

**H2R, LLC**  
**2005 Main Street**  
**Wailuku, Hawai'i 96793**

February 13, 2020

Land Use Commission  
State of Hawaii  
P. O. Box 2359  
Honolulu, Hawaii 96804-2359

Dear Executive Officer Orodener:

Subject: Annual Report for Land Use Commission Docket No. A97-721 (Makena Resort), TMK (2)2-1-005:085

H2R, LLC hereby submits this Annual Report for Docket No. A97-721 with respect to the 27.825-acre subject parcel that it currently owns in Makena, Maui Hawaii. It is noted that the parcel was identified in Docket No. A97-721 by TMK (2)2-1-005:083, 084, and 085, but has since been consolidated into a single parcel (TMK (2)2-1-005:085).

**I. INTRODUCTION AND BACKGROUND**

As background, on February 19, 1998, the Land Use Commission of the State of Hawaii (the "Commission") filed its "Findings of Fact, Conclusions of Law, and Decision and Order" (the "1998 D&O"), which reclassified 145.943 acres of land in Makena, Maui, Hawaii from the State Land Use Agricultural District into the State Land Use Urban District (hereinafter, the "LUC Reclassified Property").

This Annual Report covers one (1) of the LUC Reclassified Parcels, hereafter referred to as the H-2 Parcel, that is owned by H2R, LLC (TMK (2)2-1-005:085) and does not address any properties owned by others. It is noted that the ownership of the remainder (and majority) of the LUC Reclassified Parcels was recently transferred from ATC Makena Entities ("ATC Makena") to AREG AC Makena Propco, LLC (doing business as "Makena Golf & Beach Club Owners").

It is noted that, on August 27 of 2012, the Commission filed an Order Granting with Modification Movant's Motion for Sixth Amendment to the Findings of Fact, Conclusions of Law, and Decision and Order, Filed on February 19, 1998, and for Release of Certain Conditions (the "2012 Amendment"). In compliance with the 2012 Amendment, the Commission released the LUC Reclassified Property from Conditions 4, 15, and 21, and amended Conditions 12 and 22 (thereafter renumbered to 11 and 19). An Amended and Restated Declaration of Conditions was recorded on September 7, 2012, in the Bureau of Conveyances as Doc. A-46330782.

## II. REPORT ON COMPLIANCE WITH LUC CONDITIONS

Pursuant to Condition No. 17, the following Annual Report presents the conditions set forth in the 1998 D&O (as amended by the 2012 Amendment) and a status of compliance for each condition:

### **Condition No. 1**

*Petitioner shall provide affordable housing opportunities for low, low- moderate, and gap group income residents of the State of Hawai'i in accordance with applicable laws, rules, and regulations of the County of Maui. The location and distribution of the affordable housing or other provisions for affordable housing shall be under such terms as may be mutually agreeable between Petitioner and the County of Maui.*

**Response:** H2R, LLC acknowledges that it is committed to meeting its workforce housing obligations for the H-2 Parcel, in full compliance with the applicable County's Workforce Housing Policy (Chapter 2.96 of the Maui County Code).

### **Condition No. 2**

*Petitioner shall coordinate with the County of Maui Board of Water Supply to incorporate the proposed project into the County Water Use and Development Plan for the area. Prior to the granting of the first discretionary permit for the single-family and multi-family residential development described in paragraph 20 of the Decision and Order or the hotel described in paragraph 21 of the Decision and Order and by or before one year from the issuance date of this Decision and Order, Petitioner shall furnish the Commission with a letter from the County of Maui Board of Water Supply confirming that (a) the potable water allocation that will be credited to Petitioner will be available to and sufficient for the proposed project as it is described in the Petition, (b) the availability of potable water will not be an obstacle or impediment to the development of the proposed project as described in the Petition and (c) the proposed project as it is described in the Petition has been incorporated into the County Water Use and Development Plan for the area and that this plan will prevent the continued over pumping of the sustainable yield of the lao aquifer.*

**Response:** H2R, LLC understands that this condition has been complied with. According to the Twenty-First Annual Report submitted by Makena Golf & Beach Club Owners in 2019, this condition was complied with as set forth in a letter from David Craddick, Director of the Department of Water Supply, County of Maui, dated February 18, 1999, which was included in its Second Annual Report.

Additional letters regarding compliance with this condition, dated October 1, 2003, from Petitioner to the Department of Water Supply, and the response from George Tengan, Director of Water Supply, dated October 7, 2003, were attached to Makena Golf & Beach Club Owner's Sixth Annual Report.

In regards to the H-2 Parcel, H2R, LLC has obtained and installed a water meter from the Department of Water Supply to serve its parcel.

### **Condition No. 3**

*Petitioner shall participate in the funding and construction of adequate water source, storage, and transmission facilities and improvements to accommodate the proposed project in accordance with the applicable laws, rules and regulations of the County of Maui, and consistent with the County of Maui water use and development plan.*

**Response:** H2R, LLC understands this condition has been satisfied. In 1976, the Petitioner participated in the Central Maui Source Development Joint Venture and also the Central Maui Transmission Joint Venture, which developed water sources in Waiehu, Maui and a transmission line from the newly developed water sources down to the Wailea and Makena regions. Further, in 1985, Makena Resort constructed a 1.5 million gallon water storage tank at the Makena Resort. As mentioned above, H2R, LLC has obtained and installed a water meter from the Department of Water Supply to serve the H-2 Parcel.

### **Condition No. 4**

*Petitioner shall contribute to the development, funding, and/or construction of school facilities, on a pro rata basis for the residential developments in the proposed project, as determined by and to the satisfaction of the State Department of Education ("DOE"). Terms of the contribution shall be agreed upon by Petitioner and DOE prior to Petitioner acquiring county rezoning or prior to Petitioner applying for building permits if county zoning is not required.*

**Response:** H2R, LLC executed an amendment to the Education Contribution Agreement for Makena Resort reflecting that the H-2 Parcel will participate in the Department of Education facilities contribution program currently set at \$5,560 per unit. See **Exhibit "A"**.

### **Condition No. 5**

*Petitioner shall participate in the pro rata funding and construction of adequate civil defense measures as determined by the State of Hawai'i and County of Maui civil defense agencies.*

**Response:** H2R, LLC understands that this condition has been complied with. As discussed in the Twenty-First Annual Report submitted by Makena Golf & Beach Club Owners, Makena Golf & Beach Club Owners and Hawaii Emergency Management Agency (HiEMA) agreed to two (2) locations for emergency sirens, one at the Makena Wastewater Treatment Plant (WWTP) and the other near Makena Big Beach (Oneloa) (sirens 157 and 158, respectively). Makena Golf & Beach Club Owners executed Rights of Entry/License Agreements with HiEMA in 2012, however, DOD informed Makena Golf & Beach Club Owners that they decided to change the location of one of the sirens from Makena Big Beach (Oneloa) to Makena State Park. In 2017, DOD completed installation of both sirens at the Makena WWTP and the Makena State Park.

### **Condition No. 6**

*Should any human burials or any historic sites such as artifacts, charcoal deposits, stone platforms, pavings, or walls be found, Petitioner shall stop work in the immediate vicinity and contact SHPD. The significance of these finds shall then be determined and approved by SHPD, and an acceptable mitigation plan shall be approved by SHPD. SHPD must verify that the fieldwork portion of the mitigation plan has been successfully executed prior to work proceeding in the immediate vicinity of the find. Burials must be treated under specific provisions of Chapter 6E, Hawai‘i Revised Statutes.*

**Response:** H2R, LLC acknowledges that the H-2 Parcel is subject to the provisions of this condition and will comply.

### **Condition No. 7**

*Petitioner shall follow the State DLNR recommendations for Petition Areas 1, 2 and 3, for archaeological data recovery and preservation. An archaeological data recovery plan (scope of work) must be approved by SHPD. That plan then must be successfully executed (to be verified in writing by the SHPD), prior to any grading, clearing, grubbing or other land alteration in these areas. In Petition Area 1, three significant historic sites (1969, 2563, 2569) are committed to preservation. A preservation plan must be approved by SHPD. This plan, or minimally its interim protection plan phase, must be successfully executed (to be verified in writing by the SHPD), prior to any grading, clearing, grubbing or other land alteration in these areas.*

**Response:** The H-2 Parcel is located in Petition Area 5, and as such, is not subject to the provisions of this condition. It is noted that an Archaeological Preservation Plan (APP) and three (3) Archaeological Monitoring Plans (AMPs) for the H-2 Parcel were prepared in compliance with the requirements of Chapter 6E, HRS, consistent with the findings of Archaeological Inventory Surveys (AIS) for the H-2 Parcel which were accepted by the State Historic Preservation Division (SHPD) in July 2008. Both APP and AMPs were accepted by the SHPD, the acceptance letters for which are included herein as **Exhibit “B”**.

**Condition No. 8**

*Petitioner shall implement efficient soil erosion and dust control measures during and after the development process to the satisfaction of the State Department of Health and County of Maui.*

**Response:** H2R, LLC acknowledges that the H-2 Parcel is subject to provisions of this condition and will comply at the appropriate time prior to development of the H-2 Parcel.

**Condition No. 9**

*Petitioner shall initiate and fund a nearshore water quality monitoring program. The monitoring program shall be approved by the State Department of Health in consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Services, and the State Division of Aquatic Resources, DLNR. Petitioner shall coordinate this consultation process with the concurrence of the State Department of Health. Mitigation measures shall be implemented by Petitioner if the results of the monitoring program warrant them. Mitigation measures shall be approved by the State Department of Health in consultation with the above mentioned agencies.*

**Response:** Makena Golf & Beach Club Owners, as the owner of Makena Resort (and majority of the LUC Reclassified Property), conducts and funds the nearshore water quality monitoring program required by this condition. The most recent monitoring reports are submitted each year as part of Makena Golf & Beach Club Owners' Annual Report. These reports are also transmitted to the State Department of Health (DOH).

**Condition No. 10**

*Petitioner shall submit a Traffic Impact Analysis Report (TIAR) for review and approval by the State Department of Transportation and the County of Maui.*

**Response:** H2R, LLC understands that this condition has been complied with. As set forth in the Twenty-First Annual Report submitted by Makena Golf & Beach Club Owners, a Traffic Impact Analysis Report (TIAR) was prepared and submitted for review by the State Department of Transportation (DOT) and the County of Maui as part of the Change in Zoning application. Following certain comments by DOT, revisions were made to the TIAR and resubmitted to DOT. The letter from DOT which confirms and accepts the TIAR was included in Makena Golf & Beach Club Owner's Third Annual Report.

Furthermore, Makena Golf & Beach Club Owners also prepared and submitted a Makena Resort Master Traffic Study, dated June 6, 2003 (Revised September 14, 2003), which was submitted to the DOT and County of Maui, and approved by

the County on September 26, 2003. The Makena Resort Master Traffic Study was included in Makena Golf & Beach Club Owners Sixth Annual Report.

In regards to the H-2 Parcel, a TIAR (assessing traffic impacts related to the proposed project on the H-2 Parcel) was prepared in October 2019 and has been submitted to DOT and the County of Maui for review and approval. See **Exhibit “C”**.

**Condition No. 11**

*(as amended) Petitioner shall participate in the pro rata funding and construction of local and regional transportation improvements and programs including dedication of rights-of-way as determined by the State Department of Transportation (“DOT”) and the County of Maui. Agreement between Petitioner and DOT as to the level of funding and participation shall be obtained within fourteen (14) years from June 1, 2000.*

**Response:** H2R, LLC acknowledges that the H-2 Parcel is subject to provisions of this condition and will comply. H2R, LLC is currently coordinating with DOT regarding compliance with this condition. H2R, LLC has prepared and recently submitted to DOT a Memorandum of Agreement regarding their pro rata funding of local and regional transportation improvements.

**Condition No. 12**

*Petitioner shall fund the design and construction of drainage improvements required as a result of the development of the Property to the satisfaction of the appropriate State of Hawai‘i and County of Maui agencies.*

**Response:** H2R, LLC acknowledges that the H-2 Parcel is subject to provisions of this condition and will comply.

**Condition No. 13**

*The Petition Areas will be developed in accordance with the Kihei-Makena Community Plan.*

**Response:** H2R, LLC acknowledges that it will develop the H-2 Parcel in accordance with the Kihei-Makena Community Plan.

**Condition No. 14**

*Petitioner shall fund, design and construct all necessary traffic improvements necessitated by development of the Petition Areas as required by the State Department of Transportation and the County of Maui Department of Public Works and Waste Management.*

**Response:** H2R, LLC acknowledges that the H-2 Parcel is subject to the provisions of this condition and will comply.

**Condition No. 15**

*Petitioner shall develop the Property in substantial compliance with the representations made to the Commission. Failure to so develop the Property may result in a reversion of the Property to its former classification, a change to a more appropriate classification, or other reasonable remedy as determined by the Commission.*

**Response:** H2R, LLC acknowledges that the H-2 Parcel is subject to the provisions of this condition and will comply.

**Condition No. 16**

*Petitioner shall give notice to the Commission of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Property, prior to development of the Property.*

**Response:** H2R, LLC acknowledges that it is subject to the provisions of this condition and will comply.

**Condition No. 17**

*Petitioner shall timely provide without any prior notice, annual reports to the Commission, the Office of Planning, and the County of Maui Planning Department in connection with the status of the subject project and Petitioner's progress in complying with the conditions imposed herein. The annual report shall be submitted in a form prescribed by the Executive Officer of the Commission.*

**Response:** In compliance with Condition No. 17, this Annual Report is being submitted by H2R, LLC for the H-2 Parcel.

**Condition No. 18**

*The commission may fully or partially release or amend the conditions provided herein as to all or any portion of the petition area upon timely motion and upon the provision of adequate assurance of satisfaction of these conditions by Petitioner.*

**Response:** H2R, LLC acknowledges the provisions of this condition.


**Condition No. 19**

*(as amended) Petitioner shall record the conditions imposed herein by the Commission and every amendment thereto with the Bureau of Conveyances pursuant to Section 15-15-92, Hawai'i Administrative Rules.*

**Response:** All conditions and amendments have been recorded as required by this condition.

If you have any questions or require any further information, please contact me at (808) 270-5936 or leilanip@pacificrimland.com.

Sincerely,



Leilani Pulmano  
H2R, LLC

Encl.

cc: Mary Alice Evans, State of Hawaii, Office of Planning (w/enclosures)  
Ann Cua, County of Maui, Department of Planning (w/enclosures)  
Yukino Uchiyama, Munekiyo Hiraga (w/enclosures)

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# **EXHIBIT A**

FIRST AMENDMENT TO  
EDUCATION CONTRIBUTION AGREEMENT FOR MAKENA RESORT

FEE IN LIEU AND CONSTRUCTION COST COMPONENT IMPACT FEE

This First Amendment, made this 15<sup>th</sup> day of November, 2019 (the "Effective Date"), by and between H2R, LLC, whose principal place of business and mailing address is 2005 Main Street, Wailuku, Hawaii 96793 (hereinafter referred to as "H2R"), and the STATE OF HAWAII DEPARTMENT OF EDUCATION, whose mailing address is Department of Education, Facilities Development Branch, 3633 Waiālae Avenue, Honolulu, Hawaii 96816 (hereinafter referred to as "DOE"). The date that the last party signs this Agreement will be the Effective Date.

WHEREAS, Makena Resort Corporation (hereinafter referred to as "MRC") and the DOE entered into that certain Education Contribution Agreement for Makena Resort (hereinafter referred to as "Agreement") made as of August 17, 2000 pursuant to which MRC agreed to pay a cash contribution to satisfy condition 5 of the Land Use Commission Docket No. A97-721 and any similar requirements imposed by the County of Maui on zoned parcels;

WHEREAS, MRC agreed to pay a cash contribution of \$1,125.00 upon the closing of each unit;

WHEREAS, at the time of the Agreement MRC had not determined the timetable for development and had not determined the number of single family or multi-family units to be developed;

WHEREAS, the terms of the Agreement and this Amendment are to be renegotiated in the event that the DOE adopts any amendment to its school facilities contribution program;

WHEREAS, the Agreement is binding upon and shall be endued to the benefit of the parties and their respective successors and assigns;

WHEREAS, the DOE school facilities contribution program was amended in 2007 by Act 245, now codified as Hawaii Revised Statutes (HRS) Section 302A-1601, which established the statewide school impact fee program;

WHEREAS, H2R is a successor to MRC, but only as to Tax Map Key No. (2) 2-1-005:085 mentioned below;

WHEREAS, H2R is the developer and recorded fee simple owner of that certain parcel of land comprised of approximately 27.825 acres and identified as Tax Map Key No. (2) 2-1-005:085 ("Parcel H-2"), also shown on the map attached as Exhibit A and made part hereof;

WHEREAS, Parcel H-2, when fully developed, is anticipated to contain a total of 53 house lots to contain the maximum permissible number of 53 single-family residential units ("Units");

WHEREAS, the site of Parcel H-2 is located in the "school impact district" as defined and determined under HRS Sections 302A-1602 and 1604;

WHEREAS, pursuant to the current provisions of HRS Sections 302A-1601 to 1612, DOE is authorized to collect impact fees from all new residential development in designated areas;

WHEREAS, for the land component, pursuant to HRS Section 302A-1606(c)(5), DOE has exclusive authority to determine whether the obligation shall be satisfied by actual acreage or fees in lieu thereof; and

WHEREAS, H2R and DOE have mutually agreed that the educational contribution set forth in this First Amendment will satisfy all DOE requirements for all Units developed on Parcel H-2, less any that are specifically exempted by statute.

NOW, THEREFORE, H2R and DOE agree that the Agreement is hereby amended to incorporate the following provisions, to supersede and replace any existing provisions that are in conflict with or inconsistent herewith:

1. Land Component Fee in Lieu and Construction Cost Component Impact Fee. Pursuant to HRS Section 302A-1606(c)(3), DOE has determined that, in lieu of a "dedication of land", it will require a cash payment of a "fee in lieu" thereof by H2R with respect to the development of Parcel H-2. The "construction cost component impact fee" required under HRS Section 302A-1601 and 1607 will also be payable in cash.

2. Total Impact Fee. H2R and its successors in interest shall contribute to DOE a cash-only contribution (Land Component Fee in Lieu and Construction Cost Component Impact Fee) in the amount of FIVE THOUSAND FIVE HUNDRED SIXTY AND NO/100 DOLLARS (\$5,560.00) for each Unit developed on Parcel H-2 (which amount may be adjusted to the amount reflected in the Central Maui District Fee Schedule in effect at the time of actual payment, if different).

(a) This total cash-only contribution shall be paid out of Escrow and made payable to the "State of Hawaii, Department of Education" in the amount of FIVE THOUSAND FIVE HUNDRED SIXTY AND NO/100 DOLLARS (\$5,560.00) or such higher or lower amount that shall be reflected in the Central Maui District Fee Schedule in effect at the time of actual payment, payable prior to issuance of a building permit for construction on each of the lots of a single family unit within Parcel H-2.

(b) The amount of the fee shall be adjusted from time to time after the Effective Date of this First Amendment to the date it is paid so that it is always equal to the Central Maui District Fee Schedule that is in effect at the time of payment.

3. Binding Effect and Transfer. This First Amendment shall be binding upon H2R or its successors in interest, including each developer of Units on Parcel H-2. H2R shall not sell, gift or otherwise transfer all or part of its rights or obligations under this First Amendment to any corporation, partnership, company, LLC or other business entity or individual without notification to and approval of DOE, which approval shall not be unreasonably withheld, and such sale, gift or other transfer shall be conditioned upon the understanding that such additional entity is bound by the terms and conditions of the Agreement as amended hereby.

4. Scope. This First Amendment applies to the development of Parcel H-2 only, as shown on Exhibit A, and shall not be construed as amending the Agreement as to the development of any other portions of the lands in Makena Resort or elsewhere that are or may be covered by the Agreement.

5. Amendment. This First Amendment shall not be further amended except in writing signed by H2R and DOE.

6. Entire Agreement. This First Amendment constitutes the entire agreement of H2R and DOE with respect to the matters set forth in this First Amendment, and there are no agreements, understandings, warranties or representations between H2R and DOE except as set forth herein.

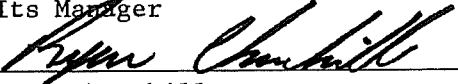
7. Governing Law and Venue. The validity of this First Amendment and any of its terms or provisions as well as the rights and duties of the parties to this First Amendment, shall be governed by the laws of the State of Hawaii. Any action at law or in equity to enforce or interpret the provisions of this First Amendment shall be brought in a state court of competent jurisdiction in Wailuku, Hawaii.

8. Execution. This First Amendment may be executed in counterparts, each of which shall be deemed an original, and said counterparts shall together constitute one and the same document. Each counterpart shall be executed by one or more of the parties to this instrument and several counterparts shall constitute one instrument to the same effect as though the signature of all parties were upon the same instrument. For all purposes, including, without limitation, recordation, filing and delivery of this instrument, duplicate unexecuted and unacknowledged pages of the counterparts may be discarded and the remaining pages assembled as one document.

IN WITNESS WHEREOF, the parties have executed and delivered this First Amendment the day and year first above written.

H2R, LLC  
By Pacific Rim Land, Inc.  
Its Manager

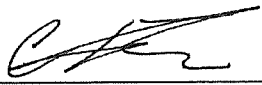
Date: \_\_\_\_\_

By  \_\_\_\_\_  
Ryan Churchill  
Its President

"H2R"


STATE OF HAWAII DEPARTMENT OF  
EDUCATION

Date: November 15, 2019

By  \_\_\_\_\_  
CHRISTINA M. KISHIMOTO  
Superintendent

"DOE"

APPROVED AS TO FORM:



Stuart N. Fujieka

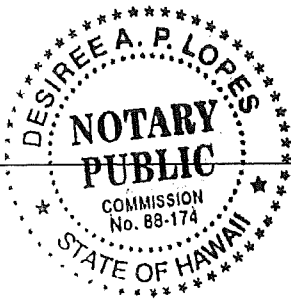
Deputy Attorney General  
State of Hawaii

OCT 10 2019

Date: \_\_\_\_\_

STATE OF HAWAII )  
 ) SS.  
COUNTY OF MAUI )

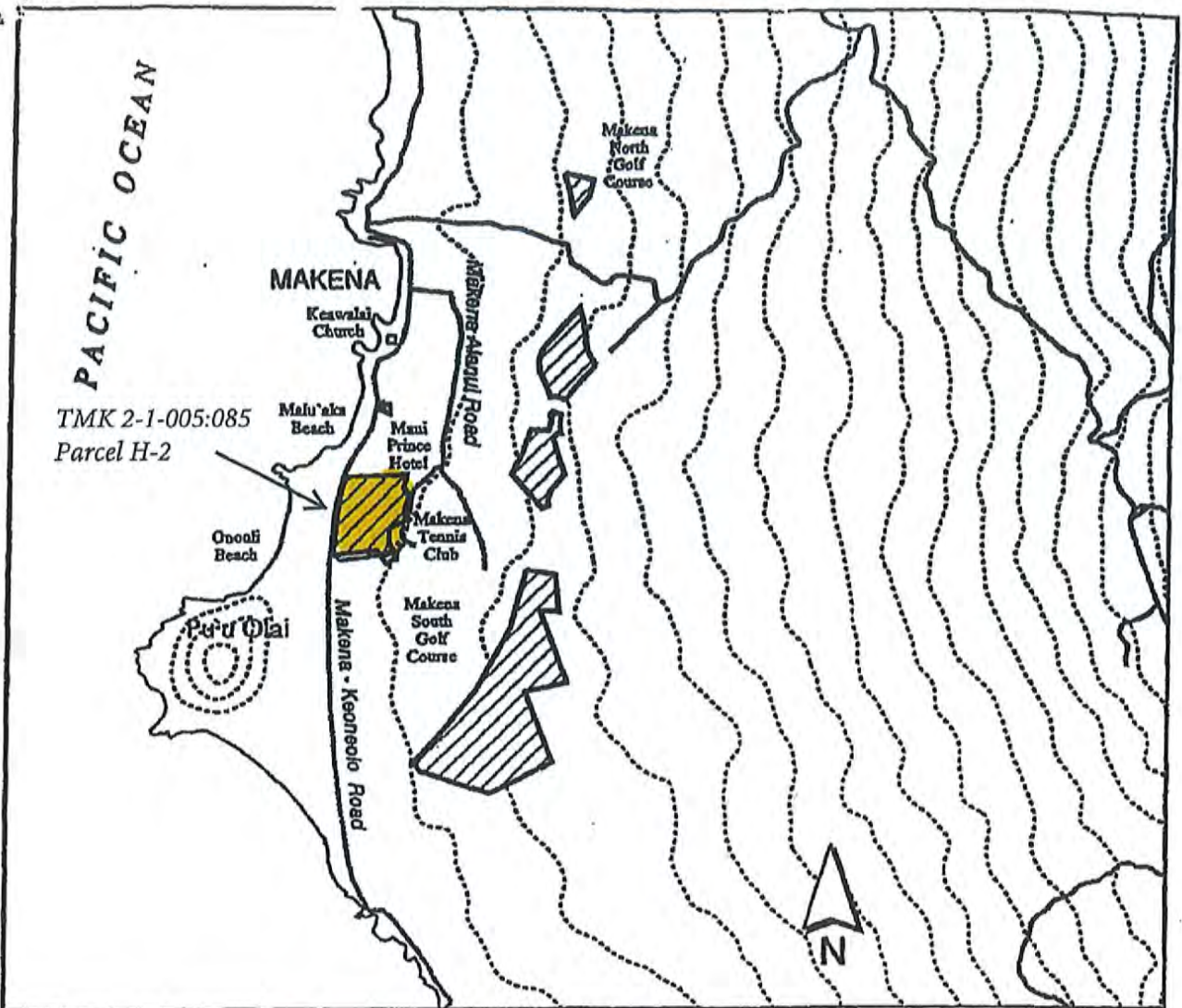
On November 4, 2019, before me personally appeared Ryan Churchill, to me personally known, who, being by me duly sworn or affirmed, did say that such person(s) executed this 7-page First Amendment to Education Contribution Agreement for Makena Resort dated undated at time of notary in the Second Circuit of the State of Hawaii, as the free act and deed of such person(s), and if applicable, in the capacity(ies) shown, having been duly authorized to execute such instrument in such capacity(ies).





Print Name: **DESIREE A. P. LOPES**  
Notary Public, State of Hawaii. **My commission expires 3/30/2020**

My commission expires: \_\_\_\_\_



A97-721 / MAKENA RESORT  
CORP.,  
A Hawai'i Corporation

LOCATION MAP

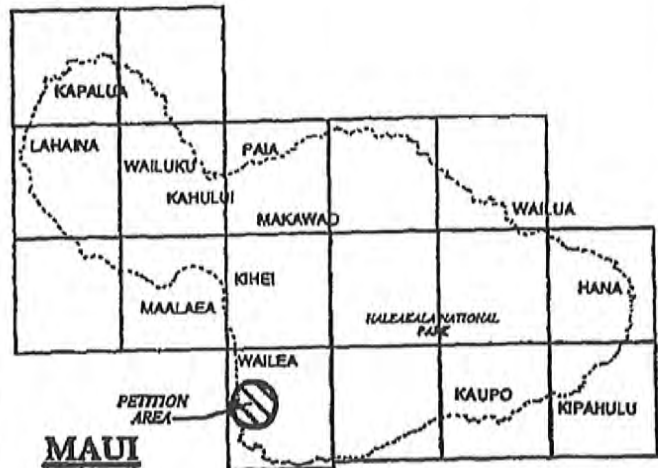
TAX MAP KEY NO.: 2-1-05: 83, 84,  
85, & por. 108; 2-1-07: 4; &  
2-1-08: por. 90

Makena, Maui, Hawai'i



**APPROVED AREA**

**EXHIBIT " A "**



**MAUI**

# **EXHIBIT B**



LINDA LINGLÉ  
GOVERNOR OF HAWAII



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

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

RUSSELL Y. TSUIJI  
FIRST DEPUTY

KEN C. KAWAHARA  
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
PLANNING 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  
KAOLOAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

July 21, 2009

Jeffrey Pantaleo, M.A.  
Archaeological Services Hawai'i, LLC  
1930 A Vineyard Street  
Wailuku, Hawai'i 96793  
[hja@ashmaui.com](mailto:hja@ashmaui.com)

LOG NO: 2009.2918  
DOC NO: 0907PC53  
Archaeology

**SUBJECT:** Chapter 6E-42 Historic Preservation Review -- REVISED Archaeological Preservation Plan for SHHP #50-50-14-6371, -6373, -6374, -6377, -6378 and -6379 Maluaka Ahupua'a, Makawao District, Island of Maui, Hawai'i  
TMK: (2) 2-1-005:085 and (2) 2-1-005:108 por.

Thank you for the opportunity to again review this plan, which our staff received in PDF format on July 14 of 2009 (Rotunno-Hazuka and Pantaleo 2009): *Archaeological Preservation Plan for Sites 50-50-14-6371, -6373, -6374 Feature 1, -6377, -6378 and -6379*...Archaeological Services Hawai'i, LLC.

The plan was reviewed by SHPD staff on June 17 (SHPD LOG NO: 2008.5257; DOC NO: 0906PC32) and again on July 6 of 2009 (SHPD LOG NO: 2009.2892; DOC NO: 0907PC04), resulting in several requested revisions.

The preservation plan now contains the required information as specified in HAR §13-277-3 regarding the contents of preservation plans in general and is acceptable. An associated monitoring plan, received in July of 2008, was held pending acceptance of the preservation plan and will now be reviewed under separate cover.

Now that the plan has been accepted pursuant to HAR §13-277, please send one hardcopy of the *revised* document clearly marked FINAL, along with a copy of this review letter and a text-searchable PDF file on CD to the attention of "SHPD Library" at the Kapolei SHPD office.

If you have any questions or comments regarding this letter, please contact the SHPD's Lead Maui Archaeologist, Ms. Patty Conte ([Patty.J.Conte@hawaii.gov](mailto:Patty.J.Conte@hawaii.gov)).

Aloha,

Nancy McMahon, Deputy SHPO/State Archaeologist  
State Historic Preservation Division

c: Jeff Hunt, Director, Dept. of Planning, FAX (808) 270-7634  
Maui CRC, Dept. of Planning, 250 S. High Street, Wailuku, Hawai'i 96793

LINDA LINGLE  
GOVERNOR OF HAWAII



**RECEIVED**

BY *SLI* DATE *05/18/07*



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
601 KAMOKILA BOULEVARD, ROOM 555  
KAPOLEI, HAWAII 96707

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

ROBERT K. MASUDA  
DEPUTY DIRECTOR

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

May 11, 2007

Mr. Jeffrey Pantaleo  
Archaeological Services Hawaii, LLC.  
1930 A Vineyard Street  
Wailuku, Hawaii 96793

LOG NO: 2007.1108  
DOC NO: 0704MK44  
Archaeology

Dear Mr. Pantaleo:

**SUBJECT:** Chapter 6E-42 Historic Preservation Review – (County/DSA)  
Archaeological Monitoring Plan for the  
Proposed Development of Parcel H-1 for Keaka LLC, SM1 2005/0015,  
72 Unit Condominium, Ancillary Recreation Building and Related Improvements,  
Grading and Grubbing (G T2007/0004), (WTP T 2007/0003) and  
Building Permit Applications (B T 2006/2989 through B T2006/3026)  
Maluaka and Kaeo Ahupuaa, Makawao District, Island of Maui  
TMK (2) 2-1-005: 084 and 2-1-006:037, 2-1-006:056

Thank you for the opportunity to review this plan and permit applications which were received by our staff on the following dates: November 28, 2006 (Archaeological Monitoring Plan), December 8, 2006 (SM1 2005/0015), January 17, 2007 (Mass Grading/Work on County Highway (G 2007/0004, WTP 2007/0003) and February 20, 2007 (Building Permit Applications B T 2006/2989 through 2006/3026). There has been some confusion regarding particular permit applications as covered by the archaeological monitoring plan, as the monitoring plan references the above three parcels on the cover, and includes a portion of TMK 2-1-005:085, 083, and 108. While we understand that portions of these parcels will be utilized during development of TMKs 2-1-005: 084, 2-1-006: 037, and 2-1-006: 056, and that they are included in the archaeological monitoring plan text, we will address those issues separately. TMK 2-1-005:0084 is a two acre parcel mauka the old Makena Road on which the old Makena School was located, TMK 2-1-006: 037 is 9.2 acres and 2-1-006:056 is 1.01 acres.

We have previously provided comments on an archaeological inventory survey (LOG NO: 2006.2117/ DOC NO: 0606MK35), a Draft Environmental Assessment (LOG 2006.2121/ DOC NO: 0606MK40), additional testing at SIHP 50-50-14-5711, Feature 7 (LOG NO: 2006.4243/ DOC NO: 0612MK38), a Preservation Plan for a Ceremonial Complex (LOG NO:2006.4244/ DOC NO: 0612MK39), and a Burial Treatment Plan for SIHP 50-50-14-5706, Feature 11 (2006.2468/ DOC NO:0609HR08).

During the archaeological inventory survey, which was conducted on TMKs 2-1-005:084 and 2-1-006:037 and 056, a total of 15 historic properties comprised of 80 features were identified. Several of these (N=11) were previously identified during prior archaeological work in the area by Bishop Museum,

Mr. Jeffrey Pantaleo

Page 2

but did not receive formal SIHP designations until this survey. SHPD concurred with the preservation recommendation that SIHP 50-50-14-5711, a ceremonial site with eight features. Subsequent testing at Feature 7 of this site determined that this particular feature was not part of the ceremonial complex. It was interpreted as a water control feature within a small swale. It was excluded from the above mentioned Preservation Plan.

Outstanding concerns during review of the Draft Environmental Assessment included the Preservation Plan, the Burial Treatment Plan, and the Data Recovery Report for the old Makena School Site. We have reviewed and accepted, as indicated above, both the Preservation Plan for SIHP 50-50-14-5711 and the Burial Treatment Plan. Still outstanding is the Data Recovery Report. The data recovery project was conducted by Bishop Museum, long ago. Your firm has been unsuccessful in obtaining the field notes from the data-recovery work. We have recently received a copy of the oral historic component of the project, which was prepared by Hana Pono, LLC (Taua and Kapahulehua 2006). We understand that the current developer will assume responsibility for obtaining information from Bishop Museum to complete this report in the future.

The archaeological monitoring plan conforms to Hawaii Administrative Rules Chapter 13-279 which govern standards for monitoring; the subject plan includes the following provisions. An archaeologist will be on site on a full-time basis and will have the authority to halt excavation in the event that cultural materials are identified. Consultation with Maui SHPD will occur in this event, to determine acceptable course of action. If human burials are identified, work will cease, the SHPD Burial Sites Program, Maui SHPD, Oahu SHPD and the Maui/Lanai Islands Burial Council will be notified, and compliance with procedures outlined in HRS 6.E-43 will be followed. Coordination meetings with the construction crew will be held prior to project initiation. The plan further indicates that an acceptable report will be submitted to this office within 180 days of project completion. We appreciate your voluntary correction of page 1, assuring that only the three above mentioned parcels are included in this plan.

Please notify our Maui and Oahu offices, via facsimile, at onset and completion of the project and monitoring program.

The plan is acceptable. We believe there will be "no historic properties affected" with the implementation of this monitoring plan, and the interim and long term protection measures detailed in the Burial Treatment Plan and the Preservation Plan. If you have any questions, please contact Dr. Melissa Kirkendall at (808) 243-5169.

Aloha,

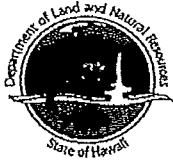


Melanie Chinen, Administrator  
State Historic Preservation Division

MK:kf

c: Bert Ratte, DPWEM, County of Maui  
Jeff Hunt, Director, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793  
Maui Cultural Resources Commission, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793  
Jeff Pantaleo, Principle Investigator, ASH, LLC 837-0171  
Hinano Rodrigues, Cultural Historian, SHPD  
Everett Dowling, Dowling Company, Inc. FAX 242-2777

LINDA LINGLE  
GOVERNOR OF HAWAII



AUG 07 2008

BY: \_\_\_\_\_



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
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FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

August 5, 2008

Jeffrey Pantaleo, M.A.  
Archaeological Services Hawai'i, LLC  
1930 A Vineyard Street  
Wailuku, Hawai'i 96793

LOG NO: 2008.3404  
DOC NO: 0808PC11  
Archaeology

Dear Mr. Pantaleo:

**SUBJECT: Chapter 6E-42 Historic Preservation Review--REVISED Archaeological Monitoring Plan for H2 Parcel 83 in Maluaka Ahupua'a, Makawao District, Maui Island**  
**TMK: (2) 2-1-005:083 and 120 por.**

Thank you for the opportunity to review this revised plan, which our staff received on July 31, 2008 (Rotunno-Hazuka and Pantaleo 2008): *Archaeological Monitoring Plan for Parcel 83 Located at TMK (2) 2-1-005:083 and Portion of 120...* Archaeological Services Hawai'i, LLC.

The plan was first reviewed by SHPD staff on July 31 of 2008, resulting in a revisions regarding TMK clarification (SHPD LOG NO: 2008.1983; DOC NO: 0807PC42). The most recent version of the report was reviewed in PDF format to confirm completion of the revision.

Precautionary monitoring was recommended by your firm for all future ground altering disturbance within the subject parcel after completion of an inventory survey in which two culturally significant sites comprised of 18 component features, now on record as SIHP #50-50-14-6366 [walls/wall segments, wooden house remnant, concrete slab foundations, surface 'ili 'ili and refuse scatters, mounds] and -6367 [L- and U-shaped enclosures], with the former representing an historic period homestead and the latter a traditional period (late pre-Contact to early historic) short-term habitation and/or agricultural site were identified.

The SHPD has recently accepted a revised version of the inventory survey report (SHPD LOG NO: 2008.3048; DOC NO: 0807PC41) and with respect to the Hawai'i Register of Historic Places, concurred that SIHP #50-50-14-6366 and -6367 are significant under Criterion D for their potential to yield information important to history or prehistory. We also concurred that enough such information has been collected and except for precautionary archaeological monitoring during all future ground altering disturbance within the subject parcel, no further historic preservation work with respect to the abovementioned sites themselves is necessary.

As specified in the monitoring plan, there will be one archaeological monitor on site at all times for each piece of ground disturbing equipment in use. A coordination meeting with the construction crew and all other pertinent parties to explain monitoring procedures and that the monitoring archaeologist has the authority to halt work in the vicinity of a culturally significant find will be undertaken, and should anything of cultural significance be identified, the SHPD will be consulted for mitigation

Jeffrey Pantaleo, M.A.  
Page 2

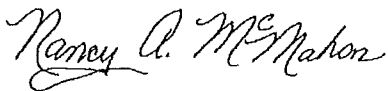
recommendations. The plan further states that in the event human remains are inadvertently exposed, both the SHPD and Maui/Lana'i Islands Burial Council (MLIBC) will be notified and appropriate burial protocol followed. A report detailing the findings of the monitoring will be prepared and submitted to our office for review within 180 days after the completion of the project.

The plan now contains the required information as specified in HAR §13-279-4(a) regarding monitoring plans in general and is acceptable.

Please forward two hardcopies of the revised monitoring plan to our office for archiving. One should be sent to O'ahu and the other to Maui with a copy of this letter attached.

