608	426
RTOR Reduction (vph)	0	143	0	0	0	204
Lane Group Flow (vph)	512	82	0	87	608	222
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	20.3	20.3		20.3	25.3	25.3
Effective Green, g (s)	20.3	20.3		20.3	25.3	25.3
Actuated g/C Ratio	0.36	0.36		0.36	0.45	0.45
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	675	573		1013	799	715
v/s Ratio Prot	c0.27				c0.34	
v/s Ratio Perm		0.05		0.03		0.14
v/c Ratio	0.76	0.14		0.09	0.76	0.31
Uniform Delay, d1	15.7	12.0		11.7	12.8	9.8
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.3	0.0		0.0	3.9	0.1
Delay (s)	20.0	12.0		11.8	16.7	9.9
Level of Service	C	B		B	B	A
Approach Delay (s)	17.6			11.8	13.9	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	56.0	Sum of lost time (s)	14.4
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	16	6	22	11	11	26	48	388	163	21	126	4	0	0
Future Vol, veh/h	16	6	22	11	11	26	48	388	163	21	126	4	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	17	7	24	12	12	28	52	422	177	23	137	4	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	820	888	139	812	802	511	141	0	0	599	0	0
Stage 1	185	185	-	615	615	-	-	-	-	-	-	-
Stage 2	635	703	-	197	187	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	294	283	909	298	317	563	1442	-	-	978	-	-
Stage 1	817	747	-	479	482	-	-	-	-	-	-	-
Stage 2	467	440	-	805	745	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	259	266	909	268	298	563	1442	-	-	978	-	-
Mov Cap-2 Maneuver	259	266	-	268	298	-	-	-	-	-	-	-
Stage 1	788	729	-	462	465	-	-	-	-	-	-	-
Stage 2	417	424	-	762	727	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	15.7	0.6	1.2
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1442	-	-	909	387	978	-	-
HCM Lane V/C Ratio	0.036	-	-	0.007	0.135	0.023	-	-
HCM Control Delay (s)	7.6	-	-	9	15.7	8.8	-	-
HCM Lane LOS	A	-	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	21	191	29	5	173	19	777	50	17	206	6
Future Vol, veh/h	0	21	191	29	5	173	19	777	50	17	206	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	23	208	32	5	188	21	845	54	18	224	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1181	1205	228	1293	1181	872	231	0	0	899	0	0
Stage 1	264	264	-	914	914	-	-	-	-	-	-	-
Stage 2	917	941	-	379	267	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	167	184	811	140	190	350	1337	-	-	756	-	-
Stage 1	741	690	-	327	352	-	-	-	-	-	-	-
Stage 2	326	342	-	643	688	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	73	177	811	91	182	350	1337	-	-	756	-	-
Mov Cap-2 Maneuver	73	177	-	91	182	-	-	-	-	-	-	-
Stage 1	729	673	-	322	346	-	-	-	-	-	-	-
Stage 2	146	337	-	451	671	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.7	23.1	0.2	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1337	-	-	599	419	756	-	-
HCM Lane V/C Ratio	0.015	-	-	0.385	0.537	0.024	-	-
HCM Control Delay (s)	7.7	-	-	14.7	23.1	9.9	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.8	3.1	0.1	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	131	1	6	166	27	0	0	0	66	0	8
Future Vol, veh/h	5	131	1	6	166	27	0	0	0	66	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	5	142	1	7	180	29	0	0	0	72	0	9

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	209	0	0	143	0	0	362	362	195
Stage 1	-	-	-	-	-	-	209	209	-
Stage 2	-	-	-	-	-	-	153	153	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1362	-	-	1440	-	-	637	565	846
Stage 1	-	-	-	-	-	-	826	729	-
Stage 2	-	-	-	-	-	-	875	771	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1362	-	-	1440	-	-	631	0	846
Mov Cap-2 Maneuver	-	-	-	-	-	-	631	0	-
Stage 1	-	-	-	-	-	-	823	0	-
Stage 2	-	-	-	-	-	-	870	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0.2	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1362	-	-	1440	-	-	649
HCM Lane V/C Ratio	0.004	-	-	0.005	-	-	0.124
HCM Control Delay (s)	7.7	0	-	7.5	0	-	11.3
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	214	1	6	190	32	1	0	7	42	0	5
Future Vol, veh/h	5	214	1	6	190	32	1	0	7	42	0	5
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	5	233	1	7	207	35	1	0	8	46	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	242	0	0	234	0	0	485	500	234	487	483	225
Stage 1	-	-	-	-	-	-	244	244	-	239	239	-
Stage 2	-	-	-	-	-	-	241	256	-	248	244	-
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	1324	-	-	1333	-	-	492	473	805	491	483	814
Stage 1	-	-	-	-	-	-	760	704	-	764	708	-
Stage 2	-	-	-	-	-	-	762	696	-	756	704	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1324	-	-	1333	-	-	485	468	805	483	478	814
Mov Cap-2 Maneuver	-	-	-	-	-	-	485	468	-	483	478	-
Stage 1	-	-	-	-	-	-	757	701	-	761	704	-
Stage 2	-	-	-	-	-	-	752	692	-	746	701	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	9.9	12.9
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	744	1324	-	-	1333	-	-	505
HCM Lane V/C Ratio	0.012	0.004	-	-	0.005	-	-	0.101
HCM Control Delay (s)	9.9	7.7	0	-	7.7	0	-	12.9
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	260	2	19	217	11	66
Future Vol, veh/h	260	2	19	217	11	66
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	283	2	21	236	12	72

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	285	0	562	284
Stage 1	-	-	-	-	284	-
Stage 2	-	-	-	-	278	-
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	-	-	1277	-	488	755
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	769	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1277	-	479	755
Mov Cap-2 Maneuver	-	-	-	-	479	-
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	754	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	698	-	-	1277	-
HCM Lane V/C Ratio	0.12	-	-	0.016	-
HCM Control Delay (s)	10.9	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	328	235	17	24	2
Future Vol, veh/h	1	328	235	17	24	2
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	1	357	255	18	26	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	273	0	-	0	623	264
Stage 1	-	-	-	-	264	-
Stage 2	-	-	-	-	359	-
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	1290	-	-	-	450	775
Stage 1	-	-	-	-	780	-
Stage 2	-	-	-	-	707	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1290	-	-	-	450	775
Mov Cap-2 Maneuver	-	-	-	-	450	-
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	707	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1290	-	-	-	465
HCM Lane V/C Ratio	0.001	-	-	-	0.061
HCM Control Delay (s)	7.8	0	-	-	13.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	347	2	1	243	4	9	2	179	11	0	1
Future Vol, veh/h	0	347	2	1	243	4	9	2	179	11	0	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	377	2	1	264	4	10	2	195	12	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	268	0	0	379	0	0	647	648	378	745	647	266
Stage 1	-	-	-	-	-	-	378	378	-	268	268	-
Stage 2	-	-	-	-	-	-	269	270	-	477	379	-
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	1296	-	-	1179	-	-	384	389	669	330	390	773
Stage 1	-	-	-	-	-	-	644	615	-	738	687	-
Stage 2	-	-	-	-	-	-	737	686	-	569	615	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1296	-	-	1179	-	-	383	389	669	233	390	773
Mov Cap-2 Maneuver	-	-	-	-	-	-	383	389	-	233	390	-
Stage 1	-	-	-	-	-	-	644	615	-	738	686	-
Stage 2	-	-	-	-	-	-	735	685	-	402	615	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13.3	20.4
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	641	1296	-	-	1179	-	-	247
HCM Lane V/C Ratio	0.322	-	-	-	0.001	-	-	0.053
HCM Control Delay (s)	13.3	0	-	-	8.1	0	-	20.4
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	1.4	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	534	0	1	219	3	0	0	0	24	0	32
Future Vol, veh/h	7	534	0	1	219	3	0	0	0	24	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	8	580	0	1	238	3	0	0	0	26	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	241	0	0	580	0	0	855	839	580	838	838	240
Stage 1	-	-	-	-	-	-	596	596	-	242	242	-
Stage 2	-	-	-	-	-	-	259	243	-	596	596	-
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	1326	-	-	994	-	-	278	302	514	286	302	799
Stage 1	-	-	-	-	-	-	490	492	-	762	705	-
Stage 2	-	-	-	-	-	-	746	705	-	490	492	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1326	-	-	994	-	-	264	299	514	284	299	799
Mov Cap-2 Maneuver	-	-	-	-	-	-	264	299	-	284	299	-
Stage 1	-	-	-	-	-	-	486	488	-	755	704	-
Stage 2	-	-	-	-	-	-	713	704	-	486	488	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	14.2
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1326	-	-	994	-	-	450
HCM Lane V/C Ratio	-	0.006	-	-	0.001	-	-	0.135
HCM Control Delay (s)	0	7.7	0	-	8.6	0	-	14.2
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	578	229	73	44	4
Future Vol, veh/h	5	578	229	73	44	4
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	5	628	249	79	48	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	328	0	-	0	927	289
Stage 1	-	-	-	-	289	-
Stage 2	-	-	-	-	638	-
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	1232	-	-	-	298	750
Stage 1	-	-	-	-	760	-
Stage 2	-	-	-	-	526	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1232	-	-	-	296	750
Mov Cap-2 Maneuver	-	-	-	-	296	-
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	526	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	18.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1232	-	-	-	312
HCM Lane V/C Ratio	0.004	-	-	-	0.167
HCM Control Delay (s)	7.9	0	-	-	18.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	538	77	12	281	20	3
Future Vol, veh/h	538	77	12	281	20	3
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	585	84	13	305	22	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	669	0	958	627
Stage 1	-	-	-	-	627	-
Stage 2	-	-	-	-	331	-
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	-	-	921	-	285	484
Stage 1	-	-	-	-	532	-
Stage 2	-	-	-	-	728	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	921	-	280	484
Mov Cap-2 Maneuver	-	-	-	-	280	-
Stage 1	-	-	-	-	532	-
Stage 2	-	-	-	-	716	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	18.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	296	-	-	921	-
HCM Lane V/C Ratio	0.084	-	-	0.014	-
HCM Control Delay (s)	18.3	-	-	9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	544	0	4	0	3	4	2	156	0	0	374	0
Future Volume (vph)	544	0	4	0	3	4	2	156	0	0	374	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			0.91		1.00	1.00			1.00	
Flt Protected	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1683			1703		1770	1863			1863	
Flt Permitted	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1683			1703		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	0	4	0	3	4	2	170	0	0	407	0
RTOR Reduction (vph)	0	68	0	0	4	0	0	0	0	0	0	0
Lane Group Flow (vph)	295	232	0	0	3	0	2	170	0	0	407	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Effective Green, g (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Actuated g/C Ratio	0.31	0.31			0.02		0.01	0.44			0.35	
Clearance Time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	520	521			26		25	811			647	
v/s Ratio Prot	c0.18	0.14			c0.00		0.00	c0.09			c0.22	
v/s Ratio Perm												
v/c Ratio	0.57	0.44			0.12		0.08	0.21			0.63	
Uniform Delay, d1	18.4	17.6			30.9		30.9	11.2			17.3	
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2	1.4	0.6			2.0		1.4	0.1			1.9	
Delay (s)	19.8	18.2			32.9		32.3	11.3			19.2	
Level of Service	B	B			C		C	B			B	
Approach Delay (s)		19.0			32.9			11.5			19.2	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	63.6	Sum of lost time (s)	19.9
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	322	377	115	382	297	166
Future Volume (vph)	322	377	115	382	297	166
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.99	0.95	1.00
Satd. Flow (prot)	1863	1583		3499	1770	1583
Flt Permitted	1.00	1.00		0.78	0.95	1.00
Satd. Flow (perm)	1863	1583		2773	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	350	410	125	415	323	180
RTOR Reduction (vph)	0	244	0	0	0	120
Lane Group Flow (vph)	350	166	0	540	323	60
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	16.2	16.2		16.2	13.4	13.4
Effective Green, g (s)	16.2	16.2		16.2	13.4	13.4
Actuated g/C Ratio	0.40	0.40		0.40	0.34	0.34
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	754	641		1123	592	530
v/s Ratio Prot	0.19				c0.18	
v/s Ratio Perm		0.10		c0.19		0.04
v/c Ratio	0.46	0.26		0.48	0.55	0.11
Uniform Delay, d1	8.7	7.9		8.8	10.8	9.2
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		0.3	0.6	0.0
Delay (s)	8.9	8.0		9.1	11.4	9.2
Level of Service	A	A		A	B	A
Approach Delay (s)	8.4			9.1	10.6	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	14.4
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	8	8	63	19	5	6	15	150	75	25	355	7	0	0
Future Vol, veh/h	8	8	63	19	5	6	15	150	75	25	355	7	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	9	9	68	21	5	7	16	163	82	27	386	8	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	686	721	390	689	684	204	394	0	0	245	0	0
Stage 1	444	444	-	236	236	-	-	-	-	-	-	-
Stage 2	242	277	-	453	448	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	362	353	658	360	371	837	1165	-	-	1321	-	-
Stage 1	593	575	-	767	710	-	-	-	-	-	-	-
Stage 2	762	681	-	586	573	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	346	341	658	339	358	837	1165	-	-	1321	-	-
Mov Cap-2 Maneuver	346	341	-	339	358	-	-	-	-	-	-	-
Stage 1	585	564	-	756	700	-	-	-	-	-	-	-
Stage 2	740	671	-	558	562	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	15.1	0.5	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1165	-	-	658	389	1321	-	-
HCM Lane V/C Ratio	0.014	-	-	0.013	0.084	0.021	-	-
HCM Control Delay (s)	8.1	-	-	10.5	15.1	7.8	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	19	89	15	7	15	28	443	28	2	480	8
Future Vol, veh/h	1	19	89	15	7	15	28	443	28	2	480	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	21	97	16	8	16	30	482	30	2	522	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1092	1103	527	1147	1092	497	531	0	0	512	0	0
Stage 1	531	531	-	557	557	-	-	-	-	-	-	-
Stage 2	561	572	-	590	535	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	192	211	551	176	215	573	1036	-	-	1053	-	-
Stage 1	532	526	-	515	512	-	-	-	-	-	-	-
Stage 2	512	504	-	494	524	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	177	204	551	131	208	573	1036	-	-	1053	-	-
Mov Cap-2 Maneuver	177	204	-	131	208	-	-	-	-	-	-	-
Stage 1	517	525	-	500	497	-	-	-	-	-	-	-
Stage 2	476	489	-	391	523	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.9	22.1	0.5	0
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1036	-	-	419	250	1053	-	-
HCM Lane V/C Ratio	0.029	-	-	0.283	0.161	0.002	-	-
HCM Control Delay (s)	8.6	-	-	16.9	22.1	8.4	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	0.6	0	-	-

APPENDIX C

LOS WORKSHEETS

Base Year 2025 Conditions

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	159	2	18	133	60	0	0	0	25	0	5
Future Vol, veh/h	13	159	2	18	133	60	0	0	0	25	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	14	173	2	20	145	65	0	0	0	27	0	5

