HoKua Place
Section 343-5e HRS Second Draft
Environmental Impact Statement (2nd DEIS)
Volume II-A
Exhibits 1 & A to H

Prepared for:
Accepting Authority
State of Hawai'i Land Use Commission
&
Petitioner
HG Kaua'i Joint Venture LLC

Prepared by:

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Volume II-A Contents

EXHIBIT "1"

HG Kauai Joint Venture, LLC

November 2, 2017

To whom it may concern:

We hereby authorize Ron Agor Architect of Agor Jehn Architects LLC to prepare and submit the Final Environment Impact Statement (FEIS) for the HoKua Place. (TMK: (4) 4-3-003:001) We further authorize the use of information and data provided by one of our consultants, Ho'okuleana, LLC, for their submittal of the DEIS.

Please do not hesitate to contact me with any questions at: 435.272.3709.

Jacob Bracken
Manager

5662 W. Clubhouse Dr., Hurricane, UT 84747

HoKua Place FEIS

Exhibits

&

Responses to DEIS Comments

Exhibit A

Kapa'a Housing Market Study

I. INTRODUCTION

The Data@Work is a market research firm that specializes in analyzing residential real estate markets for developers and lenders. We have been retained to perform a study analyzing the market for proposed master planned community on the island of Kauai, called Kapaa Highlands.

This study focuses on the historical and projected market conditions and trends in accessing the ability of the project to be successful in selling its residential properties at a price and at a velocity. The study entailed collecting, comparing and analyzing information that has a bearing on the numerous aspects of market demand for the proposed project, including but not limited to publicly available real property, economic and commercial data.

The author makes every effort to verify that all of the information in study and in particular the market description and analysis is accurate, but is aware that 100% accuracy is unlikely. Finally, the analysis and statements herein are based on independent research by the author.

II. PROJECT DESCRIPTION & STUDY OUTLINE

Project

Kapaa Highlands is a master planned project on the Island of Kauai targeting primary housing demand from local and in-migrant families, as well as offshore second home demand for view estate ownership. It sits above the historic town of Kapaa and below the foothills of the mountain chain that forms the island. It is equidistant from the two major resorts on the island (and at the center of the third, the Coconut Coast). Thus, it is at or close to the centers of employment and commercial activity.

As Kapaa is arguably at the center of the island, the target market for this development will be spread across a wide range of households, but mainly appealing to local families looking for reasonably priced housing that is well-located with regard to the centers of employment in the county, as well as to a good range of shopping, recreational and social facilities.

The development contains a portion of the Kapaa bypass road, a major arterial road adjacent to the property. As such, the property is accessible from three sides and is adjacent to already improved county roads. Furthermore, the property has no significant restraints relative to adequate water availability and wastewater. Finally, the Kapaa Middle School is located adjacent to the property and adds to the attractiveness of the site to the local population.

KAPAA HIGHLANDS PRODUCT MIX AND SALES PROJECTION

Product	Units
House Lot Packages, On Large Lots (10,000 sf)	36
House Lot Packages, On Medium Lots (7,500 sf)	50
Multi-Family Dwelling Units (4 Plex, 8 DU/Ac)	500
Affordable Housing Dwelling Units (12 DU/Ac)	183

The units described above include condominiums (Multi-Family pads and Affordable Housing) and single-family homes (House Lot package).

EXHIBIT "A"

[Note that some of the House/Lot package units may be sold as home sites, depending on future demand and market conditions].

The condominium units will be designed in a range of bedroom configurations that will best meet the demand for housing by providing designs that apply to different family types, including starter families, empty nesters, families with children, and households that qualify for affordably priced housing.

The design of the single family units will appeal to some of those in the aforementioned condominium demographic groupings, but will go further by addressing the needs of large families, families wanting to be close to the Middle School, trans-generational families needing adequate (read larger and more defined) living space, and professional families or those with multiple wage-earners.

The design of the condominiums could include stacked flats and townhomes, both of which have cost and livability advantages. They will located in multi-unit buildings (four and six-plex, etc.) and laid out in a way that will be taking advantage of the site's benefits: including those of the ocean views, the cooling winds, the warming sunlight, etc. Their density would range from 8 to 12 units per acre.

The single-family units will be designed to take advantage of the area topography, as well as wind and sun direction and views. By having two different lot sizes allows for the land plan to address two demographics: the smaller lot size units would be most appropriate to starter families, and larger lot size units would be appropriate for larger families and multigenerational households.

It is worth being mindful that, generally speaking, the high cost of housing production in Hawaii, and Kauai in particular, often pushes housing prices beyond what local families, particularly workforce families, can afford. To counter that, often Kauai home purchasers include a number of income earners into the purchase, both family members and non-family members. It is this market demand segment that the larger lot size and house size units will address.

In keeping with the county's affordable housing requirement, the requisite number of units will be produced and priced according to the existing income guidelines when marketed. The current affordable requirement is 30%, and the fulfillment of that will be a benefit to the local families seeking better housing or a more convenient location.

Additionally, while the market homes will be priced to the market, and done so at the time of the start of construction, they will also be more affordably priced, relative to much of the new construction on the island. This is because the large size of the overall development (750+ units) is conducive to achieving construction economies of scale, both for infrastructure and vertical construction - which can be passed on to the consumer.

Further, these homes and condos will also be designed with the needs of local families in mind, as opposed to the offshore buyer market. This will thus 'lessen' the overall demand for them, resulting in a more moderate price point. This stands in contrast to many other new home construction projects and developments on the island and in the state, which seek to address the needs of the offshore buyer (and are priced accordingly higher).

Finally, it is important to note that this development will benefit those in the community who will not be purchasing here, but who nonetheless are in the market for affordable housing. This is because this, or any, provision of new housing acts to soften the pressures that push housing prices higher – national and local studies and data has shown that the supply of new housing into an existing market place results in a moderating trend in prices.

Study Outline

In an effort to evaluate the proposed project, the study will begin by describing the area, the housing stock and the economy. It will take account of the economic factors and trends that affect housing relative to the county and to the proposed project. Thereafter, it will describe the housing market in general, and in particular to this project. In doing so, it will describe and analyze the factors and trends behind the general and specific supply and demand for housing. And it will summarize the findings and finish with some concluding remarks and expectations.

III. OVERVIEW of COUNTY and MARKET

Subject Property's Community

Kauai County is the fourth largest county in the state, as ranked by population and economic activity, behind the City & County of Honolulu (Oahu), Maui County and the Big Island of Hawaii.

The majority of the island's roughly 52,000 residents lives and works in the coastal areas leaving the interior of Kauai natural and pristine. Kauai's weather is near perfect year round with daytime temperatures ranging from the mid 70's to the mid 80's, slightly warmer in the summer. The northeast trade winds average about 15 mph for most of the year, and provide refreshing breezes. Rain showers usually fall in the evening and early morning hours, predominantly over the mountain ranges. The temperature of the ocean ranges from 68 to 80 degrees Fahrenheit.

It has one of the strongest brands in the global visitor industry, as well as arguably the most diversified visitor industry of any of the islands, combining large resort master planned communities, cruise ship visitations, time share developments and small-scale bed and breakfasts.

The breadth and depth of this economic base, like the rest of the state, rests on the county's economy's unique comparative advantage relative to the other visitor destinations world-wide: it has a very high quality of life, a function of a naturally beautiful setting, with a benign environment and near perfect climate. Indeed, the proof of its attractiveness can be found in the quality of the number of 'rich and famous' who have bought in Hawaii, starting with Lawrence Rockefeller in 1960 (followed by John Wayne, George Harrison, Peter Gruber, Charles Schwab, Michael Dell, Ben Stiller, Oprah Winfrey, Akio Morita, Michael Creighton, etc.)

Kauai has three major resort destinations:

- **Princeville**, a 45-minute drive from the Airport, is a resort that runs across a large plateau overlooking one of the largest deep-water bays in Hawaii. The view of the sunset, looking west, is extraordinarily beautiful.

- **Poipu**, also a 45-minute drive from the airport, sits above the south shore, with numerous bays and beaches safe for swimming. It has the largest concentration of hotels and golf courses on the island. .

- **Coconut Coast**, a 20 minute drive from the airport, this area was the favored area of Hawaiian royalty and the original site of resort development on the island and, save for Waikiki, the state. It today hosts one of the largest percentage of accommodations, shops, recreation, restaurants and historical sites on the island.

The majority of the primary housing development is located within the Kapaa and Lihue urban zones, with secondary sources located areas in and around Poipu, Kilauea/Hanalei, and Hanapepe and Waimea. Second home development is located within and around the three major resort communities, as well as in locations that are close to the coastline and/or in westward facing locales).

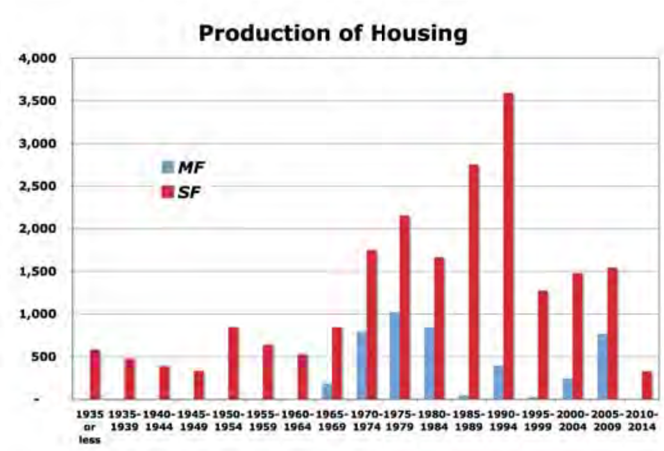
Subject Property's Housing Stock

Most of the primary housing inventory and on-going development is located within the Kapaa and Lihue urban zones. Primary housing is also concentrated, but to a lesser degree, in and around the communities of Poipu, Kilauea/Hanalei, and Hanapepe and Waimea.

Since the 1990s, Kauai's housing stock has grown faster than the population, as measured by the average annual growth rate for dwellings: it grew by 3.5% p.a. between 1990 and 2000, the highest in the State. The growth rate dropped to around 1.7% over the 2000-2010 period. Many of these new units have been targeted for the visitor or second home industry.

For instance, in 1990, the percentage of occupied housing units was about 92.5% of the county's total housing stock. By 2006, according to the Hawaii Housing Study, that dropped to 76.2 percent, the greatest rate of change among the four counties. Since 2006, however, there has been a reversal of that trend, with the percent of housing stock being build for primary homeownership has increased to 89.6%.

By way of context, housing development and construction was most active on Kauai during the time when the major resorts were developed in the 1970 and 1980s. Thereafter, primary housing production reached only half that level, save for periods of housing reconstruction that followed a major hurricane event.



In the years after the establishment of the resorts, there was a boom in condominium production, but many of these projects that were developed targeted the offshore buyer market. TMK records

show that over 70% of the condo units and 12% of the single-family homes are owned by out of state residents.

Census records have shown that a quarter of the County's housing stock did not house residents in 2000. Thus, while the Census categorizes these units as "vacant," they may be actually rented to vacationers, reserved by owners as a second home, or both. Demand in the housing market hence comes from residents, investors, and non-residents.

As a result, the average prices for housing units are skewed upwards and do not necessarily reflect residents' ability to pay for housing. Kauai housing stock is 78% owner occupied and 22% vacant, per their definition (it includes seasonal or recreational use, which itself constitutes 64% of all vacant units, with rental units constituting 20% of that total).

Indeed, housing inventory shows that about 3,000 of the 4,000 condominium units in the county, or 73%, are owned out-of-state. This would account for the high prices of condos in the county, the second highest in the state. Median resale price this May 2013 for a condo on Kauai is $323,000.

HOUSING CHARACTERISTICS OF THE MARKET

Kauai County	Units
Occupied housing units	23,051
Owner-occupied housing units	13,968
Renter-occupied housing units	9,272
Vacant housing units	6,553
For rent	1,312
Rented, not occupied	61
For sale only	251
Sold, not occupied	51
For seasonal, recreational use	4,172
All other vacant units	706
Homeowner vacancy rate (percent)	1.8%
Rental vacancy rate (percent)	12.3%

Note that the homeowner vacancy rate is low but the rental vacancy rate is high. This is indicative of a community that has high priced houses – therefore the homeowner vacancy rates are low. Additionally, as it is a very desirable place to live, there are a lot of rental units for vacation rental – and therefore the rental vacancy rate is high.

HOUSING CHARACTERISTICS OF THE MARKET, BY AREA

	Waimea	Koloa	Lihue	Kawaihau	Hanalei	Total
Detached Home	2,270	4,843	4,706	5,212	2,013	19,044
Townhouse	57	128	142	36	113	484
Condominium	0	195	326	190	366	1,082
Duplex/multiplex	85	201	24	142	22	484
Apartment	328	139	564	202	185	1,428
Co-op	0	67	107	0	0	184
Other/Not	0	179	65	148	52	345
	2,739	5,752	5,935	5,930	2,751	23,051

Note that the area of the proposed development is Kawaihau, highlighted in blue, and that area has very few dwellings that are attached units (condo, townhouse, etc.).

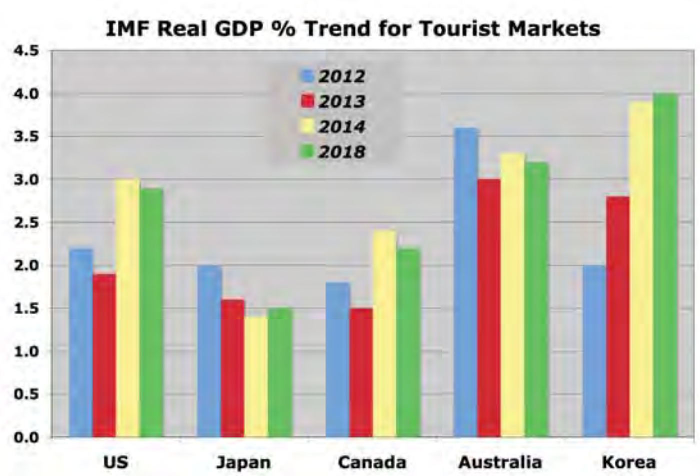
IV. THE ECONOMY

Simply put, residential for-sale and rental values move closely in synch with an area's economic growth, and economic growth is determined in the short run by the balance of trade between the area and it's major trading partners. And the mechanism by which this growth in values occurs is via rising incomes and higher job counts. We start by looking at the economic outlook for the state and the county. As the major industry is tourism, the county's significant visitor sources would be the US, Canada and Asia

As such, we look at the economic trends in all three sources.

GLOBAL ECONOMY:

The overall global economic forecast by the IMF earlier this year noted that the recovery had solidified, but the unemployment remained high. It said global financial risks have shrunk, including the chance of a fallback in economic activity (a double dip).

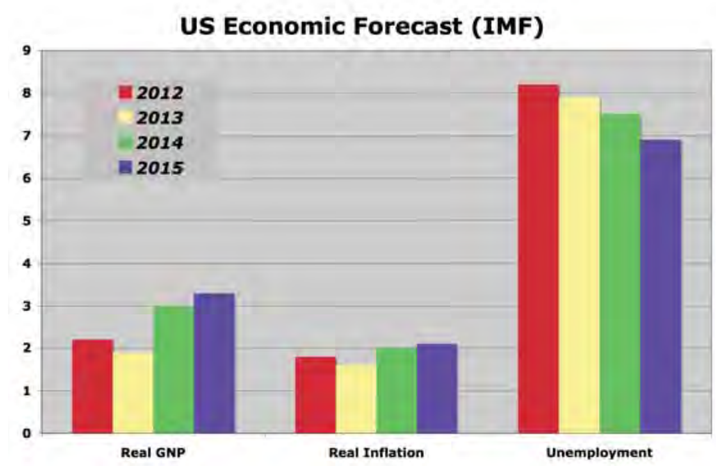


If the advanced economies continue to repair their public and financial balance sheets, and stimulate employment, and if emerging markets do not overheat their economies, global financial markets and property markets will stabilize and grow.

UNITES STATES:

The US economy is projected to grow by 3 percent in 2014, as firmer private final demand takes the burden to stimulate the economy off of federal fiscal policy. More and more, the risks to the economic outlook are abating: the recovery in housing prices and the slight growth in the job

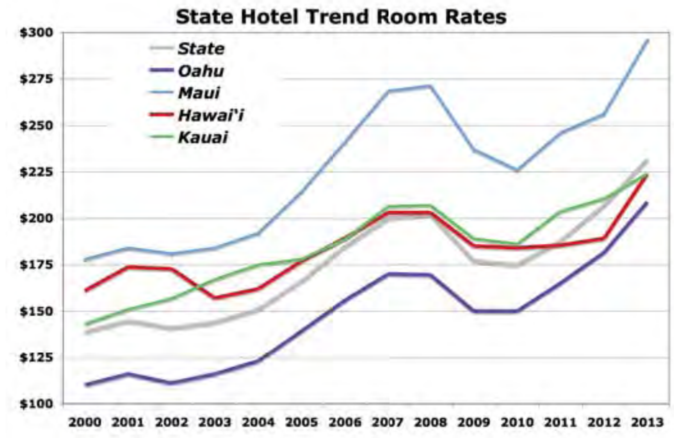
market are big positives looking ahead. Given the slack in the economy, inflation is expected to remain subdued, but with a rise in the interest rates in the cards.



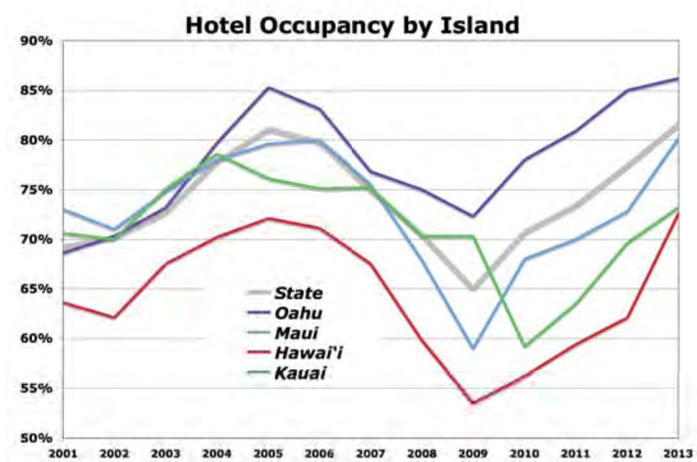
Looking ahead, the US economy will be on the rise. That, plus the perception of a growing economy, should be sufficient to grow the Hawaii state and the Oahu county economies. As an improved US economy is manifested in terms of higher visitor industry revenues, this commensurate growth in state economic activity will then put pressure on housing, via higher job counts (immigration) and incomes.

HAWAII STATE:

According to the state economic forecasters, Hawaii's economy continues to grow strongly in 2013 at an accelerating rate. The state has very low unemployment relative to the rest of the nation, thanks to a resurgent demand in the visitor industry, which is the major engine of economic growth in the county and the state (as seen below).

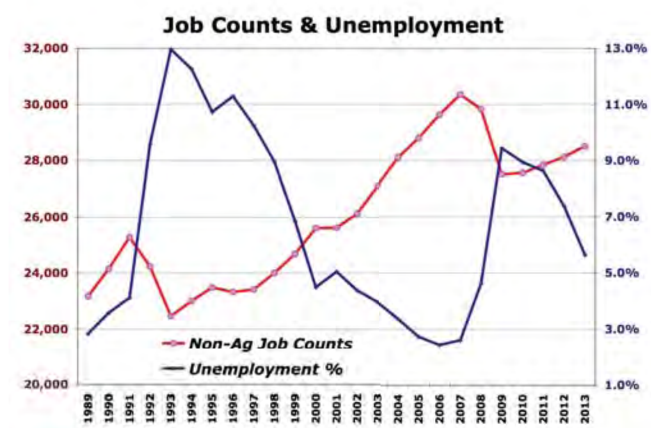


Historically, Hawaii's economy follows those of the Pacific Rim countries, which bodes well for the future.



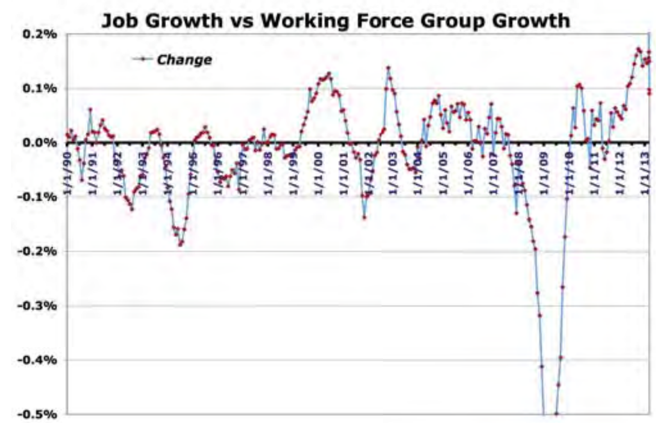
KAUAI:

Kauai is enjoying economy growth again, thanks to a resurgent demand in the visitor industry, which is the major engine of economic growth in the county and the state (as seen in job counts rising and unemployment rates falling).

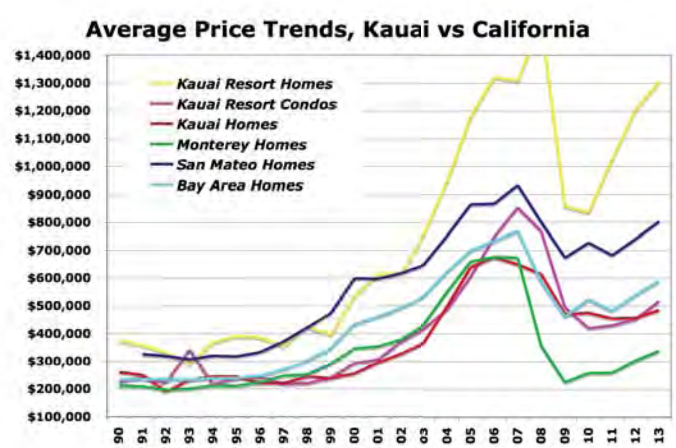


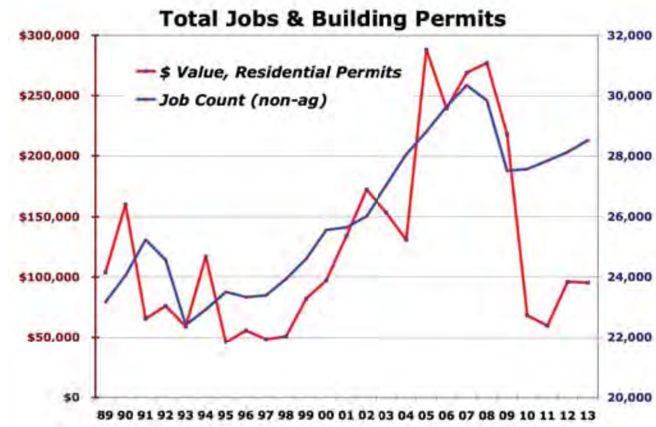
Going forward, Kauai will begin to experience tight labor conditions, with immigration occurring in order to meet rising job growth. Indeed, this is happening already, as seen next.

This chart shows that the recent growth in jobs is outpacing the natural growth in the workforce, i.e., population growth. Thus, in-migration will occur (which leads to increased housing demand).

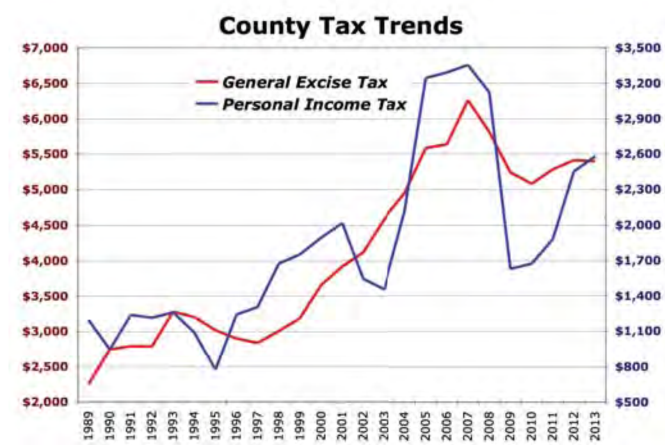


Housing demand will also grow thanks to offshore demand. As seen, when California's residential markets improve, prices (demand) for second homes in Kauai also rises.





Finally, Kauai's economy and real estate market are closely tied, as an increase in one leads to an increase in the activity of the other (per the following chart). In sum, economic indicators look to growth for the island's residential market.



V. HOUSING MARKET

Overview: Much like the state, Kauai's residential real estate supply is inflexible and constrained, but to a greater degree – the cost constraints are even tighter (higher costs of transporting material inputs to a remote locale, plus of sourcing labor in a small community), and the political climate there is generally unfavorable to housing development, particularly at the high end and/or in areas that are highly visible (but decidedly less so, relative to affordable and senior housing, as well as work force housing, which this project is proposing).

At the same time, demand for residential real estate is both flexible and strong, particularly in good economic times and over the long run. It can be, and is currently, constrained to an uncharacteristic degree, thanks to havoc in the financial markets the last few years and the drastic fall off in economic activity globally and nationally.

The first condition, limited supply, arises due to Kauai having a very small landmass, coupled with inadequate infrastructure and challenging geographic conditions (atop the aforementioned political, social and legal impediments).

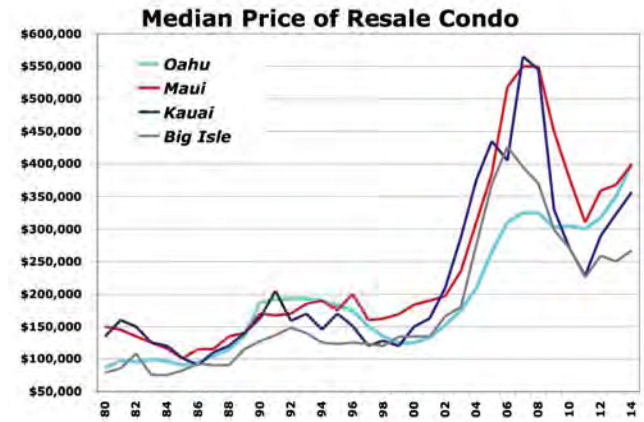
The second starts with the very high quality (defined a high quality of life, in terms of being a place that is environmentally safe, aesthetically pleasing, socially accommodating, politically stable, etc.). This is coupled by a deep and broad appreciation of that lifestyle by very large population accustomed to visiting the island (mainly West Coast and East Asia), which has one of the highest rankings in brand awareness and acceptance.

In combination, this results in a market that can dramatically volatile, up and down, in terms of sales and, to a lesser extent, prices. We note that in the past cycles, prices have been relatively 'sticky' downward, i.e., generally holding on to accumulated values. In this cycle, however, the price appreciation was so extensive and lasted so long, that the ensuing price depreciation during the down cycle has also been extensive.

Currently, Kauai's residential markets are now at the beginning of the up-cycle. The question is, going forward, how long this will last. The rule of thumb for the residential market is that the upswing in the cycle, the up cycle, generally lasts about 6.5 years, and is about twice as long as the down cycles. In addition, the up cycle, through to peak, results a tripling of the number of closings.

For the condo market, the up cycles last about 7 years, almost more than twice as long as the down cycles. In addition, the movement trough to peak of closings can be 300% or 400%, while for prices, it can be 400% or higher (note that this condition is not just particular to Kauai, but to all the neighbor islands).

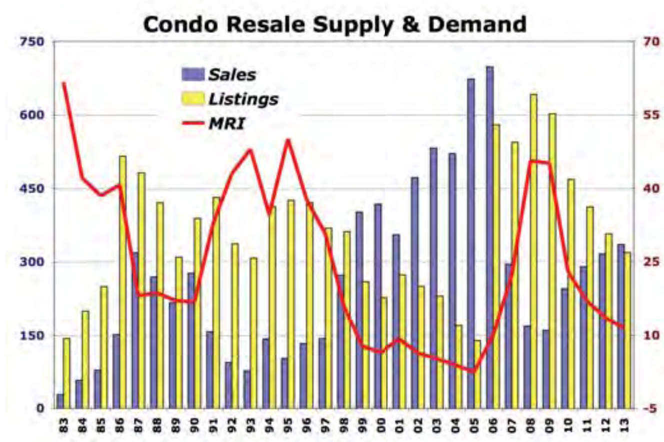
The following charts illustrate this, starting with price appreciation trends.



For the condo market on Kauai, the one that relates to this project, the up cycles last about 7 years, almost more than twice as long as the down cycles.

Next, we describe the balance between supply and the demand using sales and listings island-wide for condos, as well as the indicator showing the balance between the two, MRI or Months of Remaining Inventory.

Right now, the MRI trend is declining, per the growth of sales and shrinkage of listings, indicative of a tight market. A normal reading is between 8 and 12 months, with the two balanced.

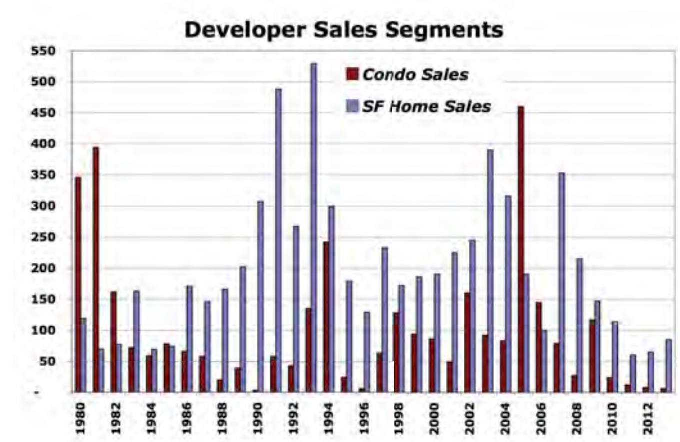


Looking ahead, we assume that the sales will continue to grow (as a function of low interest rates, plus the spread of the economic recovery in the areas where buyers of Kauai real estate reside (basically on Kauai, plus on the west coast of North America).

In this case, the proper market response to tight supply is for sellers to raise their prices. As seen in other charts, this has already started two years ago, and continues this year as well.

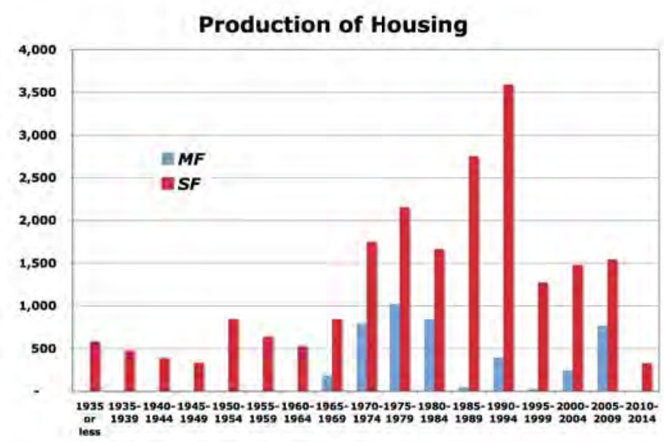
The following chart shows the price trend over the last 32 years for the four basic housing products: single-family resales and developer (newly construct4ed) sales, plus condominium resales and developer sales. As seen, the price trend over the last four years has been down, with the recovery taking hold first with single-family product, followed by condos.

Next, we look at the market for developer sales. As seen in the next chart, the level of new housing production is at a historic low. This is a condition of scarcity and it leads to price movement to the upside.



When that happens, the general public will get a sense that there is a housing shortage, and pressure will be brought politically to increase the supply of affordable housing. In and of itself, that will help to alleviate the demand existing for affordable rental units. That said, it is likely that the demand for reasonably priced housing will vastly outpace the supply.

Another way of seeing this is the long-term production of housing chart. Not only has housing production been low of late, but this also says that the current stock of housing is old, and dated.



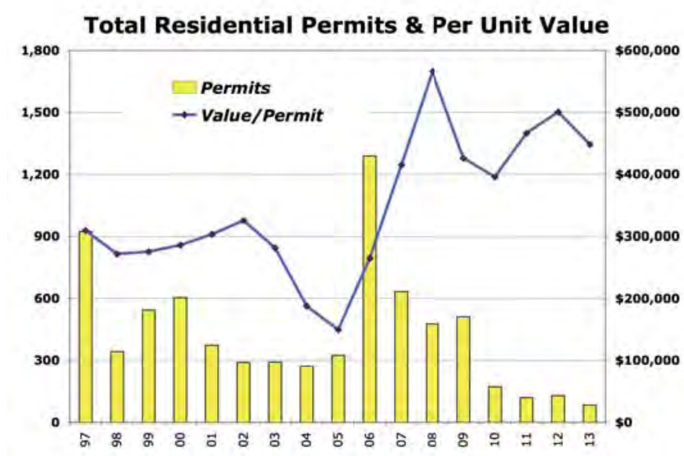
VI. FUTURE KAUAI HOUSING SUPPLY

PERMITS

The easiest way to look ahead to where the housing market is going in the short-term is by examining the activity in permits (where developers apply for permission, and pay their fees, for building residential units). A high level of activity indicates more supply is in the works, which means that more demand will be met, and the potential for prices adjusting downwards. With less supply in the works, prices will feel pressure upwards (and higher prices in the future, when demand recovers).

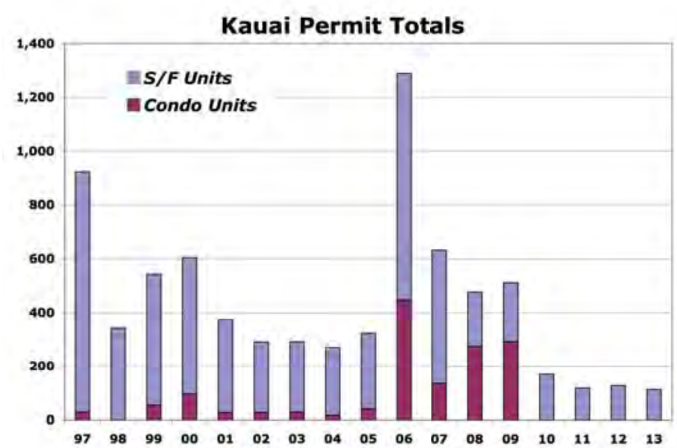
In addition, low levels of per unit value indicate that the units being built are for the lower end of the market (and vice versa). And, this has not been the case overtime on Kauai, indicating that most of the new housing has been targeted on the upper income end of the housing market.

An overview of the TOTAL RESIDENTIAL PERMITS AND VALUES Chart shows that the number of permitted units has sunk so low that it is at an all-time historical low. On the other hand, the value per permitted unit is at a record high.

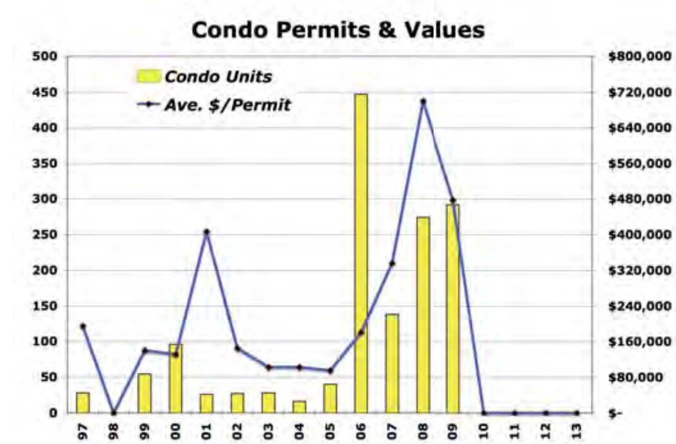


Note that the 2013 data is extrapolated, using actual data through April 2013.

The following chart shows the actual breakdown between condos and single-family homes.

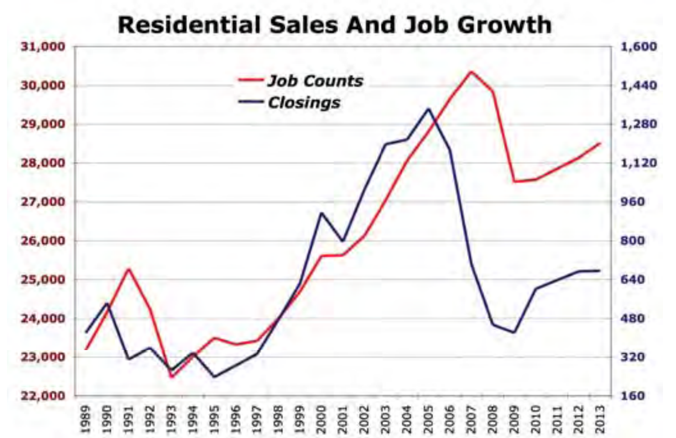


As seen, the number of permits is very low – caused mainly by the condo market.



VII. HOUSING DEMAND

The prime determinant of housing demand is household formation, itself is a function of the economy and demographic and social trends. As noted above, in the short term, residential housing demand is driven by economics – specifically of job creation/income growth, as well as interest rate trends.



Incomes to buy homes, and they drive immigration, which is a prime source of housing demand (sometimes linked to population growth). This linkage is best illustrated in the RESIDENTIAL SALES & JOB GROWTH Chart.

Note how closely the two trends track one another, up until the 2004-2005 period, when high prices prevented many families from buying a house. This then shows how the lack of housing supply on an on-going basis drives prices higher, and thus lowers the sales of homes.

Further note, the gap that has opened up between the two trends starting in 2005. In previous recessions, a similar pattern occurred, with the sales of homes (blue line) picking up during the recovery. This was because a lot of families doubled up (multiple families living in one dwelling) during the recession. Thereafter, they took the economic gains they made in the recovery and invested it in housing. This will be happening in the next few years.

If the subject property were under construction, then this unmet housing demand would turn to this project as a source of housing supply.

VIII. HOUSING DEMAND POTENTIAL & PROJECTION

JOB GROWTH TO HOUSING DEMAND: In the tables below, we describe DBEDT's predictions for wage and salary job creation on Kauai for the next 10-15 years, and derive from that a general expectation for housing demand over the next five to ten years (in other words, we will translate it into housing demand). Note that the model* used here ran from 2007, but was updated in 2009

HOUSING DEMAND, FROM DBEDT'S 2035 JOB FORECAST FOR WAGE & SALARY JOBS

	2007	2015	2020	2025
Total civilian wage and salary jobs	44,077	46,900	49,500	51,900
5 Year Growth		2,823	2,600	2,400
Annual Job Growth		565	520	480
Annual Housing Demand (1.75 Jobs: 1 Home)		332	306	282

*(http://hawaii.gov/dbedt/info/economic/data_reports/2035LongRangeSeries/LRFreport_2035series_revised_Aug09.pdf)

As seen, we use the annual changes in job counts to derive housing demand on the premise that it will take an average of 1.75 new jobs to generate demand for one new house.

However, the job counts used in the charts and tables above are just the number of wage and salary jobholders, and do not encompass the self-employed or home worker. According to DBEDT's projections, self-employed workers consist of about 20% of the total work force, but are growing to 25% in the next ten to twenty years. As such, we want to add this demand for housing into our projections.

The following transforms those projections into annual job growth projections, and then summarizes it in a complete DBEDT projection table.

HOUSING DEMAND, FROM DBEDT'S 2035 JOB FORECAST, SELF-EMPLOYED

	2007	2015	2020	2025
Annual Housing Demand (1.75 Jobs: 1 Home)		332	306	282
Self Employed Housing Demand (15% of total)		33	31	28
Total Annual Housing Demand		365	336	311

Finally, we want to take into consideration offshore demand, relative to housing demand. Studies have shown that this demand varies from a low of 15% on Oahu to a high of 60% on Maui. For Kauai and our purposes here, we use a very conservative factor of 20%. Thus, the total amount of housing demanded in the future should see an increase of another 20%. The following table shows this:

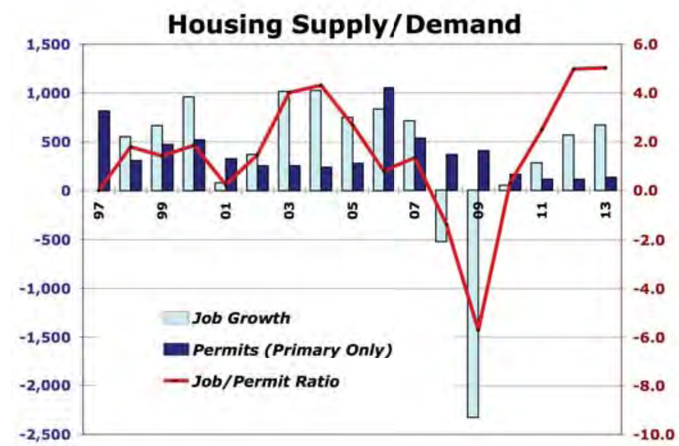
HOUSING DEMAND, FROM DBEDT'S 2035 JOB FORECAST PLUS OFFSHORE DEMAND

	2007	2015	2020	2025
Total Annual Housing Demand		365	336	311
Offshore Buyer Housing Demand (20% of total)		66	61	56
Total Annual Housing Demand		431	397	367

Note that the average number of residential permits taken out in the last five years for the county is 373 units p.a., but the average over the last 2 years (projecting 2011 using YTD numbers through September, is 125 units, p.a.