If you have any questions or comments regarding this letter, please contact Patty Conte ([Patty.J.Conte@hawaii.gov](mailto:Patty.J.Conte@hawaii.gov)).

Aloha,



Nancy McMahon, Deputy SHPO/State Archaeologist  
State Historic Preservation Division

c: Jeff Hunt, Director, Dept. of Planning, 250 S. High Street, Wailuku, Hawai'i 96793  
Maui CRC, Dept. of Planning, 250 S. High Street, Wailuku, Hawai'i 96793

LINDA LINGLE  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

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ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOLAWEHI AND RESERVE COMMISSION  
LAND  
STATE PARKS

July 21, 2009

Jeffrey Pantaleo, M.A.  
Archaeological Services Hawai'i, LLC  
1930 A Vineyard Street  
Wailuku, Hawai'i 96793  
[lisa@ashmaui.com](mailto:lisa@ashmaui.com)

LOG NO: 2008.3045  
DOC NO: 0907PC54  
Archaeology

**SUBJECT: Chapter 6E-42 Historic Preservation Review --  
Archaeological Monitoring Plan for Parcel H-2  
Maluaka Ahupua'a, Makawao District, Island of Maui, Hawai'i  
TMK: (2) 2-1-005:085; (2) 2-1-005:108; (2) 2-1-005:120 por.**

Thank you for the opportunity to review this plan, which although originally submitted in 2008 was not subject to formal SHPD review until now. The plan (Rotunno-Hazuka and Pantaleo 2008); *Archaeological Monitoring Plan for Parcel H-2*... Archaeological Services Hawai'i, LLC, was received by our staff in hardcopy format on July 23 of 2008 but held pending acceptance of an archaeological inventory survey report and associated site preservation plan.

The plan was proactively prepared by your firm as a result of a long-standing archaeological consultant commitment between your firm and the project developer. Precautionary archaeological monitoring for all ground altering disturbance in the project area was recommended upon completion of at least two prior archaeological inventory surveys within the bounds of the current subject parcels, during which several culturally and historically significant sites have been identified (SHPD LOG NO: 2008.3048; DOC NO: 0807PC41 and SHPD LOG NO: 2008.4506; DOC NO: 0810PC21). Those known to be in the immediate vicinity of the proposed project include SIHP #50-50-14-6366 [post-Contact period walls/wall segments, wooden house remnant, concrete slab foundations, surface *ʻŪ* *ʻŪ* and refuse scatters, mounds], -6367 [late pre-Contact to early post-Contact L- and U-shaped enclosures], -6371 [pre-Contact habitation platform and five walled pits], -6372 [mid 19<sup>th</sup> century habitation midden scatter and wooden shack], -6373 [pre-Contact habitation enclosures and platform] -6374 [four boundary walls and a modified outcrop wall, all post-Contact in origin], -6376 [pre-Contact to early post-Contact habitation and agricultural features], -6377 [pre-Contact habitation U-shape and circular walled pit probably used for agriculture], -6378 [pre-Contact habitation square enclosure and modified outcrop with constructed pits and a natural cupboard] and -6379 [two rectangular pre-Contact habitation enclosures and platforms].

Feature 1 of -6374 and five other sites (-6371, -6373, -6377, -6378 and -6379) are subject to archaeological site preservation commitments (SHPD LOG NO: 2008.5257/DOC NO: 0906PC32; SHPD LOG NO: 2009.2892/DOC NO: 0907PC04; SHPD LOG NO: 2009.2918/DOC NO: 0907PC53). *Please note, we expect to receive written and photographic verification that short-term preservation measures are in place prior to the onset of ground altering activity within the subject parcels.*

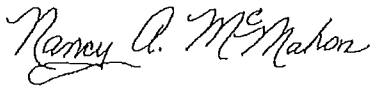
As specified in the monitoring plan, there will be one archaeological monitor on site for each piece of ground altering machinery in operation during the proposed project. A coordination meeting with the construction crew and all other pertinent parties to explain monitoring procedures and that the monitoring archaeologist has the authority to halt work in the vicinity of a culturally significant find will be undertaken, and should anything of cultural significance be identified, the SHPD will be consulted for mitigation recommendations. The plan further states that in the event human remains are inadvertently exposed, both the SHPD and Maui/Lana'i Islands Burial Council (MLIBC) will be notified and appropriate burial protocol followed once jurisdictional determination has been made. *No human remains will be collected or removed from the project area unless specifically authorized by the SHPD.* A report detailing the findings of the monitoring activity will be prepared and submitted to our office for review within 180 days after the completion of the project.

The plan contains the required information as specified in HAR §13-279-4(a) regarding monitoring plans in general and is acceptable.

Now that the monitoring plan has been accepted pursuant to HAR §13-279, please send one hardcopy, clearly marked FINAL, along with a copy of this review letter and a text-searchable PDF file on CD to the attention of "SHPD Library" at the Kapolei SHPD office.

If you have any questions or comments regarding this letter, please contact the SHPD's Lead Maui Archaeologist, Ms. Patty Conte ([Patty.J.Conte@hawaii.gov](mailto:Patty.J.Conte@hawaii.gov)).

Aloha,



Nancy McMahon, Deputy SHPO/State Archaeologist  
State Historic Preservation Division

c: Jeff Hunt, Director, Dept. of Planning, FAX (808) 270-7634  
Maui CRC, Dept. of Planning, 250 S. High Street, Wailuku, Hawai'i 96793

# **EXHIBIT C**



---

# TRAFFIC IMPACT ANALYSIS REPORT MAKENA PARCEL H-2 PROJECT

Makena, Maui, Hawaii

**FINAL DRAFT**

October 4, 2019

Prepared for:

H2R LLC  
2005 Main Street  
Wailuku, Maui 96793



*Austin, Tsutsumi & Associates, Inc.*

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Honolulu • Wailuku • Hilo, Hawaii

---

**TRAFFIC IMPACT ANALYSIS REPORT  
MAKENA PARCEL H-2 PROJECT**

Makena, Maui, Hawaii

**FINAL DRAFT**

Prepared for

H2R LLC

Prepared by

**Austin, Tsutsumi & Associates, Inc.**

Civil Engineers • Surveyors  
Honolulu • Wailuku • Hilo, Hawai'i

October 4, 2019



## TABLE OF CONTENTS

	<b><u>Page</u></b>
1. INTRODUCTION.....	1-4
1.1 Location.....	1
1.2 Project Description .....	1
2. METHODOLOGY .....	4
2.1 Study Methodology.....	4
2.2 Intersection Analysis .....	4
3. EXISTING CONDITIONS.....	5-10
3.1 Roadway System .....	5
3.2 Existing Traffic Volumes.....	5
3.3 Existing Traffic Conditions Observations and Analysis .....	6
3.3.1 Existing Intersection Analysis .....	6
4. BASE YEAR 2028 TRAFFIC CONDITIONS .....	11-21
4.1 Defacto Growth Rate.....	11
4.2 Traffic Forecasts for Known Developments.....	11
4.2.1 Background Projects.....	11
4.3 Planned Roadway Improvements .....	17
4.4 Base Year 2028 Analysis .....	17
4.4.1 Base Year 2028 Intersection Analysis.....	17
5. FUTURE YEAR 2028 TRAFFIC CONDITIONS.....	22-30
5.1 Background .....	22
5.1.1 Trip Generation.....	22
5.1.2 Trip Distribution and Assignment.....	22
5.2 Future Year 2028 Analysis .....	24



5.2.1	Future Year 2028 Intersection Analysis.....	24
6.	CONCLUSIONS.....	31-32
6.1	Existing Conditions.....	31
6.2	Base Year 2028.....	31
6.3	Future Year 2028 .....	32
7.	REFERENCES.....	33



## TABLE OF CONTENTS Cont'd

### TABLES

3.1	LOS SUMMARY TABLE EXISTING CONDITIONS .....	10
4.1	BACKGROUND PROJECTS TRIP GENERATION.....	14
4.2	EXISTING 2018 AND BASE YEAR 2028 LEVEL OF SERVICE SUMMARY .....	21
5.1	TRIP GENERATION RATES.....	23
5.2	PROJECT-GENERATED TRIPS.....	24
5.3	EXISTING 2018 CONDITIONS, BASE YEAR 2028 CONDITIONS AND FUTURE YEAR 2028 CONDITIONS.....	29-30

### FIGURES

1.1	LOCATION MAP .....	2
1.2	SITE PLAN .....	3
3.1	EXISTING LANE CONFIGURATION, VOLUMES AND LOS – MAKENA AREA.....	8
3.2	EXISTING LANE CONFIGURATION, VOLUMES AND LOS – KIHEI- WAILEA AREA .....	9
4.1	BACKGROUND PROJECTS IN KIHEI.....	15
4.2	BACKGROUND PROJECTS IN WAILEA-MAKENA .....	16
4.3	BASE YEAR 2028 LANE CONFIGURATION, VOLUMES AND LOS – MAKENA AREA .....	19
4.4	BASE YEAR 2028 LANE CONFIGURATION, VOLUMES AND LOS – KIHEI-WAILEA AREA .....	20
5.1	PROJECT-GENERATED TRIPS – MAKENA AREA.....	25
5.2	PROJECT-GENERATED TRIPS – KIHEI-WAILEA AREA.....	26
5.3	FUTURE YEAR 2028 LANE CONFIGURATION, VOLUMES AND LOS – MAKENA AREA .....	27
5.4	FUTURE YEAR 2028 LANE CONFIGURATION, VOLUMES AND LOS – KIHEI-WAILEA AREA .....	28



## TABLE OF CONTENTS Cont'd

### APPENDICES

- A. TRAFFIC COUNT DATA
- B. LEVEL OF SERVICE CRITERIA
- C. LEVEL OF SERVICE CALCULATIONS
- D. FOUR-HOUR VEHICLE VOLUME SIGNAL WARRANTS
- E. RESORT RESIDENTIAL TRIP GENERATION RATE DEVELOPMENT



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Maui Branch Manager

## TRAFFIC IMPACT ANALYSIS REPORT

### MAKENA H-2 PARCEL PROJECT

#### Makena, Maui, Hawaii

## 1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the proposed Makena H-2 Parcel Project (hereinafter referred to as the "Project").

### 1.1 Location

The Project is located on a currently vacant parcel of land bound by Makena Alanui Road to the east and south, and Makena Keoneoio Road to the west. Figure 1.1 shows the Project location.

### 1.2 Project Description

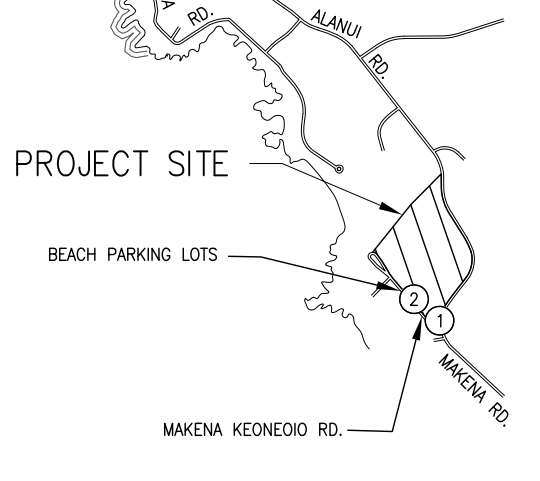
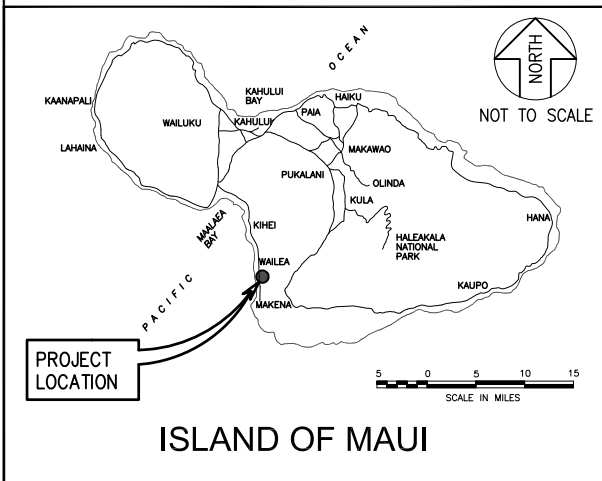
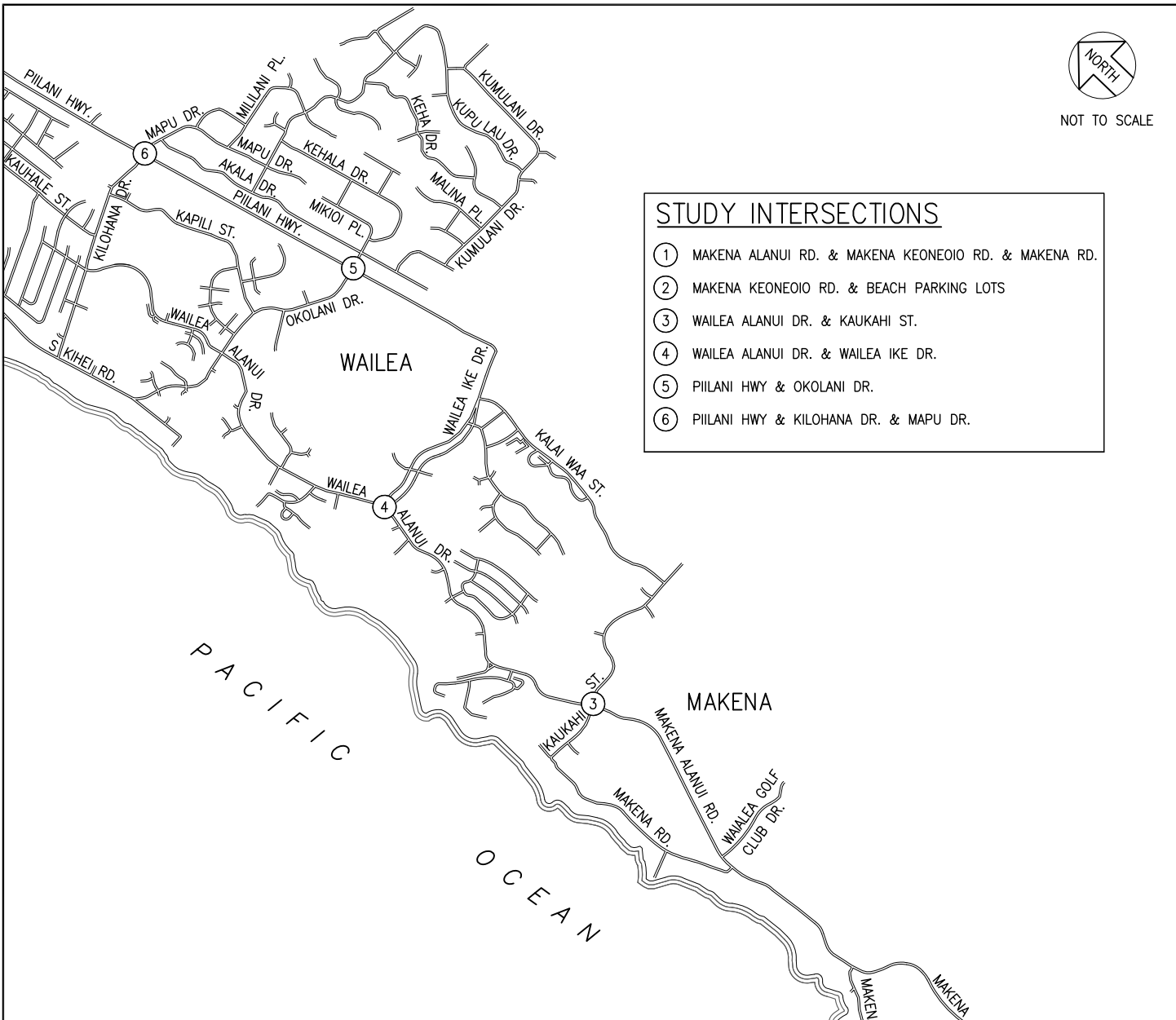
The Project proposes to develop a 53-unit CPR residential development with a 57-stall beach parking lot. It should be noted that an existing 50-stall beach parking lot will be replaced, resulting in a beach parking stall count increase of 7 stalls. The Project's residential component will have one access via Makena Keoneoio Road near the northwest corner of the parcel, while the beach parking lot will be serviced by a separate driveway. Figure 1.2 shows the Project site plan.



NOT TO SCALE

### STUDY INTERSECTIONS

- ① MAKENA ALANUI RD. & MAKENA KEONEOIO RD. & MAKENA RD.
- ② MAKENA KEONEOIO RD. & BEACH PARKING LOTS
- ③ WAILEA ALANUI DR. & KAUKAHI ST.
- ④ WAILEA ALANUI DR. & WAILEA IKE DR.
- ⑤ PIILANI HWY & OKOLANI DR.
- ⑥ PIILANI HWY & KILOHANA DR. & MAPU DR.



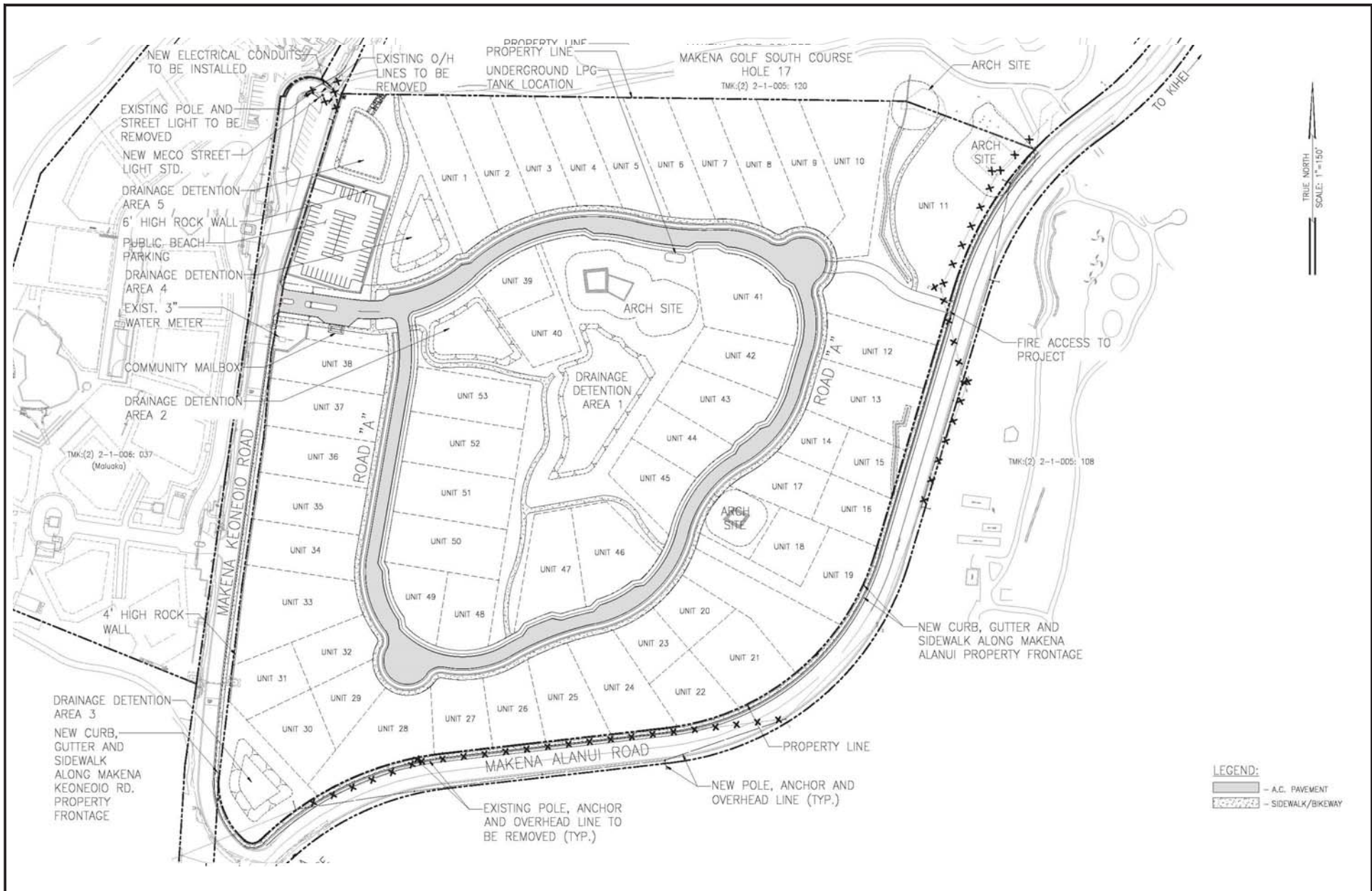
MAKENA PARCEL H-2 PROJECT  
TIAR

**AUSTIN, TSUTSUMI & ASSOCIATES, INC.**  
ENGINEERS, SURVEYORS HONOLULU, HAWAII

**PROJECT LOCATION MAP**

**FIGURE**  
**1.1**





MAKENA PARCEL  
H-2 PROJECT  
TIAR

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

FIGURE

1.2

**PROJECT SITE PLAN**



## 2. METHODOLOGY

### 2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.
- Traffic projections for Base Year 2028 (without the Project) including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate. These other known developments are projects that are currently under construction or known new/future developments that are anticipated to affect traffic demand and operations within the study area.
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for Future Year 2028 (with the Project), which includes Base Year traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations for Base Year and Future Year roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by known developments in the region or the Project.

### 2.2 Intersection Analysis

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6<sup>th</sup> Edition, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix B.

Analyses for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.



### 3. EXISTING CONDITIONS

#### 3.1 Roadway System

The following are brief descriptions of the existing roadways in the vicinity of the Project:

Piilani Highway – is an undivided, north-south State highway that extends from Mokulele Highway at its intersection with North Kihei Road and continues for approximately seven (7) miles to the south where it terminates at Wailea Ike Drive. In the vicinity of the study area, Piilani Highway is a two-lane principal arterial providing access to Kihei and Wailea. Piilani Highway widens to four (4) lanes north of Kilohana Drive and provides right- and left-turn deceleration/storage lanes at most major intersections along the highway. Within the study area, the posted speed limit is generally 40 mph and decreases to 20 mph in the southbound direction near its terminus at Wailea Ike Drive.

Okolani Drive – is a divided, east-west, four-lane collector roadway from South Kihei Road to Wailea Alanui Drive and narrows to an undivided, east-west, two-lane collector roadway from Wailea Alanui Drive to Piilani Highway. Okolani Drive provides access to numerous residential subdivisions adjacent to the roadway. The posted speed limit is 30 mph.

Wailea Alanui Drive – is a divided, north-south, two-way, four-lane collector roadway with a posted speed limit of 30 miles per hour (mph). This roadway begins to the north at its intersection with Kilohana Drive and terminates at its intersection with Kaukahi Street, continuing as Makena Alanui Road.

Wailea Ike Drive – is a divided, east-west, two-way, four-lane collector roadway that connects Piilani Highway with Wailea Alanui Drive. Wailea Ike Drive provides access to resort, residential and commercial areas. The posted speed limit is 30 mph.

Kilohana Drive – is an undivided, east-west, two-way, two-lane roadway that begins to the east at its intersection with Piilani Highway and Mapu Drive and continues westward until its intersection with South Kihei Road. Kilohana Drive provides access to numerous resorts and residences including Wailea Palms. The posted speed limit is 25 mph.

Mapu Drive – is an undivided, two-way, two-lane roadway that provides access to several condos and vacation rental units from Piilani Highway. It begins to the west at its intersection with Piilani Highway and Kilohana Drive and continues eastward and then curves southward until it ends to the south in a cul-de-sac south of Kupulau Drive. The posted speed limit is 20 mph.

Kaukahi Street – is an undivided, east-west, two-way, two-lane roadway that provides access to residences and businesses including The Fairmont, Wailea Golf Club, Hotel Wailea, Polo Beach Club, Wailea Golf Vistas.

Makena Alanui Road – is an undivided north-south, two-way, two-lane roadway that provides regional access to all of Makena. It begins to the north at a T-intersection with Makena Road and Wailea Alanui Drive and terminates to the south near the Project site at its intersection with Makena Road and Makena Keoneoio Road.

Makena Keoneoio Road – is an undivided north-south, two-way, two-lane local roadway that provides public access to the Maluaka Beach. It begins to the south at a T-intersection with



Makena Alanui Road and Makena Road and continues approximately 1,000 feet northward where it forms a loop.

### 3.2 Existing Traffic Volumes

Based on the proximity to the proposed Project site, the following intersections were studied in the existing conditions scenario. The weekday hourly turning movement data was collected on Tuesday May 1, 2018, with the exception of Piilani Highway and Kilohana Drive, which was collected on April 4, 2018:

- Piilani Highway and Kilohana Drive
- Piilani Highway and Okolani Drive
- Wailea Alanui Drive and Wailea Ike Drive
- Wailea Alanui Drive and Kaukahi Street
- Makena Alanui Road and Makena Keoneoio Road
- Makena Keoneoio Road and Beach Parking Lot

Based on traffic count data, the weekday morning peak hour was determined to occur between 7:45 AM and 8:45 AM and the afternoon peak hour was determined to occur between 3:30 PM and 4:30 PM.

### 3.3 Existing Traffic Conditions Observations and Analysis

In the study area, Piilani Highway acts as the main thoroughfare between Kihei and Wailea, and Wailea Alanui Drive acts as the main thoroughfare between Wailea and Makena. Traffic along Makena Alanui Road was relatively low with no major traffic impacts. It should be noted, that construction-related vehicles are generated at the Makena Alanui Road/Makena Keoneoio Road intersection for existing construction of the Makena H1 development at the time of the traffic count. These construction vehicles were removed based on observations during the AM and PM peak hours of traffic.

Wailea Alanui Drive/Wailea Ike Drive – This signalized study intersection was observed to operate smoothly during the AM and PM peak hours of traffic with all movements operating at LOS D or better with no significant delay or queuing under normal operating conditions. All movements typically cleared within one signal cycle.

Wailea Alanui Drive/Kaukahi Street – This unsignalized study intersection was observed to operate smoothly during the AM and PM peak hours of traffic with all movements operating at LOS C or better with no significant delay or queuing under normal operating conditions. Based on the Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration, dated 2009, Four-Hour Vehicular Volume traffic signal warrant, a traffic signal is currently not warranted. Signal warrant figures are shown in Appendix D.

Piilani Highway/Okolani Drive/Mikioi Place – This unsignalized study intersection primarily serves north-south vehicle traffic along Piilani Highway and provides channelized right-turns for all approaches along with dedicated left-turn lanes for northbound and southbound approaches. During the AM peak hour of traffic, all approaches were observed to operate relatively smoothly with minor movements experiencing moderate delay with traffic analysis indicating that the



northbound and southbound left-turn movements operate at LOS A and the eastbound and westbound left-turn/through movements operating at LOS E.

During the PM peak hour of traffic, higher volumes along Piilani Highway result in longer delays to the minor street movements. Traffic analysis indicates that the northbound and southbound left-turn movements operate at LOS A/B and the westbound approach operates at LOS F and the eastbound approach operates at LOS F and overcapacity conditions. However, based on observations, eastbound left-turn queues did not exceed vehicle queues of 5 vehicles. A traffic signal is currently planned to be implemented at the Piilani Highway/Okolani Drive intersection as part of the mitigation for the Kai Malu Wailea residential development.

Piilani Highway/Kilohana Drive/Mapu Place – This signalized intersection primarily serves north-south vehicle traffic along Piilani Highway and provides protected access for the minor street movements. Piilani Highway is generally a four-lane roadway about 700 feet to the north of this intersection, and reduces to a two-lane highway south of this intersection. One of the two southbound through lanes terminates to an exclusive southbound right-turn lane onto Kilohana Drive.

During the AM peak hour of traffic, southbound volumes were observed to traverse the intersection smoothly. Traffic analysis indicates the intersection operates at overall LOS B with all movements operating at LOS D or better.

During the PM peak hour of traffic, traffic operated relatively smoothly however, northbound volumes were observed to queue for about a 30-35 minute period extending as far south to Okolani Drive. By 4:50 PM, vehicle queues were observed to clear without congestion. Traffic analysis indicates the intersection operates at overall LOS C. All other movements operate at LOS E or better.

Figure 3.1 illustrates the existing lane configurations, volumes and LOS. See Table 3.1 for a summary of the existing conditions analysis.



NOT TO SCALE

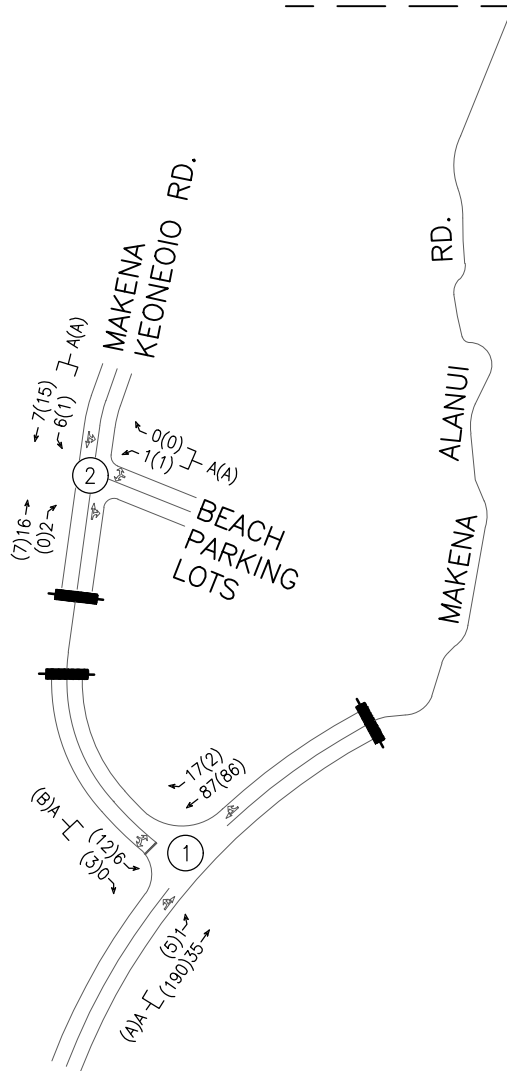
**NOTE:**  
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

DATE OF COUNTS:  
MAY 1, 2018

AM PEAK HOUR:  
7:45 AM – 8:45 AM

PM PEAK HOUR:  
3:30 PM – 4:30 PM

MATCH LINE  
FOR CONTINUATION, SEE FIGURE 3.2



**LEGEND**

- ##(##) – AM(PM) PEAK HOUR OF VEHICLE VOLUMES
- (X) – UNSIGNALIZED INTERSECTION X
- X(X) – AM(PM) LOS

MAKENA PARCEL H-2 PROJECT  
TIAR

**AYA** AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
ENGINEERS, SURVEYORS HONOLULU, HAWAII

**EXISTING LANE CONFIGURATION, VOLUMES AND LOS – MAKENA AREA**

FIGURE  
**3.1**



NOT TO SCALE

**NOTE:**

THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

DATE OF COUNTS:

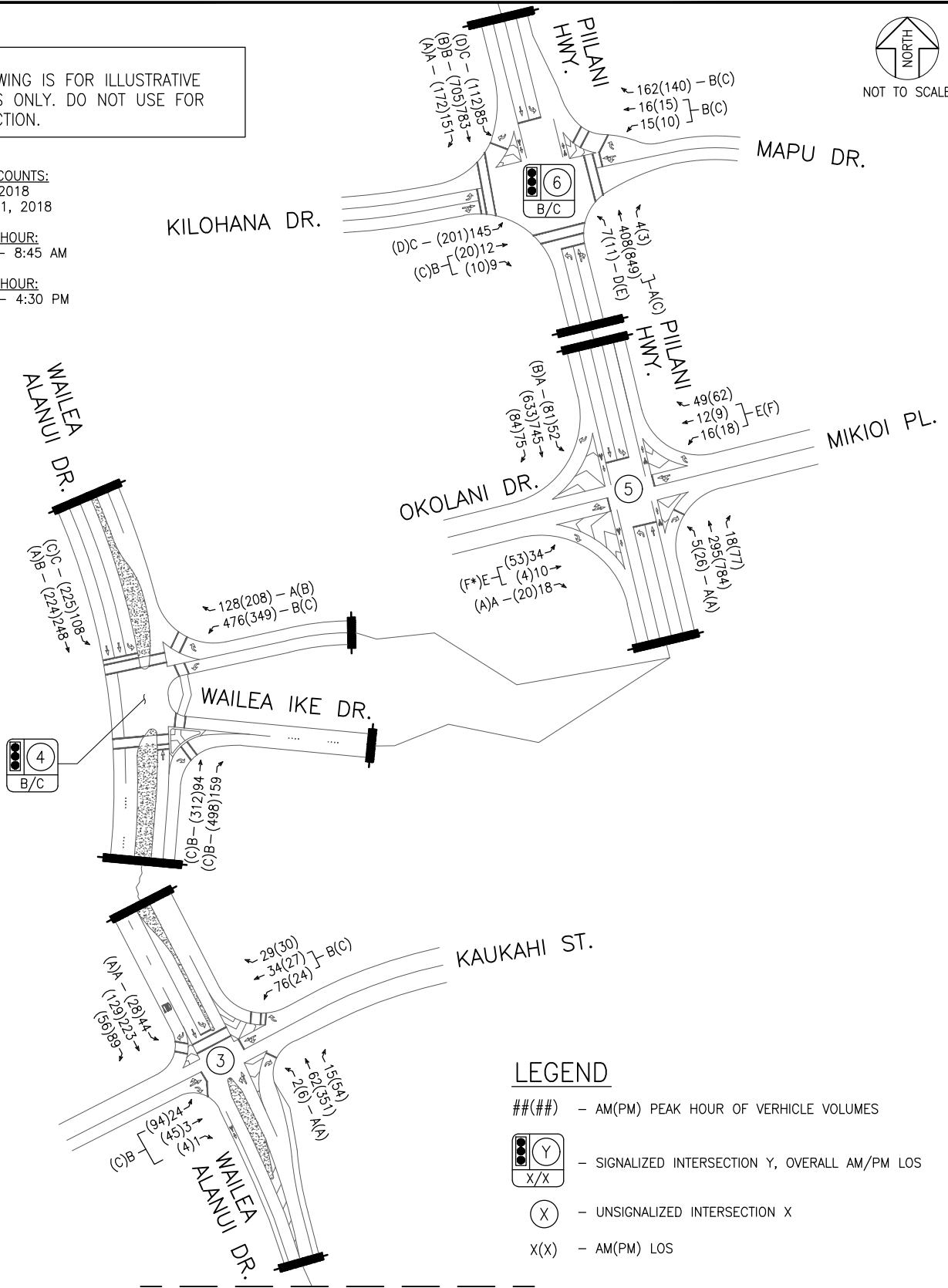
APRIL 4, 2018  
AND MAY 1, 2018

AM PEAK HOUR:

7:45 AM - 8:45 AM

PM PEAK HOUR:

3:30 PM - 4:30 PM



**LEGEND**

- ##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES
- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
- UNSIGNALIZED INTERSECTION X
- X(X) - AM(PM) LOS

MATCH LINE  
FOR CONTINUATION, SEE FIGURE 3.1

MAKENA PARCEL H-2 PROJECT  
TIAR

**ATA** AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
ENGINEERS, SURVEYORS HONOLULU, HAWAII

**EXISTING LANE CONFIGURATION, VOLUMES  
AND LOS - KIHAI-WAILEA AREA**

FIGURE  
**3.2**

Table 3.1: Existing 2018 Level of Service Summary

Intersection	Existing Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
<b>1: Makena Rd/Makena Alanui Rd &amp; Makena Keoneoio Rd</b>						
NB LT	7.4	0.00	A	7.4	0.00	A
EB LT/RT	9.3	0.01	A	10.1	0.02	B
Overall	0.4	-	-	0.6	-	-
<b>2: Beach Parking Lot &amp; Makena Keoneoio Road</b>						
WB LT/TH	8.7	0.00	A	8.6	0.00	A
SB LT	7.3	0.00	A	7.2	0.00	A
Overall	1.7	-	-	0.7	-	-
<b>3: Wailea Alanui Drive &amp; Kaukahi Street</b>						
NB LT	7.7	0.00	A	7.5	0.01	A
EB LT/TH/RT	12.6	0.06	B	20.2	0.40	C
WB LT/TH	13.8	0.23	B	16.2	0.15	C
SB LT	7.4	0.03	A	8.1	0.03	A
Overall	3.9	-	-	4.9	-	-
<b>4: Wailea Alanui Drive &amp; Wailea Ike Drive**</b>						
NB TH	19.3	0.27	B	21.3	0.59	C
NB RT	18.5	0.11	B	20.2	0.35	C
WB LT	14.6	0.66	B	27.2	0.71	C
WB RT	9.3	0.09	A	19.0	0.15	B
SB LT	23.9	0.47	C	28.6	0.61	C
SB TH	10.5	0.18	B	6.7	0.12	A
Overall	14.9	0.53	B	21.3	0.64	C
<b>5: Piilani Highway/Piilani Hwy &amp; Okolani Drive/Mikiioi Place</b>						
NB LT	9.8	0.01	A	9.5	0.03	A
EB LT/TH	45.6	0.35	E	364.2	1.29	F*
WB LT/TH	39.9	0.23	E	136.9	0.55	F
SB LT	8.1	0.05	A	10.6	0.12	B
Overall	2.9	-	-	14.5	-	-
<b>6: Piilani Hwy &amp; Kilohana Drive/Mapu Drive</b>						
NB LT	41.3	0.43	D	56.1	0.47	E
NB TH/RT	9.8	0.49	A	21.1	0.90	C
EB LT	22.9	0.46	C	37.6	0.66	D
EB TH/RT	18.9	0.05	B	29.4	0.07	C
WB LT/TH	19.1	0.09	B	29.4	0.07	C
WB RT	19.2	0.11	B	29.4	0.06	C
SB LT	33.1	0.74	C	47.9	0.78	D
SB TH	12.1	0.84	B	11.3	0.66	B
SB RT	6.0	0.11	A	6.9	0.12	A
Overall	13.7	-	B	20.5	-	C

\* v/c ratio > 1.0 denotes overcapacity conditions

\*\* Intersection analyzed using HCM 2000 methodology due to HCM 6th Edition methodology currently not supporting signalized intersections with hold phases (in this case, a hold phase occurs on the southbound through movement when the pedestrian phase on the northbound approach is actuated with the southbound left-turn movement).





## 4. BASE YEAR 2028 TRAFFIC CONDITIONS

The Base Year 2028 was selected to reflect the completion year of the Project. The Base Year 2028 scenario represents the traffic conditions within the study area without the Project. Base Year traffic projections were formulated by applying a defacto growth rate to the existing 2018 traffic count volumes and adding trips generated by known developments in the vicinity of the Project.

### 4.1 Defacto Growth Rate

Projections for Base Year 2028 traffic were generally based on State of Hawaii Department of Transportation (HDOT) historic traffic counts, HDOT's Maui Regional Travel Demand Model (MRTDM) growth for forecast years between 2007, 2020 and 2035, TIARs completed for other projects in the study area and nearby developments in the vicinity of the Project. An annual growth rate of 0.6% was applied along the mainline of the major roadways in the area.

### 4.2 Traffic Forecasts for Known Developments

#### 4.2.1 Background Projects

By Year 2028, traffic in the Project area is expected to experience growth due to several developments in the Wailea and Makena regions. Trip rates for many of the single-family and multi-family resort residential land uses were obtained from the Resort Residential Trip Generation Rate Development, prepared by Parsons Brinkerhoff (PB) in October 2006. See Appendix D for the PB single-family and multi-family resort residential trip rates.