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	210	0	0	175	0	0	420	421	178
Stage 1	-	-	-	-	-	-	218	218	-
Stage 2	-	-	-	-	-	-	202	203	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1361	-	-	1401	-	-	590	524	865
Stage 1	-	-	-	-	-	-	818	723	-
Stage 2	-	-	-	-	-	-	832	733	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1361	-	-	1401	-	-	574	0	865
Mov Cap-2 Maneuver	-	-	-	-	-	-	574	0	-
Stage 1	-	-	-	-	-	-	809	0	-
Stage 2	-	-	-	-	-	-	819	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0.6	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1361	-	-	1401	-	-	608
HCM Lane V/C Ratio	0.01	-	-	0.014	-	-	0.054
HCM Control Delay (s)	7.7	0	-	7.6	0	-	11.3
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	189	2	15	217	23	0	0	2	21	0	1
Future Vol, veh/h	3	189	2	15	217	23	0	0	2	21	0	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	3	205	2	16	236	25	0	0	2	23	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	261	0	0	207	0	0	493	505	206	494	494	249
Stage 1	-	-	-	-	-	-	212	212	-	281	281	-
Stage 2	-	-	-	-	-	-	281	293	-	213	213	-
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	1303	-	-	1364	-	-	486	470	835	486	476	790
Stage 1	-	-	-	-	-	-	790	727	-	726	678	-
Stage 2	-	-	-	-	-	-	726	670	-	789	726	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1303	-	-	1364	-	-	479	462	835	478	468	790
Mov Cap-2 Maneuver	-	-	-	-	-	-	479	462	-	478	468	-
Stage 1	-	-	-	-	-	-	788	725	-	724	669	-
Stage 2	-	-	-	-	-	-	715	661	-	785	724	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.5	9.3	12.8
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	835	1303	-	-	1364	-	-	487
HCM Lane V/C Ratio	0.003	0.003	-	-	0.012	-	-	0.049
HCM Control Delay (s)	9.3	7.8	0	-	7.7	0	-	12.8
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	195	18	76	254	3	64
Future Vol, veh/h	195	18	76	254	3	64
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	212	20	83	276	3	70

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	232	0	664	222
Stage 1	-	-	-	-	222	-
Stage 2	-	-	-	-	442	-
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	-	-	1336	-	426	818
Stage 1	-	-	-	-	815	-
Stage 2	-	-	-	-	648	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1336	-	395	818
Mov Cap-2 Maneuver	-	-	-	-	395	-
Stage 1	-	-	-	-	815	-
Stage 2	-	-	-	-	601	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	781	-	-	1336	-
HCM Lane V/C Ratio	0.093	-	-	0.062	-
HCM Control Delay (s)	10.1	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	256	326	17	20	4
Future Vol, veh/h	3	256	326	17	20	4
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	3	278	354	18	22	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	372	0	-	0	647	363
Stage 1	-	-	-	-	363	-
Stage 2	-	-	-	-	284	-
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	1186	-	-	-	436	682
Stage 1	-	-	-	-	704	-
Stage 2	-	-	-	-	764	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1186	-	-	-	435	682
Mov Cap-2 Maneuver	-	-	-	-	435	-
Stage 1	-	-	-	-	702	-
Stage 2	-	-	-	-	764	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1186	-	-	-	463
HCM Lane V/C Ratio	0.003	-	-	-	0.056
HCM Control Delay (s)	8	0	-	-	13.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	268	6	140	340	6	0	0	9	0	2	1
Future Vol, veh/h	0	268	6	140	340	6	0	0	9	0	2	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	291	7	152	370	7	0	0	10	0	2	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	377	0	0	298	0	0	974	976	295	978	976	374
Stage 1	-	-	-	-	-	-	295	295	-	678	678	-
Stage 2	-	-	-	-	-	-	679	681	-	300	298	-
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	1181	-	-	1263	-	-	231	251	744	230	251	672
Stage 1	-	-	-	-	-	-	713	669	-	442	452	-
Stage 2	-	-	-	-	-	-	441	450	-	709	667	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1181	-	-	1263	-	-	202	213	744	201	213	672
Mov Cap-2 Maneuver	-	-	-	-	-	-	202	213	-	201	213	-
Stage 1	-	-	-	-	-	-	713	669	-	442	383	-
Stage 2	-	-	-	-	-	-	371	382	-	700	667	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	9.9	18.2
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	744	1181	-	-	1263	-	-	276
HCM Lane V/C Ratio	0.013	-	-	-	0.12	-	-	0.012
HCM Control Delay (s)	9.9	0	-	-	8.2	0	-	18.2
HCM Lane LOS	A	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0.4	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	264	0	1	477	11	0	0	1	9	0	9
Future Vol, veh/h	13	264	0	1	477	11	0	0	1	9	0	9
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	14	287	0	1	518	12	0	0	1	10	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	530	0	0	287	0	0	846	847	287	842	841	524
Stage 1	-	-	-	-	-	-	315	315	-	526	526	-
Stage 2	-	-	-	-	-	-	531	532	-	316	315	-
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	1037	-	-	1275	-	-	282	299	752	284	301	553
Stage 1	-	-	-	-	-	-	696	656	-	535	529	-
Stage 2	-	-	-	-	-	-	532	526	-	695	656	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1037	-	-	1275	-	-	274	294	752	280	296	553
Mov Cap-2 Maneuver	-	-	-	-	-	-	274	294	-	280	296	-
Stage 1	-	-	-	-	-	-	685	646	-	526	528	-
Stage 2	-	-	-	-	-	-	522	525	-	683	646	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	9.8	15.2
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	752	1037	-	-	1275	-	-	372
HCM Lane V/C Ratio	0.001	0.014	-	-	0.001	-	-	0.053
HCM Control Delay (s)	9.8	8.5	0	-	7.8	0	-	15.2
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	277	520	34	14	1
Future Vol, veh/h	1	277	520	34	14	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	1	301	565	37	15	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	602	0	-	0	887	584
Stage 1	-	-	-	-	584	-
Stage 2	-	-	-	-	303	-
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	975	-	-	-	315	512
Stage 1	-	-	-	-	557	-
Stage 2	-	-	-	-	749	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	975	-	-	-	315	512
Mov Cap-2 Maneuver	-	-	-	-	315	-
Stage 1	-	-	-	-	556	-
Stage 2	-	-	-	-	749	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	16.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	975	-	-	-	323
HCM Lane V/C Ratio	0.001	-	-	-	0.05
HCM Control Delay (s)	8.7	0	-	-	16.7
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	261	32	6	491	61	5
Future Vol, veh/h	261	32	6	491	61	5
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	284	35	7	534	66	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	319	0	850	302
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	548	-
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	-	-	1241	-	331	738
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	579	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1241	-	328	738
Mov Cap-2 Maneuver	-	-	-	-	328	-
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	574	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	18.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	342	-	-	1241	-
HCM Lane V/C Ratio	0.21	-	-	0.005	-
HCM Control Delay (s)	18.3	-	-	7.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	261	0	3	1	4	11	12	468	0	0	167	0
Future Volume (vph)	261	0	3	1	4	11	12	468	0	0	167	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00		1.00	0.89		1.00	1.00			1.00	
Flt Protected	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1682		1770	1653		1770	1863			1863	
Flt Permitted	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1682		1770	1653		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	284	0	3	1	4	12	13	509	0	0	182	0
RTOR Reduction (vph)	0	77	0	0	12	0	0	0	0	0	0	0
Lane Group Flow (vph)	145	65	0	1	4	0	13	509	0	0	182	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	11.1	11.1		0.9	0.9		0.9	23.5			17.9	
Effective Green, g (s)	11.1	11.1		0.9	0.9		0.9	23.5			17.9	
Actuated g/C Ratio	0.22	0.22		0.02	0.02		0.02	0.46			0.35	
Clearance Time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	368	368		31	29		31	863			657	
v/s Ratio Prot	c0.09	0.04		0.00	c0.00		0.01	c0.27			0.10	
v/s Ratio Perm												
v/c Ratio	0.39	0.18		0.03	0.15		0.42	0.59			0.28	
Uniform Delay, d1	16.9	16.1		24.5	24.5		24.6	10.0			11.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.7	0.2		0.4	2.3		8.9	1.0			0.2	
Delay (s)	17.6	16.3		24.9	26.8		33.6	11.1			12.0	
Level of Service	B	B		C	C		C	B			B	
Approach Delay (s)		17.0			26.7			11.6			12.0	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	50.7	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	490	257	28	60	591	447
Future Volume (vph)	490	257	28	60	591	447
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.98	0.95	1.00
Satd. Flow (prot)	1863	1583		3484	1770	1583
Flt Permitted	1.00	1.00		0.75	0.95	1.00
Satd. Flow (perm)	1863	1583		2656	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	533	279	30	65	642	486
RTOR Reduction (vph)	0	175	0	0	0	212
Lane Group Flow (vph)	533	104	0	95	642	274
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	21.3	21.3		21.3	25.3	25.3
Effective Green, g (s)	21.3	21.3		21.3	25.3	25.3
Actuated g/C Ratio	0.37	0.37		0.37	0.44	0.44
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	696	591		992	785	702
v/s Ratio Prot	c0.29				c0.36	
v/s Ratio Perm		0.07		0.04		0.17
v/c Ratio	0.77	0.18		0.10	0.82	0.39
Uniform Delay, d1	15.7	12.0		11.6	13.8	10.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.5	0.1		0.0	6.3	0.1
Delay (s)	20.2	12.0		11.6	20.1	10.8
Level of Service	C	B		B	C	B
Approach Delay (s)	17.4			11.6	16.1	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	57.0	Sum of lost time (s)	14.4
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	16	6	22	11	11	26	48	433	169	21	135	4	0	0
Future Vol, veh/h	16	6	22	11	11	26	48	433	169	21	135	4	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	17	7	24	12	12	28	52	471	184	23	147	4	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	882	954	149	874	864	563	151	0	0	655	0	0
Stage 1	195	195	-	667	667	-	-	-	-	-	-	-
Stage 2	687	759	-	207	197	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	267	259	898	270	292	526	1430	-	-	932	-	-
Stage 1	807	739	-	448	457	-	-	-	-	-	-	-
Stage 2	437	415	-	795	738	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	233	243	898	242	274	526	1430	-	-	932	-	-
Mov Cap-2 Maneuver	233	243	-	242	274	-	-	-	-	-	-	-
Stage 1	778	721	-	432	441	-	-	-	-	-	-	-
Stage 2	388	400	-	751	720	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	16.9	0.6	1.2
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1430	-	-	898	355	932	-	-
HCM Lane V/C Ratio	0.036	-	-	0.007	0.147	0.024	-	-
HCM Control Delay (s)	7.6	-	-	9	16.9	9	-	-
HCM Lane LOS	A	-	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	7.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	21	197	29	5	173	19	865	50	17	269	6
Future Vol, veh/h	0	21	197	29	5	173	19	865	50	17	269	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	23	214	32	5	188	21	940	54	18	292	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1344	1368	296	1459	1344	967	299	0	0	994	0	0
Stage 1	332	332	-	1009	1009	-	-	-	-	-	-	-
Stage 2	1012	1036	-	450	335	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	129	147	743	107	152	308	1262	-	-	696	-	-
Stage 1	681	644	-	290	318	-	-	-	-	-	-	-
Stage 2	288	309	-	589	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	47	141	743	65	145	308	1262	-	-	696	-	-
Mov Cap-2 Maneuver	47	141	-	65	145	-	-	-	-	-	-	-
Stage 1	669	627	-	285	313	-	-	-	-	-	-	-
Stage 2	108	304	-	394	626	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.3	41.4	0.2	0.6
HCM LOS	C	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1262	-	-	526	312	696	-	-
HCM Lane V/C Ratio	0.016	-	-	0.45	0.721	0.027	-	-
HCM Control Delay (s)	7.9	-	-	17.3	41.4	10.3	-	-
HCM Lane LOS	A	-	-	C	E	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.3	5.2	0.1	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	142	1	6	183	29	0	0	0	69	0	8
Future Vol, veh/h	5	142	1	6	183	29	0	0	0	69	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	5	154	1	7	199	32	0	0	0	75	0	9

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	231	0	0	155	0	0	394	394	215
Stage 1	-	-	-	-	-	-	229	229	-
Stage 2	-	-	-	-	-	-	165	165	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1337	-	-	1425	-	-	611	542	825
Stage 1	-	-	-	-	-	-	809	715	-
Stage 2	-	-	-	-	-	-	864	762	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1337	-	-	1425	-	-	605	0	825
Mov Cap-2 Maneuver	-	-	-	-	-	-	605	0	-
Stage 1	-	-	-	-	-	-	806	0	-
Stage 2	-	-	-	-	-	-	859	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0.2	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1337	-	-	1425	-	-	622
HCM Lane V/C Ratio	0.004	-	-	0.005	-	-	0.135
HCM Control Delay (s)	7.7	0	-	7.5	0	-	11.7
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	227	1	8	208	34	1	0	11	44	0	5
Future Vol, veh/h	5	227	1	8	208	34	1	0	11	44	0	5
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	5	247	1	9	226	37	1	0	12	48	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	263	0	0	248	0	0	523	539	248	527	521	245
Stage 1	-	-	-	-	-	-	258	258	-	263	263	-
Stage 2	-	-	-	-	-	-	265	281	-	264	258	-
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	1301	-	-	1318	-	-	465	449	791	462	460	794
Stage 1	-	-	-	-	-	-	747	694	-	742	691	-
Stage 2	-	-	-	-	-	-	740	678	-	741	694	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1301	-	-	1318	-	-	458	444	791	451	454	794
Mov Cap-2 Maneuver	-	-	-	-	-	-	458	444	-	451	454	-
Stage 1	-	-	-	-	-	-	744	691	-	739	685	-
Stage 2	-	-	-	-	-	-	729	673	-	727	691	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	9.9	13.6
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	746	1301	-	-	1318	-	-	472
HCM Lane V/C Ratio	0.017	0.004	-	-	0.007	-	-	0.113
HCM Control Delay (s)	9.9	7.8	0	-	7.8	0	-	13.6
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	279	2	20	240	11	69
Future Vol, veh/h	279	2	20	240	11	69
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	303	2	22	261	12	75