In sum, housing production in the past has not satisfied housing demand, as driven by job growth, leading to higher priced housing and overcrowding in existing housing.

Looking ahead, this will only continue, as the level of permitting this year has been below what is would house just the recent growth in potential homebuyers.



IX. FORECAST

As seen earlier, the cycle for both the economy and real estate is coming off of a dramatic fall-off in overall activity and in values. Going forward, we believe the markets will right themselves and the county will resume the normal pattern of multi-year periods of both economic growth and job and personal income expansion. In turn, this will lead to housing demand. As seen in the past, the housing market will begin to overheat, manifested by rising housing prices that outrun people's rising incomes. This will lead again to an affordable housing 'crisis' – where demand outstrips supply. A major part of this problem, one of the county's own making, is that there will be limited amounts of land suitable and zoned for housing.

Given this, we believe the development this project will contribute to the satisfaction of housing demand, that has been deep and persistent, from both off-shore and on-island. We also believe that the development will be successful, particularly so in light of the coming up cycle in the housing market. Finally, the historically low level of permitting activity indicates there will little or no competitive interference coming in the short run from other housing development on the island.

The following table describes the potential pricing at the retail level for each product type in the development (note that, in the eventuality that some or all of the house/lot package units are sold as simple home sites, the prices will be lower, as reflected in the final column below).

KAPAA HIGHLANDS PRODUCT SALES PRICE PROJECTION

Housing Produced	Total Units	Retail Price Per Unit	Home Site Only Prices
A House Lot Package, Large Lots (10,000 sf)	36	$800,000-$950,000	$266,000-$316,000
A House Lot Package, Medium Lots (7,500 sf)	50	$650,000-$700,000	$216,000-$233,000
Multi-Family Dwellings (4 Plex, 8 DU/Ac)	500	$250,000-$350,000	
Affordable Housing Dwellings (12 DU/Ac)	183	$125,000-$175,000	

Given that these prices, particularly the affordable ones, are below the historical trend for housing, we expect that sales will start up strongly. We expect them then to hold this momentum over the first three years, coinciding with the market's expansion. Thereafter, they will experience a gradual fall-off, coinciding with the downturn in the cycle. After that, the market will recover, as will sales of the final units.

KAPAA HIGHLANDS PRODUCT CLOSING PROJECTION

Product	2016	2017	2018	2019	2020	2021	2022	2023
Large Lot Homes	11	9	9	7				
Medium Lot Homes	15	15	14	6				
Multi-Family Units	90	100	90	70	50	30	30	40
Affordable Housing Units	40	40	40	35	28			

Exhibit B

Kapa'a Highlands II Sustainability Plan

EXHIBIT "B"

Kapaʻa Highlands II Sustainability Plan

Prepared by:

Hoʻokuleana LLC
... to take responsibility ...

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Table of Contents

Kapaʻa Highlands II Project Information

Kapaʻa Highlands II is a proposed development of a mix of single-family and multi-family residential, market and affordable rate homes. This 163-acre Ocean View "Planned" community is positioned to be the pride of Kapaʻa. The development seeks to fill the housing needs of Kapaʻa within the Urban Center of the district. Situated in close proximity to schools and commercial areas, Kapaʻa Highlands II is proposed to be a sustainable community that preserves the rural character of Kapaʻa while meeting its growing housing needs.

Kapaʻa Highlands II has received letters of support from the County Mayor, County Planning Department and County Housing Department. Letters of approval have been received from the County Department of Public Works regarding wastewater, State Department of Transportation and the County Water Department.

Project Name:	Kapaʻa Highlands Phase II
Location:	Wailua, Kauaʻi, Hawaiʻi
TMK:	(4) 4-3-003:001
Total Area:	163-acres
Existing Use:	Vacant, undeveloped, former sugarcane land
County Zoning:	Agriculture
General Plan Land Use Designation:	Urban Center
State Land Use:	Agricultural
Approvals Required:	LUC Boundary Amendment; County Class IV Zoning & Use Permits; County Council Approval for Zoning Change; Building Permits

Project Components:

Mix of single-family and multi-family residential.
Approximately 69-acres subdivided into:
- 86-single family (lots ranging from 5,000 to 8,000 SqFt.)
  - $180,000.00 to $250,000.00
- 683-multi-family (lots from 1-5 acre parcels)
  - $220,000.00 to $450,000.00
- Totals above include – 167-affordable units on site
  - $189,000.00 to $363,000.00

Open space encompassing 14.3-acres including:
- 3.1-acre park adjacent to Kapaʻa Middle School
  - Relocation of County Swimming Pool
- Greenways surrounding development

Commercial Areas totaling 1.4-acres
- Stores, personal services
- Land for police/fire sub-stations

Project Components: Infrastructure Improvements:

Water:
- Contributions to repairs of Kapaʻa Sewer Treatment Plant
- Water Master Plan approved by County Water Department
- Well on site to be dedicated to County Water Department

Transportation:
- Dedication of Kapaʻa By-Pass Road to the State
- Complete multi-modal roadway running thru the property
- Bus stops located along roadway
- Bike/Walking path

Aerial Image Overlooking Kapaʻa Highlands II Project Area

018

Kapaʻa Highlands II Sustainability Plan

This Kapaʻa Highlands II Sustainability Plan is a comprehensive set of goals, strategies and actions focused on improving environmental quality, economic strength and social benefit within the Kapaʻa Highlands II project, as well as the broader community.

This Plan serves as a roadmap guiding Kapaʻa Highlands II toward a more sustainable future, with implementation of actions through a comprehensive, inclusive stakeholder process.

Before discussing the global context of "sustainability," we explore the Hawaiian view of "ʻ *āina* " – core to the term "sust*aina*bility."

In a traditional Hawaiian context, nature and culture are one and the same; there is no division between the two. The wealth and limitations of the land and ocean resources gave birth to and shaped the Hawaiian worldview. In Hawaiian culture, natural and cultural resources are one and the same.

All forms of the natural environment, from the skies and mountain peaks, to the watered valleys and lava plains, and to the shoreline and ocean depths are believed to be embodiments of Hawaiian gods and deities. (Maly)

ʻĀina – That Which Sustains the People
(Context, here, primarily provided from writings of Kepa Maly)

The *ʻāina*, that which feeds, nourishes and sustains life (in English referred to as "land"), *wai* (water), *kai* (ocean), and *lewa* (sky) were the foundation of life and the source of the spiritual relationship between people and their environs. Hawaiian *moʻolelo*, or traditions, express the attachment felt between the Hawaiian people and the earth around them.

In any discussion of Hawaiian land - ʻāina, that which sustains the people - and its place in culture, it is also appropriate to briefly discuss traditional Hawaiian land terms, as the terms demonstrate an intimate knowledge of the environment about them. In the Hawaiian mind, all aspects of natural and cultural resources are interrelated. All are culturally significant.

Hawaiian culture revolves around the value of "aloha ʻāina" or love of the land. This love is not a passing sentiment, a summer fling or a fair weather affair. It is a deep-seated commitment to the wellbeing of the earth, which sustains us like a parent.

The Hawaiian concept of malama ʻāina (literally, caring for or living in harmony with the land,) demands conservation, sustainable use and enhancement of the local, regional and global environment. By simply taking care and respecting the land, it will sustain life. This straightforward relationship has been honored for thousands of years, since the Polynesians followed the stars to the shores of Hawaii.

The traditional land use in the Hawaiian Islands evolved from shifting cultivation into a stable form of agriculture around 1200 AD (Kirch, 2000). Stabilization required a new form of land use. It is widely believed ʻUmi a Līloa, the ruler of the Island of Hawaiʻi, was the first ruler to create the ancient Hawaiian land division, according to a chiefly management system, nearly 600 years ago.

This was the *ahupua'a* land use system, which consisted of vertical landscape segments from the mountains to the near-shore ocean environment, and into the ocean as deep as a person could stand in the water (Isabella Aiona Abbott).

For hundreds of years since, on the death of all *mō'ī* (kings or queens), the new monarch re-divided the land, giving control of it to his or her favorite chiefs. The common people never owned or ruled land.

In the term *ahupua'a*, the words *ahu* (stone altar or stone mound) and *pua'a* (pig) are combined. The *pua'a* was a carved wooden image of a pig head. These stone altars served as border markers and deposition places for offerings to the agricultural god *Lono* and a high chief (*ali'i nui*), who was the god's representative.

Each *ahupua'a* in turn was ruled by a lower chief, or *ali'i 'ai*. He in turn appointed a headman, or *konohiki*. The *konohiki* served as general manager responsible for the use of an *ahupua'a* as a resource system. He in turn was assisted by specialists, or *luna*. For example, the *luna wai* was responsible for the fresh water flow and irrigation system (Kamehameha Schools, 1994).

Manageable parcels of land would typically run *mauka* (upland) to *makai* (toward to ocean) and would be marked with stonewall alignments. Tenants cultivated smaller crops for family consumption, to supply the needs of chiefs and provide tributes.

Kapu (restrictions/prohibitions) were observed as a matter of resource and land management among other things. Access to resources was tied to residency and earned as a result of taking responsibility to steward the environment and supply the needs of *ali'i*. The social structure reinforced land management.

Sustainability – United Nations Context

In 1983, the United Nations Secretary General invited Norwegian Prime Minister Gro Harlem Brundtland to chair a World Commission on Environment and Development. The Report of the Brundtland Commission, Our Common Future, was transmitted to the General Assembly as an Annex to *document A/42/427* - Development and International Co-operation: Environment, in 1987

Chapter 2, "Towards Sustainable Development" of the Brundtland "Our Common Future" defines "sustainable development" as:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:
>
> - the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and
> - the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.
>
> In its broadest sense, the strategy for sustainable development aims to promote harmony among human beings and between humanity and nature.

Sustainability in Hawai'i (Hawai'i 2050)

The following definition, vision and guiding principles are incorporated in the Hawai'i 2050.

Definition:
A Hawai'i that achieves the following:

- Respects the culture, character, beauty and history of our state's island communities
- Strikes a balance between economic, social and community, and environmental priorities
- Meets the needs of the present without compromising the ability of future generations to meet their own needs

Vision:
Living responsibly and within our own means is top-of-mind for all individuals and organizations. We learn about the virtues and values of a sustainable Hawai'i. As a result, our goals of economic prosperity, social and community well-being and environmental stewardship are in balance and achieved.

Hawai'i 2050 Guiding Principles of Sustainability

- Balance economic, social, community and environmental priorities.
- Respect and live within the natural resources and limits of our islands.
- Achieve a diversified and dynamic economy.
- Honor the host culture.
- Make decisions based on meeting the present needs without compromising the needs of future generations.
- Principles of the ahupua'a system guide our resource management decisions.
- Everyone — individuals, families, communities, businesses and government — has a responsibility for achieving a sustainable Hawai'i.

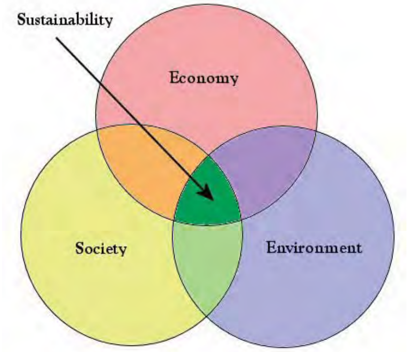
Sustainability in Hawai'i means achieving a quality of life that achieves the following goals:

- It emphasizes respect for the culture, character, beauty and history of our state's island communities.
- It strikes a balance between economic prosperity, social and community well-being, and environmental stewardship.
- It meets the needs of the present community without compromising the ability of future generations to meet their own needs.

Typically, "sustainability" is depicted in a three-themed Venn diagram (noted below,) highlighting the economy, environment and society. The achievement of sustainable development requires integration of these components at all levels.

With respect to Kapaʻa Highlands II, sustainable development is achieved when it is:

- economically feasible in order to be successful as a development, while also providing for economic opportunities for future generations who reside, work or visit Kapaʻa Highlands II
- protecting and preserving the environment, for today and tomorrow, serving as a model for others to follow
- addressing the needs of a wide variety of people, including their cultural values, as well as providing opportunities for people to interact, grow and learn together



Sustainability is not contradictory to growth, profit and development. Sustainability means that we plan to our limits; sustainable community development draws from and gives back to local strengths, resources and uniqueness. Local development can become more sustainable by having a better environmental, economic and social balance.

Ultimately, a goal is to meld Hawaiian traditional wisdom with modern sustainability concepts and take an integrated approach in the design and operation at Kapaʻa Highlands II. This plan was created to highlight the actions of the Kapaʻa Highlands II development in terms of sustainability.

In developing this plan, a variety of recognized programs and plans were reviewed, summarized and their recommendations were incorporated into this plan. These include:

- Smart Growth
- SmartCode
- Hawaiʻi 2050 Sustainability Plan
- OEQC Sustainable Building Design Guidelines
- Hawaii BuiltGreen Program
- US Green Building Council Leadership in Energy and Environmental Design (LEED)
- Energy Star Program
- Whole Building Design Guide (WBDG,) of the National Institute of Building Sciences
- EPA Low Impact Development
- One Planet Living

Further discussion on these programs and plans follow in the next Chapter of this Kapaʻa Highlands II Sustainability Plan. Following this are chapters addressing issue-specific sustainability concerns. These include:

- **Natural and Cultural Resources:** Protecting and preserving archaeological sites, trails and dryland forest, for present and future generations
- **Land Use:** Focuses on consistency with local land use planning, fulfilling the community's vision for development in the future
- **Design Features:** Incorporating design features to fit development into natural features, protecting the resources, while taking advantage of natural elements
- **Transportation:** Focuses on sustainable modes of transportation and an improved infrastructure including: multi-modal bicycle, pedestrian and vehicular infrastructure, complete streets, etc
- **Economic Opportunities:** Encourages a vibrant economy through diversity of employment and sustainable business opportunities
- **Open Space and Parks:** Encourages protection of urban open spaces by focusing on the urban landscaping, green spaces and mixed-use development and recreational opportunities
- **Water Management**: Focuses on reducing and conserving water use, as well as minimizing impacts to nearby ecosystems from source to stormwater systems
- **Energy Management:** Encourages energy conservation, energy efficiency and renewable energy
- **Health:** Encourages healthy lifestyles through places to walk and recreate, as well as provide state of the art medical facilities to address community needs
- **Education:** Encourages understanding and practice of sustainable lifestyles, as well as providing opportunities for life-long learning
- **Housing:** Responds to the market and demographic trends and community needs, providing a broad range of housing types and price points

Anticipated beneficial impacts from the Kapaʻa Highlands II project include the following:

- Provision of 86 single family homes and 683 multi-family units
- Increased housing choices, including affordable housing
- Increase housing inventory to meet future demands
- Provision of 3.1-acre park with area for relocation of Kapaʻa County swimming pool
- Planned growth in an area designated for urban growth by the General Plan of the County of Kauaʻi
- Provision of a pedestrian and transit-friendly community

Kapa'a Highlands II will be a sustainable community and will incorporate the following:

Sustainability Programs and Plans: Kapa'a Highlands will incorporate the core principles of the various sustainability programs and plans.

Natural and Cultural Resources: No archaeological sites are known to exist on the property. Should any archaeologically significant artifacts, bones, or other indicators be uncovered during construction, Kapa'a Highlands II is committed to strict compliance with State laws and rules.

Land Use: Kapa'a Highlands is consistent with local land use plans including the General Plan of the County of Kaua'i, the Kapa'a Town Development Plan and the Kapa'a-Wailua Basin Community Plan.

Design Features: Kapa'a Highlands II will include sustainable design features including strategies to reduce solar heat gain through roofs, walls and windows; using site planning and landscaping to improve natural ventilation; daylighting design; and energy efficient light fixtures.

Transportation: Kapa'a Highlands II will incorporate bus stops into its road system; multi-modal interconnected roads; and complete streets design.

Economic Opportunities: Kapa'a Highlands proposes two areas for commercial uses which will provide a variety of job opportunities; construction and construction-related employment will have direct beneficial impact on the local economy during construction.

Open Space and Parks: Kapa'a Highlands II proposes open space and open greenway areas encompassing 14.3-acres including a 3.1-acre park for the proposed relocation of the Kapa'a county swimming pool.

Water Management: Kapa'a Highlands II will install water efficient fixtures, appliances and high efficiency toilets to reduce indoor water use.

Energy Management: Kapa'a Highlands II will incorporate energy conservation and efficiency measures; solar energy for water heating; encourage photovoltaic systems and other renewable energy sources.

Health: Kapa'a Highlands II's layout and design will create an opportunity for both residents and the community to have a positive effect on their health through walkable and bikable transportation options.

Education: Kapa'a Highlands II will coordinate with the DOE to ensure that the facility assessment policy is addressed. In addition, a 3.1-acre park will be included in the plan and the Kapa'a county swimming pool will be relocated within the park.

Housing: Kapa'a Highlands II conforms to the Kaua'i County Affordable Housing Ordinance No. 860 and offers a variety of housing types that will address a portion of the housing needs of the island.

Social: Kapa'a Highlands II promotes social sustainability through socially-focused actions that will support quality of life, sense of place and community livability for all residents and the community.

Sustainability Programs and Plans

In developing this Kapa'a Highlands II Sustainability Plan, a variety of recognized sustainability programs and plans were reviewed, summarized and incorporated into this plan. In part, the recommendations from these programs and plans serve as guides to the sustainability actions noted in this Plan.
These include:

- Smart Growth
- SmartCode
- Hawai'i 2050 Sustainability Plan (Hawai'i 2050)
- OEQC Sustainable Building Design Guidelines
- Hawaii BuiltGreen Program
- US Green Building Council Leadership in Energy and Environmental Design (LEED)
- ENERGY STAR Program
- Whole Building Design Guide (WBDG,) of the National Institute of Building Sciences
- EPA Low Impact Development
- One Planet Living
- Complete Streets

In this chapter, these various programs and plans are summarized.

As you will see, there are several consistent principles and themes that run through the various programs and plans. While some are broad-based and include several of these, others are focused on single issues.

Following are some of the consistent messages found in these programs and plans:

- Soft touch on the land
- Respect and protection of natural and cultural resources
- Use of natural elements (shading, ventilation, lighting, etc)
- Diversity of land uses, housing types, prices
- Live, work, play, shop and learn
- Walking, bicycle and transit transportation focused
- Reuse and minimization of waste
- Renewable and efficient electric
- People and community focused

Kapa'a Highlands II will implement, to the extent feasible and practicable, measures to promote energy conservation, sustainable design, environmental stewardship and protection of the natural and cultural resources into the project. These actions are in part, based on the recommendations noted in the following sustainability programs and plans.

Smart Growth Network

In 1996, the U.S. Environmental Protection Agency joined with several non-profit and government organizations to form the Smart Growth Network. The Network was formed in response to increasing community concerns about the need for new ways to grow that boost the economy, protect the environment, and enhance community vitality.

Smart growth refers to the management of growth to make it possible "for communities to grow in ways that support economic development and jobs; create strong neighborhood with a range of housing, commercial, and transportation options; and achieve healthy communities that provide families with a clean environment." (Smart Growth Network)

There are 10 accepted principles that define Smart Growth

1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create walkable neighborhoods
5. Foster distinctive, attractive communities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and direct development towards existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost effective
10. Encourage community and stakeholder collaboration in development decisions

SmartCode

The SmartCode is a form-based code that incorporates Smart Growth and New Urbanism principles. It is a unified development ordinance, addressing development at all scales of design, from regional planning on down to the building signage.

The SmartCode is also a transect-based code. A "transect" is usually seen as a continuous cross-section of natural habitats for plants and animals, ranging from shorelines to wetlands to uplands. It is based on the rural-to-urban transect rather than separated-use zoning, thereby able to integrate a full range of environmental techniques.

The SmartCode is a model transect-based planning and zoning document based on environmental analysis. It addresses all scales of planning, from the region to the community to the block and building. The SmartCode is distributed by the nonprofit Center for Applied Transect Studies (CATS.)

Kapa'a Highlands II has incorporated the SmartCode principles and transects into its layout and design.

Hawai'i 2050 Sustainability Plan (Hawai'i 2050)

The Hawai'i State Plan, embodied in Chapter 226, Hawai'i Revised Statutes (HRS), serves as a guide for goals, objectives, policies, and priorities for the State.

The Hawaii State Planning Act (HRS 226) states that the State shall strive to improve the quality of life for Hawaii's present and future population through the pursuit of desirable courses of action in six major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education and principles of sustainability.

In 2005, the legislature authorized the creations of a task force to review the Hawaii state plan and the State's planning process and to prepare the Hawai'i 2050 Plan. The creation of the Hawaii 2050 sustainability plan raises questions about the long-term limits of growth in the State and highlights the need to begin planning and acting to assure Hawaii's future. Thus, the objectives of the Hawaii 2050 sustainability plan focuses on the revitalization of the State's long-term planning process to better guide the future development of Hawaii.

The Plan offers detailed strategic actions and indicators to serve as a guide towards meeting the Plan's sustainability goals. The Plan incorporates tangible targets and benchmarks. Priority actions for 2020, to be addressed immediately, include:

1. Increase affordable housing opportunities for households up to 140% of median income.
2. Strengthen public education.
3. Reduce reliance on fossil (carbon-based) fuels.
4. Increase recycling, reuse and waste reduction strategies.
5. Develop a more diverse and resilient economy.
6. Create a sustainability ethic.
7. Increase production and consumption of local foods and products, particularly agriculture.
8. Provide access to long-term care and elderly housing.
9. Preserve and perpetuate our Kanaka Maoli and island cultural values.

In 2011, the State established sustainability as a state priority by incorporating the Hawaii 2050 sustainability plan definitions, guiding principles and goals, into chapter 226, Hawaii Revised Statutes (the Hawaii state planning act).

"Sustainability" definition was added to the Planning Act as: "achieving the following:

(1) Respect of the culture, character, beauty, and history of the State's island communities;
(2) Striking a balance between economic, social, community, and environmental priorities; and
(3) Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

The Act also added "principles of sustainability" as one of the six major areas of statewide concern which merit priority attention, economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education and principles of sustainability."

OEQC's Sustainable Building Design Guidelines

The Environmental Council, as part of a "Planner's Checklist," adopted Guidelines for Sustainable Building Design in Hawai`i (October 13, 1999.) These guidelines do not constitute rules or law. A sustainable building is built to minimize energy use, expense, waste and impact on the environment. It seeks to improve the region's sustainability by meeting the needs of Hawai`i's residents and visitors today without compromising the needs of future generations. Compared to conventional projects, a resource-efficient building project will:

1. Use less energy for operation and maintenance
2. Contain less *embodied* energy (i.e. locally produced building products often contain less *embodied* energy than imported products because they require less energy-consuming transportation.)
3. Protect the environment by preserving/conserving water and other natural resources and by minimizing impact on the site and ecosystems
4. Minimize health risks to those who construct, maintain and occupy the building
5. Minimize construction waste
6. Recycle and reuse generated construction wastes
7. Use resource-efficient building materials (e.g. materials with recycled content and low embodied energy, and materials that are recyclable, renewable, environmentally benign, non-toxic, low VOC (Volatile Organic Compound) emitting, durable, and that give high life cycle value for the cost.)
8. Provide the highest quality product practical at competitive (affordable) first and life cycle costs.

In the design and construction of Kapa'a Highlands II, Three Stooges, LLC will seek to implement feasible measures to conform to these general guidelines.

Hawaii BuiltGreen Program

The Hawaii BuiltGreen Program is a statewide program to "incentivize" the designing and building of energy and resource efficient homes in Hawaii. Originally developed in 2000 by a public/private partnership between the State Dept. of Business, Economic Development & Tourism (DBEDT), USDOE and five other partners. Now promoted by the State, BIA, Hawaii utility companies and other organizations.

Hawai'i BuiltGreen is a self-certification program administered by the Building Industry Association of Hawai'i, which is a professional trade organization affiliated with the National Association of Home Builders. This is a local initiative based on homegrown knowledge of professionals familiar with the unique conditions of Hawaii. The Hawaii BuiltGreen program focuses on design choices through:

- Protecting Site Features and Functions
- Energy Performance and Comfort
- Health and Indoor Air Quality
- Durability and Materials Conservation
- Environmentally-Friendly Home Operations

US Green Building Council
Leadership in Energy and Environmental Design (LEED)

The US Green Building Council's Leadership in Energy and Environmental Design (LEED) program is a voluntary green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Specific LEED programs include:

- Homes
- Neighborhood Development
- New Commercial Construction and Major Renovation projects
- Existing Building Operations and Maintenance
- Commercial Interiors projects

LEED for Homes is a voluntary rating system that promotes the design and construction of high performance "green" homes. A green home uses less energy, water and natural resources; creates less waste; and is healthier and more comfortable for the occupants.

LEED for Neighborhood Development is a collaboration between the U.S. Green Building Council, the Congress for the New Urbanism and the Natural Resources Defense Council. The LEED for Neighborhood Development Rating System integrates the principles of smart growth and green building into the first national standard for neighborhood design. LEED for Neighborhood Development recognizes development projects that successfully protect and enhance the overall health, natural environment and quality of life of our communities. The rating system encourages urban smart growth best practices, promoting the design of neighborhoods that reduce vehicle miles traveled and communities where jobs and services are accessible by foot or public transit.

ENERGY STAR Program

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy.

In 1992, the US Environmental Protection Agency (EPA) introduced ENERGY STAR as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Computers and monitors were the first labeled products. Through 1995, EPA expanded the label to additional office equipment products and residential heating and cooling equipment. In 1996, EPA partnered with the US Department of Energy for particular product categories.

The ENERGY STAR label is now on major appliances, office equipment, lighting, home electronics, and more. EPA has also extended the label to cover new homes and commercial and industrial buildings.

National Institute of Building Sciences
Whole Building Design Guide (WBDG)

The goal of 'Whole Building' Design is to create a successful high-performance building by applying an integrated design and team approach to the project during the planning and programming phases. The WBDG program is a collaborative effort among federal agencies, private sector companies, non-profit organizations and educational institutions. In buildings, to achieve a truly successful holistic project, these design objectives must be considered in concert with each other:

- Accessible: to address the specific needs of disabled people.
- Aesthetics: the physical appearance and image of building elements and spaces
- Cost-Effective: weighing options during concepts, design development and value engineering
- Functional/Operational: spatial needs and requirements, system performance durability and efficiency
- Historic Preservation: whereby building elements and strategies are classifiable into preservation, rehabilitation, restoration or reconstruction.
- Productive: physical and psychological comfort—including air distribution, lighting, workspaces, systems, and technology.
- Secure/Safe: physical protection of occupants and assets from man-made and natural hazards.
- Sustainable: Pertains to environmental performance of building elements and strategies.

Land Use and Development Practices - Low Impact Development (LID)

Land use practices can improve air quality, reduce stormwater runoff, increase energy efficiency and reduce greenhouse emissions to improve the quality of life for citizens. LID is a land development approach that allows land to be developed but in a manner that helps lessen potential environmental impacts. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. LID has been characterized as a sustainable stormwater practice by the Water Environment Research Foundation and others.

In general, implementing integrated LID practices can result in enhanced environmental performance while at the same time reducing development costs when compared to traditional stormwater management approaches. LID techniques promote the use of natural systems, which can effectively remove nutrients, pathogens and metals from stormwater.

Conservation designs can be used to minimize the generation of runoff by preserving open space. Examples of Conservation Design include:

- Cluster development
- Open space preservation
- Reduced pavement widths (streets, sidewalks)
- Shared driveways

One Planet Living

One Planet Living is a vision of a sustainable world, in which people everywhere can enjoy a high quality of life within the productive capacity of the planet, with space left for wildlife and wilderness. Organizations around the world are using the one planet living approach to take measurable steps towards genuine sustainability. From zero carbon buildings to procurement policies that support the green economy, one planet living solutions are cost-effective, creative, inspirational and replicable.

- Zero Carbon - Making buildings more energy efficient and delivering all energy with renewable technologies
- Zero Waste - Reducing waste, reusing where possible, and ultimately sending zero waste to landfill
- Sustainable Transport - Encouraging low carbon modes of transport to reduce emissions, reducing the need to travel
- Sustainable Materials - Using sustainable and healthy products, such as those with low embodied energy, sourced locally, made from renewable or waste resources
- Local and Sustainable Food - Choosing low impact, local, seasonal and organic diets and reducing food waste
- Sustainable Water - Using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution
- Land and Wildlife - Protecting and restoring existing biodiversity and natural habitats through appropriate land use and integration into the built environment
- Culture and Heritage - Reviving local identity and wisdom; supporting and participating in the arts
- Equity and Local Economy - Creating bioregional economies that support fair employment, inclusive communities and international fair trade
- Health and Happiness - Encouraging active, sociable, meaningful lives to promote good health and well being

Complete Streets

Complete Streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street. Complete Streets make it easy to cross the street, walk to shops and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from train stations.

By adopting a Complete Streets policy, communities direct their transportation planners and engineers to routinely design and operate the entire right of way to enable safe access for all users, regardless of age, ability or mode of transportation. This means that every transportation project will make the street network better and safer for drivers, transit users, pedestrians and bicyclists – making your town a better place to live.

Natural and Cultural Resources

The preservation of the natural and cultural resources is essential for a prosperous and sustainable future. Kapaʻa Highlands II holds respect for the culture and the environment and will interlink natural features and cultural features as core components of the community. Archaeological and cultural sites will be protected and maintained with appropriate treatment and buffers from adjacent uses, as necessary.

No archaeological or cultural historic sites are known to exist on the property.

Brief discussions separately with historians of the subject area, Randy Wichman, Walter Smith and Albert Fukushima, concluded that the subject property has been in sugar cultivation since the 1800s until the early 1990s.

Albert Fukushima, who was employed by Lihue Plantation and worked in the subject area, said that no evidence of artifacts, bones, or other indicators of previous historic on-site activity were uncovered during the cultivation of sugar. Randy Wichman and Walter Smith concurred that the subject land was consistently cultivated for sugar for nearly a hundred years.

In 1995 SHPD stated for the "Site Selection EIS" for the adjacent Kapaʻa Middle School that the site may not be Archaeological or Historically rich because of the consistent cultivation of sugar for nearly a hundred years.

In the late 1999, the State Historic Preservation Division (SHPD) issued a letter of "no significance" to the potential developer at that time.

There exists sparingly, evidence of inactive sugar irrigation ditches. Nearly all have lost their banks and flattened out. Currently, SHPD has requested that the applicant record the locations of the remaining remnants of the former irrigation ditches prior to the development stages. The Applicant is committed to conducting and Archaeological Inventory Survey at the time of design and development phase in order to properly record the remains of the plantation irrigation ditches.

Should any archaeologically significant artifacts, bones, or other indicators of previous historic on-site activity be uncovered during construction, the Applicant is committed to their treatment being conducted in strict compliance with the requirements of SHPD.

Additionally, whenever existing rock walls must be removed, the rocks from these walls will be set aside and reused in the construction of new screen, buffer and retaining walls built within Kapaʻa Highlands II. Whenever feasible, rocks from Kapaʻa Highlands II will be used for such walls (minimize importation of rock from offsite).

Greenbelts

Greenbelts are undeveloped areas that surround the developed areas. Greenbelt is a strategic planning tool to prevent urban sprawl by keeping land permanently open. The purpose of the Greenbelt is to prevent urban sprawl, prevent neighboring towns from merging into one another, and to preserve the setting and the character of the area. Approximately 14.3-acres are proposed for open greenway areas.

Consistency with Regional Land Use Planning

Consistency with local land use planning documents is an essential element of sustainability. The local plans articulate and illustrate the community's vision. Without consistency with that vision, a development project cannot be sustainable.

Two primary planning documents address land use development in Kapaʻa, the General Plan of the County of Kauaʻi and the Kapaʻa-Wailua Basin Community Plan. Following are brief summaries of each.

The General Plan of the County of Kauaʻi (General Plan)

The General Plan of the County of Kauai ("General Plan") was adopted in 1971 and updated in November 2000. The General Plan is a statement of the County's vision for Kauaʻi and establishes strategies for achieving that vision. Section 7-1.2 of the amended Chapter 7 of the Kauai County Code states:

Pursuant to the provision of the Charter for the County of Kauaʻi, the General Plan sets forth in graphics and text, policies to govern the future physical development of the county. The General Plan is intended to improve the physical environment of the County and the health, safety and general welfare of Kauaʻi's people.

The General Plan states the County's vision for Kauaʻi and establishes strategies for achieving that vision. The strategies are expressed in terms of policies and implementing actions. They may be augmented and changed as new strategies are developed.

The General Plan is a direction-setting policy document. It is not intended to be regulatory. It is intended to be a guide for future amendments to the lands regulations and to be considered in reviewing specific zoning amendment and development applications.

The vision, the maps and text policies, and the implementing actions are intended to guide the county actions and decisions. In addition, the maps and text policies are intended to guide the County in specific types of actions: making revisions to land use and land development Regulations; deciding on zoning changes; preparing and adopting Development Plans and Public Facility Plans; and preparing and adopting capital improvement plans.

The General Plan contains six major themes, each with various policies for implementation. The major themes are as follows:

1. Caring for Land, Water and Culture
2. Developing Jobs and Businesses
3. Preserving Kauaʻi's Rural Character
4. Enhancing Towns & Communities and Providing for Growth
5. Building Public Facilities and Services
6. Improving Housing, Parks and Schools

In particular, the proposed reclassification of the Property responds and conforms to Theme No. 6. Market studies have shown that the population growth and correlating need and demand for housing is extremely high on Kaua'i.

The proposed reclassification, which will allow residents to purchase an affordable house and lot as well as allow other residents to purchase a lot to design and build their own homes, will present an opportunity to address the critical community need for residential housing. It should also be noted that the proposed development will assist in maintaining a viable economy as construction-related employment opportunities for residents would be generated.

Kapa'a-Wailua Basin Community Plan

The Kapa'a-Wailua Basin community plan outlines the regional issues and opportunities that will be subjects for future community planning. A "Build-Out Analysis" of the Kapa'a-Wailua Basin was prepared in the General Plan Update. As of 1998, this area had an estimated 4,700 dwelling units, making it the largest residential community on Kauai.

Based on the General Plan Land Use Map designations, the analysis found that an additional 4,000 units could be developed if the General Plan-designated lands were fully zoned, subdivided and built out. About 2,400 more units could be built in Urban Residential areas, about 500 more in Rural Residential areas and approximately 1,100 more units in the Agricultural areas. This would increase the housing units and population of the area by 85%.

The "Build-Out Analysis" specifically included the subject property as an "expansion area". The new General Plan Land Use Map designates the subject property as Urban Center.

The Kapa'a Highlands II project conforms to and implements the policies of the Kaua'i General Plan by developing within the designated Urban District, contiguous to Kapa'a town and its neighboring residential community.

Sustainable Design Features

Thoughtful planning of site, neighborhood and improvements design, incorporating mixed-use land uses, walkable streets, encouraging walking, bicycling and public transportation, and respect for the natural and cultural features creates opportunities for more environmentally-responsible and sustainable development. These sustainable neighborhoods are beneficial to the community, the individual and the environment.

Several sustainability programs and plans (noted previously in Chapter 2) identify and address a wide variety of design features that may be incorporated into a development project to enhance its sustainability. These items design features include:

- **Site Planning**
    - Respect for the Land – Work with topography
    - Siting - Proximity to mass transit, shopping, employment centers, recreation, schools
    - Interconnectivity – Connection with neighbors, Multi-modal transportation (to be discussed in another section of this Plan)
    - Intensity of Layout – Village Center; Clustering into compact villages
    - Natural/Cultural Resources – Protection of natural and cultural resources (to be addressed in another section of this Plan)

- **Improvements Planning**
    - Alternatives – Provide a range of housing options at various price levels (to be discussed in another section of this Plan)
    - Orientation – Ventilation; Take advantage of natural air flow
    - Shading – Eve overhang; Vegetation
    - Landscaping – Native plants; Low irrigation
    - Energy Efficiency – (to be discussed in another section of this Plan)

The objectives of Kapa'a Highlands II are to create an attractive master-planned residential community with a variety of housing opportunities and mixed uses, as well as recreational resources.

Site Planning

As a mixed-use community, the objectives of Kapa'a Highlands II are to:
- Create a diverse, sustained community of mixed uses, including residential, retail and commercial spaces, recreational spaces, and open space.
- Cultivate intrinsic respect for the land and natural surroundings, develop an inherent Hawaiian sense of place and nourish a sustaining living environment.
- Provide housing for the working families of Hawai'i nearby areas of workforce demand, resultantly improving overall quality of life through the reduction of commuting and facilitation of everyday function.
- Openly embrace a diversity of people and activities through offering mixed uses and housing types.
- Contribute to the social fabric of the community by providing infrastructure and facilities, and by including recreational, and civic sites.
- Engender and incorporate intelligent, planned sustainability by design.
- Emphasize non-vehicular transit for mainstream community-wide travel.

Kapa'a Highlands II is strategically located north of Kapa'a town. The Kapa'a By-Pass Road separates the Kapa'a town and the Kapa'a Highlands II development. Kapa'a Highlands II is on the north-west corner of the Kapa'a By-Pass Road and Olohena Road. Olohena Road runs along and adjacent to the east and north boundaries of the Property. The Kapa'a Middle School is located on the northern end of the Property fronted by Olohena Road. The area also has a long-standing and growing residential base.

This area will continue to be the focus of such development as the Island's population grows. This region is also the near commercial and industrial heart of Kaua'i, serving the needs of the visitor, residents and other industries of the western half of the Island.

Kapa'a Highlands II is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, and a variety of businesses and employment opportunities with supporting retail, commercial, infrastructure, recreational and open space uses.

The Project proposes to develop Phase II of Kapa'a Highlands into an approximately 97-acre single-family and multi-family residential subdivision. Approximately 69-acres will be subdivided into single family lots ranging from 5,000 to 8,000 square feet and multi-family lots from 1-acre to 5-acre parcels. A total of 683 multi-family units and 86 single family units are planned. Open space encompassing 14.3-acres will be developed and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater). Affordable housing will be provided in accordance with County of Kaua`i requirements.

A 3.1-acre park is proposed adjacent to the existing Kapa'a Middle School. The park will have an area for the county's proposed relocation of the Kapa'a county swimming pool. A 0.4-acre parcel is proposed for commercial use. A country type store and small personal service types of use are anticipated. A remnant parcel of a one acre on the Makai side of the Kapa a Bypass road is also proposed as commercial use or for sub-stations for the police and fire departments. Approximately 14.3-acres are proposed for open greenway areas.

The site is presently fallow, undeveloped, and predominantly vegetated with weeds. The undesirable dumping of old cars, appliances, rubbish associated with undeveloped lands continue to exist on the property. The proposed project will increase the productive use of the property and significantly upgrade the immediate vicinity.

The proposed development will have minimal impact in terms of agriculture. Although the Property was previously used as part of large scale agricultural activities, it is presently fallow, and undeveloped. With the closing of the sugar plantations on Kaua'i, close proximity to existing residential areas, and demand for affordable housing, large-scale agricultural operations were not deemed feasible.

Construction of the proposed development will involve grading, excavation and trenching of presently undeveloped areas within the project site. The project will require alteration of existing landforms to create more efficient land development areas. Appropriate engineering, design and construction measures will be undertaken to minimize potential erosion of soils during construction.

On-Site grading and infrastructure improvements and residential construction will result in an increase in dust, storm run-offs and noise. The prevailing trade wind pattern is from the north-east directions. Potential airborne matters will generally be carried in the south-west direction, away from the school and existing residential areas. However, on occasions, the westerly winds may carry the potential

airborne matters towards the school and existing residential neighborhoods. Construction noise relating to infrastructure installations will be expected.

In the short term, during construction, measures will be taken to minimize impacts such as increased dust, noise and traffic. Construction activities shall comply with the provisions of Hawaii Administrative Rules, S-11-60.11.33 on Fugitive Dust. Dust preventive measures will include;

- Planning of construction phases to minimize the amount of dust generating materials and activities, centralizing on-site vehicular traffic routes and locating of potential dust-generating equipment in areas of the least impact.
- Provide adequate water source at the site prior to start of construction.
- Landscape and provide rapid covering of bare areas developed during construction.
- Minimize dust from shoulders and access roads.
- Provide dust control measures during weekends, after hours, and prior to daily construction.
- Control dust from debris being hauled away from the site.

A national Pollutant Discharge Elimination System (NPDES) general permit will be acquired prior to construction to minimize storm run-offs during construction.

Mitigation measures will be instituted following site-specific assessments, incorporating structural and non-structural BMPs such as minimizing soil exposure and implementing erosion control measures such as silt fences and sediment basins. Following construction, erosion is anticipated to decrease since the soils will have been graded, built over, paved over or landscaped. Landscaping in turn will provide erosion control. Mass grading of the development areas will be in compliance with the County of Kaua'i's grading ordinance requirements and will require NPDES permit from the State DOH for storm water construction activities, including BMPs to minimize off-site impacts.

The Property is encompassed by the Kapa'a By-Pass Road to the south and Olohena Road to the east and the north side. The by-pass road is owned by the Applicant and the Applicant intends to dedicate said road to the Department of Transportation (DOT) for continued public use.