Table 4.1 includes the proposed land use(s) and AM and PM peak hour forecast trip generation for each of the known developments within the study area. Figure 4.1 and 4.2 illustrates the location of each development.

#### Kihei Developments

- South Maui Community Park Phase 1-B, 1-C, 2 and 3 – Proposed along the future Liloa Drive Extension (with Phase 3 along East Welakahao Road) and will include construction of a gymnasium, two (2) soccer fields, two (2) baseball/softball fields, six (6) multi-use courts, and a pavilion. A playground, soccer field and softball field are currently constructed as part of the Phase 1 completion of South Maui Community Park.
- Krausz Downtown Kihei – Proposed to construct approximately 249,450 SF of retail space, 18,500 SF of office space, and a 150-room specialty hotel along Piikea Avenue, west of Liloa Drive. *Assumed buildout timeline: 50% in 2028.*
- Kenolio Apartments – Proposed to construct approximately 186 apartments with access via Liloa Drive.
- Kaiwahine Village – Proposed to construct approximately 120 multi-family dwelling units with access via Kaiwahine Street
- Kihei Residential (Kamalani) – Proposed to construct approximately 631 single-family & multi-family dwelling units and a 3,000 SF recreational center with access via Kaiwahine Street.



- Kihei High School – Proposed along the mauka side of Piilani Highway with access via an extension of Kulanihakoi Street and anticipated to serve approximately 800 students.
- Maui Bay Villas (formerly Maui Lu) - Proposed to construct approximately 388 timeshare dwelling units and 12 beach parking stalls with access via Kaonoulu Street.
- Welakahao Village Residential – Proposed to construct approximately 172 single-family dwelling units with access via East Welakahao Road.
- Alahele Subdivision – Proposed to construct approximately 48 single family dwelling units and up to 48 ohana units with access via Auhana Road.
- Kalama Kai – Proposed to construct approximately 40 affordable multi-family residential units with access via Kanani Road.

### **Wailea Developments**

- Kahoolawe Island Reserve Commission (KIRC) Education & Operations Center – Proposed 23,950 square feet building that will provide educational, administrative exhibition, and office functions.
- Kilohana Makai – Proposed to construct approximately 28 affordable single-family residential units with access via Wela Street.
- Makalii at Wailea (MF-15) – This project proposes to develop 68 multi-family residential units. The project is located on the northeast corner of the Wailea Alanui Drive/Kaukahi Street intersection.
- Wailea Village Center Expansion – This project proposes to expand the existing Wailea Village Center by developing an additional 22,000 square-feet of shopping center use. The project is located to the south of Wailea Ike Drive between Wailea Alanui Drive and Wailea Ike Place.
- Parcel MF-7 – Proposed to construct approximately 75 resort multi-family residential units with access via Okolani Drive.
- Parcel SF-S – Proposed to construct approximately 57 single-family residential units with access via Kapili Street.
- Keala O Wailea (MF-11) – This project proposes to develop 70 multi-family units as part of the Wailea Resort. The project is located next to the Wailea Gateway Center on the northwest corner of the Piilani Highway/Wailea Ike Drive intersection.
- Parcel B-1 – This project proposes to develop an approximate 97,600 SF square-foot shopping center. The project is located on the southeast corner of the Wailea Ike Drive/Kalai Waa intersection.
- The Ridge at Wailea (MF-19) – This project proposes to develop nine (9) single-family residential units as part of the Wailea Resort. The project is located east of Kalai Waa Street and north of Hotel Wailea.
- Hotel Ike Project (MF-10) – This project proposes to construct a 110-room hotel at the northeast corner of the Wailea Ike Drive and Wailea Ike Place (North) intersection. Primary access to the site will occur at the Wailea Ike Drive/Wailea Ike Place (North) intersection with the Project access located along Wailea Ike Place (North). The project will also share an internal easement with the adjacent Marriott Residence Inn Hotel to



the east, and secondary access may occur at the Wailea Ike Drive/Wailea Ekolu Place intersection

- Honua'ula - This is a master planned residential and commercial community being proposed mauka of Piilani Highway at the southern terminus adjacent to the Piilani Highway/Wailea Ike Drive intersection. It's unknown when development will occur, but for purposes of this study, the initial 250 affordable single family residential units are assumed to be built by Year 2028.
- Grand Wailea Expansion – The existing Grand Wailea Hotel is proposing to increase the room count by an additional 224 rooms.
- SF-7a, MF-12 & MF-13 – Proposed multi-family residential subdivision adjacent to Okolani Drive.
- Parcel B2 –10,000 SF shopping center along Kalai Waa Street.
- MF-10 (BMX Commercial) – Proposed 30,000 SF (BMX Commercial Development) adjacent to Wailea Ike Drive.
- MF 16 – Proposed multi-family residential subdivision on Kalai Waa Street.

### **Makena Developments**

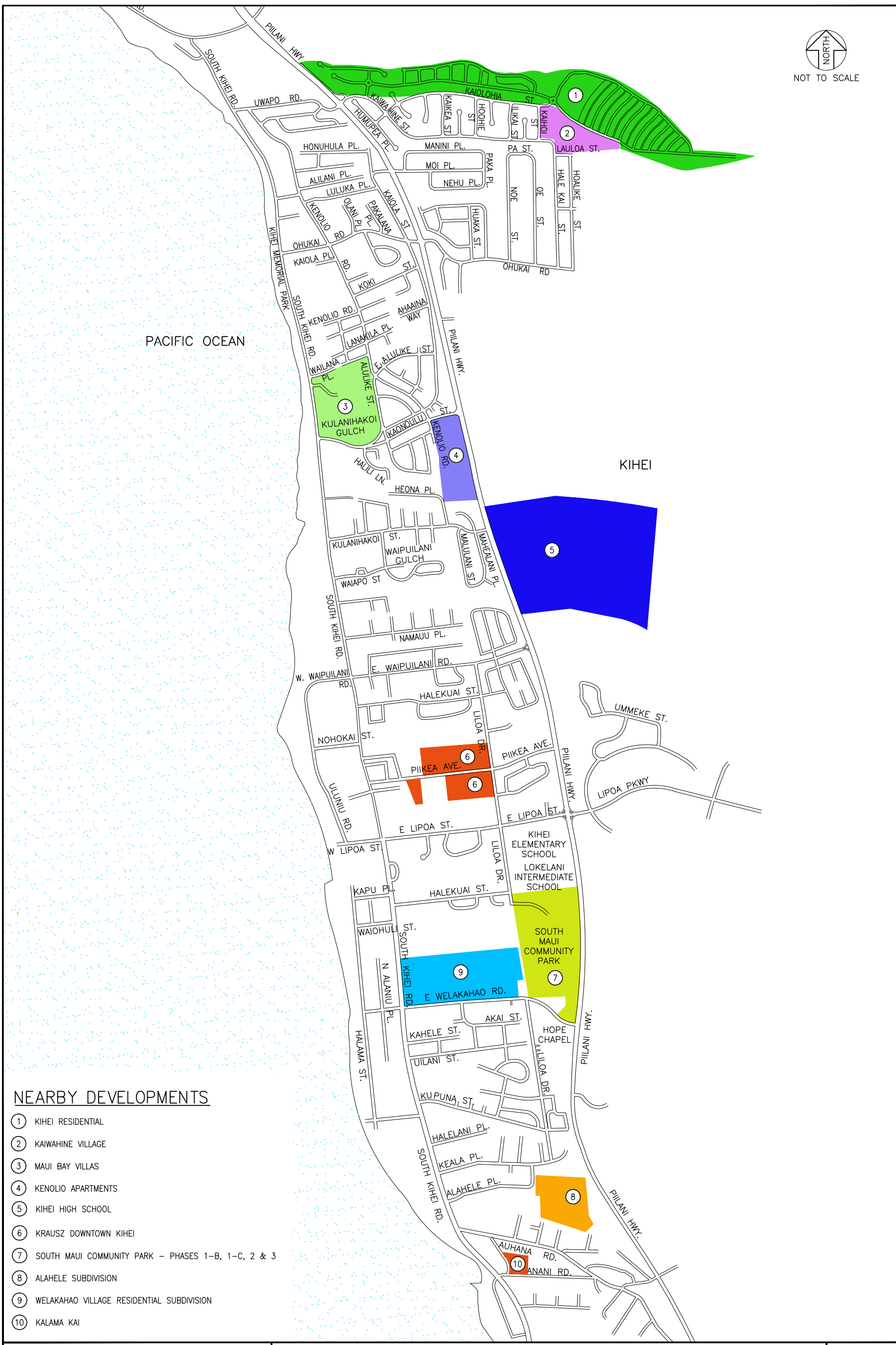
- Makena Parcel H-1 Ocean Villas Maluaka Development – This project proposes to develop 13 single-family residential units and six (6) multi-family condominium units. Parcel H-1 is located south of the former Makena Beach & Golf Resort and is bordered by the Makena Golf Course to the south and west and by Makena Keoneoio Road to the east.
- Makena Resort H-M Development – This project proposes to convert the former 310-room hotel at the Makena Beach & Golf Resort into 65 multi-family resort residential units, including a beach club for residents only.
- Makena M-5/M-6/S-7/B-2 – This project will consist of 46 resort single-family and residential units, 88 resort multi-family residential units, 10 Transient Vacation Rental (TVR) units, 14 residential condominium units, and approximately 27,300 square feet (SF) of retail space. The project also proposes to provide two new vehicular accesses; one (1) access along Honoiki Street and one (1) access along Makena Alanui Road.

Table 4.1: Background Projects Trip Generation

Background Development	Land Uses	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
<b>Kihei Developments</b>							
South Maui Community Park Phase 1-B, 1-C, 2 and 3	Obtained from Project's TIAR	57	42	99	80	45	125
Krausz Downtown Kihei <sup>3</sup>	Obtained from Project's TIAR	230	133	363	393	416	809
Kenolio Apartments	Obtained from Project's TIAR	30	73	103	77	50	127
Kaiwahine Village	120 Multi Family Residential (ITE 230)	19	47	66	49	31	80
Kihei Residential (Kamalani)	Obtained from Project's TIAR (w/ adjustments)	93	290	383	311	178	489
Kihei High School	Obtained from Project's TIAR	277	130	407	58	65	123
Maui Bay Villas (formerly Maui Lu)	Obtained from Project's TIAR	110	60	170	210	136	346
Welakahao Village Residential	Obtained from Project's TIAR	33	95	128	109	63	172
Alahele Subdivision	48 Single-Family Residential (ITE 210)	11	33	44	35	20	55
Kalama Kai	40 Multi Family Residential (ITE 220)	5	15	20	16	10	26
<b>Total Kihei Developments</b>		<b>865</b>	<b>918</b>	<b>1,783</b>	<b>1,338</b>	<b>1,014</b>	<b>2,352</b>
<b>Wailea Developments</b>							
KIRC Education and Operations Center	Office Building	52	6	58	10	55	65
Kilohana Makai	Obtained from Project's TIAR	6	19	25	19	11	30
Makalii at Wailea (MF-15)	Resort MF Residential	6	9	15	11	12	23
Wailea Village Center Expansion	Shopping Center	7	5	12	60	66	126
Keala O Wailea (MF-11)	Wailea Resort TIAR Phase I	6	25	31	24	13	37
Wailea Parcel B-1		153	111	264	279	300	579
The Ridge at Wailea (MF-19)		2	2	4	2	2	4
Hotel Ike (MF-10)		25	10	35	20	26	46
SF-7a, MF-12 & MF-13	Wailea Resort TIAR Phase II	24	15	39	62	67	129
SF-S		16	16	32	16	14	30
MF-7		7	12	19	15	14	29
Parcel B2		24	15	39	62	67	129
MF-10 (BMX Commercial)		47	28	75	41	53	94
MF-16		8	11	19	14	15	29
Grand Wailea Expansion	240 Hotel Rooms (ITE 330)	55	21	76	46	61	107
Honua'ula Phase 1A	250 Residential Dwelling Units (ITE 210/ITE 220)	31	101	132	102	59	161
<b>Total Wailea Developments</b>		<b>469</b>	<b>406</b>	<b>875</b>	<b>783</b>	<b>835</b>	<b>1,618</b>
<b>Makena Developments</b>							
Makena Resort H-M	Resort MF Residential & Beach Club	54	25	79	46	47	93
Makena Parcel H-1	Resort SF/MF Residential	3	4	7	3	4	7
Makena M-5/M-6/S-7/B-2	Obtained from Project's TIAR	65	61	126	62	70	132
<b>Total Makena Developments</b>		<b>122</b>	<b>90</b>	<b>212</b>	<b>111</b>	<b>121</b>	<b>232</b>

Notes:

- Forecast trips derived from available TIAR's for each Project, ITE Trip Generation, and/or updated to reflect current status.
- Table shows total trips generated by known developments in the vicinity of the Project. Not all traffic generated by these developments travel through the study area of this TIAR, since some traffic will be routed to various roadways and intersections that were not included in this TIAR. Majority of Kihei developments likely routed further north to Central Maui or within Kihei and won't impact study intersections.
- By Year 2028, approximately 50% of Krausz may be completed based on current completion dates.



**NEARBY DEVELOPMENTS**

- ① KIHEI RESIDENTIAL
- ② KAIWAHINE VILLAGE
- ③ MAUI BAY VILLAS
- ④ KENOLIO APARTMENTS
- ⑤ KIHEI HIGH SCHOOL
- ⑥ KRAUSZ DOWNTOWN KIHEI
- ⑦ SOUTH MAUI COMMUNITY PARK - PHASES 1-B, 1-C, 2 & 3
- ⑧ ALAHELE SUBDIVISION
- ⑨ WELAKAHAO VILLAGE RESIDENTIAL SUBDIVISION
- ⑩ KALAMA KAI

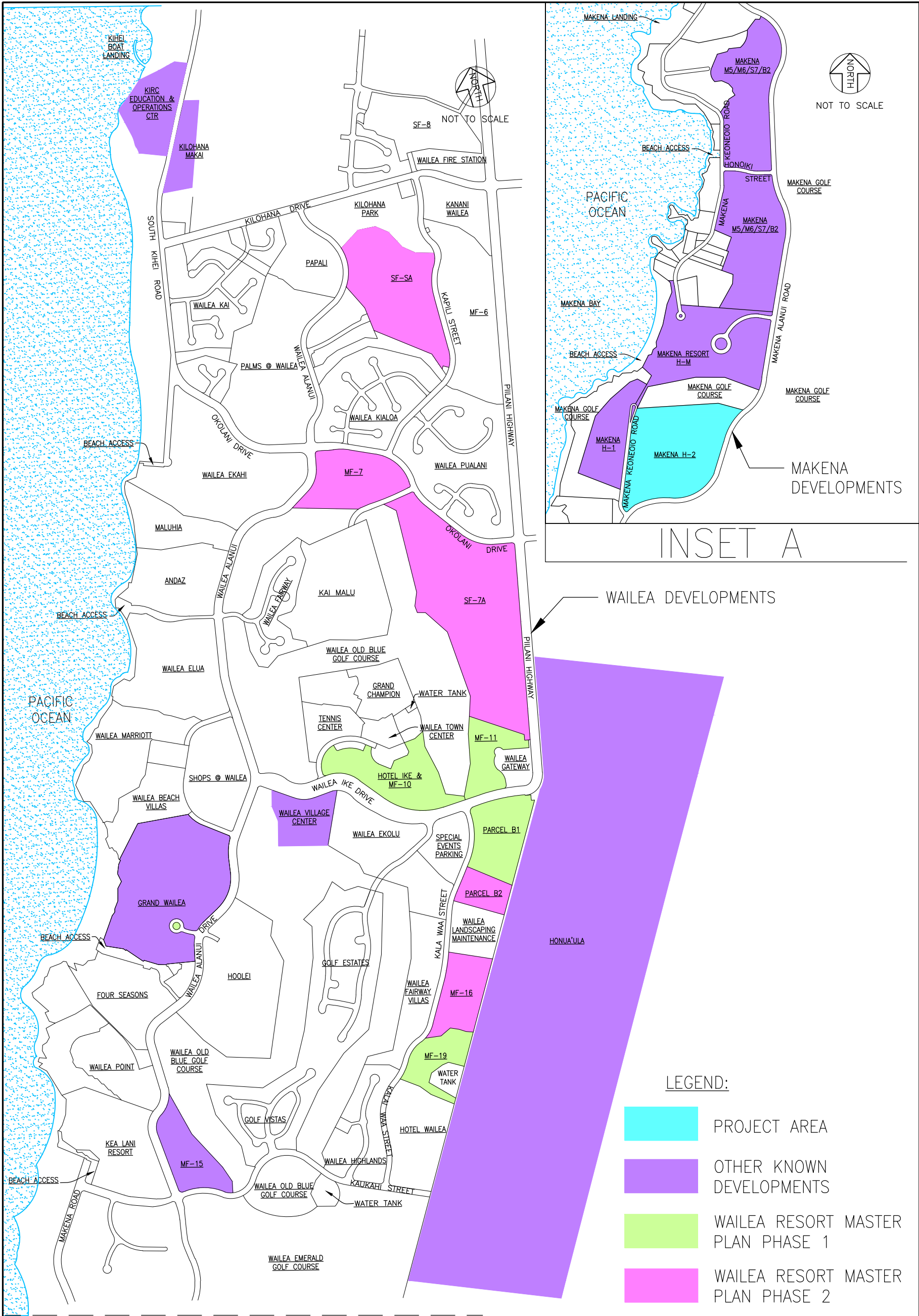
MAKENA PARCEL H-2 PROJECT  
TIAR

**ATA** AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
ENGINEERS, SURVEYORS HONOLULU, HAWAII

**BACKGROUND PROJECTS IN KIHEI**

FIGURE

**4.1**



↓ SEE INSET A ↓

MAKENA PARCEL H-2 PROJECT  
TIAR

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**BACKGROUND PROJECTS IN WALEA-MAKENA**

FIGURE  
**4.2**



### 4.3 Planned Roadway Improvements

- Piilani Highway/Okolani Drive/Mikioi Place intersection – New traffic signal system
  - The construction of a traffic control signal at this location is planned by a private entity as part of the roadway improvements for the Kai Malu at Wailea residential development and should be operational before Year 2028.
- Piilani Highway/Kilohana Drive/Mapu Drive intersection – Additional northbound through lane and exclusive northbound right-turn lane.
  - The construction of an additional northbound through lane and an exclusive northbound right-turn lane along Piilani Highway is anticipated to occur before Year 2028. Existing agreements between HDOT and Wailea Resort will result in the construction of this improvement as part of the Wailea Resort Master Plan.

### 4.4 Base Year 2028 Analysis

It is anticipated that by Base Year 2028, traffic will have increased over existing conditions due to the development in the Kihei, Wailea and Makena regions. Actual growth within the study region may vary based upon the approval process and actual construction of the various nearby developments. All background projects and ambient growth is anticipated to account for approximately 30 percent of traffic increases by Base Year 2028.

#### 4.4.1 Base Year 2028 Intersection Analysis

The study intersection on Makena Alanui Road will continue operating adequately with all movements at LOS B or better.

##### Wailea Alanui Drive/Kaukahi Street

By Base Year 2028, this intersection will operate adequately during the AM peak hour with all movements at LOS D or better. However, during the PM peak hour of traffic, vehicular increases primarily along Wailea Alanui Drive will result in the eastbound approach to operate at LOS F and the westbound approach to operate at LOS E. Based on the MUTCD signal warrant analysis, the intersection will be just shy of meeting the Four-Hour Vehicular Volume traffic signal warrant. This intersection should continue to be monitored to determine if a signal would be warranted in the future.

Wailea Alanui Drive/Wailea Ike Drive – This signalized study intersection is forecast to operate at overall LOS D or better, with all movements operating at LOS D or better during the AM and PM peak hours of traffic, with the exception of the southbound left-turn movement and the westbound left-turn movement operating at LOS E during the PM peak hour of traffic.

Piilani Highway/Okolani Drive/Mikioi Place – As discussed in Section 4.3, this intersection is assumed to be signalized by Year 2028 without the Project and is forecast to experience overall LOS B conditions during the AM and PM peak hours of traffic. All movements at this intersection are forecast to operate at LOS D or better during the AM and PM peak hours of traffic, with the exception of the southbound left-turn movement and the northbound left-turn movement operating at LOS E during the PM peak hour of traffic.



### Piilani Highway/Kilohana Drive/Mapu Drive

As discussed in Section 4.3, an additional northbound through lane and an exclusive northbound right-turn lane along Piilani Highway will be constructed as part of the Wailea Resort Master Plan. All movements at this intersection are forecast to operate at LOS D or better during the AM and PM peak hours of traffic with the exception of the turning movements operating at LOS E or better during both peak hours of traffic.

Figures 4.3 and 4.4 illustrate the Base Year 2028 forecast traffic volumes and LOS for the study intersection movements. Table 4.2 summarizes the Base Year 2028 LOS at the study intersections compared to existing conditions. LOS worksheets are provided in Appendix C.

Figure 4.3: BY 2028 Traffic Volumes & LOS





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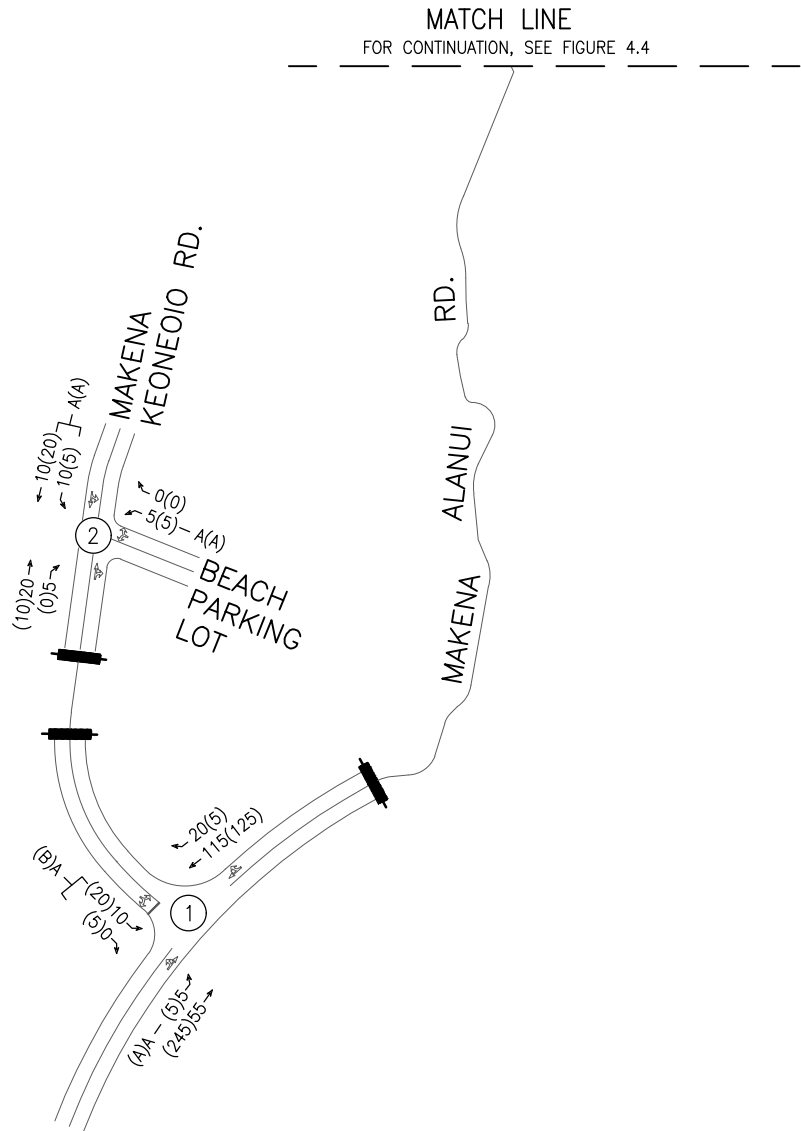
**NOTE:**  
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**LEGEND**

##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES

(X) - UNSIGNALIZED INTERSECTION X

X(X) - AM(PM) LOS



MAKENA PARCEL H-2 PROJECT  
TIAR

**ATA** AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
ENGINEERS, SURVEYORS HONOLULU, HAWAII

**BASE YEAR 2028 LANE CONFIGURATION,  
VOLUMES AND LOS - MAKENA AREA**

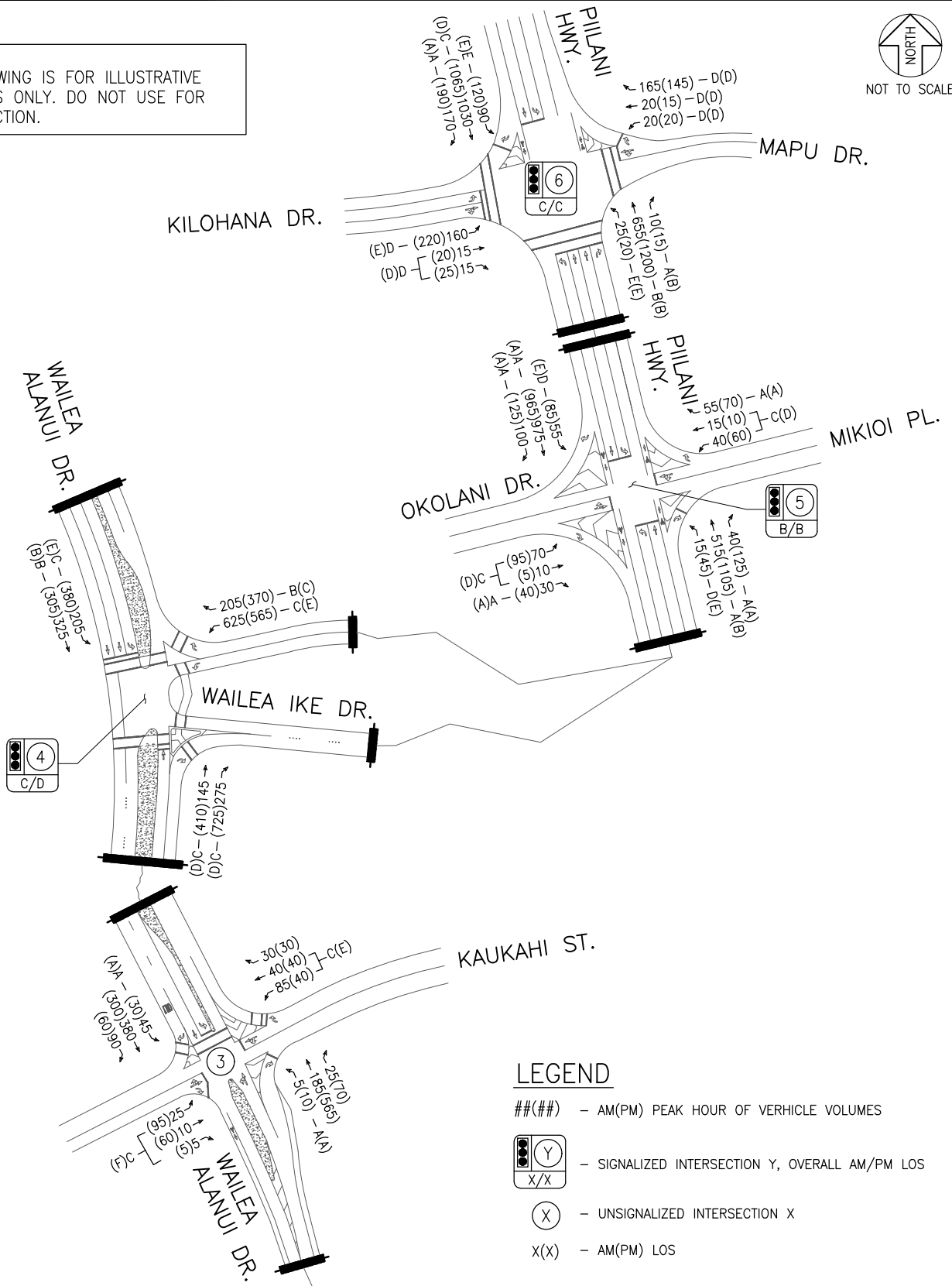
FIGURE  
**4.3**



NOT TO SCALE

**NOTE:**

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**LEGEND**

##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES



- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS



- UNSIGNALIZED INTERSECTION X

X(X) - AM(PM) LOS

MATCH LINE

FOR CONTINUATION, SEE FIGURE 4.3

MAKENA PARCEL H-2 PROJECT  
TIAR



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FIGURE

BASE YEAR 2028 CONFIGURATION,  
VOLUMES AND LOS - KIHEI-WAILEA AREA

4.4

Table 4.2: Existing 2018 and Base Year 2028 Level of Service Summary

Intersection	Existing Conditions						Base Year 2028 Conditions					
	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
<b>1: Makena Rd/Makena Alanui Rd &amp; Makena Keoneoio Rd</b>												
NB LT	7.4	0.00	A	7.4	0.00	A	7.5	0.00	A	7.5	0.00	A
EB LT/RT	9.3	0.01	A	10.1	0.02	B	9.7	0.01	A	10.9	0.04	B
Overall	0.4	-	-	0.6	-	-	0.6	-	-	0.8	-	-
<b>2: Beach Parking Lot &amp; Makena Keoneoio Road</b>												
WB LT/RT	8.7	0.00	A	8.6	0.00	A	8.8	0.01	A	8.8	0.01	A
SB LT	7.3	0.00	A	7.2	0.00	A	7.3	0.01	A	7.2	0.00	A
Overall	1.7	-	-	0.7	-	-	2.3	-	-	2.0	-	-
<b>3: Wailea Alanui Drive &amp; Kaukahi Street</b>												
NB LT	7.7	0.00	A	7.5	0.01	A	8.2	0.01	A	7.9	0.01	A
EB LT/TH/RT	12.6	0.06	B	20.2	0.40	C	17.9	0.14	C	95.3	0.92	F
WB LT/TH	13.8	0.23	B	16.2	0.15	C	23.9	0.42	C	42.8	0.49	E
SB LT	7.4	0.03	A	8.1	0.03	A	7.7	0.04	A	8.9	0.03	A
Overall	3.9	-	-	4.9	-	-	4.6	-	-	14.9	-	-
<b>4: Wailea Alanui Drive &amp; Wailea Ike Drive**</b>												
NB TH	19.3	0.27	B	21.3	0.59	C	29.7	0.48	C	53.5	0.88	D
NB RT	18.5	0.11	B	20.2	0.35	C	27.5	0.19	C	37.7	0.65	D
WB LT	14.6	0.66	B	27.2	0.71	C	23.4	0.81	C	55.1	0.94	E
WB RT	9.3	0.09	A	19.0	0.15	B	11.9	0.18	B	24.2	0.30	C
SB LT	23.9	0.47	C	28.6	0.61	C	33.3	0.65	C	67.7	0.94	E
SB TH	10.5	0.18	B	6.7	0.12	A	14.4	0.24	B	11.5	0.17	B
Overall	14.9	0.53	B	21.3	0.64	C	22.7	0.71	C	43.0	0.93	D
<b>5: Piilani Highway/Piilani Hwy &amp; Okolani Drive/Mikiioi Place</b>												
NB LT	9.8	0.01	A	9.5	0.03	A	39.0	0.46	D	60.2	0.73	E
NB TH	-	-	-	-	-	-	5.7	0.46	A	17.8	0.91	B
NB RT	-	-	-	-	-	-	3.9	0.03	A	4.5	0.09	A
EB LT/TH	45.6	0.35	E	364.2	1.29	F*	28.2	0.37	C	45.1	0.51	D
EB RT	-	-	-	-	-	-	0.0	0.00	A	0.0	0.00	A
WB LT/TH	39.9	0.23	E	136.9	0.55	F	27.3	0.25	C	43.2	0.35	D
WB RT	-	-	-	-	-	-	0.0	0.00	A	0.0	0.00	A
SB LT	8.1	0.05	A	10.6	0.12	B	35.7	0.65	D	55.4	0.78	E
SB TH	-	-	-	-	-	-	8.8	0.83	A	9.2	0.76	A
SB RT	-	-	-	-	-	-	3.3	0.08	A	3.6	0.09	A
Overall	2.9	-	-	14.5	-	-	10.1	-	B	17.3	-	B
<b>6: Piilani Hwy &amp; Kilohana Drive/Mapu Drive</b>												
NB LT	41.3	0.43	D	56.1	0.47	E	62.9	0.59	E	65.9	0.56	E
NB TH	-	-	-	-	-	-	11.3	0.34	B	16.5	0.64	B
NB TH/RT	9.8	0.49	A	21.1	0.90	C	-	-	-	-	-	-
NB RT	-	-	-	-	-	-	9.0	0.01	A	10.1	0.01	B
EB LT	22.9	0.46	C	37.6	0.66	D	43.6	0.58	D	57.6	0.78	E
EB TH/RT	18.9	0.05	B	29.4	0.07	C	41.4	0.07	D	43.3	0.10	D
WB LT	-	-	-	-	-	-	48.0	0.14	D	50.4	0.14	D
WB TH	-	-	-	-	-	-	52.1	0.30	D	53.7	0.22	D
WB LT/TH	19.1	0.09	B	29.4	0.07	C	-	-	-	-	-	-
WB RT	19.2	0.11	B	29.4	0.06	C	49.4	0.02	D	51.9	0.02	D
SB LT	33.1	0.74	C	47.9	0.78	D	58.9	0.78	E	59.2	0.81	E
SB TH	12.1	0.84	B	11.3	0.66	B	30.8	0.94	C	35.1	0.96	D
SB RT	6.0	0.11	A	6.9	0.12	A	7.9	0.14	A	7.9	0.16	A
Overall	13.7	-	B	20.5	-	C	26.4	-	C	29.0	-	C

\* v/c ratio > 1.0 denotes overcapacity conditions

\*\* Intersection analyzed using HCM 2000 methodology due to HCM 6th Edition methodology currently not supporting signalized intersections with hold phases (in this case, a hold phase occurs on the southbound through movement when the pedestrian phase on the northbound approach is actuated with the southbound left-turn movement).



## 5. FUTURE YEAR 2028 TRAFFIC CONDITIONS

### 5.1 Background

The Project proposes to develop a 53-unit CPR residential development with a 57-stall beach parking lot. It should be noted that an existing 50-stall beach parking lot will be replaced, resulting in a beach parking stall count increase of 7 stalls. The Project's residential component will have one access via Makena Keoneoio Road near the northwest corner of the parcel, while the beach parking lot will be serviced by a separate driveway.

#### 5.1.1 Trip Generation

Vehicular trips for the Project were generated based on two (2) publications. The Project assumes approximately 90% of the single-family residential units will consist of part-time residents, while the remaining 10% are full-time residents. Therefore, local resort residential trip rates obtained from the Resort Residential Trip Generation Rate Development, prepared by Parsons Brinkerhoff (PB) in October 2006 were used for this roughly 90% single-family resort residential units. These trip rates were derived from a local Maui study that calculated AM and PM peak hour trip rates for single-family resort residential units within the Wailea Resort area. These rates were accepted by HDOT.

Trips generated by the remaining 10% of resort residential units (full-time residents) was calculated based on the national Institute of Transportation Engineers (ITE) trip rates, which publishes a book based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms, and associations. This publication, titled Trip Generation, 10<sup>th</sup> Edition, provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables. The independent variables can range from Dwelling Units (DU) for single and multi-family attached homes to Square-foot Gross Leasable Area (SF GLA) for commercial development.

See Tables 5.1 and 5.2 for Trip Generation formulae and projections for the Project.

#### 5.1.2 Trip Distribution and Assignment

Trips generated by the Project were assigned throughout the study area generally based upon existing travel patterns and anticipated traffic reroutes from known projects in the area. The traffic generated by the Project was added to the forecast Base Year 2028 traffic volumes within the vicinity of the Project to constitute the traffic volumes for Future Year 2028 traffic conditions. Figure 5.1 and Figure 5.2 illustrates the Project-generated trip distribution for Future Year 2028.



Table 5.1: Trip Generation Rates

Land Use (ITE Code)	Independent Variable	AM Peak Hour		PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Single-Family Detached Housing (210)	5 DU	[a]	25%	[b]	63%
Resort Single-Family Residential (PB Calculated)	48 DU	0.46	58%	0.46	50%
Beach Parking Lots <sup>1</sup>	7 New Stalls	0.35	89%	0.18	11%

Notes:

- [a] (T) = 0.71(X) + 4.8                      [b] (T) = 0.96(X) + 0.2

1. Beach Parking trip rates were calculated based on the observed AM and PM peak hour traffic volumes generated by existing beach parking lots on a per stall basis, at the time of the traffic counts in May 2018. Observations indicated that the existing parking lots were not fully occupied, so additional beach parking stalls should not generate additional traffic. However, to remain conservative and account for future potential growth, additional trips were generated based on the total increased beach parking stall count.

Table 5.2: Project-Generated Trips

Land Use (ITE Code)	Independent Variable	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Single-Family Detached Housing (210)	5 DU	2	6	8	3	2	5
Resort Single-Family Residential (PB Calculated)	48 DU	13	9	22	11	11	22
Beach Parking (-)	7 New Stalls	2	0	2	0	1	1
<b>Total</b>		<b>17</b>	<b>15</b>	<b>32</b>	<b>14</b>	<b>14</b>	<b>28</b>



## **5.2 Future Year 2028 Analysis**

By Year 2028, the Project is projected to generate a total of 32(28) trips during the AM(PM) peak hours of traffic. The Project is anticipated to account for approximately 0.8 percent of traffic increases at the Wailea Alanui Drive/Wailea Ike Drive Intersection and 0.4-0.5 percent of traffic increases along Piilani Highway at its intersections with Kilohana Drive and Okolani Drive by Future Year 2028 scenario.

### **5.2.1 Future Year 2028 Intersection Analysis**

By Future Year 2028 conditions, all study intersections are generally expected to operate similarly to Base Year conditions. All intersection movement LOS will nearly operate with the same LOS as Base Year conditions, with most movement vehicle delay increases only ranging from 0-2 second increases.

At the Wailea Alanui Drive/Kaukahi Street intersection, based on the MUTCD signal warrant analysis, the intersection will continue to fall just shy of meeting the Four-Hour Vehicular Volume traffic signal warrant. This intersection should continue to be monitored to determine if a signal would be warranted in the future.