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	305	0	609	304
Stage 1	-	-	-	-	304	-
Stage 2	-	-	-	-	305	-
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	-	-	1256	-	458	736
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	748	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1256	-	449	736
Mov Cap-2 Maneuver	-	-	-	-	449	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	733	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	11.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	677	-	-	1256	-
HCM Lane V/C Ratio	0.128	-	-	0.017	-
HCM Control Delay (s)	11.1	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	350	259	17	24	2
Future Vol, veh/h	1	350	259	17	24	2
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	1	380	282	18	26	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	300	0	-	0	673	291
Stage 1	-	-	-	-	291	-
Stage 2	-	-	-	-	382	-
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	1261	-	-	-	421	748
Stage 1	-	-	-	-	759	-
Stage 2	-	-	-	-	690	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1261	-	-	-	421	748
Mov Cap-2 Maneuver	-	-	-	-	421	-
Stage 1	-	-	-	-	758	-
Stage 2	-	-	-	-	690	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1261	-	-	-	436
HCM Lane V/C Ratio	0.001	-	-	-	0.065
HCM Control Delay (s)	7.9	0	-	-	13.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	369	2	1	267	4	9	2	187	11	0	1
Future Vol, veh/h	0	369	2	1	267	4	9	2	187	11	0	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	401	2	1	290	4	10	2	203	12	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	294	0	0	403	0	0	697	698	402	799	697	292
Stage 1	-	-	-	-	-	-	402	402	-	294	294	-
Stage 2	-	-	-	-	-	-	295	296	-	505	403	-
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	1268	-	-	1156	-	-	356	364	648	304	365	747
Stage 1	-	-	-	-	-	-	625	600	-	714	670	-
Stage 2	-	-	-	-	-	-	713	668	-	549	600	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1268	-	-	1156	-	-	355	364	648	208	365	747
Mov Cap-2 Maneuver	-	-	-	-	-	-	355	364	-	208	365	-
Stage 1	-	-	-	-	-	-	625	600	-	714	669	-
Stage 2	-	-	-	-	-	-	711	667	-	375	600	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13.9	22.3
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	620	1268	-	-	1156	-	-	221
HCM Lane V/C Ratio	0.347	-	-	-	0.001	-	-	0.059
HCM Control Delay (s)	13.9	0	-	-	8.1	0	-	22.3
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	1.5	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	564	0	1	244	3	0	0	0	24	0	32
Future Vol, veh/h	7	564	0	1	244	3	0	0	0	24	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	8	613	0	1	265	3	0	0	0	26	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	268	0	0	613	0	0	915	899	613	898	898	267
Stage 1	-	-	-	-	-	-	629	629	-	269	269	-
Stage 2	-	-	-	-	-	-	286	270	-	629	629	-
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	1296	-	-	966	-	-	253	279	492	260	279	772
Stage 1	-	-	-	-	-	-	470	475	-	737	687	-
Stage 2	-	-	-	-	-	-	721	686	-	470	475	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1296	-	-	966	-	-	240	276	492	258	276	772
Mov Cap-2 Maneuver	-	-	-	-	-	-	240	276	-	258	276	-
Stage 1	-	-	-	-	-	-	466	471	-	730	686	-
Stage 2	-	-	-	-	-	-	688	685	-	466	471	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	15.1
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1296	-	-	966	-	-	416
HCM Lane V/C Ratio	-	0.006	-	-	0.001	-	-	0.146
HCM Control Delay (s)	0	7.8	0	-	8.7	0	-	15.1
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	608	254	73	44	4
Future Vol, veh/h	5	608	254	73	44	4
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	5	661	276	79	48	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	355	0	-	0	987	316
Stage 1	-	-	-	-	316	-
Stage 2	-	-	-	-	671	-
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	1204	-	-	-	274	724
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	508	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1204	-	-	-	272	724
Mov Cap-2 Maneuver	-	-	-	-	272	-
Stage 1	-	-	-	-	734	-
Stage 2	-	-	-	-	508	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	20.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1204	-	-	-	287
HCM Lane V/C Ratio	0.005	-	-	-	0.182
HCM Control Delay (s)	8	0	-	-	20.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	568	77	12	306	20	3
Future Vol, veh/h	568	77	12	306	20	3
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	617	84	13	333	22	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	701	0	1018	659
Stage 1	-	-	-	-	659	-
Stage 2	-	-	-	-	359	-
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	-	-	896	-	263	464
Stage 1	-	-	-	-	515	-
Stage 2	-	-	-	-	707	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	896	-	258	464
Mov Cap-2 Maneuver	-	-	-	-	258	-
Stage 1	-	-	-	-	515	-
Stage 2	-	-	-	-	694	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	19.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	274	-	-	896	-
HCM Lane V/C Ratio	0.091	-	-	0.015	-
HCM Control Delay (s)	19.5	-	-	9.1	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	574	0	4	0	3	4	2	180	0	0	407	0
Future Volume (vph)	574	0	4	0	3	4	2	180	0	0	407	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			0.91		1.00	1.00			1.00	
Flt Protected	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1683			1703		1770	1863			1863	
Flt Permitted	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1683			1703		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	624	0	4	0	3	4	2	196	0	0	442	0
RTOR Reduction (vph)	0	68	0	0	4	0	0	0	0	0	0	0
Lane Group Flow (vph)	312	248	0	0	3	0	2	196	0	0	442	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Effective Green, g (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Actuated g/C Ratio	0.31	0.31			0.02		0.01	0.44			0.35	
Clearance Time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	520	521			26		25	811			647	
v/s Ratio Prot	c0.19	0.15			c0.00		0.00	c0.11			c0.24	
v/s Ratio Perm												
v/c Ratio	0.60	0.48			0.12		0.08	0.24			0.68	
Uniform Delay, d1	18.6	17.8			30.9		30.9	11.3			17.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2	1.9	0.7			2.0		1.4	0.2			3.0	
Delay (s)	20.5	18.5			32.9		32.3	11.5			20.7	
Level of Service	C	B			C		C	B			C	
Approach Delay (s)		19.5			32.9			11.7			20.7	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	63.6	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	336	417	159	399	338	206
Future Volume (vph)	336	417	159	399	338	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.99	0.95	1.00
Satd. Flow (prot)	1863	1583		3489	1770	1583
Flt Permitted	1.00	1.00		0.74	0.95	1.00
Satd. Flow (perm)	1863	1583		2622	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	365	453	173	434	367	224
RTOR Reduction (vph)	0	260	0	0	0	144
Lane Group Flow (vph)	365	193	0	607	367	80
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	20.2	20.2		20.2	16.9	16.9
Effective Green, g (s)	20.2	20.2		20.2	16.9	16.9
Actuated g/C Ratio	0.43	0.43		0.43	0.36	0.36
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	792	673		1115	629	563
v/s Ratio Prot	0.20				c0.21	
v/s Ratio Perm		0.12		c0.23		0.05
v/c Ratio	0.46	0.29		0.54	0.58	0.14
Uniform Delay, d1	9.8	8.9		10.2	12.4	10.4
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		0.5	0.9	0.0
Delay (s)	9.9	9.0		10.8	13.3	10.4
Level of Service	A	A		B	B	B
Approach Delay (s)	9.4			10.8	12.2	
Approach LOS	A			B	B	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	14.4
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	8	8	63	19	5	6	15	162	76	25	388	7	0	0
Future Vol, veh/h	8	8	63	19	5	6	15	162	76	25	388	7	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	9	9	68	21	5	7	16	176	83	27	422	8	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	736	771	426	739	734	218	430	0	0	259	0	0
Stage 1	480	480	-	250	250	-	-	-	-	-	-	-
Stage 2	256	291	-	489	484	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	335	331	628	333	347	822	1129	-	-	1306	-	-
Stage 1	567	554	-	754	700	-	-	-	-	-	-	-
Stage 2	749	672	-	561	552	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	320	319	628	313	335	822	1129	-	-	1306	-	-
Mov Cap-2 Maneuver	320	319	-	313	335	-	-	-	-	-	-	-
Stage 1	559	542	-	743	690	-	-	-	-	-	-	-
Stage 2	727	663	-	533	540	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	15.9	0.5	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1129	-	-	628	362	1306	-	-
HCM Lane V/C Ratio	0.014	-	-	0.014	0.09	0.021	-	-
HCM Control Delay (s)	8.2	-	-	10.8	15.9	7.8	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	19	90	15	7	15	28	540	28	2	567	8
Future Vol, veh/h	1	19	90	15	7	15	28	540	28	2	567	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	21	98	16	8	16	30	587	30	2	616	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1291	1302	621	1346	1291	602	625	0	0	617	0	0
Stage 1	625	625	-	662	662	-	-	-	-	-	-	-
Stage 2	666	677	-	684	629	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	140	161	487	128	163	500	956	-	-	963	-	-
Stage 1	473	477	-	451	459	-	-	-	-	-	-	-
Stage 2	449	452	-	439	475	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	127	156	487	90	158	500	956	-	-	963	-	-
Mov Cap-2 Maneuver	127	156	-	90	158	-	-	-	-	-	-	-
Stage 1	458	476	-	437	445	-	-	-	-	-	-	-
Stage 2	414	438	-	335	474	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.5	31.6	0.4	0
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	956	-	-	350	175	963	-	-
HCM Lane V/C Ratio	0.032	-	-	0.342	0.23	0.002	-	-
HCM Control Delay (s)	8.9	-	-	20.5	31.6	8.7	-	-
HCM Lane LOS	A	-	-	C	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.5	0.9	0	-	-

APPENDIX C

LOS WORKSHEETS

Future Year 2025 Conditions

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	161	2	18	133	63	0	0	0	26	0	5
Future Vol, veh/h	14	161	2	18	133	63	0	0	0	26	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	15	175	2	20	145	68	0	0	0	28	0	5

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	213	0	0	177	0	0	425	426	179
Stage 1	-	-	-	-	-	-	219	219	-
Stage 2	-	-	-	-	-	-	206	207	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1357	-	-	1399	-	-	586	520	864
Stage 1	-	-	-	-	-	-	817	722	-
Stage 2	-	-	-	-	-	-	829	731	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1357	-	-	1399	-	-	570	0	864
Mov Cap-2 Maneuver	-	-	-	-	-	-	570	0	-
Stage 1	-	-	-	-	-	-	807	0	-
Stage 2	-	-	-	-	-	-	816	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0.6	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1357	-	-	1399	-	-	603
HCM Lane V/C Ratio	0.011	-	-	0.014	-	-	0.056
HCM Control Delay (s)	7.7	0	-	7.6	0	-	11.3
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	192	2	15	221	24	0	0	2	23	0	1
Future Vol, veh/h	3	192	2	15	221	24	0	0	2	23	0	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	3	209	2	16	240	26	0	0	2	25	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	266	0	0	211	0	0	502	514	210	502	502	253
Stage 1	-	-	-	-	-	-	216	216	-	285	285	-
Stage 2	-	-	-	-	-	-	286	298	-	217	217	-
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	1298	-	-	1360	-	-	480	464	830	480	471	786
Stage 1	-	-	-	-	-	-	786	724	-	722	676	-
Stage 2	-	-	-	-	-	-	721	667	-	785	723	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1298	-	-	1360	-	-	473	456	830	472	463	786
Mov Cap-2 Maneuver	-	-	-	-	-	-	473	456	-	472	463	-
Stage 1	-	-	-	-	-	-	784	722	-	720	667	-
Stage 2	-	-	-	-	-	-	710	658	-	781	721	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	9.3	12.9
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	830	1298	-	-	1360	-	-	480
HCM Lane V/C Ratio	0.003	0.003	-	-	0.012	-	-	0.054
HCM Control Delay (s)	9.3	7.8	0	-	7.7	0	-	12.9
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	198	19	80	259	3	68
Future Vol, veh/h	198	19	80	259	3	68
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	215	21	87	282	3	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	236	0	682	226
Stage 1	-	-	-	-	226	-
Stage 2	-	-	-	-	456	-
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	-	-	1331	-	415	813
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	638	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1331	-	383	813
Mov Cap-2 Maneuver	-	-	-	-	383	-
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	589	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.9	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	776	-	-	1331	-
HCM Lane V/C Ratio	0.099	-	-	0.065	-
HCM Control Delay (s)	10.2	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	263	334	17	20	4
Future Vol, veh/h	3	263	334	17	20	4
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	3	286	363	18	22	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	381	0	-	0	664	372
Stage 1	-	-	-	-	372	-
Stage 2	-	-	-	-	292	-
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	1177	-	-	-	426	674
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	758	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1177	-	-	-	425	674
Mov Cap-2 Maneuver	-	-	-	-	425	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	758	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1177	-	-	-	453
HCM Lane V/C Ratio	0.003	-	-	-	0.058
HCM Control Delay (s)	8.1	0	-	-	13.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	275	6	148	348	6	0	0	9	0	2	1
Future Vol, veh/h	0	275	6	148	348	6	0	0	9	0	2	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	299	7	161	378	7	0	0	10	0	2	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	385	0	0	306	0	0	1008	1010	303	1012	1010	382
Stage 1	-	-	-	-	-	-	303	303	-	704	704	-
Stage 2	-	-	-	-	-	-	705	707	-	308	306	-
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	1173	-	-	1255	-	-	219	240	737	218	240	665
Stage 1	-	-	-	-	-	-	706	664	-	428	440	-
Stage 2	-	-	-	-	-	-	427	438	-	702	662	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1173	-	-	1255	-	-	190	201	737	188	201	665
Mov Cap-2 Maneuver	-	-	-	-	-	-	190	201	-	188	201	-
Stage 1	-	-	-	-	-	-	706	664	-	428	368	-
Stage 2	-	-	-	-	-	-	355	367	-	693	662	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	10	18.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	737	1173	-	-	1255	-	-	262
HCM Lane V/C Ratio	0.013	-	-	-	0.128	-	-	0.012
HCM Control Delay (s)	10	0	-	-	8.3	0	-	18.9
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0.4	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	271	0	1	493	11	0	0	1	9	0	9
Future Vol, veh/h	13	271	0	1	493	11	0	0	1	9	0	9
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	14	295	0	1	536	12	0	0	1	10	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	548	0	0	295	0	0	872	873	295	868	867	542
Stage 1	-	-	-	-	-	-	323	323	-	544	544	-
Stage 2	-	-	-	-	-	-	549	550	-	324	323	-
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	1021	-	-	1266	-	-	271	289	744	273	291	540
Stage 1	-	-	-	-	-	-	689	650	-	523	519	-
Stage 2	-	-	-	-	-	-	520	516	-	688	650	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1021	-	-	1266	-	-	263	284	744	269	286	540
Mov Cap-2 Maneuver	-	-	-	-	-	-	263	284	-	269	286	-
Stage 1	-	-	-	-	-	-	678	640	-	515	518	-
Stage 2	-	-	-	-	-	-	510	515	-	676	640	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	9.8	15.6
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	744	1021	-	-	1266	-	-	359
HCM Lane V/C Ratio	0.001	0.014	-	-	0.001	-	-	0.054
HCM Control Delay (s)	9.8	8.6	0	-	7.8	0	-	15.6
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	284	536	34	14	1
Future Vol, veh/h	1	284	536	34	14	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	1	309	583	37	15	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	620	0	-	0	913	602
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	311	-
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	960	-	-	-	304	500
Stage 1	-	-	-	-	547	-
Stage 2	-	-	-	-	743	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	960	-	-	-	304	500
Mov Cap-2 Maneuver	-	-	-	-	304	-
Stage 1	-	-	-	-	546	-
Stage 2	-	-	-	-	743	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	17.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	960	-	-	-	312
HCM Lane V/C Ratio	0.001	-	-	-	0.052
HCM Control Delay (s)	8.8	0	-	-	17.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	268	32	6	507	61	5
Future Vol, veh/h	268	32	6	507	61	5
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	291	35	7	551	66	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	326	0	874	309
Stage 1	-	-	-	-	309	-
Stage 2	-	-	-	-	565	-
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	-	-	1234	-	320	731
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	569	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1234	-	317	731
Mov Cap-2 Maneuver	-	-	-	-	317	-
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	564	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	18.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	331	-	-	1234	-
HCM Lane V/C Ratio	0.217	-	-	0.005	-
HCM Control Delay (s)	18.9	-	-	7.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	268	0	4	1	4	11	14	468	0	0	167	0
Future Volume (vph)	268	0	4	1	4	11	14	468	0	0	167	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00		1.00	0.89		1.00	1.00			1.00	
Flt Protected	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1681		1770	1653		1770	1863			1863	
Flt Permitted	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1681		1770	1653		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	291	0	4	1	4	12	15	509	0	0	182	0
RTOR Reduction (vph)	0	77	0	0	12	0	0	0	0	0	0	0
Lane Group Flow (vph)	148	70	0	1	4	0	15	509	0	0	182	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	11.2	11.2		0.9	0.9		0.9	23.5			17.9	
Effective Green, g (s)	11.2	11.2		0.9	0.9		0.9	23.5			17.9	
Actuated g/C Ratio	0.22	0.22		0.02	0.02		0.02	0.46			0.35	
Clearance Time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	370	370		31	29		31	861			656	
v/s Ratio Prot	c0.09	0.04		0.00	c0.00		0.01	c0.27			0.10	
v/s Ratio Perm												
v/c Ratio	0.40	0.19		0.03	0.15		0.48	0.59			0.28	
Uniform Delay, d1	16.9	16.1		24.5	24.6		24.7	10.1			11.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.7	0.2		0.4	2.3		11.4	1.1			0.2	
Delay (s)	17.6	16.4		24.9	26.9		36.1	11.2			12.0	
Level of Service	B	B		C	C		D	B			B	
Approach Delay (s)		17.0			26.8			11.9			12.0	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	50.8	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	494	259	28	62	604	447
Future Volume (vph)	494	259	28	62	604	447
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.98	0.95	1.00
Satd. Flow (prot)	1863	1583		3485	1770	1583
Flt Permitted	1.00	1.00		0.75	0.95	1.00
Satd. Flow (perm)	1863	1583		2663	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	537	282	30	67	657	486
RTOR Reduction (vph)	0	176	0	0	0	220
Lane Group Flow (vph)	537	106	0	97	657	266
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	21.6	21.6		21.6	25.3	25.3
Effective Green, g (s)	21.6	21.6		21.6	25.3	25.3
Actuated g/C Ratio	0.38	0.38		0.38	0.44	0.44
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	702	596		1003	781	698
v/s Ratio Prot	c0.29				c0.37	
v/s Ratio Perm		0.07		0.04		0.17
v/c Ratio	0.76	0.18		0.10	0.84	0.38
Uniform Delay, d1	15.6	11.9		11.5	14.2	10.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.5	0.1		0.0	7.8	0.1
Delay (s)	20.1	12.0		11.6	22.1	10.9
Level of Service	C	B		B	C	B
Approach Delay (s)	17.3			11.6	17.3	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	14.4
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	16	6	22	11	11	26	48	435	169	21	136	4	0	0
Future Vol, veh/h	16	6	22	11	11	26	48	435	169	21	136	4	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	17	7	24	12	12	28	52	473	184	23	148	4	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	885	957	150	877	867	565	152	0	0	657	0	0
Stage 1	196	196	-	669	669	-	-	-	-	-	-	-
Stage 2	689	761	-	208	198	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	266	258	896	269	291	524	1429	-	-	931	-	-
Stage 1	806	739	-	447	456	-	-	-	-	-	-	-
Stage 2	436	414	-	794	737	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	232	243	896	241	274	524	1429	-	-	931	-	-
Mov Cap-2 Maneuver	232	243	-	241	274	-	-	-	-	-	-	-
Stage 1	777	721	-	431	440	-	-	-	-	-	-	-
Stage 2	387	399	-	750	719	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	16.9	0.6	1.2
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1429	-	-	896	354	931	-	-
HCM Lane V/C Ratio	0.037	-	-	0.007	0.147	0.025	-	-
HCM Control Delay (s)	7.6	-	-	9	16.9	9	-	-
HCM Lane LOS	A	-	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	21	197	29	5	173	19	879	50	17	271	6
Future Vol, veh/h	0	21	197	29	5	173	19	879	50	17	271	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	23	214	32	5	188	21	955	54	18	295	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1362	1386	299	1477	1362	982	302	0	0	1009	0	0
Stage 1	335	335	-	1024	1024	-	-	-	-	-	-	-
Stage 2	1027	1051	-	453	338	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	125	143	741	104	148	302	1259	-	-	687	-	-
Stage 1	679	643	-	284	313	-	-	-	-	-	-	-
Stage 2	283	304	-	586	641	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	44	137	741	63	142	302	1259	-	-	687	-	-
Mov Cap-2 Maneuver	44	137	-	63	142	-	-	-	-	-	-	-
Stage 1	667	626	-	279	308	-	-	-	-	-	-	-
Stage 2	103	299	-	391	624	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.6	43.8	0.2	0.6
HCM LOS	C	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1259	-	-	520	305	687	-	-
HCM Lane V/C Ratio	0.016	-	-	0.456	0.738	0.027	-	-
HCM Control Delay (s)	7.9	-	-	17.6	43.8	10.4	-	-
HCM Lane LOS	A	-	-	C	E	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.4	5.5	0.1	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	143	1	6	184	32	0	0	0	72	0	8
Future Vol, veh/h	6	143	1	6	184	32	0	0	0	72	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	7	155	1	7	200	35	0	0	0	78	0	9