There is a round-about located at the south east corner of Olohena Road and the Kapa'a By-Pass Road. Kuhio Highway is accessible from the Property by driving south on Olohena and Kukui Street approximately 0.5 mile. The project will have a complete multi-modal roadway from the Kapa'a By-Pass Road running north through the Property to Olohena Road. A couple of bus stops will be located along the roadway. A bike/walking path is proposed from the south of the property to the Kapa'a Middle School located on the North portion of the Property.

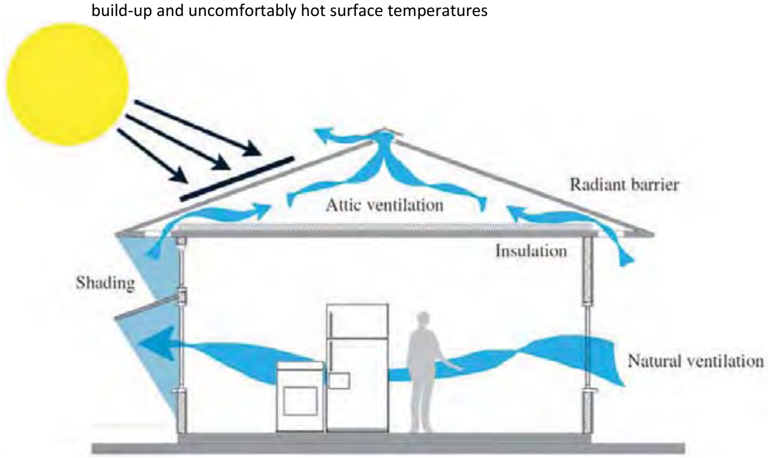
Improvements Planning

There are three major sources of unwanted heat in homes: direct solar impacts on a building and through windows and skylights; heat transfer and infiltration, of exterior high temperatures, through the materials and elements of the structure; and the internal heat produced by appliances, equipment and inhabitants.

The DBEDT Field Guide for Energy Performance, Comfort and Value in Hawaii Homes provides a number of recommended ways to incorporate effective design options to address home temperatures. These items to be considered in the development of Kapaʻa Highlands II are summarized and illustrated below:

Design for Comfort and Value

A. Control Heat Gain: Use strategies to reduce solar heat gain through roofs, walls and windows.
   1. Orient and arrange building to control heat gain
   2. Landscape and design outdoor surfaces to reduce air temperatures and glare; minimize paving area and use grassed and planted areas to provide lowered site temperatures, shade and evaporative cooling
   3. Shade roofs, walls and windows with:
      a. Architectural elements such as eaves, awnings and carports, and
      b. Window treatments such as blinds and shutters
   4. Use insulation and/or radiant heat barriers in roofs and walls exposed to the sun
   5. Use high performance windows (Low-e, spectrally selective, or tinted glazing) to keep solar heat out of interior spaces while admitting daylight
   6. Use light colored roofing and wall finishes
   7. Shade or insulate materials with high thermal mass, such as concrete floors, to avoid heat build-up and uncomfortably hot surface temperatures



B. Use Natural Ventilation: Provide ample fresh air ventilation for living spaces and areas where hot air and humidity accumulate, such as attics, high ceiling spaces, kitchens, bathrooms and laundry areas.
   1. Orient buildings to maximize the cooling potential of prevailing winds and minimize morning and afternoon heat gain
   2. Design floor plans and opening placement and type to provide effective cross ventilation with good air circulation throughout room areas and at body level
   3. Provide generous screened openings well protected from the rain

   4. Use architectural design elements such as vents and casement windows to improve interior air circulation
   5. Enhance natural ventilation with fans as needed:
      a. Use ceiling and whole house fans to provide comfort on warm, humid or still days
      b. Use solar powered attic vent fans when appropriate and economically feasible

Shaded areas stay cooler

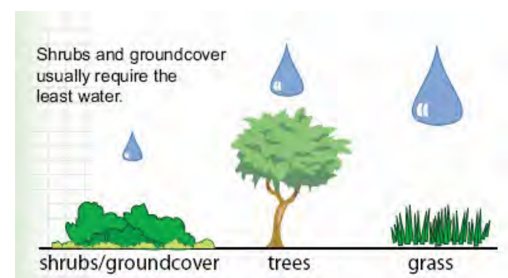
Consistent with the principles and recommendations noted in the DBEDT publication *Hawaiʻi Homeowner's Guide to Energy, Comfort & Value*, to the extent feasible and practical, Kapaʻa Highlands II will incorporate the following:

Site Planning and Landscaping

Orientation of homes is important. Try to minimize the area of east- and west-facing walls and windows because they are difficult to shade from the sun.

Landscaping and the design of outdoor surfaces can reduce air temperatures and glare. Landscaping minimizes paving area provides lowered site temperatures, shade and evaporative cooling.

Low impact landscaping. Selection and distribution of plants must be carefully planned when designing a functional landscape. Aesthetics are a primary concern, but it is also important to consider long-term maintenance goals to reduce inputs of labor, water, and chemicals. Properly preparing soils and selecting species adapted to the microclimates of a site greatly increases the success of plant establishment and growth, thereby stabilizing soils and allowing for biological uptake of pollutants. Dense, healthy plant growth offers such benefits as pest resistance (reducing the need for pesticides) and improved soil infiltration from root growth. Low impact landscaping can thus reduce impervious surfaces, improve infiltration potential and improve the aesthetic quality of the site.



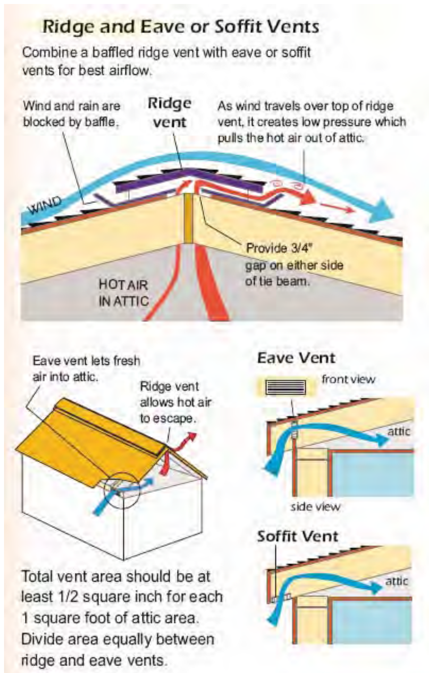
Protect and retain existing landscaping and natural features. Select plants that have low water and pesticide needs, and generate minimum plant trimmings. Use compost and mulches. This will save water and time.

<u>Examples of Low Impact Landscaping</u>

- Planting native, drought tolerant plants
- Converting turf areas to shrubs and trees
- Reforestation
- Encouraging longer grass length
- Planting wildflower meadows rather than turf along medians and in open space

Control Heat Gain

By using strategies to reduce solar heat gain through roofs, walls and windows, a house can stay cool. Roofs, walls, windows and outdoor flooring can be shaded with architectural elements such as eaves, awnings and carports, and shutters.



Walls

Unshaded walls can get very hot and make your home uncomfortable. The best "cool wall" strategy is shading with overhanging eaves, lanais, or landscaping. If complete shade isn't feasible, use insulation or radiant barriers in the exposed walls. Use a white exterior finish to improve cool wall performance.

Windows

The use of high performance windows (Low-e, spectrally selective, or tinted glazing) helps keep solar heat out of interior spaces while admitting daylight. Overhangs, awning and trees can keep the sun from striking windows directly.

Roofs and Roofing Material

A cool roof is essential for a comfortable home. Insulation keeps roofs and homes cool by blocking heat on the roof thus, the attic, the ceiling and the rest of the house stay cool and comfortable. Installing a white roof will keep a home cooler.

Ventilation is another tool for keeping homes cool. For houses with attics good ventilation is recommended. Ridge and Eave or Soffit Vents work as well. If a ridge vent is not feasible, use a solar powered vent fan in combination with eave or soffit vents, to push warm air out of the house and attic.

Solar Water Heating

Minimizing the energy required for water heating is the most important energy saving step for a Hawaii home. Conventional water heating is a big expense and accounts for about 40% of the utility bill in a Hawaii house.

Hawaii was the first state in the nation to require solar water heaters in new home construction. Act 204 SLH 2008, requires all building permits for single-family homes issued after Jan. 1, 2010, to include solar water heaters. Exceptions are allowed where homes have poor sunlight; if it is cost-prohibitive after 15 years; when the dwelling has a substitute renewable energy source; or if there is an approved tankless water heater and another appliance, both powered by gas.

Additionally insulating hot water supply lines and pipes with at least ½" foam or 1" fiberglass insulation and setting heater thermostats adjustable for 120F or less, can add additional energy savings to a homeowner.

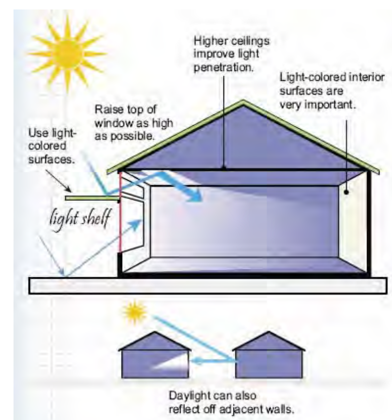
Photovoltaic systems

Alternative energy sources such as photovoltaics and fuel cells that are now available in new products and applications will be available as a house feature option. Renewable energy sources provide a great symbol of emerging technologies for the future.

Lighting

Energy Efficient Light Design

Energy efficient light design features help minimize electric lighting energy demand and heat gain. An efficient lighting system uses fluorescent lamps as the primary light source and may selectively use incandescent (also halogen, a type of incandescent) for accent lighting and for applications where the light is usually off (like exterior lights on motion sensor controls). Modern fluorescent lighting can provide excellent color rendering and be free of flicker and hum. Additionally, start up is nearly instantaneous with electronic instant-start and rapid-start ballasts. Fluorescent lamps last 10 to 20 times longer than incandescents, saving energy all the while, so the lifetime cost is much lower and fluorescent lights do not emit as much heat as incandescents.

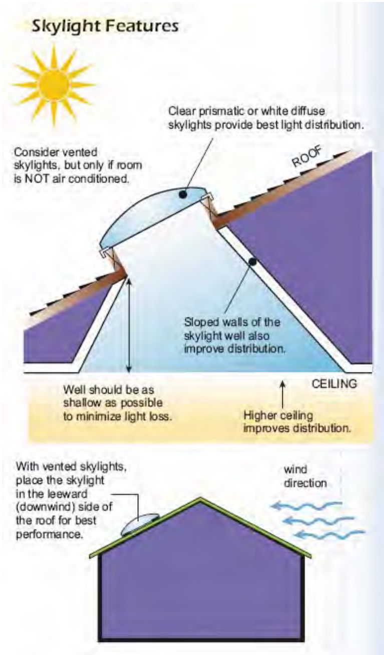


Providing controls such as timers, dimmers, sensors and separate fan/light controls to limit power use to the times and levels needed, also helps reduce lighting power consumption.

The use of solar powered landscape lighting when economically feasible is another energy saving design feature which can be used for both residential homes as well as business and civic buildings and spaces.

Daylighting

Daylighting is the use of natural sunlight to light interior spaces. Using controlled, filtered and indirect daylighting to light interior spaces reduces electric lighting loads. The effectiveness of daylighting can be increased with generous wall openings, open floor plans and light colored interior finishes.



Windows are usually a home's main source of daylight. Blocking direct sunlight and bouncing light on to the ceiling helps facilitate daylighting. Minimizing areas of east- or west-facing windows and using blue or green glass help.

Skylights (traditional, vented, tubular) can provide significant daylighting opportunities.

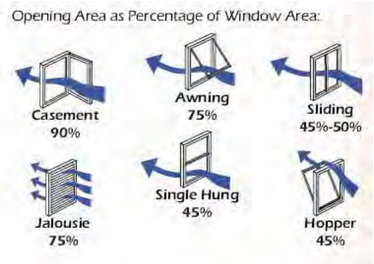
Light-colored interior finishes are critical for good light distribution thus, white ceiling is recommended.

Rooms with higher ceilings and narrow floor plans are easier to daylight. Consider several smaller skylights instead of one larger skylight for better light distribution.

Natural Ventilation

Kapa'a Highlands II will optimize air-flow by designing homes that capture cooling breezes to keep homes comfortable. Utilizing natural ventilation also helps reduce health hazards such as mold and mildew.

Buildings should be oriented to maximize the cooling potential of prevailing winds and minimize morning and afternoon heat gain. Floor plan design will include effective cross ventilation with good air circulation throughout room areas and at body level.



Providing generous screened openings and using architectural design elements such as vents and casement windows will improve interior air circulation.

Ceiling fans are a great way to enhance natural ventilation. Use ceiling and whole house fans to provide comfort on warm, humid or still days.

Transportation

The Property is encompassed by the Kapa'a By-Pass Road to the south and Olohena Road to the east and the north side. The by-pass road is owned by the Kapa'a Highlands II which is working with the Department of Transportation (DOT) and has been allowing for the continuous public use of the road. The by-pass road is in the process of being dedicated to DOT. The agreement of transfer will include that all mitigating measures will be the shared responsibility of DOT and Kapa'a Highlands II.

There is a round-about located at the south east corner of Olohena Road and the Kapa'a By-Pass Road. Kuhio Highway is accessible from the Property by driving south on Olohena and Kūkuī Street approximately 0.5-mile. The project will have a main roadway from the Kapa'a By-Pass Road running north through the Property to Olohena Road. The roadway will follow the county's resolution for complete roads and as such will be a multi-modal roadway. A couple of bus stops will be located along the roadway. A bike/walking path from the round-about south east of the property will follow the bypass road, connect to the main road and continue to the Kapa'a Middle School located on the North portion of the Property. Kapa'a Highlands II is continuing to work with the DOT on potential traffic issues.

Transportation, housing, land use and infrastructure need to be integrated and incorporated into Kaua'i's long-term transportation policies as the population continues to grow in the years ahead. The Kaua'i General Plan, includes the following policies:

Bus Transit.

- Continue to operate The Kaua'i Bus; seek to increase ridership and expand service, subject to the availability of funds.
- Improve bus stops to increase safety and convenience of service.
  - Improvements to pullover areas along roadways in order to create safe and accessible bus stops.
  - Designated areas at housing projects (particularly those with elderly and disabled residents) that provide safe and accessible paratransit stops.

Bikeways.

- Support funding to develop Kaua'i's bikeway system to provide for alternative means of transportation, recreation, and visitor activities (economic development).

Regional Highways and Roads.

- Use General Plan policies concerning rural character, preservation of historic and scenic resources, and scenic roadway corridors as part of the criteria for long-range highway planning and design. The goal of efficient movement of through traffic should be weighed against community goals and policies relating to community character, livability, and natural beauty.
- Consider transportation alternatives to increasing the size and capacity of roadways. Alternatives include increased utilization of public transit.
- Planning for the Kapa'a By-Pass should incorporate connector roads between the By-Pass and the coastal highway and between the By-Pass and roads serving the valley.
- The State and the County should jointly undertake a study of the existing roadway network and the future transportation needs within the Kapa'a-Wailua homesteads area.

- Reserve corridors for future roadways as shown on the General Plan Land Use Map. The corridors are conceptual only and are subject to environmental assessment and evaluation of alternative alignments.

Kapa‘a Highlands II is committed to Multi-modal, Interconnected and Concurrent Transportation for its residents and community.

Multi-modal Interconnected Roads and Streets

The proposed main complete, multi-modal roadway through the development will include bus stops, sidewalks and a bike and walking path connecting from Kapa‘a Middle School down through the development to the round-about, facilitating green travel to and from Kapa‘a's town core.

Kapa‘a Highlands II incorporates multiple road interconnections with neighbors.

Kapa‘a Highlands II will incorporate a system of interconnected roads that will provide residents alternative transportation routes within the project. The internal circulation pattern will provide safe and convenient choices for drivers, bicyclists and pedestrians.

Additional sustainable connectivity concepts including bikeways and walkways to and from the planned County pool, neighborhood commercial areas, the middle school and Kapa ‘a's town core are planned.

Complete Streets

Through recent legislation, the State of Hawaii Department of Transportation (HDOT) and county transportation departments are required to ensure the accommodation of all users of the road, regardless of their age, ability, or preferred mode of transportation. In addition, the concept of "Complete Streets" is prioritized where:

> “(T)ransportation facilities ... are planned, designed, operated and maintained to provide safe access and mobility for all users, including bicyclists, pedestrians, transit riders, freight and motorists".

In addition to providing vehicle access, roadway networks are a vital part of the livability of our communities. Complete streets will provide an ease of use and access to destinations by providing an appropriate path of travel for all users, and enhance the ability to move people and goods throughout the state and its counties.

Additionally, complete streets principles will help contribute to a clean and secure energy future for Hawaii by offering flexibility and better accommodation for safe transit, walking, bicycling and alternate fuel vehicles that together, will decrease demand for imported oil.

Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and public transportation users of all ages and abilities are able to safely move along and across a complete street.

Complete Streets make it easy to cross the street, walk to shops, and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from transit stations.

Economic Opportunities

Kapa‘a Highlands II provides significant, on-going economic and fiscal benefits for residents of Kaua‘i, as well as for the County and State governments.

Development of facilities would generate employment and consequent income and taxes. In addition, by providing the opportunity for new residents to the Island of Kaua‘i and generating additional real estate sales activity, the Project is expected to support long-term impacts, including additional consumer expenditures, employment opportunities, personal income and government revenue enhancement.

On a short-term basis, the proposed development will have a direct beneficial impact on the local economy during construction through construction and construction-related employment. It should also be noted that the proposed development will assist in maintaining a viable economy as construction-related employment opportunities for residents would be generated.

Over the long term, the residential homeowners will require various services related to home maintenance and improvement that will further support the local economy.

On-Site Employment Generators

Kapa‘a Highlands II proposes two areas for commercial uses that, ultimately, will serve to promote and provide a variety of job opportunities. A 0.4-acre parcel is proposed for commercial uses such as a country store and small personal service type uses are anticipated. A 1-acre site on the Makai side of the Kapa‘a Bypass Road is also proposed for commercial development or for use as sub-stations for the police and/or fire department.

Open Space and Parks

Kapa‘a Highlands II holds respect for the environment by interlinking natural features and open space as core components of the community.

There are several parks within Kapa‘a town, including a beach park. A County-owned 1.9-acre park is located within walking distance from the Property, just south east of the corner of Olohena Road and the by-pass road round-about. The park consists of a baseball field, football field, basketball courts, restroom facilities, picnic tables and a barbecue area.

Open space and open greenway areas encompassing 14.3-acres will be developed within the project. A 3.1-acre park is proposed within the project for outdoor recreation. Land for the proposed relocation of the Kapa‘a county swimming pool will be available within the 3.1-acre park. The provision of a 3.1-acre park with a county swimming pool within the proposed development will provide residents with an opportunity for leisurely recreational activities.

Kapa‘a Highlands II is conforms with HRS § 205-a-2(B) (3) (A) which states that CZM's objective is to "protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources."

The policies to achieve this objective are as follows:

1. Identify valued scenic resources in the coastal zone management area;
2. Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
3. Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and
4. Encourage those developments which are not coastal dependent to locate in inland area.

No scenic, historic, cultural spaces exist or will be created on the subject site and the site is well away from the shoreline. There are no natural wildlife, forest, marine, or unique ecological preserves on or near the subject site. Thus, open space and recreation will not be adversely affected. Park and beaches of Kapa‘a are within walking distances from the project.

The proposed project will not adversely impact scenic or open space resources. The proposed project will not involve significant alteration of the existing topographic character of the site and will not affect public views to and along the shoreline.

Water Management

As an overarching philosophy in all source alternatives, Kapa‘a Highlands II is committed to water conservation strategies to reduce consumption, conserve resources and minimize water use. The goal is to reduce the total water use through a combination of water saving equipment and strategies.

A number of measures may be implemented to facilitate end-use conservation, including water restrictions during drier periods, public education and more efficient landscaping practices. Consumption could be significantly reduced through end-user conservation.

Efficient fixtures and appliances will reduce indoor water use. The water distribution system will be maintained to prevent water loss and homeowners and businesses will be encouraged to maintain fixtures to prevent leaks. Landscaping will emphasize climate-adapted native and other appropriate plants suitable for coastal locations. Best management practices will be designed and implemented to minimize infiltration and runoff from daily operations.

WaterSense

WaterSense, a partnership program by the U.S. Environmental Protection Agency, seeks to protect the future of our nation's water supply by offering people a simple way to use less water with water-efficient products, new homes, and services. WaterSense brings together a variety of stakeholders to:

- Promote the value of water efficiency.
- Provide consumers with easy ways to save water, as both a label for products and an information resource to help people use water more efficiently.
- Encourage innovation in manufacturing.
- Decrease water use and reduce strain on water resources and infrastructure.

The program seeks to help consumers make smart water choices that save money and maintain high environmental standards without compromising performance. Products and services that have earned the WaterSense label have been certified to be at least 20 percent more efficient without sacrificing performance.

If one in every 10 homes in the United States were to install WaterSense labeled faucets or faucet accessories in their bathrooms, it could save 6 billion gallons of water per year, and more than $50 million in the energy costs to supply, heat, and treat that water!

Water Efficient Fixtures

Water is a finite resource—even though about 70 percent of the Earth's surface is covered by water, less than 1 percent is available for human use. Each American uses an average of 100 gallons of water a day at home. We can all use 30 percent less water by installing water-efficient fixtures and appliances. The average household spends as much as $500 per year on their water and sewer bill and can save about $170 per year by installing water-efficient fixtures and appliances.

Water-efficient fixtures reduce water and sewer costs, reduce demand on water supplies and treatment facilities, and reduce heating energy consumption and associated greenhouse gas emissions.

High efficiency toilets: (HETs) reduce flush volumes by no less than 20% compared to conventional ultra-low flow (ULFT) toilets. Dual-flush HETs allow users to choose one of two flushes: liquids or solids. In actual operation, dual-flush HETs average about 1.2 to 1.4 gpf. Pressure-assist HETs use a pressurized tank that creates for a more forceful flush with less water.

Faucets: Water flow is reduced by ***Flow limiters*** which are built into the faucet or are installed as after-market fittings. Aerators or laminar flow devices are types of flow limiters.

- Aeration injects air into the stream of water, displacing much of the water content.
- Laminar flow uses multiple small diameter parallel streams of water that are not aerated.

Flow control valves can limit water flow down to 1.5 to 0.5 gpm per side (hot and cold).

Showerheads: Federal law since 1994 mandates that all showerheads sold in the United States use 2.5 gpm or less. Despite this, some showerheads actually use much more than 2.5 gpm, and shower towers that include multiple showerheads or jets can total 12.5 gpm or more. A better option is a good quality low-flow showerhead designed to use 2.0 gpm or less while providing a satisfying shower.

Groundwater

A Water Master Plan has been approved, in concept, by the County Department of Water (DOW). Kapa'a Highlands II has a proven well site that will be dedicated to the DOW to feed the Department of Water's storage tanks and existing water system. Kapa'a Highlands II is committed to working with the DOW on pertinent water issues during the design and development phase.

The proposed water system will be subject to regulation as a public water system and will meet conditions of the State Department of Health, including HAR Chapter 11-20, 11-21 and 11-25.

Kapa'a Highlands, Phase II consists of approximate 97-acres on the eastern half of the 163.123-acres of Kapa'a Highlands. The proposed development is not anticipated to have significant adverse impacts on ground water because no active water systems are on the 97-acres. The irrigation facility for this former sugar land is no longer available.

A stream exists on Kapa'a Highlands I, flowing from north to south along the western border of the 163.123-acres of Kapa'a Highlands II. Kapa'a Highlands II is committed to keeping the flow of the stream consistent to prevent any potential health and mosquito problems associated with streams when not flowing naturally.

Storm and Surface Water Runoff

A Preliminary Drainage Report has been prepared. A detailed Drainage and Erosion Mitigation Plan will be prepared and submitted to the County Engineer for approval during the design and development stages. The Applicant will be providing major drainage improvements in connection with development of the property. Multiple detention ponds are proposed for the property. Additionally, a series of catch basins, drainage, pipes and culverts will be utilized to direct run off to major drainage areas on the property.

The project's proposed drainage system will be designed to minimize impacts to near shore coastal waters. Water quality treatment and detention basins will be built to prevent runoff and sedimentation from impacting groundwater resources. Prior to the occupancy of any residential or commercial unit within the project, Kapa'a Highlands II shall implement and maintain storm and surface-water runoff BMPs, subject to any applicable review and approval of the State DOH, designed to prevent violations of State water quality standards as a result of storm-water discharges originating from the project. These BMPs will be documented in a declaration of covenants, conditions and restrictions that will be recorded against the property and will run with the land.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

BMPs include storm water runoff and non-storm water sources control measures and practices that will be implemented to minimize the discharge of erosion and other pollutants from entering into the receiving State waters. The erosion control plan for the proposed project include temporary and permanent control measures BMPs that will be implemented in accordance with Chapter 10 of the Hawai'i County Code.

Post construction BMPs to prevent erosion and storm water runoff after construction is completed includes the installation of drain inlets and shallow drywells within the project site, and landscaping and grassing of disturbed areas.

Prior to occupancy, Kapa'a Highlands II will implement and maintain storm and surface-water runoff BMPs, subject to any applicable review and approval of the DOH. Those BMPs will be designed to prevent violations of State water quality standards as a result of storm-water discharges originating from the Project.

Wastewater

Kapa'a Highlands II The project will be contributing to the deferred maintenance and repair of the Kapa'a Waste Water Treatment plant. The project will not be a detriment to the capacity of the Plant.

Energy Management

Pursuant to Chapter 344 (State Environmental Policy) and Chapter 226 (Hawai'i State Planning Act), HRS, all Kapa'a Highlands II activities, buildings and grounds will be designed with a significant emphasis on energy conservation and efficiency. Efficient design practices and technologies will be the cornerstone of Kapa'a Highlands II's design phase. Buildings within Kapa'a Highlands II will further comply with the County of Kaua'i Energy Conservation Code (Kaua'i County Ordinance 890). Furthermore, solar water heaters will be utilized as made requisite under Section 196-6.5, HRS. Kapa'a Highlands II will confer with KIUC in regards to suggestions and proposals for customized demand-oriented management programs offering rebates for the installation of alternative energy efficient technologies and measures

	Kaua'i	Oahu	State
Medium Income (2009)	$55,723	$67,019	$63,741
Electricity Price (May 2011)	44.27 cents/kWh	30.1 cents/kWh	-

Kapa'a Highlands II is committed to renewable energy and energy efficiently as ways to reduce environmental harm and self sufficiency. Kapa'a Highlands II will continue to improve programs and create new programs as the development is initiated.

Residents of the State of Hawaii pay the highest electricity rates in the US. The average American paid 10.5 cents/kWh in 2010. In the state of Hawaii, O'ahu currently has the lowest residential electricity rates, while Lana'i has the highest. Residential rates on Kaua'i average between 40-45 cents/kWh. Hawaii relies on imported oil for approximately 76% of its total electricity production. The price variation across the state is largely a result of difference in power plant efficiencies, power purchasing agreement and other infrastructure.

The Kaua'i Island Utility Cooperative ("KIUC") is the sole electric utility on Kaua'i. KIUC began serving the people of Kauai on November 1, 2002, when it purchased Kauai Electric from Connecticut-based Citizens Communications. KIUC is America's newest electric cooperative, but it's by no means the only one. It is one of approximately 900 electric cooperatives serving electric consumers in 47 states. Like all cooperatives, KIUC operates as a not-for-profit organization that is owned and controlled by the people it serves. KIUC serves over 23,300 customers with 92% of KIUC's electricity coming from the burning of imported fossil fuels.

In 2009 the State Legislature codified the need for energy efficiency by enacting the statewide energy efficiency portfolio standard with a target of reducing energy consumption by 30% of forecasted energy consumption by 2030 (4,300 GWh) and beginning the process for separating efficiency from the existing renewable portfolio standard.

Energy efficiency in homes and buildings

- Hawai'i Revised Statutes section 46-19.6 requires all county agencies to place a "priority on processing of permit applications for construction projects incorporating energy and environmental design building standards."

To reduce net energy consumption and demand, Kapa'a Highlands II will consider the implementation of elements of the United States Environmental Protection Agency (EPA) Energy Star Program; including efficient insulation, high performance windows, compact construction, efficient ventilation systems, and energy efficient lighting elements and appliances.

Kapa'a Highlands II will furthermore seek to harness energy conservations and technologies to facilitate the possibility of net energy metering in building design to empower residents and tenants to reduce their electricity costs and provide energy back to the grid.

Energy conservation and efficiency measures will be implemented and emphasized where applicable in the design of Kapa'a Highlands II. Energy-efficiency technologies to be considered include:

- Solar energy for water heating
- Photovoltaic systems, fuel cells, biofuels and other renewable energy sources
- Optimal utilization of daytime sunlight
- High efficiency light fixtures
- Roof and wall insulation, radiant barriers and energy efficient windows
- Optimized air-flow
- Installation of heat resistant roofing
- Intelligent Landscaping to provide for shading, dust control, and heat-mitigation
- Portable solar lighting (i.e. parking lots)

A photovoltaic system that can generate up to 1.18 MW of electricity is situated in Phase I of the Kapa'a Highlands project. Its operator entered into an agreement to sell to Kaua'i Island Utility Cooperative electricity generated from the solar farm for 20 years. "Creating more renewable energy alternatives is one of the most critical challenges we face," Kauai Mayor Bernard Carvalho said at a dedication ceremony for the solar farm.

The project spreads over five acres of a 165-acre property, and has 5,376 solar panels mounted on posts and piers. The panels average about 12-feet off the ground.

Health and Active Lifestyles

Through the layout and design of Kapa'a Highlands II, there is an overall opportunity for a positive effect on the health of its residents. Communities that make it easy and safe to walk and ride bikes are opening the door to a wide range of health benefits for their residents. They are reducing barriers to being physically active and helping individuals integrate physical activity into their daily lives.

Active living is a way of life that integrates physical activity into daily routines. For individuals, the goal is to get a total of at least 30 minutes of activity each day by, for example, walking, bicycling, playing in the park, working in the yard, taking the stairs, or using recreation facilities. For communities, the goal is to provide opportunities for people of all ages and abilities to engage in routine physical activity and to create places and policies that encourage better physical health.

The burden of physical inactivity:
The Problem:

- 25% of adults are sedentary
- 60% of adults not active enough

The Outcome:

- Obesity, cardiovascular disease, cancer, diabetes, depression
- Physical inactivity is a primary factor in over 250,000 deaths annually.
- Medical costs associated with physical inactivity and its consequences may exceed $76 billion annually. (hawaii.gov/health/healthy-lifestyles)

Walkable and bikable communities increase active living. Active living can improve health by:

- Reducing the risk of dying prematurely.
- Reducing the risk of dying from heart disease.
- Reducing the risk of developing diabetes, colon cancer and high blood pressure.
- Reducing feelings of depression and anxiety.
- Helping control weight.
- Helping build and maintain healthy bones, muscles and joints.
- Promoting psychological well being. (Michigan Department of Community Health)

Growing body of evidence:

- San Diego study: 70 minutes more physical activity/week among residents in walkable neighborhood; 35% vs. 60% overweight (Saelens, Sallis, et. al. 2003)
- 6 lb weight difference in sprawling vs. compact counties
- King County study: 5% increase in neighborhood's "walkability index" correlated with 32% increase in active transportation; 0.23 point reduction in BMI (Frank, Sallis, et. al. 2006) (hawaii.gov/health/healthy-lifestyles)

Community Design Policies Work! The Task Force on Community Preventive Services concluded that:

- Community-scale policies & design are effective
    - Zoning for compact, mixed-use development
    - Transit-oriented development
    - Policies related to street design & connectivity

- Street-scale policies & design are effective:
    - Traffic calming
    - Street lighting
    - Improving street crossings (hawaii.gov/health/healthy-lifestyles)

Education

Schools servicing the project include Kapa'a Elementary, Kapa'a Middle School and Kapa'a High School.

Kapa'a Middle School borders the project site to the north. Kapa'a Elementary School and Kapa'a High School share a campus which is approx imately 2-miles from the project site.

Kapa'a Elementary School serves grads K-5 and is one of the largest elementary schools in the state. It shares a campus with Kapa'a High School. Kapa'a E lementary School's capacity is 1,373 students, and the 2009/2010 school year enrollment was 827 students (Department of Education, 2010a).

Kapa'a Middle School, with facilities for 1,059 students, was opened in 1997 and has an enrollment of 652 students (Department of Education, 2010b).

Kapa'a High School currently has a student body numbering 1,033 with a capacity of 1,445 (Department of Education, 2010c).

The proposed project will generate increased demand on student enrollment within the region. Kapa'a Highlands II will coordinate with the DOE to ensure that the DOE's facility assessment policy provisions are appropriately addressed.

Additionally, a 3.1-acre park is proposed adjacent to the existing Kapa'a Middle School. The park will have an area for the county's proposed relocation of the Kapa'a county swimming pool. Kapa'a Highlands II also plans to develop a bike/walking path from the south of the property to the Kapa'a Middle School to facilitate biking and walking around the development.

Housing

Kapa'a Highlands II is a well located master planned project on the Island of Kaua'i targeting primary housing demand from local and in-migrant families, as well as offshore second home demand for view estate ownership. Located in the middle of the island, the project is close to the centers of employment and resort activity, plus the airport, beaches, shopping, recreation, etc. It sits above the historic town of Kapaa and below the foothills of the mountain chain that forms the island.

The proposed development, Kapa'a Highlands Phase II, will utilize 163-acres of land for single-family and multi-family residential and commercial purposes. Development of the Property will address a portion of the significant demand for affordable housing in the County of Kaua'i, without significantly affecting reserve areas for foreseeable urban growth.

Kapa'a Highlands II will respond to varying spectrums of demand for housing within Kaua'i by providing a wide range of housing opportunities inclusive of affordable housing alternatives. Kapa'a Highlands II will seek to create and sustain a mixed-income community allowing for unparalleled social diversity.

Affordable housing demands exhibited a significant upward trend over the last several years. Recent market studies have indicated a current shortage of single-family housing in the East Kaua'i area. The forecast is that demand for housing will continue to increase, especially in the area of affordable housing. The proposed development will assist in alleviating some of the current supply-and-demand pressures on Kaua'i's current housing market by providing a variety of additional housing products and opportunities for long-term local residents.

The Kawaihau Planning District has substantial capacity for additional residential development, as described in Section 6.2.3.1 (Build-Out Analysis) of the Kaua'i General Plan. "Lands previously designated for urban use but as yet mostly undeveloped include an area located near Kapa'a, south of Olohena Road. This area was previously designated for Urban Mixed Use and is shown as Urban Center on the new GP Land Use Map. Owned partly by the State and partly by Amfac/JMB (or its successor), this "expansion area" for Kapa'a has already accommodated the Kapa'a Middle School."

In a 2010 letter to the applicant, the Planning Director wrote "We are writing in general support of Three Stooges LLC's petition to amend 97-acres in Kapa'a to the Urban district. The proposed amendment is in conformance with the County of Kaua'i's General Plan and will provide 231 units of affordable housing. Affordable housing remains an acute need on Kaua'i, even with a falling real estate market and as such the County is generally supportive of any petition that proposes additional affordable housing, particularly when contiguous to developed urban areas, infrastructure and consistent with our General Plan."

Current Housing Stock

The housing stock on Kaua'i is primarily single family, 69%, with attached housing only at 31%. Around 40% of all single-family homes are built on lots sized less than 10,000 sf. The condominium stock is 64% fee-simple and 34% leasehold. It is also only 10% owner occupied, with the balance of the units investor-owned, either in a rental pool, or part of a hotel operation. About 30% of the condo units were built since 1990, with most of the rest around 25 years or more in age. 38% of the condominium units are one bedrooms, with two bedrooms at 45%.

Housing Mix

The target market for this development is relatively broad, as Kapa'a is arguably at the center of the island, with strong retail and recreational facilities, and easy commute to two out of the three major resort areas on the island. The demand for affordable housing is also significant. The proposed development will not only address a critical community need, it will also provide residents with a unique opportunity to purchase a lot and construct a home that best fits their needs on the proposed development's market-priced lots.

Kapa'a Highlands II – Market Housing Mix (2010 dollars)

Type	Average Sales Price	Lot Size	Total Units
Single-Family Lots	$180,000 to $250,000	5,000 to 8,000 Sq. Ft.	86-lots
Multi-Family Units	$220,000 to $450,000	1 to -acre Parcels	683-units

Kapa'a Highlands II – Affordable Housing Mix (2010 dollars)

Type	Average Sales Price	Lot Size	Total Units
Single-Family	$189,000 to $363,000	1,100 to 1,200 Sq. Ft. living area	13-lots
Multi-Family Units	$189,000 to $363,000	750 to 1,200 Sq. Ft. living area	154-units

Affordable Housing

An affordable housing element of the project is proposed and will conform to Kaua'i County Ordinance No. 860, Kaua'i's new housing policy wherein developers contribute up to thirty percent (30%) of the total residential units for affordable housing.

The Kaua'i housing policy provides incentives to developers who provide the required affordable units on-site and for providing single family affordable units. Kapa'a Highlands will be providing all of its affordable units on site and will include affordable single family units. This will reduce the number of affordable units required from approximately 205 units (30%) to approximately 167 units (21.7%), assuming a mix of 13 single family units and 154 multi-family units. The number of affordable units required will fluctuate depending on how many affordable single family units are provided. The proposed development will provide much needed affordable housing in the East Kaua'i region.

Under the proposed development's preliminary marketing concept, the affordable units are anticipated to be sold in the range of $189,000.00 to $363,000.00, which will be affordable to families earning from 80% up to 140% of the County's annual median income.

Anticipated Buyer Markets

The proposed products respond to the market opportunities identified above as follows:

Entry-level markets – Those units designated as affordable units, as well as many of the multifamily market units are conceived to appeal to entry-level markets, typified by the rapidly increasing 25- to 34-year-old Echo Boom cohort.

Move-up markets – Kapa'a Highlands II's single-family lot products could appeal to move-up markets and growing families.

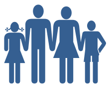
- The first level move-up market, typified by persons aged 35 to 44, is projected to grow particularly rapidly in the 2020 to 2030 period as the Echo Boomers mature.
- A more affluent move-up market could also be attracted to the views, convenient location and lifestyle offerings at Kapa'a Highlands II.

Based on the Project location, development concept and the comparison projects surveyed, some 75% of Kapa'a Highlands II residents are anticipated to be long-term Island residents. However, some product types could also appeal to second home buyers, relocating retirees or others that may come from off-Island

There has been strong demand historically for these products offerings at these price ranges, and the future should be no different. The location is very desirable, particularly for local buyers, but also for offshore second homeowners who want to feel a part of a 'normal' (but new or upgraded) neighborhood (to say nothing of wanting to take advantage of the views).

Despite current economic conditions, there is capacity amongst prospective buyers, thanks to a strong build up in their own home equity. Coupled with a desire to secure a central location for their home, there should be a goodly number of lots purchased when they come to market (particularly if there is advanced notification).

Social Sustainability



A community is composed of people, as well as places where they live; it is as much a social environment as a physical development. Thus, communities must not only be environmentally sustainable, they must also be socially sustainable.

A socially sustainable development supports more equitable distribution of resources, supports diversity within the community, meets the basic needs of residents and invests in social and human capital, thereby sustaining the quality of life and community livability for all residents into the future.

Socially sustainable development includes the following:

- recognizes, respects and values cultural and social diversity;
- preserve and maintains a high quality of life for all of its residents;
- meets basic needs of food, shelter, education, work, income and safe living and working;
- is equitable, ensuring that the benefits of development are distributed fairly across society;
- promotes education, creativity and the development of human potential;
- preserves our cultural and biological heritage, thus strengthening our sense of connectedness to our history and environment;
- is democratic, promoting citizen participation and involvement;
- promotes the context of "Live Aloha," with people living together harmoniously and in mutual support and respect for each other

We saved the concept of Social Sustainability for the end of the analysis, to serve as a summary of the many socially-focused actions suggested in prior sections of this Sustainability Plan. Following are just a few of the issues previously mentioned:

- Affordable housing will be incorporated within the development, allowing for a diversity and mix of housing types and options
- Complete streets with walkways and bile lanes, allowing for slow movement through the neighborhoods for easy social interaction
- Space for the relocated County swimming pool
- Allocation for commercial spaces, affording project residents the opportunity to work near where they live
- Proximity to the Middle School affords multi-generation al interaction and learning
- Cooperation with the State by making land available for the Kapa'a Bypass Road, helping regional residents
- Project layout and design will create an opportunity for both residents and the community to have a positive effect on their health through walkable and bikable transportation options.
- Consistency with long range planning documents, implementing the community's vision for the future

Exhibit C

Kapa'a Highlands Agricultural Master Plan

EXHIBIT "C"

Kapaa Highlands
Agricultural Master Plan

June 1, 2007

Agricon Hawaii LLC
P.O. Box 95
Kamuela, HI 96743

Table of Contents

A. SUMMARY

Livestock (goats) can be raised successfully at Kapaa Highlands. Climate conditions will allow for normal pasture rotation the year around. The ratio of livestock to fenced pasture should be 3 animal units (AU) to 1 acre or better.