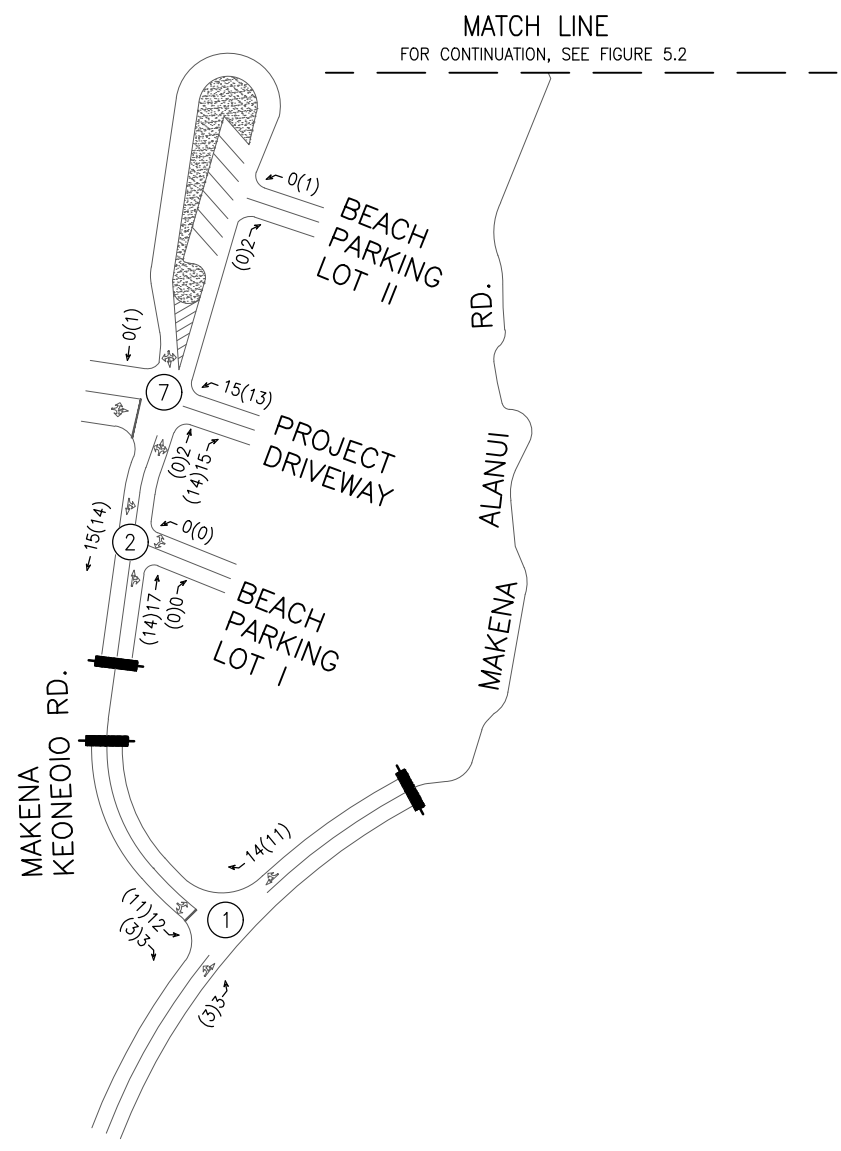
Figures 5.2 and 5.3 illustrates the Future Year 2028 forecast traffic volumes and LOS for the study intersection movements. Table 5.3 summarizes the Future Year 2028 LOS at the study intersections compared to Base Year 2028 and Existing 2018 conditions. LOS worksheets are provided in Appendix C.




**NOTE:**  
 THIS DRAWING IS FOR ILLUSTRATIVE  
 PURPOSES ONLY. DO NOT USE FOR  
 CONSTRUCTION.

**LEGEND**

- ##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES
- (X) - UNSIGNALIZED INTERSECTION X



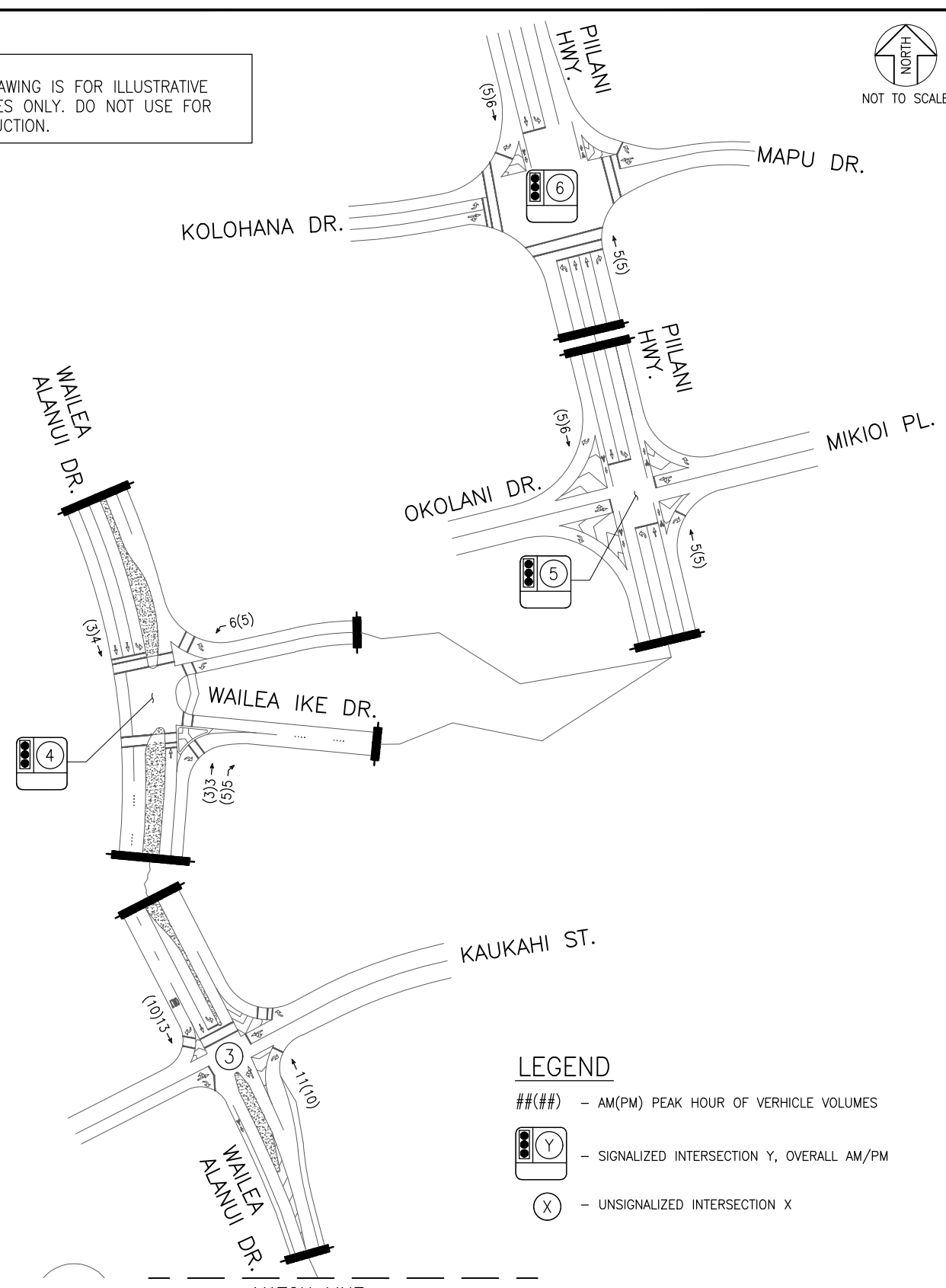
MAKENA PARCEL H-2 PROJECT  
 TIAR


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

**PROJECT-GENERATED TRIPS  
 - MAKENA AREA**

FIGURE  
**5.1**

**NOTE:**  
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**LEGEND**

- ##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES
- SIGNALIZED INTERSECTION Y, OVERALL AM/PM
- UNSIGNALIZED INTERSECTION X

MATCH LINE  
FOR CONTINUATION, SEE FIGURE 5.1

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**PROJECT-GENERATED TRIPS -  
KIHEI-WALEA AREA**

FIGURE  
**5.2**





NOT TO SCALE

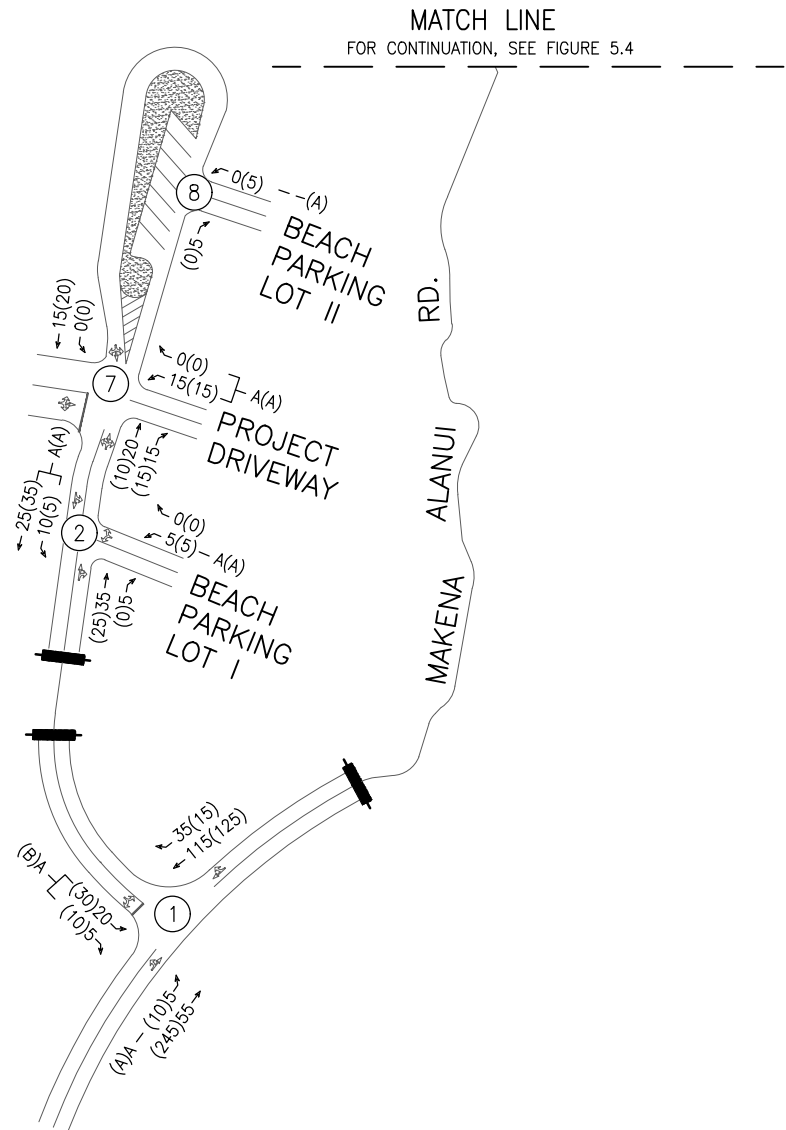
**NOTE:**  
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**LEGEND**

##(##) - AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(X) - UNSIGNALIZED INTERSECTION X

X(X) - AM(PM) LOS



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**FUTURE YEAR 2028 LANE CONFIGURATION,  
VOLUMES AND LOS - MAKENA AREA**

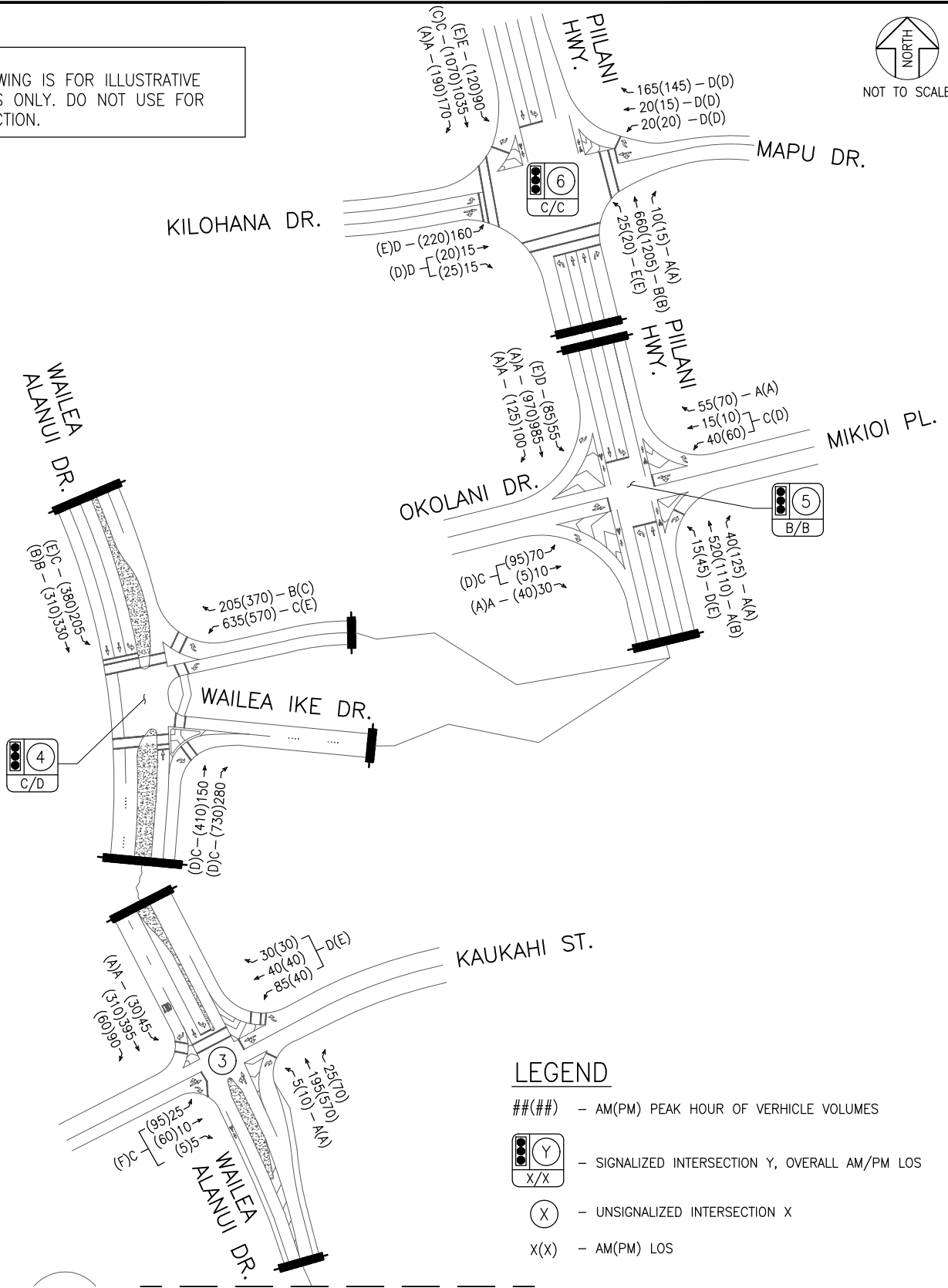
FIGURE  
**5.3**





NOT TO SCALE

**NOTE:**

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**LEGEND**

- ##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES
-  - SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
-  - UNSIGNALIZED INTERSECTION X
- X(X) - AM(PM) LOS

MATCH LINE  
FOR CONTINUATION, SEE FIGURE 5.3

MAKENA PARCEL H-2 PROJECT  
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**FUTURE YEAR 2028 CONFIGURATION,  
VOLUMES AND LOS - KIHEI-WAILEA AREA**

FIGURE

**5.4**

Table 5.3: Existing 2018 Conditions, Base Year 2028 Conditions and Future Year 2028 Conditions

Intersection	Existing Conditions						Base Year 2028 Conditions						Future Year 2028 Conditions					
	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
<b>1: Makena Rd/Makena Alanui Rd &amp; Makena Keoneoio Rd</b>																		
NB LT	7.4	0.00	A	7.4	0.00	A	7.5	0.00	A	7.5	0.00	A	7.6	0.00	A	7.5	0.01	A
EB LT/RT	9.3	0.01	A	10.1	0.02	B	9.7	0.01	A	10.9	0.04	B	9.7	0.03	A	11.1	0.07	B
Overall	0.4	-	-	0.6	-	-	0.6	-	-	0.8	-	-	1.2	-	-	1.2	-	-
<b>2: Beach Parking Lot &amp; Makena Keoneoio Road</b>																		
WB LT/RT	8.7	0.00	A	8.6	0.00	A	8.8	0.01	A	8.8	0.01	A	9.0	0.01	A	8.9	0.01	A
SB LT	7.3	0.00	A	7.2	0.00	A	7.3	0.01	A	7.2	0.00	A	7.3	0.01	A	7.3	0.00	A
Overall	1.7	-	-	0.7	-	-	2.3	-	-	2.0	-	-	1.5	-	-	1.1	-	-
<b>3: Wailea Alanui Drive &amp; Kaukahi Street</b>																		
NB LT	7.7	0.00	A	7.5	0.01	A	8.2	0.01	A	7.9	0.01	A	8.2	0.01	A	8.0	0.01	A
EB LT/TH/RT	12.6	0.06	B	20.2	0.40	C	17.9	0.14	C	95.3	0.92	F	18.5	0.14	C	102.7	0.94	F
WB LT/TH	13.8	0.23	B	16.2	0.15	C	23.9	0.42	C	42.8	0.49	E	25.4	0.44	D	45.2	0.50	E
SB LT	7.4	0.03	A	8.1	0.03	A	7.7	0.04	A	8.9	0.03	A	7.8	0.04	A	8.9	0.03	A
Overall	3.9	-	-	4.9	-	-	4.6	-	-	14.9	-	-	4.7	-	-	15.8	-	-
<b>4: Wailea Alanui Drive &amp; Wailea Ike Drive**</b>																		
NB TH	19.3	0.27	B	21.3	0.59	C	29.7	0.48	C	53.5	0.88	D	29.8	0.49	C	53.8	0.88	D
NB RT	18.5	0.11	B	20.2	0.35	C	27.5	0.19	C	37.7	0.65	D	27.5	0.20	C	38.4	0.66	D
WB LT	14.6	0.66	B	27.2	0.71	C	23.4	0.81	C	55.1	0.94	E	24.4	0.83	C	56.4	0.95	E
WB RT	9.3	0.09	A	19.0	0.15	B	11.9	0.18	B	24.2	0.30	C	12.0	0.18	B	24.2	0.30	C
SB LT	23.9	0.47	C	28.6	0.61	C	33.3	0.65	C	67.7	0.94	E	33.2	0.65	C	68.2	0.94	E
SB TH	10.5	0.18	B	6.7	0.12	A	14.4	0.24	B	11.5	0.17	B	14.4	0.24	B	11.6	0.17	B
Overall	14.9	0.53	B	21.3	0.64	C	22.7	0.71	C	43.0	0.93	D	23.1	0.71	C	43.6	0.93	D
<b>5: Piilani Highway/Piilani Hwy &amp; Okolani Drive/Mikioi Place</b>																		
NB LT	9.8	0.01	A	9.5	0.03	A	39.0	0.46	D	60.2	0.73	E	39.6	0.46	D	61.0	0.73	E
NB TH	-	-	-	-	-	-	5.7	0.46	A	17.8	0.91	B	5.7	0.46	A	18.2	0.91	B
NB RT	-	-	-	-	-	-	3.9	0.03	A	4.5	0.09	A	3.9	0.03	A	4.4	0.09	A
EB LT/TH	45.6	0.35	E	364.2	1.29	F*	28.2	0.37	C	45.1	0.51	D	28.8	0.37	C	45.6	0.52	D
EB RT	-	-	-	-	-	-	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
WB LT/TH	39.9	0.23	E	136.9	0.55	F	27.3	0.25	C	43.2	0.35	D	27.8	0.25	C	43.7	0.35	D
WB RT	-	-	-	-	-	-	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
SB LT	8.1	0.05	A	10.6	0.12	B	35.7	0.65	D	55.4	0.78	E	36.5	0.65	D	55.9	0.78	E
SB TH	-	-	-	-	-	-	8.8	0.83	A	9.2	0.76	A	8.8	0.84	A	9.3	0.76	A
SB RT	-	-	-	-	-	-	3.3	0.08	A	3.6	0.09	A	3.3	0.07	A	3.6	0.09	A
Overall	2.9	-	-	14.5	-	-	10.1	-	B	17.3	-	B	10.2	-	B	17.6	-	B

Table 5.3: Existing 2018 Conditions, Base Year 2028 Conditions and Future Year 2028 Conditions Cont'd

Intersection	Existing Conditions						Base Year 2028 Conditions						Future Year 2028 Conditions					
	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
<b>6: Piilani Hwy &amp; Kilohana Drive/Mapu Drive</b>																		
NB LT	41.3	0.43	D	56.1	0.47	E	62.9	0.59	E	65.9	0.56	E	63.3	0.59	E	65.4	0.56	E
NB TH	-	-	-	-	-	-	11.3	0.34	B	16.5	0.64	B	11.4	0.34	B	15.9	0.63	B
NB TH/RT	9.8	0.49	A	21.1	0.90	C	-	-	-	-	-	-	-	-	-	-	-	-
NB RT	-	-	-	-	-	-	9.0	0.01	A	10.1	0.01	B	9.0	0.01	A	9.7	0.01	A
EB LT	22.9	0.46	C	37.6	0.66	D	43.6	0.58	D	57.6	0.78	E	44.0	0.58	D	56.4	0.78	E
EB TH/RT	18.9	0.05	B	29.4	0.07	C	41.4	0.07	D	43.3	0.10	D	41.6	0.07	D	42.8	0.10	D
WB LT	-	-	-	-	-	-	48.0	0.14	D	50.4	0.14	D	48.3	0.14	D	49.9	0.14	D
WB TH	-	-	-	-	-	-	52.1	0.30	D	53.7	0.22	D	52.5	0.30	D	53.2	0.22	D
WB LT/TH	19.1	0.09	B	29.4	0.07	C	-	-	-	-	-	-	-	-	-	-	-	-
WB RT	19.2	0.11	B	29.4	0.06	C	49.4	0.02	D	51.9	0.02	D	49.8	0.02	D	51.4	0.02	D
SB LT	33.1	0.74	C	47.9	0.78	D	58.9	0.78	E	59.2	0.81	E	59.2	0.78	E	58.7	0.81	E
SB TH	12.1	0.84	B	11.3	0.66	B	30.8	0.94	C	35.1	0.96	D	31.3	0.95	C	33.3	0.96	C
SB RT	6.0	0.11	A	6.9	0.12	A	7.9	0.14	A	7.9	0.16	A	7.9	0.14	A	7.6	0.16	A
Overall	13.7	-	B	20.5	-	C	26.4	-	C	29.0	-	C	26.6	-	C	27.9	-	C
<b>7: Makena Keoneoio Road &amp; Project DW</b>																		
WB LT/TH	-	-	-	-	-	-	-	-	-	-	-	-	8.8	0.02	A	8.8	0.02	A
Overall	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	-	2.2	-	-
<b>8: Beach Parking Lot II &amp; Makena Keoneoio Road</b>																		
WB LT/TH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	0.01	A
Overall	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	7.1	-	-

\* v/c ratio > 1.0 denotes overcapacity conditions

\*\* Intersection analyzed using HCM 2000 methodology due to HCM 6th Edition methodology currently not supporting signalized intersections with hold phases (in this case, a hold phase occurs on the southbound through movement when the pedestrian phase on the northbound approach is actuated with the southbound left-turn movement).



## 6. CONCLUSIONS

The Project proposes to develop a 53-unit CPR residential development with a 57-stall beach parking lot. It should be noted that an existing 50-stall beach parking lot will be replaced, resulting in a beach parking stall count increase of 7 stalls.

### 6.1 Existing Conditions

The majority of movements at the study intersections operated adequately at LOS D or better and under-capacity conditions during the peak hours of traffic. However, at the Piilani Highway/Okolani Drive/Mikioi Place intersection, some movements operate at LOS E/F and overcapacity conditions during the AM and/or PM peak hours. A signal is currently planned at this intersection by a separate private entity as part of the roadway improvements for the Kai Malu at Wailea residential development.

During the PM peak hour of traffic at the Piilani Highway/Kilohana Drive/Mapu Place intersection, traffic operated relatively smoothly however, northbound volumes were observed to queue for about a 30-35 minute period extending as far south to Okolani Drive. By 4:50 PM, vehicle queues were observed to clear without congestion.

At the Wailea Alanui Drive/Kaukahi Street intersection, traffic was observed to operate smoothly during the AM and PM peak hours of traffic with all movements operating at LOS C or better with no significant delay or queuing under normal operating conditions. Based on the Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration, dated 2009, Four-Hour Vehicular Volume traffic signal warrant, a traffic signal is currently not warranted.

### 6.2 Base Year 2028

By Base Year 2028, all background projects in Kihei, Wailea and Makena and regional ambient growth is anticipated to account for approximately 30 percent of traffic increases by Base Year 2028.

With the installation of the traffic signal at Piilani Highway/Okolani Drive/Mikioi Place intersection and the widening of the northbound approach at the Piilani Highway/Kilohana Drive/Mapu Drive intersection, traffic is anticipated to operate adequately with all movements operating at LOS D or better during the AM and PM peak hours, with the exception of the southbound left-turn movement and the northbound left-turn movement operating at LOS E during the PM peak hour of traffic.

At the Wailea Alanui Drive/Wailea Ike Drive intersection, the intersection will operate overall at LOS C or better with all movements operating at LOS D or better during the AM and PM peak hours of traffic, with the exception of the southbound left-turn movement and the westbound left-turn movement operating at LOS E during the PM peak hour of traffic.

At the Wailea Alanui Drive/Kaukahi Street intersection, during the PM peak hour of traffic, vehicular increases primarily along Wailea Alanui Drive will result in the eastbound approach to operate at LOS F and the westbound approach to operate at LOS E. Based on the MUTCD signal warrant analysis, the intersection will be just shy of meeting the Four-Hour Vehicular Volume traffic signal warrant. This intersection should continue to be monitored to determine if a signal would be warranted in the future.



### **6.3 Future Year 2028**

By Future Year 2028, the Project is projected to generate a total of 32(28) trips during the AM(PM) peak hours of traffic. The Project is anticipated to account for approximately 0.8 percent of traffic increases at the Wailea Alanui Drive/Wailea Ike Drive Intersection and 0.4-0.5 percent of traffic increases along Piilani Highway at its intersections with Kilohana Drive and Okolani Drive by Future Year 2028 scenario.

Upon completion of the Project, all study intersections are forecast to operate similar to Base Year 2028. All intersection movement LOS will nearly operate with the same LOS as Base Year conditions, with most movement vehicle delay increases only ranging from 0-2 second increases. At the Wailea Alanui Drive/Kaukahi Street intersection, based on the MUTCD signal warrant analysis, the intersection will continue to fall just shy of meeting the Four-Hour Vehicular Volume traffic signal warrant. This intersection should continue to be monitored to determine if a signal would be warranted in the future.

No mitigation is recommended as a result of the Project.



## 7. REFERENCES

1. Austin, Tsutsumi & Associates, Krausz Companies Commercial Mixed-Use Development TIAR, April 2014.
2. Austin, Tsutsumi & Associates, Maui Bay Villas Traffic Assessment, April 2015.
3. Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2009.
4. Institute of Transportation Engineers, Trip Generation, 10th Edition, 2017.
5. Phillip Rowell and Associates, Traffic Impact Analysis Report For South Maui Park at Piilani, December 2, 2005.
6. Phillip Rowell and Associates, Traffic Impact Assessment Report for Kenolio Apartments, June 2014.
7. Phillip Rowell and Associates, Traffic Impact Assessment Report for Alahele Subdivision, June 2007.
8. Phillip Rowell and Associates, Traffic Impact Assessment Report for Kenolio Apartments, June 2014.
9. Phillip Rowell & Associates, Traffic Impact Assessment Report for Wailea MF-11, June 22, 2012.
10. Transportation Research Board, Highway Capacity Manual, 6<sup>th</sup> Edition, 2016.
11. Wilson Okamoto Corporation, Traffic Impact Report for Kihei High School, September 2011.



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# APPENDICES

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# APPENDIX A

## TRAFFIC COUNT DATA

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# Austin Tsutsumi & Associates

501 Sumner Street, Suite 521

Honolulu, HI 96817-5031

Phone: 533-3646 Fax: 526-1267

File Name : Piilani Hwy - Kilohana Dr  
 Site Code : 18-510 Kihei Information Center & Admin Bldg  
 Start Date : 4/4/2018  
 Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	PIILANI HWY SOUTHBOUND				KILOHANA DR WESTBOUND				PIILANI HWY NORTHBOUND				KILOHANA DR EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:00	2	83	7	0	1	1	15	0	1	46	0	1	11	0	2	0	170
06:15	7	131	9	0	1	2	15	0	3	42	0	0	7	3	0	0	220
06:30	5	180	19	0	2	0	18	0	0	81	2	2	21	3	0	0	333
06:45	10	199	27	0	5	2	34	0	0	78	0	1	12	2	0	0	370
<b>Total</b>	<b>24</b>	<b>593</b>	<b>62</b>	<b>0</b>	<b>9</b>	<b>5</b>	<b>82</b>	<b>0</b>	<b>4</b>	<b>247</b>	<b>2</b>	<b>4</b>	<b>51</b>	<b>8</b>	<b>2</b>	<b>0</b>	<b>1093</b>
07:00	10	141	32	0	0	4	35	0	2	92	0	1	25	2	1	0	345
07:15	8	185	12	0	2	5	38	0	2	96	0	1	27	3	4	0	383
07:30	12	212	24	0	2	5	36	0	1	75	0	0	37	4	2	0	410
07:45	16	200	51	0	3	2	40	0	2	99	0	0	43	3	0	0	459
<b>Total</b>	<b>46</b>	<b>738</b>	<b>119</b>	<b>0</b>	<b>7</b>	<b>16</b>	<b>149</b>	<b>0</b>	<b>7</b>	<b>362</b>	<b>0</b>	<b>2</b>	<b>132</b>	<b>12</b>	<b>7</b>	<b>0</b>	<b>1597</b>
08:00	19	184	36	0	3	8	41	0	1	72	2	0	34	2	3	0	405
08:15	21	178	25	0	4	2	48	0	3	119	2	0	39	4	2	0	447
08:30	29	221	39	0	5	4	33	0	1	118	0	0	29	3	4	0	486
08:45	27	160	37	0	4	11	36	0	3	109	0	1	39	5	3	0	435
<b>Total</b>	<b>96</b>	<b>743</b>	<b>137</b>	<b>0</b>	<b>16</b>	<b>25</b>	<b>158</b>	<b>0</b>	<b>8</b>	<b>418</b>	<b>4</b>	<b>1</b>	<b>141</b>	<b>14</b>	<b>12</b>	<b>0</b>	<b>1773</b>
<b>Grand Total</b>	<b>166</b>	<b>2074</b>	<b>318</b>	<b>0</b>	<b>32</b>	<b>46</b>	<b>389</b>	<b>0</b>	<b>19</b>	<b>1027</b>	<b>6</b>	<b>7</b>	<b>324</b>	<b>34</b>	<b>21</b>	<b>0</b>	<b>4463</b>
<b>Apprch %</b>	<b>6.5</b>	<b>81.1</b>	<b>12.4</b>	<b>0</b>	<b>6.9</b>	<b>9.9</b>	<b>83.3</b>	<b>0</b>	<b>1.8</b>	<b>97</b>	<b>0.6</b>	<b>0.7</b>	<b>85.5</b>	<b>9</b>	<b>5.5</b>	<b>0</b>	
<b>Total %</b>	<b>3.7</b>	<b>46.5</b>	<b>7.1</b>	<b>0</b>	<b>0.7</b>	<b>1</b>	<b>8.7</b>	<b>0</b>	<b>0.4</b>	<b>23</b>	<b>0.1</b>	<b>0.2</b>	<b>7.3</b>	<b>0.8</b>	<b>0.5</b>	<b>0</b>	
<b>Motorcycles</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>
<b>% Motorcycles</b>	<b>0</b>	<b>0.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4.3</b>	<b>0</b>	<b>0</b>	<b>5.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>
<b>Cars</b>	<b>114</b>	<b>1388</b>	<b>210</b>	<b>0</b>	<b>20</b>	<b>22</b>	<b>303</b>	<b>0</b>	<b>9</b>	<b>849</b>	<b>4</b>	<b>0</b>	<b>254</b>	<b>21</b>	<b>13</b>	<b>0</b>	<b>3207</b>
<b>% Cars</b>	<b>68.7</b>	<b>66.9</b>	<b>66</b>	<b>0</b>	<b>62.5</b>	<b>47.8</b>	<b>77.9</b>	<b>0</b>	<b>47.4</b>	<b>82.7</b>	<b>66.7</b>	<b>0</b>	<b>78.4</b>	<b>61.8</b>	<b>61.9</b>	<b>0</b>	<b>71.9</b>
<b>Light Goods Vehicles</b>	<b>49</b>	<b>629</b>	<b>99</b>	<b>0</b>	<b>12</b>	<b>22</b>	<b>84</b>	<b>0</b>	<b>7</b>	<b>160</b>	<b>2</b>	<b>0</b>	<b>63</b>	<b>12</b>	<b>6</b>	<b>0</b>	<b>1145</b>
<b>% Light Goods Vehicles</b>	<b>29.5</b>	<b>30.3</b>	<b>31.1</b>	<b>0</b>	<b>37.5</b>	<b>47.8</b>	<b>21.6</b>	<b>0</b>	<b>36.8</b>	<b>15.6</b>	<b>33.3</b>	<b>0</b>	<b>19.4</b>	<b>35.3</b>	<b>28.6</b>	<b>0</b>	<b>25.7</b>
<b>Buses</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>14</b>
<b>% Buses</b>	<b>1.2</b>	<b>0.1</b>	<b>0.9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5.3</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.9</b>	<b>2.9</b>	<b>4.8</b>	<b>0</b>	<b>0.3</b>
<b>Single-Unit Trucks</b>	<b>1</b>	<b>41</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>68</b>
<b>% Single-Unit Trucks</b>	<b>0.6</b>	<b>2</b>	<b>1.9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.5</b>	<b>0</b>	<b>5.3</b>	<b>1.3</b>	<b>0</b>	<b>0</b>	<b>0.9</b>	<b>0</b>	<b>4.8</b>	<b>0</b>	<b>1.5</b>
<b>Articulated Trucks</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>
<b>% Articulated Trucks</b>	<b>0</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.1</b>
<b>Bicycles on Road</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>
<b>% Bicycles on Road</b>	<b>0</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.3</b>	<b>0</b>	<b>0</b>	<b>0.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>
<b>Bicycles on Crosswalk</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>% Bicycles on Crosswalk</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Pedestrians</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>
<b>% Pedestrians</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>

# Austin Tsutsumi & Associates

501 Sumner Street, Suite 521

Honolulu, HI 96817-5031

Phone: 533-3646 Fax: 526-1267

File Name : Piilani Hwy - Kiloohana Dr

Site Code : 18-510 Kihei Information Center & Admin Bldg

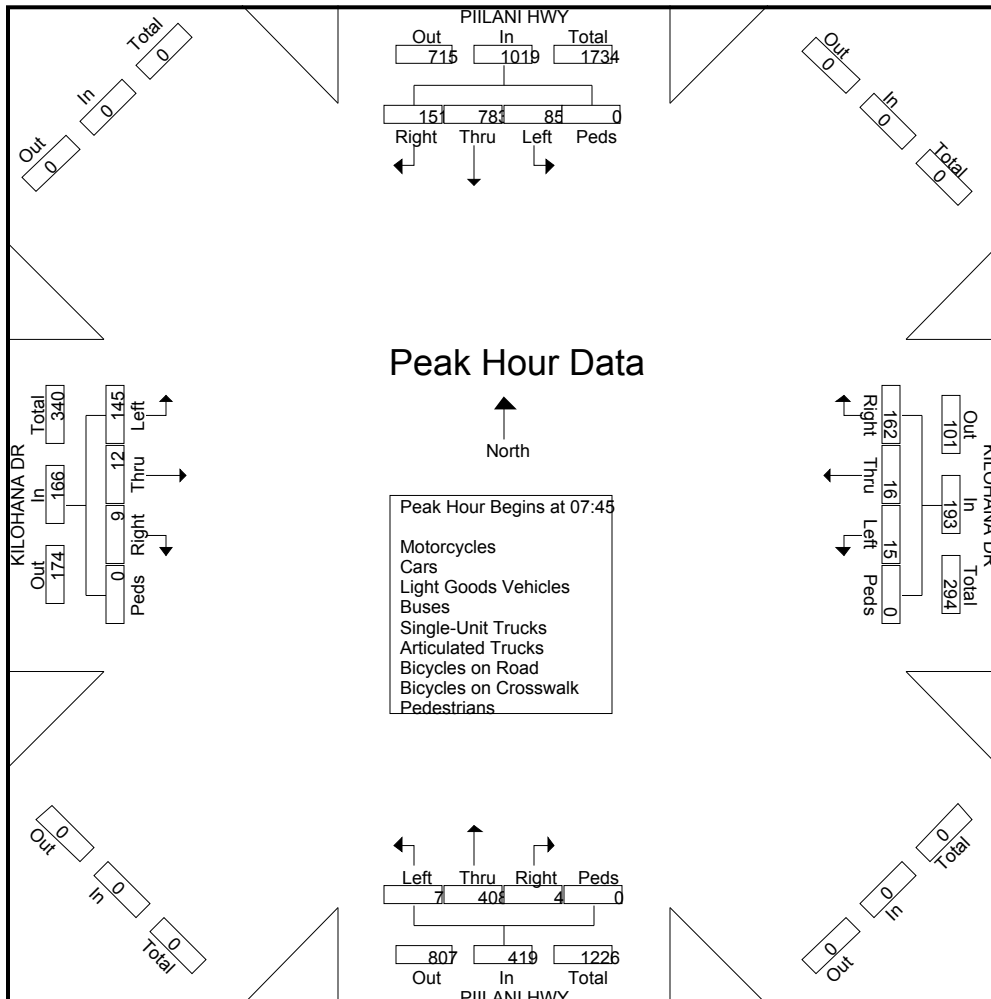
Start Date : 4/4/2018

Page No : 2

Start Time	PIILANI HWY SOUTHBOUND					KILOHANA DR WESTBOUND					PIILANI HWY NORTHBOUND					KILOHANA DR EASTBOUND					Int. Total
	Left	Thru	Rig	Ped	App. Total	Left	Thru	Rig	Ped	App. Total	Left	Thru	Rig	Ped	App. Total	Left	Thru	Rig	Ped	App. Total	
07:45	16	200	51	0	267	3	2	40	0	45	2	99	0	0	101	43	3	0	0	46	459
08:00	19	184	36	0	239	3	8	41	0	52	1	72	2	0	75	34	2	3	0	39	405
08:15	21	178	25	0	224	4	2	48	0	54	3	119	2	0	124	39	4	2	0	45	447
08:30	29	221	39	0	289	5	4	33	0	42	1	118	0	0	119	29	3	4	0	36	486
Total	85	783	151	0	1019	15	16	162	0	193	7	408	4	0	419	145	12	9	0	166	1797
% App. Total	8.3	76.8	14.8	0		7.8	8.3	83.9	0		1.7	97.4	1	0		87.3	7.2	5.4	0		
PHF	.733	.886	.740	.000	.881	.750	.500	.844	.000	.894	.583	.857	.500	.000	.845	.843	.750	.563	.000	.902	.924

Peak Hour Analysis From 06:00 to 08:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:45