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	235	0	0	156	0	0	402	402	218
Stage 1	-	-	-	-	-	-	232	232	-
Stage 2	-	-	-	-	-	-	170	170	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1332	-	-	1424	-	-	604	537	822
Stage 1	-	-	-	-	-	-	807	713	-
Stage 2	-	-	-	-	-	-	860	758	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1332	-	-	1424	-	-	597	0	822
Mov Cap-2 Maneuver	-	-	-	-	-	-	597	0	-
Stage 1	-	-	-	-	-	-	802	0	-
Stage 2	-	-	-	-	-	-	855	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0.2	11.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1332	-	-	1424	-	-	614
HCM Lane V/C Ratio	0.005	-	-	0.005	-	-	0.142
HCM Control Delay (s)	7.7	0	-	7.5	0	-	11.8
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	231	1	8	212	37	1	0	11	46	0	6
Future Vol, veh/h	6	231	1	8	212	37	1	0	11	46	0	6
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	7	251	1	9	230	40	1	0	12	50	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	270	0	0	252	0	0	538	554	252	540	534	250
Stage 1	-	-	-	-	-	-	266	266	-	268	268	-
Stage 2	-	-	-	-	-	-	272	288	-	272	266	-
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	1293	-	-	1313	-	-	454	440	787	453	452	789
Stage 1	-	-	-	-	-	-	739	689	-	738	687	-
Stage 2	-	-	-	-	-	-	734	674	-	734	689	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1293	-	-	1313	-	-	445	434	787	441	446	789
Mov Cap-2 Maneuver	-	-	-	-	-	-	445	434	-	441	446	-
Stage 1	-	-	-	-	-	-	735	685	-	734	682	-
Stage 2	-	-	-	-	-	-	722	669	-	719	685	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	10	13.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	740	1293	-	-	1313	-	-	465
HCM Lane V/C Ratio	0.018	0.005	-	-	0.007	-	-	0.122
HCM Control Delay (s)	10	7.8	0	-	7.8	0	-	13.8
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	284	2	22	246	11	72
Future Vol, veh/h	284	2	22	246	11	72
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	309	2	24	267	12	78

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	311	0	625	310
Stage 1	-	-	-	-	310	-
Stage 2	-	-	-	-	315	-
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	-	-	1249	-	449	730
Stage 1	-	-	-	-	744	-
Stage 2	-	-	-	-	740	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1249	-	439	730
Mov Cap-2 Maneuver	-	-	-	-	439	-
Stage 1	-	-	-	-	744	-
Stage 2	-	-	-	-	723	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	671	-	-	1249	-
HCM Lane V/C Ratio	0.134	-	-	0.019	-
HCM Control Delay (s)	11.2	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	358	267	17	24	2
Future Vol, veh/h	1	358	267	17	24	2
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	1	389	290	18	26	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	308	0	-	0	690	299
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	391	-
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	1253	-	-	-	411	741
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	683	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1253	-	-	-	411	741
Mov Cap-2 Maneuver	-	-	-	-	411	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	683	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1253	-	-	-	426
HCM Lane V/C Ratio	0.001	-	-	-	0.066
HCM Control Delay (s)	7.9	0	-	-	14.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	377	2	1	275	4	9	2	195	11	0	1
Future Vol, veh/h	0	377	2	1	275	4	9	2	195	11	0	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	410	2	1	299	4	10	2	212	12	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	303	0	0	412	0	0	715	716	411	821	715	301
Stage 1	-	-	-	-	-	-	411	411	-	303	303	-
Stage 2	-	-	-	-	-	-	304	305	-	518	412	-
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	1258	-	-	1147	-	-	346	356	641	293	356	739
Stage 1	-	-	-	-	-	-	618	595	-	706	664	-
Stage 2	-	-	-	-	-	-	705	662	-	541	594	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1258	-	-	1147	-	-	345	356	641	195	356	739
Mov Cap-2 Maneuver	-	-	-	-	-	-	345	356	-	195	356	-
Stage 1	-	-	-	-	-	-	618	595	-	706	663	-
Stage 2	-	-	-	-	-	-	703	661	-	361	594	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	14.2	23.5
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	613	1258	-	-	1147	-	-	208
HCM Lane V/C Ratio	0.365	-	-	-	0.001	-	-	0.063
HCM Control Delay (s)	14.2	0	-	-	8.1	0	-	23.5
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	1.7	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	580	0	1	251	3	0	0	0	24	0	32
Future Vol, veh/h	7	580	0	1	251	3	0	0	0	24	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	8	630	0	1	273	3	0	0	0	26	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	276	0	0	630	0	0	940	924	630	923	923	275
Stage 1	-	-	-	-	-	-	646	646	-	277	277	-
Stage 2	-	-	-	-	-	-	294	278	-	646	646	-
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	1287	-	-	952	-	-	244	269	482	250	270	764
Stage 1	-	-	-	-	-	-	460	467	-	729	681	-
Stage 2	-	-	-	-	-	-	714	680	-	460	467	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1287	-	-	952	-	-	231	266	482	248	267	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	231	266	-	248	267	-
Stage 1	-	-	-	-	-	-	455	462	-	722	680	-
Stage 2	-	-	-	-	-	-	681	679	-	455	462	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	15.5
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1287	-	-	952	-	-	404
HCM Lane V/C Ratio	-	0.006	-	-	0.001	-	-	0.151
HCM Control Delay (s)	0	7.8	0	-	8.8	0	-	15.5
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	624	261	73	44	4
Future Vol, veh/h	5	624	261	73	44	4
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	5	678	284	79	48	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	363	0	-	0	1012	324
Stage 1	-	-	-	-	324	-
Stage 2	-	-	-	-	688	-
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	1196	-	-	-	265	717
Stage 1	-	-	-	-	733	-
Stage 2	-	-	-	-	499	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1196	-	-	-	263	717
Mov Cap-2 Maneuver	-	-	-	-	263	-
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	499	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	20.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1196	-	-	-	278
HCM Lane V/C Ratio	0.005	-	-	-	0.188
HCM Control Delay (s)	8	0	-	-	20.9
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	584	77	12	313	20	3
Future Vol, veh/h	584	77	12	313	20	3
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	635	84	13	340	22	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	719	0	1043	677
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	366	-
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	-	-	882	-	254	453
Stage 1	-	-	-	-	505	-
Stage 2	-	-	-	-	702	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	882	-	249	453
Mov Cap-2 Maneuver	-	-	-	-	249	-
Stage 1	-	-	-	-	505	-
Stage 2	-	-	-	-	689	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	20
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	265	-	-	882	-
HCM Lane V/C Ratio	0.094	-	-	0.015	-
HCM Control Delay (s)	20	-	-	9.1	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	588	0	6	0	3	4	3	180	0	0	407	0
Future Volume (vph)	588	0	6	0	3	4	3	180	0	0	407	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			0.91		1.00	1.00			1.00	
Flt Protected	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1682			1703		1770	1863			1863	
Flt Permitted	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1682			1703		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	639	0	7	0	3	4	3	196	0	0	442	0
RTOR Reduction (vph)	0	68	0	0	4	0	0	0	0	0	0	0
Lane Group Flow (vph)	326	252	0	0	3	0	3	196	0	0	442	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Effective Green, g (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Actuated g/C Ratio	0.31	0.31			0.02		0.01	0.44			0.35	
Clearance Time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	520	520			26		25	811			647	
v/s Ratio Prot	c0.19	0.15			c0.00		0.00	c0.11			c0.24	
v/s Ratio Perm												
v/c Ratio	0.63	0.48			0.12		0.12	0.24			0.68	
Uniform Delay, d1	18.8	17.8			30.9		31.0	11.3			17.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2	2.4	0.7			2.0		2.1	0.2			3.0	
Delay (s)	21.2	18.5			32.9		33.1	11.5			20.7	
Level of Service	C	B			C		C	B			C	
Approach Delay (s)		19.9			32.9			11.8			20.7	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	63.6	Sum of lost time (s)	19.9
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	343	425	159	403	314	206
Future Volume (vph)	343	425	159	403	314	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.99	0.95	1.00
Satd. Flow (prot)	1863	1583		3490	1770	1583
Flt Permitted	1.00	1.00		0.74	0.95	1.00
Satd. Flow (perm)	1863	1583		2624	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	373	462	173	438	341	224
RTOR Reduction (vph)	0	261	0	0	0	148
Lane Group Flow (vph)	373	201	0	611	341	76
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	20.1	20.1		20.1	15.7	15.7
Effective Green, g (s)	20.1	20.1		20.1	15.7	15.7
Actuated g/C Ratio	0.44	0.44		0.44	0.34	0.34
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	810	688		1141	601	537
v/s Ratio Prot	0.20				c0.19	
v/s Ratio Perm		0.13		c0.23		0.05
v/c Ratio	0.46	0.29		0.54	0.57	0.14
Uniform Delay, d1	9.2	8.4		9.6	12.5	10.6
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		0.5	0.7	0.0
Delay (s)	9.4	8.5		10.1	13.2	10.6
Level of Service	A	A		B	B	B
Approach Delay (s)	8.9			10.1	12.2	
Approach LOS	A			B	B	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	46.2	Sum of lost time (s)	14.4
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	8	8	63	19	5	6	15	163	76	25	389	7	0	0
Future Vol, veh/h	8	8	63	19	5	6	15	163	76	25	389	7	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	9	9	68	21	5	7	16	177	83	27	423	8	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	738	773	427	741	736	219	431	0	0	260	0	0
Stage 1	481	481	-	251	251	-	-	-	-	-	-	-
Stage 2	257	292	-	490	485	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	334	330	628	332	346	821	1129	-	-	1304	-	-
Stage 1	566	554	-	753	699	-	-	-	-	-	-	-
Stage 2	748	671	-	560	552	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	319	318	628	312	334	821	1129	-	-	1304	-	-
Mov Cap-2 Maneuver	319	318	-	312	334	-	-	-	-	-	-	-
Stage 1	558	542	-	742	689	-	-	-	-	-	-	-
Stage 2	726	662	-	532	540	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	16	0.5	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1129	-	-	628	361	1304	-	-
HCM Lane V/C Ratio	0.014	-	-	0.014	0.09	0.021	-	-
HCM Control Delay (s)	8.2	-	-	10.8	16	7.8	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	19	90	15	7	15	28	543	28	2	575	8
Future Vol, veh/h	1	19	90	15	7	15	28	543	28	2	575	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	21	98	16	8	16	30	590	30	2	625	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1303	1314	630	1358	1303	605	634	0	0	620	0	0
Stage 1	634	634	-	665	665	-	-	-	-	-	-	-
Stage 2	669	680	-	693	638	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	138	158	482	126	161	498	949	-	-	960	-	-
Stage 1	467	473	-	449	458	-	-	-	-	-	-	-
Stage 2	447	451	-	434	471	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	125	153	482	88	156	498	949	-	-	960	-	-
Mov Cap-2 Maneuver	125	153	-	88	156	-	-	-	-	-	-	-
Stage 1	452	472	-	435	443	-	-	-	-	-	-	-
Stage 2	412	437	-	330	470	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.9	32.2	0.4	0
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	949	-	-	345	172	960	-	-
HCM Lane V/C Ratio	0.032	-	-	0.347	0.234	0.002	-	-
HCM Control Delay (s)	8.9	-	-	20.9	32.2	8.8	-	-
HCM Lane LOS	A	-	-	C	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.5	0.9	0	-	-