The climate and soils at Kapaa Highlands are not ideal for the growing of most commercially viable crops due to the poor soil, strong trade winds, and the salt spray from the ocean.

Goats are sold for their meat value and the local markets on all of the islands are excellent. The intended markets for goats raised on the property are the local Kauai market and the Honolulu market.

The Economics for Goats included in this report provides a picture of expected revenue and classifications of operating expenses associated with a livestock (goat) operation ("Project").

The Association of Condominium Owners of the Kapaa Highlands Condominium ("Association") may choose to operate the Project on behalf of participating owners. Alternatively, the Association may choose to enter into a contractual relationship with a livestock contractor pursuant to a license agreement in which the livestock contractor will pay an annual rent per acre to graze the property, plus a percentage of gross profits.

Livestock grazing is a permissible use within the agricultural districts as outlined under Hawaii Revised Statutes (HRS) Chapter 205, Section 205-4.5.

B. DESCRIPTION

The Kapaa Highlands Subdivision is located in Kapaa, above the Kapaa Bypass Road and adjacent to Kapaa Middle School. The property is further identified by Kauai Tax Map Key No. (4) 4-3-03:01. The total land area is 163.125 acres and the combined grazing area is approximately 101.573 acres.

Almost all of the property is located in the State Land Use Commission Agricultural District and within the Agriculture District of the Comprehensive Zoning Ordinance of the County of Kauai (CZO). As such, owners of subdivision lots will be required to comply with the requirements of HRS Chapter 205 and the CZO. Individual lot owners, through the Association, will be required either to provide a portion of their lot for the grazing of livestock as outlined in this Agricultural Master Plan, or to obtain an amendment to this Agricultural Master Plan to conduct alternative agricultural activities. The Kapaa Highlands is shown on the map attached hereto as Exhibit "A".

C. ENVIRONMENTAL SUITABILITY

1. Climate

The property is exposed to the northeast trade winds and, due to the proximity of the property to the ocean the trade winds will carry some salt spray to the property. This is problematic for most commercial crops, but should have no impact on livestock and minimal impact on salt resistant grasses. Annual rainfall is generally between 40 and 50 inches.

2. Soil

The soils are generally well-drained, dark reddish-brown silty clay and silty clay loam. The soil depth is generally between 10 and 15 inches.

The property was previously planted to sugar cane and due to the nature of sugar cane cultivation, these soils can be expected to be low in organic matter and have a low pH (very acid).

A Soils Map for the property is attached hereto as Exhibit "B", and a Soils Inventory (containing technical descriptions of soil types) is attached hereto as Exhibit "C".

The Land Study Bureau Land Classification for this property is B, C, D and E lands, as shown on the Detailed Land Classification Maps attached hereto as Exhibits "D" and "E".

3. Drainage

All the soils on the property are well drained indicating that, if good conservation practices are used, they should not erode.

D. CROP SUITABILITY

Due to the generally poor soils and harsh climate, the commercial crops most suited to the area are sugar and pineapple. Both of these industries are declining in Hawaii. Pineapple is no longer grown on Kauai and there is only one sugar mill that remains in operation. With appropriate irrigation and management, both tropical orchard crops (including trees) and some vegetable crops could be grown on the property, although with some difficulty and risk given the physical conditions at the property.

E. LIVESTOCK

1. Association Project

The Association may choose to operate the Project on behalf of all participating owners. In such case, the Association would be responsible for the rotation, care and marketing of the animals. The participating owners would be responsible for providing fixed assets (fences, gates, and water systems) on the owners' lots. The participating owners would be required to pay their proportionate share of all operational costs to the Association, and would be entitled to their proportionate share of all profits generated by the Project.

2. Contractor Operation

As an alternative, the Association could hire an independent contractor ("Contractor") to operate the Project. In such a case, the Contractor would own the goats and be responsible for the rotation, care, and marketing of the animals. The Association, through the participating owners, would be responsible for the fixed assets. These assets would include the fences, gates, and water systems. The Contractor would pay the Association a fixed rent per acre of pasture plus a percentage of gross profits, and would be responsible for normal maintenance of the fixed assets associated with the livestock operation.

3. Individual Goat Operators

The Owner may elect to engage in individual goat raising operations within the Owner's Agricultural Area of the Owner's Lot ("Owner's Operation"). In such case, the following shall apply:

a. The Owner shall be solely responsible for the costs of the Owner's Operation.

b. The Owner shall raise a minimum of three (3) goats for each acre within the Owner's Agricultural Area.

c. The Owner shall submit reports to, and as required by, the Association providing pertinent information concerning the Owner's Operation and in such detail as to comply with and satisfy the reporting requirement contained in the Agricultural Subdivision Agreement and the County Subdivision Approval.

4. Goat Husbandry

It is recommended that a breeding herd with a ratio of 1 buck to 50 does be maintained. Does will produce an average 1.5 kids per year. Kids can be weaned at approximately 5 to 6 months and should be separated from the breeding herd at this point. The gestation period for a doe is approximately 5 months.

The carrying capacity of the pasture at Kapaa Highlands is approximately 3 to 4 animal units (AU) to the acre. The breeding herd that consists of bucks and does is considered to be one AU per animal. Kids are ½ AU per animal. Therefore, assuming all of the owners became participants in the Project, there would be 101.573 acre of pasture available to carry 355 AU at 3.5 AU per acre. Attached hereto as Exhibit "F" is a spreadsheet entitled "Economics for Goats" which contains detailed assumptions regarding carrying capacity.

The breeding herd should be given good pasture and be kept on a strict health program so that its production of kids is at its optimum. The herd should be wormed every 30 to 60 days and provided with a mineral supplement. The water requirement for goats is between 2 and 3 gallons per day per AU. This will be dependent upon climatic conditions. Supplemental feeding is generally not required unless rainfall diminishes over several months to a point where the grass growth is insufficient to maintain the herd. At this point, the contractor has the option of providing supplemental feed or moving some or all of the goats to another location.

Goats are marketed at between 6 and 9 months of age at a weight of between 60 and 80 pounds. The estimate market price per goat ranges from $140 and $180. The primary market is the Kauai Island market that commands a higher price. The secondary market is Honolulu. The freight to Honolulu is paid by the buyer. Goats are generally sold to individuals who slaughter them for their meat. The market in Hawaii for goats is very stable.

The Economics for Goats spreadsheet contains details on the economics of the livestock (goat) operation.

F. HRS 205 COMPLIANCE

Hawaii Revised Statutes Chapter 205 establishes classifications of lands and requirements for land use. Section 205-4.5 defines permissible uses within the agricultural districts. This section also defines the soil classification rating that applies to the Chapter.

Section 205-4.5 uses the Land Study Bureau's (LSB) soil classification productivity rating system to determine which lands are to be governed by the Chapter. The LSB ratings for Kapaa Highlands are B, C, D and E. Land classification ratings A and B are restricted to the permitted uses as outlined in the section. The cultivation of crops and the raising of livestock are permitted uses. Uses on C, D and E lands also include crop cultivation and the raising of livestock.

G. CONCLUSION

The climate and soils at Kapaa Highlands are not ideal for the growing of most commercially viable crops due to the poor soil, strong trade winds, and the salt spray from the ocean. Thus a livestock operation provides an economically viable agricultural use for the property.

Either the Association operation of a livestock project, or a contractual relationship between the Association and a livestock Contractor, would allow the agricultural component of the property to be managed as one unit. Individual lot owners would also have the option of compliance with alternate methods of livestock grazing or with the cultivation of agricultural crops, provided they obtained the approval of the Planning Commission of the County of Kauai, Subdivision Committee, for an amendment to this Agricultural Master Plan for such alternative agricultural activities.

Livestock grazing is a permissible use within the agricultural districts as outlined under HRS Chapter 205, Section 205-4.5.

Exhibit "A"

Subdivision Map

Exhibit "B"

Soils Map

EXHIBIT "C"
Soils Inventory Report

USDA

Soils Map

Date: 5/31/2018

Field Office: LIHUE SERVICE CENTER
Agency: USDA-NRCS
Assisted By: GENOA STARRS

State and County: HI, Kauai County, Hawaii
Land Units: (4) 4-3-003:001
Approximate Acres: 163.13

Legend

600 0 600 1,200 Feet

1 inch = 600 feet

Rice Soils Map

MUSYM, MUNAME

- HnA;Hanalei silty clay, 0 to 2 percent slopes, MLRA 167
- IoB;Ioleau silty clay loam, 2 to 6 percent slopes
- IoC;Ioleau silty clay loam, 6 to 12 percent slopes
- IoD2;Ioleau silty clay loam, 12 to 20 percent slopes, eroded
- IoE2;Ioleau silty clay loam, 20 to 30 percent slopes, eroded
- LhB;Lihue silty clay, 0 to 8 percent slopes
- LhC;Lihue silty clay, 8 to 15 percent slopes
- LhD;Lihue silty clay, 15 to 25 percent slopes
- MZ;Marsh
- Mta;Mokuleia clay loam, poorly drained variant
- PkB;Pohakupu silty clay loam, 0 to 8 percent slopes
- PnB;Puhi silty clay loam, 3 to 8 percent slopes
- rRR;Rough broken land
- Rice Poly Layer

N

Soils Inventory Report

TMK (4) 4-3-3:1

Map Unit Symbol	Acres	Percent
HnA	1.4	1%
IoB	44.5	27%
IoC	16.2	10%
IoD2	10.7	7%
IoE2	24.7	15%
LhB	8.4	5%
LhC	0.8	0%
LhD	4	2%
Mta	3.2	2%
MZ	0.3	0%
PkB	0.9	1%
PnB	31.9	20%
rRR	15	9%
Total:	162	

Hanalei Series

This series consists of somewhat poorly drained to poorly drained soils on bottom lands on the islands of Kauai and Oahu. These soils developed in alluvium derived from basic igneous rock. They are level to gently sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 20 to 120 inches. The mean annual soil temperature is 74° F. Hanalei soils are geographically associated with Haleiwa, Hihimanu, Mokuleia, and Pearl Harbor soils.

These soils are used for taro, pasture, sugarcane, and vegetables. The natural vegetation consists of paragrass, sensitiveplant, honohono, Java plum, and guava.

Hanalei silty clay, 0 to 2 percent slopes (HnA).

This soil is on stream bottoms and flood plains. Included in the areas mapped on Kauai along the Waimea River and in Waipaoiki Valley are small areas where the surface layer is 8 to 10 inches of reddish-brown silty clay. Included in the areas mapped on Oahu were small areas of very deep, well-drained alluvial soils and small areas of very poorly drained to poorly drained clay soils that are strongly mottled and are underlain by peat, muck, or massive marine clay.

In a representative profile the surface layer, about 10 inches thick, is dark-gray and very dark gray silty clay that has dark-brown and reddish mottles. The subsurface layer is very dark gray and dark-gray silty clay about 3 inches thick. The subsoil, about 13 inches thick, is mottled, dark gray and dark grayish-brown silty clay loam that has angular blocky structure. The substratum is stratified alluvium. The soil is strongly acid to very strongly acid in the surface layer and neutral in the subsoil.

Permeability is moderate. Runoff is very slow, and the erosion hazard is no more than slight. The available moisture capacity is about 2.1 inches per foot of soil. Roots penetrate to the water table. Flooding is a hazard.

Representative profile: Island of Kauai, lat. 22°12'37.8" N. and long. 159°28'47" W.

Ap-0 to 6 inches, dark-gray (10YR 4/1) silty clay; common distinct mottles of dark brown (7.5YR 4/4), red (2.5YR 5/8), and dark reddish brown (5YR 3/4) ; weak, coarse and medium, granular structure; very hard, friable, sticky and plastic; abundant fine and medium roots; many fine and medium pores; very strongly acid; abrupt, wavy boundary. 4 to 6 inches thick.

A1g-6 to 10 inches, very dark gray (10YR 3/1) silty clay; many distinct mottles of dark reddish brown (5YR 3/4), yellowish red (5YR 4/8), dark brown (7.5YR 4/4), and dark grayish brown (10YR 4/2); weak, coarse, prismatic structure; very hard, firm, sticky and plastic; abundant fine and medium roots; common fine and medium pores; strongly acid; gradual, smooth boundary. 3 to 5 inches thick.

A3g-10 to 13 inches, mixed, very dark gray (10YR 3/1) and dark gray (10YR 4/1) silty clay; many distinct mottles of yellowish red (5YR 4/6) and dark reddish brown (2.5YR 3/4); weak, coarse, prismatic structure; very hard, firm, sticky and plastic; common medium and fine roots; many fine and medium pores, slightly acid, gradual, smooth boundary. 2 to 4 inches thick.

B21g-13 to 18 inches, mixed, dark-gray (10YR 4/1) and dark grayish-brown (10YR 4/2) silty clay loam; many distinct mottles of strong brown and dark red (2.5YR 3/6); massive, but a few pockets have weak, medium, angular blocky structure; hard, firm, sticky and plastic; few medium and fine roots; many fine and medium pores; neutral; gradual, smooth boundary. 4 to 7 inches thick.

B22g-18 to 26 inches, dark grayish-brown (10YR 4/2) silty clay loam; many distinct mottles of dark red (2.5YR 3/6) and strong brown (7.5YR 5/6); weak, coarse, prismatic structure breaking to weak, fine and medium, angular blocky; slightly hard, firm, sticky and plastic; few medium and fine roots; many fine and medium pores; neutral; gradual, smooth boundary. 7 to 9 inches thick.

C-26 to 36 inches, dark grayish-brown (10YR 4/2) silty clay loam; common distinct mottles of strong brown (7.5YR 5/6), dark red (2.5YR 3/6), and red (2.5YR 4/8); massive; slightly hard, friable, sticky and plastic; few medium roots; many, fine and medium, tubular pores; slightly acid, water stands above this layer.

The A horizon ranges from 10YR to 2.5Y in hue, from 3 to 4 in value, and from 1 to 2 in chroma. Mottles range from a few faint ones to many distinct ones. The B horizon ranges from 10YR to 2.5Y in hue, from 2 to 4 in value, and from 1 to 2 in chroma. Mottles in the B and C horizons range from few to many. The depth to the seasonal high water table ranges from 2 to 5 feet. The C horizon is stratified. It ranges from silty clay to sand in texture.

This soil is used for taro, pasture, and sugarcane. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei silty clay, 2 to 6 percent slopes (HnB).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, taro, and pasture. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei stony silty clay, 2 to 6 percent slopes (HoB).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except that it is stony. Runoff is slow, and the erosion hazard is slight. Stones hinder machine cultivation.

This soil is used for sugarcane and pasture. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei silty clay, deep water table, 0 to 6 percent slopes (HrB).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except that it has fewer mottles and the water table is at a depth of more than 3 feet. Included in mapping were small areas of stony soils.

This soil is used for sugarcane, taro, pasture, and vegetables. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei silty clay loam, 0 to 2 percent slopes (HmA).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except for the texture of the surface layer. Also, this soil is underlain by sand at a depth of 30 to 50 inches. Included in mapping was an area on the Hanalei River bottom that is less than 30 inches deep over sand.

This soil is used for taro, pasture, and sugarcane. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei peaty silty clay loam, 0 to 2 percent slopes (HpA).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except for the texture of the surface layer. Also, the water table is at the surface.

This soil is used for pasture. (Capability classification IVw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Ioleau Series

This series consists of well-drained soils on uplands on the island of Kauai. These soils developed in material weathered from basic igneous rock, probably mixed with volcanic ash. They are gently sloping to steep. Elevations range from 100 to 750 feet. The annual rainfall amounts to 40 to 70 inches. The mean annual soil temperature is 72° F. Ioleau soils are geographically associated with Lihue and Puhi soils.

These soils are used for irrigated sugarcane, pasture, pineapple, irrigated orchards, irrigated truck crops, wildlife habitat, and woodland. The natural vegetation consists of lantana, koa haole, guava, and associated shrubs and grasses.

Ioleau silty clay loam, 6 to 12 percent slopes (IoC).

This soil is on ridgetops in the uplands.

In a representative profile the surface layer is darkbrown and yellowish-red silty clay loam 15 inches thick. The subsoil, 40 to 60 inches thick, is dark-brown and dark reddish-brown silty clay that has subangular blocky structure and is very compact in place. The substratum is soft, weathered rock. The soil is very strongly acid to extremely acid throughout.

Permeability is slow. Runoff is medium, and the erosion hazard is moderate. The available water capacity is about 1.4 inches per foot of soil. Roots penetrate to a depth of 15 to 25 inches or to the plow depth.

Representative profile: Island of Kauai, lat. 22°07'32.9" N. and long. 157°13'03" W.

Ap1-0 to 6 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; cloddy, breaking to moderate, fine and very fine, subangular blocky structure; hard, firm, sticky and plastic; abundant medium and fine roots and plentiful very fine roots; very strongly acid; abrupt, wavy boundary. 6 to 8 inches thick.

Ap2-6 to 15 inches, mixture of yellowish-red (5YR 4/6) silty clay loam, strong brown (7.5YR 5/6) when dry; massive; slightly hard, friable, sticky and plastic; and yellowish-red (5YR 4/8) silty clay, reddish brown (5YR 4/4) when dry; strong, very fine, subangular blocky structure; hard, firm, sticky and plastic; few medium roots and plentiful fine and very fine roots; common fine pores; very strongly acid, abrupt, wavy boundary. 7 to 10 inches thick.

B21t-15 to 27 inches, dark reddish-brown (5YR 3/4) silty clay, reddish brown (5YR 4/4) when dry; strong, fine and very fine, subangular blocky structure; very hard, firm, sticky and plastic; very few fine and very fine roots; common very fine pores; very compact in place; many moderately thick clay films on ped faces; very strongly acid; clear, wavy boundary. 5 to 12 inches thick.

B22t-27 to 38 inches, dark-brown (7.5YR 3/2) silty clay, yellowish red (5YR 3/6) in pores, dark brown (7.5YR 4/4) when dry; strong, fine and very fine, subangular blocky structure; very hard, firm, sticky and plastic; very few fine and very fine roots; few medium pores and many very fine pores; compact in place; many moderately thick clay films on ped faces and in pores; few pebbles; very strongly acid; clear, wavy boundary. 9 to 11 inches thick.

B23t-38 to 57 inches, dark-brown (7.5YR 3/3) light silty clay, dark brown (7.5YR 4/4) in pores, dark brown (7.5YR 4/4) when dry; strong, fine and very fine, subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few medium, fine, and very fine roots; many very fine pores; patchy, moderately thick clay films on ped faces; continuous in pores; few pebbles; extremely acid; clear, wavy boundary. 15 to 22 inches thick.

B24t-57 to 61 inches, dark reddish-brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) when dry; moderate, fine and very fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; no roots; many very fine pores; patchy, moderately thick clay films on ped faces; continuous in pores; extremely acid.

The A horizon ranges from 5YR to 10YR in hue. In places the texture of the A horizon is clay loam. The B horizon ranges from 2.5YR to 7.5YR in hue, from 3 to 4 in value, and from 2 to 6 in chroma. The depth to the very compact B21t ranges from 15 to 25 inches.

This soil is used for sugarcane, pasture, pineapple, orchards, and truck crops. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group I; pineapple group 6; pasture group 6; woodland group 6)

Ioleau silty clay loam, 2 to 6 percent slopes (IoB).

This soil has a profile like that of Ioleau silty clay loam, 6 to 12 percent slopes, except that it is 10 to 20 inches deeper to the compact layer. Runoff is slow, and the erosion hazard is slight. Roots penetrate to a depth of 25 to 40 inches.

This soil is used for sugarcane, pasture, pineapple, orchards, and truck crops. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5; pasture group 6; woodland group 6)

Ioleau silty clay loam, 12 to 20 percent slopes, eroded (IoD2).

This soil is similar to Ioleau silty clay loam, 6 to 12 percent slopes, except that it is moderately steep and part of the surface layer has been removed by erosion. Runoff is rapid, and the erosion hazard is moderate to severe.

This soil is used for sugarcane, pineapple, and pasture. (Capability classification IVe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 6; woodland group 6)

Ioleau silty clay loam, 20 to 35 percent slopes, eroded (IoE2).

This soil is similar to Ioleau silty clay loam, 6 to 12 percent slopes, except that it is steep and most of the surface layer has been removed by erosion. Runoff is rapid, and the erosion hazard is severe.

This soil is used for pasture, woodland, sugarcane, pineapple, and water supply. (Capability classification VIe, nonirrigated; pasture group 6; woodland group 6)

Lihue Series

This series consists of well-drained soils on uplands on the island of Kauai. These soils developed in material weathered from basic igneous rock. They are gently sloping to steep. Elevations range from nearly sea level to 800 feet. The annual rainfall amounts to 40 to 60 inches. The mean annual soil temperature is 73° F. Lihue soils are geographically associated with Ioleau and Puhi soils.

These soils are used for irrigated sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, woodland, and homesites. The natural vegetation consists of lantana, guava, koa haole, joee, kikuyugrass, molassesgrass, guineagrass, bermudagrass, and Java plum.

Lihue silty clay, 0 to 8 percent slopes (LhB).

This soil is on the tops of broad interfluves in the uplands. Included in mapping were small areas of a soil that has a very dark grayish-brown surface layer and a mottled subsoil.

In a representative profile the surface layer is duskyred silty clay about 12 inches thick. The subsoil, more than 48 inches thick, is dark-red and dark reddish-brown, compact silty clay that has subangular blocky structure. The substratum is soft, weathered rock. The surface layer is strongly acid. The subsoil is slightly acid to neutral.

Permeability is moderately rapid. Runoff is slow, and the erosion hazard is no more than slight. The available water capacity is about 1.5 inches per foot of soil. In places roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Kauai, lat. 21°59'06.7" N. and long. 159°21'50" W.

Ap1-0 to 6 inches, dusky-red (2.5YR 3/2) silty clay, yellowish red (5YR 4/8) when dry; cloddy breaking to weak, fine and medium, subangular blocky structure; very hard, firm, sticky and plastic; abundant roots; common very fine and fine pores; many black concretions; strong effervescence with hydrogen peroxide; strongly acid; abrupt, smooth boundary. 4 to 8 inches thick.

Ap2-6 to 12 inches, dusky-red (2.5YR 3/2) silty clay, yellowish red (5YR 4/6) when dry; massive; very hard, friable, sticky and plastic; many roots; many very fine and fine pores; many, very fine, black concretions; strong effervescence with hydrogen peroxide; strongly acid; abrupt, smooth boundary. 4 to 8 inches thick.

B21-12 to 21 inches, dark reddish-brown (2.5YR 3/4) silty clay, red (2.5YR 4/6) when dry; moderate, medium to very fine, subangular blocky structure; hard, friable, sticky and plastic; abundant roots; many very fine and fine pores; many, fine, black concretions; moderate effervescence with hydrogen peroxide; nearly continuous glaze on ped surfaces, glaze looks like clay films; slightly acid; clear, broken boundary. 7 to 10 inches thick.

B22-21 to 27 inches, dark reddish-brown (2.5YR 3/4) silty clay, red (2.5YR 4/6) when dry; strong, very fine, subangular blocky structure; very hard, friable, sticky and plastic; many roots; many very fine and fine pores; nearly continuous glaze on ped faces; common, black concretions; weak effervescence with hydrogen peroxide; few, fine, black, manganese dioxide stains on ped faces; neutral; clear, smooth boundary. 5 to 8 inches thick.

B23-27 to 48 inches, dark reddish-brown (2.5YR 3/4) silty clay, red (2.5YR 4/6) when dry; strong, very fine, subangular and angular blocky structure; hard, firm, sticky and plastic; few roots; many very fine and fine pores; continuous glaze on ped faces, glaze looks like thick clay films; superimposed on the glaze is dark-red (10R 3/6) material that looks like pseudosand under magnification; large, black coatings on primary structural units; neutral; gradual, smooth boundary. 15 to 30 inches thick

B24-48 to 60 inches, dark-red (2.5YR 3/6) silty clay, red (2.5YR 4/6) when dry; strong, very fine, subangular and angular blocky structure; hard, firm, slightly sticky and plastic; no roots; many very fine and fine pores; thin, patchy coatings that look like clay films; many distinct pressure cutans; ped surfaces have superimposed on them stringy, dark-red (10R 3/6) pseudosand or frostlike coatings; this condition is more prevalent than in the B23 horizon; neutral.

The A horizon ranges from 10R to 5YR in hue, from 2 to 3 in chroma, and from 2 to 3 in value. The B horizon ranges from 10R to 2.5YR in hue and from 4 to 6 in chroma.

This soil is used for sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, and homesites. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5; pasture group 5; woodland group 5)

Lihue silty clay, 8 to 15 percent slopes (LhC).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, and homesites. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 5; woodland group 5)

Lihue silty clay, 15 to 25 percent slopes (LhD).

On this soil, runoff is medium and the erosion hazard is moderate. This soil is used for sugarcane, pineapple, pasture, wildlife habitat, and woodland. (Capability classification IVe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 5; woodland group 5)

Lihue silty clay, 25 to 40 percent slopes, eroded (LhE2).

This soil is similar to Lihue silty clay, 0 to 8 percent slopes, except that the surface layer is thin. Runoff is rapid, and the erosion hazard is severe.

This soil is used for pasture, woodland, and wildlife habitat. Small areas are used for pineapple and sugarcane. (Capability classification VIe, nonirrigated; pasture group 5; woodland group 5)

Lihue gravelly silty clay, 0 to 8 percent slopes (LIB).

This soil is similar to Lihue silty clay, 0 to 8 percent slopes, except that it contains ironstone-gibbsite pebbles and has brighter colors in the B horizon. Included in mapping in the Eleele area and north of the town of Hanamaulu were small areas of soils that have a dark yellowish-brown, friable subsoil.

This soil is used for sugarcane, pasture, and homesites. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5 ; pasture group 5 ; woodland group 5)

Lihue gravelly silty clay, 8 to 15 percent slopes (LIC).

On this soil, runoff is slow and the erosion hazard is slight. Included in mapping were areas where the slope is as much as 25 percent.

This soil is used for sugarcane, pasture, wildlife habitat, and homesites. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 5; woodland group 5)

Marsh

Marsh (MZ) consists of wet, periodically flooded areas covered dominantly with grasses and bulrushes or other herbaceous plants. It occurs as small, low-lying areas along the coastal plains. Water stands on the surface, but marsh vegetation thrives. The water is fresh or brackish, depending on proximity to the ocean. Included in mapping were small areas of mangrove swamp and small areas of open water. (Capability classification VIIIw, nonirrigated)

Mokuleia Series

This series consists of well-drained soils along the coastal plains on the islands of Oahu and Kauai. These soils formed in recent alluvium deposited over coral sand. They are shallow and nearly level. Elevations range from nearly sea level to 100 feet. The annual rainfall amounts to 15 to 40 inches on Oahu and 50 to 100 inches on Kauai. The mean annual soil temperature is 74° F. Mokuleia soils are geographically associated with Hanalei, Jaucas, and Keaau soils.

In this survey area a poorly drained variant of the Mokuleia series was mapped. This soil, Mokuleia clay loam, poorly drained variant, is described in alphabetical order, along with other mapping units of this series.

These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of kiawe, klu, koa haole. and bermudagrass in the drier areas and napiergrass, guava, and joee in the wetter areas.

Mokuleia clay loam (Mt).

This soil occurs as small areas on the coastal plains. It is nearly level. Included in mapping were small areas of Jaucas soils; small areas of very deep, well-drained soils in drainageways; and small areas of poorly drained clay soils underlain by reef limestone.

In a representative profile the surface layer is very dark grayish-brown clay loam about 16 inches thick. The next layer, 34 to more than 48 inches thick, is dark-brown and light-gray, single-grain sand and loamy sand. The surface layer is neutral in reaction, and the underlying material is moderately alkaline.

Permeability is moderate in the surface layer and rapid in the subsoil. Runoff is very slow, and the erosion hazard is no more than slight. The available water capacity is about 1.9 inches per foot in the surface layer and about 1.0 inches per foot in the subsoil. In places roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Oahu, lat. 21°34'49" N. and long. 158°10'09" W.

Ap-0 to 16 inches, very dark grayish-brown (10YR 3/2) Clay loam, dark grayish brown (10YR 4/2) when dry; moderate, very fine and fine, granular and subangular blocky structure; hard, firm, sticky and plastic; plentiful fine roots; many, very fine and fine, interstitial pores; few, fine and very fine, tubular pores; common wormholes and worm casts; horizon consists of about 25 percent coral sand; slight effervescence with hydrogen peroxide; violent effervescence with hydrochloric acid; neutral; abrupt, wavy boundary. 10 to 16 inches thick.

IIC1-16 to 22 inches, dark-brown (10YR 4/3) loamy sand, brown (10YR 5/3) when dry; massive; soft, slightly hard, nonsticky and nonplastic; plentiful fine roots; porous; few pieces of reef limestone; horizon consists of about 80 percent coral sand; violent effervescence with hydrochloric acid; moderately alkaline; abrupt, smooth boundary. 6 to 20 inches thick.

IIC2-22 to 50 inches, light-gray (10YR 7/2), moist and dry, coral sand; single grain; loose when moist or dry, nonsticky and nonplastic; few fine roots; porous; few pieces of coral; violent effervescence with hydrochloric acid; moderately alkaline.

The depth to coral sand ranges from 12 to 30 inches. The A horizon ranges from 10YR to 5YR in hue and from 1 to 3 in value when moist and 3 to 5 when dry. It ranges from 1 to 3 in chroma when moist and 1 to 3 when dry. The IIC1 horizon ranges from 10YR to 7.5YR in hue, from 3 to 6 in value when moist and 4 to 7 when dry, and from 1 to 3 in chroma.

This soil is used for sugarcane, truck crops, and pasture. Capability classification IIs if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia clay (Mtb).

This soil has a profile like that of Mokuleia clay loam, except for the texture of the surface layer. It is nearly level. Permeability is slow in the surface layer. Workability is difficult because of the sticky, plastic clay.

This soil is used for sugarcane and pasture. (Capability classification IIIs if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia fine sandy loam (Mr).

This soil occurs on the eastern and northern coastal plains of Kauai. It is nearly level. This soil has a profile like that of Mokuleia clay loam, except for the texture of the surface layer.

Permeability is moderately rapid in the surface layer and rapid in the subsoil. Runoff is very slow, and the erosion hazard is slight. The available water capacity is about 1 inch per foot in the surface layer and 0.7 inch per foot in the subsoil. Included in mapping were small areas where the slope is as much as 8 percent.

This soil is used for pasture. (Capability classification IIIs if irrigated, IVs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia loam (Ms).

This soil has a profile like that of Mokuleia clay loam, except that the surface layer is loam and in most places is about 8 inches thick. It is nearly level.

This soil is used for sugarcane, truck crops, and pasture. (Capability classification IIs if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia clay loam, poorly drained variant (Mta).

This soil occurs on Kauai. It is nearly level. The soil is poorly drained, and in this way, it differs from other soils of the Mokuleia series. The surface layer is dark brown to black and is mottled.

This soil is used for sugarcane, taro, and pasture. (Capability classification IIIw, irrigated or nonirrigated; sugarcane group 3; pasture group 3)

Pohakupu Series

This series consists of well-drained soils on terraces and alluvial fans on the islands of Oahu and Kauai. These soils formed in old alluvium derived from basic igneous material. They are nearly level to moderately sloping. Elevations range from 50 to 250 feet. The annual rainfall amounts to 40 to 60 inches. The mean annual soil temperature is 73° F. Pohakupu soils are geographically associated with Alaeloa, Papaa, and Lihue soils.

These soils are used for sugarcane, pineapple, truck crops, pasture, and homesites. The natural vegetation consists of guava, Christmas berry, Japanese tea, koa haole, and kikuyugrass.

Pohakupu silty clay loam, 0 to 8 percent slopes (PkB).

This soil has smooth slopes and occurs on terraces and alluvial fans. The slopes are mainly 3 to 8 percent. Included in mapping were small areas of Alaeloa and Waialua soils and small areas where the slope is as much as 15 percent. Also included on Kauai were small areas where the texture is silty clay and small areas that have a hue of 2.5YR in the subsoil.

In a representative profile the surface layer is dark reddish-brown silty clay loam about 13 inches thick. The subsoil, 40 to more than 60 inches thick, is dark reddishbrown and dark-brown silty clay loam that has angular and subangular blocky structure. The substratum is strongly weathered gravel. The soil is slightly acid to medium acid.

Permeability is moderately rapid. Runoff is slow, and the erosion hazard is slight. The available water capacity is about 1.5 inches per foot of soil. In places roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Oahu, lat. 21°22'53" N. and long. 157°45'16" W.

Ap-0 to 13 inches, dark reddish-brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/3) when dry; strong, very fine, subangular blocky structure; hard, friable, sticky and plastic; abundant roots; many very fine and fine pores; common wormholes and worm casts; moderate effervescence with hydrogen peroxide; slightly acid; abrupt, smooth boundary. 8 to 13 inches thick.

B21-13 to 21 inches, dark reddish-brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/4) when dry; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky and plastic; abundant roots; many, very fine and fine, tubular pores; common, patchy pressure cutans; slight effervescence with hydrogen peroxide; slightly acid; abrupt, smooth boundary. 4 to 9 inches thick.

B22-21 to 38 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; strong, very fine, blocky and subangular blocky structure; hard, friable, sticky and plastic; plentiful roots; many, very fine and fine, tubular pores; continuous pressure cutans on ped surfaces; few highly weathered pebbles; many black stains in pores and on peds; stains show strong effervescence with hydrogen peroxide; slightly acid; clear, irregular boundary. 4 to 17 inches thick.

B23-38 to 50 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; strong, very fine, angular and subangular blocky structure; hard, friable, sticky and plastic; few roots; many, very fine and fine, tubular pores; strong, continuous pressure cutans; few highly weathered pebbles; common black stains that effervesce with hydrogen peroxide; slightly acid; clear, irregular boundary. 12 to 20 inches thick.

B3-50 to 76 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; strong, very fine, angular and subangular blocky structure; hard, friable, slightly sticky and plastic; few roots; many, very fine and fine tubular pores; nearly continuous pressure cutans; few highly weathered pebbles; few, fine, black stains that effervesce with hydrogen peroxide; slightly acid.

Effervescence with hydrogen peroxide ranges from slight to moderate in the upper part of the profile and from slight to none below. The structure in the B horizon ranges from moderate to strong. In places a few boulder cores occur within the lower part of the profile. The A horizon ranges from 2 to 3 in chroma and value when moist. The B horizon ranges from 7.5YR to 5YR in hue and from 3 to 4 in chroma and value when moist.

This soil is used for pasture, truck crops, and homesites on Oahu and for sugarcane and pineapple on Kauai. (Capability classification IIe if irrigated, IIIe if nonirrigated; sugarcane group 1; pasture group 6; woodland group 5)

Pohakupu silty clay loam, 8 to 15 percent slopes (PkC).

On this soil, runoff is slow to medium and the erosion hazard is slight to moderate. Workability is slightly difficult because of the slope.

Included in mapping were small areas where the surface layer and part of the subsoil have been removed. Also included, near the drainageways, were areas where the slope ranges from 15 to 25 percent.

This soil is used for pasture. (Capability classification IIIe, nonirrigated; sugarcane group 1; pasture group 6; woodland group 5)

Puhi Series

This series consists of well-drained soils on uplands on the island of Kauai. These soils developed in material derived from basic igneous rock. They are nearly level to steep. Elevations range from 175 to 500 feet. The annual rainfall amounts to 60 to 80 inches. The mean annual soil temperature is 73° F. Puhi soils are geographically associated with Lihue and Kapaa soils.

These soils are used for sugarcane, pineapple, truck crops, orchards, pasture, woodland, wildlife habitat, water supply, and homesites. The natural vegetation consists of guava, Java plum, pangolagrass, kikuyugrass, elephantopus, joee, yellow foxtail, and rhodomyrtus.

Puhi silty clay loam, 0 to 3 percent slopes (PnA).

This soil is on broad interfluves on the uplands.

In a representative profile the surface layer is brown silty clay loam about 12 inches thick. The subsoil, about 48 inches thick, is reddish-brown and dark reddish-brown silty clay loam and silty clay that has subangular blocky structure. The substratum is silty clay. The surface layer is very strongly acid. The subsoil is slightly acid to medium acid.

Permeability is moderately rapid. Runoff is very slow, and there is no erosion hazard. The available water capacity is about 1.3 inches per foot of soil. In places, roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Kauai, lat. 22°01'14" N. and long. 159°23'8.1" W.

Ap-0 to 12 inches, brown (10YR 4/3) silty clay loam, brown (10YR 4/3) when rubbed, yellowish brown (10YR 5/4) when dry; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; abundant roots; many, very fine and fine, tubular pores and common interstitial pores; many gritty particles that are hard to break down; delayed efforvescence with hydrogen peroxide; very strongly acid; abrupt, wavy boundary. 11 to 14 inches thick.

B21-12 to 21 inches, reddish-brown (5YR 4/4) silty clay loam, yellowish red (5YR 4/6) when dry; weak, very fine and fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; plentiful fine and very fine roots; many very fine pores and common fine pores; nearly continuous, shiny glaze on peds; patchy coatings that look like clay films on some peds; medium acid; gradual, smooth boundary. 7 to 11 inches thick.

B22-21 to 33 inches, dark reddish-brown (5YR 3/4) silty clay loam, yellowish red (5YR 4/6) when dry; common black specks; moderate, very fine and fine, sub angular blocky structure; hard, friable, slightly sticky and slightly plastic; plentiful fine and very fine roots; many very fine pores and common fine pores; nearly continuous, shiny glaze on peds, patchy coatings that look like clay films on some peds; stringy coatings of stronger chroma; slightly acid; gradual, smooth boundary. 10 to 14 inches thick.

B23-33 to 41 inches, dark reddish-brown (2.5YR 3/4) silty clay loam, yellowish red (5YR 4/6) when dry; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; many very fine pores and common medium pores; continuous, shiny glaze on peds ; patchy coatings that look like clay films on peds ; many shiny particles; many, very fine, black specks; medium acid; gradual, smooth boundary. 6 to 9 inches thick.

B24-41 to 60 inches, dark reddish-brown (5YR 3/3) silty clay, yellowish red (5YR 4/8) when dry; strong, very fine and fine, subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many very fine and fine pores and common medium pores; continuous, shiny glaze on peds; many, very fine, black specks and shiny particles; medium acid.

The A horizon ranges from 7.5YR to 10YR in hue, from 2 to 4 in value, and from 2 to 4 in chroma. The B horizon ranges from 2.5YR to 7.5YR in hue, from 3 to 4 in value, and from 3 to 4 in chroma.

This soil is used for sugarcane, pineapple, orchards, truck crops, pasture, and homesites. (Capability classification IIs, irrigated or nonirrigated; sugarcane group 1; pineapple group 4; pasture group 8; woodland group 7)

Puhi silty clay loam, 3 to 8 percent slopes (PnB).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane,

pineapple, orchards, pasture, truck crops, and homesites. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5; pasture group 8; woodland group 7)

Puhi silty clay loam, 8 to 15 percent slopes (PnC).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, pineapple, pasture, and orchards. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 8; woodland group 7)

Puhi silty clay loam, 15 to 25 percent slopes (PnD).

On this soil, runoff is medium and the erosion hazard is moderate. Included in mapping were small, eroded areas.

This soil is used for sugarcane, pineapple, orchards, pasture, woodland, wildlife habitat, and water supply. (Capability classification IVe, irrigated or nonirrigated; sugarcane group 1, pineapple group 6; pasture group 8; woodland group 7)

Puhi silty clay loam, 25 to 40 percent slopes (PnE).

On this soil, runoff is rapid and the erosion hazard is severe.

This soil is used for pasture, woodland, wildlife habitat, and water supply. (Capability classification VIe, nonirrigated; pasture group 8; woodland group 7)

Rough Broken Land

Rough broken land (rRR) consists of very steep land broken by numerous intermittent drainage channels. In most places it is not stony. It occurs in gulches and on mountainsides on all the islands except Oahu. The slope is 40 to 70 percent. Elevations range from nearly sea level to about 8,000 feet. The local relief is generally between 25 and 500 feet. Runoff is rapid, and geologic erosion is active. The annual rainfall amounts to 25 to more than 200 inches.

These soils are variable. They are 20 to more than 60 inches deep over soft, weathered rock. In most places some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones, and soil slips are common. Included in mapping were areas of colluvium and alluvium along gulch bottoms.