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Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	PIILANI HWY SOUTHBOUND				KILOHANA DR WESTBOUND				PIILANI HWY NORTHBOUND				KILOHANA DR EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	23	160	40	0	4	7	38	0	3	178	1	0	45	10	3	0	512
15:15	20	186	44	0	4	3	29	0	2	257	1	0	40	8	5	0	599
15:30	23	185	60	0	2	4	34	0	3	193	2	0	54	0	3	0	563
15:45	31	173	35	0	2	4	37	0	4	216	0	0	50	9	2	0	563
Total	97	704	179	0	12	18	138	0	12	844	4	0	189	27	13	0	2237
16:00	27	170	39	0	3	4	28	0	3	213	1	0	49	6	3	0	546
16:15	31	151	38	0	3	3	41	0	1	227	0	0	48	5	2	0	550
16:30	37	140	45	0	2	2	20	0	0	225	1	1	48	3	2	0	526
16:45	35	161	29	0	4	11	28	0	2	221	0	2	47	14	5	0	559
Total	130	622	151	0	12	20	117	0	6	886	2	3	192	28	12	0	2181
17:00	35	133	36	0	5	4	17	0	5	218	2	0	35	7	6	0	503
17:15	23	142	30	0	5	6	27	2	1	211	2	4	24	5	3	1	486
17:30	34	132	35	0	2	8	28	0	8	134	1	2	28	7	6	4	429
17:45	31	127	26	0	3	3	16	0	5	153	1	0	29	7	4	0	405
Total	123	534	127	0	15	21	88	2	19	716	6	6	116	26	19	5	1823
Grand Total	350	1860	457	0	39	59	343	2	37	2446	12	9	497	81	44	5	6241
Apprch %	13.1	69.7	17.1	0	8.8	13.3	77.4	0.5	1.5	97.7	0.5	0.4	79.3	12.9	7	0.8	
Total %	5.6	29.8	7.3	0	0.6	0.9	5.5	0	0.6	39.2	0.2	0.1	8	1.3	0.7	0.1	
Motorcycles	2	3	1	0	1	2	2	0	0	8	0	0	2	1	1	0	23
% Motorcycles	0.6	0.2	0.2	0	2.6	3.4	0.6	0	0	0.3	0	0	0.4	1.2	2.3	0	0.4
Cars	249	1581	417	0	29	45	234	0	30	1879	11	0	352	52	35	0	4914
% Cars	71.1	85	91.2	0	74.4	76.3	68.2	0	81.1	76.8	91.7	0	70.8	64.2	79.5	0	78.7
Light Goods Vehicles	97	260	34	0	9	11	104	0	6	523	1	0	135	25	8	0	1213
% Light Goods Vehicles	27.7	14	7.4	0	23.1	18.6	30.3	0	16.2	21.4	8.3	0	27.2	30.9	18.2	0	19.4
Buses	1	5	1	0	0	0	0	0	0	9	0	0	2	0	0	0	18
% Buses	0.3	0.3	0.2	0	0	0	0	0	0	0.4	0	0	0.4	0	0	0	0.3
Single-Unit Trucks	1	8	2	0	0	0	3	0	0	17	0	0	5	1	0	0	37
% Single-Unit Trucks	0.3	0.4	0.4	0	0	0	0.9	0	0	0.7	0	0	1	1.2	0	0	0.6
Articulated Trucks	0	1	0	0	0	0	0	0	1	6	0	0	0	0	0	0	8
% Articulated Trucks	0	0.1	0	0	0	0	0	0	2.7	0.2	0	0	0	0	0	0	0.1
Bicycles on Road	0	2	2	0	0	1	0	0	0	4	0	0	1	2	0	0	12
% Bicycles on Road	0	0.1	0.4	0	0	1.7	0	0	0	0.2	0	0	0.2	2.5	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	0	0	0	0	2	0	0	0	9	0	0	0	5	16
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	100	0.3

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File Name : Piilani Hwy - Kiloohana Dr

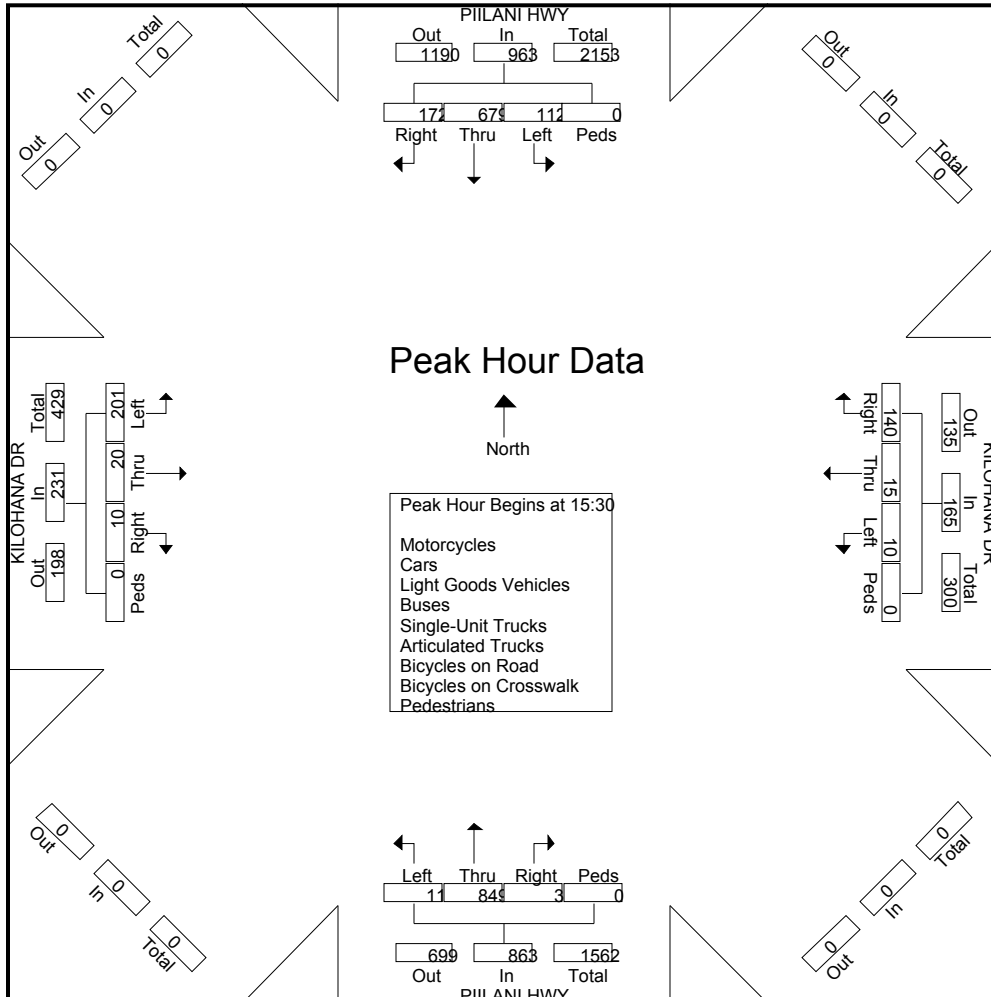
Site Code : 18-510 Kihei Information Center & Admin Bldg

Start Date : 4/4/2018

Page No : 2

Start Time	PIILANI HWY SOUTHBOUND					KILOHANA DR WESTBOUND					PIILANI HWY NORTHBOUND					KILOHANA DR EASTBOUND					Int. Total
	Left	Thru	Rig	Ped	App. Total	Left	Thru	Rig	Ped	App. Total	Left	Thru	Rig	Ped	App. Total	Left	Thru	Rig	Ped	App. Total	
15:30	23	185	60	0	268	2	4	34	0	40	3	193	2	0	198	54	0	3	0	57	563
15:45	31	173	35	0	239	2	4	37	0	43	4	216	0	0	220	50	9	2	0	61	563
16:00	27	170	39	0	236	3	4	28	0	35	3	213	1	0	217	49	6	3	0	58	546
16:15	31	151	38	0	220	3	3	41	0	47	1	227	0	0	228	48	5	2	0	55	550
Total	112	679	172	0	963	10	15	140	0	165	11	849	3	0	863	201	20	10	0	231	2222
% App. Total	11.6	70.5	17.9	0		6.1	9.1	84.8	0		1.3	98.4	0.3	0		87	8.7	4.3	0		
PHF	.903	.918	.717	.000	.898	.833	.938	.854	.000	.878	.688	.935	.375	.000	.946	.931	.556	.833	.000	.947	.987

Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1  
 Peak Hour for Entire Intersection Begins at 15:30



# Austin Tsutsumi & Associates

501 Sumner Street #521

Honolulu, HI 96817

Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Piilani Hwy - Okolani Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	PIILANI HWY Southbound					OKOLANI DR Westbound					PIILANI HWY Northbound					OKOLANI DR Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:30 AM	4	198	19	0	221	6	5	13	0	24	0	62	1	0	63	3	1	1	0	5	313
06:45 AM	3	136	17	1	157	6	8	14	1	29	1	49	1	0	51	7	2	0	3	12	249
Total	7	334	36	1	378	12	13	27	1	53	1	111	2	0	114	10	3	1	3	17	562
07:00 AM	6	166	13	0	185	5	3	18	0	26	0	62	2	0	64	7	2	3	0	12	287
07:15 AM	9	165	19	0	193	9	7	26	0	42	1	50	2	0	53	7	1	0	0	8	296
07:30 AM	14	202	24	0	240	12	3	24	0	39	1	68	3	1	73	8	3	1	0	12	364
07:45 AM	13	201	16	0	230	7	6	21	0	34	1	65	3	0	69	7	4	3	0	14	347
Total	42	734	72	0	848	33	19	89	0	141	3	245	10	1	259	29	10	7	0	46	1294
08:00 AM	17	199	15	0	231	3	3	19	0	25	2	75	5	0	82	10	2	7	0	19	357
08:15 AM	19	187	22	0	228	4	2	6	0	12	2	66	7	0	75	10	3	2	0	15	330
08:30 AM	3	158	22	0	183	2	1	3	0	6	0	89	3	0	92	7	1	6	0	14	295
08:45 AM	0	131	22	0	153	1	1	6	0	8	1	75	0	1	77	16	0	2	0	18	256
Total	39	675	81	0	795	10	7	34	0	51	5	305	15	1	326	43	6	17	0	66	1238
Grand Total	88	1743	189	1	2021	55	39	150	1	245	9	661	27	2	699	82	19	25	3	129	3094
Apprch %	4.4	86.2	9.4	0		22.4	15.9	61.2	0.4		1.3	94.6	3.9	0.3		63.6	14.7	19.4	2.3		
Total %	2.8	56.3	6.1	0	65.3	1.8	1.3	4.8	0	7.9	0.3	21.4	0.9	0.1	22.6	2.7	0.6	0.8	0.1	4.2	
Motorcycles	0	3	0	0	3	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	5
% Motorcycles	0	0.2	0	0	0.1	0	5.1	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0.2
Cars	52	1208	125	0	1385	35	30	121	0	186	6	558	19	0	583	68	14	17	0	99	2253
% Cars	59.1	69.3	66.1	0	68.5	63.6	76.9	80.7	0	75.9	66.7	84.4	70.4	0	83.4	82.9	73.7	68	0	76.7	72.8
Light Goods Vehicles	32	487	60	0	579	17	7	28	0	52	2	83	4	0	89	13	5	6	0	24	744
% Light Goods Vehicles	36.4	27.9	31.7	0	28.6	30.9	17.9	18.7	0	21.2	22.2	12.6	14.8	0	12.7	15.9	26.3	24	0	18.6	24
Buses	2	5	0	0	7	1	0	0	0	1	1	3	0	0	4	0	0	0	0	0	12
% Buses	2.3	0.3	0	0	0.3	1.8	0	0	0	0.4	11.1	0.5	0	0	0.6	0	0	0	0	0	0.4
Single-Unit Trucks	2	36	3	0	41	0	0	1	0	1	0	11	0	0	11	1	0	1	0	2	55
% Single-Unit Trucks	2.3	2.1	1.6	0	2	0	0	0.7	0	0.4	0	1.7	0	0	1.6	1.2	0	4	0	1.6	1.8
Articulated Trucks	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
% Articulated Trucks	0	0.2	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0.1	0	0	0	0	0	0.1
Bicycles on Road	0	1	1	0	2	2	0	0	0	2	0	5	4	0	9	0	0	1	0	1	14
% Bicycles on Road	0	0.1	0.5	0	0.1	3.6	0	0	0	0.8	0	0.8	14.8	0	1.3	0	0	4	0	0.8	0.5
Bicycles on Crosswalk	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
Pedestrians	0	0	0	1	1	0	0	0	1	1	0	0	0	2	2	0	0	0	3	3	7
% Pedestrians	0	0	0	100	0	0	0	0	100	0.4	0	0	0	100	0.3	0	0	0	100	2.3	0.2

# Austin Tsutsumi & Associates

501 Sumner Street #521

Honolulu, HI 96817

Phone: (808) 533-3646 Fax: (808) 526-1267

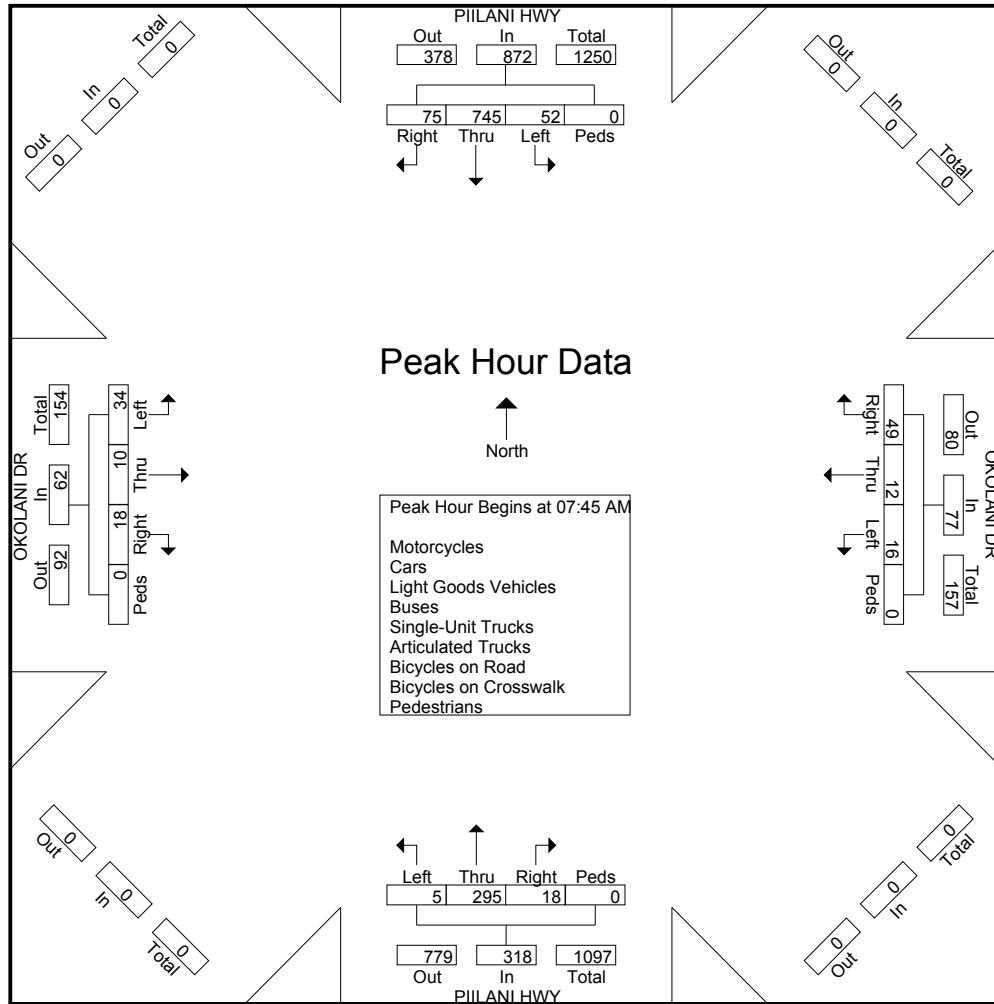
File Name : Piilani Hwy - Okolani Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	PIILANI HWY Southbound					OKOLANI DR Westbound					PIILANI HWY Northbound					OKOLANI DR Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	13	201	16	0	230	7	6	21	0	34	1	65	3	0	69	7	4	3	0	14	347
08:00 AM	17	199	15	0	231	3	3	19	0	25	2	75	5	0	82	10	2	7	0	19	357
08:15 AM	19	187	22	0	228	4	2	6	0	12	2	66	7	0	75	10	3	2	0	15	330
08:30 AM	3	158	22	0	183	2	1	3	0	6	0	89	3	0	92	7	1	6	0	14	295
Total Volume	52	745	75	0	872	16	12	49	0	77	5	295	18	0	318	34	10	18	0	62	1329
% App. Total	6	85.4	8.6	0		20.8	15.6	63.6	0		1.6	92.8	5.7	0		54.8	16.1	29	0		
PHF	.684	.927	.852	.000	.944	.571	.500	.583	.000	.566	.625	.829	.643	.000	.864	.850	.625	.643	.000	.816	.931







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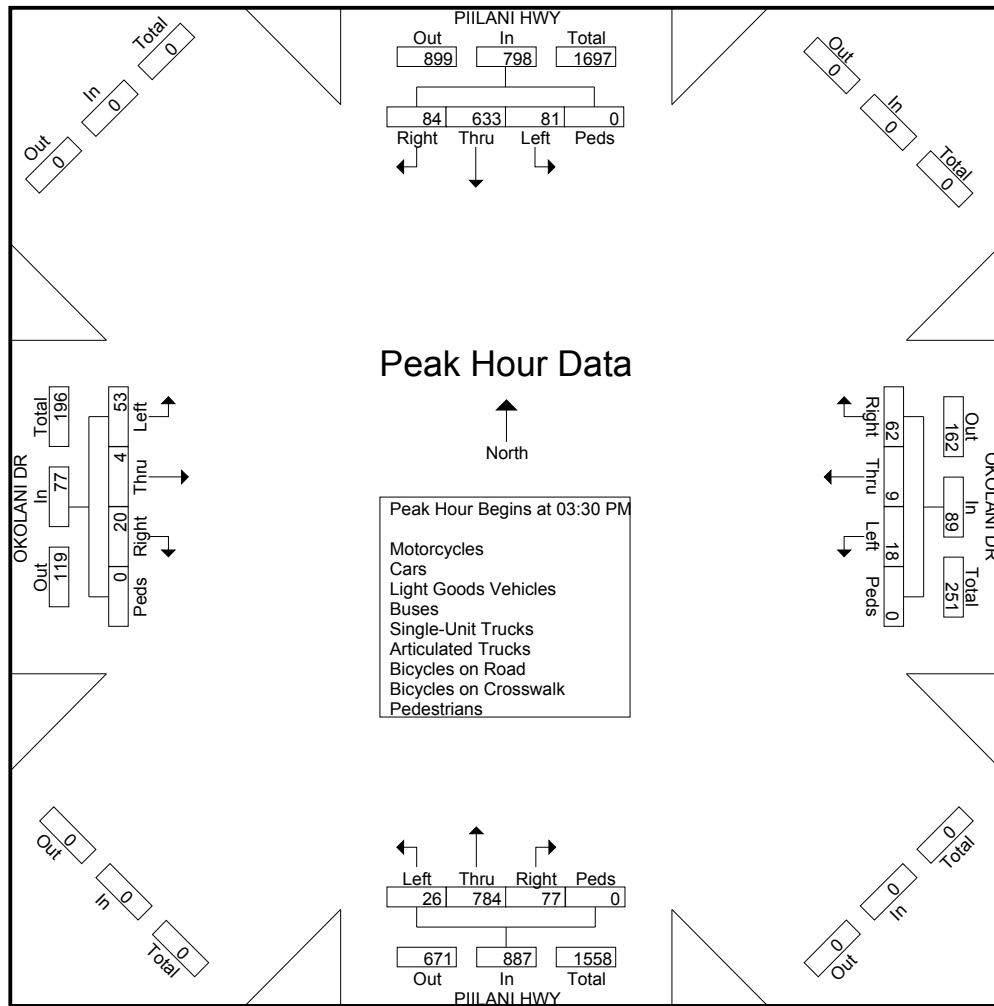
File Name : Piilani Hwy - Okolani Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	PIILANI HWY Southbound					OKOLANI DR Westbound					PIILANI HWY Northbound					OKOLANI DR Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:15 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	14	155	24	0	193	9	2	12	0	23	7	191	9	0	207	15	2	5	0	22	445
03:45 PM	22	164	18	0	204	6	4	21	0	31	3	213	12	0	228	17	1	6	0	24	487
04:00 PM	26	174	25	0	225	2	3	14	0	19	10	183	28	0	221	11	1	1	0	13	478
04:15 PM	19	140	17	0	176	1	0	15	0	16	6	197	28	0	231	10	0	8	0	18	441
Total Volume	81	633	84	0	798	18	9	62	0	89	26	784	77	0	887	53	4	20	0	77	1851
% App. Total	10.2	79.3	10.5	0		20.2	10.1	69.7	0		2.9	88.4	8.7	0		68.8	5.2	26	0		
PHF	.779	.909	.840	.000	.887	.500	.563	.738	.000	.718	.650	.920	.688	.000	.960	.779	.500	.625	.000	.802	.950



# Austin Tsutsumi & Associates

501 Sumner Street #521

Honolulu, HI 96817

Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Wailea Alanui Dr - Wailea Ike Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	WAILEA ALANUI DR Southbound					WAILEA IKE DR Westbound					WAILEA ALANUI DR Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:30 AM	18	36	0	0	54	101	0	24	0	125	0	12	46	2	60	0	0	0	0	0	239
06:45 AM	13	45	0	0	58	111	0	34	0	145	0	10	33	2	45	0	0	0	0	0	248
Total	31	81	0	0	112	212	0	58	0	270	0	22	79	4	105	0	0	0	0	0	487
07:00 AM	16	42	0	0	58	91	0	18	0	109	0	10	34	7	51	0	0	0	0	0	218
07:15 AM	21	52	0	2	75	98	0	33	3	134	0	11	38	6	55	0	0	0	0	0	264
07:30 AM	18	45	0	9	72	96	0	42	3	141	0	14	25	10	49	0	0	0	0	0	262
07:45 AM	24	56	0	1	81	119	0	29	0	148	0	16	42	7	65	0	0	0	0	0	294
Total	79	195	0	12	286	404	0	122	6	532	0	51	139	30	220	0	0	0	0	0	1038
08:00 AM	35	68	0	0	103	126	0	33	0	159	0	23	48	6	77	0	0	0	0	0	339
08:15 AM	19	56	0	2	77	131	0	33	1	165	0	25	36	8	69	0	0	0	0	0	311
08:30 AM	30	68	0	0	98	100	0	33	0	133	0	30	33	9	72	0	0	0	0	0	303
08:45 AM	29	58	0	0	87	87	0	39	0	126	0	19	39	3	61	0	0	0	0	0	274
Total	113	250	0	2	365	444	0	138	1	583	0	97	156	26	279	0	0	0	0	0	1227
Grand Total	223	526	0	14	763	1060	0	318	7	1385	0	170	374	60	604	0	0	0	0	0	2752
Apprch %	29.2	68.9	0	1.8		76.5	0	23	0.5		0	28.1	61.9	9.9		0	0	0	0	0	
Total %	8.1	19.1	0	0.5	27.7	38.5	0	11.6	0.3	50.3	0	6.2	13.6	2.2	21.9	0	0	0	0	0	
Motorcycles	2	6	0	0	8	2	0	2	0	4	0	3	1	0	4	0	0	0	0	0	16
% Motorcycles	0.9	1.1	0	0	1	0.2	0	0.6	0	0.3	0	1.8	0.3	0	0.7	0	0	0	0	0	0.6
Cars	175	383	0	0	558	758	0	227	0	985	0	127	303	0	430	0	0	0	0	0	1973
% Cars	78.5	72.8	0	0	73.1	71.5	0	71.4	0	71.1	0	74.7	81	0	71.2	0	0	0	0	0	71.7
Light Goods Vehicles	41	108	0	0	149	270	0	72	0	342	0	24	57	0	81	0	0	0	0	0	572
% Light Goods Vehicles	18.4	20.5	0	0	19.5	25.5	0	22.6	0	24.7	0	14.1	15.2	0	13.4	0	0	0	0	0	20.8
Buses	3	1	0	0	4	3	0	5	0	8	0	2	2	0	4	0	0	0	0	0	16
% Buses	1.3	0.2	0	0	0.5	0.3	0	1.6	0	0.6	0	1.2	0.5	0	0.7	0	0	0	0	0	0.6
Single-Unit Trucks	2	9	0	0	11	24	0	7	0	31	0	6	6	0	12	0	0	0	0	0	54
% Single-Unit Trucks	0.9	1.7	0	0	1.4	2.3	0	2.2	0	2.2	0	3.5	1.6	0	2	0	0	0	0	0	2
Articulated Trucks	0	0	0	0	0	2	0	2	0	4	0	0	0	0	0	0	0	0	0	0	4
% Articulated Trucks	0	0	0	0	0	0.2	0	0.6	0	0.3	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Road	0	19	0	0	19	1	0	3	0	4	0	8	5	0	13	0	0	0	0	0	36
% Bicycles on Road	0	3.6	0	0	2.5	0.1	0	0.9	0	0.3	0	4.7	1.3	0	2.2	0	0	0	0	0	1.3
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	0.2	0	0	0	0	0	0
Pedestrians	0	0	0	14	14	0	0	0	7	7	0	0	0	59	59	0	0	0	0	0	80
% Pedestrians	0	0	0	100	1.8	0	0	0	100	0.5	0	0	0	98.3	9.8	0	0	0	0	0	2.9

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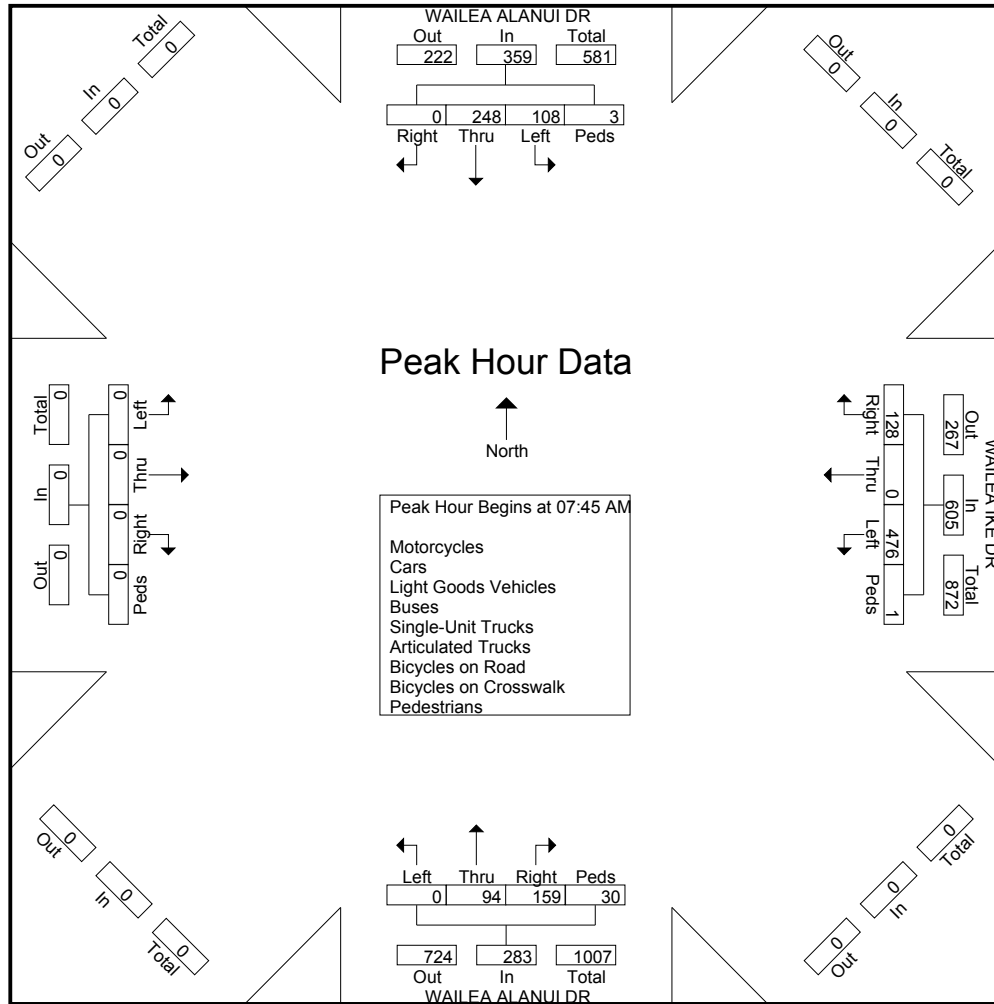
File Name : Wailea Alanui Dr - Wailea Ike Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	WAILEA ALANUI DR Southbound					WAILEA IKE DR Westbound					WAILEA ALANUI DR Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 06:30 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	24	56	0	1	81	119	0	29	0	148	0	16	42	7	65	0	0	0	0	0	294
08:00 AM	35	68	0	0	103	126	0	33	0	159	0	23	48	6	77	0	0	0	0	0	339
08:15 AM	19	56	0	2	77	131	0	33	1	165	0	25	36	8	69	0	0	0	0	0	311
08:30 AM	30	68	0	0	98	100	0	33	0	133	0	30	33	9	72	0	0	0	0	0	303
Total Volume	108	248	0	3	359	476	0	128	1	605	0	94	159	30	283	0	0	0	0	0	1247
% App. Total	30.1	69.1	0	0.8		78.7	0	21.2	0.2		0	33.2	56.2	10.6		0	0	0	0		
PHF	.771	.912	.000	.375	.871	.908	.000	.970	.250	.917	.000	.783	.828	.833	.919	.000	.000	.000	.000	.000	.920



# Austin Tsutsumi & Associates

501 Sumner Street #521

Honolulu, HI 96817

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File Name : Wailea Alanui Dr - Wailea Ike Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	WAILEA ALANUI DR Southbound					WAILEA IKE DR Westbound					WAILEA ALANUI DR Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:15 PM	45	31	0	3	79	41	0	31	2	74	0	68	123	10	201	0	0	0	0	0	354
03:30 PM	60	51	0	1	112	61	0	39	0	100	0	67	127	7	201	0	0	0	0	0	413
03:45 PM	54	52	0	3	109	81	0	49	0	130	0	74	100	4	178	0	0	0	0	0	417
Total	159	134	0	7	300	183	0	119	2	304	0	209	350	21	580	0	0	0	0	0	1184
04:00 PM	50	72	0	1	123	99	0	52	2	153	0	82	152	9	243	0	0	0	0	0	519
04:15 PM	61	49	0	3	113	108	0	68	0	176	0	89	119	9	217	0	0	0	0	0	506
04:30 PM	57	48	0	0	105	91	0	51	1	143	0	84	142	10	236	0	0	0	0	0	484
04:45 PM	40	54	0	5	99	72	0	46	5	123	0	51	89	19	159	0	0	0	0	0	381
Total	208	223	0	9	440	370	0	217	8	595	0	306	502	47	855	0	0	0	0	0	1890
05:00 PM	46	46	0	1	93	50	0	44	0	94	0	71	101	7	179	0	0	0	0	0	366
05:15 PM	50	45	0	6	101	61	0	44	2	107	0	59	92	1	152	0	0	0	0	0	360
05:30 PM	37	46	0	5	88	58	0	40	0	98	0	47	80	7	134	0	0	0	0	0	320
Grand Total	500	494	0	28	1022	722	0	464	12	1198	0	692	1125	83	1900	0	0	0	0	0	4120
Apprch %	48.9	48.3	0	2.7		60.3	0	38.7	1		0	36.4	59.2	4.4		0	0	0	0	0	
Total %	12.1	12	0	0.7	24.8	17.5	0	11.3	0.3	29.1	0	16.8	27.3	2	46.1	0	0	0	0	0	
Motorcycles	4	7	0	0	11	3	0	1	0	4	0	19	5	0	24	0	0	0	0	0	39
% Motorcycles	0.8	1.4	0	0	1.1	0.4	0	0.2	0	0.3	0	2.7	0.4	0	1.3	0	0	0	0	0	0.9
Cars	419	432	0	0	851	615	0	380	0	995	0	551	905	0	1456	0	0	0	0	0	3302
% Cars	83.8	87.4	0	0	83.3	85.2	0	81.9	0	83.1	0	79.6	80.4	0	76.6	0	0	0	0	0	80.1
Light Goods Vehicles	71	40	0	0	111	90	0	74	0	164	0	105	195	0	300	0	0	0	0	0	575
% Light Goods Vehicles	14.2	8.1	0	0	10.9	12.5	0	15.9	0	13.7	0	15.2	17.3	0	15.8	0	0	0	0	0	14
Buses	4	4	0	0	8	8	0	4	0	12	0	2	7	0	9	0	0	0	0	0	29
% Buses	0.8	0.8	0	0	0.8	1.1	0	0.9	0	1	0	0.3	0.6	0	0.5	0	0	0	0	0	0.7
Single-Unit Trucks	1	4	0	0	5	4	0	3	0	7	0	8	12	0	20	0	0	0	0	0	32
% Single-Unit Trucks	0.2	0.8	0	0	0.5	0.6	0	0.6	0	0.6	0	1.2	1.1	0	1.1	0	0	0	0	0	0.8
Articulated Trucks	1	0	0	0	1	1	0	0	0	1	0	0	1	0	1	0	0	0	0	0	3
% Articulated Trucks	0.2	0	0	0	0.1	0.1	0	0	0	0.1	0	0	0.1	0	0.1	0	0	0	0	0	0.1
Bicycles on Road	0	7	0	0	7	1	0	2	0	3	0	7	0	0	7	0	0	0	0	0	17
% Bicycles on Road	0	1.4	0	0	0.7	0.1	0	0.4	0	0.3	0	1	0	0	0.4	0	0	0	0	0	0.4
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	16.7	0.2	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	28	28	0	0	0	10	10	0	0	0	83	83	0	0	0	0	0	121
% Pedestrians	0	0	0	100	2.7	0	0	0	83.3	0.8	0	0	0	100	4.4	0	0	0	0	0	2.9

# Austin Tsutsumi & Associates

501 Sumner Street #521

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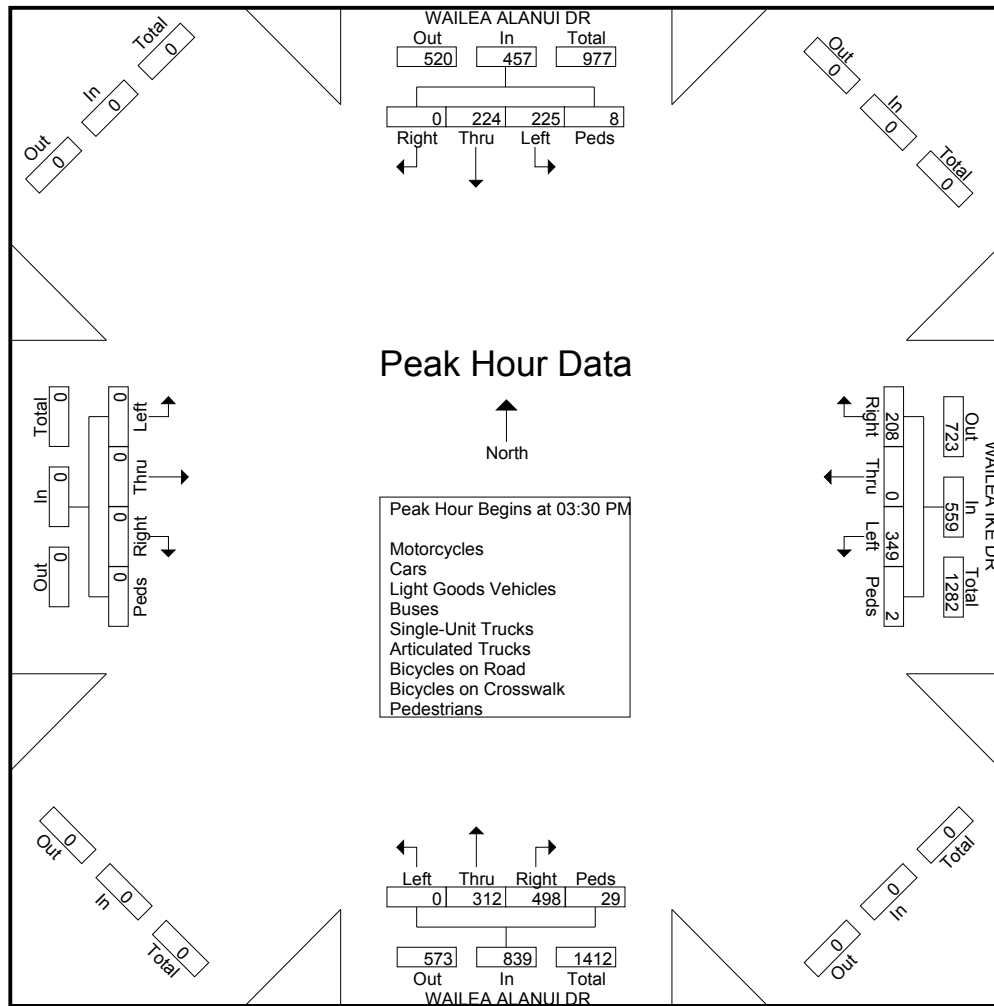
File Name : Wailea Alanui Dr - Wailea Ike Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	WAILEA ALANUI DR Southbound					WAILEA IKE DR Westbound					WAILEA ALANUI DR Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	60	51	0	1	112	61	0	39	0	100	0	67	127	7	201	0	0	0	0	0	413
03:45 PM	54	52	0	3	109	81	0	49	0	130	0	74	100	4	178	0	0	0	0	0	417
04:00 PM	50	72	0	1	123	99	0	52	2	153	0	82	152	9	243	0	0	0	0	0	519
04:15 PM	61	49	0	3	113	108	0	68	0	176	0	89	119	9	217	0	0	0	0	0	506
Total Volume	225	224	0	8	457	349	0	208	2	559	0	312	498	29	839	0	0	0	0	0	1855
% App. Total	49.2	49	0	1.8		62.4	0	37.2	0.4		0	37.2	59.4	3.5		0	0	0	0		
PHF	.922	.778	.000	.667	.929	.808	.000	.765	.250	.794	.000	.876	.819	.806	.863	.000	.000	.000	.000	.000	.894