APPENDIX C

LOS WORKSHEETS

Base Year 2029 Conditions

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	172	2	18	142	61	0	0	0	26	0	5
Future Vol, veh/h	13	172	2	18	142	61	0	0	0	26	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	14	187	2	20	154	66	0	0	0	28	0	5

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	220	0	0	189	0	0	443	444	187
Stage 1	-	-	-	-	-	-	227	227	-
Stage 2	-	-	-	-	-	-	216	217	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1349	-	-	1385	-	-	572	508	855
Stage 1	-	-	-	-	-	-	811	716	-
Stage 2	-	-	-	-	-	-	820	723	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1349	-	-	1385	-	-	555	0	855
Mov Cap-2 Maneuver	-	-	-	-	-	-	555	0	-
Stage 1	-	-	-	-	-	-	801	0	-
Stage 2	-	-	-	-	-	-	806	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0.6	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1349	-	-	1385	-	-	588
HCM Lane V/C Ratio	0.01	-	-	0.014	-	-	0.057
HCM Control Delay (s)	7.7	0	-	7.6	0	-	11.5
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	203	2	15	228	23	0	0	2	23	0	1
Future Vol, veh/h	3	203	2	15	228	23	0	0	2	23	0	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	3	221	2	16	248	25	0	0	2	25	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	273	0	0	223	0	0	521	533	222	522	522	261
Stage 1	-	-	-	-	-	-	228	228	-	293	293	-
Stage 2	-	-	-	-	-	-	293	305	-	229	229	-
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	1290	-	-	1346	-	-	466	453	818	465	459	778
Stage 1	-	-	-	-	-	-	775	715	-	715	670	-
Stage 2	-	-	-	-	-	-	715	662	-	774	715	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1290	-	-	1346	-	-	459	445	818	458	451	778
Mov Cap-2 Maneuver	-	-	-	-	-	-	459	445	-	458	451	-
Stage 1	-	-	-	-	-	-	773	713	-	713	661	-
Stage 2	-	-	-	-	-	-	704	653	-	770	713	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	9.4	13.2
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	818	1290	-	-	1346	-	-	466
HCM Lane V/C Ratio	0.003	0.003	-	-	0.012	-	-	0.056
HCM Control Delay (s)	9.4	7.8	0	-	7.7	0	-	13.2
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	209	18	77	265	3	68
Future Vol, veh/h	209	18	77	265	3	68
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	227	20	84	288	3	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	247	0	693	237
Stage 1	-	-	-	-	237	-
Stage 2	-	-	-	-	456	-
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	-	-	1319	-	409	802
Stage 1	-	-	-	-	802	-
Stage 2	-	-	-	-	638	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1319	-	378	802
Mov Cap-2 Maneuver	-	-	-	-	378	-
Stage 1	-	-	-	-	802	-
Stage 2	-	-	-	-	590	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	766	-	-	1319	-
HCM Lane V/C Ratio	0.101	-	-	0.063	-
HCM Control Delay (s)	10.2	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	274	339	17	20	4
Future Vol, veh/h	3	274	339	17	20	4
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	3	298	368	18	22	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	386	0	-	0	681	377
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	304	-
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	1172	-	-	-	416	670
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	748	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1172	-	-	-	415	670
Mov Cap-2 Maneuver	-	-	-	-	415	-
Stage 1	-	-	-	-	692	-
Stage 2	-	-	-	-	748	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1172	-	-	-	443
HCM Lane V/C Ratio	0.003	-	-	-	0.059
HCM Control Delay (s)	8.1	0	-	-	13.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	287	6	143	353	6	0	0	9	0	2	1
Future Vol, veh/h	0	287	6	143	353	6	0	0	9	0	2	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	312	7	155	384	7	0	0	10	0	2	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	391	0	0	319	0	0	1015	1017	316	1019	1017	388
Stage 1	-	-	-	-	-	-	316	316	-	698	698	-
Stage 2	-	-	-	-	-	-	699	701	-	321	319	-
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	1168	-	-	1241	-	-	217	238	724	215	238	660
Stage 1	-	-	-	-	-	-	695	655	-	431	442	-
Stage 2	-	-	-	-	-	-	430	441	-	691	653	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1168	-	-	1241	-	-	189	200	724	186	200	660
Mov Cap-2 Maneuver	-	-	-	-	-	-	189	200	-	186	200	-
Stage 1	-	-	-	-	-	-	695	655	-	431	371	-
Stage 2	-	-	-	-	-	-	358	370	-	682	653	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	10	19
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	724	1168	-	-	1241	-	-	261
HCM Lane V/C Ratio	0.014	-	-	-	0.125	-	-	0.012
HCM Control Delay (s)	10	0	-	-	8.3	0	-	19
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0.4	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	283	0	1	493	11	0	0	1	9	0	9
Future Vol, veh/h	13	283	0	1	493	11	0	0	1	9	0	9
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	14	308	0	1	536	12	0	0	1	10	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	548	0	0	308	0	0	885	886	308	881	880	542
Stage 1	-	-	-	-	-	-	336	336	-	544	544	-
Stage 2	-	-	-	-	-	-	549	550	-	337	336	-
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	1021	-	-	1253	-	-	266	284	732	267	286	540
Stage 1	-	-	-	-	-	-	678	642	-	523	519	-
Stage 2	-	-	-	-	-	-	520	516	-	677	642	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1021	-	-	1253	-	-	257	279	732	263	281	540
Mov Cap-2 Maneuver	-	-	-	-	-	-	257	279	-	263	281	-
Stage 1	-	-	-	-	-	-	666	631	-	514	518	-
Stage 2	-	-	-	-	-	-	510	515	-	665	631	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	9.9	15.8
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	732	1021	-	-	1253	-	-	354
HCM Lane V/C Ratio	0.001	0.014	-	-	0.001	-	-	0.055
HCM Control Delay (s)	9.9	8.6	0	-	7.9	0	-	15.8
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	296	536	34	14	1
Future Vol, veh/h	1	296	536	34	14	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	1	322	583	37	15	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	620	0	-	0	926	602
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	324	-
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	960	-	-	-	298	500
Stage 1	-	-	-	-	547	-
Stage 2	-	-	-	-	733	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	960	-	-	-	298	500
Mov Cap-2 Maneuver	-	-	-	-	298	-
Stage 1	-	-	-	-	546	-
Stage 2	-	-	-	-	733	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	17.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	960	-	-	-	306
HCM Lane V/C Ratio	0.001	-	-	-	0.053
HCM Control Delay (s)	8.8	0	-	-	17.4
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	280	32	6	507	61	5
Future Vol, veh/h	280	32	6	507	61	5
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	304	35	7	551	66	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	339	0	887	322
Stage 1	-	-	-	-	322	-
Stage 2	-	-	-	-	565	-
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	-	-	1220	-	315	719
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	569	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1220	-	312	719
Mov Cap-2 Maneuver	-	-	-	-	312	-
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	564	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	326	-	-	1220	-
HCM Lane V/C Ratio	0.22	-	-	0.005	-
HCM Control Delay (s)	19.1	-	-	8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	280	0	3	1	4	11	12	514	0	0	177	0
Future Volume (vph)	280	0	3	1	4	11	12	514	0	0	177	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00		1.00	0.89		1.00	1.00			1.00	
Flt Protected	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1682		1770	1653		1770	1863			1863	
Flt Permitted	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1682		1770	1653		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	304	0	3	1	4	12	13	559	0	0	192	0
RTOR Reduction (vph)	0	77	0	0	12	0	0	0	0	0	0	0
Lane Group Flow (vph)	155	75	0	1	4	0	13	559	0	0	192	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	12.2	12.2		1.9	1.9		0.9	25.9			20.3	
Effective Green, g (s)	12.2	12.2		1.9	1.9		0.9	25.9			20.3	
Actuated g/C Ratio	0.22	0.22		0.03	0.03		0.02	0.47			0.37	
Clearance Time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	371	371		60	56		28	874			685	
v/s Ratio Prot	c0.09	0.04		0.00	c0.00		0.01	c0.30			0.10	
v/s Ratio Perm												
v/c Ratio	0.42	0.20		0.02	0.08		0.46	0.64			0.28	
Uniform Delay, d1	18.5	17.5		25.7	25.8		26.9	11.1			12.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.8	0.3		0.1	0.6		11.7	1.5			0.2	
Delay (s)	19.2	17.8		25.9	26.4		38.6	12.7			12.5	
Level of Service	B	B		C	C		D	B			B	
Approach Delay (s)		18.5			26.4			13.2			12.5	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	55.2	Sum of lost time (s)	19.9
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	506	305	31	61	616	488
Future Volume (vph)	506	305	31	61	616	488
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.98	0.95	1.00
Satd. Flow (prot)	1863	1583		3480	1770	1583
Flt Permitted	1.00	1.00		0.73	0.95	1.00
Satd. Flow (perm)	1863	1583		2577	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	550	332	34	66	670	530
RTOR Reduction (vph)	0	204	0	0	0	237
Lane Group Flow (vph)	550	128	0	100	670	293
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	22.3	22.3		22.3	25.3	25.3
Effective Green, g (s)	22.3	22.3		22.3	25.3	25.3
Actuated g/C Ratio	0.38	0.38		0.38	0.44	0.44
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	716	608		990	772	690
v/s Ratio Prot	c0.30				c0.38	
v/s Ratio Perm		0.08		0.04		0.18
v/c Ratio	0.77	0.21		0.10	0.87	0.42
Uniform Delay, d1	15.6	12.0		11.4	14.8	11.3
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.5	0.1		0.0	9.8	0.2
Delay (s)	20.1	12.0		11.5	24.7	11.5
Level of Service	C	B		B	C	B
Approach Delay (s)	17.0			11.5	18.8	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	58.0	Sum of lost time (s)	14.4
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	16	6	22	11	11	26	48	479	169	21	145	4	0	0
Future Vol, veh/h	16	6	22	11	11	26	48	479	169	21	145	4	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	17	7	24	12	12	28	52	521	184	23	158	4	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	943	1015	160	935	925	613	162	0	0	705	0	0
Stage 1	206	206	-	717	717	-	-	-	-	-	-	-
Stage 2	737	809	-	218	208	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	243	238	885	246	269	492	1417	-	-	893	-	-
Stage 1	796	731	-	421	434	-	-	-	-	-	-	-
Stage 2	410	394	-	784	730	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	210	223	885	219	252	492	1417	-	-	893	-	-
Mov Cap-2 Maneuver	210	223	-	219	252	-	-	-	-	-	-	-
Stage 1	767	712	-	405	418	-	-	-	-	-	-	-
Stage 2	362	379	-	740	711	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	18.1	0.5	1.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1417	-	-	885	327	893	-	-
HCM Lane V/C Ratio	0.037	-	-	0.007	0.16	0.026	-	-
HCM Control Delay (s)	7.6	-	-	9.1	18.1	9.1	-	-
HCM Lane LOS	A	-	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0.6	0.1	-	-

Intersection	
Int Delay, s/veh	9.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	21	197	29	5	173	19	931	50	17	320	6
Future Vol, veh/h	0	21	197	29	5	173	19	931	50	17	320	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	23	214	32	5	188	21	1012	54	18	348	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1472	1496	352	1587	1472	1039	355	0	0	1066	0	0
Stage 1	388	388	-	1081	1081	-	-	-	-	-	-	-
Stage 2	1084	1108	-	506	391	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	105	123	692	87	127	280	1204	-	-	654	-	-
Stage 1	636	609	-	264	294	-	-	-	-	-	-	-
Stage 2	263	286	-	549	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	32	117	692	49	121	280	1204	-	-	654	-	-
Mov Cap-2 Maneuver	32	117	-	49	121	-	-	-	-	-	-	-
Stage 1	625	592	-	260	289	-	-	-	-	-	-	-
Stage 2	83	281	-	354	590	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.2	59	0.2	0.5
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1204	-	-	470	273	654	-	-
HCM Lane V/C Ratio	0.017	-	-	0.504	0.824	0.028	-	-
HCM Control Delay (s)	8	-	-	20.2	59	10.7	-	-
HCM Lane LOS	A	-	-	C	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.8	6.7	0.1	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	150	1	6	199	30	0	0	0	71	0	8
Future Vol, veh/h	5	150	1	6	199	30	0	0	0	71	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	5	163	1	7	216	33	0	0	0	77	0	9