This land type is used primarily for watershed and wildlife habitat. In places it is used also for pasture and woodland. The dominant natural vegetation in the drier areas consists of guava, lantana, Natal redtop, bermudagrass, koa haole, and molassesgrass. Ohia, kukui, koa, and ferns are dominant in the wetter areas. Puakeawe, aalii, and sweet vernalgrass are common at the higher elevations. (Capability classification VIIe, nonirrigated)

Exhibit "D"

LSB Map 100

EXHIBIT "D"

Exhibit "E"

LSB Map 107

EXHIBIT "E"

Exhibit "F"

Economics For Goats

Exhibit "G" of "C"

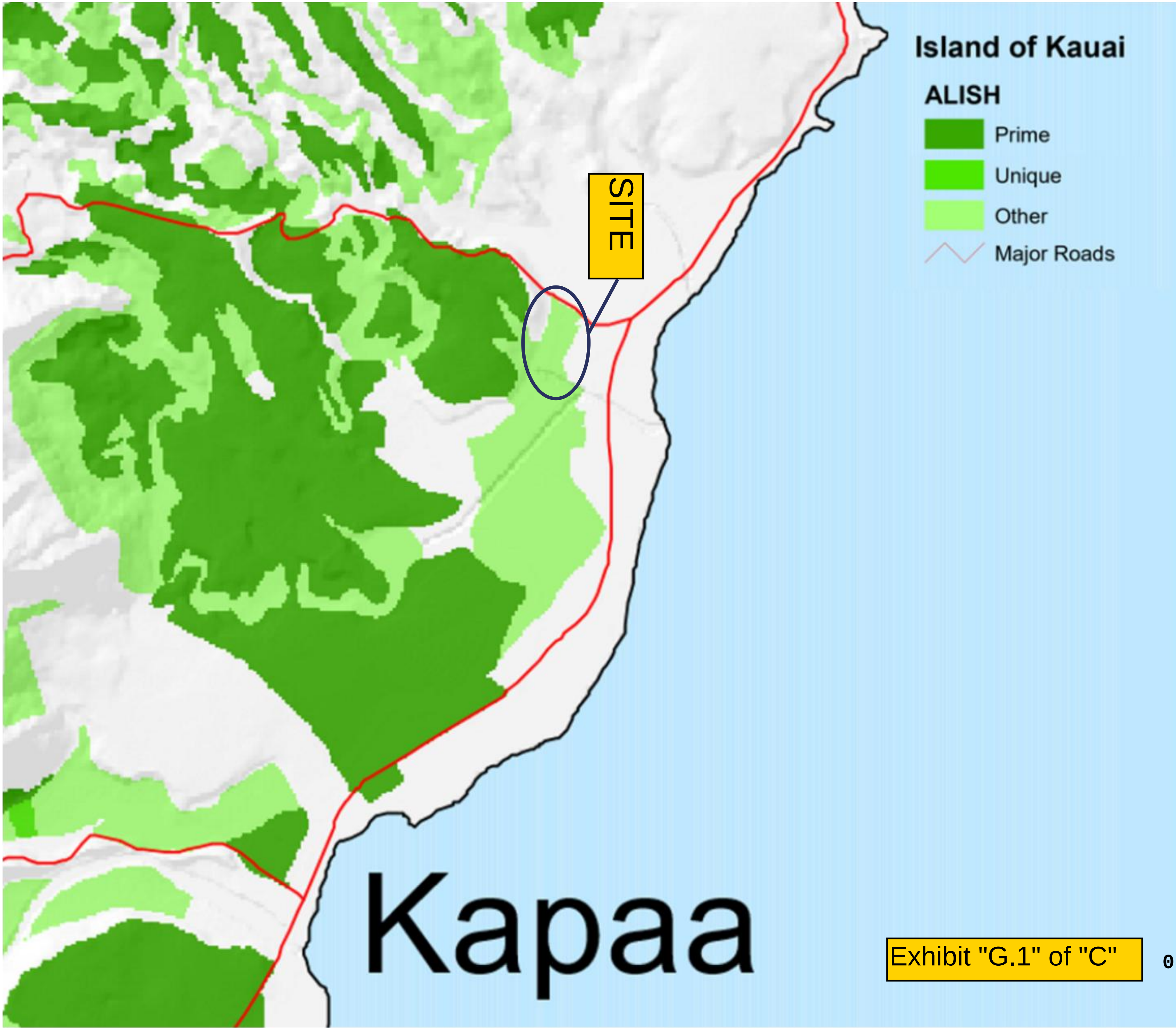
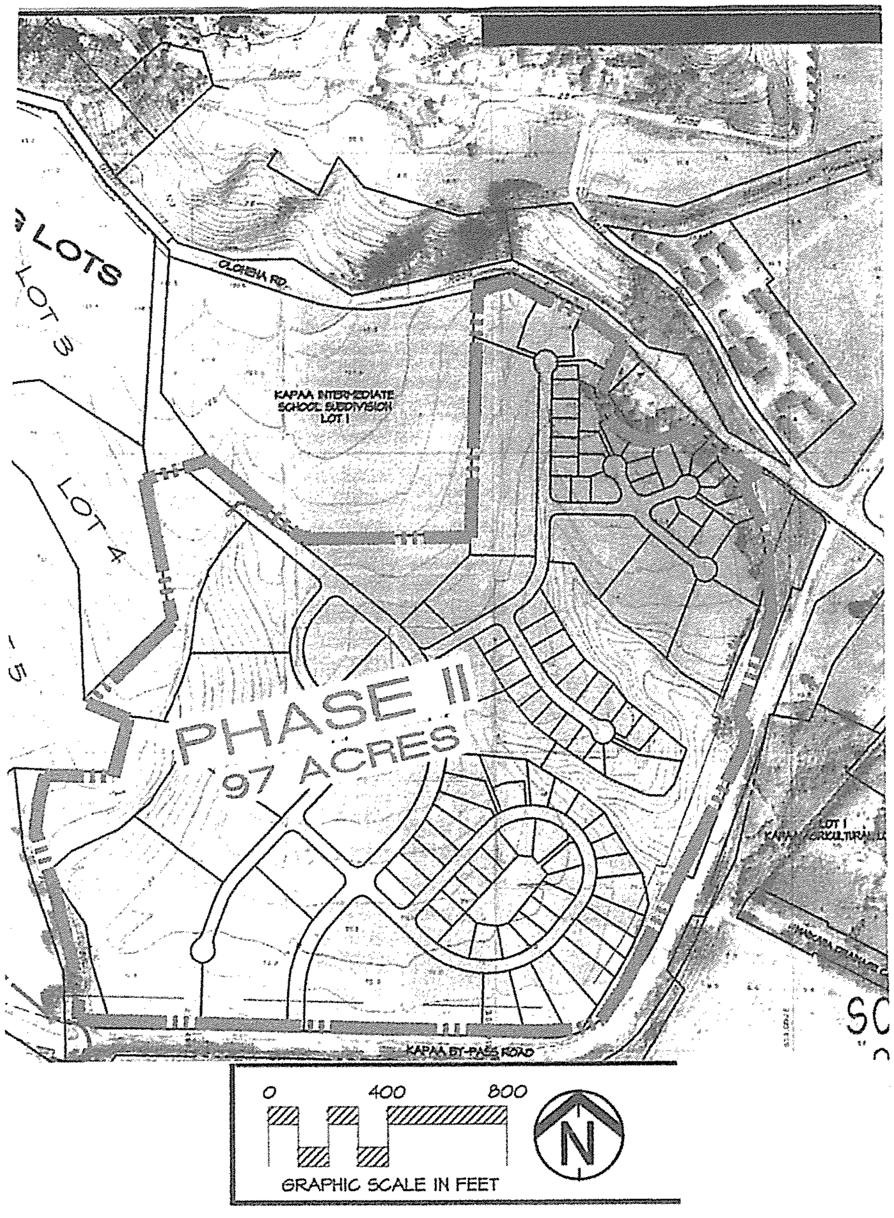


Exhibit "G.1" of "C"

EXHIBIT "C.1"

Kapaa Highlands Phase II
Agricultural Suitability

June, 2018



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Kapaa Highlands Phase II
Agricultural Suitability
June 2018

Table of Contents

Kapaa Highlands Phase II
Agricultural Suitability
June 2018

INTRODUCTION

Kapaa Highlands Phase II is a 97 acre parcel of land in Kapaa, Kauai, Hawaii near Kapaa Middle School. Phase II is part of tax map key number (4) 4-3-003:001, a 163.42 acre parcel. Phase II is presently classified and zoned agriculture under the Hawaii State Land Use and County of Kauai designations. Because of Phase II's location adjacent to urban areas and constraints that lessen its agricultural importance to the County of Kauai and the State, reclassifying Phase II from agriculture to urban would not have a significant negative impact on farming for Kauai or for the state.

SUMMARY

The climate and soils at Phase II are not ideal for the growing of most commercially viable crops due to the strong trade winds and the salt spray from the ocean.

The proximity of Kapaa Middle School and residential subdivisions to the property will require extensive buffers around the agricultural property and will require extreme care in the implementation of farming practices to prevent any dust, spray drift or noise pollution that may impact the school or existing residential property.

The cost of labor, the cost of water, less expensive food imports, food safety requirements, transportation costs and the economies of scale are all hinderances to creating a sustainable farming community on Kauai.

Kauai has an abundance of large parcels of good agricultural land that are not located within urban and rural areas.

The reclassification of 97 acres of agricultural land that is surrounded by urban development and is designated in the Kauai General Plan for urban expansion will have a minor impact on the potential of Kauai's ability to feed its population over time.

DESCRIPTION OF THE PROPERTY

The property is located in Kapaa, Kauai above the Kapaa by-pass road and adjacent to Kapaa Middle School. The property is further identified by TMK (4) 4-3-003-001, Phase II. The land area in Phase II totals 97 acres that is classified and zoned as agricultural land. The property is not currently being used for any type of agriculture.

Kapaa Highlands Phase II
Agricultural Suitability
June 2018

CLIMATE & SOILS

Climate

The climate is dominated by northeasterly tradewinds caused by high pressure weather systems with winds in the 15 to 35 plus mile per hour (mph) range. Low pressure systems occur during the winter and occasionally during the rest of the year. This latter type of weather system has winds that are variable and usually light to moderate (5 mph to 15 mph) from the south or west or a combination. There are conditions when the low pressure systems generate storms with high winds (50+ mph) and excessive rainfall. From June to November hurricanes can occur although they are infrequent.

The rainfall is approximately 50 inches although, possibly because of global warming, rainfall is difficult to predict and can be considerably higher at times than 50 inches per year.

Temperature during the day ranges from high 80 degrees Fahrenheit ('F) in the summer to low 70's 'F during the winter with slightly cooler temperatures during the night.

The strong tradewinds throughout this property are a negative factor for agricultural production. Costly windbreaks would be required to protect the crops. Another factor that will inhibit plant growth is the salt spray from the ocean carried by the strong winds. The salt spray can limit the crop selection as some agricultural crops are not tolerant of salt spray. Also, the salt spray can damage the production and decrease the quality and sale price.

Topography and Soils

The property elevation slopes gently from approximately 50 feet above sea level at southeast boundary of the property to 100 feet at the northwest section. There are no designated floodplains on the property except for a very small area on the western edge that lies within the 100 year floodplain.

The most extensive soil type on the property is the Ioleau silty clay loam with 2 to 30 percent slope although most of this soil type on Phase II has 2 to 6 percent slopes (approximately 40 acres). Soil depth to underlying igneous rock is 60 inches. This soil's natural drainage is good and flooding and ponding are not a problem. The surface soil has some organic matter (5%). There are approximately 30 acres of the Puhi silty clay loam soil with 3 to 8 percent slopes. This soil is similar to the Ioleau soils except that the surface organic matter is 7 percent. There are about 12 acres of soil categorized as rough broken land on the eastern side of Phase II, along with 3.1 acres of poorly drained Mokuleia clay loam. There is a small section of marsh (.3 acres) on the south boundary.

Because the most prevalent soils on the property drain rapidly and rainfall can be erratic, an irrigation system would be required for optimum crop production.

A large portion of this property is presently covered with common trees and bushes all of which would require removal prior to any development.

See Appendix A – Climate and Soils Information.

HAWAII LAND CLASSIFICATIONS

The Hawaii Land Study Bureau (LSB) rates this property as B, C, D and E. This rating indicates that the agricultural potential is mediocre with some areas of good soil and others fair to poor soil. The Agricultural Lands of Importance to the State of Hawaii (ALISH) designation includes Prime and Other. This rating as with the LSB rating indicates areas of the property have the potential for some good crop production as well as medium to poor production.

See Appendix B - Hawaii Land Classification Maps.

AGRICULTURAL LAND ON KAUAI & ITS USE

The total land area of the Island of Kauai is 353,900 acres. The island's four (4) basic land classifications are:

Urban	14,573 acres
Rural	1,253 acres
Conservation	198,769 acres
Agricultural	139,305 acres

Kauai has a farming and ranching community that utilizes approximately one half of the agriculturally classified acreage. There are a total of 63,244 acres in agricultural use. Pasture covers the largest acreage at 41,934 acres. Crops account for the remaining acreage with seed corn production the largest crop segment at 13,299 acres followed by coffee at 3,788 acres.

Recently the seed companies have been decreasing their acreage planted for seed production. Kauai Coffee, one of Kauai's larger agricultural operations, is not expanding its acreage, but improving and replacing coffee trees on its existing acreage under cultivation to increase per acre production. Hawaii Department of Land and Natural Resources has agricultural land that is not being farmed and could be leased to farmers.

Because of the cessation of sugar production on Kauai and the release of these lands, these former sugar lands are available for other agricultural crops. Consequently, there is adequate agricultural land available on the island to produce food to supply the residents of Kauai. Presently, however, the available agricultural land is not being fully utilized because of other constraints to agricultural development.

See Appendix C – Crop Summary by Acreage (2015).

FUTURE FOOD PRODUCTION ON KAUAI

The total acreage on Kauai that is classified for agriculture is 139,305. Of this land, 63,244 acres is currently in active agriculture. The total land area in active agriculture that is not in livestock production is 21,310 acres. Food crops account for 2,314 acres (includes aquaculture) and the predominant food crops are taro and tropical fruit. Food crops (for the purpose of this report) are crops that produce an edible vegetable or fruit. Livestock acreage is considered separately.

Providing food on Kauai for the people living on Kauai or for export is not a land availability issue and should not be in the future. The land that is classified for agriculture but is not in livestock or diversified crops totals 76,061 acres. If 75 % of this land is suitable for growing food crops, the potential for growing food crops increases by approximately 57,000 acres. Suitable is land where the soils have a LSB rating of A, B or C; have adequate rainfall (approximately 60 inches per year) or adequate water for irrigation; are not impacted by salt spray from the ocean; and are tillable.

LOCATION

A major constraint to agricultural development on Phase II of this property is the proximity of the Kapaa Middle School, located on the northern side of the property. Additionally, there are adjacent subdivisions on the north and eastern sides of the property. The existing substantial urban development that is in close proximity to the agriculturally classified parcel will require extensive buffers around the agricultural property and will require extreme care in the implementation of farming practices to prevent any dust, spray drift or noise pollution that may impact the school or existing residential property. The Kauai General Plan designates this property as future urban expansion.

LABOR

The growing of food on Kauai for the people of Kauai is constrained by the lack of people willing to farm this land. A seasoned vegetable farmer expressed the opinion that if a farmer can make money farming, more farmers will farm.

The lack of both skilled and unskilled labor for the agricultural industry on Kauai is a major problem. The present unemployment rate on Kauai is 1.8%, which is essentially full employment. The competition for labor is a serious problem for most of the industries on Kauai. The tourist industry generally pays higher wages and has better benefits for its employees. Many workers prefer the type of jobs offered in the tourist industry versus the agricultural industry. In addition, the technology industry, construction industry, suppliers to these industries and some smaller cottage industries all compete for a finite labor supply and generally offer higher wages.

The County of Kauai Economic Development Department has a very proactive farm internship program in the local high schools to address the lack of farm labor on the island. This program has grown from two high school intern participants in 2014 to 41 interns in 2018. Although it will be many years before this program can supply sufficient farm labor with the skills, experience, and desire to farm, it will eventually help to ameliorate the farm labor shortage.

INFRASTRUCTURE COSTS

Infrastructure costs to develop a farm are another constraint to farming Phase II. County water is available to the property. Although the County has an agricultural water rate to provide an incentive for farming, the water is still expensive. The current rate is $2.20 per 1,000 gallons. Installing an irrigation system would be required to ensure consistent and quality crop production. Well-designed windbreaks are needed to protect the crops from the prevailing tradewinds and require installation and time to grow large enough to provide adequate wind protection. Extensive brush clearing is required to remove the invasive plant material presently growing on the property. The primary plant species are Haole Koa (Leucaena leacocephala) and Guinea Grass (Megathyrsus maximus). Equipment and materials storage are required and would entail constructing a building. Land preparation and application of soil amendments based on a soil analysis would have to be done prior to planting the crops. A farm road(s) would need to be constructed. Incurring all these costs prior to receiving any income from the sale of the farm production requires capital and that can be difficult for a farmer to obtain.

MARKETING

For a profitable farm operation on this property investing in a good marketing program for the production is a key component. The County of Kauai is developing markets through its Sunshine Markets program for quality produce from small Island farms. However, most of the food presently consumed on Kauai is imported from the mainland because it is cheaper than the food that is produced on Kauai. Price of the product is the most important factor although quality and organic production can be factors in selling a product at a high price if the customer is motivated to pay more for what he or she considers a better product.

An important cost of marketing farm production is the requirement to comply with the United States Department of Agriculture (USDA) food security regulations. These USDA regulations are for consumer protection from diseases carried by food such as salmonella.

Efficient and available transportation to the market is another cost factor for the farm. Kauai has a severe traffic problem, and this increases the cost and makes transporting farm production to the markets a challenge.

FOOD SECURITY

Food security, defined as having sufficient food grown on Kauai to support the resident population in the event of a disruption in transportation between Hawaii and the U.S. Mainland, is a significant issue in Hawaii and is discussed on a regular basis. On Kauai the constraints listed here make achieving the production of sufficient food to feed the population difficult. There is sufficient unused agricultural land on the island if these other issues are addressed satisfactorily to supply Kauai with adequate food for its population.

CONCLUSION

The reclassification of 97 acres of agricultural land surrounded by urban development will have minimal impact on Kauai's ability to feed its population over time. The Island of Kauai has an abundance of good agricultural land that can be put into the production of food for the Island's population. The bottlenecks are first and foremost the lack of farmers and farm workers. Until the farmer can make a good living farming, it will be difficult to provide enough local food to feed the people of Kauai. Other constraints are competition from imports (lower price), infrastructure costs and marketing.

Appendix A
Climate and Soils Information

USDA

Soils Map

Date: 5/31/2018

Field Office: LIHUE SERVICE CENTER
Agency: USDA-NRCS
Assisted By: GENOA STARRS

State and County: HI, Kauai County, Hawaii
Land Units: (4) 4-3-003:001
Approximate Acres: 163.13

Legend

600 0 600 1,200 Feet

1 inch = 600 feet

Rice Soils Map

MUSYM, MUNAME

- HnA;Hanalei silty clay, 0 to 2 percent slopes, MLRA 167
- IoB;Ioleau silty clay loam, 2 to 6 percent slopes
- IoC;Ioleau silty clay loam, 6 to 12 percent slopes
- IoD2;Ioleau silty clay loam, 12 to 20 percent slopes, eroded
- IoE2;Ioleau silty clay loam, 20 to 30 percent slopes, eroded
- LhB;Lihue silty clay, 0 to 8 percent slopes
- LhC;Lihue silty clay, 8 to 15 percent slopes
- LhD;Lihue silty clay, 15 to 25 percent slopes
- MZ;Marsh
- Mta;Mokuleia clay loam, poorly drained variant
- PkB;Pohakupu silty clay loam, 0 to 8 percent slopes
- PnB;Puhi silty clay loam, 3 to 8 percent slopes
- rRR;Rough broken land
- Rice Poly Layer

N

Soils Inventory Report

Thu May 31 2018 11:17:28 GMT-1000 (Hawaiian Standard Time)

Map Unit Symbol	Map Unit Name	Acres	Percent
HnA	Hanalei silty clay, 0 to 2 percent slopes, MLRA 167	1.1	1%
IoB	Ioleau silty clay loam, 2 to 6 percent slopes	45.1	28%
IoC	Ioleau silty clay loam, 6 to 12 percent slopes	16.2	10%
IoD2	Ioleau silty clay loam, 12 to 20 percent slopes, eroded	10.6	7%
IoE2	Ioleau silty clay loam, 20 to 30 percent slopes, eroded	24	15%
LhB	Lihue silty clay, 0 to 8 percent slopes	8.2	5%
LhC	Lihue silty clay, 8 to 15 percent slopes	0.7	0%
LhD	Lihue silty clay, 15 to 25 percent slopes	3.9	2%
Mta	Mokuleia clay loam, poorly drained variant	3.1	2%
MZ	Marsh	0.3	0%
PkB	Pohakupu silty clay loam, 0 to 8 percent slopes	0.8	0%
PnB	Puhi silty clay loam, 3 to 8 percent slopes	31.4	19%
rRR	Rough broken land	16.1	10%
	Total:	161.5	100%

Map Unit Description (Brief, Generated)

Island of Kauai, Hawaii

[Minor map unit components are excluded from this report]

Map unit: HnA - Hanalei silty clay, 0 to 2 percent slopes, MLRA 167

Component: Hanalei (85%)

The Hanalei component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on flood plains on valley floors on islands. The parent material consists of alluvium derived from basalt. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is frequently flooded. It is occasionally ponded. A seasonal zone of water saturation is at 42 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 8 percent. This component is in the F164XY500HI Volcanic Ash Forest ecological site. Nonirrigated land capability classification is 2w. Irrigated land capability classification is 2w. This soil does not meet hydric criteria. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.

Map unit: IoB - Ioleau silty clay loam, 2 to 6 percent slopes

Component: Ioleau (100%)

The Ioleau component makes up 100 percent of the map unit. Slopes are 2 to 6 percent. This component is on uplands. The parent material consists of basic igneous rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: IoC - Ioleau silty clay loam, 6 to 12 percent slopes

Component: Ioleau (100%)

The Ioleau component makes up 100 percent of the map unit. Slopes are 6 to 12 percent. This component is on uplands. The parent material consists of basic igneous rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map Unit Description (Brief, Generated)

Island of Kauai, Hawaii

Map unit: IoD2 - Ioleau silty clay loam, 12 to 20 percent slopes, eroded

Component: Ioleau (100%)

The Ioleau component makes up 100 percent of the map unit. Slopes are 12 to 20 percent. This component is on uplands. The parent material consists of basic igneous rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: IoE2 - Ioleau silty clay loam, 20 to 30 percent slopes, eroded

Component: Ioleau (100%)

The Ioleau component makes up 100 percent of the map unit. Slopes are 20 to 30 percent. This component is on uplands. The parent material consists of basic igneous rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: LhB - Lihue silty clay, 0 to 8 percent slopes

Component: Lihue (100%)

The Lihue component makes up 100 percent of the map unit. Slopes are 0 to 8 percent. This component is on uplands. The parent material consists of basic igneous dust. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.

Map unit: LhC - Lihue silty clay, 8 to 15 percent slopes

Component: Lihue (100%)

The Lihue component makes up 100 percent of the map unit. Slopes are 8 to 15 percent. This component is on uplands. The parent material consists of basic igneous dust. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.

Map Unit Description (Brief, Generated)

Island of Kauai, Hawaii

Map unit: LhD - Lihue silty clay, 15 to 25 percent slopes

Component: Lihue (100%)

The Lihue component makes up 100 percent of the map unit. Slopes are 15 to 25 percent. This component is on uplands. The parent material consists of basic igneous dust. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.

Map unit: Mta - Mokuleia clay loam, poorly drained variant

Component: Mokuleia variant (85%)

The Mokuleia variant component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on coastal plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is occasionally flooded. It is occasionally ponded. A seasonal zone of water saturation is at 48 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 97 percent. There are no saline horizons within 30 inches of the soil surface.

Map unit: MZ - Marsh

Component: Marsh (100%)

The Marsh component makes up 100 percent of the map unit. Slopes are 0 to 2 percent. This component is on along Coastal Plains marshes. The parent material consists of organic. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is very high. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 80 percent. Nonirrigated land capability classification is 8w. This soil meets hydric criteria. The soil has a slightly saline horizon within 30 inches of the soil surface.

Map Unit Description (Brief, Generated)

Island of Kauai, Hawaii

Map unit: PkB - Pohakupu silty clay loam, 0 to 8 percent slopes

Component: Pohakupu (100%)

The Pohakupu component makes up 100 percent of the map unit. Slopes are 0 to 8 percent. This component is on and terraces alluvial fans. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: PnB - Puhi silty clay loam, 3 to 8 percent slopes

Component: Puhi (100%)

The Puhi component makes up 100 percent of the map unit. Slopes are 3 to 8 percent. This component is on uplands. The parent material consists of basic igneous rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 7 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The soil has a maximum sodium adsorption ratio of 3 within 30 inches of the soil surface.

Map unit: rRR - Rough broken land

Component: Rough broken land (100%)

The Rough broken land component makes up 100 percent of the map unit. Slopes are 40 to 70 percent. This component is on mountain sides gulches. The parent material consists of alluvium and colluvium. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 55 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

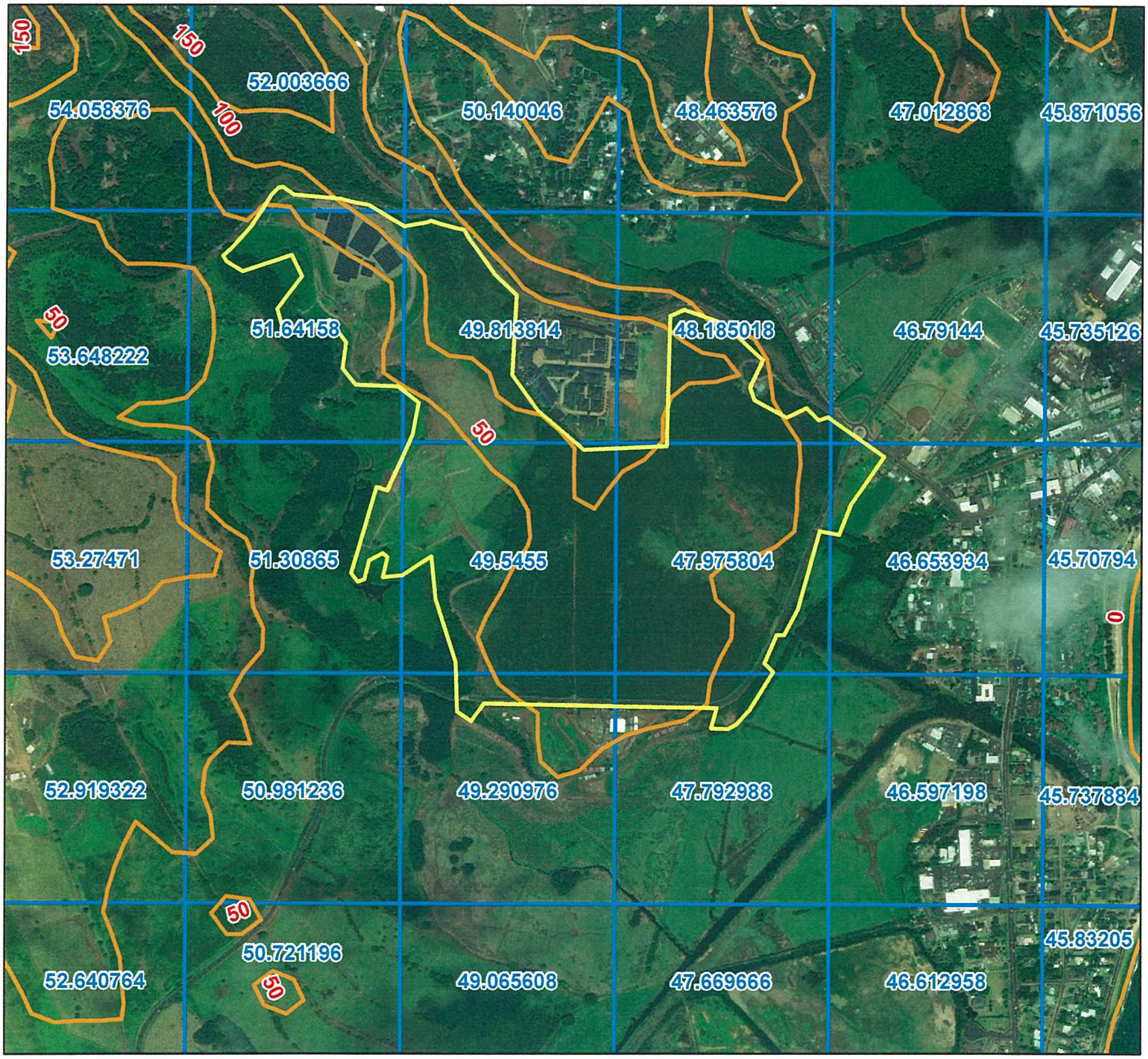
USDA

Elevation and Precipitation Map

Date: 5/31/2018

Field Office: LIHUE SERVICE CENTER
Agency: USDA-NRCS
Assisted By: GENOA STARRS

State and County: HI, Kauai County, Hawaii
Land Units: (4) 4-3-003:001
Approximate Acres: 163.13



Legend
- Rice Poly Layer
- precip2000_a_hi007
- contour50f_l_hi007

1,000 0 1,000 2,000 Feet

1 inch = 1,000 feet

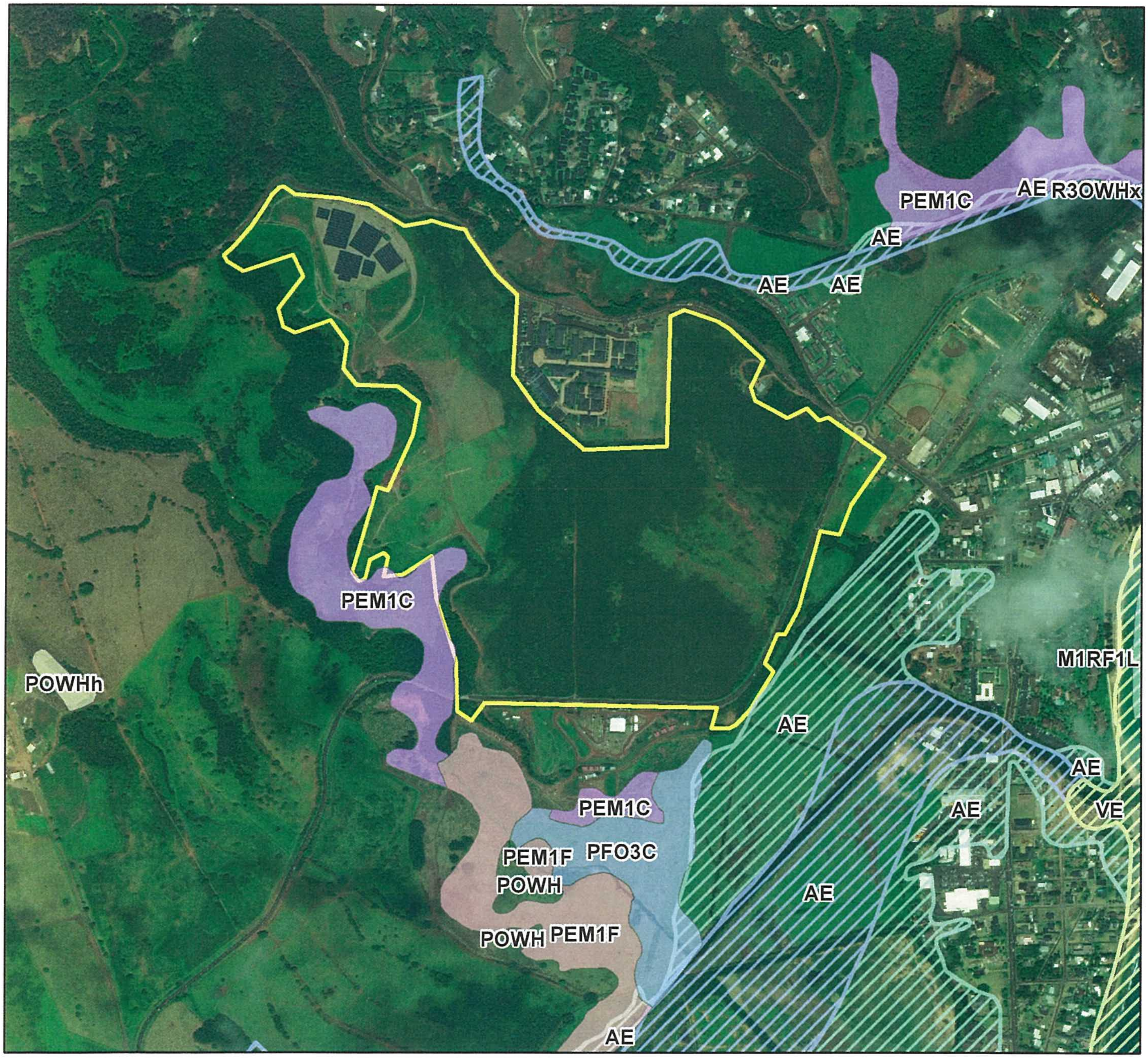
N

Wetland/Floodplain Map

Date: 5/31/2018

Field Office: LIHUE SERVICE CENTER
Agency: USDA-NRCS
Assisted By: GENOA STARRS

State and County: HI, Kauai County, Hawaii
Land Units: (4) 4-3-003:001
Approximate Acres: 163.13



Legend

1,000 0 1,000 2,000 Feet

1 inch = 1,000 feet

N

WCODE	ZONE, FLOODWAY, Descrip
M1RF1L	A; ;100yr floodplain determined by approximate methods, no base flood elevations
PEM1C	AE; ;100yr floodplain by analyses, whole-foot elevations within zone
PEM1F	AE;FLOODWAY;100yr floodplain by analyses, whole-foot elevations within zone
PFO3C	VE; ;100yr coastal floodplain with storm waves, approx. analysis, no base flood elev
POWHh	Rice Poly Layer
R3OWH	

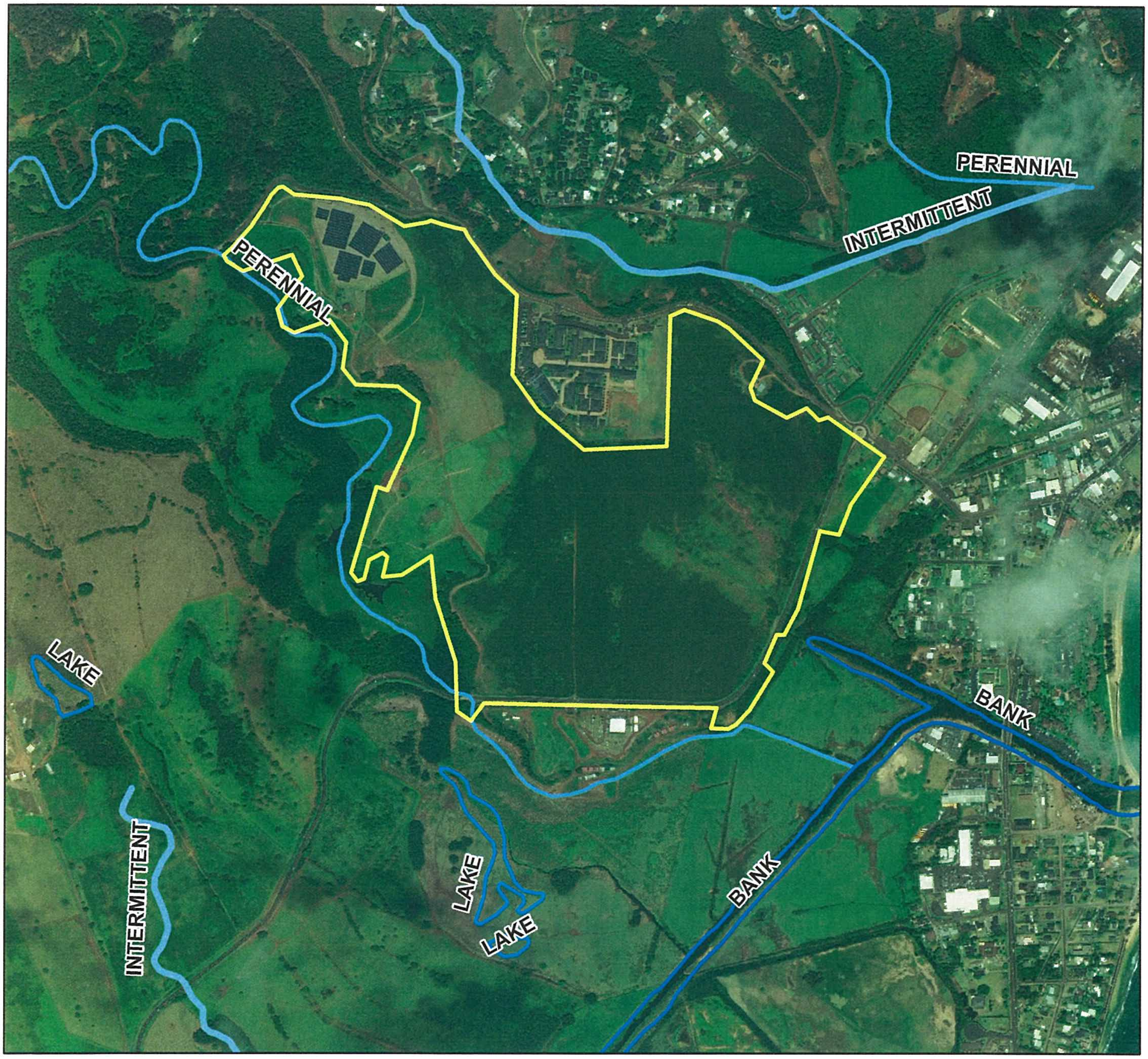
USDA

Hydrology Map

Date: 5/31/2018

Field Office: LIHUE SERVICE CENTER
Agency: USDA-NRCS
Assisted By: GENOA STARRS

State and County: HI, Kauai County, Hawaii
Land Units: (4) 4-3-003:001
Approximate Acres: 163.13



Legend

Rice Poly Layer

TYPE

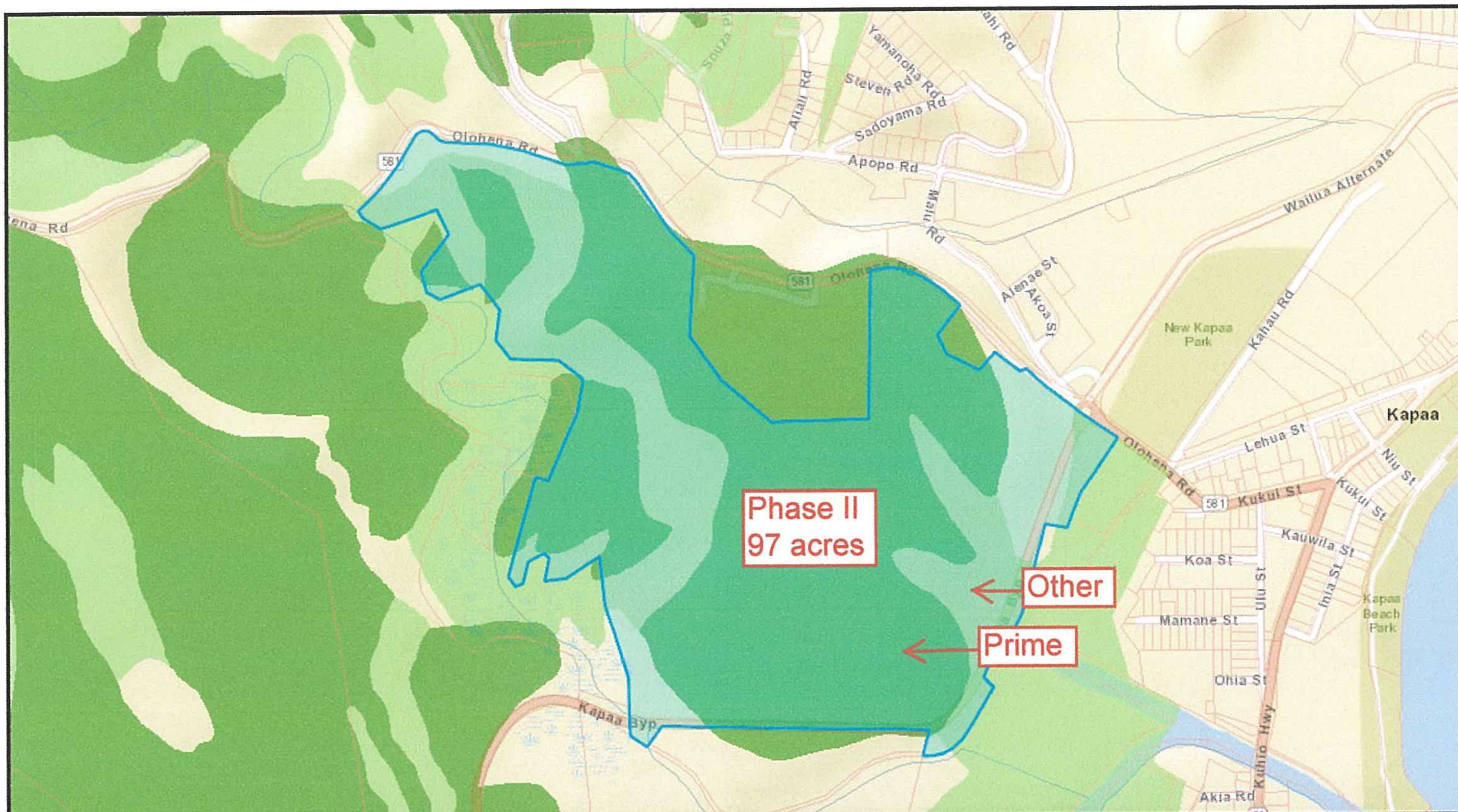
- BANK
- INTERMITTENT
- LAKE
- PERENNIAL

1,000 0 1,000 2,000 Feet

1 inch = 1,000 feet

N

Appendix B
Hawaii Land Classification Maps



Renewable EnerGIS Parcel Report - (4) 4-3-003:001

0 600 ft

SITE DESCRIPTION

Parcel Area (acres): **163.420**
County Zoning: **No data**
County Address: **Olohena Rd**
State Land Use District: **Agriculture; Urban**

LAND ECOLOGY

Critical Habitat: **No**
Special Management Area (SMA): **No**
Thermal Springs Potential: **No data**
High Temperature Resource Areas: **No data**
Reserves: **No**

LAND USE / LAND COVER

Ag Land Use (2011-2015): **Pasture**
Ag Land Use (ALUM 1980): **Grazing; S**
Ag Lands of Importance (ALISH): **Unclassified; Prime; Other**
LSB Soil Rating: **B; C; D; E**
Important Ag Land (IAL): **No data**

INFRASTRUCTURE

Ditches: **DITCH**
Studied Hydro Projects: **No**

HYDROLOGY

Flood Zone: **X**
Streams: **Waikaea**

Point Details – Coordinates of Point: 22.07523, -159.32730

SOLAR RESOURCES

Solar Radiation (calories/cm2/day): **400-450**
DNI Annual (Wh/m2/day): **4,303**
GHI Annual (Wh/m2/day): **5,095**

TERRAIN

NOAA Elevation (m): **31**
USGS Slope (%): **2.81974**
USGS Aspect (degress from N): **219.137**

MARINE RESOURCES

Temp Avg Diff (degrees C): **No data**
Temp Amplitude Diff (degrees C): **No data**
3-Mile Ocean Boundary: **Not applicable**
12-Mile Ocean Boundary: **Not applicable**
Benthic Habitat: **No data**
Whale Sanctuary: **No data**
Marine Managed Area: **No data**
Annual Rainfall: **45.168198**

WIND RESOURCES

Wind Power Density at 50m (W/m2): **239.00**
Wind Speed at 30m (m/s): **No data**
Wind Speed at 50m (m/s): **No data**
Wind Speed at 70m (m/s): **No data**
Wind Speed at 100m (m/s): **No data**

DBEDT
STATE OF HAWAII

06/24/2018

Layer Name:	Agricultural Lands of Importance to the State of Hawaii
Coverage Name:	ALISH
Layer Type:	Polygon
Status:	Complete
Geog. Extent:	Main Hawaiian Islands
Projection:	Universal Trans Mercator, Zone 4
Datum:	NAD 83
Description:	Agricultural Lands of Importance to the State of Hawaii for islands of Kauai, Oahu, Maui, Molokai, Lanai & Hawaii.
Source:	State Department of Agriculture 1:24,000 hand drafted blueline maps; compiled and drafted in 1977. Prepared with the assistance of the Soil Conservation Service, U.S.Department of Agriculture, and the College of Tropical Agriculture, University of Hawaii. See text below for information about the classification system, including criteria for classification.
History:	Digitized in Arc/Info version 6 using ArcEdit by the Office of State Planning (OSP) from State Department of Agriculture's 1:24,000 blueline maps.
Attributes:	Polygons:

AREA	area of polygon (sq. meters)
PERIMETER	perimeter of polygon (meters)
ALISH#	Polygon internal number (for Arc/Info use)
ALISH-ID	Polygon ID (for Arc/Info use)
AGTYPE	Agricultural Type

AGTYPE	Definition
<blank>	Unclassified
0	Unclassified
1	Prime Lands
2	Unique Lands
3	Other Lands

Notes: (from "Agricultural Lands of Importance to the State of Hawaii Revised," State Department of Agriculture, November, 1977).