# Austin Tsutsumi & Associates

501 Sumner Street #521

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Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Wailea Alanui Dr - Kaukahi Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	WAILEA ALANUI DR Southbound					KAUKAHI DR Westbound					WAILEA ALANUI DR Northbound					KAUKAHI DR Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:30 AM	3	42	15	3	63	9	6	2	0	17	0	5	2	0	7	3	0	0	1	4	91
06:45 AM	4	39	21	2	66	15	6	2	0	23	1	2	3	0	6	7	2	0	4	13	108
Total	7	81	36	5	129	24	12	4	0	40	1	7	5	0	13	10	2	0	5	17	199
07:00 AM	5	48	20	6	79	7	9	2	0	18	1	11	2	0	14	9	4	1	2	16	127
07:15 AM	9	44	26	0	79	5	7	5	0	17	2	6	0	0	8	1	4	0	2	7	111
07:30 AM	11	40	26	1	78	14	12	7	0	33	0	11	1	0	12	4	1	2	4	11	134
07:45 AM	13	58	27	1	99	16	5	5	0	26	0	10	4	0	14	7	2	0	6	15	154
Total	38	190	99	8	335	42	33	19	0	94	3	38	7	0	48	21	11	3	14	49	526
08:00 AM	8	52	20	2	82	21	13	9	0	43	0	18	0	0	18	6	0	0	0	6	149
08:15 AM	10	54	21	4	89	22	6	6	0	34	1	16	5	0	22	4	1	0	4	9	154
08:30 AM	13	59	21	2	95	17	10	9	0	36	1	18	6	0	25	7	0	1	3	11	167
08:45 AM	7	63	13	4	87	17	12	4	0	33	0	14	6	0	20	5	7	2	4	18	158
Total	38	228	75	12	353	77	41	28	0	146	2	66	17	0	85	22	8	3	11	44	628
Grand Total	83	499	210	25	817	143	86	51	0	280	6	111	29	0	146	53	21	6	30	110	1353
Apprch %	10.2	61.1	25.7	3.1		51.1	30.7	18.2	0		4.1	76	19.9	0		48.2	19.1	5.5	27.3		
Total %	6.1	36.9	15.5	1.8	60.4	10.6	6.4	3.8	0	20.7	0.4	8.2	2.1	0	10.8	3.9	1.6	0.4	2.2	8.1	
Motorcycles	2	3	1	0	6	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	9
% Motorcycles	2.4	0.6	0.5	0	0.7	0	0	0	0	0	0	2.7	0	0	2.1	0	0	0	0	0	0.7
Cars	51	322	124	0	497	64	59	33	0	156	2	76	9	0	87	34	10	3	0	47	787
% Cars	61.4	64.5	59	0	60.8	44.8	68.6	64.7	0	55.7	33.3	68.5	31	0	59.6	64.2	47.6	50	0	42.7	58.2
Light Goods Vehicles	28	147	68	0	243	70	25	15	0	110	3	24	13	0	40	9	9	2	0	20	413
% Light Goods Vehicles	33.7	29.5	32.4	0	29.7	49	29.1	29.4	0	39.3	50	21.6	44.8	0	27.4	17	42.9	33.3	0	18.2	30.5
Buses	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	5
% Buses	0	0	1	0	0.2	0	0	0	0	0	0	0	0	0	0	5.7	0	0	0	2.7	0.4
Single-Unit Trucks	2	10	8	0	20	6	0	3	0	9	1	2	5	0	8	3	2	1	0	6	43
% Single-Unit Trucks	2.4	2	3.8	0	2.4	4.2	0	5.9	0	3.2	16.7	1.8	17.2	0	5.5	5.7	9.5	16.7	0	5.5	3.2
Articulated Trucks	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
% Articulated Trucks	0	0.2	0	0	0.1	0	1.2	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Road	0	16	7	0	23	3	1	0	0	4	0	6	2	0	8	4	0	0	0	4	39
% Bicycles on Road	0	3.2	3.3	0	2.8	2.1	1.2	0	0	1.4	0	5.4	6.9	0	5.5	7.5	0	0	0	3.6	2.9
Bicycles on Crosswalk	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	4	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	24	24	0	0	0	0	0	0	0	0	0	0	0	0	0	30	30	54
% Pedestrians	0	0	0	96	2.9	0	0	0	0	0	0	0	0	0	0	0	0	0	100	27.3	4

# Austin Tsutsumi & Associates

501 Sumner Street #521

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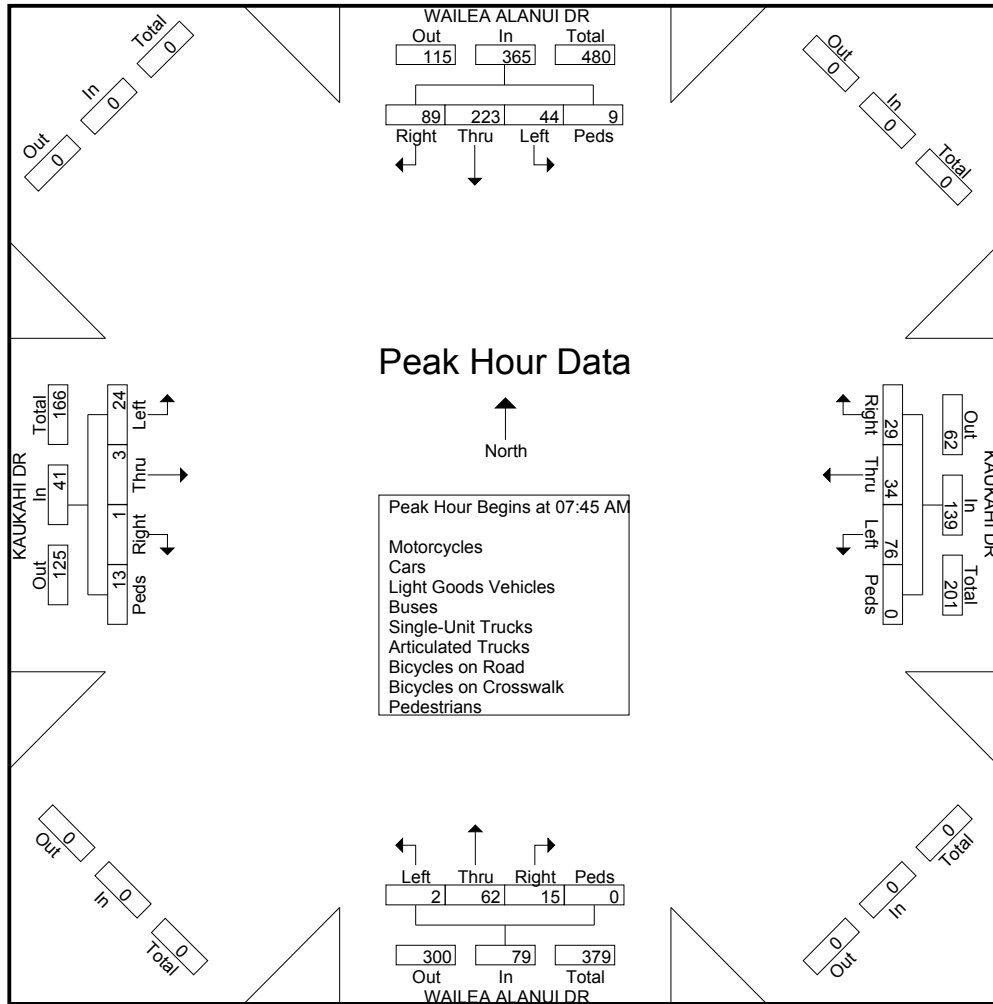
File Name : Wailea Alanui Dr - Kaukahi Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	WAILEA ALANUI DR Southbound					KAUKAHI DR Westbound					WAILEA ALANUI DR Northbound					KAUKAHI DR Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	13	58	27	1	99	16	5	5	0	26	0	10	4	0	14	7	2	0	6	15	154
08:00 AM	8	52	20	2	82	21	13	9	0	43	0	18	0	0	18	6	0	0	0	6	149
08:15 AM	10	54	21	4	89	22	6	6	0	34	1	16	5	0	22	4	1	0	4	9	154
08:30 AM	13	59	21	2	95	17	10	9	0	36	1	18	6	0	25	7	0	1	3	11	167
Total Volume	44	223	89	9	365	76	34	29	0	139	2	62	15	0	79	24	3	1	13	41	624
% App. Total	12.1	61.1	24.4	2.5		54.7	24.5	20.9	0		2.5	78.5	19	0		58.5	7.3	2.4	31.7		
PHF	.846	.945	.824	.563	.922	.864	.654	.806	.000	.808	.500	.861	.625	.000	.790	.857	.375	.250	.542	.683	.934



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501 Sumner Street #521

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Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Wailea Alanui Dr - Kaukahi Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	WAILEA ALANUI DR Southbound					KAUKAHI DR Westbound					WAILEA ALANUI DR Northbound					KAUKAHI DR Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:15 PM	5	21	6	2	34	5	7	5	0	17	1	81	13	0	95	21	10	1	0	32	178
03:30 PM	4	25	8	0	37	4	4	7	0	15	1	97	14	0	112	19	11	1	0	31	195
03:45 PM	7	24	17	2	50	4	9	5	0	18	0	75	12	0	87	17	14	1	0	32	187
Total	16	70	31	4	121	13	20	17	0	50	2	253	39	0	294	57	35	3	0	95	560
04:00 PM	9	46	16	0	71	5	7	9	0	21	1	84	18	0	103	38	10	1	1	50	245
04:15 PM	8	34	15	0	57	11	7	9	0	27	4	95	10	0	109	20	10	1	0	31	224
04:30 PM	12	32	20	0	64	3	4	7	0	14	0	82	6	0	88	25	9	0	0	34	200
04:45 PM	5	26	17	0	48	3	3	6	0	12	1	54	12	0	67	13	11	0	2	26	153
Total	34	138	68	0	240	22	21	31	0	74	6	315	46	0	367	96	40	2	3	141	822
05:00 PM	5	23	20	0	48	10	2	4	0	16	0	53	10	0	63	17	3	1	0	21	148
05:15 PM	5	31	12	1	49	6	8	6	0	20	1	39	5	0	45	16	7	1	1	25	139
05:30 PM	5	27	15	0	47	5	5	1	0	11	0	46	9	0	55	13	5	0	0	18	131
Grand Total	65	289	146	5	505	56	56	59	0	171	9	706	109	0	824	199	90	7	4	300	1800
Apprch %	12.9	57.2	28.9	1		32.7	32.7	34.5	0		1.1	85.7	13.2	0		66.3	30	2.3	1.3		
Total %	3.6	16.1	8.1	0.3	28.1	3.1	3.1	3.3	0	9.5	0.5	39.2	6.1	0	45.8	11.1	5	0.4	0.2	16.7	
Motorcycles	1	4	3	0	8	0	0	3	0	3	0	12	2	0	14	0	1	0	0	1	26
% Motorcycles	1.5	1.4	2.1	0	1.6	0	0	5.1	0	1.8	0	1.7	1.8	0	1.7	0	1.1	0	0	0.3	1.4
Cars	50	251	112	0	413	41	43	48	0	132	7	536	50	0	593	145	58	5	0	208	1346
% Cars	76.9	86.9	76.7	0	81.8	73.2	76.8	81.4	0	77.2	77.8	75.9	45.9	0	72	72.9	64.4	71.4	0	69.3	74.8
Light Goods Vehicles	14	26	24	0	64	15	13	6	0	34	2	146	53	0	201	46	31	2	0	79	378
% Light Goods Vehicles	21.5	9	16.4	0	12.7	26.8	23.2	10.2	0	19.9	22.2	20.7	48.6	0	24.4	23.1	34.4	28.6	0	26.3	21
Buses	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	6
% Buses	0	0	2.1	0	0.6	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	1	0.3
Single-Unit Trucks	0	3	2	0	5	0	0	2	0	2	0	7	3	0	10	2	0	0	0	2	19
% Single-Unit Trucks	0	1	1.4	0	1	0	0	3.4	0	1.2	0	1	2.8	0	1.2	1	0	0	0	0.7	1.1
Articulated Trucks	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	3
% Articulated Trucks	0	0.3	0	0	0.2	0	0	0	0	0	0	0.1	0.9	0	0.2	0	0	0	0	0	0.2
Bicycles on Road	0	4	2	0	6	0	0	0	0	0	0	4	0	0	4	3	0	0	0	3	13
% Bicycles on Road	0	1.4	1.4	0	1.2	0	0	0	0	0	0	0.6	0	0	0.5	1.5	0	0	0	1	0.7
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0.3
Pedestrians	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	8
% Pedestrians	0	0	0	100	1	0	0	0	0	0	0	0	0	0	0	0	0	0	75	1	0.4



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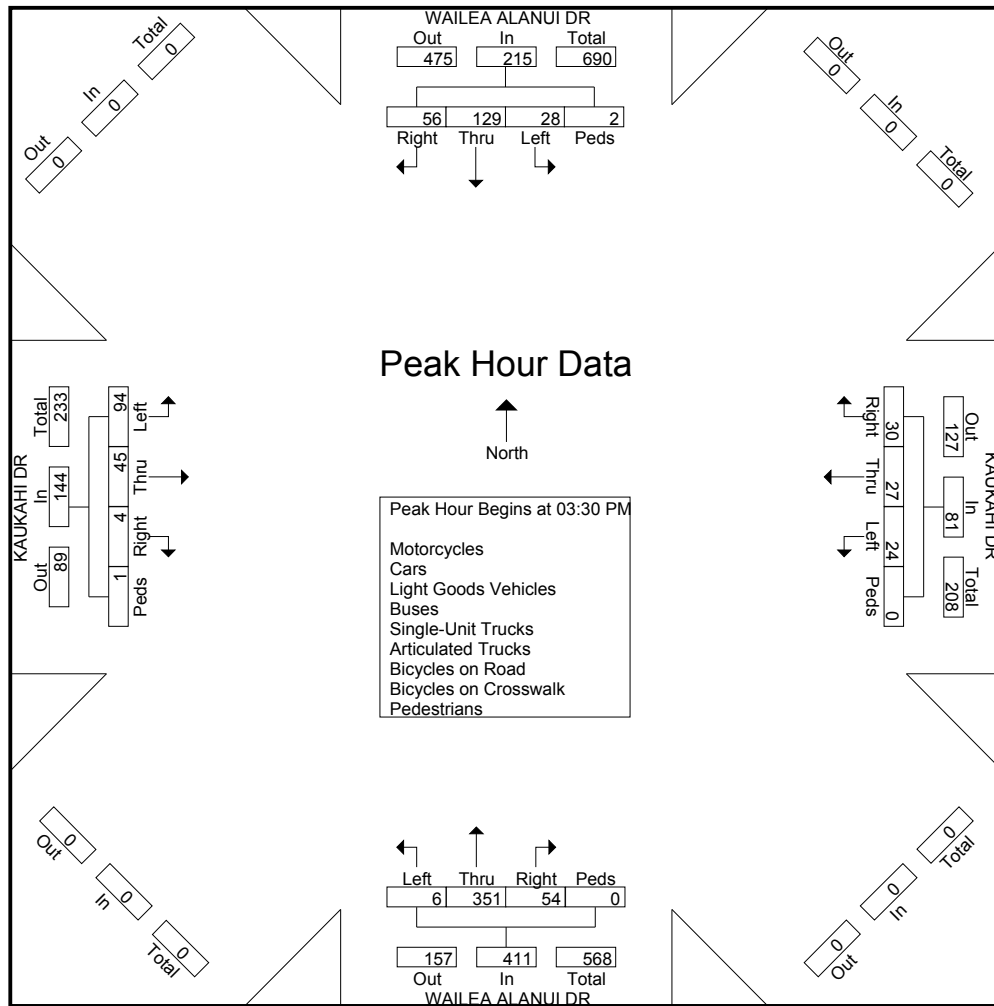
File Name : Wailea Alanui Dr - Kaukahi Dr

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	WAILEA ALANUI DR Southbound					KAUKAHI DR Westbound					WAILEA ALANUI DR Northbound					KAUKAHI DR Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	4	25	8	0	37	4	4	7	0	15	1	97	14	0	112	19	11	1	0	31	195
03:45 PM	7	24	17	2	50	4	9	5	0	18	0	75	12	0	87	17	14	1	0	32	187
04:00 PM	9	46	16	0	71	5	7	9	0	21	1	84	18	0	103	38	10	1	1	50	245
04:15 PM	8	34	15	0	57	11	7	9	0	27	4	95	10	0	109	20	10	1	0	31	224
Total Volume	28	129	56	2	215	24	27	30	0	81	6	351	54	0	411	94	45	4	1	144	851
% App. Total	13	60	26	0.9		29.6	33.3	37	0		1.5	85.4	13.1	0		65.3	31.2	2.8	0.7		
PHF	.778	.701	.824	.250	.757	.545	.750	.833	.000	.750	.375	.905	.750	.000	.917	.618	.804	1.00	.250	.720	.868





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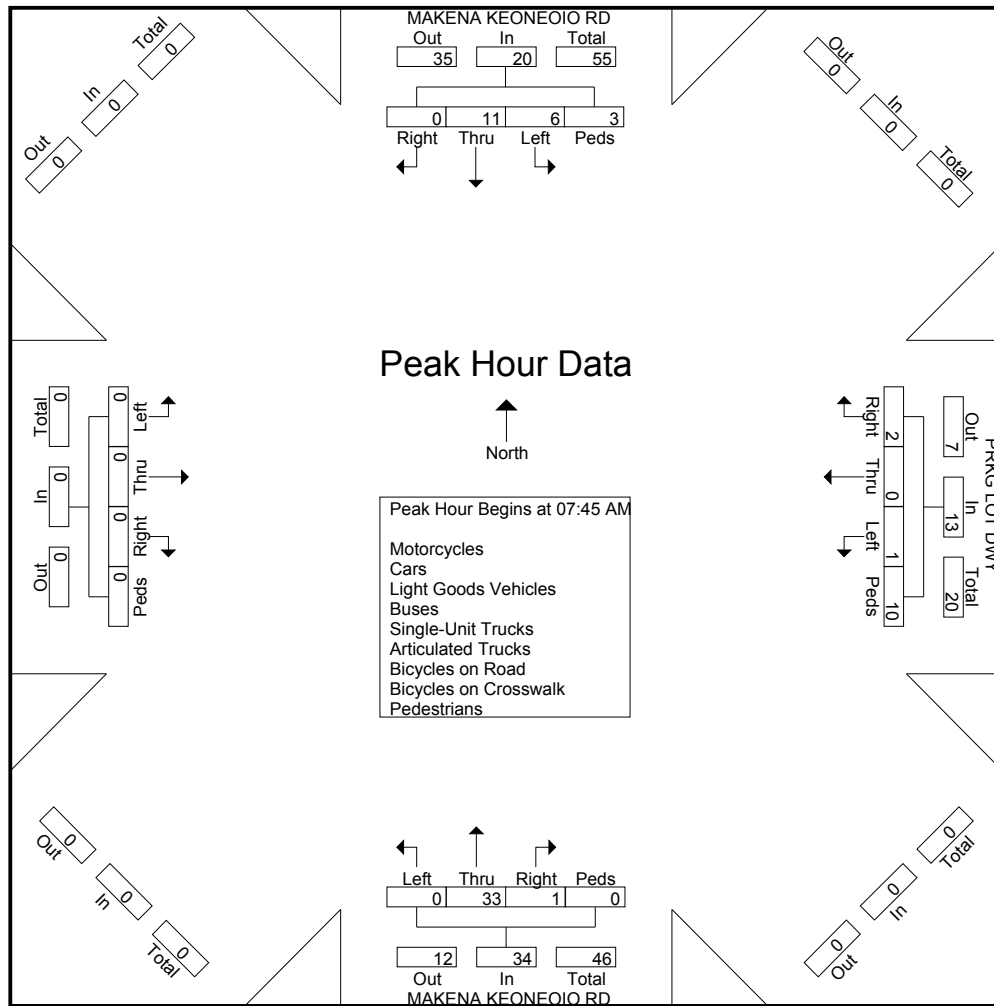
File Name : Makena Keoneoio Rd - Parking Lot

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	MAKENA KEONEOIO RD Southbound					PRKG LOT DWY Westbound					MAKENA KEONEOIO RD Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	1	0	1	2	1	0	0	0	1	0	5	0	0	5	0	0	0	0	0	8
08:00 AM	0	5	0	0	5	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	19
08:15 AM	2	0	0	2	4	0	0	1	3	4	0	8	1	0	9	0	0	0	0	0	17
08:30 AM	4	5	0	0	9	0	0	1	7	8	0	6	0	0	6	0	0	0	0	0	23
Total Volume	6	11	0	3	20	1	0	2	10	13	0	33	1	0	34	0	0	0	0	0	67
% App. Total	.30	.55	.00	.15		.77	.00	.15	.76		.00	.97	.29	.00		.00	.00	.00	.00		
PHF	.375	.550	.000	.375	.556	.250	.000	.500	.357	.406	.000	.589	.250	.000	.607	.000	.000	.000	.000	.000	.728



# Austin Tsutsumi & Associates

501 Sumner Street #521

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Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : Makena Keoneoio Rd - Parking Lot

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	MAKENA KEONEOIO RD Southbound					PRKG LOT DWY Westbound					MAKENA KEONEOIO RD Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:15 PM	0	9	0	0	9	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	10
03:30 PM	0	17	0	0	17	0	0	1	5	6	0	4	2	0	6	0	0	0	0	0	29
03:45 PM	0	11	0	0	11	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	14
Total	0	37	0	0	37	2	0	1	5	8	0	6	2	0	8	0	0	0	0	0	53
04:00 PM	0	8	0	0	8	0	0	2	0	2	0	3	0	0	3	0	0	0	0	0	13
04:15 PM	1	6	0	0	7	1	0	1	1	3	0	2	1	0	3	0	0	0	0	0	13
04:30 PM	1	7	0	0	8	2	0	0	0	2	0	4	0	0	4	0	0	0	0	0	14
04:45 PM	0	6	0	0	6	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	8
Total	2	27	0	0	29	3	0	3	1	7	0	11	1	0	12	0	0	0	0	0	48
05:00 PM	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6
05:15 PM	0	6	0	0	6	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	11
05:30 PM	0	3	0	2	5	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	6
Grand Total	2	76	0	2	80	5	0	4	6	15	0	26	3	0	29	0	0	0	0	0	124
Apprch %	2.5	95	0	2.5		33.3	0	26.7	40		0	89.7	10.3	0		0	0	0	0		
Total %	1.6	61.3	0	1.6	64.5	4	0	3.2	4.8	12.1	0	21	2.4	0	23.4	0	0	0	0	0	
Motorcycles	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Motorcycles	0	1.3	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8
Cars	2	38	0	0	40	4	0	3	0	7	0	20	3	0	23	0	0	0	0	0	70
% Cars	100	50	0	0	50	80	0	75	0	46.7	0	76.9	100	0	79.3	0	0	0	0	0	56.5
Light Goods Vehicles	0	36	0	0	36	1	0	1	0	2	0	5	0	0	5	0	0	0	0	0	43
% Light Goods Vehicles	0	47.4	0	0	45	20	0	25	0	13.3	0	19.2	0	0	17.2	0	0	0	0	0	34.7
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Single-Unit Trucks	0	1.3	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8
Articulated Trucks	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
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	3.8	0	0	3.4	0	0	0	0	0	0.8
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
Pedestrians	0	0	0	2	2	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	8
% Pedestrians	0	0	0	100	2.5	0	0	0	100	40	0	0	0	0	0	0	0	0	0	0	6.5

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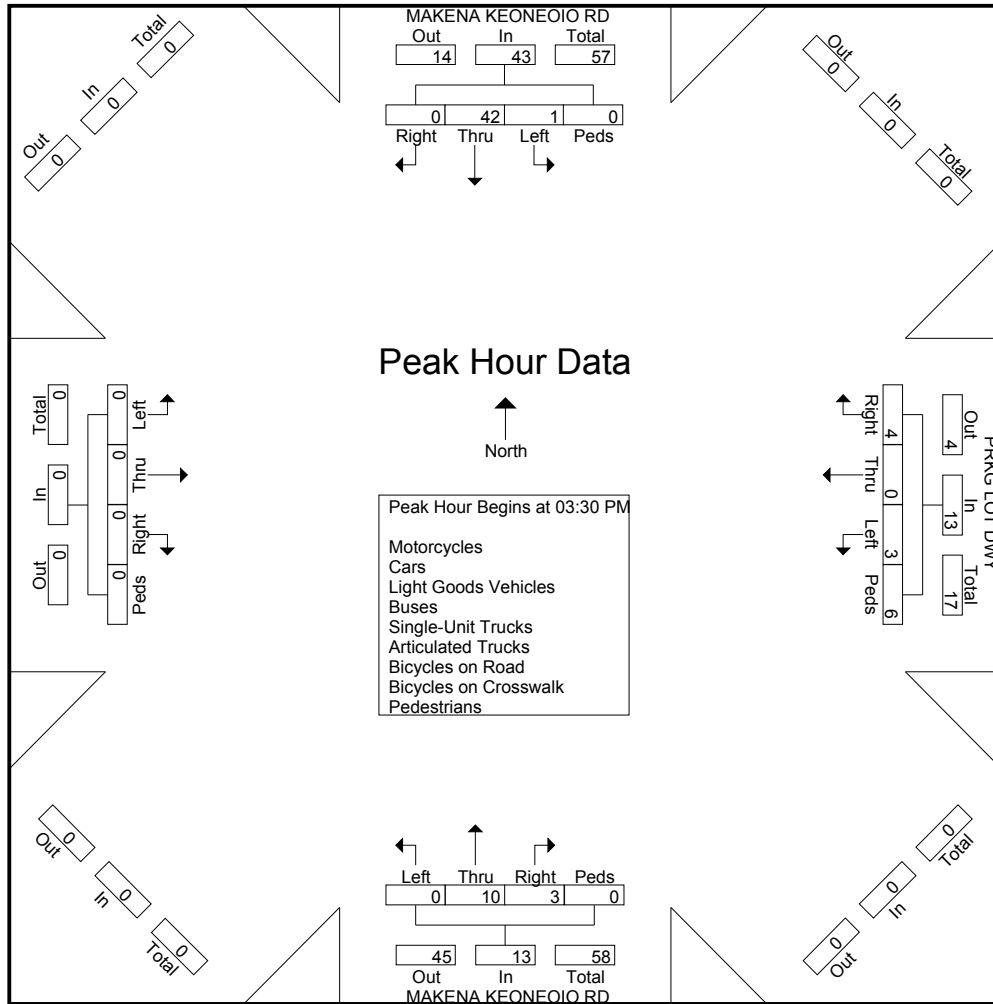
File Name : Makena Keoneoio Rd - Parking Lot

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	MAKENA KEONEOIO RD Southbound					PRKG LOT DWY Westbound					MAKENA KEONEOIO RD Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:15 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	17	0	0	17	0	0	1	5	6	0	4	2	0	6	0	0	0	0	0	29
03:45 PM	0	11	0	0	11	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	14
04:00 PM	0	8	0	0	8	0	0	2	0	2	0	3	0	0	3	0	0	0	0	0	13
04:15 PM	1	6	0	0	7	1	0	1	1	3	0	2	1	0	3	0	0	0	0	0	13
Total Volume	1	42	0	0	43	3	0	4	6	13	0	10	3	0	13	0	0	0	0	0	69
% App. Total	2.3	97.7	0	0		23.1	0	30.8	46.2		0	76.9	23.1	0		0	0	0	0		
PHF	.250	.618	.000	.000	.632	.375	.000	.500	.300	.542	.000	.625	.375	.000	.542	.000	.000	.000	.000	.000	.595



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Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	MAKENA ALANUI DR Southbound					Westbound					MAKENA ALANUI DR Northbound					MAKENA KEONEOIO RD Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:30 AM	0	4	15	0	19	0	0	0	0	0	0	6	0	0	6	0	0	1	0	1	26
06:45 AM	0	4	15	0	19	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	23
Total	0	8	30	0	38	0	0	0	0	0	0	10	0	0	10	0	0	1	0	1	49
07:00 AM	0	9	13	0	22	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	28
07:15 AM	0	11	13	0	24	0	0	0	0	0	1	3	0	0	4	2	0	2	0	4	32
07:30 AM	0	13	8	0	21	0	0	0	0	0	1	7	0	0	8	1	0	1	2	4	33
07:45 AM	0	21	9	0	30	0	0	0	0	0	0	12	0	0	12	2	0	0	0	2	44
Total	0	54	43	0	97	0	0	0	0	0	2	28	0	0	30	5	0	3	2	10	137
08:00 AM	0	18	15	0	33	0	0	0	0	0	1	6	0	0	7	0	0	0	0	0	40
08:15 AM	0	23	6	0	29	0	0	0	0	0	2	6	0	0	8	3	0	2	0	5	42
08:30 AM	0	25	12	0	37	0	0	0	0	0	1	11	0	0	12	4	0	1	0	5	54
08:45 AM	0	31	6	0	37	0	0	0	0	0	1	4	0	0	5	5	0	4	0	9	51
Total	0	97	39	0	136	0	0	0	0	0	5	27	0	0	32	12	0	7	0	19	187
Grand Total	0	159	112	0	271	0	0	0	0	0	7	65	0	0	72	17	0	11	2	30	373
Apprch %	0	58.7	41.3	0		0	0	0	0		9.7	90.3	0	0		56.7	0	36.7	6.7		
Total %	0	42.6	30	0	72.7	0	0	0	0	0	1.9	17.4	0	0	19.3	4.6	0	2.9	0.5	8	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars	0	106	52	0	158	0	0	0	0	0	3	40	0	0	43	11	0	6	0	17	218
% Cars	0	66.7	46.4	0	58.3	0	0	0	0	0	42.9	61.5	0	0	59.7	64.7	0	54.5	0	56.7	58.4
Light Goods Vehicles	0	36	54	0	90	0	0	0	0	0	1	11	0	0	12	2	0	0	0	2	104
% Light Goods Vehicles	0	22.6	48.2	0	33.2	0	0	0	0	0	14.3	16.9	0	0	16.7	11.8	0	0	0	6.7	27.9
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	2	3	0	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	6
% Single-Unit Trucks	0	1.3	2.7	0	1.8	0	0	0	0	0	0	0	0	0	0	5.9	0	0	0	3.3	1.6
Articulated Trucks	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
Bicycles on Road	0	15	3	0	18	0	0	0	0	0	3	14	0	0	17	3	0	5	0	8	43
% Bicycles on Road	0	9.4	2.7	0	6.6	0	0	0	0	0	42.9	21.5	0	0	23.6	17.6	0	45.5	0	26.7	11.5
Bicycles on Crosswalk	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
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	6.7	0.5

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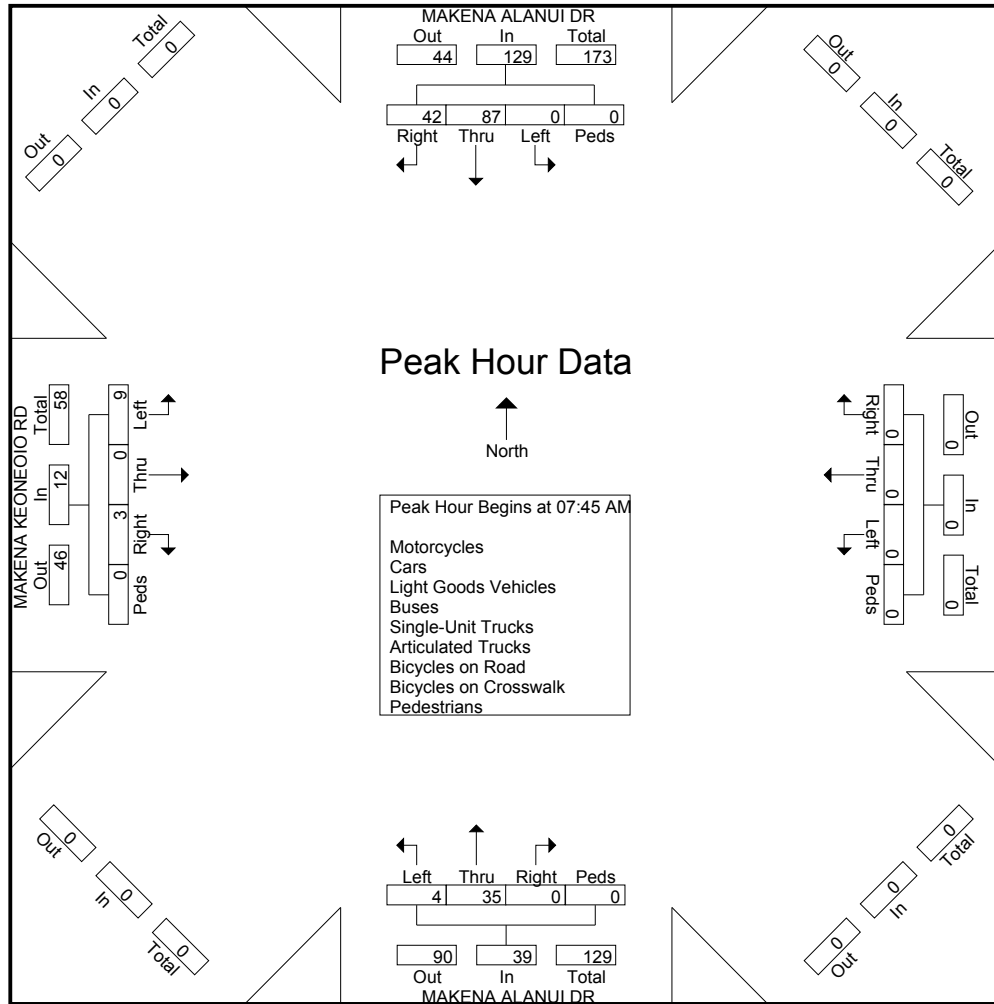
File Name : Makena Alanui - Makena Keoneoio Rd

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	MAKENA ALANUI DR Southbound					Westbound					MAKENA ALANUI DR Northbound					MAKENA KEONEOIO RD Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	21	9	0	30	0	0	0	0	0	0	12	0	0	12	2	0	0	0	2	44
08:00 AM	0	18	15	0	33	0	0	0	0	0	1	6	0	0	7	0	0	0	0	0	40
08:15 AM	0	23	6	0	29	0	0	0	0	0	2	6	0	0	8	3	0	2	0	5	42
08:30 AM	0	25	12	0	37	0	0	0	0	0	1	11	0	0	12	4	0	1	0	5	54
Total Volume	0	87	42	0	129	0	0	0	0	0	4	35	0	0	39	9	0	3	0	12	180
% App. Total	0	67.4	32.6	0		0	0	0	0	0	10.3	89.7	0	0		75	0	25	0		
PHF	.000	.870	.700	.000	.872	.000	.000	.000	.000	.000	.500	.729	.000	.000	.813	.563	.000	.375	.000	.600	.833



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Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	MAKENA ALANUI DR Southbound					Westbound					MAKENA ALANUI DR Northbound					MAKENA KEONEOIO RD Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:15 PM	0	19	0	0	19	0	0	0	0	0	0	41	0	0	41	8	0	2	1	11	71
03:30 PM	0	24	0	0	24	0	0	0	0	0	4	48	0	0	52	26	0	2	0	28	104
03:45 PM	0	12	1	0	13	0	0	0	0	0	2	32	0	0	34	17	0	0	0	17	64
Total	0	55	1	0	56	0	0	0	0	0	6	121	0	0	127	51	0	4	1	56	239
04:00 PM	0	25	3	0	28	0	0	0	0	0	2	58	0	0	60	9	0	2	0	11	99
04:15 PM	0	25	2	0	27	0	0	0	0	0	0	52	0	0	52	10	0	1	0	11	90
04:30 PM	0	21	3	0	24	0	0	0	0	0	1	31	0	0	32	7	0	1	0	8	64
04:45 PM	0	17	2	0	19	0	0	0	0	0	1	28	0	0	29	7	0	1	0	8	56
Total	0	88	10	0	98	0	0	0	0	0	4	169	0	0	173	33	0	5	0	38	309
05:00 PM	0	18	1	0	19	0	0	0	0	0	1	31	0	0	32	2	0	0	0	2	53
05:15 PM	0	12	5	0	17	0	0	0	0	0	0	19	0	0	19	3	0	2	0	5	41
05:30 PM	0	14	1	0	15	0	0	0	0	0	2	22	0	0	24	4	0	1	0	5	44
Grand Total	0	187	18	0	205	0	0	0	0	0	13	362	0	0	375	93	0	12	1	106	686
Apprch %	0	91.2	8.8	0		0	0	0	0	0	3.5	96.5	0	0		87.7	0	11.3	0.9		
Total %	0	27.3	2.6	0	29.9	0	0	0	0	0	1.9	52.8	0	0	54.7	13.6	0	1.7	0.1	15.5	
Motorcycles	0	2	0	0	2	0	0	0	0	0	0	8	0	0	8	1	0	1	0	2	12
% Motorcycles	0	1.1	0	0	1	0	0	0	0	0	0	2.2	0	0	2.1	1.1	0	8.3	0	1.9	1.7
Cars	0	165	13	0	178	0	0	0	0	0	11	312	0	0	323	44	0	8	0	52	553
% Cars	0	88.2	72.2	0	86.8	0	0	0	0	0	84.6	86.2	0	0	86.1	47.3	0	66.7	0	49.1	80.6
Light Goods Vehicles	0	14	4	0	18	0	0	0	0	0	1	34	0	0	35	48	0	2	0	50	103
% Light Goods Vehicles	0	7.5	22.2	0	8.8	0	0	0	0	0	7.7	9.4	0	0	9.3	51.6	0	16.7	0	47.2	15
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	0	1	0	1	0	0	0	0	0	0	4	0	0	4	0	0	1	0	1	6
% Single-Unit Trucks	0	0	5.6	0	0.5	0	0	0	0	0	0	1.1	0	0	1.1	0	0	8.3	0	0.9	0.9
Articulated Trucks	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
Bicycles on Road	0	6	0	0	6	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	11
% Bicycles on Road	0	3.2	0	0	2.9	0	0	0	0	0	7.7	1.1	0	0	1.3	0	0	0	0	0	1.6
Bicycles on Crosswalk	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
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0.9	0.1



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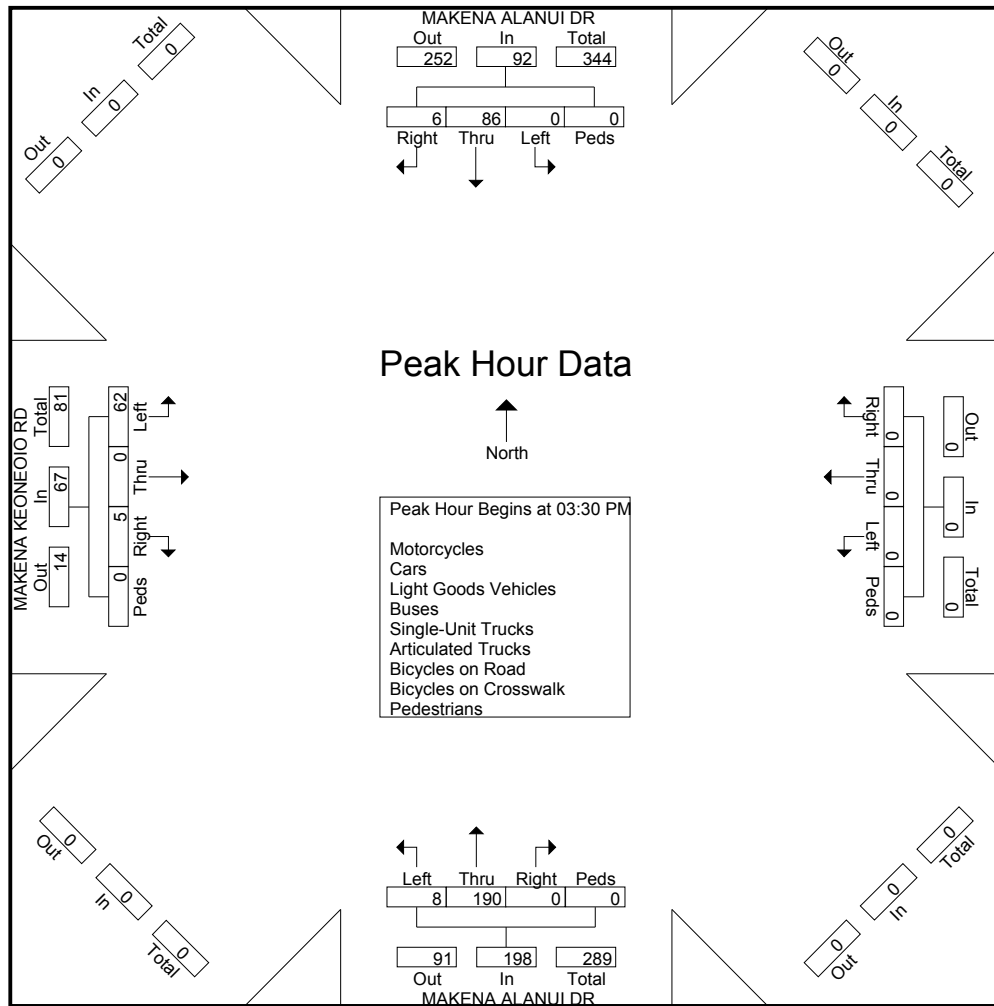
File Name : Makena Alanui - Makena Keoneoio Rd