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	249	0	0	164	0	0	421	421	233
Stage 1	-	-	-	-	-	-	247	247	-
Stage 2	-	-	-	-	-	-	174	174	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1317	-	-	1414	-	-	589	524	806
Stage 1	-	-	-	-	-	-	794	702	-
Stage 2	-	-	-	-	-	-	856	755	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1317	-	-	1414	-	-	583	0	806
Mov Cap-2 Maneuver	-	-	-	-	-	-	583	0	-
Stage 1	-	-	-	-	-	-	791	0	-
Stage 2	-	-	-	-	-	-	851	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0.2	12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1317	-	-	1414	-	-	600
HCM Lane V/C Ratio	0.004	-	-	0.005	-	-	0.143
HCM Control Delay (s)	7.7	0	-	7.6	0	-	12
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	238	1	8	226	36	1	0	11	46	0	5
Future Vol, veh/h	5	238	1	8	226	36	1	0	11	46	0	5
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	5	259	1	9	246	39	1	0	12	50	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	285	0	0	260	0	0	556	573	260	560	554	266
Stage 1	-	-	-	-	-	-	270	270	-	284	284	-
Stage 2	-	-	-	-	-	-	286	303	-	276	270	-
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	1277	-	-	1304	-	-	442	430	779	439	440	773
Stage 1	-	-	-	-	-	-	736	686	-	723	676	-
Stage 2	-	-	-	-	-	-	721	664	-	730	686	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1277	-	-	1304	-	-	434	424	779	428	434	773
Mov Cap-2 Maneuver	-	-	-	-	-	-	434	424	-	428	434	-
Stage 1	-	-	-	-	-	-	732	683	-	719	671	-
Stage 2	-	-	-	-	-	-	710	659	-	715	683	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	10	14.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	731	1277	-	-	1304	-	-	448
HCM Lane V/C Ratio	0.018	0.004	-	-	0.007	-	-	0.124
HCM Control Delay (s)	10	7.8	0	-	7.8	0	-	14.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	291	2	21	259	11	71
Future Vol, veh/h	291	2	21	259	11	71
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	316	2	23	282	12	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	318	0	645	317
Stage 1	-	-	-	-	317	-
Stage 2	-	-	-	-	328	-
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	-	-	1242	-	437	724
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	730	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1242	-	427	724
Mov Cap-2 Maneuver	-	-	-	-	427	-
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	714	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	662	-	-	1242	-
HCM Lane V/C Ratio	0.135	-	-	0.018	-
HCM Control Delay (s)	11.3	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	364	279	17	24	2
Future Vol, veh/h	1	364	279	17	24	2
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	1	396	303	18	26	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	321	0	-	0	710	312
Stage 1	-	-	-	-	312	-
Stage 2	-	-	-	-	398	-
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	1239	-	-	-	400	728
Stage 1	-	-	-	-	742	-
Stage 2	-	-	-	-	678	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1239	-	-	-	400	728
Mov Cap-2 Maneuver	-	-	-	-	400	-
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	678	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1239	-	-	-	414
HCM Lane V/C Ratio	0.001	-	-	-	0.068
HCM Control Delay (s)	7.9	0	-	-	14.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

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	0	383	2	1	287	4	9	2	193	11	0	1
Future Vol, veh/h	0	383	2	1	287	4	9	2	193	11	0	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	416	2	1	312	4	10	2	210	12	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	316	0	0	418	0	0	734	735	417	839	734	314
Stage 1	-	-	-	-	-	-	417	417	-	316	316	-
Stage 2	-	-	-	-	-	-	317	318	-	523	418	-
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	1244	-	-	1141	-	-	336	347	636	285	347	726
Stage 1	-	-	-	-	-	-	613	591	-	695	655	-
Stage 2	-	-	-	-	-	-	694	654	-	537	591	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1244	-	-	1141	-	-	335	347	636	190	347	726
Mov Cap-2 Maneuver	-	-	-	-	-	-	335	347	-	190	347	-
Stage 1	-	-	-	-	-	-	613	591	-	695	654	-
Stage 2	-	-	-	-	-	-	692	653	-	359	591	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	14.3	24
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	607	1244	-	-	1141	-	-	202
HCM Lane V/C Ratio	0.365	-	-	-	0.001	-	-	0.065
HCM Control Delay (s)	14.3	0	-	-	8.2	0	-	24
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	1.7	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	585	0	1	264	3	0	0	0	24	0	32
Future Vol, veh/h	7	585	0	1	264	3	0	0	0	24	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	8	636	0	1	287	3	0	0	0	26	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	290	0	0	636	0	0	960	944	636	943	943	289
Stage 1	-	-	-	-	-	-	652	652	-	291	291	-
Stage 2	-	-	-	-	-	-	308	292	-	652	652	-
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	1272	-	-	947	-	-	236	262	478	243	263	750
Stage 1	-	-	-	-	-	-	457	464	-	717	672	-
Stage 2	-	-	-	-	-	-	702	671	-	457	464	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1272	-	-	947	-	-	223	259	478	241	260	750
Mov Cap-2 Maneuver	-	-	-	-	-	-	223	259	-	241	260	-
Stage 1	-	-	-	-	-	-	452	459	-	710	671	-
Stage 2	-	-	-	-	-	-	669	670	-	452	459	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	15.8
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1272	-	-	947	-	-	394
HCM Lane V/C Ratio	-	0.006	-	-	0.001	-	-	0.154
HCM Control Delay (s)	0	7.8	0	-	8.8	0	-	15.8
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	629	274	73	44	4
Future Vol, veh/h	5	629	274	73	44	4
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	5	684	298	79	48	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	377	0	-	0	1032	338
Stage 1	-	-	-	-	338	-
Stage 2	-	-	-	-	694	-
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	1181	-	-	-	258	704
Stage 1	-	-	-	-	722	-
Stage 2	-	-	-	-	496	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1181	-	-	-	256	704
Mov Cap-2 Maneuver	-	-	-	-	256	-
Stage 1	-	-	-	-	717	-
Stage 2	-	-	-	-	496	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1181	-	-	-	270
HCM Lane V/C Ratio	0.005	-	-	-	0.193
HCM Control Delay (s)	8.1	0	-	-	21.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	589	77	12	326	20	3
Future Vol, veh/h	589	77	12	326	20	3
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	640	84	13	354	22	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	724	0	1062	682
Stage 1	-	-	-	-	682	-
Stage 2	-	-	-	-	380	-
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	-	-	879	-	247	450
Stage 1	-	-	-	-	502	-
Stage 2	-	-	-	-	691	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	879	-	243	450
Mov Cap-2 Maneuver	-	-	-	-	243	-
Stage 1	-	-	-	-	502	-
Stage 2	-	-	-	-	679	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	20.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	259	-	-	879	-
HCM Lane V/C Ratio	0.097	-	-	0.015	-
HCM Control Delay (s)	20.4	-	-	9.2	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	595	0	4	0	3	4	2	205	0	0	440	0
Future Volume (vph)	595	0	4	0	3	4	2	205	0	0	440	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			0.91		1.00	1.00			1.00	
Flt Protected	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1683			1703		1770	1863			1863	
Flt Permitted	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1683			1703		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	647	0	4	0	3	4	2	223	0	0	478	0
RTOR Reduction (vph)	0	68	0	0	4	0	0	0	0	0	0	0
Lane Group Flow (vph)	323	260	0	0	3	0	2	223	0	0	478	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Effective Green, g (s)	19.7	19.7			1.0		0.9	27.7			22.1	
Actuated g/C Ratio	0.31	0.31			0.02		0.01	0.44			0.35	
Clearance Time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	520	521			26		25	811			647	
v/s Ratio Prot	c0.19	0.15			c0.00		0.00	c0.12			c0.26	
v/s Ratio Perm												
v/c Ratio	0.62	0.50			0.12		0.08	0.27			0.74	
Uniform Delay, d1	18.8	17.9			30.9		30.9	11.5			18.2	
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2	2.3	0.8			2.0		1.4	0.2			4.4	
Delay (s)	21.1	18.7			32.9		32.3	11.7			22.6	
Level of Service	C	B			C		C	B			C	
Approach Delay (s)		19.9			32.9			11.9			22.6	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	63.6	Sum of lost time (s)	19.9
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	347	451	188	414	377	240
Future Volume (vph)	347	451	188	414	377	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.98	0.95	1.00
Satd. Flow (prot)	1863	1583		3485	1770	1583
Flt Permitted	1.00	1.00		0.71	0.95	1.00
Satd. Flow (perm)	1863	1583		2499	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	377	490	204	450	410	261
RTOR Reduction (vph)	0	283	0	0	0	161
Lane Group Flow (vph)	377	207	0	654	410	100
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	22.9	22.9		22.9	20.8	20.8
Effective Green, g (s)	22.9	22.9		22.9	20.8	20.8
Actuated g/C Ratio	0.42	0.42		0.42	0.38	0.38
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	788	670		1057	680	608
v/s Ratio Prot	0.20				c0.23	
v/s Ratio Perm		0.13		c0.26		0.06
v/c Ratio	0.48	0.31		0.62	0.60	0.17
Uniform Delay, d1	11.3	10.4		12.2	13.3	10.9
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		1.1	1.0	0.0
Delay (s)	11.4	10.4		13.3	14.4	11.0
Level of Service	B	B		B	B	B
Approach Delay (s)	10.9			13.3	13.1	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	54.1	Sum of lost time (s)	14.4
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	8	8	63	19	5	6	15	175	76	25	421	7	0	0
Future Vol, veh/h	8	8	63	19	5	6	15	175	76	25	421	7	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	9	9	68	21	5	7	16	190	83	27	458	8	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	786	821	462	789	784	232	466	0	0	273	0	0
Stage 1	516	516	-	264	264	-	-	-	-	-	-	-
Stage 2	270	305	-	525	520	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	310	309	600	308	325	807	1095	-	-	1290	-	-
Stage 1	542	534	-	741	690	-	-	-	-	-	-	-
Stage 2	736	662	-	536	532	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	295	298	600	289	313	807	1095	-	-	1290	-	-
Mov Cap-2 Maneuver	295	298	-	289	313	-	-	-	-	-	-	-
Stage 1	534	523	-	730	680	-	-	-	-	-	-	-
Stage 2	714	652	-	509	521	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	16.9	0.5	0.4
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1095	-	-	600	336	1290	-	-
HCM Lane V/C Ratio	0.015	-	-	0.014	0.097	0.021	-	-
HCM Control Delay (s)	8.3	-	-	11.1	16.9	7.9	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	19	90	15	7	15	28	612	28	2	631	8
Future Vol, veh/h	1	19	90	15	7	15	28	612	28	2	631	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	21	98	16	8	16	30	665	30	2	686	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1439	1450	691	1494	1439	680	695	0	0	695	0	0
Stage 1	695	695	-	740	740	-	-	-	-	-	-	-
Stage 2	744	755	-	754	699	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	111	131	445	101	133	451	901	-	-	901	-	-
Stage 1	433	444	-	409	423	-	-	-	-	-	-	-
Stage 2	407	417	-	401	442	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	99	126	445	67	128	451	901	-	-	901	-	-
Mov Cap-2 Maneuver	99	126	-	67	128	-	-	-	-	-	-	-
Stage 1	419	443	-	396	409	-	-	-	-	-	-	-
Stage 2	372	403	-	298	441	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.4	43.4	0.4	0
HCM LOS	C	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	901	-	-	303	133	901	-	-
HCM Lane V/C Ratio	0.034	-	-	0.395	0.302	0.002	-	-
HCM Control Delay (s)	9.1	-	-	24.4	43.4	9	-	-
HCM Lane LOS	A	-	-	C	E	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.8	1.2	0	-	-

APPENDIX C

LOS WORKSHEETS

Future Year 2029 Conditions

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	175	2	18	142	68	0	0	0	29	0	6
Future Vol, veh/h	15	175	2	18	142	68	0	0	0	29	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	16	190	2	20	154	74	0	0	0	32	0	7

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	228	0	0	192	0	0	454	455	191
Stage 1	-	-	-	-	-	-	231	231	-
Stage 2	-	-	-	-	-	-	223	224	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1340	-	-	1381	-	-	564	501	851
Stage 1	-	-	-	-	-	-	807	713	-
Stage 2	-	-	-	-	-	-	814	718	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1340	-	-	1381	-	-	547	0	851
Mov Cap-2 Maneuver	-	-	-	-	-	-	547	0	-
Stage 1	-	-	-	-	-	-	797	0	-
Stage 2	-	-	-	-	-	-	800	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0.6	11.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1340	-	-	1381	-	-	583
HCM Lane V/C Ratio	0.012	-	-	0.014	-	-	0.065
HCM Control Delay (s)	7.7	0	-	7.6	0	-	11.6
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	209	2	15	235	26	0	0	2	26	0	1
Future Vol, veh/h	4	209	2	15	235	26	0	0	2	26	0	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	4	227	2	16	255	28	0	0	2	28	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	283	0	0	229	0	0	538	551	228	538	538	269
Stage 1	-	-	-	-	-	-	236	236	-	301	301	-
Stage 2	-	-	-	-	-	-	302	315	-	237	237	-
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	1279	-	-	1339	-	-	454	442	811	454	450	770
Stage 1	-	-	-	-	-	-	767	710	-	708	665	-
Stage 2	-	-	-	-	-	-	707	656	-	766	709	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1279	-	-	1339	-	-	447	434	811	447	442	770
Mov Cap-2 Maneuver	-	-	-	-	-	-	447	434	-	447	442	-
Stage 1	-	-	-	-	-	-	764	707	-	705	656	-
Stage 2	-	-	-	-	-	-	696	647	-	761	706	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	9.5	13.5
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	811	1279	-	-	1339	-	-	454
HCM Lane V/C Ratio	0.003	0.003	-	-	0.012	-	-	0.065
HCM Control Delay (s)	9.5	7.8	0	-	7.7	0	-	13.5
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	2.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	217	20	86	275	4	77
Future Vol, veh/h	217	20	86	275	4	77
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	236	22	93	299	4	84