The Classification System:

The classification system for identification of agriculturally important lands in the State of Hawaii provides for the:

1. Establishment of classes of agricultural lands primarily, but not exclusively, on the basis of soil characteristics;

2. Establishment of criteria for classification of lands; and

3. Identification of lands which meet the criteria for the respective classes.

Three classes of agriculturally important lands were established forthe State of Hawaii with the intent of facilitating the SCS effort to inventory prime farmlands nationally and adapting the classification to the types of agricultural activity in Hawaii. These classes and their corresponding SCS (national) equivalents are:

Hawaii Classification System	**SCS Classification System**
Prime Agricultural Land	Prime Farmland
Unique Agricultural Land	Unique Farmland
Other Important Agricultural Land	Additional Farmland of Statewide and Local Importance

The criteria for classification of PRIME AGRICULTURAL LAND are identical to the criteria established by SCS for national application. The criteria for UNIQUE AGRICULTURAL LAND and OTHER IMPORTANT AGRICULTURAL LAND were established cooperatively by the Soil Conservation Service in Hawaii, the College of Tropical Agriculture, and the State Department of Agriculture.

Land considered for classification may or may not currently be in agricultural use, or may be in an agricultural use other than that which its classification may indicate as its agricultural capability. An example of the latter situation is land currently being used for grazing but which meets the criteria for Prime Agricultural Land. Lands not considered for classification as agricultural lands of importance to the State of Hawaii are:

1. Developed urban land over 10 acres;

2. Natural or artificial enclosed bodies of water over 10 acres;

3. Forest reserves;

4. Public use (parks and historic sites) lands;

5. Lands with slopes in excess of 35%; and

6. Military installations, except undeveloped areas over 10 acres.

The classification of agriculturally important lands does not in itself constitute a designation of any area to a specific land use. The classification should, however, provide decision makers with an awareness of the long-term implications of various land use options for production of food, feed, forage, and fiber crops in Hawaii.

Over time new areas may be developed for agricultural uses, other areas may be converted to irreversible non-agricultural uses, and new knowledge may be gained regarding soil interpretations. These and other developments will necessitate the periodic review and revisionof the classification system and lands identified for the various classes.

The Criteria for Classification:

PRIME AGRICULTURAL LAND

PRIME AGRICULTURAL LAND is land best suited for the production of food, feed, forage and fiber crops. The land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

PRIME AGRICULTURAL LAND meets the following criteria:

1. The soils have an adequate moisture supply. Included are:

   a. Soils having aquic or udic moisture regimes. (For definitions of moisture regimes see Soil Taxonomy, Agricultural Handbook 436, December 1975). These soils commonly are in humid or subhumid climates that have well distributed rainfall or have enough rain in the summer that the amount of stored moisture plus rainfall is approximately equal to or exceeds the amount of potential evapotranspiration. Water moves through the soils at some time in most years.

   b. Soils having xeric or ustic moisture regimes and in which the available water capacity is great enough to provide adequate moisture for the commonly grown crops in 7 or more years out of 10.

   c. Soils having aridic or torric moisture regimes and the area has a developed irrigation water supply that is dependable and of adequate quality. Also included are soils having xeric or ustic moisture regimes in which the available water capacity is limited but the area has a developed irrigation water supply that is dependable and of adequate quality.

   d. Soils having sufficient available water capacity within a depth of 40 inches (1 meter), or in the root zone if the root zone is less than 40 inches deep, to produce the commonly grown crops in 7 or more out of 10 years.

   A dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years for the crops commonly grown.

2. The soils have a soil temperature regime that is isomesic, isothermic, or isohyperthermic. These are soils that, at a depth of 20 inches (50 cm), have a mean annual temperature higher than 47 degrees F (8 degrees C), and the difference between the mean summer and mean winter temperature differ by less than 9.0 degrees F (5 degrees C).

3. The soils have a pH between 4.5 and 8.4 in all horizons within a depth of 40 inches (1 meter) or in the root zone if the root zone

is less than 40 inches deep. (Soils which have a pH of less than 4.5 in surface soil because of use of fertilizers are excluded). This range of pH is favorable for growing a wide variety of crops without adding large amounts of amendments.

4. The soils have no water table or a water table that is maintained at a sufficient depth during the cropping season to allow crops common to the area to be grown.

5. The soils can be managed so that in all horizons within a depth of 40 inches (1 meter) or in the root zone if the root zone is less than 40 inches deep, during part of each year the conductivity of saturation extract is less than 4 mmhos/cm and the exchangeable sodium percentage (ESP) is less than 15.

6. The soils are not flooded frequently during the growing season (less often than once in 2 years).

7. The soils have a product of K (erodability factor) x percent slope of less than 2.0. That is, soils having a serious erosion hazard are not included.

8. The soils have a permeability rate of at least 0.06 inches (0.15 cm) per hour in the upper 20 inches (50 cm) and the mean annual soil temperature at a depth of 20 inches is less than 57 degrees F (14 degrees C). Permeability rate is not a limiting factor if the mean annual soil temperature is 57 degrees F (14 degrees C) or higher.

9. Less than 10 percent of the surface layer in these soils consists of rock fragments coarser than 3 inches (7.6 cm). These soils present no particular difficulty in cultivating with large equipment.

10. Must not be thixotropic and have isomesic temperature regime.

UNIQUE AGRICULTURAL LAND

UNIQUE AGRICULTURAL LAND is land other than PRIME AGRICULTURAL LAND and is used for the production of specific high-value food crops. The land has the special combination of soil quality, growing season, temperature, humidity, sunlight, air drainage, elevation, aspect, moisture supply, or other conditions, such as nearness to market, that favor the production of a specific crop of high quality and/or high yield when the land is treated and managed according to modern farming methods. In Hawaii, some examples of such crops are coffee, taro, rice, watercress and non-irrigated pineapple.

Land that qualifies as PRIME AGRICULTURAL LAND and is used for a specific high-value crop is classified as PRIME AGRICULTURAL LAND rather than as UNIQUE AGRICULTURAL LAND.

OTHER IMPORTANT AGRICULTURAL LAND

OTHER IMPORTANT AGRICULTURAL LAND is land other than PRIME or UNIQUE AGRICULTURAL LAND that is of state-wide or local importance for the production of food, feed, fiber and forage crops. The lands in this classification are important to agriculture in Hawaii yet they exhibit properties, such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, or droughtiness, that exclude them from the PRIME or UNIQUE AGRICULTURAL LAND classifications. Two examples are lands which do not have an adequate moisture supply to qualify as PRIME AGRICULTURAL LAND and lands which have similar characterisitics and properties as UNIQUE AGRICULTURAL LAND except that the land is not currently in use for the production of a "unique" crop. These lands can be farmed satisfactorily by applying greater inputs of fertilizer and other soil amendments, drainage improvement, erosion control practices, flood protection and produce fair to good crop yields when managed properly.

Other criteria which may qualify lands as OTHER IMPORTANT AGRICULTURAL LAND are:

1. The land has slopes less than 20%, is presently in crop or has cropping potential, and is not classified as PRIME or UNIQUE AGRICULTURAL LAND. The soils have a moisture supply which is adequate for the commonly grown crop.

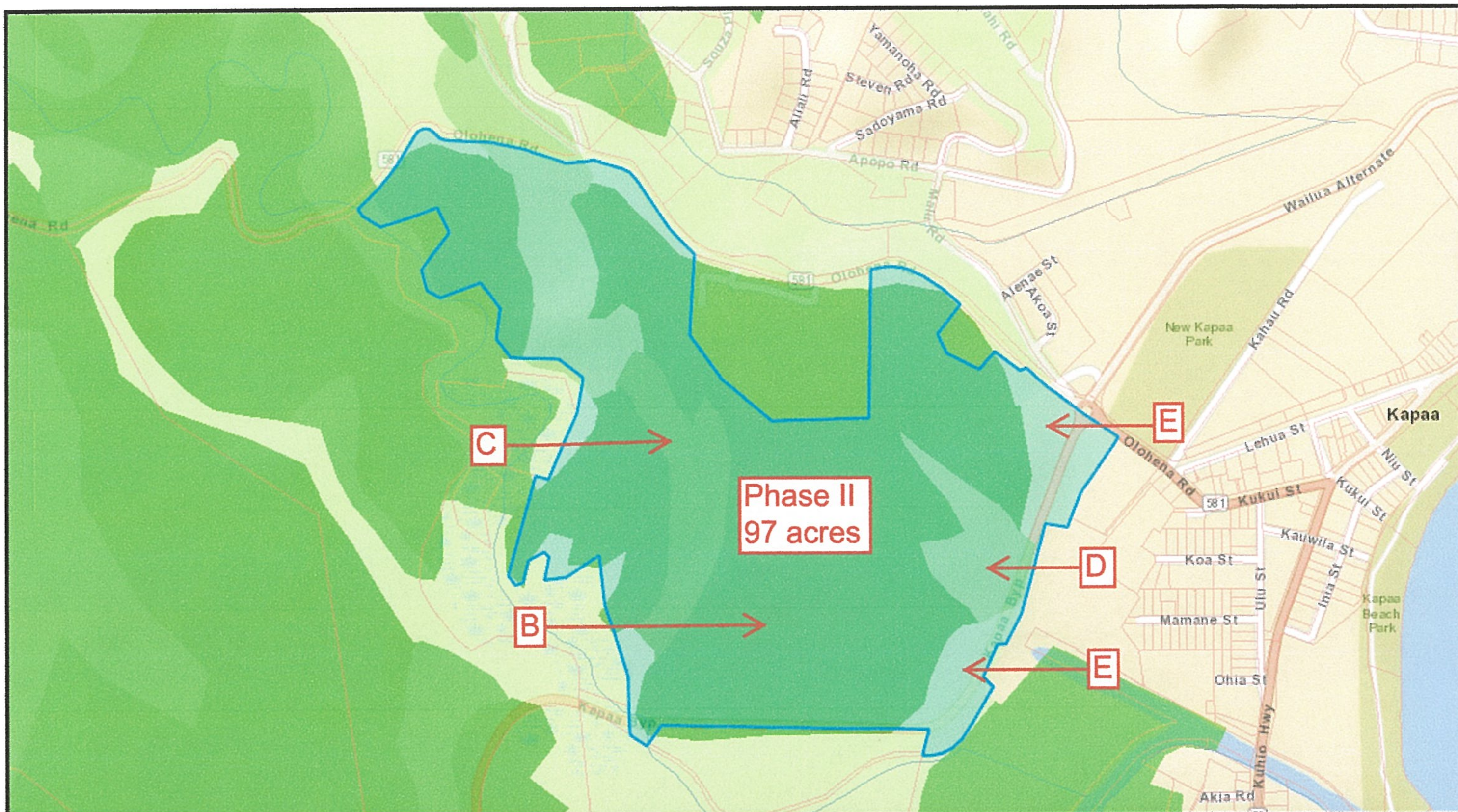
2. The land has slopes less than 35%, is presently used for grazing or has grazing potential, and is not classified as PRIME or UNIQUE AGRICULTURAL LAND. The soils have:

   a. An aquic, udic, xeric, or ustic moisture regime in which the available water capacity is sufficient to produce fair to good yields of adapted forage.

   b. Less than 10% rock outcrops and coarse fragments coarser than 3 inches (7.6 cm) in the surface layer.

3. The soils are thin organic soils underlain by aa lava (typic tropo-folists) having aquic, udic, xeric, or ustic moisture regimes and isohyperthemic (greater than 72 degrees F) or isothermic (59 - 72 degrees F) soil temperature regimes.

Contact: Joan Delos Santos, Office of Planning, State of Hawaii,
PO Box 2359, Honolulu, Hi. 96804; (808) 587-2895.
email: JDelos_Santos@dbedt.hawaii.gov



Renewable EnerGIS Parcel Report - (4) 4-3-003:001

0 600 ft

SITE DESCRIPTION

Parcel Area (acres): **163.420**
County Zoning: **No data**

County Address: **Olohena Rd**
State Land Use District: **Agriculture; Urban**

LAND ECOLOGY

Critical Habitat: **No**
Special Management Area (SMA): **No**
Thermal Springs Potential: **No data**
High Temperature Resource Areas: **No data**
Reserves: **No**

LAND USE / LAND COVER

Ag Land Use (2011-2015): **Pasture**
Ag Land Use (ALUM 1980): **Grazing; S**
Ag Lands of Importance (ALISH): **Unclassified; Prime; Other**
LSB Soil Rating: **B; C; D; E**
Important Ag Land (IAL): **No data**

INFRASTRUCTURE

Ditches: **DITCH**
Studied Hydro Projects: **No**

HYDROLOGY

Flood Zone: **X**
Streams: **Waikaea**

Point Details – Coordinates of Point: 22.07523, -159.32730

SOLAR RESOURCES

Solar Radiation (calories/cm2/day): **400-450**
DNI Annual (Wh/m2/day): **4,303**
GHI Annual (Wh/m2/day): **5,095**

TERRAIN

NOAA Elevation (m): **31**
USGS Slope (%): **2.81974**
USGS Aspect (degress from N): **219.137**

MARINE RESOURCES

Temp Avg Diff (degrees C): **No data**
Temp Amplitude Diff (degrees C): **No data**
3-Mile Ocean Boundary: **Not applicable**
12-Mile Ocean Boundary: **Not applicable**

Benthic Habitat: **No data**
Whale Sanctuary: **No data**
Marine Managed Area: **No data**
Annual Rainfall: **45.168198**

WIND RESOURCES

Wind Power Density at 50m (W/m2): **239.00**
Wind Speed at 30m (m/s): **No data**
Wind Speed at 50m (m/s): **No data**

Wind Speed at 70m (m/s): **No data**
Wind Speed at 100m (m/s): **No data**

DBEDT
STATE OF HAWAII

06/24/2018

Layer Name: Land Study Bureau (LSB) Detailed Land Classification

Layer Type: Polygon

Status: Complete; currently being updated

Geog. Extent: Main Hawaiian Islands

Projection: Universal Trans Mercator, Zone 4, Meters, NAD 83 HARN

Description: Land Study Bureau's Detailed Agricultural land productivity ratings for Kauai, Oahu, Maui, Molokai, Lanai and Hawaii.

Source: Land Study Bureau's Detailed Land Classification Aerial Photos hand drafted onto paper overlays of the U.S.G.S., 1:24,000 topographic and orthophoto quads. Ratings were developed for both over-all productivity, and for specific crops. This layer represents only the over-all productivity ratings.

Dates of LSB studies:
Hawaii - 1965
Maui - 1967
Oahu - 1972
Kauai - 1967
Molokai - 1968
Lanai - 1967

History: Digitized in Arc/Info version 7.1.1 using ArcEdit by the Office of Planning (OP), 1998.

Note 1: Lands having the LSB rating of "U," which the Land Study Bureau assigned to built-up or urbanized areas (as of the date of the studies), were not digitized.

Note 2: All classified lands falling within the State Land Use Urban District were deleted from the layer using the 1995 LUDB coverages.

Note 3: Although LSB classification polygons falling within the 1995 LUDB Urban District were deleted from the GIS layer, the classifications themselves still exist – they simply are not represented in this GIS layer. Specifically, there is no provision in State law requiring the rescission of the soil ratings that apply to an area that has been reclassified by the Land Use Commission, e.g., from the Agricultural to Urban districts. Similarly, there is no provision in State law requiring the Detailed Land Classification (Land Study Bureau) bulletins to be reviewed and revised to reflect changes to the land areas for which urban development has occurred.

Attributes: Polygons:

AREA	area of polygon (sq. meters)
PERIMETER	perimeter of polygon (meters)
TYPE	Agricultural Productivity Rating
Island	Island
GISAcres	Acreage, as calculated by GIS software

TYPE	DEFINITION
A-E	Agricultural productivity rating, from A to E, with "A" having the highest rating.

Discussion:

From "A Report on the State of Hawaii Land Evaluation and Site Assessment System" February, 1986, Section IV, pp.23-25):

"Land Study Bureau's Overall Productivity Rating (LSB):

The Land Study Bureau of the University of Hawaii prepared an inventory and evaluation of the State's land resources during the 1960's and 1970's. The Bureau grouped all lands in the State, except those in the urban district**, into homogeneous units of land types; described their condition and environment; rated the land on its over-all quality in terms of agricultural productivity; appraised its performance for selected alternative crops; and delineated the various land types and groupings based on soil properties and productive capabilities.

**Office of Planning note: "urban district," in this context/document, does not refer to the State Land Use District Boundary "Urban District", but instead refers lands that were observed to have been "built areas" in the aerial photographs.

These properties included:

a. Texture-which refers to the proportion of sand, silt and clay in a particular soil. Medium-textured soils which have nearly equal proportions of sand, silt and clay are generally the most desirable for agriculture because of good tillability and water retention.

b. Structure-which refers to the cohesion of soil material into aggregates or clumps. The size, shape and amount of these clumps affect the pore spaces which contain the air and moisture necessary for growth.

c. Depth-which refers to the distance to which roots can penetrate. Generally, the deeper the rooting depth, the more desirable the soil because more moisture can be stored and more soil volume is available from which nutrients can be obtained.

d. Drainage-refers to the frequency and duration of soil saturation with moisture.

e. Parent material-refers to the geologic material from which a soil has developed. Soils formed from coral have neutral to alkaline reactions and are high in calcium. Most of the soils have developed from volcanic material and under tropical conditions of high temperature and rainfall. These soils tend to be acid and fertility levels are relatively low.

f. Stoniness-affects the productivity of land by limiting the use of machinery and the selection of crops.

g. Topography-refers to slope and surface configuration. Lands with flat terrain are better suited for a wider variety of agricultural uses than lands having steeper slopes. Cultivated lands generally have slopes of less than 20 percent. Lands with slopes between 20 to 35 percent usually are not machine-tilled, but are still suitable for certain uses such as orchards and grazing.

h. Climate-with its elements of temperature, sunlight and rainfall constitutes the exterior environment of land, unlike the soil properties which constitute the interior segment.

i. Rain-is the basic source of irrigation. Ideally, it should fall at the place, in the quantity and at the time when it is needed.

The interaction of particular soil properties, topography and climate served to differentiate land types and provided a basis for correlating and establishing productivity ratings. A five-class productivity rating system was developed with "A" representing the class of highest productivity and "E" the lowest."

From "Detailed Land Classification - Island of Kauai," December, 1967, Land Study Bureau, pp. 25-27:

"Over-all (Master) Productivity Rating:

The Over-all Productivity Rating evaluates each Land Type in its over-all or general productive capacity and not for any specific crop. Two independent methods were utilized in ascertaining and checking this over-all rating: averaging the Selected Crop Productivity Ratings and application of the Modified Storie Index (6) (7).

....The Modified Storie Rating Index is a formula whereby the productivity index of the land is developed by multiplying the several factors in the formula. The higher the product, the better suited the Land Type is for agricultural uses.

Modified Storie Rating Index = A x B x C x X x Y

A = percentage rating for the general character of the soil profile
B = percentage rating for the texture of the surface horizon
C = percentage rating for the slope of the land
X = percentage rating for such factors as salinity, soil reaction, damaging winds, erosion, etc.
Y = percentage rating for rainfall

The percentage rating for each factor (A, B, C, X and Y) increases as the favorableness of the factor increases. Therefore, it follows that as the land productivity index approaches 100 percent, the agricultural quality of the land increases. Conversely, less desirable lands have low value indexes. The following are the Modified Storie Index percentages and their associated Over-all Productivity Ratings.

Modified Storie Index Percentages	Over-all Productivity Rating
85-100	A
70-84	B
55-69	C
30-54	D
0-30	E

.....each factor is discussed briefly to indicate its role in determining land quality for agricultural purposes:

The ratings for factor A take drainage and depth of the soil profile into consideration. Deep and shallow soils are recognized and differentiated. The nature of the surface soil and subsoil are considered. Parent material and degree of soil development are recognized as they affect fertility, structure, depth, aeration and moisture-holding capacity of the soil.

Factor B, which expresses the texture of the surface soil, reflects the relative workability of the soil as well as its composition of silt, sand and clay. Stony lands, including lava lands, are placed in special categories. The soils are separated into textural groups. Soils are usually expected to react quite similarly when of similar textural groups. Texture is closely associated with moisture-holding capacity and workability of the soil.

Factor C accounts for the variations in the slope of the land. The slope classes are designed to differentiate ease of irrigation and use of mechanical equipment, susceptibility to erosion, amount of surface runoff, and suitability for commercial forest production. In general, slopes exceeding 35 percent are considered too steep for cultivated crops, and slopes greater than 80 percent are assumed impractical for commercial forest production.

Factor X includes the miscellaneous land characteristics such as soil fertility, soil reaction, soil salinity, and presence of strong winds.

Factor Y accounts for rainfall and associated climatic feature. As a general rule, lands in the higher rainfall zones are cloudy and therefore lower in productivity; irrigated lands are rated 100 because the moisture requirement is adequately met. It is the general assumption that where irrigation is required, climate is usually satisfactory for crop production."

Note: For more detailed explanations of the Land Rating criteria, refer to the Land Study Bureau's publications for each island:

Detailed land classification: island of Hawaii. , Honolulu: Land Study Bureau, University of Hawaii, Nov. 1965.
Detailed land classification - island of Kauai. , Honolulu: University of Hawaii, Land Study Bureau, Dec. 1967.
Detailed land classification - island of Lanai. , Honolulu: University of Hawaii, Land Study Bureau, May 1967.
Detailed land classification: Island of Maui. , Honolulu: Land Study Bureau, University of Hawaii, May 1967.
Detailed land classification: Island of Molokai. , Honolulu: Land Study Bureau, University of Hawaii, June 1968.
Detailed land classification: Island of Oahu. , Honolulu: Land Study Bureau, University of Hawaii, Jan. 1963.

Note: The Detailed Land Classification and the Hawaii Land Evaluation and Site Assessment System publications referenced above can be found at the Hawaii Legislative Reference Bureau (http://lrbhawaii.org/, 808-587-0690), and at Hawaii State Public Libraries (http://www.librarieshawaii.org/, 808-586-3500).

Contact : Statewide GIS Program, Office of Planning, State of Hawaii,
PO Box 2359, Honolulu, Hi. 96804; (808) 587-2846.
email: gis@hawaii.gov

Appendix C
2015 Crop Summary by Acreage

2015 Crop Summary by Acreage							
Crop Types	Hawai'i	Kaua'i	Maui	Moloka'i	Lāna'i	O'ahu	State Total
Aquaculture	165	183	-	28	-	274	*651*
Banana	536	26	62	-	-	345	*969*
Coffee	5,525	3,788	545	123	-	168	*10,149*
Commercial Forestry	21,061	1,743	33	-	-	26	*22,864*
Dairy	1,855	-	-	-	-	-	*1,855*
Diversified Crop	3,266	1,199	1,582	937	54	9,865	*16,904*
Flowers / Foliage / Landscape	1,612	165	134	26	10	484	*2,432*
Macadamia Nuts	21,359	-	186	-	-	-	*21,545*
Papaya	2,566	-	-	93	-	166	*2,824*
Pineapple	-	-	1,094	-	-	3,414	*4,508*
Seed Production	-	13,299	754	2,342	-	7,333	*23,728*
Sugar	-	-	38,810	-	-	-	*38,810*
Taro	61	443	54	2	-	51	*612*
Tropical Fruit	3,144	463	104	43	-	227	*3,980*
Crop Total:	***61,149***	***21,310***	***43,360***	***3,593***	***65***	***22,354***	***151,831***
Pasture	554,324	41,934	108,447	38,261	-	18,464	761,429
Total Agriculture	***615,473***	***63,244***	***151,808***	***41,854***	***65***	***40,818***	***913,261***

Appendix D
Resources

RESOURCES

County of Kauai Office of Economic Development, Kauai Economic Development Board. Kauai Economic Development Plan 2005-2015. Lihue, Kauai, Hawaii. Pages 65 – 73.

County of Kauai Planning Department. Kauai General Plan 2018. Lihue, Kauai. Pages 4-20 to 4-26.

Hawaii Land Use Law and Policy. How Much Agricultural Land Does Hawaii Need? @HILandUseLaw. March 11, 2008.

Kauai Coffee Company, LLC. Kalaheo, Hawaii.

Melrose, Jeffrey, Perroy R., Cares S. Statewide Agricultural Land Use Baseline Study 2015. Hawaii Department of Agriculture. University of Hawaii at Hilo Spatial Data Analysis & Visualization Research Lab, Hilo, Hawaii.

State of Hawaii Office of State Planning. Hawaii Statewide GIS Program June 2018. Honolulu, Hawaii.

United States Department of Agriculture Natural Resource and Conservation Service, Pacific Islands Area. Lihue Service Center, Lihue, Kauai.

Kapaa Highlands Agricultural Master Plan
June 1, 2007

Economics for Goats

01-Jun-07

General Assumptions:	Ratio	Units
Acreage		102
Animal units per acre		3.5
Total animal units (AU)		357
Breeding herd :		206
Bucks (1)	3%	6
Does (30)	97%	200
Kids per doe per year	1.5	300
Total animal units (AU)		356

Note: Bucks & Does = 1 AU each, Kids = 1/2 AU each.

Annual Revenue from Goat Sales:	Ratio	Units	Unit Price	Annual Revenue
Local Kauai Sales	75%	225	$ 160	$ 35,968
Honolulu Sales (FOB Lihue)	25%	75	$ 140	$ 10,491
Totals		300		$ 46,458

Expense:	Units	Unit Cost	Fixed Cost	Annual Cost
Labor:				
Part-time labor (hours)	520	$ 15.00		$ 7,800
Feed:				
Barley-Corn (per head)	206	$ 2.90		$ 597
Minerals:				
Mineral block (per head)	206	$ 12.00		$ 2,472
Veterinary Supplies:				
Worming (per head)	206	$ 1.20		$ 247
Water:				
Annual requirement (3 gallons per head per day)	206	$ 2.03		$ 417
Repair & Maintenance:				
Repair fences, gates, water system			$ 1,200	$ 1,200
Vehicle - Repair , Maintenance and Fuel			$ 2,000	$ 2,000
Hauling Goats (per head):	206	$ 0.70		$ 144
Total Direct Costs				$ 14,878
Overhead:				
Lease Rent (unit cost per acre per year)		$ 35.00		$ 3,570
Administration			$ 500	$ 500
Management			$ 5,000	$ 5,000
Other			$ 250	$ 250
Total Overhead				$ 9,320
Net Operating Profit (Loss)				$ 22,260

Exhibit D

Department of Water, Kaua'i County
Manger's Report 12-10

EXHIBIT "D"

MANAGER'S REPORT 12-10:

July 21, 2011

Re: Kapaa Highland Request

RECOMMENDATION:

Your concurrence is requested to allow the staff to enter into an agreement in accordance with Part III Section XII of the rules with Kapaa Highland subject to county attorney concurrence. This exchange should be on a dollar for dollar basis not gallon for gallon.

BACKGROUND:

The developer is proposing the following exchange: the developer will give the DOW undeveloped water and in return, the DOW will provide the developer with storage for the developer's project; both will be built to department standards.

The project has a large portion of land that shows in the community plan to be affordable housing though not currently zoned as such. I have checked with the county housing department and the Mayor's office and both want to see the affordable housing go forward. This concurrence is verbal.

The planned storage for planned water exchange will allow this project to move forward when other developments have been stopped due to inadequate storage. There appears to be an overall county benefit and the implementation would be subject to finally getting the storage and source completed.

Our storage project is scheduled to be completed in 3-4 years. The source development could be sooner. The issue with this proposal is wells in different locations have different yields and DOW storage is only subject to available funds.

The developer has drilled a well and tested it. The well is too crooked to be used as a normal source of water and have to be redrilled in another location. The next one may not provide the same yield. It is low enough risk that this is being recommended.

Respectfully submitted,

David R. Craddick, P.E.
Manager and Chief Engineer

Department of Water County of Kaua'i

Water has no substitute.......Conserve it

August 22, 2011

Mr. Gregg Allen
161 Wailua Road
Kapaa, HI 96746

Dear Mr. Allen:

Subject: Water Master Plan for the Kapa'a Highlands Project on TMK: 4-3-03:001

At the Department of Water, Water Board July 28th 2011 meeting, via Managers Report 12-10, in response to your letters of April 22, 2011 and May 11, 2011, accepted the proposed exchange of source for storage on a dollar for dollar basis. This acceptance is based on your commitment to proceed with zoning changes in your development to match the county zoning. That zoning change requires affordable housing in certain portions of your proposed development.

This acceptance is based on building permits and County water meter service not being issued if the source and storage requirements have not been completed as of the date of requested building permit approval. We ask that you submit a proposed draft of an agreement to memorialize this action. We would expect that this agreement runs with the land.

If you have any questions, please contact Mr. Gregg Fujikawa at (808) 245-5416.

Sincerely,

David R. Craddick, P.E.
Manager and Chief Engineer

GF/WE:bdm
Bill/Gregg Allen Response Letter/July Board Mtg.

4398 Pua Loke St., P.O. Box 1706, Lihue, HI 96766 Phone: 808-245-5400
Engineering and Fiscal Fax: 808-245-5813, Operations Fax: 808-245-5402, Administration Fax: 808-246-8628

Exhibit E

Irrigation Supply For the Kapa'a Highlands Agricultural Subdivision
Water Master Plan

EXHIBIT "E"

TNWRE
Tom Nance Water Resource Engineering

No. of pages: 8
Email: gallen@harbormail.net

Original ☑ will ☐ will not be mailed to you.

October 27, 2006
06-281 (05-41)

MEMORANDUM

TO:	Greg Allen
FROM:	Tom Nance
SUBJECT:	Irrigation Supply for the Kapaa Highlands Agricultural Subdivision

Introduction

This memo report assesses the feasibility of developing an onsite well (or wells) to provide the necessary irrigation supply for the Kapaa Highlands Agricultural Subdivision. The total area of the project is 163 acres. Wagner Engineering Services, Inc. has determined that up to 113 acres of the site is suitable for agricultural use (Figure 1). The Kauai Department of Water (DOW) standards require an average supply for irrigation for 2500 GPD/acre. For 113 acres, this translates to a year-round average of 0.283 MGD. Applying a maximum seasonal use factor of 1.5 results in a required summertime supply capability of 0.424 MGD (equivalent to 295 GPM operating continuously).

Results of an Onsite Exploratory Borehole

To investigate the possibility of providing the irrigation supply with an onsite well or wells, an exploratory borehole was drilled and pump tested. The location of this exploratory borehole is shown on Figures 1 and 2. Ground elevation at the well site is 25 feet. It was drilled to a depth of 260 feet or 235 feet below sea level. During the course of drilling, two separate aquifers were encountered. The upper aquifer has a static water level of about 19 feet above sea level (MSL) and it extends to a depth of about 80 feet (ie. to 55 feet below sea level). It has very limited yield (less than 30 GPM) as it is essentially a collection of water in the soil mantle perched on poorly permeable Koloa lavas beneath it.

The strata between 80- and 210-foot depth are poorly permeable and function as an aquiclude separating the upper and lower aquifers. The lower aquifer, which starts at 210-foot depth and extends below the 260-foot depth of the exploratory borehole, has a static water level about 13 feet (MSL). This lower aquifer is quite productive.

A pump test was run at my direction to define the potential yield and quality of water from the lower aquifer. Using a combination of casing and grout, water from the upper aquifer was sealed off for this test. Results of the 12-hour test conducted on October 19, 2006 are presented on Figures 3, 4, and 5. A series of flowrate steps were run initially to define hydraulic performance (Figure 3). Using a curve fitting technique, these results define expectable drawdown for a range of pumping rates (Figure 4). For example, at 500 GPM, the drawdown would be 7.5 feet.

The remainder of the 12-hour test was run at 550 GPM to see if any salinity change would occur. These results are shown on Figure 5 and Table 1. The salinity (as measured by conductivity) actually decreased for the first two hours and stabilized after that. Chlorides of just 53 MG/L demonstrate that the water is quite fresh and obviously suitable for irrigation use.

Conclusions and Recommendations Regarding the Irrigation Supply

1. Results of the exploratory borehole demonstrate that an adequate irrigation supply for the Agricultural Subdivision can be developed from a single onsite well located in the near proximity of the exploratory borehole.

2. The finished dimensions of the production well should be based on the following:

   a. A 17-inch borehole should be drilled to 300-foot depth.

   b. 220 feet of 8-inch solid casing and 80 feet of 8-inch perforated casing should be installed in the borehole.

   c. The annular space from 220 feet to the ground surface should be sealed with cement grout.

   d. Final pump testing at rates up to 550 GPM should be conducted to confirm the well's yield.

3. A companion report by ITC Water Management describes the delivery components of the irrigation system based on the following:

   a. A 7.5 horsepower, 450 GPM submersible pump and motor should be installed in the well at a depth of 30 to 40 feet.

   b. The well pump should deliver water to an adjacent storage tank of at least 30,000 gallons in size. Well pump cycles would be controlled by a level switch in the tank.

   c. An on-demand pump station of up to 600 GPM capacity should be installed next to the tank to draw water from the tank and deliver it to users in the agricultural subdivision.

Attachments

Specific Conductance and Chlorides of Samples
Collected During the 12-Hour Pump Test on October 19, 2006

Sample Time	Pumping Rate (GPM)	Specific Conductance (µS/cm @ 25° C.)	Chlorides (MG/L)
10:05	317	468	55
10:30	317	449	54
11:00	438	440	54
11:30	529	436	53
12:00	528	432	53
13:00	527	430	53
14:00	527	429	53
15:00	527	429	53
16:00	528	429	53
17:00	529	428	53
18:00	531	429	53
19:00	532	430	53
20:00	533	431	53
21:00	533	431	53
22:00	533	431	53

Notes:
1. Specific conductance measured in the TNWRE office using a HACH Sension5 meter calibrated with a 12.88 mS/cm standard.
2. Chlorides determined by mercuric nitrate titration in the TNWRE office. Samples were diluted 10 fold.