Site Code : 18-521 Makena H2

Start Date : 5/1/2018

Page No : 2

Start Time	MAKENA ALANUI DR Southbound					Westbound					MAKENA ALANUI DR Northbound					MAKENA KEONEOIO RD Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:15 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	24	0	0	24	0	0	0	0	0	4	48	0	0	52	26	0	2	0	28	104
03:45 PM	0	12	1	0	13	0	0	0	0	0	2	32	0	0	34	17	0	0	0	17	64
04:00 PM	0	25	3	0	28	0	0	0	0	0	2	58	0	0	60	9	0	2	0	11	99
04:15 PM	0	25	2	0	27	0	0	0	0	0	0	52	0	0	52	10	0	1	0	11	90
Total Volume	0	86	6	0	92	0	0	0	0	0	8	190	0	0	198	62	0	5	0	67	357
% App. Total	0	93.5	6.5	0		0	0	0	0		4	96	0	0		92.5	0	7.5	0		
PHF	.000	.860	.500	.000	.821	.000	.000	.000	.000	.000	.500	.819	.000	.000	.825	.596	.000	.625	.000	.598	.858





# **APPENDIX B**

## **LEVEL OF SERVICE CRITERIA**

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## APPENDIX B – LEVEL OF SERVICE (LOS) CRITERIA

### VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6<sup>th</sup> 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 6<sup>th</sup> EDITION)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50



# APPENDIX C

## LEVEL OF SERVICE CALCULATIONS

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## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Existing AM Conditions
- 
-

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	6	0	1	35	87	17
Future Vol, veh/h	6	0	1	35	87	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	0	1	38	95	18

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	144	104	113	0	-	0
Stage 1	104	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	849	951	1476	-	-	-
Stage 1	920	-	-	-	-	-
Stage 2	982	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	848	951	1476	-	-	-
Mov Cap-2 Maneuver	848	-	-	-	-	-
Stage 1	919	-	-	-	-	-
Stage 2	982	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1476	-	848	-	-
HCM Lane V/C Ratio	0.001	-	0.008	-	-
HCM Control Delay (s)	7.4	0	9.3	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM 6th TWSC  
 2: Beach Parking Lot & Makena Keoneoio Road

11/12/2018

Intersection						
Int Delay, s/veh	1.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	1	0	16	2	6	7
Future Vol, veh/h	1	0	16	2	6	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	0	17	2	7	8

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	40	18	0	0	19	0
Stage 1	18	-	-	-	-	-
Stage 2	22	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	972	1061	-	-	1597	-
Stage 1	1005	-	-	-	-	-
Stage 2	1001	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	968	1061	-	-	1597	-
Mov Cap-2 Maneuver	968	-	-	-	-	-
Stage 1	1001	-	-	-	-	-
Stage 2	1001	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	3.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	968	1597
HCM Lane V/C Ratio	-	-	0.001	0.004
HCM Control Delay (s)	-	-	8.7	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 6th TWSC  
3: Wailea Alanui Drive & Kaukahi Street

11/12/2018

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	24	3	1	76	34	29	2	62	15	44	223	89
Future Vol, veh/h	24	3	1	76	34	29	2	62	15	44	223	89
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	-	-	Free	-	-	Yield	-	-	Yield
Storage Length	-	-	-	-	-	20	-	-	110	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	3	1	83	37	32	2	67	16	48	242	97

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	428	409	242	411	409	-	242	0	0	67	0	0
Stage 1	338	338	-	71	71	-	-	-	-	-	-	-
Stage 2	90	71	-	340	338	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	-	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	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	537	532	797	551	532	0	1324	-	-	1535	-	-
Stage 1	676	641	-	939	836	0	-	-	-	-	-	-
Stage 2	917	836	-	675	641	0	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	495	514	797	534	514	-	1324	-	-	1535	-	-
Mov Cap-2 Maneuver	495	514	-	534	514	-	-	-	-	-	-	-
Stage 1	675	621	-	937	834	-	-	-	-	-	-	-
Stage 2	875	834	-	650	621	-	-	-	-	-	-	-

Approach	EB		WB		NB			SB		
HCM Control Delay, s	12.6		13.8		0.2			0.9		
HCM LOS	B		B							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1324	-	-	504	528	-	1535	-	-
HCM Lane V/C Ratio	0.002	-	-	0.06	0.226	-	0.031	-	-
HCM Control Delay (s)	7.7	-	-	12.6	13.8	0	7.4	-	-
HCM Lane LOS	A	-	-	B	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.9	-	0.1	-	-



# HCM Signalized Intersection Capacity Analysis

## 4: Wailea Alanui Drive & Wailea Ike Drive

07/05/2018



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	476	128	94	159	108	248
Future Volume (vph)	476	128	94	159	108	248
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.97	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1528	1863	1545	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1528	1863	1545	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	517	139	102	173	117	270
RTOR Reduction (vph)	0	78	0	137	0	0
Lane Group Flow (vph)	517	61	102	36	117	270
Confl. Peds. (#/hr)		14		4		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	25.1	25.1	11.7	11.7	8.0	23.7
Effective Green, g (s)	25.1	25.1	11.7	11.7	8.0	23.7
Actuated g/C Ratio	0.44	0.44	0.21	0.21	0.14	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	782	675	383	318	249	1476
v/s Ratio Prot	c0.29		c0.05		c0.07	0.08
v/s Ratio Perm		0.04		0.02		
v/c Ratio	0.66	0.09	0.27	0.11	0.47	0.18
Uniform Delay, d1	12.5	9.2	18.9	18.3	22.4	10.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	0.1	0.4	0.2	1.4	0.1
Delay (s)	14.6	9.3	19.3	18.5	23.9	10.5
Level of Service	B	A	B	B	C	B
Approach Delay (s)	13.5		18.8			14.5
Approach LOS	B		B			B
<b>Intersection Summary</b>						
HCM 2000 Control Delay			14.9		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.53			
Actuated Cycle Length (s)			56.8		Sum of lost time (s)	12.5
Intersection Capacity Utilization			45.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↑	↕	↕	↑	↕
Traffic Vol, veh/h	34	10	18	16	12	49	5	295	18	52	745	75
Future Vol, veh/h	34	10	18	16	12	49	5	295	18	52	745	75
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	50	-	-	50	250	-	250	275	-	200
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	37	11	20	17	13	53	5	321	20	57	810	82

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1273	1276	-	1302	1338	-	893	0	0	341	0	0
Stage 1	925	925	-	331	331	-	-	-	-	-	-	-
Stage 2	348	351	-	971	1007	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	-	7.12	6.52	-	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	-	3.518	4.018	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	144	167	0	138	153	0	759	-	-	1218	-	-
Stage 1	323	348	0	682	645	0	-	-	-	-	-	-
Stage 2	668	632	0	304	319	0	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	129	158	-	125	145	-	758	-	-	1218	-	-
Mov Cap-2 Maneuver	129	158	-	125	145	-	-	-	-	-	-	-
Stage 1	320	331	-	677	640	-	-	-	-	-	-	-
Stage 2	650	628	-	280	304	-	-	-	-	-	-	-

Approach	EB		WB		NB			SB		
HCM Control Delay, s	45.6		39.9		0.2			0.5		
HCM LOS	E		E							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	758	-	-	135	-	133	-	1218	-	-
HCM Lane V/C Ratio	0.007	-	-	0.354	-	0.229	-	0.046	-	-
HCM Control Delay (s)	9.8	-	-	45.6	0	39.9	0	8.1	-	-
HCM Lane LOS	A	-	-	E	A	E	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.5	-	0.8	-	0.1	-	-

HCM 6th Signalized Intersection Summary  
 6: Piilani Hwy & Kilohana Drive/Mapu Drive

11/12/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	12	9	15	16	162	7	408	4	85	783	151
Future Volume (veh/h)	145	12	9	15	16	162	7	408	4	85	783	151
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	158	13	1	16	17	28	8	443	3	92	851	96
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	340	285	22	200	177	264	19	901	6	124	1018	863
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.01	0.49	0.49	0.07	0.54	0.54
Sat Flow, veh/h	1361	1715	132	604	1063	1585	1781	1856	13	1781	1870	1585
Grp Volume(v), veh/h	158	0	14	33	0	28	8	0	446	92	851	96
Grp Sat Flow(s),veh/h/ln	1361	0	1847	1667	0	1585	1781	0	1868	1781	1870	1585
Q Serve(g_s), s	6.0	0.0	0.3	0.0	0.0	0.8	0.2	0.0	8.7	2.7	20.5	1.6
Cycle Q Clear(g_c), s	6.8	0.0	0.3	0.8	0.0	0.8	0.2	0.0	8.7	2.7	20.5	1.6
Prop In Lane	1.00		0.07	0.48		1.00	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	340	0	307	377	0	264	19	0	907	124	1018	863
V/C Ratio(X)	0.46	0.00	0.05	0.09	0.00	0.11	0.43	0.00	0.49	0.74	0.84	0.11
Avail Cap(c_a), veh/h	745	0	857	856	0	736	364	0	4997	529	5176	4387
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.9	0.0	18.9	19.0	0.0	19.0	26.5	0.0	9.4	24.6	10.2	5.9
Incr Delay (d2), s/veh	1.0	0.0	0.1	0.1	0.0	0.2	14.8	0.0	0.4	8.5	1.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.1	0.3	0.0	0.3	0.2	0.0	2.2	1.3	4.9	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.9	0.0	18.9	19.1	0.0	19.2	41.3	0.0	9.8	33.1	12.1	6.0
LnGrp LOS	C	A	B	B	A	B	D	A	A	C	B	A
Approach Vol, veh/h		172			61			454			1039	
Approach Delay, s/veh		22.6			19.2			10.3			13.4	
Approach LOS		C			B			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.7	32.1		14.0	4.6	35.3		14.0				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	16.0	144.0		25.0	11.0	149.0		25.0				
Max Q Clear Time (g_c+I1), s	4.7	10.7		2.8	2.2	22.5		8.8				
Green Ext Time (p_c), s	0.1	2.5		0.2	0.0	6.8		0.4				

Intersection Summary

HCM 6th Ctrl Delay	13.7
HCM 6th LOS	B

Notes

User approved changes to right turn type.

HCM 6th TWSC  
 7: Makena Keoneoio Road & Project DW

11/12/2018

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑			↑
Traffic Vol, veh/h	0	0	16	0	0	13
Future Vol, veh/h	0	0	16	0	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	17	0	0	14

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	31	17	0	-	-	-
Stage 1	17	-	-	-	-	-
Stage 2	14	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	983	1062	-	0	0	-
Stage 1	1006	-	-	0	0	-
Stage 2	1009	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	983	1062	-	-	-	-
Mov Cap-2 Maneuver	983	-	-	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	1009	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	-	-
HCM Lane V/C Ratio	-	-
HCM Control Delay (s)	-	0
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	-



## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Existing PM Conditions
- 
-

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	3	5	190	86	2
Future Vol, veh/h	12	3	5	190	86	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	3	5	207	93	2

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	311	94	95	0	-	0
Stage 1	94	-	-	-	-	-
Stage 2	217	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	681	963	1499	-	-	-
Stage 1	930	-	-	-	-	-
Stage 2	819	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	678	963	1499	-	-	-
Mov Cap-2 Maneuver	678	-	-	-	-	-
Stage 1	926	-	-	-	-	-
Stage 2	819	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1499	-	721	-	-
HCM Lane V/C Ratio	0.004	-	0.023	-	-
HCM Control Delay (s)	7.4	0	10.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 6th TWSC  
 2: Beach Parking Lot & Makena Keoneoio Road

11/12/2018

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	0	7	0	1	15
Future Vol, veh/h	1	0	7	0	1	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	0	8	0	1	16

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	26	8	0	0	8
Stage 1	8	-	-	-	-
Stage 2	18	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	989	1074	-	-	1612
Stage 1	1015	-	-	-	-
Stage 2	1005	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	988	1074	-	-	1612
Mov Cap-2 Maneuver	988	-	-	-	-
Stage 1	1014	-	-	-	-
Stage 2	1005	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	988	1612
HCM Lane V/C Ratio	-	-	0.001	0.001
HCM Control Delay (s)	-	-	8.6	7.2
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 6th TWSC  
3: Wailea Alanui Drive & Kaukahi Street

11/12/2018

Intersection												
Int Delay, s/veh	4.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔		↑	↔	↔	↑	↔
Traffic Vol, veh/h	94	45	4	24	27	30	6	351	54	28	129	56
Future Vol, veh/h	94	45	4	24	27	30	6	351	54	28	129	56
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	-	-	Free	-	-	Yield	-	-	Yield
Storage Length	-	-	-	-	-	20	-	-	110	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	102	49	4	26	29	33	7	382	59	30	140	61

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	611	596	140	623	596	-	140	0	0	382	0	0
Stage 1	200	200	-	396	396	-	-	-	-	-	-	-
Stage 2	411	396	-	227	200	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	-	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	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	406	417	908	398	417	0	1443	-	-	1176	-	-
Stage 1	802	736	-	629	604	0	-	-	-	-	-	-
Stage 2	618	604	-	776	736	0	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	374	404	908	351	404	-	1443	-	-	1176	-	-
Mov Cap-2 Maneuver	374	404	-	351	404	-	-	-	-	-	-	-
Stage 1	797	717	-	625	600	-	-	-	-	-	-	-
Stage 2	584	600	-	701	717	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	20.2		16.2		0.1		1.1	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1443	-	-	390	377	-	1176	-	-
HCM Lane V/C Ratio	0.005	-	-	0.399	0.147	-	0.026	-	-
HCM Control Delay (s)	7.5	-	-	20.2	16.2	0	8.1	-	-
HCM Lane LOS	A	-	-	C	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.9	0.5	-	0.1	-	-



# HCM Signalized Intersection Capacity Analysis

## 4: Wailea Alanui Drive & Wailea Ike Drive

11/14/2018



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	349	208	312	498	225	224
Future Volume (vph)	349	208	312	498	225	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95
Frbp, ped/bikes	1.00	0.96	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1521	1863	1543	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1521	1863	1543	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	379	226	339	541	245	243
RTOR Reduction (vph)	0	158	0	374	0	0
Lane Group Flow (vph)	379	68	339	167	245	243
Confl. Peds. (#/hr)		14		4		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	22.4	22.4	22.9	22.9	16.7	43.6
Effective Green, g (s)	22.4	22.4	22.9	22.9	16.7	43.6
Actuated g/C Ratio	0.30	0.30	0.31	0.31	0.23	0.59
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	535	460	576	477	399	2085
v/s Ratio Prot	c0.21		c0.18		c0.14	0.07
v/s Ratio Perm		0.04		0.11		
v/c Ratio	0.71	0.15	0.59	0.35	0.61	0.12
Uniform Delay, d1	22.9	18.8	21.6	19.8	25.8	6.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.3	0.2	1.5	0.4	2.8	0.0
Delay (s)	27.2	19.0	23.1	20.2	28.6	6.7
Level of Service	C	B	C	C	C	A
Approach Delay (s)	24.1		21.3			17.7
Approach LOS	C		C			B

### Intersection Summary

HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection												
Int Delay, s/veh	14.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↑	↕	↕	↑	↕
Traffic Vol, veh/h	53	4	20	18	9	62	26	784	77	81	633	84
Future Vol, veh/h	53	4	20	18	9	62	26	784	77	81	633	84
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	50	-	-	50	250	-	250	275	-	200
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	58	4	22	20	10	67	28	852	84	88	688	91

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1820	1857	-	1820	1864	-	780	0	0	936	0	0
Stage 1	865	865	-	908	908	-	-	-	-	-	-	-
Stage 2	955	992	-	912	956	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	-	7.12	6.52	-	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	-	3.518	4.018	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	60	74	0	60	73	0	837	-	-	732	-	-
Stage 1	348	371	0	330	354	0	-	-	-	-	-	-
Stage 2	310	324	0	328	336	0	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 47	63	-	50	62	-	836	-	-	732	-	-
Mov Cap-2 Maneuver	~ 47	63	-	50	62	-	-	-	-	-	-	-
Stage 1	336	326	-	319	342	-	-	-	-	-	-	-
Stage 2	291	313	-	285	295	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s\$	364.2	136.9	0.3	1.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	836	-	-	48	-	53	-	732	-	-
HCM Lane V/C Ratio	0.034	-	-	1.291	-	0.554	-	0.12	-	-
HCM Control Delay (s)	9.5	-	-	\$ 364.2	0	136.9	0	10.6	-	-
HCM Lane LOS	A	-	-	F	A	F	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	5.8	-	2.2	-	0.4	-	-

Notes  
 -: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

HCM 6th Signalized Intersection Summary  
6: Piilani Hwy & Kilohana Drive/Mapu Drive

11/12/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	201	20	10	10	15	140	11	849	3	112	705	172
Future Volume (veh/h)	201	20	10	10	15	140	11	849	3	112	705	172
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	218	22	2	11	16	19	12	923	3	122	766	121
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	331	327	30	165	217	307	26	1025	3	156	1166	988
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.01	0.55	0.55	0.09	0.62	0.62
Sat Flow, veh/h	1373	1689	154	556	1121	1585	1781	1863	6	1781	1870	1585
Grp Volume(v), veh/h	218	0	24	27	0	19	12	0	926	122	766	121
Grp Sat Flow(s),veh/h/ln	1373	0	1843	1677	0	1585	1781	0	1869	1781	1870	1585
Q Serve(g_s), s	13.7	0.0	0.9	0.0	0.0	0.9	0.6	0.0	39.3	6.0	23.3	2.8
Cycle Q Clear(g_c), s	14.8	0.0	0.9	1.1	0.0	0.9	0.6	0.0	39.3	6.0	23.3	2.8
Prop In Lane	1.00		0.08	0.41		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	331	0	357	382	0	307	26	0	1028	156	1166	988
V/C Ratio(X)	0.66	0.00	0.07	0.07	0.00	0.06	0.47	0.00	0.90	0.78	0.66	0.12
Avail Cap(c_a), veh/h	451	0	518	525	0	445	220	0	3025	520	3132	2654
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.4	0.0	29.3	29.3	0.0	29.3	43.5	0.0	17.9	39.7	10.7	6.8
Incr Delay (d2), s/veh	2.2	0.0	0.1	0.1	0.0	0.1	12.6	0.0	3.2	8.2	0.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.0	0.4	0.5	0.0	0.3	0.3	0.0	14.0	2.8	7.1	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.6	0.0	29.4	29.4	0.0	29.4	56.1	0.0	21.1	47.9	11.3	6.9
LnGrp LOS	D	A	C	C	A	C	E	A	C	D	B	A
Approach Vol, veh/h		242			46			938			1009	
Approach Delay, s/veh		36.8			29.4			21.5			15.2	
Approach LOS		D			C			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	54.9		22.2	5.3	61.5		22.2				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	26.0	144.0		25.0	11.0	149.0		25.0				
Max Q Clear Time (g_c+I1), s	8.0	41.3		3.1	2.6	25.3		16.8				
Green Ext Time (p_c), s	0.2	7.6		0.1	0.0	5.8		0.5				

Intersection Summary

HCM 6th Ctrl Delay	20.5
HCM 6th LOS	C

HCM 6th TWSC  
7: Makena Keoneoio Road & Project DW

11/12/2018

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑			↑
Traffic Vol, veh/h	0	0	7	0	0	16
Future Vol, veh/h	0	0	7	0	0	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	8	0	0	17

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	25	8	0	-	-	-
Stage 1	8	-	-	-	-	-
Stage 2	17	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	991	1074	-	0	0	-
Stage 1	1015	-	-	0	0	-
Stage 2	1006	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	991	1074	-	-	-	-
Mov Cap-2 Maneuver	991	-	-	-	-	-
Stage 1	1015	-	-	-	-	-
Stage 2	1006	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	-	-
HCM Lane V/C Ratio	-	-
HCM Control Delay (s)	-	0
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	-



## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Base Year 2028 without Project AM Peak Conditions
- 
-

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	10	0	5	55	115	20
Future Vol, veh/h	10	0	5	55	115	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	0	5	60	125	22

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	206	136	147	0	0
Stage 1	136	-	-	-	-
Stage 2	70	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	782	913	1435	-	-
Stage 1	890	-	-	-	-
Stage 2	953	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	779	913	1435	-	-
Mov Cap-2 Maneuver	779	-	-	-	-
Stage 1	886	-	-	-	-
Stage 2	953	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1435	-	779	-	-
HCM Lane V/C Ratio	0.004	-	0.014	-	-
HCM Control Delay (s)	7.5	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM 6th TWSC  
 2: Beach Parking Lot & Makena Keoneoio Road

09/30/2019

Intersection						
Int Delay, s/veh	2.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	5	0	20	5	10	10
Future Vol, veh/h	5	0	20	5	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	22	5	11	11

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	58	25	0	0	27
Stage 1	25	-	-	-	-
Stage 2	33	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	949	1051	-	-	1587
Stage 1	998	-	-	-	-
Stage 2	989	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	942	1051	-	-	1587
Mov Cap-2 Maneuver	942	-	-	-	-
Stage 1	991	-	-	-	-
Stage 2	989	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	3.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	942	1587
HCM Lane V/C Ratio	-	-	0.006	0.007
HCM Control Delay (s)	-	-	8.8	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 6th TWSC  
3: Wailea Alanui Drive & Kaukahi Street

09/30/2019

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↔			↕↔	↕↔		↕	↕	↕	↕	↕
Traffic Vol, veh/h	25	10	5	85	40	30	5	185	25	45	380	90
Future Vol, veh/h	25	10	5	85	40	30	5	185	25	45	380	90
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	-	-	Free	-	-	Yield	-	-	Yield
Storage Length	-	-	-	-	-	20	-	-	110	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	11	5	92	43	33	5	201	27	49	413	98

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	744	722	413	730	722	-	413	0	0	201	0	0
Stage 1	511	511	-	211	211	-	-	-	-	-	-	-
Stage 2	233	211	-	519	511	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	-	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	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	331	353	639	338	353	0	1146	-	-	1371	-	-
Stage 1	545	537	-	791	728	0	-	-	-	-	-	-
Stage 2	770	728	-	540	537	0	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	289	339	639	317	339	-	1146	-	-	1371	-	-
Mov Cap-2 Maneuver	289	339	-	317	339	-	-	-	-	-	-	-
Stage 1	542	518	-	787	724	-	-	-	-	-	-	-
Stage 2	720	724	-	505	518	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	17.9		23.9		0.2		0.7	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1146	-	-	323	324	-	1371	-	-
HCM Lane V/C Ratio	0.005	-	-	0.135	0.419	-	0.036	-	-
HCM Control Delay (s)	8.2	-	-	17.9	23.9	0	7.7	-	-
HCM Lane LOS	A	-	-	C	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	2	-	0.1	-	-



# HCM Signalized Intersection Capacity Analysis

## 4: Wailea Alanui Drive & Wailea Ike Drive

09/30/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	625	205	145	275	205	325
Future Volume (vph)	625	205	145	275	205	325
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1519	1863	1543	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1519	1863	1543	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	679	223	158	299	223	353
RTOR Reduction (vph)	0	93	0	246	0	0
Lane Group Flow (vph)	679	130	158	53	223	353
Confl. Peds. (#/hr)		14		4		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	36.7	36.7	13.8	13.8	15.0	32.8
Effective Green, g (s)	36.7	36.7	13.8	13.8	15.0	32.8
Actuated g/C Ratio	0.47	0.47	0.18	0.18	0.19	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	838	719	331	274	342	1497
v/s Ratio Prot	c0.38		c0.08		c0.13	0.10
v/s Ratio Perm		0.09		0.03		
v/c Ratio	0.81	0.18	0.48	0.19	0.65	0.24
Uniform Delay, d1	17.4	11.7	28.6	27.1	28.8	14.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.0	0.1	1.1	0.3	4.4	0.1
Delay (s)	23.4	11.9	29.7	27.5	33.3	14.4
Level of Service	C	B	C	C	C	B
Approach Delay (s)	20.5		28.2			21.7
Approach LOS	C		C			C
<b>Intersection Summary</b>						
HCM 2000 Control Delay			22.7		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			77.5		Sum of lost time (s)	12.5
Intersection Capacity Utilization			65.5%		ICU Level of Service	C
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM 6th Signalized Intersection Summary

## 5: Piilani Highway/Piilani Hwy & Okolani Drive/Mikioi Place

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	70	10	30	40	15	55	15	515	40	55	975	100
Future Volume (veh/h)	70	10	30	40	15	55	15	515	40	55	975	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	76	11	0	43	16	0	16	560	26	60	1060	81
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	221	16		192	47		35	1209	1024	93	1271	1076
Arrive On Green	0.08	0.08	0.00	0.08	0.08	0.00	0.02	0.65	0.65	0.05	0.68	0.68
Sat Flow, veh/h	1377	199	1585	1117	584	1585	1781	1870	1584	1781	1870	1584
Grp Volume(v), veh/h	87	0	0	59	0	0	16	560	26	60	1060	81
Grp Sat Flow(s),veh/h/ln	1576	0	1585	1700	0	1585	1781	1870	1584	1781	1870	1584
Q Serve(g_s), s	1.2	0.0	0.0	0.0	0.0	0.0	0.5	9.3	0.4	2.0	25.7	1.1
Cycle Q Clear(g_c), s	3.1	0.0	0.0	1.9	0.0	0.0	0.5	9.3	0.4	2.0	25.7	1.1
Prop In Lane	0.87		1.00	0.73		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	237	0		239	0		35	1209	1024	93	1271	1076
V/C Ratio(X)	0.37	0.00		0.25	0.00		0.46	0.46	0.03	0.65	0.83	0.08
Avail Cap(c_a), veh/h	545	0		560	0		195	2687	2275	305	2803	2374
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.2	0.0	0.0	26.7	0.0	0.0	29.7	5.5	3.9	28.5	7.3	3.3
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.5	0.0	0.0	9.3	0.3	0.0	7.3	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	0.8	0.0	0.0	0.3	2.6	0.1	1.0	6.8	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.2	0.0	0.0	27.3	0.0	0.0	39.0	5.7	3.9	35.7	8.8	3.3
LnGrp LOS	C	A		C	A		D	A	A	D	A	A
Approach Vol, veh/h		87	A		59	A		602			1201	
Approach Delay, s/veh		28.2			27.3			6.5			9.8	
Approach LOS		C			C			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.7	44.1		9.4	5.7	46.1		9.4				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	10.5	88.0		18.0	6.7	91.8		18.0				
Max Q Clear Time (g_c+1), s	11.3			5.1	2.5	27.7		3.9				
Green Ext Time (p_c), s	0.0	4.4		0.3	0.0	13.9		0.2				

### Intersection Summary

HCM 6th Ctrl Delay	10.1
HCM 6th LOS	B

### Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
6: Piilani Hwy & Kilohana Drive/Mapu Drive

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	15	15	20	20	165	25	655	10	90	1030	170
Future Volume (veh/h)	160	15	15	20	20	165	25	655	10	90	1030	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	174	16	1	22	22	1	27	712	6	98	1120	142
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	300	219	14	162	74	62	46	2095	935	126	1186	1005
Arrive On Green	0.11	0.13	0.13	0.02	0.04	0.04	0.03	0.59	0.59	0.07	0.63	0.63
Sat Flow, veh/h	1781	1742	109	1781	1870	1585	1781	3554	1585	1781	1870	1585
Grp Volume(v), veh/h	174	0	17	22	22	1	27	712	6	98	1120	142
Grp Sat Flow(s),veh/h/ln	1781	0	1851	1781	1870	1585	1781	1777	1585	1781	1870	1585
Q Serve(g_s), s	9.6	0.0	0.9	1.3	1.2	0.1	1.6	11.0	0.2	5.8	58.3	3.8
Cycle Q Clear(g_c), s	9.6	0.0	0.9	1.3	1.2	0.1	1.6	11.0	0.2	5.8	58.3	3.8
Prop In Lane	1.00		0.06	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	300	0	232	162	74	62	46	2095	935	126	1186	1005
V/C Ratio(X)	0.58	0.00	0.07	0.14	0.30	0.02	0.59	0.34	0.01	0.78	0.94	0.14
Avail Cap(c_a), veh/h	315	0	450	297	420	356	83	2095	935	433	1313	1112
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.2	0.0	41.2	47.6	49.9	49.3	51.5	11.3	9.0	48.9	17.8	7.8
Incr Delay (d2), s/veh	2.5	0.0	0.1	0.4	2.2	0.1	11.4	0.1	0.0	10.0	13.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.0	0.4	0.6	0.6	0.0	0.8	3.7	0.1	2.8	23.4	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.6	0.0	41.4	48.0	52.1	49.4	62.9	11.3	9.0	58.9	30.8	7.9
LnGrp LOS	D	A	D	D	D	D	E	B	A	E	C	A
Approach Vol, veh/h		191			45			745			1360	
Approach Delay, s/veh		43.4			50.1			13.2			30.4	
Approach LOS		D			D			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.5	69.0	16.1	9.2	7.8	73.8	6.9	18.4				
Change Period (Y+Rc), s	5.0	6.0	4.5	5.0	5.0	6.0	4.5	5.0				
Max Green Setting (Gmax), s	20.0	54.0	12.5	24.0	5.0	75.0	10.5	26.0				
Max Q Clear Time (g_c+1), s	17.8	13.0	11.6	3.2	3.6	60.3	3.3	2.9				
Green Ext Time (p_c), s	0.2	4.7	0.0	0.1	0.0	7.5	0.0	0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay											26.4	
HCM 6th LOS											C	

HCM 6th TWSC  
7: Makena Keoneoio Road & Project DW

09/30/2019

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑			↑
Traffic Vol, veh/h	0	0	20	0	0	15
Future Vol, veh/h	0	0	20	0	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	22	0	0	16

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	38	22	0	-	-	-
Stage 1	22	-	-	-	-	-
Stage 2	16	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	974	1055	-	0	0	-
Stage 1	1001	-	-	0	0	-
Stage 2	1007	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	974	1055	-	-	-	-
Mov Cap-2 Maneuver	974	-	-	-	-	-
Stage 1	1001	-	-	-	-	-
Stage 2	1007	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	-	-
HCM Lane V/C Ratio	-	-
HCM Control Delay (s)	-	0
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	-



## **APPENDIX C**

### LEVEL OF SERVICE CALCULATIONS

- Base Year 2028 without Project PM Peak Conditions
- 
-

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	5	5	245	125	5
Future Vol, veh/h	20	5	5	245	125	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	5	5	266	136	5

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	415	139	141	0	-	0
Stage 1	139	-	-	-	-	-
Stage 2	276	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	594	909	1442	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	592	909	1442	-	-	-
Mov Cap-2 Maneuver	592	-	-	-	-	-
Stage 1	884	-	-	-	-	-
Stage 2	771	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.9	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1442	-	636	-	-
HCM Lane V/C Ratio	0.004	-	0.043	-	-
HCM Control Delay (s)	7.5	0	10.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 6th TWSC  
 2: Beach Parking Lot & Makena Keoneoio Road

09/30/2019

Intersection						
Int Delay, s/veh	2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	5	0	10	0	5	20
Future Vol, veh/h	5	0	10	0	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	11	0	5	22

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	43	11	0
Stage 1	11	-	-
Stage 2	32	-	-
Critical Hdwy	6.42	6.22	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	-
Pot Cap-1 Maneuver	968	1070	-
Stage 1	1012	-	-
Stage 2	991	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	965	1070	-
Mov Cap-2 Maneuver	965	-	-
Stage 1	1009	-	-
Stage 2	991	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	1.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	965	1608
HCM Lane V/C Ratio	-	-	0.006	0.003
HCM Control Delay (s)	-	-	8.8	7.2
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 6th TWSC  
3: Wailea Alanui Drive & Kaukahi Street

09/30/2019

Intersection												
Int Delay, s/veh	14.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔		↑	↔	↔	↑	↔
Traffic Vol, veh/h	95	60	5	40	40	30	10	565	70	30	300	60
Future Vol, veh/h	95	60	5	40	40	30	10	565	70	30	300	60
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	-	-	Free	-	-	Yield	-	-	Yield
Storage Length	-	-	-	-	-	20	-	-	110	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	103	65	5	43	43	33	11	614	76	33	326	65

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1050	1028	326	1063	1028	-	326	0	0	614	0	0
Stage 1	392	392	-	636	636	-	-	-	-	-	-	-
Stage 2	658	636	-	427	392	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	-	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	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	205	234	715	201	234	0	1234	-	-	965	-	-
Stage 1	633	606	-	466	472	0	-	-	-	-	-	-
Stage 2	453	472	-	606	606	0	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	168	223	715	149	223	-	1234	-	-	965	-	-
Mov Cap-2 Maneuver	168	223	-	149	223	-	-	-	-	-	-	-
Stage 1	624	585	-	459	465	-	-	-	-	-	-	-
Stage 2	404	465	-	516	585	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	95.3		42.8		0.1		0.7	
HCM LOS	F		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1234	-	-	190	179	-	965	-	-
HCM Lane V/C Ratio	0.009	-	-	0.915	0.486	-	0.034	-	-
HCM Control Delay (s)	7.9	-	-	95.3	42.8	0	8.9	-	-
HCM Lane LOS	A	-	-	F	E	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	7.1	2.4	-	0.1	-	-



# HCM Signalized Intersection Capacity Analysis

## 4: Wailea Alanui Drive & Wailea Ike Drive

09/30/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	565	370	410	725	380	305
Future Volume (vph)	565	370	410	725	380	305
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.95	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1507	1863	1539	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1507	1863	1539	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	614	402	446	788	413	332
RTOR Reduction (vph)	0	238	0	516	0	0
Lane Group Flow (vph)	614	164	446	272	413	332
Confl. Peds. (#/hr)		14		4		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	39.1	39.1	28.9	28.9	26.4	59.3
Effective Green, g (s)	39.1	39.1	28.9	28.9	26.4	59.3
Actuated g/C Ratio	0.37	0.37	0.27	0.27	0.25	0.56
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	650	553	506	418	439	1972
v/s Ratio Prot	c0.35		c0.24		c0.23	0.09
v/s Ratio Perm		0.11		0.18		
v/c Ratio	0.94	0.30	0.88	0.65	0.94	0.17
Uniform Delay, d1	32.6	23.9	37.1	34.3	39.2	11.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	22.5	0.3	16.4	3.5	28.5	0.0
Delay (s)	55.1	24.2	53.5	37.7	67.7	11.5
Level of Service	E	C	D	D	E	B
Approach Delay (s)	42.8		43.4			42.7
Approach LOS	D		D			D

### Intersection Summary

HCM 2000 Control Delay	43.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	106.4	Sum of lost time (s)	12.5
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM 6th Signalized Intersection Summary

## 5: Piilani Highway/Piilani Hwy & Okolani Drive/Mikioi Place

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	95	5	40	60	10	70	45	1105	125	85	965	125
Future Volume (veh/h)	95	5	40	60	10	70	45	1105	125	85	965	125
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	103	5	0	65	11	0	49	1201	99	92	1049	103
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	204	6		192	26		67	1324	1121	118	1377	1166
Arrive On Green	0.09	0.09	0.00	0.09	0.09	0.00	0.04	0.71	0.71	0.07	0.74	0.74
Sat Flow, veh/h	1515	74	1585	1412	296	1585	1781	1870	1584	1781	1870	1584
Grp Volume(v), veh/h	108	0	0	76	0	0	49	1201	99	92	1049	103
Grp Sat Flow(s),veh/h/ln	1589	0	1585	1708	0	1585	1781	1870	1584	1781	1870	1584
Q Serve(g_s), s	2.3	0.0	0.0	0.0	0.0	0.0	2.6	50.9	1.9	4.9	32.7	1.8
Cycle Q Clear(g_c), s	6.2	0.0	0.0	3.9	0.0	0.0	2.6	50.9	1.9	4.9	32.7	1.8
Prop In Lane	0.95		1.00	0.86		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	211	0		217	0		67	1324	1121	118	1377	1166
V/C Ratio(X)	0.51	0.00		0.35	0.00		0.73	0.91	0.09	0.78	0.76	0.09
Avail Cap(c_a), veh/h	350	0		361	0		123	1695	1435	193	1768	1497
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.2	0.0	0.0	42.3	0.0	0.0	46.2	11.6	4.4	44.7	7.7	3.6
Incr Delay (d2), s/veh	1.9	0.0	0.0	1.0	0.0	0.0	13.9	6.3	0.0	10.7	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	0.0	1.8	0.0	0.0	1.4	19.1	0.5	2.5	10.7	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.1	0.0	0.0	43.2	0.0	0.0	60.2	17.8	4.5	55.4	9.2	3.6
LnGrp LOS	D	A		D	A		E	B	A	E	A	A
Approach Vol, veh/h		108	A		76	A		1349			1244	
Approach Delay, s/veh		45.1			43.2			18.4			12.1	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.9	73.3		13.0	8.2	76.0		13.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	10.5	88.0		18.0	6.7	91.8		18.0				
Max Q Clear Time (g_c+10), s	10.9	52.9		8.2	4.6	34.7		5.9				
Green Ext Time (p_c), s	0.1	15.9		0.3	0.0	13.5		0.2				

### Intersection Summary

HCM 6th Ctrl Delay	17.3
HCM 6th LOS	B

### Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 6: Piilani Highway & Kilohana Drive/Mapu Drive

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	220	20	25	20	15	145	20	1200	15	120	1065	190
Future Volume (veh/h)	220	20	25	20	15	145	20	1200	15	120	1065	190
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	22	2	22	16	1	22	1304	8	130	1158	160
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	305	216	20	157	72	61	39	2049	914	161	1206	1022
Arrive On Green	0.11	0.13	0.13	0.02	0.04	0.04	0.02	0.58	0.58	0.09	0.64	0.64
Sat Flow, veh/h	1781	1689	154	1781	1870	1585	1781	3554	1585	1781	1870	1585
Grp Volume(v), veh/h	239	0	24	22	16	1	22	1304	8	130	1158	160
Grp Sat Flow(s),veh/h/ln	1781	0	1843	1781	1870	1585	1781	1777	1585	1781	1870	1585
Q Serve(g_s), s	12.5	0.0	1.3	1.3	0.9	0.1	1.4	27.5	0.2	8.0	64.7	4.5
Cycle Q Clear(g_c), s	12.5	0.0	1.3	1.3	0.9	0.1	1.4	27.5	0.2	8.0	64.7	4.5
Prop In Lane	1.00		0.08	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	305	0	236	157	72	61	39	2049	914	161	1206	1022
V/C Ratio(X)	0.78	0.00	0.10	0.14	0.22	0.02	0.56	0.64	0.01	0.81	0.96	0.16
Avail Cap(c_a), veh/h	305	0	428	285	401	340	80	2049	914	414	1254	1062
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.2	0.0	43.1	50.0	52.2	51.8	54.2	15.9	10.1	50.0	18.6	7.9
Incr Delay (d2), s/veh	12.4	0.0	0.2	0.4	1.5	0.1	11.8	0.7	0.0	9.3	16.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	0.0	0.6	0.6	0.5	0.0	0.7	10.1	0.1	3.9	28.3	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.6	0.0	43.3	50.4	53.7	51.9	65.9	16.5	10.1	59.2	35.1	7.9
LnGrp LOS	E	A	D	D	D	D	E	B	B	E	D	A
Approach Vol, veh/h		263			39			1334			1448	
Approach Delay, s/veh		56.3			51.8			17.3			34.3	
Approach LOS		E			D			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	15.1	70.5	7.0	19.3	7.5	78.1	17.0	9.3				
Change Period (Y+Rc), s	5.0	6.0	4.5	5.0	5.0	6.0	4.5	5.0				
Max Green Setting (Gmax), s	20.0	54.0	10.5	26.0	5.0	75.0	12.5	24.0				
Max Q Clear Time (g_c+10), s	10.0	29.5	3.3	3.3	3.4	66.7	14.5	2.9				
Green Ext Time (p_c), s	0.3	9.9	0.0	0.1	0.0	5.5	0.0	0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay											29.0	
HCM 6th LOS											C	