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	258	0	732	247
Stage 1	-	-	-	-	247	-
Stage 2	-	-	-	-	485	-
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	-	-	1307	-	388	792
Stage 1	-	-	-	-	794	-
Stage 2	-	-	-	-	619	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1307	-	355	792
Mov Cap-2 Maneuver	-	-	-	-	355	-
Stage 1	-	-	-	-	794	-
Stage 2	-	-	-	-	566	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.9	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	747	-	-	1307	-
HCM Lane V/C Ratio	0.118	-	-	0.072	-
HCM Control Delay (s)	10.5	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	291	357	17	20	4
Future Vol, veh/h	3	291	357	17	20	4
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	3	316	388	18	22	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	406	0	-	0	719	397
Stage 1	-	-	-	-	397	-
Stage 2	-	-	-	-	322	-
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	1153	-	-	-	395	652
Stage 1	-	-	-	-	679	-
Stage 2	-	-	-	-	735	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1153	-	-	-	394	652
Mov Cap-2 Maneuver	-	-	-	-	394	-
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	735	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	14.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1153	-	-	-	422
HCM Lane V/C Ratio	0.003	-	-	-	0.062
HCM Control Delay (s)	8.1	0	-	-	14.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	302	6	159	371	6	0	0	10	0	2	1
Future Vol, veh/h	0	302	6	159	371	6	0	0	10	0	2	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	328	7	173	403	7	0	0	11	0	2	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	410	0	0	335	0	0	1086	1088	332	1090	1088	407
Stage 1	-	-	-	-	-	-	332	332	-	753	753	-
Stage 2	-	-	-	-	-	-	754	756	-	337	335	-
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	1149	-	-	1224	-	-	194	216	710	193	216	644
Stage 1	-	-	-	-	-	-	681	644	-	402	417	-
Stage 2	-	-	-	-	-	-	401	416	-	677	643	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1149	-	-	1224	-	-	165	176	710	163	176	644
Mov Cap-2 Maneuver	-	-	-	-	-	-	165	176	-	163	176	-
Stage 1	-	-	-	-	-	-	681	644	-	402	341	-
Stage 2	-	-	-	-	-	-	325	340	-	667	643	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.5	10.1	20.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	710	1149	-	-	1224	-	-	232
HCM Lane V/C Ratio	0.015	-	-	-	0.141	-	-	0.014
HCM Control Delay (s)	10.1	0	-	-	8.4	0	-	20.7
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0.5	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	300	0	1	527	11	0	0	1	9	0	9
Future Vol, veh/h	13	300	0	1	527	11	0	0	1	9	0	9
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	14	326	0	1	573	12	0	0	1	10	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	585	0	0	326	0	0	940	941	326	936	935	579
Stage 1	-	-	-	-	-	-	354	354	-	581	581	-
Stage 2	-	-	-	-	-	-	586	587	-	355	354	-
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	990	-	-	1234	-	-	244	263	715	245	265	515
Stage 1	-	-	-	-	-	-	663	630	-	499	500	-
Stage 2	-	-	-	-	-	-	496	497	-	662	630	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	990	-	-	1234	-	-	236	258	715	241	260	515
Mov Cap-2 Maneuver	-	-	-	-	-	-	236	258	-	241	260	-
Stage 1	-	-	-	-	-	-	652	619	-	491	500	-
Stage 2	-	-	-	-	-	-	486	497	-	650	619	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	10	16.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	715	990	-	-	1234	-	-	328
HCM Lane V/C Ratio	0.002	0.014	-	-	0.001	-	-	0.06
HCM Control Delay (s)	10	8.7	0	-	7.9	0	-	16.7
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	313	570	34	14	1
Future Vol, veh/h	1	313	570	34	14	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	1	340	620	37	15	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	657	0	-	0	981	639
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	342	-
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	931	-	-	-	277	476
Stage 1	-	-	-	-	526	-
Stage 2	-	-	-	-	719	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	931	-	-	-	277	476
Mov Cap-2 Maneuver	-	-	-	-	277	-
Stage 1	-	-	-	-	525	-
Stage 2	-	-	-	-	719	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	18.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	931	-	-	-	285
HCM Lane V/C Ratio	0.001	-	-	-	0.057
HCM Control Delay (s)	8.9	0	-	-	18.4
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	297	32	6	541	61	5
Future Vol, veh/h	297	32	6	541	61	5
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	323	35	7	588	66	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	358	0	943	341
Stage 1	-	-	-	-	341	-
Stage 2	-	-	-	-	602	-
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	-	-	1201	-	291	701
Stage 1	-	-	-	-	720	-
Stage 2	-	-	-	-	547	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1201	-	288	701
Mov Cap-2 Maneuver	-	-	-	-	288	-
Stage 1	-	-	-	-	720	-
Stage 2	-	-	-	-	542	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	20.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	301	-	-	1201	-
HCM Lane V/C Ratio	0.238	-	-	0.005	-
HCM Control Delay (s)	20.7	-	-	8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.9	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	295	0	5	1	4	11	15	514	0	0	177	0
Future Volume (vph)	295	0	5	1	4	11	15	514	0	0	177	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00		1.00	0.89		1.00	1.00			1.00	
Flt Protected	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1680		1770	1653		1770	1863			1863	
Flt Permitted	0.95	0.95		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1680		1770	1653		1770	1863			1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	321	0	5	1	4	12	16	559	0	0	192	0
RTOR Reduction (vph)	0	77	0	0	12	0	0	0	0	0	0	0
Lane Group Flow (vph)	164	85	0	1	4	0	16	559	0	0	192	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	12.6	12.6		1.9	1.9		1.0	26.1			20.4	
Effective Green, g (s)	12.6	12.6		1.9	1.9		1.0	26.1			20.4	
Actuated g/C Ratio	0.23	0.23		0.03	0.03		0.02	0.47			0.37	
Clearance Time (s)	4.7	4.7		5.0	5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	379	379		60	56		31	871			681	
v/s Ratio Prot	c0.10	0.05		0.00	c0.00		0.01	c0.30			0.10	
v/s Ratio Perm												
v/c Ratio	0.43	0.23		0.02	0.08		0.52	0.64			0.28	
Uniform Delay, d1	18.5	17.6		26.0	26.1		27.2	11.3			12.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.8	0.3		0.1	0.6		13.7	1.6			0.2	
Delay (s)	19.3	17.9		26.2	26.7		40.9	12.9			12.7	
Level of Service	B	B		C	C		D	B			B	
Approach Delay (s)		18.6			26.7			13.7			12.7	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	19.9
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	517	309	31	64	643	488
Future Volume (vph)	517	309	31	64	643	488
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.98	0.95	1.00
Satd. Flow (prot)	1863	1583		3482	1770	1583
Flt Permitted	1.00	1.00		0.73	0.95	1.00
Satd. Flow (perm)	1863	1583		2581	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	562	336	34	70	699	530
RTOR Reduction (vph)	0	205	0	0	0	230
Lane Group Flow (vph)	562	131	0	104	699	300
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	22.9	22.9		22.9	25.3	25.3
Effective Green, g (s)	22.9	22.9		22.9	25.3	25.3
Actuated g/C Ratio	0.39	0.39		0.39	0.43	0.43
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	728	618		1008	764	683
v/s Ratio Prot	c0.30				c0.40	
v/s Ratio Perm		0.08		0.04		0.19
v/c Ratio	0.77	0.21		0.10	0.91	0.44
Uniform Delay, d1	15.6	11.9		11.3	15.6	11.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.6	0.1		0.0	15.2	0.2
Delay (s)	20.2	11.9		11.4	30.8	11.8
Level of Service	C	B		B	C	B
Approach Delay (s)	17.1			11.4	22.6	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	58.6	Sum of lost time (s)	14.4
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	16	6	22	11	11	26	48	483	169	21	147	4	0	0
Future Vol, veh/h	16	6	22	11	11	26	48	483	169	21	147	4	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	17	7	24	12	12	28	52	525	184	23	160	4	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	949	1021	162	941	931	617	164	0	0	709	0	0
Stage 1	208	208	-	721	721	-	-	-	-	-	-	-
Stage 2	741	813	-	220	210	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	240	236	883	243	267	490	1414	-	-	890	-	-
Stage 1	794	730	-	419	432	-	-	-	-	-	-	-
Stage 2	408	392	-	782	728	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	208	221	883	216	250	490	1414	-	-	890	-	-
Mov Cap-2 Maneuver	208	221	-	216	250	-	-	-	-	-	-	-
Stage 1	765	711	-	403	416	-	-	-	-	-	-	-
Stage 2	360	377	-	738	709	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	18.2	0.5	1.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1414	-	-	883	324	890	-	-
HCM Lane V/C Ratio	0.037	-	-	0.007	0.161	0.026	-	-
HCM Control Delay (s)	7.6	-	-	9.1	18.2	9.2	-	-
HCM Lane LOS	A	-	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0.6	0.1	-	-

Intersection	
Int Delay, s/veh	10.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	21	197	29	5	173	19	959	50	17	325	6
Future Vol, veh/h	0	21	197	29	5	173	19	959	50	17	325	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	23	214	32	5	188	21	1042	54	18	353	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1507	1531	357	1622	1507	1069	360	0	0	1096	0	0
Stage 1	393	393	-	1111	1111	-	-	-	-	-	-	-
Stage 2	1114	1138	-	511	396	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	99	117	687	82	121	269	1199	-	-	637	-	-
Stage 1	632	606	-	254	285	-	-	-	-	-	-	-
Stage 2	253	276	-	545	604	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	28	112	687	46	116	269	1199	-	-	637	-	-
Mov Cap-2 Maneuver	28	112	-	46	116	-	-	-	-	-	-	-
Stage 1	621	589	-	249	280	-	-	-	-	-	-	-
Stage 2	73	271	-	350	587	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.8	70.4	0.1	0.5
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1199	-	-	460	257	637	-	-
HCM Lane V/C Ratio	0.017	-	-	0.515	0.875	0.029	-	-
HCM Control Delay (s)	8.1	-	-	20.8	70.4	10.8	-	-
HCM Lane LOS	A	-	-	C	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.9	7.4	0.1	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	152	1	6	202	36	0	0	0	78	0	8
Future Vol, veh/h	6	152	1	6	202	36	0	0	0	78	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	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	7	165	1	7	220	39	0	0	0	85	0	9

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	259	0	0	166	0	0	434	434	240
Stage 1	-	-	-	-	-	-	254	254	-
Stage 2	-	-	-	-	-	-	180	180	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1306	-	-	1412	-	-	579	515	799
Stage 1	-	-	-	-	-	-	788	697	-
Stage 2	-	-	-	-	-	-	851	750	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1306	-	-	1412	-	-	572	0	799
Mov Cap-2 Maneuver	-	-	-	-	-	-	572	0	-
Stage 1	-	-	-	-	-	-	783	0	-
Stage 2	-	-	-	-	-	-	846	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0.2	12.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1306	-	-	1412	-	-	588
HCM Lane V/C Ratio	0.005	-	-	0.005	-	-	0.159
HCM Control Delay (s)	7.8	0	-	7.6	0	-	12.3
HCM Lane LOS	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	245	1	8	234	43	1	0	11	50	0	6
Future Vol, veh/h	6	245	1	8	234	43	1	0	11	50	0	6
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	7	266	1	9	254	47	1	0	12	54	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	301	0	0	267	0	0	580	600	267	583	577	278
Stage 1	-	-	-	-	-	-	281	281	-	296	296	-
Stage 2	-	-	-	-	-	-	299	319	-	287	281	-
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	1260	-	-	1297	-	-	426	415	772	424	427	761
Stage 1	-	-	-	-	-	-	726	678	-	712	668	-
Stage 2	-	-	-	-	-	-	710	653	-	720	678	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1260	-	-	1297	-	-	417	409	772	413	421	761
Mov Cap-2 Maneuver	-	-	-	-	-	-	417	409	-	413	421	-
Stage 1	-	-	-	-	-	-	721	673	-	707	663	-
Stage 2	-	-	-	-	-	-	698	648	-	704	673	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	10.1	14.6
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	721	1260	-	-	1297	-	-	434
HCM Lane V/C Ratio	0.018	0.005	-	-	0.007	-	-	0.14
HCM Control Delay (s)	10.1	7.9	0	-	7.8	0	-	14.6
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	302	2	25	273	12	78
Future Vol, veh/h	302	2	25	273	12	78
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	328	2	27	297	13	85

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	330	0	680	329
Stage 1	-	-	-	-	329	-
Stage 2	-	-	-	-	351	-
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	-	-	1229	-	417	712
Stage 1	-	-	-	-	729	-
Stage 2	-	-	-	-	713	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1229	-	406	712
Mov Cap-2 Maneuver	-	-	-	-	406	-
Stage 1	-	-	-	-	729	-
Stage 2	-	-	-	-	694	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	647	-	-	1229	-
HCM Lane V/C Ratio	0.151	-	-	0.022	-
HCM Control Delay (s)	11.6	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	382	297	17	24	2
Future Vol, veh/h	1	382	297	17	24	2
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	1	415	323	18	26	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	341	0	-	0	749	332
Stage 1	-	-	-	-	332	-
Stage 2	-	-	-	-	417	-
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	1218	-	-	-	379	710
Stage 1	-	-	-	-	727	-
Stage 2	-	-	-	-	665	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1218	-	-	-	379	710
Mov Cap-2 Maneuver	-	-	-	-	379	-
Stage 1	-	-	-	-	726	-
Stage 2	-	-	-	-	665	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1218	-	-	-	393
HCM Lane V/C Ratio	0.001	-	-	-	0.072
HCM Control Delay (s)	8	0	-	-	14.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	401	2	1	305	4	10	2	211	11	0	1
Future Vol, veh/h	0	401	2	1	305	4	10	2	211	11	0	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	436	2	1	332	4	11	2	229	12	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	336	0	0	438	0	0	774	775	437	889	774	334
Stage 1	-	-	-	-	-	-	437	437	-	336	336	-
Stage 2	-	-	-	-	-	-	337	338	-	553	438	-
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	1223	-	-	1122	-	-	316	329	620	264	329	708
Stage 1	-	-	-	-	-	-	598	579	-	678	642	-
Stage 2	-	-	-	-	-	-	677	641	-	517	579	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1223	-	-	1122	-	-	315	329	620	165	329	708
Mov Cap-2 Maneuver	-	-	-	-	-	-	315	329	-	165	329	-
Stage 1	-	-	-	-	-	-	598	579	-	678	641	-
Stage 2	-	-	-	-	-	-	675	640	-	325	579	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	15.3	27.1
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	590	1223	-	-	1122	-	-	176
HCM Lane V/C Ratio	0.411	-	-	-	0.001	-	-	0.074
HCM Control Delay (s)	15.3	0	-	-	8.2	0	-	27.1
HCM Lane LOS	C	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	2	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	620	0	1	281	3	0	0	0	24	0	32
Future Vol, veh/h	7	620	0	1	281	3	0	0	0	24	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	8	674	0	1	305	3	0	0	0	26	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	308	0	0	674	0	0	1016	1000	674	999	999	307
Stage 1	-	-	-	-	-	-	690	690	-	309	309	-
Stage 2	-	-	-	-	-	-	326	310	-	690	690	-
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	1253	-	-	917	-	-	216	243	455	222	243	733
Stage 1	-	-	-	-	-	-	435	446	-	701	660	-
Stage 2	-	-	-	-	-	-	687	659	-	435	446	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1253	-	-	917	-	-	204	240	455	220	240	733
Mov Cap-2 Maneuver	-	-	-	-	-	-	204	240	-	220	240	-
Stage 1	-	-	-	-	-	-	431	442	-	694	659	-
Stage 2	-	-	-	-	-	-	654	658	-	431	442	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	16.8
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1253	-	-	917	-	-	367
HCM Lane V/C Ratio	-	0.006	-	-	0.001	-	-	0.166
HCM Control Delay (s)	0	7.9	0	-	8.9	0	-	16.8
HCM Lane LOS	A	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	664	291	73	44	4
Future Vol, veh/h	5	664	291	73	44	4
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	5	722	316	79	48	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	395	0	-	0	1088	356
Stage 1	-	-	-	-	356	-
Stage 2	-	-	-	-	732	-
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	1164	-	-	-	239	688
Stage 1	-	-	-	-	709	-
Stage 2	-	-	-	-	476	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1164	-	-	-	237	688
Mov Cap-2 Maneuver	-	-	-	-	237	-
Stage 1	-	-	-	-	704	-
Stage 2	-	-	-	-	476	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	23.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1164	-	-	-	251
HCM Lane V/C Ratio	0.005	-	-	-	0.208
HCM Control Delay (s)	8.1	0	-	-	23.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	624	77	12	343	20	3
Future Vol, veh/h	624	77	12	343	20	3
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	678	84	13	373	22	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	762	0	1119	720
Stage 1	-	-	-	-	720	-
Stage 2	-	-	-	-	399	-
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	-	-	850	-	229	428
Stage 1	-	-	-	-	482	-
Stage 2	-	-	-	-	678	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	850	-	225	428
Mov Cap-2 Maneuver	-	-	-	-	225	-
Stage 1	-	-	-	-	482	-
Stage 2	-	-	-	-	665	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	21.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	240	-	-	850	-
HCM Lane V/C Ratio	0.104	-	-	0.015	-
HCM Control Delay (s)	21.7	-	-	9.3	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM Signalized Intersection Capacity Analysis
9: Kaumana Dr & Waianuenue Ave/Lele St