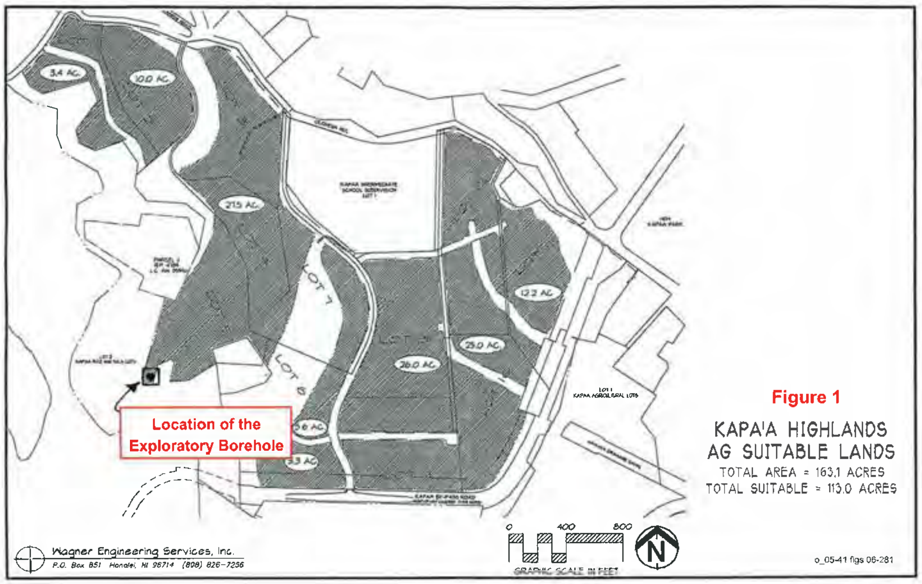


Figure 1

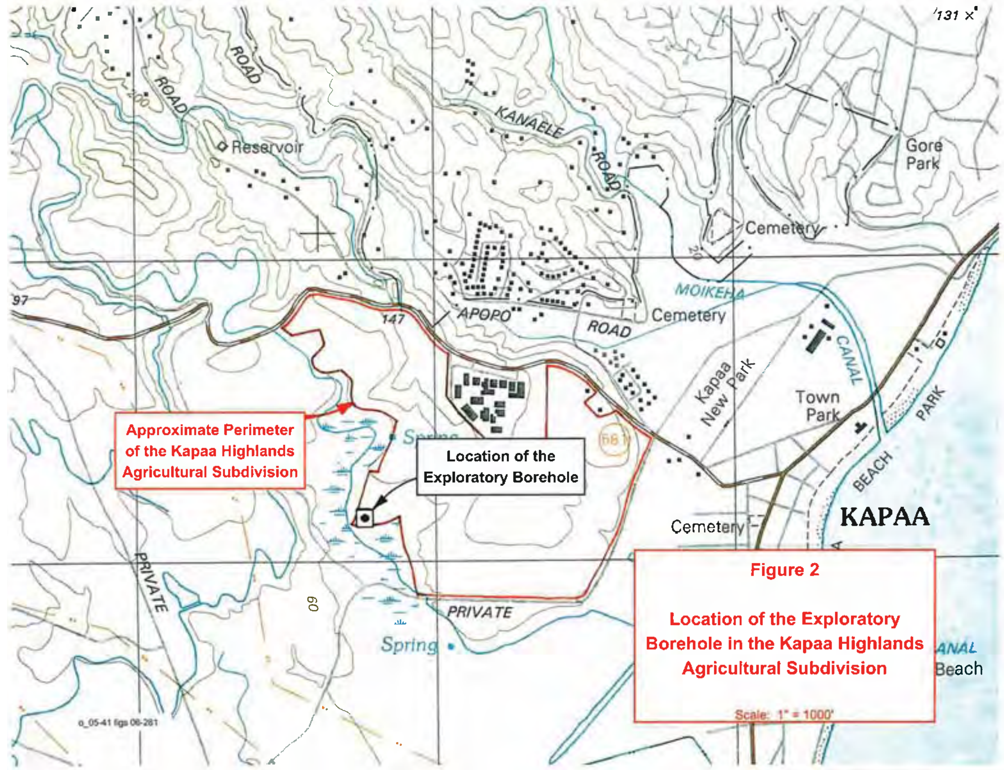


Figure 2

Location of the Exploratory Borehole in the Kapaa Highlands Agricultural Subdivision

Figure 3. Pumping Rate and Water Level During the 12-Hour Test

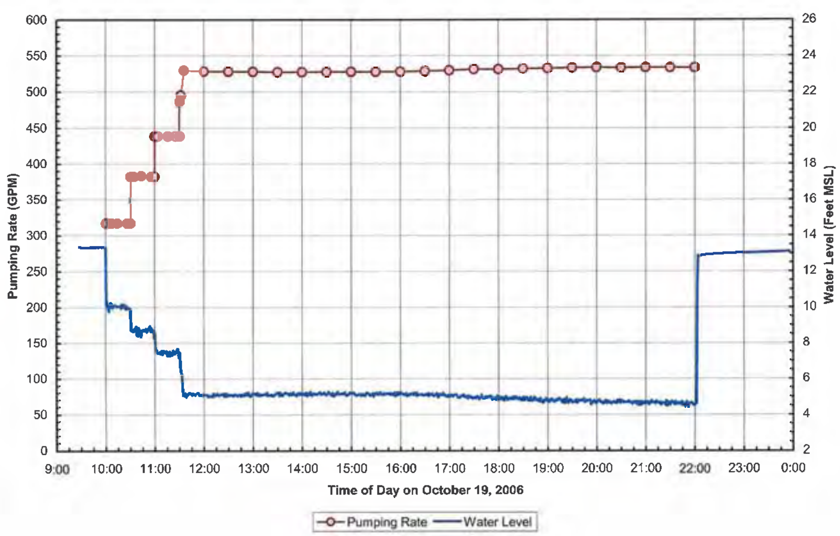


Figure 4. Hydraulic Performance of the Well Based on Step Test Data

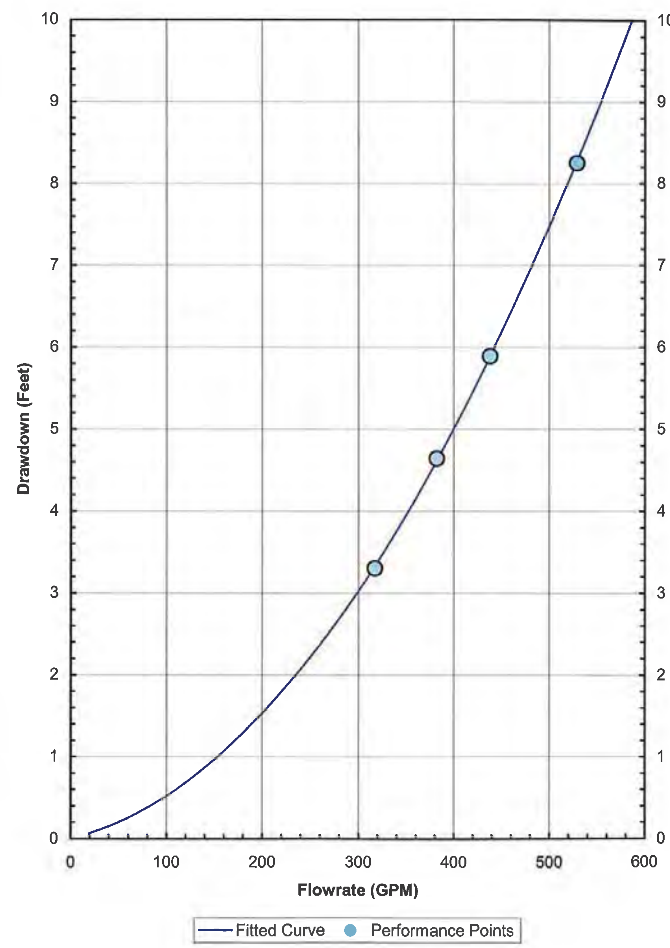


Figure 5. Pumped Water Conductivity through the 12-Hour Test

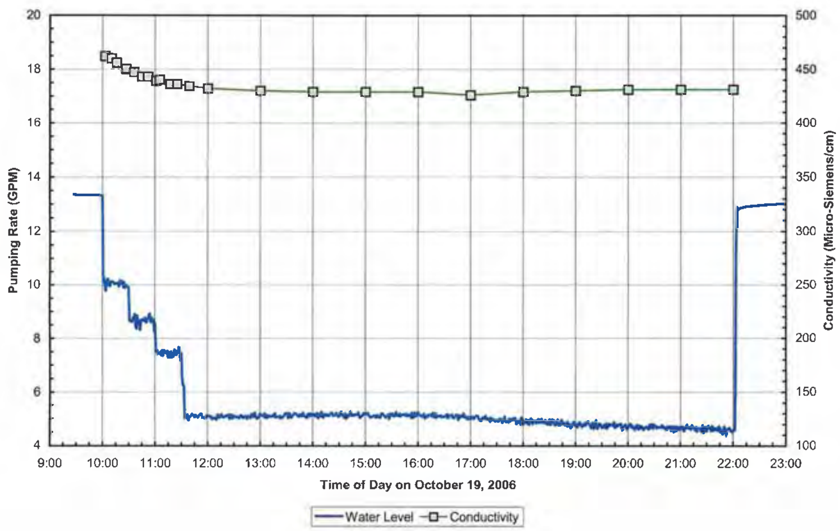


Exhibit E - Part 2

Private Water System

BELLES GRAHAM PROUDFOOT
WILSON & CHUN, LLP
ATTORNEYS AT LAW

MICHAEL J. BELLES
MAX W.J. GRAHAM, III
DONALD H. WILSON
JONATHAN J. CHUN

Federal I.D. No. 99-0317683

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TELEPHONE NO: (808) 245-4705
FACSIMILE NO: (808) 245-3277
E-MAIL: mail@kauai-law.com

October 2, 2012

Mr. David R. Craddick
Manager & Chief Engineer
Department of Water
County of Kauai
P. O. Box 1706
Lihue, Kauai, Hawaii 96766

VIA EMAIL & HAND DELIVERY

Re: **Kapaa Highlands Subdivision (S-99-45)**
(fna Kūlana Kai/Kauai Highlands)
Subdivision Of Parcel 1 Being A Portion Of
Grant 5266 To Rufus P. Spalding Into Lots 1 To 18, Inclusive
Kapaa and Waipouli, Kauai, Hawaii
Kauai Tax Map Key No. (4) 4-3-003:001 (por.)
Owner: Allen Family LLC; Moloaa Bay Ventures, LLC; and The Three Stooges LLC

Dear Mr. Craddick:

I am writing to you on behalf of the above-identified applicants ("Applicants") in the Kapaa Highlands Subdivision matter ("Subdivision"). In lieu of obtaining water for the Subdivision from the public water system operated by the Department of Water ("Department"), the Applicants have decided to construct an on-site private water system ("PWS").

The PWS is described in an enclosed Memorandum dated September 12, 2012 prepared by Tom Nance of Tom Nance Water Resource Engineering ("Nance Report"). The essential design specifications are described below.

A. Private Water System.

1. The Applicants will construct a well ("Well") and two storage tanks ("Tanks") on-site.

2. The Well will be located along the south boundary of Lot 5, as shown in Figure 3 of the Nance Report.

3. The Storage Tanks will be located on the north boundary of Lot 3, as shown in Figure 3 of the Nance Report.

4. The Well design is shown on Figure 2 of the Nance Report. The Well will be twelve (12) inches in diameter and operated by two identical 100 gallons per minute ("GPM") pumps, each driven by 7.5 horsepower motors. The first pump will supply the needs of the Subdivision, which is 97,310 gallons per day ("GPD") maximum day use, and the second will serve as a standby pump.

5. Based on the water needs for 50 farm dwelling units, the total maximum day demand is 93,750 GPD. The two 50,000 gallon Tanks will be adequately sized to provide necessary storage plus fire flowrate protection. The Tanks will be lined with bolted steel with reinforced concrete base and passive cathodic protection (zinc anode rods).

6. The pipelines ("Pipelines") for the PWS will be sized to provide: fire flowrate with coincident maximum day demand and a minimum residual pressure of 20 psi (velocities not exceeding 10 fps); and peak flowrate with minimum residual pressure of 40 psi (maximum velocity in Pipelines of 6 fps). NSF-approved, high density polyethylene (HPDE), pipes will be used for the PWS. The Pipeline system is shown on Figure 3 of the Nance Report.

7. Pursuant to the Agricultural Master Plan submitted in this matter, the agricultural activities in the Subdivision will be limited to a goat raising operation ("Goat Project"). The Goat Project will require minimal water (at the most, 3,560 GPD), which will be supplied by the PWS.

8. The on-site Tank elevations will not provide adequate gravity pressure to meet the Department's delivery pressure requirements. Providing the necessary pressure would be done with parallel domestic and fire flowrate pumping systems with a generator to provide back power. These pump systems would provide up to 70 GPM for peak domestic use and 500 GPM for the fire flowrate condition. Both pumping systems would be sized to produce a total dynamic head of 110 feet, in effect creating a single, 270-foot service pressure zone across the entire project site.

B. Modification Of Requirements.

The Applicants are requesting the Department and/or the Board of Water Supply ("Water Board") to grant a modification from the Department's Water System Standards for the PWS as follows:

1. DOW Rule Part 3, Section XII, provides as follows:

"**SECTION XII – MODIFICATION OF REQUIREMENTS**

When conditions pertaining to any subdivision are such that the public may be properly served with water and with fire protection without full and strict compliance with these rules and regulations, or where the subdivision site or layout is such that the public interest will be adequately protected, such modification thereof as is reasonably necessary or expedient, and not contrary to law or the intent and purposes of these rules and regulations, may be made by the Department."

2. As part of the Subdivision in this case, the Applicants propose to have water for potable, fire, and agricultural uses for the Subdivision supplied by the PWS.

3. The PWS does not comply strictly with all of the Department's Water System Standards ("DOW Standards") which typically apply to the DOW's public water systems. These differences are set forth in the enclosed Comparison Of Kapaa Highlands PWS With DOW Water System Standards.

4. The Applicants are requesting the Department and/or the Water Board to find that the PWS: will properly serve the water and fire protection needs of the Subdivision without full and strict compliance with the DOW Standards; that, given the fact that the Subdivision will be served by the PWS, the public interest will be adequately protected by the PWS; that the differences between the PWS and the DOW Standards are, under all of the circumstances of this case, reasonably necessary and expedient; and that such differences are not contrary to the law or the intent or purposes of the DOW Rules.

Based on the above, the Applicants are requesting the Department and/or the Water Board to approve the proposed PWS for the Subdivision, together with the requested modifications. In the event this matter needs to be referred to the Water Board, then I am requesting that it be placed on the next available agenda of the Water Board. For these purposes, I have enclosed a Supporting Information For The Board Of Water Supply, County of Kauai in compliance with the Department's requirements for persons wishing to testify at Water Board Meetings.

Thank you very much for your consideration of this request.

Sincerely yours,

BELLES GRAHAM PROUDFOOT
WILSON & CHUN, LLP

Max W. J. Graham, Jr.

MWJG:jgm
Enclosures
cc: Mr. Greg Allen, Jr., w/encls. (via email only)
Andrea A. Suzuki, Esq., w/encls. (via email only)
Mr. William Eddy, DOW, w/encls. (via email only)
Mr. Gregg Fujikawa, DOW, w/encls. (via email only)
Mr. Dale A. Cua, Staff Planner, w/encls. (via email only)

TNWRE
Tom Nance Water
Resource Engineering

No. of pages: 7
Email: gallen@harbormall.net
mwg@kauai-law.com
greg@tnwre.com

Original ☑ will ☐ will not be mailed to you.

September 10, 2012
12-177 | 09-12

MEMORANDUM

To: Greg Allen

From: Tom Nance

Subject: Sizing and Layout of a Private Water System to Supply the Kapaa Highlands Project

Introduction

This memo and its attachments present the sizing and layout of major infrastructure elements of a private water system that would be developed to supply the Kapaa Highlands project. The basis of the water system sizing assumes the project would be developed in two phases. Phase 1 would consist of 16 residential units on five lots in an agricultural subdivision. Phase 2 would consist of an urban residential development comprised of 86 SF residential units, 683 MF residential units, and parks (3.1 ac.), church (0.8 ac.), commercial (0.4 ac.), roads (9.4 ac.), and unirrigated open space (14.3 ac.). In the event that land use entitlements are not obtained for the residential development, Phase 2 would consist of 34 residential units on seven lots in an agricultural subdivision.

Required Water Supply

Due to the size of the residential lots in the agricultural subdivision, which vary from 1.47 to 6.67 acres in size for the Phase 1 development, an allocation of 2000 GPD as the average demand per residential lot is recommended, a rate which is four times greater than the Kauai Department of Water (DOW) design standard for single family residential units. For the residential subdivision in Phase 2, use of DOW's design criteria is recommended. Based on these recommendations, Tables 1 and 2 are tabulations of the average and maximum day demands for the private water system. Maximum day demand is defined as 1.5 times the average demand, also in accord with DOW design standards.

Required Water System Capacities

Well Supply. DOW's design criterion for well pumping capacity is to provide the maximum day demand in a 24-hour pumping day with the largest well pump out of service. For Phase 1, this requirement amounts to 48,000 GPD, equivalent to 33 GPM. With the addition of the Phase 2 residential development, this requirement becomes 496,275 MGD, equivalent to 345 GPM. If Phase 2 was limited to the agricultural subdivision, the ultimate well supply requirement would be 150,000 GPD or 104 GPM.

A test well, identified as State No. 0419-05, was drilled and pump tested in October 2006. Over its 260-foot drilled depth, two aquifers were encountered. The upper aquifer can not provide a sufficient source of supply and it is also potentially subject to contamination due to its shallow depth. The lower and confined aquifer was reached at a depth of about 215 feet or 190 feet below sea level. Its piezometric head was about 13 feet above sea level or about 10 feet below ground. Pump testing showed that a properly designed well to exclusively tap this lower aquifer could develop up to 500 GPM of low salinity (chlorides of 55 MG/L), potable quality water. At its depth and overlying confining layers, it is not subject to contamination.

The low ground elevation (about 20 feet), high piezometric head (about 13 feet above sea level), and modest drawdown (3 feet or less at 350 GPM) provide the opportunity to develop one well configured with a pump sump that would enable two pumps to draw from the same well, thereby providing the necessary standby pumping capacity for a stand-alone system with a single well. The recommendation herein is to drill a new 12-inch well to 300-foot depth, complete it with a pump sump as shown on Figure 1, and outfit it with two, 25 horsepower, 350 GPM submersible pumps. Either of the 350 GPM pumps would provide the ultimate maximum demand requirement with the other providing full back-up capacity.

Reservoir Storage. With regard to the reservoir storage volume, DOW's two design criteria are appropriate for the private water system: (1) provide the maximum day demand with no credit for well inflow; and (2) provide the fire flowrate with coincident maximum day demand for the duration of the fire with the largest well pump out of service and the reservoir 3/4 full at the start of the fire. For the Phase 1 fire flowrate, DOW's standards require only 250 GPM for one hour. A stricter criterion of 500 GPM for two hours is used herein. Application of the two sizing criteria results in the required storage volumes tabulated below. In all cases, the maximum day sizing criterion governs.

Summary of Computed Required Reservoir Storage Volumes*

Design Criteria	Phase 1 Ag Subd.	Phase 2 Residential	Phased 2 Ag Subd.
(1) Maximum Day Demand (Gallons)	48,000	496,275	150,000
(2) Fire Flowrate			
- Fire Flowrate (GPM)	500	2000	500
- Fire Duration (Hours)	2	2	2
- Coincident Max. Demand (GPM)	33	345	104
- Well Inflow Credit (GPM)	350	350	350
- Required Storage Volume (Gallons)	29,280	319,200	40,640

*Phase 2 storage volumes include the Phase 1 requirement.

Based on the foregoing calculations, the recommended reservoir storage is as follows:

- For Phase 1, a 50,000-gallon storage tank would be installed.
- For the Phase 2 residential project, a second tank of 500,000-gallon capacity would be installed.
- In the event that Phase 2 consists of the 34 SF residential units in an agricultural subdivision, the second tank would be 100,000 gallons.
- All storage tanks would be lined and bolted steel with a concrete floor and passive cathodic protection.
- The tanks would be located at the project's highest elevation which is adjacent to residential Lot 7 in Phase 1. The Phase 1 and Phase 2 tanks would have identical floor and spillway elevations of 142 and 160 feet, respectively.
- Except at the project's lowest elevations, pumped delivery from the storage tanks will be necessary to provide adequate delivery pressures and fire flowrates. These pumping requirements are described in the section following.

Pumped Delivery for the Distribution System. DOW's design criteria for required delivery pressures are appropriate for this private water system. These are: (1) to provide a minimum of 40 psi residual pressure during the peak flowrate condition, with peak flowrate defined as three times the average demand; and (2) to provide a minimum 20 psi residual pressure at the critical hydrant during fire flowrate at that hydrant and coincident maximum day demand throughout the system.

The onsite storage reservoir elevations will not provide adequate gravity pressure to meet either of these criteria. In each development phase, this will require parallel domestic and fire flowrate pumping systems with a generator to provide back up power. For Phase 1, the pump systems would provide up to 70 GPM for peak domestic use and a 500 GPM fire pump. For the Phase 2 residential development, the domestic pumping capacity would be increased to 700 GPM and the fire pump to 2000 GPM. All pumping systems would be sized to produce a total dynamic head of 110 feet, in effect creating a single, 270-foot service pressure zone across the entire project site.

Water System Layout

Figure 2 illustrates all of the water system components described above with the assumption that Phase 2 would consist of the 769-unit residential development. By development phase, these would consist of:

Phase 1

- 12-inch, 300-foot deep well, pump sump, and two 350 GPM pumps in the pump sump located at the makai end of the Phase 1 development area.
- A dedicated 8-inch transmission pipeline from the well pumps to the storage reservoir.
- A 50,000-gallon storage tank.
- Parallel domestic and fire flowrate pump systems at the storage tank with backup generator power.
- A distribution pipeline loop consisting of 12-inch for the section that will also serve Phase 2 and 6-inch for the remainder of the loop.

Phase 2

- No change or additions to the well, well pumps, or transmission pipeline.
- Second storage tank of 500,000-gallon capacity.
- Substantial capacity increases for the parallel domestic and fire pumping systems and generator backup power.
- Distribution pipelines of 12-, 8-, and 6-inch size.

cc: Max Graham [Email Only]
greg@tnwre.com

Attachments

Table 1

Average and Maximum Day Demands for the
Phase 1 Agricultural Subdivision and Phase 2 Residential Development

Development Phase	Land Use	Design Criterion (GPD / Unit)	Average Demand (GPD)	Maximum Demand (GPD)
1	16 SF Residential	2,000	32,000	48,000
2	86 SF Residential	500	43,000	64,500
	683 MF Residential	350	239,050	358,575
	3.1 Ac. Parks	4,000	12,400	18,600
	0.8 Ac. Church	4,000	3,200	4,800
	0.4 Ac. Commercial	3,000	1,200	1,800
	Total for Phase 2		298,850	448,275
Total for Both Phases			330,850	496,275

Table 2

Average and Maximum Day Demands for Development of
Phases 1 and 2 as Agricultural Subdivisions

Development Phase	Land Use	Design Criterion (GPD / Unit)	Average Demand (GPD)	Maximum Demand (GPD)
1	16 SF Residential	2,000	32,000	48,000
2	34 SF Residential	2,000	68,000	102,000
Total for Both Phases			100,000	150,000

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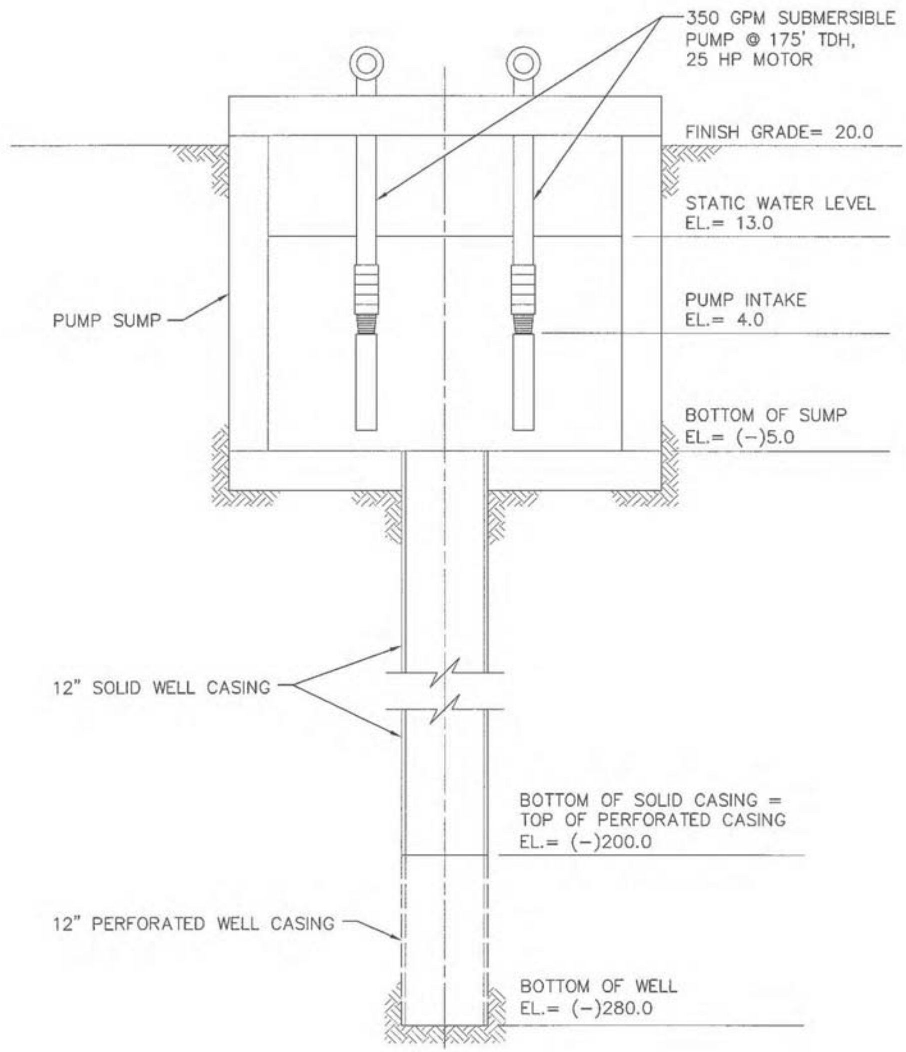

FIGURE 1
RECOMMENDED WELL DEVELOPMENT AND PUMP INSTALLATION
FOR THE KAPAA HIGHLANDS PROJECT
NOT TO SCALE

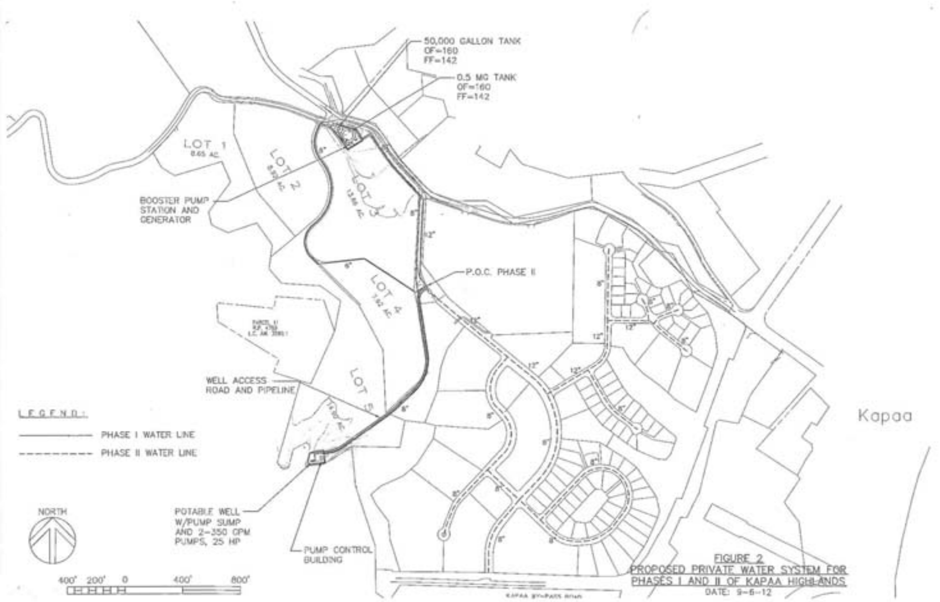

FIGURE 2
PROPOSED PRIVATE WATER SYSTEM FOR PHASES I AND II OF KAPAA HIGHLANDS
DATE: 9-6-12

TNWRE
Tom Nance Water
Resource Engineering

No. of pages: 7
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greg@tnwre.com

Original ☑ will ☐ will not be mailed to you.

September 12, 2012
12-183 | 09-12

MEMORANDUM

To:	Greg Allen
From:	Tom Nance
Subject:	Basis of Design of the Private Water System for the Kapaa Highlands Agricultural Subdivision

Introduction

This memo and its attachments describe the basis of design for a private water system to serve the 12-lot Kapaa Highlands Agricultural Subdivision. Figure 1 depicts the 12-agricultural lots and the 50-half acre homesites that ultimately would be developed on the 12 lots. The water system would consist of: one 12-inch, 300-foot deep well outfitted with two 100 GPM pumps, one of which would provide back-up capacity; two side-by-side and identical 50,000-gallon storage reservoirs located next to Homesite 7, the highest elevation on the property; two parallel pumping systems to provide pressure and flowrates for peak and fire flowrate conditions; and 8- and 6-inch distribution pipelines.

As described herein, there are differences between the standards used for the private system's design and the standards of the Kauai Department of Water (DOW). These differences are noted and discussed as appropriate in the sections following.

Required Water Supply

The agricultural use in the subdivision will be for raising goats for which no specific water allocation is made. An average demand of 1250 GPD for each of the 50-half acre homesites is recommended, a use rate which is 2.5 times DOW's standard for single family residential units. The higher use rate is an appropriate allowance due to the larger than typical size of the homesites.

For the 50 homesites, the total average demand is 62,500 GPD. In conformance with DOW's standards, maximum day use is defined as 1.5 times the average demand. For the 50 homesites, the total maximum day demand is 93,750 GPD.

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Required Well Supply

Well Configuration. A test well, identified as State No. 0419-05, was drilled and pump tested at the makai end of the project site in October 2006. Over its 260-foot drilled depth, two aquifers were encountered. The upper aquifer can not provide a sufficient source of supply and it is also potentially subject to contamination due to its shallow depth. The lower and confined aquifer was reached at a depth of about 215 feet or 190 feet below sea level. Its piezometric head was about 13 feet above sea level or about 10 feet below ground. Pump testing showed that a properly designed well to exclusively tap this lower aquifer could develop up to 500 GPM of low salinity (chlorides of 55 MG/L), potable quality water. At its depth and due to the presence of the overlying and poorly permeable confining layers, this lower aquifer is not subject to contamination.

The low ground elevation (about 20 feet), high piezometric head (about 13 feet above sea level), and modest drawdown provide the opportunity to develop one well configured with a pump sump that would enable two pumps to draw from the same well, thereby providing the necessary standby pumping capacity for a stand-alone system with a single well. The recommendation herein is to drill a new 12-inch well to 300-foot depth and complete it with a pump sump and two pumps as shown on Figure 2. This will enable one pump to provide the required supply and the other pump to provide full back up capacity.

Required Well Pumping Capacity. DOW's design criteria of having the well pumping capacity capable of delivering the maximum day use in a 24-hour pumping day with the largest well pump out of service is adopted for the private water system. The project's 93,750 GPD maximum day use translates to a required well pump capacity of 65 GPM. The proposal herein is to install two identical 100 GPM pumps, each driven by 7.5 horsepower motors. Either pump would provide the required capacity with the other as standby.

Reservoir Storage

DOW's two reservoir storage sizing criteria are appropriate for the private water system. The first, to provide the maximum day use with no credit for well inflow, translates to a required storage volume of 93,750 gallons. The second is to provide the fire flowrate plus the coincident maximum day demand for the duration of the fire with the reservoir 3/4 full at the start of the fire. There is credit for well inflow with the largest well pump considered to be out of service.

For an agricultural subdivision, DOW standards require a fire flowrate of 250 GPM for one hour. A stricter standard of 500 GPM for two hours is adopted for the private water system. With one of the two 100 GPM well pumps on, this higher fire flowrate and longer duration translates to reservoir storage of 74,417 gallons (calculation below). The first criterion governs.

$$\frac{4}{3}(120\text{ min})\left(500+\frac{93{,}750}{1{,}440}-100\right)=74{,}417\text{ gallons}$$

Proposed reservoir storage consists of two, side-by-side and identical 50,000-gallon tanks with 142- and 160-foot floor and spillway elevations, respectively. The storage tanks would be lined and bolted steel with reinforced concrete base and passive cathodic protection consisting of zinc anode rods suspended in the water. DOW's standards require storage tanks to be constructed of reinforced concrete. However, lined and bolted steel tanks have a successful operating history in Hawaii. With two side-by-side tanks, one can be taken offline when necessary for maintenance with no interruption of service to customers.

Pumping Systems for Peak and Fire Flowrate Design Conditions

DOW's design criteria for required delivery pressures are appropriate for this private water system. These are: (1) to provide a minimum of 40 psi residual pressure during the peak flowrate condition, with peak flowrate defined as three times the average demand; and (2) to provide a minimum 20 psi residual pressure at the critical hydrant during fire flowrate at that hydrant and coincident maximum day demand throughout the system.

The onsite storage reservoir elevations will not provide adequate gravity pressure to meet either of these delivery pressure requirements. Providing the necessary pressure would be done with parallel domestic and fire flowrate pumping systems with a generator to provide back up power. These pump systems would provide up to 70 GPM for peak domestic use and 500 GPM for the fire flowrate condition. Both pumping systems would be sized to produce a total dynamic head of 110 feet, in effect creating a single, 270-foot service pressure zone across the entire project site.

Distribution Pipelines

The design criteria used for pipeline sizing for the private system are equivalent to DOW's standards. Pipelines shall be sized to provide: (1) fire flowrate with coincident maximum day demand and a minimum residual pressure of 20 psi at the critical hydrant with velocities not exceeding 10 fps; and (2) peak flowrate with a minimum residual pressure of 40 psi and a maximum velocity in pipelines of 6 fps.

DOW's standards require pipelines to be of ductile iron or PVC, the latter conforming to ASTM C-900. However, NSF-approved, high density polyethylene (HPDE) pipes will be used for the private water system. SDR (pressure ratings) of the HDPE pipe will be selected so as not to exceed 80 percent of the recommended working pressure rating. Hazen-Williams "C" values of 130 will be used for all

September 12, 2012
12-183 | 09-12

HDPE pipes. This is less (ie. more conservative) than manufacturer's suggested values of 140 to 150 but greater than DOW's standards for ductile iron and PVC pipes.

Water System Layout

Figure 3 illustrates the water system components as described above. There would be a dedicated 6-inch pipeline from the well to the storage tanks. Distribution pipeline sizing, driven by the fire flowrate sizing criterion, would be 8- and 6-inch to the last hydrants and 4-inch beyond the last hydrants.

cc: Max Graham [Email Only]
greg@tnwre.com

Attachments

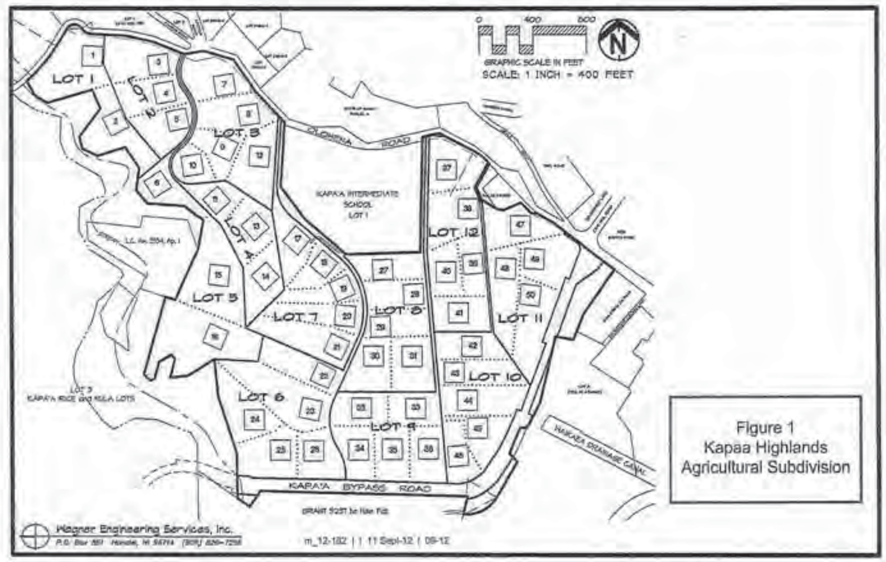

Figure 1
Kapaa Highlands
Agricultural Subdivision

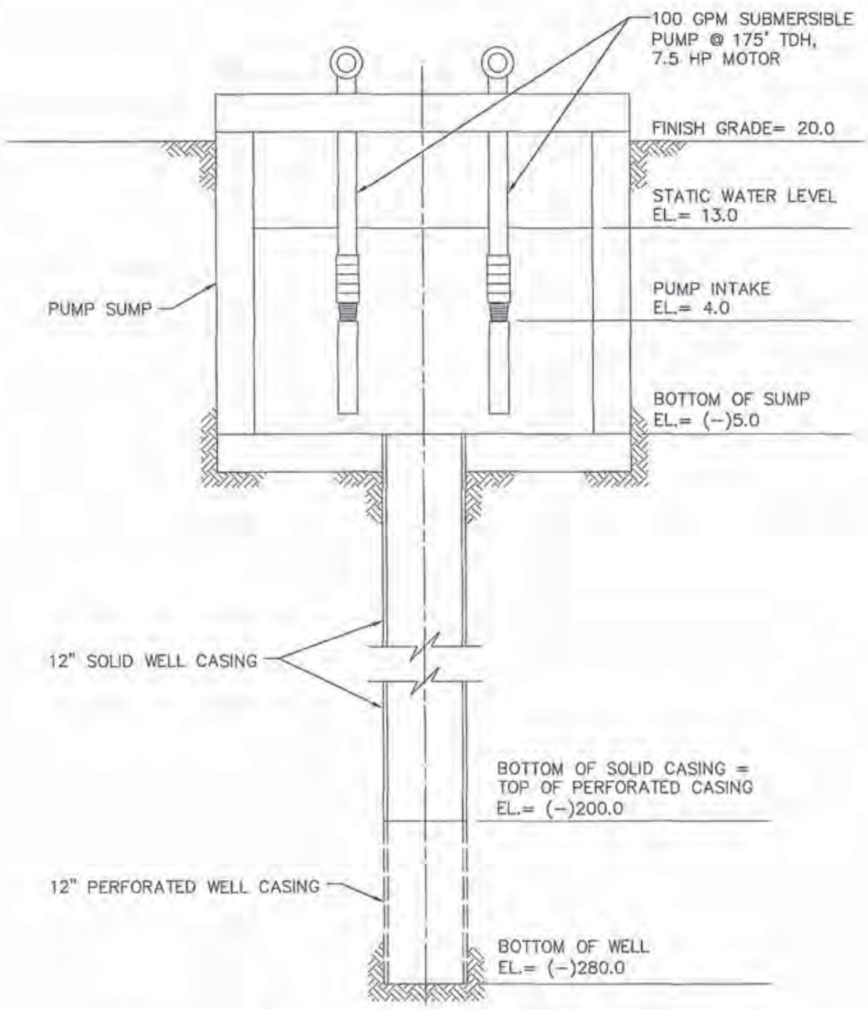

FIGURE 2
RECOMMENDED WELL DEVELOPMENT AND PUMP INSTALLATION FOR THE KAPAA HIGHLANDS AGRICULTURAL SUBDIVISION
NOT TO SCALE

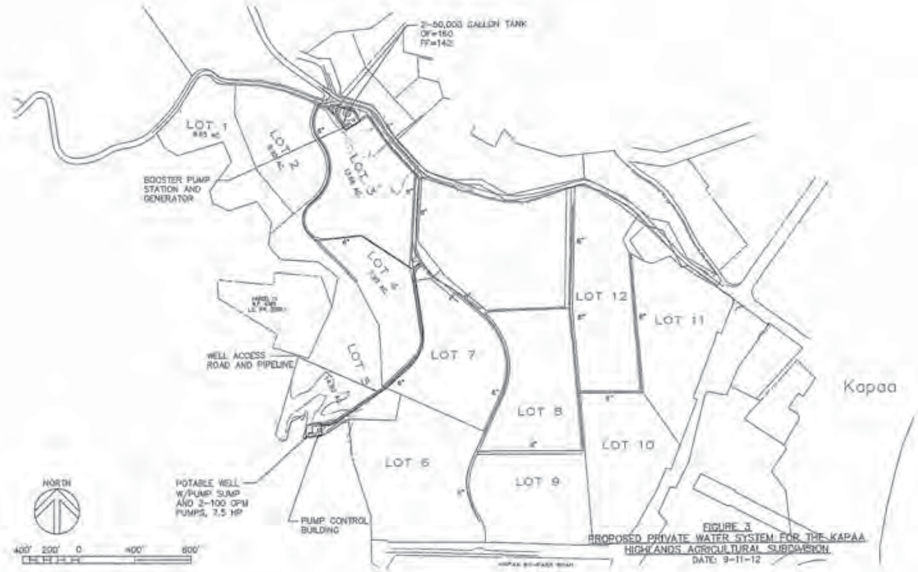

FIGURE 3
PROPOSED PRIVATE WATER SYSTEM FOR THE KAPAA HIGHLANDS AGRICULTURAL SUBDIVISION
DATE: 9-11-12

Table 1

Cost Estimate of the Major Water System Components for Kapaa Highlands Phase I

Item Description	Quantity	Unit	Unit Price	Amount	Total
Drill, Case, and Pump Test Supply Well					
Mobilization		LS		15,000	
Drill 12-Inch Pilot Hole	300	LF	150	45,000	
Video Log Pilot Hole	1	EA	2,500	2,500	
Test Pump Pilot Hole	1	EA	12,500	12,500	
Ream Pilot Hole to 19 Inches	300	LF	125	37,500	
12" Solid Casing	220	LF	175	38,500	
12" Perforated Casing	80	LF	200	16,000	
Furnishing and Installing grout	215	LF	60	12,900	
Plumbness and Alignment Test	1	EA	3,000	3,000	
Furnishing and Installing Test Pump	1	EA	15,000	15,000	
Development and Test Pumping	72	HRS	250	18,000	
Demobilization		LS		5,000	
Total					$220,900
Well Site Work and Pump Outfitting					
Site Earthwork	450	CY	50	22,500	
Site Basecourse	805	SY	20	16,100	
Site Fencing	348	LF	35	12,180	
Site Gate	1	EA	2,500	2,500	
Site Drainage System		LS		15,000	
Wet Well Sump and Cover at Well Casing		LS		60,000	
Submersible Pump (350 GPM, 4-Pole, 25 HP)	2	EA	45,000	90,000	
Discharge Unit, includes Support Pads and Piping		LS		25,000	
Pump Control Building		LS		35,000	
Chlorination System		LS		25,000	
Control Building Mechanical		LS		15,000	
Pump and Building Electrical		LS		50,000	
KIUC Transformer Pad and Ducts		LS		35,000	
Metering, Motor Control Center, SCADA System		LS		150,000	
Back Generator with Fuel Tank (60 KW)		LS		40,000	
Transfer Switch for Generator		LS		3,000	
KIUC Facility Charge for Service (OH Service Available)		LS		50,000	
Total					$646,280
New Well Access Road (from existing culdesac)					
Access Road Excavation and Preparation	1,530	LF	50	76,500	
Basecourse	3,400	SY	25	85,000	
Drainage and Erosion Control		LS		30,000	
Total					$191,500

Table 1

Cost Estimate of the Major Water System Components for Kapaa Highlands Phase I

Item Description	Quantity	Unit	Unit Price	Amount	Total
0.05 MG Tank					
Site Earthwork	1,935	CY	40	77,400	
Basecourse	1,890	SY	20	37,800	
Gravel Fill	452	SY	15	6,780	
Site Fencing	590	LF	35	20,650	
Site Gate	1	EA	2,500	2,500	
Site Drainage System		LS		20,000	
Tank Drainage System		LS		25,000	
Pipe Valves and Fittings		LS		15,000	
0.05 MG Steel Tank With Concrete Floor		LS		150,000	
Tank Level Transmitter System		LS		15,000	
Pipe and Tank Testing		LS		15,000	
Erosion and Dust Control		LS		10,000	
Construction Survey		LS		5,000	
Total					$400,130
Booster System					
Sitework for Booster Pump Station		LS		25,000	
Booster Station Connection Piping & Valves		LS		30,000	
Domestic Booster Pump Station (VFD 25 to 70 gpm, 5 HP)		LS		25,000	
Fire Pump Station (500 GPM at 110-ft TDH, 20 HP)		LS		80,000	
Power and Control Connections		LS		30,000	
MCC for both station with SCADA Controls		LS		125,000	
Back Generator with Fuel Tank (60 KW)		LS		50,000	
Transfer Switch for Generator		LS		3,000	
Total					$368,000
Pipeline in Phase I Subdivision (includes 8-inch well feed line)					
Main Installation Access and Site Preparation		LS		50,000	
12" HDPE Pipe	1,500	LF	85	127,500	
8" HDPE Pipe	3,115	LF	55	171,325	
6" HDPE Pipe	2,256	LF	40	90,240	
12" GV w/VB	2	EA	3,000	6,000	
8" GV w/VB	3	EA	2,500	7,500	
6" GV w/VB	2	EA	2,000	4,000	
12" DI Fittings	5	EA	1,800	9,000	
8" DI Fittings	6	EA	1,200	7,200	
6" DI Fittings	4	EA	800	3,200	
Fire Hydrant w/GV	5	EA	3,500	17,500	
Pipe Testing and Chlorination		LS		25,000	
Erosion and Dust Control		LS		30,000	
Construction Survey		LS		15,000	
Total					$563,465
Total for Construction					**$2,390,275**
Engineering Design (8%)					**190,725**
Construction Management (3%)					**73,000**
Total Cost					**$2,654,000**

Table 2

Cost Estimate of the Major Water System Components
for Kapaa Highlands Phase 2 Residential Project

Item Description	Quantity	Unit	Unit Price	Amount	Total
0.50 MG Tank and Booster Station					
Tank Foundation Earthwork	504	CY	40	20,160	
Basecourse	980	SY	20	19,600	
Tank Drainage System		LS		35,000	
Pipe Valves and Fittings		LS		30,000	
0.50 MG Steel Tank With Concrete Floor		LS		750,000	
Tank Level Transmitter System		LS		15,000	
Pipe and Tank Testing		LS		20,000	
Erosion and Dust Control		LS		15,000	
Construction Survey		LS		5,000	
Total					$909,760
Booster System (Upgrade both Booster Pump Stations)					
Modify Booster Pump Station		LS		40,000	
Booster Station Connection Piping & Valves		LS		45,000	
Domestic Booster Pump Station (VFD 200 to 625 gpm, 25 HP)		LS		120,000	
Fire Pump Station (2000 GPM at 110-ft TDH, 75 HP)		LS		125,000	
Power and Control Connections		LS		30,000	
Modify Existing MCC for New Pump Stations		LS		80,000	
New Back Generator with Fuel Tank for Fire Pump (175kw)		LS		75,000	
Transfer Switch for Generator		LS		6,000	
Total					$521,000
Pipeline in Phase 2 Subdivision					
Main Installation Access and Site Preparation		LS		60,000	
12" HDPE Pipe	2,100	LF	85	178,500	
8" HDPE Pipe	6,830	LF	50	341,500	
12" GV w/VB	3	EA	3,000	9,000	
8" GV w/VB	10	EA	2,500	25,000	
12" DI Fittings	6	EA	1,800	10,800	
8" DI Fittings	15	EA	1,200	18,000	
Fire Hydrant w/GV	14	EA	3,500	49,000	
Pipe Testing and Chlorination		LS		40,000	
Erosion and Dust Control		LS		30,000	
Construction Survey		LS		15,000	
Total					$776,800

Total for Construction	**$2,207,560**
Engineering Design (8%)	**176,440**
Construction Management (3%)	**66,000**
Total Cost	**$2,450,000**

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Exhibit F

Preliminary Engineering Report Drainage Improvements
Kapa'a Highlands Phase II

EXHIBIT "F"

Preliminary Engineering Report
Drainage Improvements

KAPAA HIGHLANDS – PHASE II

Prepared for:
Greg Allen
161 Wailua Rd.
Kapa'a, HI 96746

Prepared by:
Honua Engineering, Inc.
P. O. Box 851
Hanalei, HI 96714

Project Description

The Kapa'a Highlands Subdivision is on former cane lands situated on a bluff adjacent to the coastal plain of Kapa'a Town. It is bordered by Olohena Road to the north and the Kapa'a Bypass Road on the south and east sides of the project. Kapa'a Intermediate School is near the middle of the north portion of the property. Phase I of the development will consist of five agricultural lots on the west side of the property. The remainder of the property to the south and east of the school are proposed to be developed during Phase II of the subdivision. The proposed Phase II development will consist of 86 single and 683 multi-family units, plus a neighborhood commercial site, parks, and a church site as shown on Exhibit 1. Ground elevation of the development ranges from 20 to 180 feet above mean sea level.