HCM 6th TWSC  
7: Makena Keoneoio Road & Project DW

09/30/2019

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑			↑
Traffic Vol, veh/h	0	0	10	0	0	20
Future Vol, veh/h	0	0	10	0	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	11	0	0	22

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	33	11	0	-	-	-
Stage 1	11	-	-	-	-	-
Stage 2	22	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	980	1070	-	0	0	-
Stage 1	1012	-	-	0	0	-
Stage 2	1001	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	980	1070	-	-	-	-
Mov Cap-2 Maneuver	980	-	-	-	-	-
Stage 1	1012	-	-	-	-	-
Stage 2	1001	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	-	-
HCM Lane V/C Ratio	-	-
HCM Control Delay (s)	-	0
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	-



## **APPENDIX C**

### LEVEL OF SERVICE CALCULATIONS

- Future Year 2028 with Project AM Peak Conditions
- 
-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	5	5	55	115	35
Future Vol, veh/h	20	5	5	55	115	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	5	5	60	125	38

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	214	144	163	0	-	0
Stage 1	144	-	-	-	-	-
Stage 2	70	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	774	903	1416	-	-	-
Stage 1	883	-	-	-	-	-
Stage 2	953	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	771	903	1416	-	-	-
Mov Cap-2 Maneuver	771	-	-	-	-	-
Stage 1	879	-	-	-	-	-
Stage 2	953	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1416	-	794	-	-
HCM Lane V/C Ratio	0.004	-	0.034	-	-
HCM Control Delay (s)	7.6	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 6th TWSC  
 2: Beach Parking Lot & Makena Keoneoio Road

09/30/2019

Intersection						
Int Delay, s/veh	1.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	0	35	5	10	25
Future Vol, veh/h	5	0	35	5	10	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	38	5	11	27

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	90	41	0	0	43	0
Stage 1	41	-	-	-	-	-
Stage 2	49	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	910	1030	-	-	1566	-
Stage 1	981	-	-	-	-	-
Stage 2	973	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	904	1030	-	-	1566	-
Mov Cap-2 Maneuver	904	-	-	-	-	-
Stage 1	974	-	-	-	-	-
Stage 2	973	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	2.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	904	1566
HCM Lane V/C Ratio	-	-	0.006	0.007
HCM Control Delay (s)	-	-	9	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 6th TWSC  
3: Wailea Alanui Drive & Kaukahi Street

09/30/2019

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔		↑	↔	↔	↑	↔
Traffic Vol, veh/h	25	10	5	85	40	30	5	195	25	45	395	90
Future Vol, veh/h	25	10	5	85	40	30	5	195	25	45	395	90
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	-	-	Free	-	-	Yield	-	-	Yield
Storage Length	-	-	-	-	-	20	-	-	110	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	11	5	92	43	33	5	212	27	49	429	98

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	771	749	429	757	749	-	429	0	0	212	0	0
Stage 1	527	527	-	222	222	-	-	-	-	-	-	-
Stage 2	244	222	-	535	527	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	-	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	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	317	341	626	324	341	0	1130	-	-	1358	-	-
Stage 1	535	528	-	780	720	0	-	-	-	-	-	-
Stage 2	760	720	-	529	528	0	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	276	327	626	303	327	-	1130	-	-	1358	-	-
Mov Cap-2 Maneuver	276	327	-	303	327	-	-	-	-	-	-	-
Stage 1	532	509	-	776	716	-	-	-	-	-	-	-
Stage 2	710	716	-	495	509	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB			
HCM Control Delay, s	18.5		25.4		0.2		0.7			
HCM LOS	C		D							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1130	-	-	310	310	-	1358	-	-
HCM Lane V/C Ratio	0.005	-	-	0.14	0.438	-	0.036	-	-
HCM Control Delay (s)	8.2	-	-	18.5	25.4	0	7.8	-	-
HCM Lane LOS	A	-	-	C	D	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	2.1	-	0.1	-	-



# HCM Signalized Intersection Capacity Analysis

## 4: Wailea Alanui Drive & Wailea Ike Drive

09/30/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	635	205	150	280	205	330
Future Volume (vph)	635	205	150	280	205	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1519	1863	1543	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1519	1863	1543	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	690	223	163	304	223	359
RTOR Reduction (vph)	0	91	0	250	0	0
Lane Group Flow (vph)	690	132	163	54	223	359
Confl. Peds. (#/hr)		14		4		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	36.7	36.7	13.9	13.9	15.1	33.0
Effective Green, g (s)	36.7	36.7	13.9	13.9	15.1	33.0
Actuated g/C Ratio	0.47	0.47	0.18	0.18	0.19	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	836	717	333	276	343	1503
v/s Ratio Prot	c0.39		c0.09		c0.13	0.10
v/s Ratio Perm		0.09		0.04		
v/c Ratio	0.83	0.18	0.49	0.20	0.65	0.24
Uniform Delay, d1	17.7	11.8	28.7	27.2	28.9	14.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.7	0.1	1.1	0.4	4.4	0.1
Delay (s)	24.4	12.0	29.8	27.5	33.2	14.4
Level of Service	C	B	C	C	C	B
Approach Delay (s)	21.4		28.3			21.6
Approach LOS	C		C			C
<b>Intersection Summary</b>						
HCM 2000 Control Delay			23.1		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			77.7		Sum of lost time (s)	12.0
Intersection Capacity Utilization			66.3%		ICU Level of Service	C
Analysis Period (min)			15			
c	Critical Lane Group					

HCM 6th Signalized Intersection Summary  
 5: Piilani Highway/Piilani Hwy & Okolani Drive/Mikioi Place

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↑	↖	↖	↑	↗
Traffic Volume (veh/h)	70	10	30	40	15	55	15	520	40	55	985	100
Future Volume (veh/h)	70	10	30	40	15	55	15	520	40	55	985	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	76	11	0	43	16	0	16	565	27	60	1071	81
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	219	16		189	47		35	1219	1032	92	1279	1083
Arrive On Green	0.08	0.08	0.00	0.08	0.08	0.00	0.02	0.65	0.65	0.05	0.68	0.68
Sat Flow, veh/h	1377	199	1585	1116	586	1585	1781	1870	1584	1781	1870	1584
Grp Volume(v), veh/h	87	0	0	59	0	0	16	565	27	60	1071	81
Grp Sat Flow(s),veh/h/ln	1577	0	1585	1701	0	1585	1781	1870	1584	1781	1870	1584
Q Serve(g_s), s	1.3	0.0	0.0	0.0	0.0	0.0	0.6	9.4	0.4	2.1	26.4	1.1
Cycle Q Clear(g_c), s	3.2	0.0	0.0	1.9	0.0	0.0	0.6	9.4	0.4	2.1	26.4	1.1
Prop In Lane	0.87		1.00	0.73		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	235	0		237	0		35	1219	1032	92	1279	1083
V/C Ratio(X)	0.37	0.00		0.25	0.00		0.46	0.46	0.03	0.65	0.84	0.07
Avail Cap(c_a), veh/h	535	0		549	0		191	2636	2232	300	2750	2329
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.8	0.0	0.0	27.3	0.0	0.0	30.3	5.4	3.9	29.0	7.3	3.3
Incr Delay (d2), s/veh	1.0	0.0	0.0	0.5	0.0	0.0	9.3	0.3	0.0	7.5	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.0	0.8	0.0	0.0	0.3	2.7	0.1	1.0	7.1	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.8	0.0	0.0	27.8	0.0	0.0	39.6	5.7	3.9	36.5	8.8	3.3
LnGrp LOS	C	A		C	A		D	A	A	D	A	A
Approach Vol, veh/h		87	A		59	A		608			1212	
Approach Delay, s/veh		28.8			27.8			6.5			9.8	
Approach LOS		C			C			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.7	45.2		9.5	5.7	47.2		9.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	10.5	88.0		18.0	6.7	91.8		18.0				
Max Q Clear Time (g_c+1), s	11.4			5.2	2.6	28.4		3.9				
Green Ext Time (p_c), s	0.0	4.5		0.3	0.0	14.3		0.2				

Intersection Summary

HCM 6th Ctrl Delay	10.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 6: Piilani Hwy & Kilohana Drive/Mapu Drive

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	160	15	15	20	20	165	25	660	10	90	1035	170
Future Volume (veh/h)	160	15	15	20	20	165	25	660	10	90	1035	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	174	16	1	22	22	1	27	717	6	98	1125	143
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	299	218	14	162	73	62	46	2101	937	125	1189	1008
Arrive On Green	0.11	0.13	0.13	0.02	0.04	0.04	0.03	0.59	0.59	0.07	0.64	0.64
Sat Flow, veh/h	1781	1742	109	1781	1870	1585	1781	3554	1585	1781	1870	1585
Grp Volume(v), veh/h	174	0	17	22	22	1	27	717	6	98	1125	143
Grp Sat Flow(s),veh/h/ln	1781	0	1851	1781	1870	1585	1781	1777	1585	1781	1870	1585
Q Serve(g_s), s	9.7	0.0	0.9	1.3	1.2	0.1	1.6	11.1	0.2	5.8	59.1	3.9
Cycle Q Clear(g_c), s	9.7	0.0	0.9	1.3	1.2	0.1	1.6	11.1	0.2	5.8	59.1	3.9
Prop In Lane	1.00		0.06	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	299	0	232	162	73	62	46	2101	937	125	1189	1008
V/C Ratio(X)	0.58	0.00	0.07	0.14	0.30	0.02	0.59	0.34	0.01	0.78	0.95	0.14
Avail Cap(c_a), veh/h	313	0	448	296	417	354	83	2101	937	431	1305	1106
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.5	0.0	41.5	47.9	50.2	49.7	51.8	11.3	9.0	49.2	17.9	7.8
Incr Delay (d2), s/veh	2.5	0.0	0.1	0.4	2.3	0.1	11.4	0.1	0.0	10.0	13.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.0	0.4	0.6	0.6	0.0	0.8	3.7	0.1	2.8	23.8	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.0	0.0	41.6	48.3	52.5	49.8	63.3	11.4	9.0	59.2	31.3	7.9
LnGrp LOS	D	A	D	D	D	D	E	B	A	E	C	A
Approach Vol, veh/h		191			45			750			1366	
Approach Delay, s/veh		43.8			50.4			13.2			30.8	
Approach LOS		D			D			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.6	69.6	16.2	9.2	7.8	74.4	6.9	18.5				
Change Period (Y+Rc), s	5.0	6.0	4.5	5.0	5.0	6.0	4.5	5.0				
Max Green Setting (Gmax), s	20.0	54.0	12.5	24.0	5.0	75.0	10.5	26.0				
Max Q Clear Time (g_c+1), s	17.8	13.1	11.7	3.2	3.6	61.1	3.3	2.9				
Green Ext Time (p_c), s	0.2	4.7	0.0	0.1	0.0	7.3	0.0	0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay											26.6	
HCM 6th LOS											C	

HCM 6th TWSC  
7: Makena Keoneoio Road & Project DW

09/30/2019

Intersection						
Int Delay, s/veh	2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑			↑
Traffic Vol, veh/h	15	0	20	15	0	15
Future Vol, veh/h	15	0	20	15	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	0	22	16	0	16

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	46	30	0	0	-	-
Stage 1	30	-	-	-	-	-
Stage 2	16	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	964	1044	-	-	0	-
Stage 1	993	-	-	-	0	-
Stage 2	1007	-	-	-	0	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	964	1044	-	-	-	-
Mov Cap-2 Maneuver	964	-	-	-	-	-
Stage 1	993	-	-	-	-	-
Stage 2	1007	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	964
HCM Lane V/C Ratio	-	-	0.017
HCM Control Delay (s)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.1

HCM 6th TWSC  
 8: Beach Parking Lot II & Makena Keoneoio Road

09/30/2019

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘		↗			↗
Traffic Vol, veh/h	0	0	0	5	0	0
Future Vol, veh/h	0	0	0	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	5	0	0

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	4	-	0	0	-	-
Stage 1	3	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	-	-
Pot Cap-1 Maneuver	1018	0	-	-	0	-
Stage 1	1020	0	-	-	0	-
Stage 2	1022	0	-	-	0	-
Platoon blocked, %		-	-	-	-	-
Mov Cap-1 Maneuver	1018	-	-	-	-	-
Mov Cap-2 Maneuver	1018	-	-	-	-	-
Stage 1	1020	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	0
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	-



## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Future Year 2028 with Project PM Peak Conditions
- 
-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	30	10	10	245	125	15
Future Vol, veh/h	30	10	10	245	125	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	11	11	266	136	16

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	432	144	152	0	0
Stage 1	144	-	-	-	-
Stage 2	288	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	581	903	1429	-	-
Stage 1	883	-	-	-	-
Stage 2	761	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	576	903	1429	-	-
Mov Cap-2 Maneuver	576	-	-	-	-
Stage 1	875	-	-	-	-
Stage 2	761	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.1	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1429	-	633	-	-
HCM Lane V/C Ratio	0.008	-	0.069	-	-
HCM Control Delay (s)	7.5	0	11.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

HCM 6th TWSC  
 2: Beach Parking Lot & Makena Keoneoio Road

09/30/2019

Intersection						
Int Delay, s/veh	1.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	5	0	25	0	5	35
Future Vol, veh/h	5	0	25	0	5	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	27	0	5	38

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	75	27	0	0	27	0
Stage 1	27	-	-	-	-	-
Stage 2	48	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	928	1048	-	-	1587	-
Stage 1	996	-	-	-	-	-
Stage 2	974	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	925	1048	-	-	1587	-
Mov Cap-2 Maneuver	925	-	-	-	-	-
Stage 1	993	-	-	-	-	-
Stage 2	974	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	925	1587
HCM Lane V/C Ratio	-	-	0.006	0.003
HCM Control Delay (s)	-	-	8.9	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0



HCM 6th TWSC  
3: Wailea Alanui Drive & Kaukahi Street

09/30/2019

Intersection												
Int Delay, s/veh	15.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔		↑	↔	↔	↑	↔
Traffic Vol, veh/h	95	60	5	40	40	30	10	570	70	30	310	60
Future Vol, veh/h	95	60	5	40	40	30	10	570	70	30	310	60
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	-	-	Free	-	-	Yield	-	-	Yield
Storage Length	-	-	-	-	-	20	-	-	110	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	103	65	5	43	43	33	11	620	76	33	337	65

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1067	1045	337	1080	1045	-	337	0	0	620	0	0
Stage 1	403	403	-	642	642	-	-	-	-	-	-	-
Stage 2	664	642	-	438	403	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	-	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	-	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	200	229	705	196	229	0	1222	-	-	960	-	-
Stage 1	624	600	-	463	469	0	-	-	-	-	-	-
Stage 2	450	469	-	597	600	0	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	163	218	705	144	218	-	1222	-	-	960	-	-
Mov Cap-2 Maneuver	163	218	-	144	218	-	-	-	-	-	-	-
Stage 1	615	580	-	456	462	-	-	-	-	-	-	-
Stage 2	402	462	-	508	580	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	102.7		45.2		0.1		0.7	
HCM LOS	F		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1222	-	-	185	173	-	960	-	-
HCM Lane V/C Ratio	0.009	-	-	0.94	0.503	-	0.034	-	-
HCM Control Delay (s)	8	-	-	102.7	45.2	0	8.9	-	-
HCM Lane LOS	A	-	-	F	E	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	7.4	2.5	-	0.1	-	-

# HCM Signalized Intersection Capacity Analysis

## 4: Wailea Alanui Drive & Wailea Ike Drive

09/30/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	570	370	410	730	380	310
Future Volume (vph)	570	370	410	730	380	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.95	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1507	1863	1539	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1507	1863	1539	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	620	402	446	793	413	337
RTOR Reduction (vph)	0	235	0	517	0	0
Lane Group Flow (vph)	620	167	446	276	413	337
Confl. Peds. (#/hr)		14		4		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	39.3	39.3	28.9	28.9	26.4	59.3
Effective Green, g (s)	39.3	39.3	28.9	28.9	26.4	59.3
Actuated g/C Ratio	0.37	0.37	0.27	0.27	0.25	0.56
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	652	555	505	417	438	1968
v/s Ratio Prot	c0.35		c0.24		c0.23	0.10
v/s Ratio Perm		0.11		0.18		
v/c Ratio	0.95	0.30	0.88	0.66	0.94	0.17
Uniform Delay, d1	32.7	23.9	37.2	34.5	39.4	11.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.7	0.3	16.6	3.9	28.9	0.0
Delay (s)	56.4	24.2	53.8	38.4	68.2	11.6
Level of Service	E	C	D	D	E	B
Approach Delay (s)	43.8		44.0			42.8
Approach LOS	D		D			D
<b>Intersection Summary</b>						
HCM 2000 Control Delay			43.6		HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.93			
Actuated Cycle Length (s)			106.6		Sum of lost time (s)	12.5
Intersection Capacity Utilization			84.3%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM 6th Signalized Intersection Summary

## 5: Piilani Highway/Piilani Hwy & Okolani Drive/Mikioi Place

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	95	5	40	60	10	70	45	1110	125	85	970	125
Future Volume (veh/h)	95	5	40	60	10	70	45	1110	125	85	970	125
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	103	5	0	65	11	0	49	1207	100	92	1054	103
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	203	6		191	26		67	1327	1124	117	1381	1169
Arrive On Green	0.09	0.09	0.00	0.09	0.09	0.00	0.04	0.71	0.71	0.07	0.74	0.74
Sat Flow, veh/h	1516	74	1585	1414	295	1585	1781	1870	1584	1781	1870	1584
Grp Volume(v), veh/h	108	0	0	76	0	0	49	1207	100	92	1054	103
Grp Sat Flow(s),veh/h/ln	1589	0	1585	1709	0	1585	1781	1870	1584	1781	1870	1584
Q Serve(g_s), s	2.3	0.0	0.0	0.0	0.0	0.0	2.7	51.9	1.9	5.0	33.2	1.8
Cycle Q Clear(g_c), s	6.3	0.0	0.0	4.0	0.0	0.0	2.7	51.9	1.9	5.0	33.2	1.8
Prop In Lane	0.95		1.00	0.86		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	210	0		216	0		67	1327	1124	117	1381	1169
V/C Ratio(X)	0.52	0.00		0.35	0.00		0.73	0.91	0.09	0.78	0.76	0.09
Avail Cap(c_a), veh/h	347	0		358	0		122	1676	1420	191	1749	1481
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.6	0.0	0.0	42.7	0.0	0.0	46.8	11.7	4.4	45.2	7.7	3.6
Incr Delay (d2), s/veh	2.0	0.0	0.0	1.0	0.0	0.0	14.3	6.6	0.0	10.8	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	0.0	1.8	0.0	0.0	1.4	19.5	0.5	2.5	10.9	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.6	0.0	0.0	43.7	0.0	0.0	61.0	18.2	4.4	55.9	9.3	3.6
LnGrp LOS	D	A		D	A		E	B	A	E	A	A
Approach Vol, veh/h		108	A		76	A		1356			1249	
Approach Delay, s/veh		45.6			43.7			18.8			12.2	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	1.0	74.2		13.0	8.2	77.0		13.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	10.5	88.0		18.0	6.7	91.8		18.0				
Max Q Clear Time (g_c+1T), s	10.5	53.9		8.3	4.7	35.2		6.0				
Green Ext Time (p_c), s	0.1	15.8		0.3	0.0	13.7		0.2				

### Intersection Summary

HCM 6th Ctrl Delay	17.6
HCM 6th LOS	B

### Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 6: Piilani Highway & Kilohana Drive/Mapu Drive

09/30/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	220	20	25	20	15	145	20	1205	15	120	1070	190
Future Volume (veh/h)	220	20	25	20	15	145	20	1205	15	120	1070	190
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	22	2	22	16	1	22	1310	8	130	1163	160
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	308	218	20	158	72	61	40	2070	923	161	1217	1031
Arrive On Green	0.11	0.13	0.13	0.02	0.04	0.04	0.02	0.58	0.58	0.09	0.65	0.65
Sat Flow, veh/h	1781	1689	154	1781	1870	1585	1781	3554	1585	1781	1870	1585
Grp Volume(v), veh/h	239	0	24	22	16	1	22	1310	8	130	1163	160
Grp Sat Flow(s),veh/h/ln	1781	0	1843	1781	1870	1585	1781	1777	1585	1781	1870	1585
Q Serve(g_s), s	12.5	0.0	1.3	1.3	0.9	0.1	1.4	27.0	0.2	7.9	63.7	4.4
Cycle Q Clear(g_c), s	12.5	0.0	1.3	1.3	0.9	0.1	1.4	27.0	0.2	7.9	63.7	4.4
Prop In Lane	1.00		0.08	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	308	0	238	158	72	61	40	2070	923	161	1217	1031
V/C Ratio(X)	0.78	0.00	0.10	0.14	0.22	0.02	0.56	0.63	0.01	0.81	0.96	0.16
Avail Cap(c_a), veh/h	308	0	432	287	405	343	80	2070	923	418	1281	1086
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.6	0.0	42.6	49.5	51.7	51.3	53.7	15.3	9.7	49.5	17.9	7.5
Incr Delay (d2), s/veh	11.8	0.0	0.2	0.4	1.5	0.1	11.7	0.6	0.0	9.2	15.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.5	0.0	0.6	0.6	0.5	0.0	0.7	9.8	0.1	3.8	27.4	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.4	0.0	42.8	49.9	53.2	51.4	65.4	15.9	9.7	58.7	33.3	7.6
LnGrp LOS	E	A	D	D	D	D	E	B	A	E	C	A
Approach Vol, veh/h	263			39			1340			1453		
Approach Delay, s/veh	55.2			51.3			16.7			32.7		
Approach LOS	E			D			B			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.0	69.6	7.0	19.3	7.5	77.2	17.0	9.3				
Change Period (Y+Rc), s	5.0	5.0	4.5	5.0	5.0	5.0	4.5	5.0				
Max Green Setting (Gmax), s	20.0	55.0	10.5	26.0	5.0	76.0	12.5	24.0				
Max Q Clear Time (g_c+1), s	19.5	29.0	3.3	3.3	3.4	65.7	14.5	2.9				
Green Ext Time (p_c), s	0.3	10.3	0.0	0.1	0.0	6.5	0.0	0.0				

### Intersection Summary

HCM 6th Ctrl Delay	27.9
HCM 6th LOS	C

### Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th TWSC  
7: Makena Keoneoio Road & Project DW

09/30/2019

Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑		↑			↑
Traffic Vol, veh/h	15	0	10	15	0	20
Future Vol, veh/h	15	0	10	15	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	0	11	16	0	22

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	41	19	0	0	-	-
Stage 1	19	-	-	-	-	-
Stage 2	22	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	970	1059	-	-	0	-
Stage 1	1004	-	-	-	0	-
Stage 2	1001	-	-	-	0	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	970	1059	-	-	-	-
Mov Cap-2 Maneuver	970	-	-	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	1001	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	970
HCM Lane V/C Ratio	-	-	0.017
HCM Control Delay (s)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.1

HCM 6th TWSC  
 8: Beach Parking Lot II & Makena Keoneoio Road

09/30/2019

Intersection						
Int Delay, s/veh	7.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘		↗			↗
Traffic Vol, veh/h	5	0	0	0	0	0
Future Vol, veh/h	5	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	0	0	0	0

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1	-	0	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	-	-
Pot Cap-1 Maneuver	1022	0	-	0	0	-
Stage 1	-	0	-	0	0	-
Stage 2	1022	0	-	0	0	-
Platoon blocked, %		-	-	-	-	-
Mov Cap-1 Maneuver	1022	-	-	-	-	-
Mov Cap-2 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 1022	-
HCM Lane V/C Ratio	- 0.005	-
HCM Control Delay (s)	- 8.5	-
HCM Lane LOS	- A	-
HCM 95th %tile Q(veh)	- 0	-



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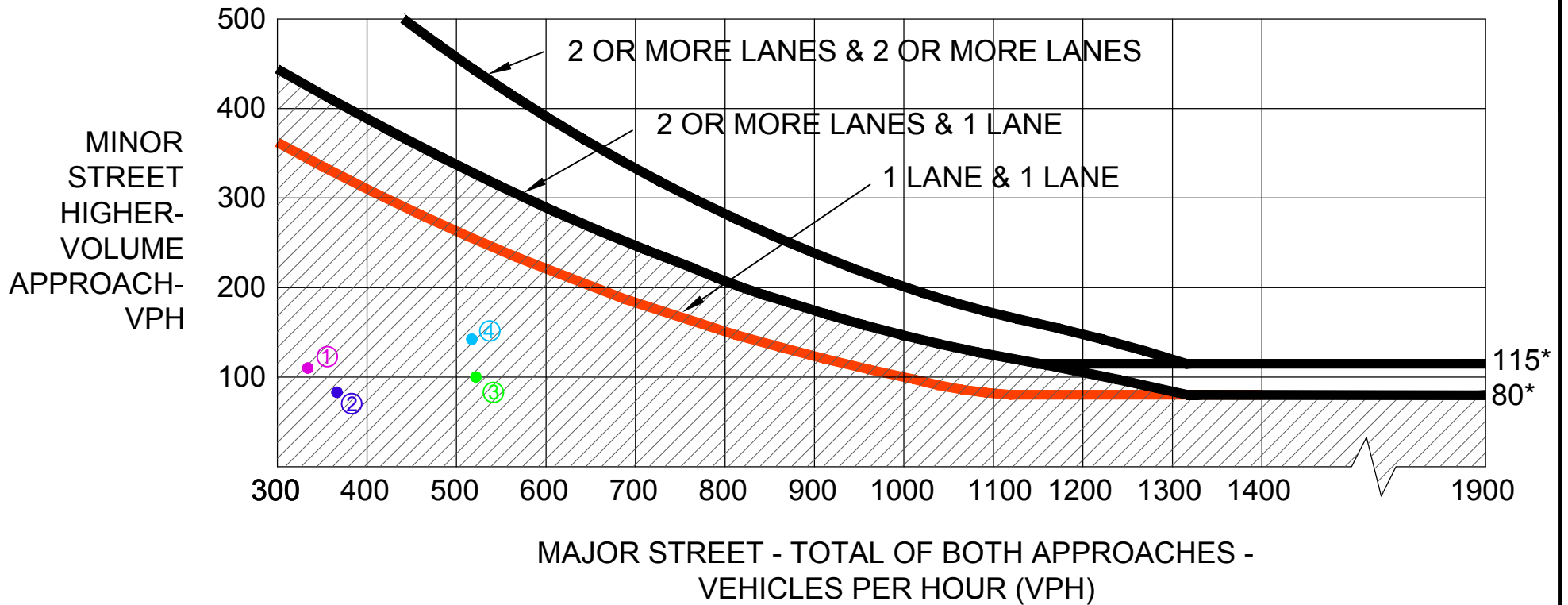
# APPENDIX D

## TRAFFIC SIGNAL WARRANTS

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## Warrant 2, Four-Hour Vehicular Volume

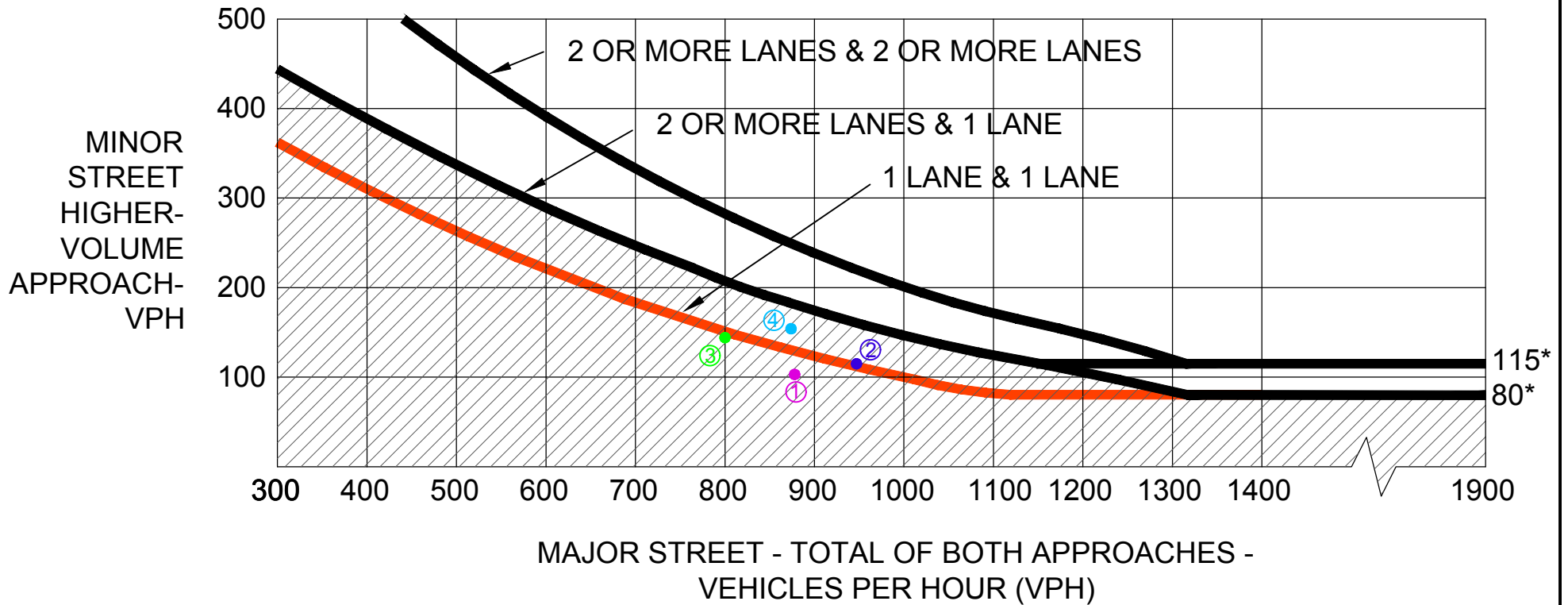


\*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

- ① (7:45 AM to 8:45 PM), (331, 110)
- ② (8:45 AM to 9:45 PM), (363, 83)
- ③ (2:00 PM to 3:00 PM), (521, 100)
- ④ (3:30 PM to 4:30 PM), (514, 143)



## Warrant 2, Four-Hour Vehicular Volume



\*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

- ① (11:15 AM to 12:15 PM), (878, 103)
- ② (2:00 PM to 3:00 PM), (947, 115)
- ③ (3:00 PM to 4:00 PM), (800, 144)
- ④ (4:00 PM to 5:00 PM), (874, 154)

MAKENA PARCEL H-2  
PROJECT TIAR

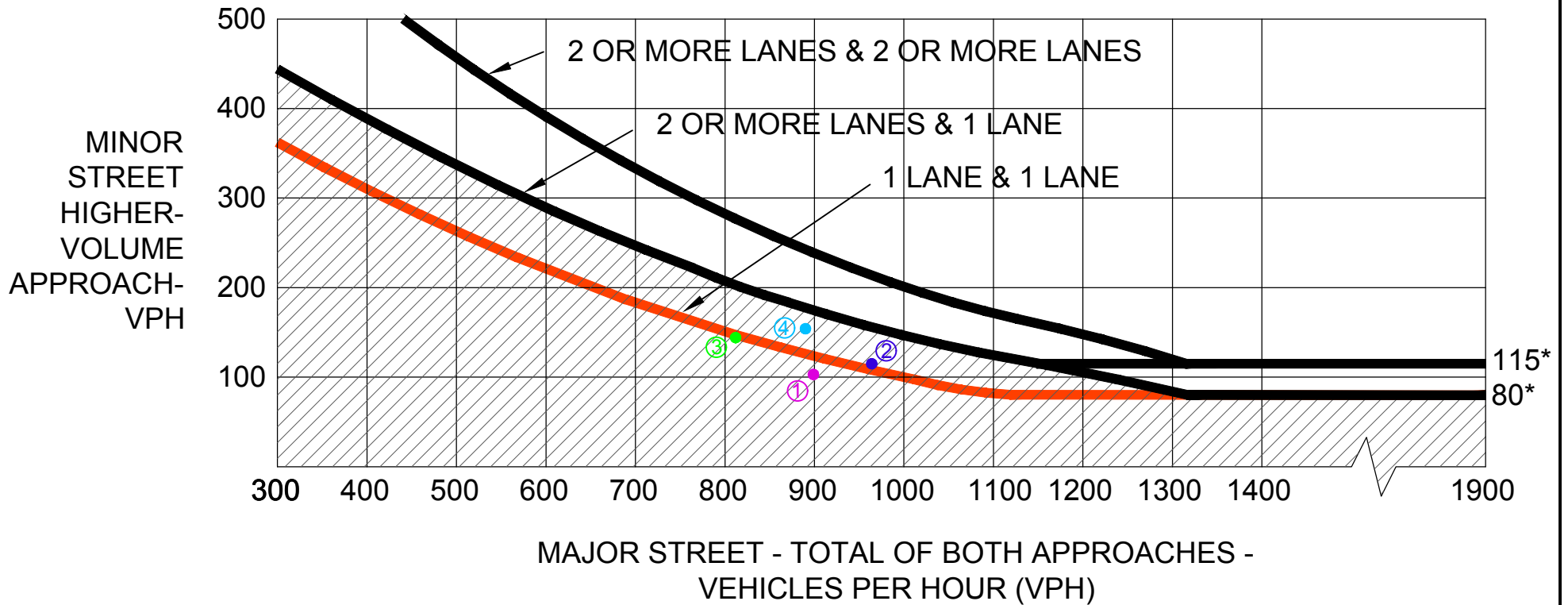
**AUSTIN, TSUTSUMI & ASSOCIATES, INC.**  
ENGINEERS, SURVEYORS

FIGURE

**BASE YEAR 2028 CONDITIONS - FOUR HOUR TRAFFIC SIGNAL WARRANT FOR  
WIALEA ALANUI DRIVE AND KAUKAHI STREET**

D2

## Warrant 2, Four-Hour Vehicular Volume



\*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

- ① (11:15 AM to 12:15 PM), (899, 103)
- ② (2:00 PM to 3:00 PM), (964, 115)
- ③ (3:00 PM to 4:00 PM), (812, 144)
- ④ (4:00 PM to 5:00 PM), (890, 154)



**APPENDIX E**  
RESORT RESIDENTIAL TRIP GENERATION RATE DEVELOPMENT

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## Resort Residential Trip Generation Rate Development

### Background

At the request of the State of Hawaii Department of Transportation (HDOT), data were collected to determine if the resort residential trip generation rates documented in the Institute of Transportation Engineers publication entitled, Trip Generation, 7<sup>th</sup> Edition, were appropriate for the Wailea-Makena area on Maui.

Three major developers within the Wailea-Makena area agreed to participate in this effort and directed their traffic consultants to develop a methodology to collect trip data and use these data to determine alternative resort residential trip generation rates. The three traffic consultants involved were Austin-Tsutsumi and Associates, Parsons Brinckerhoff, and Phillip Rowell Associates.

This write-up summarizes the methodology used to develop alternative resort residential trip generation rates based on observation of existing resort residential development located in Wailea Resort.

### Methodology

In developing a methodology to research resort residential trip generation rates for the Wailea-Makena area, it was decided to collect data separately for single-family and for multi-family resort residential development. All developments used for data collection were located in the Wailea Resort area.

Effort was made to determine which multi-family resort residential developments allow units to be rented out as opposed to units that only allow owners and selected guests to occupy the units. Effort was also made through discussions with the Wailea Homeowners Association and Wailea Resort to determine which resort residential developments were primarily absentee owner units that are occupied only a few months out of the year and resident owner units that are occupied all year long.

Based on these criteria, 24-hour traffic data were collected at the accesses to resort residential between July 7, 2006 and July 17, 2006. Using the categories of resort residential identified in the previous paragraph, data were collected at the developments summarized in Table 1.

**Table 1**  
**Resort Residential Development Data Collection Sites**

<b>Development Name</b>	<b>Residents/ Long-Term Rental</b>	<b>Short-Term Rental</b>	<b>Total Units</b>
<b>Single-Family</b>			
Pualani Estates	92	0	92
Wailea Golf Vistas	48	0	48
Wailea Highlands	23	0	23
Wailea Golf Estates	61	0	61
Wailea Kialoa	102	0	102
<b>Multi-Family</b>			
Palms I	19	139	150
Palms II	120	0	120
Grand Champions	73	128	201
Wailea Elua	73	79	152
Fairway Villas	118	0	118
Note: Fairway Villas data were available because of technical difficulties and the sale of Makena Resort.			

All of the multi-family developments were used to calculate trip generation rates for resort multi-family development. This probably makes this rate conservatively high, since it contains both developments that allow short-term rentals and those that do not.

For the single-family developments, only Wailea Golf Estates and Pualani Estates were used to calculate trip generation rates. There were units in Wailea Golf Vistas and Wailea Highlands that were still under construction and it was judged that construction traffic would create an atypical trip generation rate. Wailea Kialoa was not used because it was determined through discussions with Wailea Resort and the Wailea Homeowners Association that Wailea Kialoa contained mostly residents that live in Wailea year round. This is not the typical resort residential situation in which owners usually occupy the unit only part time.

The resulting trip generation rates for resort single-family and resort multi-family are shown in Table 2.

**Table 2**  
**Resort Residential Trip Generation Rates**

Parcel	AM Peak Hour		PM Peak Hour	
	Rate	Enter/Exit %	Rate	Enter/Exit %
non-TV Resort Single-Family Residential	0.46	58/42	0.46	50/50
TVR Resort Multi-Family Residential	0.22	40/60	0.34	49/51

Note: Rates are vehicle trips per hour per dwelling unit.

Single Family rates based on average of Wailea Golf Estates and Pualani Estates.

Multi-Family rates based on average of Wailea Grand Champions, Palms I, Palms II, and Wailea Elua

Table 3 compares the calculated resort residential rates with the ITE published rates. As shown, the calculated resort residential rates for the single-family resort residential are about twice as high as the ITE published rates, and the calculated resort residential rates for the multi-family resort residential are slightly higher for than those published by ITE.

**Table 3**  
**Comparison of Calculate and ITE Published Resort Residential Trip Generation Rates**

Rate Source	AM Peak Hour		PM Peak Hour	
	Rate	Enter/Exit %	Rate	Enter/Exit %
Calculated Single-Family Residential	0.46	58/42	0.46	50/50
Calculated Multi-Family Residential	0.22	40/60	0.34	49/51
ITE Published Recreational Homes (260)	0.16	67/33	0.26	41/59

Note: Rates are vehicle trips per hour per dwelling unit.