11/18/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	626	0	8	0	3	4	4	205	0	0	440	1
Future Volume (vph)	626	0	8	0	3	4	4	205	0	0	440	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			0.91		1.00	1.00			1.00	
Flt Protected	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1681	1681			1703		1770	1863			1862	
Flt Permitted	0.95	0.95			1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1681	1681			1703		1770	1863			1862	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	680	0	9	0	3	4	4	223	0	0	478	1
RTOR Reduction (vph)	0	68	0	0	4	0	0	0	0	0	0	0
Lane Group Flow (vph)	347	274	0	0	3	0	4	223	0	0	479	0
Turn Type	Split	NA		Split	NA		Prot	NA			NA	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases								2				
Actuated Green, G (s)	19.7	19.7			1.0		0.9	27.8			22.2	
Effective Green, g (s)	19.7	19.7			1.0		0.9	27.8			22.2	
Actuated g/C Ratio	0.31	0.31			0.02		0.01	0.44			0.35	
Clearance Time (s)	4.7	4.7			5.0		4.7	5.5			5.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	519	519			26		25	813			648	
v/s Ratio Prot	c0.21	0.16			c0.00		0.00	c0.12			c0.26	
v/s Ratio Perm												
v/c Ratio	0.67	0.53			0.12		0.16	0.27			0.74	
Uniform Delay, d1	19.2	18.2			30.9		31.0	11.5			18.2	
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2	3.3	1.0			2.0		3.0	0.2			4.4	
Delay (s)	22.4	19.1			32.9		34.0	11.7			22.6	
Level of Service	C	B			C		C	B			C	
Approach Delay (s)		20.8			32.9			12.1			22.6	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	63.7	Sum of lost time (s)	19.9
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	362	468	188	423	384	240
Future Volume (vph)	362	468	188	423	384	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4		6.4	4.0	4.0
Lane Util. Factor	1.00	1.00		0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		0.98	0.95	1.00
Satd. Flow (prot)	1863	1583		3486	1770	1583
Flt Permitted	1.00	1.00		0.69	0.95	1.00
Satd. Flow (perm)	1863	1583		2458	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	393	509	204	460	417	261
RTOR Reduction (vph)	0	293	0	0	0	160
Lane Group Flow (vph)	393	216	0	664	417	101
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	23.6	23.6		23.6	21.6	21.6
Effective Green, g (s)	23.6	23.6		23.6	21.6	21.6
Actuated g/C Ratio	0.42	0.42		0.42	0.39	0.39
Clearance Time (s)	6.4	6.4		6.4	4.0	4.0
Vehicle Extension (s)	2.0	2.0		3.0	2.0	2.0
Lane Grp Cap (vph)	790	671		1043	687	614
v/s Ratio Prot	0.21				c0.24	
v/s Ratio Perm		0.14		c0.27		0.06
v/c Ratio	0.50	0.32		0.64	0.61	0.17
Uniform Delay, d1	11.7	10.7		12.6	13.6	11.1
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		1.3	1.0	0.0
Delay (s)	11.9	10.8		13.9	14.6	11.2
Level of Service	B	B		B	B	B
Approach Delay (s)	11.2			13.9	13.3	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	14.4
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations														
Traffic Vol, veh/h	8	8	63	19	5	6	15	177	76	25	425	7	0	0
Future Vol, veh/h	8	8	63	19	5	6	15	177	76	25	425	7	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	80	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	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	2	2
Mvmt Flow	9	9	68	21	5	7	16	192	83	27	462	8	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	792	827	466	795	790	234	470	0	0	275	0	0
Stage 1	520	520	-	266	266	-	-	-	-	-	-	-
Stage 2	272	307	-	529	524	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	307	307	597	305	322	805	1092	-	-	1288	-	-
Stage 1	539	532	-	739	689	-	-	-	-	-	-	-
Stage 2	734	661	-	533	530	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	292	296	597	286	310	805	1092	-	-	1288	-	-
Mov Cap-2 Maneuver	292	296	-	286	310	-	-	-	-	-	-	-
Stage 1	531	521	-	728	679	-	-	-	-	-	-	-
Stage 2	712	651	-	506	519	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	17	0.5	0.4
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1092	-	-	597	333	1288	-	-
HCM Lane V/C Ratio	0.015	-	-	0.015	0.098	0.021	-	-
HCM Control Delay (s)	8.3	-	-	11.1	17	7.9	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	19	90	15	7	15	28	619	28	2	648	8
Future Vol, veh/h	1	19	90	15	7	15	28	619	28	2	648	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	320	-	-	95	-	-
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	21	98	16	8	16	30	673	30	2	704	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1465	1476	709	1520	1465	688	713	0	0	703	0	0
Stage 1	713	713	-	748	748	-	-	-	-	-	-	-
Stage 2	752	763	-	772	717	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	106	126	434	97	128	446	887	-	-	895	-	-
Stage 1	423	435	-	404	420	-	-	-	-	-	-	-
Stage 2	402	413	-	392	434	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	95	121	434	64	123	446	887	-	-	895	-	-
Mov Cap-2 Maneuver	95	121	-	64	123	-	-	-	-	-	-	-
Stage 1	409	434	-	390	406	-	-	-	-	-	-	-
Stage 2	367	399	-	289	433	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.5	46	0.4	0
HCM LOS	D	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	887	-	-	293	127	895	-	-
HCM Lane V/C Ratio	0.034	-	-	0.408	0.317	0.002	-	-
HCM Control Delay (s)	9.2	-	-	25.5	46	9	-	-
HCM Lane LOS	A	-	-	D	E	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.9	1.2	0	-	-

ASSESSMENT OF PROPOSED ACTION'S APPLICABILITY TO THE HAWAI'I STATE PLAN

APPENDIX

F

APPENDIX "F"

Analysis of Project Applicability to Hawai'i State Plan

Chapter 226, 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 to expand the Hilo Medical Center (HMC) increases health care infrastructure to service current and future East Hawai'i residents, ensuring adequate provision of health care facilities.**			
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 expand hospital capacity to accommodate population growth and the aging population in the East Hawai‘i region, with South Hilo being the most populated district in Hawai‘i County. The proposed expansion will increase economic opportunities in the health care sector in the long term, and in the short term through project construction-related jobs and spending.**			
Chapter 226-6 Objectives and policies for the economy – – in general			
<u>Objectives</u>: 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.		✓	
<u>Policies</u>:			
(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.			✓

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
(8) Assure that the basic economic needs of Hawaii's people are maintained in the event of disruptions in overseas transportation.			✓
(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 project indirectly supports the general objectives and policy 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. Additionally, the proposed project will provide long-term employment opportunities in the health care industry and in facility maintenance.**			
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:			

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
(1) Viability of Hawaii's sugar and pineapple industries.			✓
(2) Growth and development of diversified agriculture throughout the State.			✓
(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.			✓

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
(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.			✓
(18) Increase and develop small-scale farms.			✓
Analysis: **The proposed action does not directly or indirectly affect the objective and policies for agriculture. The location of the proposed action is not located within an agricultural district and will not affect the availability of agricultural land or promote the development of agricultural initiatives.**			
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 and 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;			✓

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
(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, 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 project is proposed by the Hawaii Health Systems Corporation (HHSC), which is an agency of the State. The proposed action is neither directly or indirectly applicable to the objective of a stable federal investment base as an integral component 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;			✓

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) 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;			✓
(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: **The proposed action is directly applicable to the objective and policies of the development and expansion of potential growth activities that serve to increase and diversify Hawai‘i's economic base. The proposed action specifically facilitates investment in the health care sector and employment growth in the industry.**			
Chapter 226-10.5 Objectives and policies for the economy – – information industry.			

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
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;			✓
(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 wireless communications industries, nor does it affect these innovation industries in advancing Hawai‘i's economic position in the Pacific Region.**			
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.			✓

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
(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.			✓
Analysis: **The proposed action is indirectly applicable to the objectives and policies for the physical environment by making prudent use of land-based resources. The proposed project expands the existing HMC within a previously developed area. The preparation of an Environmental Assessment (EA) for the proposed action assesses project impacts and identifies proposed mitigation measures; significant adverse impacts to Hawai'i's unique and fragile environmental resources are not anticipated. Additionally, the use of Best Management Practices (BMPs) ensures natural resources are not impacted by construction activities. The use of BMPs also ensures compatibility between land-based and water-based functions, resources, and ecological systems.**			
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.			✓

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
Analysis: **The proposed action is indirectly applicable to the objective and policies to preserve Hawai‘i’s natural and historical resources. An archeological study and cultural impact assessment conducted as part of the environmental review process demonstrates an effort to preserve Hawai‘i’s natural and historical resources and protect Hawai‘i’s ethnic and cultural heritage. The State Historic Preservation Division (SHPD) has been consulted and the proposed project will comply with SHPD's recommendations for mitigation.**			
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.			✓
(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 action is indirectly applicable to the objectives and policies for Hawai‘i’s physical environment by expanding an existing facility in a previously developed area. The completion of an EA and use of construction BMPs help to minimize adverse impacts and maintain land, air, and water quality and resources. Industry standard design and construction practices will be employed for this project to minimize any anticipated natural or man-made hazards. In addition, it is noted that the project site is located inland, and outside of flood hazard zones, the tsunami evacuation zone, and the projected sea level rise hazard area.**			
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.	✓		

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
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 directly and indirectly applicable to the goals and objectives for facility systems through investing in the health care sector and making capital improvements to an existing medical facility in a previously developed area, making prudent use of existing infrastructure systems. A Traffic Impact Analysis Report has been conducted to address anticipated traffic flow patterns that will affect the project area. The project also encourages flexibility in its design with identification of space for future programs and the construction of the building above existing parking areas. Additionally, cost saving measures have been taken to meet budgetary requirements.**			
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:			
(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 action is indirectly applicable to the objectives for waste facility systems as the proposed new structures will connect to the County wastewater system and is nearby existing County sewerlines. Coordination will be undertaken with the County Department of Environmental Management (DEM) to determine if improvements to the County's wastewater system will be required to service the project.**			
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:			

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(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 proposed action is directly applicable to the objectives and policies for water facility systems by expanding an existing facility that is already serviced by existing County water infrastructure. Coordination will be undertaken with the County Department of Water Supply (DWS) to determine if 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 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;			✓

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(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 action does not directly or indirectly affect the objectives or policies for statewide transportation systems and does not impact the development or diversification of transportation systems.**			
Chapter 226-18 Objectives and policies for facility systems – – energy.			
<u>Objectives</u>: 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 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.			✓
<u>Policies</u>:			
(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:			✓

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(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;			✓
(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: **The proposed action does not directly or indirectly support the objectives and policies for energy related facility systems. However, the Applicant will explore employing energy-efficient measures in its design of the project where feasible.**			
Chapter 226-18.5 Objectives and policies for facility systems – – telecommunications.			
<u>Objectives</u>: 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.			
<u>Policies</u>:			
(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.			✓
(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			✓

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(4) Facilitate the development of education and training of telecommunications personnel.			✓
Analysis: **The proposed action does not directly or indirectly affect Hawai‘i’s capacity to be a leader in the broadband wireless communication industries, nor does it affect innovate industries from advancing Hawai‘i’s economic position or influence in the Pacific Region.**			
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.			✓
(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 action is not directly or indirectly applicable to the objectives or policies to increase homeownership or rental opportunities and does not affect the availability of affordable housing in Hawai‘i.**			
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:			

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(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.			✓
(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 is directly applicable to the objectives and policies of socio-cultural health through the improvement and expansion to the Hilo Medical Center, which increases hospital capacity to meet individual health needs.**			
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.			✓

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(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.			✓
Analysis: **The proposed action is not directly or indirectly applicable to the objectives and policies for education, nor does it affect the State's ability to promote or enhance educational programs or opportunities.**			
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.			✓

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Analysis: **The proposed action is not directly or indirectly applicable to the objectives and policies for the provision of social services and will not impact the promotion of assistance programs for vulnerable populations.**			
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.			✓
(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: **The proposed action does not enhance the enjoyment or opportunities for recreational activities and is not indirectly applicable to the objectives 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.			✓

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(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 action is not directly or indirectly applicable to the objectives and policies for the advancement of individual rights and self-determination and has no implications for the alleviation of the consequences of criminal acts.**			
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 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: **The proposed action is indirectly applicable to the objectives and policies for the enhancement of culture and helps to foster an increased knowledge and understanding of Hawai‘i's ethnic and cultural heritages and history through the preparation of a Cultural Impact Assessment (CIA) that was completed as part of the environmental review process.**			
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.			✓

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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 proposed project does not address protection of life and property parameters, organizational readiness and capacity, criminal justice, or community responsibility for people's 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 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.			✓

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(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 is indirectly applicable to the objectives and policies for government as HHSC is a State founded and partially State-funded public agency with the objective of providing hospital facilities specifically to communities on the neighbor islands or in lower populated, rural areas. Additionally, the proposed project will comply with regulatory requirements of the environmental review process that advances transparency in the flow of project-related information to the public.**			

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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.			✓

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(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.			✓
(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.			✓

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(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.			✓
(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.			✓

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(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.			✓
(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.			✓

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Analysis: **The proposed action directly and indirectly supports the economic priority guidelines by improving needed medical facilities and services in East Hawai'i, supporting local construction activity and encouraging increased employment opportunities in the health care industry, which contributes to a diversified economy.**			
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.			✓
(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.			✓

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(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.			✓
Analysis: **The proposed action indirectly supports the goals and priority guidelines for population growth and land resource management by increasing hospital capacity for East Hawai'i residents and by expanding an existing facility in a developed area, in proximity to other services and existing infrastructure.**			
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 is not directly or indirectly applicable to the priority guidelines for crime and criminal justice and will not support law enforcement efficacy, conditions of correctional facilities, or alternative sanctions.**			
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.			✓

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(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 action is not directly or indirectly applicable to the priority guidelines for affordable housing and will not affect or encourage the availability of affordable housing.**			
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 is not directly or indirectly applicable to the priority guidelines and principles for quality education and does not affect the improvement or development of educational programs and resources.**			
CHAPTER 226-108: Sustainability			

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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 supports the priority guidelines and principles for sustainability by expanding an existing structure, making prudent use of land and resources. Additionally, the project indirectly encourages a sustainable economy through the promotion of construction activity and the health care sector which promotes a diversified economy.**			
CHAPTER 226-109: Climate change adaptation			
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.		✓	

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Analysis: **The proposed action is indirectly related to the priority guidelines for the environment by using construction practices and methods to avoid impacts related to climate change.**			

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