Per the County of Kauai's "Storm Water Runoff System Manual" 2001, all developments of this scope are required to maintain the existing stormwater flows and patterns as feasibly possible so that downstream properties are not subject to any additional stormwater flows that are created by the increases in impervious surfaces of the watershed by the proposed development. The report examines the existing drainage conditions of the property and the proposed measures to control the stormwater from the proposed Phase II development.

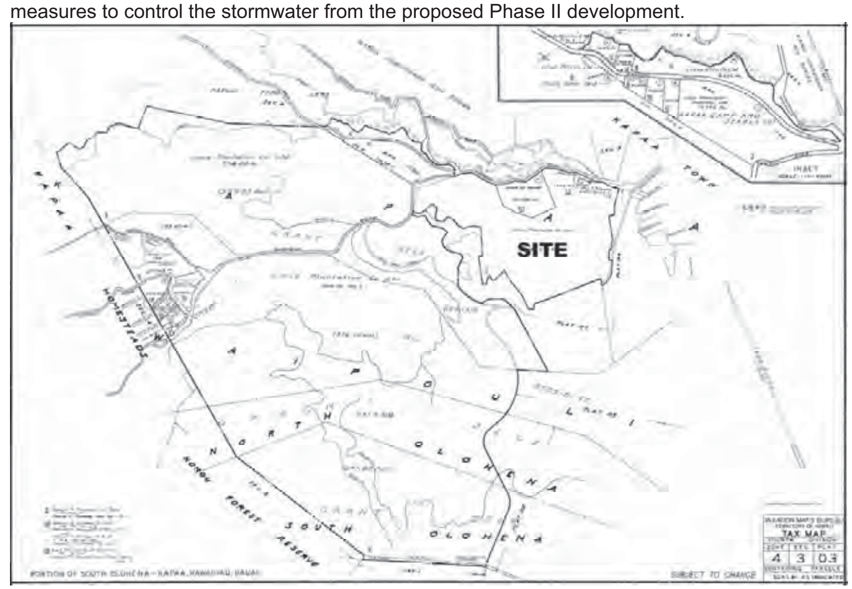

Figure 1: Tax Map Key 4-3-03 (4th Division)

Existing Conditions:

The property is located along Olohena Road about ½ mile mauka of Kapaa Town. The property rises from the coastal flat lands of Kapaa to an elevation of about 140 feet above mean sea level (msl). The Temporary Kapaa Bypass Road passes through a portion of the property along the east and south sides of the property. An unnamed stream flows along the west side of the property. The stream flows along the boundary, passes under a bridge on the By-Pass Road at the southwest corner of the property, and empties into the Waikaea drainage canal about 800' downstream from the property. Near the middle of the property on the north side, along Olohena Road, is the Kapaa Intermediate School site.

The Lihue Plantation had planted a majority of the 163-acre property in sugar cane, which since the property-changed owners has been allowed to go fallow. The Phase II portion of the property is approximately 97-acres. The fallow lands are presently overgrown with grass and remnant cane. A portion of the property on the northwest side near the unnamed stream is being used for cattle pasture. There are numerous abandoned irrigation ditches on the property that will be filled or rendered inoperable as the property is developed. There is also a small amount of the property that is overly steep for farming and is presently covered in brush and trees.

According to the Natural Resource Conservation Service (NRCS) soil survey the soils on the property are Ioleau and Puhi silt clay loams. The NRCS hydrologic classification for these soils is Group C for the Ioleau soils and Group B for the Puhi soils. Group B soils have a moderately low runoff potential, while the Group C soils have a moderately high runoff potential. Both soils are in Group I erosion resistance classification, which is the least erodible of the NRCS classifications.

The topography of the site varies from gently sloping, bluff top property, to steep areas that drop off into drainage gullies that lead to the unnamed stream and to the Bypass Road. The topography is illustrated on Exhibit 1 from aerial mapping done in 1975 for the County of Kauai.

Proposed Phase II:

The proposed Phase II development will consist of 86 single and 683 multi-family units, plus a neighborhood commercial site, parks, and a church site as shown on Exhibit 1. Stormwater generated from each of the Phase II lots will be directed to the nearest downstream street or natural drainageway. A drainage system along the streets will collect the stormwater and convey it to the detention basins shown on Exhibit 1. The detentions basins moderate the storm flows and allow infiltration back into the soil. They are sized so that the outlet peaks flows match or lower the existing stormwater flows prior to the development for both small rainfall events and the 100 year storm event.

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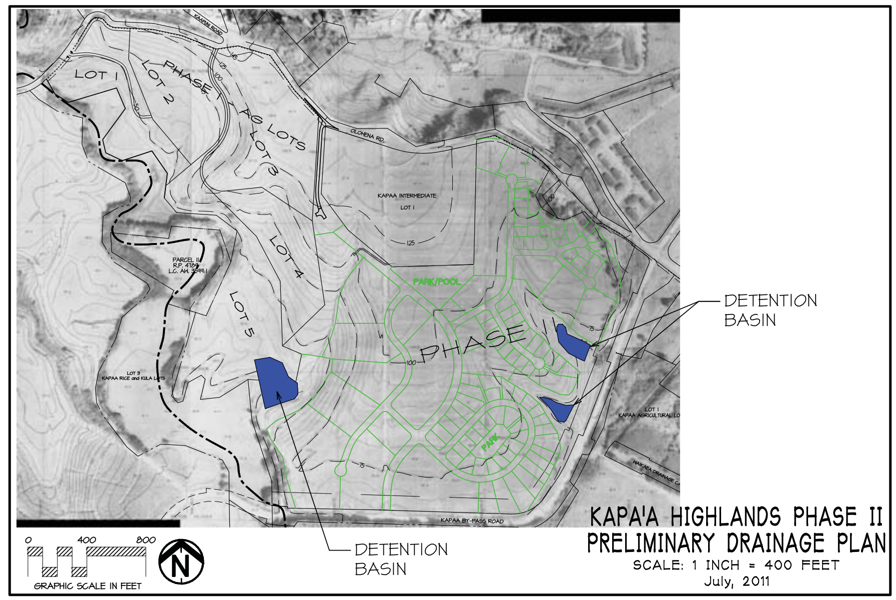


Exhibit G

Preliminary Engineering Report Wastewater Improvements
Kapa‘a Highlands Phase II

Preliminary Engineering Report
Wastewater Improvements

KAPAA HIGHLANDS – PHASE II

Prepared for:
Greg Allen
161 Wailua Rd.
Kapa’a, HI 96746

Prepared by:
Honua Engineering, Inc.
P. O. Box 851
Hanalei, HI 96714

July 11, 201i
Project No: 1892

EXHIBIT "G"

Project Description

The Kapa'a Highlands Subdivision is on former cane lands situated on a bluff adjacent to the coastal plain of Kapa'a Town. It is bordered by Olohena Road to the north and the Kapa'a Bypass Road on the south and east sides of the project. Kapa'a Intermediate School is near the middle of the north portion of the property. Phase I of the development will consist of five agricultural lots on the west side of the property. The remainder of the property to the south and east of the school are proposed to be developed during Phase II of the subdivision. The proposed Phase II development will consist of 86 single and 683 multi-family units, plus a neighborhood commercial site, parks, and a church site as shown on Exhibit 1. Ground elevation of the development ranges from 20 to 180 feet above mean sea level. Due to it's high density the Phase II development will require connection to the Wailua-Kapa'a Sewer System. The following report reviews the anticipated wastewater flows, the adequacy of the existing sewer collection system, and the proposed improvements needed to provide service for the development of Phase II.

Basis of Design

The *Sewer Design Standards, 1973* by the County of Kauai, Department of Public Works, together with the *Wailua Facility Plan, September 2008* by Fukunaga and Associates were the primary references for this report and will be abbreviated as SDS and WFP, respectively, when quoted in the report.

The WFP is a detailed study of the entire Wailua to Kapa'a wastewater system completed in 2008 to guide the County with the necessary expansion and management of the system through the year 2025. It broke down projected flows to the Wailua Treatment Plant in three phases, the current and near term flows up to the year 2010, middle term flows for the 2010-2015 period, and far term flows for the years 2015 to 2025.

Wailua-Kapa'a Average Daily Wastewater Flows[1]	
Planning Interval	Average Wastewater Flow (mgd)
Current	0.70
Near Term (2010)	0.98
Middle Term (2015)	1.39
Far Term at Wailua WWTP(2025)	1.72
Kapaa Start-Up (2025)	0.40

The need for the WFP was partially based upon the rapid development that was occurring in the Wailua-Kapaa area during 2004-2007 period. Development has slowed considerably since this time and several of the developments anticipated in the WFP calculations have been put on hold or are no longer proposed. Of the proposed developments, the Coco Palms Hotel will be removed from the near term anticipate flows and be considered part of the middle term flows. The Coconut Beach Resort and Coconut Plantation Village will be removed from the middle term flows and be considered for the far term flows.

The proposed Kapa'a Highlands development is not expected to be at total capacity by 2015, but for the purposes of this report, it will be considered to be completed in the middle term planning period of the WFP. The table below is the adjusted Average Daily Flows (ADF) based upon the current flow to the Wailua Treatment Plant and adjustments due to slower development than anticipated by WFP.

Adjusted Wailua-Kapa'a Average Daily Wastewater Flows	
Planning Interval	Average Wastewater Flow (mgd)
Current	0.70
Near Term (2010)	0.98
Middle Term (2015)	1.39
Far Term at Wailua WWTP(2025)	1.72

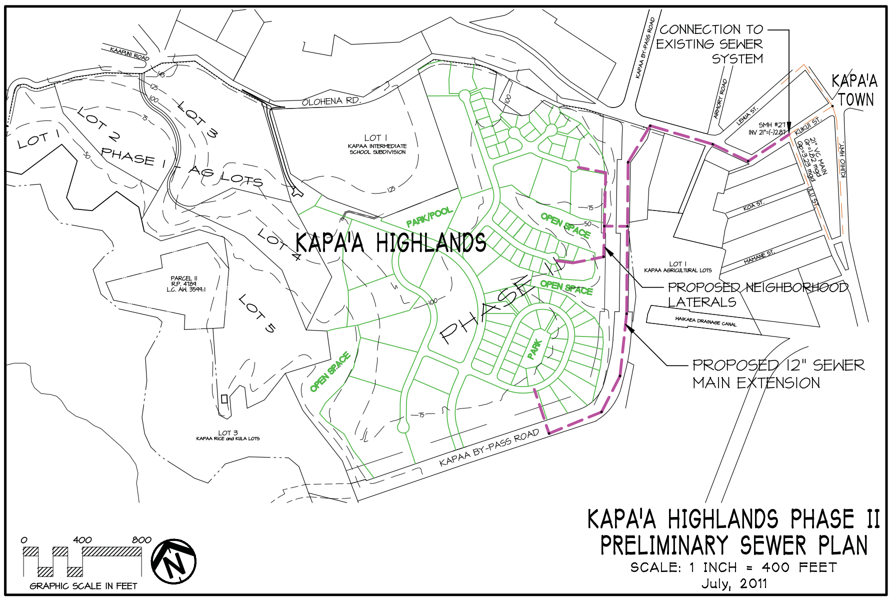
Kapa'a Highlands Phase II Wastewater Flow Estimates	
Item	Projected Wastewater Flow (gpd)
Single Family Homes	34,400
Multi-Family Homes	170,750
Neighborhood Commercial	4,800
Total	209,950

Note: Single Family Homes assumed to have 4 occupants/unit and Multi-Family Homes have 2.5 occupants/unit.

[1] Table ES-1, WFP, September 2008

Preliminary Design

Based upon the projected flow of 209,950 gpd (0.21 mgd), with a max load factor of 4.1, a 12" sewer main would be required to serve the development. The location of the main is shown on Exhibit 1. It would begin along the Kapa'a By-pass Road and terminate at an existing manhole near the intersection of Ulu and Kukui Streets. The length of the main within the existing public Right-of-Ways would be about 3,400 linear feet. At the existing manhole connection the existing main downstream of the connection is a 21" main with a capacity of 3.2 mgd. The 21" main currently has a peak flow of about 0.6 mgd, therefore the proposed flow is well within the capacity of the existing sewer system, including allowances for the future increases anticipated in the "Final Wailua Facility Plan", September 2008.



COMPUTATION OF SANITARY SEWAGE FLOW

SEWER: Kapaa
DISTRICT: Kawaihau YEAR: 2010
REFERENCE MAPS:

PAGE: 1 of 1
COMPUTED BY: BH
DATE: 3-9-10

SEWER LOCATION: DISTRICT ZONE OR STREET	FROM	TO	SANITARY SEWAGE (MGD): TRIBUTARY AREA (ACRES) INCREMENT	TRIBUTARY AREA (ACRES) TOTAL	TRIBUTARY POPULATION INCREMENT	TRIBUTARY POPULATION TOTAL	AVERAGE FLOW	SUMMATION AVERAGE FLOW	MAX FLOW FACTOR	MAX FLOW	INFILTRATION @ 1,250 or 2,750 GAD	SUMMATION INFILTRATION	PEAK FLOW	SEWER DESIGN: SIZE (in.)	SLOPE (ft/100 f)	CAPACITY (mgd)	AVERAGE VELOCITY (fps)	PEAK VELOCITY (fps)
Kapaa Highlands				67				0.21	4.1	0.86	1,250	0.08	0.94	12	1	2.3	2.6	4.2

Remarks:

EXHIBIT "H"

Updated Traffic Impact Report (TIAR)

By Traffic Management Consultant

Response to State DOT Comments

Comments by State DOT

Response to County DPW Comments

Comments by County DPW

THE TRAFFIC MANAGEMENT CONSULTANT

Randall S. Okaneku, P.E., Principal * 1188 Bishop Street, Suite 1907 * Honolulu, Hawaii 96813
Telephone: (808) 536-0223 * Facsimile: (808) 537-2985 * Email: TMCHawaii@aol.com

TMC Job No. 201708
October 3, 2017

State of Hawaii
Department of Transportation
Highways Division-Kauai District
1720 Haleukana Street
Lihu`e, Kauai, Hawai`i 96766

Attn.: Mr. Larry Dill, P.E., District Engineer

Dear Mr. Dill:

Subject: Traffic Impact Analysis Report Update
For the Proposed Hokua Place
Tax Map Key: (4) 4-3-003: Portion of 001
Kapa`a, Kauai, Hawaii

Thank you for the review comments in your letter, dated September 29, 2017, on the subject traffic study. Our responses follow:

Comment No. 1

Noted.

Comment No. 2

Noted.

Comment No. 3

The AM and PM Peak Hour Traffic Without Project rows of Table 6 summarize the capacity analysis under existing roadway conditions. The AM and PM Peak Hour Traffic With Project rows of Table 6 summarize the capacity analysis with the recommended site access improvements under Section V.B. of the TIAR Update. The AM and PM Peak Hour Traffic With Project – Improved rows in Table 6 summarize the capacity analysis of the recommended traffic improvements under Section V.A. of the TIAR Update.

Comment No. 4

Noted.

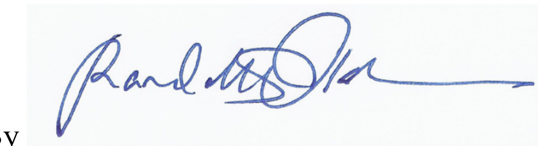
Comment No. 5

Noted.

If you require clarification on any of the above material or have any other questions, please do not hesitate to call me.

Very truly yours,

The Traffic Management Consultant

By 

Randall S. Okaneku, P. E.
Principal

DAVID Y. IGE
GOVERNOR

FORD N. FUCHIGAMI
DIRECTOR

Deputy Directors
JADE T. BUTAY
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

IN REPLY REFER TO:

HWAY-K 4.170445

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
KAUAI DISTRICT
1720 HALEUKANA STREET
LIHUE, HAWAII 96766

September 29, 2017

Randall S. Okaneku, P.E.
The Traffic Management Consultant
1188 Bishop Street, Suite 1907
Honolulu, Hawaii 96813

Dear Mr. Okaneku:

Subject: Traffic Impact Analysis Report Update
Hokua Place
Kapa'a, Kawaihau District, Island of Kaua'i
TMK: (4) 4-3-03: Por. 001

Thank you for submitting the updated Traffic Impact Analysis Report(TIAR) update that was transmitted via email on June 15, 2017. We have circulated the TIAR for comment through the Highways Division Planning Branch as well as the Traffic Branch. We have also reviewed the comments provided by the County of Kauai Department of Public Works Engineering Division on September 1, 2017.

The combined comments for the Hawaii Department of Transportation Highways Division are as follows:

1. The report discussed the projects that are proposed in the Kapaa Transportation Solutions Report dated August 2015. It should be noted that these projects may not be completed on schedule. Therefore, they should not be considered in this report.
2. It is understood that the proposed Road A will be funded and constructed by the developer.
3. Please clarify the scenarios in Table 7, Summary of Capacity Analysis. What assumed improvements are completed for AM/PM peak hour traffic without project, with project, and with project-improved.
4. Section V of the TIAR recommends traffic improvements without the project. Although these recommendations are appreciated, they are not a consideration for this development.
5. We concur with the comments provided by the County of Kauai Department of Engineering Division.

Please contact Raymond McCormick at 808-241-3015 by telephone or by email at Raymond.j.mccormick@hawaii.gov if you have comments or questions regarding this letter.

Sincerely,

Larry Dill, P.E.
District Engineer
For

THE TRAFFIC MANAGEMENT CONSULTANT

Randall S. Okaneku, P.E., Principal * 1188 Bishop Street, Suite 1907 * Honolulu, Hawaii 96813
Telephone: (808) 536-0223 * Facsimile: (808) 537-2985 * Email: TMCHawaii@aol.com

TMC Job No. 201708
October 3, 2017

Department of Public Works
County of Kauai
4444 Rice Street, Suite 275
Lihu`e, Kauai, Hawai`i 96766

Attn.: Mr. Michael Moule, P.E., Chief, Engineering Division

Dear Mr. Moule:

Subject: Traffic Impact Analysis Report Update
For the Proposed Hokua Place
Tax Map Key: (4) 4-3-003: Portion of 001
Kapa`a, Kauai, Hawaii

Thank you for the thorough review comments in your letter, dated September 1, 2017, on the subject traffic study. Our responses follow:

Comment No. 1 – Introduction, Project Description

a. Concur. The design of the intersection between the Phase 1 access road and Olohena Road, mauka of its intersection with Ka`apuni Road, will include the appropriate vertical and horizontal sight distances in accordance with the AASHTO A Policy on Geometric Design of Highways and Streets and the Hawaii Statewide Uniform Design Manual for Streets and Highways.

Comment No. 2 – Existing Roadways

a. Concur. The stated speed limits are intended to provide guidance to the design of the intersection of Road A and the Kapa`a Bypass Road.

b. Concur.

c. Concur.

Comment No. 3 – Existing Peak Hour Traffic Volumes and Operation Conditions

a. Noted. The traffic impact analysis is based upon the methodology presented in the Highway Capacity Manual (HCM). The HCM methodology consists of a series of mathematical calculations to determine roadway capacity, vehicle delay, vehicle queuing, etc. The LOS concept was defined in the HCM to translate the results of the complex calculations into a simplified "A" through "F" grading system.

b. Corrected. The second sentence in the last paragraph on Page 10 should read “South of Ulu Street, Kuhio Highway carried over 1,700 vph…”.

c. Corrected. The revised Figure 6 is attached. The PM peak hour of traffic from 3:45 PM to 4:45 PM on March 15, 2015 was selected for the intersection of Kuhio Highway and the Kapa`a Bypass Road because it corresponded with of the commuter PM peak hour traffic at the intersections in Kapa`a Town. The revised traffic data sheets for the intersection of Kuhio Highway and Kapa`a Bypass Road also are attached.

d. LOS, by definition, is the result of a series of mathematical calculations. For the purpose of the traffic impact analysis, the HCM methodology provides a common basis for comparing future traffic conditions without the proposed project and future traffic conditions with the proposed project.

Comment No. 4 – Kapa`a Transportation Solutions

a. Noted. The Kapa`a Transportation Solutions, cited in the TIAR Update, is dated August 2015. Please transmit the latest version of the Kapa`a traffic study.

b. Noted.

Comment No. 5 – Trip Generation Characteristics

a. Noted. The revised Table 6 is shown below:

Table 1. Hokua Place Trip Generation Characteristics

Land Use (ITE Code)	Units	AM Peak Hour (vph)			PM Peak Hour (vph)		
		Enter	Exit	Total	Enter	Exit	Total
Single-Family Phase 1 (265)	16 DU	5	16	21	13	7	20
Single-Family Phase 2 (265)	100 DU	20	60	80	66	38	104
Condominium/ Townhouse (230)	700 DU	52	256	308	244	120	364
Retail Center (820)	8,000 SFGFA	21	13	34	53	57	110
	Pass-By	0	0	0	(-)45	(-)45	(-)90
Total External Trips		**98**	**345**	**443**	**331**	**177**	**509**

b. The ITE Trip Generation Handbook cites a 9,000-square foot retail center, where 20 percent of the trip generation were primary trips. Comparing the retail center to smaller convenience markets, the Trip Generation Handbook listed sites where the primary trip percentages ranged from 8 percent to 28 percent of the PM peak period trip generation. The retail center is described in the DEIS as a neighborhood-oriented commercial center. Therefore, it is reasonable to assume that a significant portion of the retail trips will be generated from within the proposed project, which can be defined as “internal capture” or “diverted trips”.

Comment No. 6 – Site Access Improvements

a. Noted. The AM and PM peak hour traffic demands at the Olohena Road intersections at the Phase 1 Driveway and at Road A do not meet the AASHTO left-turn lane guidelines. During the AM peak hour of traffic, the advancing (mauka bound) volumes on Olohena Road do not meet the AASHTO minimum requirements. The left-turn demands at Road A and at the Phase 1 Driveway do not meet the AASHTO minimum left-turn volumes, during the PM peak hour of traffic. The Olohena Road intersections at Road A and the Phase 1 Driveway are expected to operate at satisfactory LOS during the AM peak hour of traffic. The Phase 1 Driveway also is expected to operate at satisfactory LOS at Olohena Road, during the PM peak hour of traffic. Road A is expected to operate at LOS "D", during the PM peak hour of traffic. However, the average delay of 26.7 seconds/vehicle on Road A is in the upper range of LOS "D". Therefore, a median refuge lane at Road A was not recommended at this time. Furthermore, separate left-turn and right-turn lanes on Road A would not improve the LOS.

Comment No. 7 – Traffic Assignment

a. The traffic assignment for the proposed project was primarily based upon the direction of peak hour traffic at the roundabout intersection of the Kapa`a Bypass Road and Olohena Road, where only about one third of Olohena Road traffic turns to/from the south leg of the Kapa`a Bypass Road. The Phase 2 development is concentrated on the makai half of the project site. Only the trips generated from the mauka-most portion of the site and the estimated AM peak hour school trips are expected to use the mauka access of Road A at Olohena Road.

b. The peak hour trip destinations, mauka of the Ka`apuni Road/Olohena Road intersection, are virtually nil, as observed in mauka bound/makai bound directional splits on Olohena Road. The retail trips generated from the mauka neighboring communities are represented in the "pass-by" trips using Road A.

Comment No. 8 – Figures 11 through 14 (Traffic Assignment)

a. The diverted peak hour trips on Road A are depicted on the attached Figures 12.1 and 14.1.

b. The revised Figure 11 is attached.

c. The revised Figure 13 is attached.

d. The revised Figure 14 is attached.

Comment No. 9 – PM Peak Hour Traffic Analysis With Project

a. The recommendation of extending the median refuge lane/two-way left-turn lane in Section V.A.7. of the TIAR Update is expected to mitigate the "bottle-neck" on Kuhio Highway, north of Lehua Street. Ultimately, the improvement of the north leg of the Kapa`a Bypass Road from a one-way roadway to a two-way bypass road is expected to improve traffic operations in Kapa`a Town.

Comment No. 10 – Recommendation of Traffic Improvements Without Project

a. Noted.

Comment No. 11 – Recommendation of Traffic Improvements With Project

a. Noted. While the MUTCD does not provide warrants for roundabout intersections, it does advise that a roundabout intersection can be considered as an alternative to traffic signal control. Based upon the TIAR Update, the intersection of Olohena Road and Road A is not expected to warrant all-way stop controls or traffic signals. Therefore, a roundabout intersection was not considered. However, a reassessment of the traffic operations at the Road A intersection at Olohena Road may be considered after the project is fully built out and occupied. A roundabout intersection was considered at the intersection of Olohena Road, Ka`apuni Road, and Kaehulua Road. However, based upon a preliminary assessment of the horizontal and vertical alignments of the intersecting roadways, it was determined that a roundabout intersection would not be feasible. The realignment of Kaehulua Road to form a four-legged intersection with the Olohena Road and Ka`apuni Road was recommended in Section V.A.6.

If you require clarification on any of the above material or have any other questions, please do not hesitate to call me.

Very truly yours,

The Traffic Management Consultant

By

Randall S. Okaneku, P. E.
Principal

Attachments:

Figure 6-Revised
Kuhio Hwy Kapa`a Bypass Rd Traffic Count Data-Revised
Figure 12.1
Figure 14.1
Figure 11-Revised
Figure 13-Revised
Figure 14-Revised

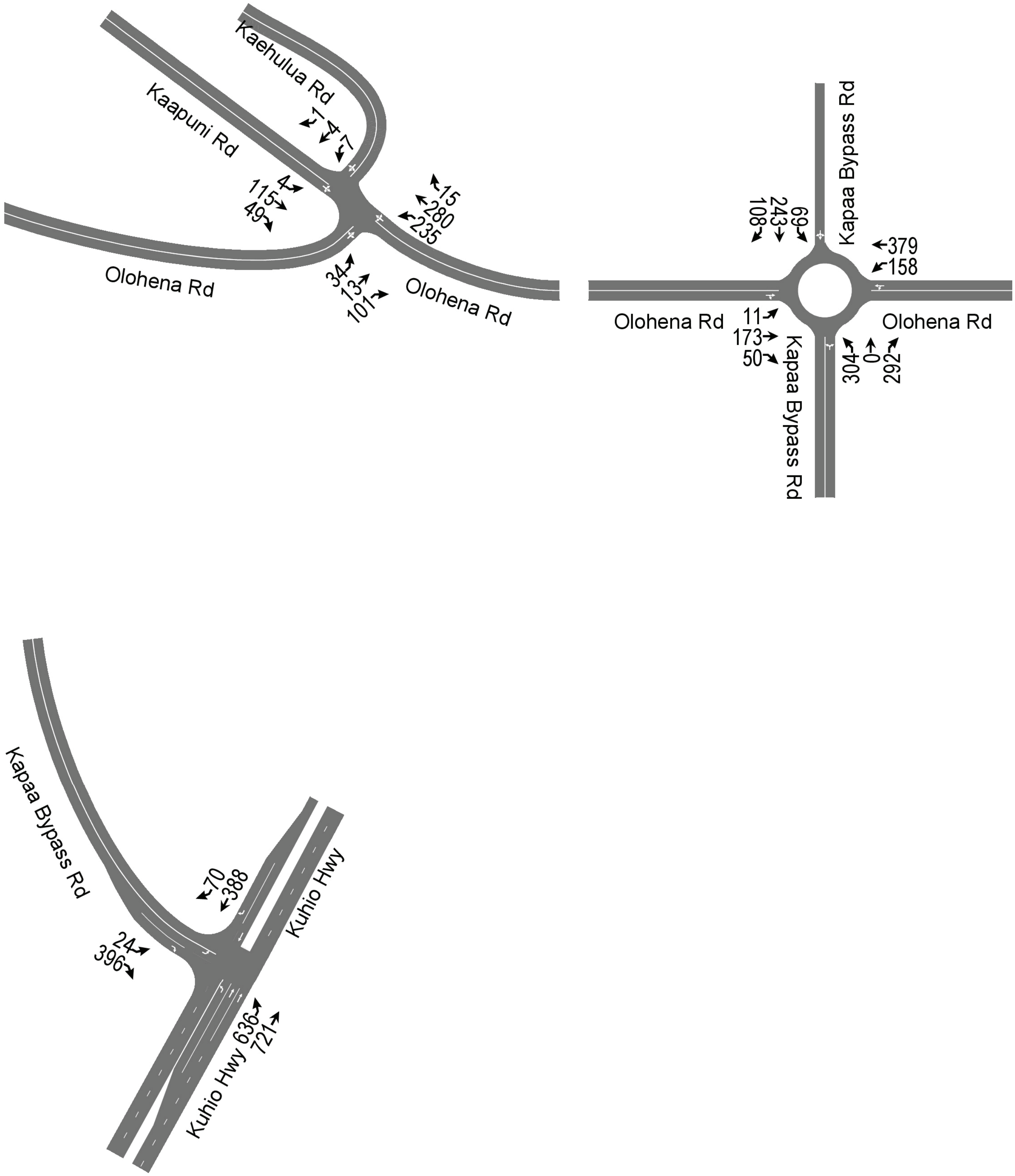


Figure 6. Existing PM Peak Hour Traffic (Cont'd.)

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Count Name: Kuhio Hwy Kapaa Bypass 3-15-17 to 3-17-17
Site Code: Hokua Place
Start Date: 03/15/2017
Page No: 1

Turning Movement Data

	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
Start Time	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:00 PM	1	105	0	106	99	191	0	290	0	106	5	0	111	507
3:15 PM	3	100	0	103	122	210	0	332	0	88	7	0	95	530
3:30 PM	8	93	0	101	120	207	0	327	0	73	8	0	81	509
3:45 PM	8	104	0	112	148	201	0	349	0	88	21	0	109	570
Hourly Total	20	402	0	422	489	809	0	1298	0	355	41	0	396	2116
4:00 PM	1	108	0	109	168	161	0	329	0	91	16	0	107	545
4:15 PM	9	94	0	103	154	172	0	326	0	97	14	0	111	540
4:30 PM	6	90	0	96	166	187	0	353	0	112	19	0	131	580
4:45 PM	2	95	0	97	146	176	0	322	0	112	15	0	127	546
Hourly Total	18	387	0	405	634	696	0	1330	0	412	64	0	476	2211
5:00 PM	5	88	0	93	149	232	0	381	0	138	27	0	165	639
5:15 PM	2	91	0	93	149	192	0	341	0	152	25	0	177	611
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	7	179	0	186	298	424	0	722	0	290	52	0	342	1250
6:30 AM	0	78	0	78	14	124	0	138	0	203	0	0	203	419
6:45 AM	2	116	0	118	8	124	0	132	0	190	1	0	191	441
Hourly Total	2	194	0	196	22	248	0	270	0	393	1	0	394	860
7:00 AM	1	161	0	162	20	129	0	149	0	233	0	0	233	544
7:15 AM	1	184	0	185	25	155	0	180	0	200	1	0	201	566
7:30 AM	2	152	0	154	24	152	0	176	0	167	0	0	167	497
7:45 AM	1	155	1	156	33	180	0	213	0	135	0	0	135	504
Hourly Total	5	652	1	657	102	616	0	718	0	735	1	0	736	2111
8:00 AM	0	150	0	150	24	187	0	211	0	132	1	0	133	494
8:15 AM	3	131	0	134	21	177	0	198	0	165	0	0	165	497
8:30 AM	3	130	0	133	33	191	0	224	0	161	1	0	162	519
8:45 AM	1	108	0	109	25	209	0	234	0	189	0	0	189	532
Hourly Total	7	519	0	526	103	764	0	867	0	647	2	0	649	2042
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	5	103	0	108	97	217	0	314	0	96	6	0	102	524
3:15 PM	8	117	0	125	131	156	0	287	0	84	9	0	93	505
3:30 PM	6	83	0	89	138	227	0	365	1	76	8	0	85	539
3:45 PM	2	87	1	89	119	182	0	301	0	76	7	0	83	473
Hourly Total	21	390	1	411	485	782	0	1267	1	332	30	0	363	2041
4:00 PM	2	122	0	124	126	152	0	278	0	96	7	0	103	505
4:15 PM	6	109	1	115	136	158	0	294	0	95	6	0	101	510
4:30 PM	6	96	1	102	143	174	0	317	0	78	2	0	80	499
4:45 PM	5	93	0	98	138	181	0	319	0	83	6	0	89	506
Hourly Total	19	420	2	439	543	665	0	1208	0	352	21	0	373	2020
5:00 PM	2	98	0	100	146	204	0	350	0	85	3	0	88	538
5:15 PM	4	113	0	117	121	159	0	280	0	92	2	0	94	491
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	6	211	0	217	267	363	0	630	0	177	5	0	182	1029
6:30 AM	0	82	0	82	11	115	0	126	0	185	0	0	185	393
6:45 AM	0	89	0	89	10	126	0	136	0	164	3	0	167	392
Hourly Total	0	171	0	171	21	241	0	262	0	349	3	0	352	785
7:00 AM	1	131	0	132	17	133	0	150	0	219	1	0	220	502
7:15 AM	3	168	0	171	32	158	0	190	0	182	3	0	185	546
7:30 AM	1	125	0	126	40	146	0	186	0	166	2	0	168	480
7:45 AM	1	123	0	124	30	165	0	195	0	138	0	0	138	457
Hourly Total	6	547	0	553	119	602	0	721	0	705	6	0	711	1985
8:00 AM	4	116	0	120	20	169	0	189	0	150	0	0	150	459
8:15 AM	1	125	0	126	28	158	0	186	0	133	2	0	135	447
Grand Total	116	4313	4	4429	3131	6537	0	9668	1	5030	228	0	5259	19356
Approach %	2.6	97.4	-	-	32.4	67.6	-	-	0.0	95.6	4.3	-	-	-
Total %	0.6	22.3	-	22.9	16.2	33.8	-	49.9	0.0	26.0	1.2	-	27.2	-
Lights	114	4214	-	4328	3083	6353	-	9436	1	4901	225	-	5127	18891
% Lights	98.3	97.7	-	97.7	98.5	97.2	-	97.6	100.0	97.4	98.7	-	97.5	97.6
Mediums	2	91	-	93	47	171	-	218	0	115	3	-	118	429
% Mediums	1.7	2.1	-	2.1	1.5	2.6	-	2.3	0.0	2.3	1.3	-	2.2	2.2
Articulated Trucks	0	8	-	8	1	13	-	14	0	14	0	-	14	36
% Articulated Trucks	0.0	0.2	-	0.2	0.0	0.2	-	0.1	0.0	0.3	0.0	-	0.3	0.2
All Pedestrians	-	-	4	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

Kuhio Hwy [Makai]

Exit	Enter	Total
6467	5127	11594
173	118	291
13	14	27
0	0	0
6653	**5259**	**11912**

RT	Th	LT	Ped
225	4901	1	0
3	115	0	0
0	14	0	0
0	0	0	0
228	**5030**	**1**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
3308	4328	7636
50	93	143
1	8	9
0	0	0
3359	**4429**	**7788**

Ped	RT	LT
0	4214	114
0	91	2
0	8	0
4	0	0
4	**4313**	**116**

03/15/2017 3:00 PM
Ending At
03/17/2017 8:30 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [Ewa]

Exit	Enter	Total
1	0	1
0	0	0
0	0	0
0	0	0
1	**0**	**1**

LT	Th	Ped
3083	6353	0
47	171	0
1	13	0
0	0	0
3131	**6537**	**0**

Exit	Enter	Total
9115	9436	18551
206	218	424
22	14	36
0	0	0
9343	**9668**	**19011**

Kuhio Hwy [Mauka]

Turning Movement Data Plot

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
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Turning Movement Peak Hour Data (3:45 PM)

Start Time	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:45 PM	8	104	0	112	148	201	0	349	0	88	21	0	109	570
4:00 PM	1	108	0	109	168	161	0	329	0	91	16	0	107	545
4:15 PM	9	94	0	103	154	172	0	326	0	97	14	0	111	540
4:30 PM	6	90	0	96	166	187	0	353	0	112	19	0	131	580
Total	24	396	0	420	636	721	0	1357	0	388	70	0	458	2235
Approach %	5.7	94.3	-	-	46.9	53.1	-	-	0.0	84.7	15.3	-	-	-
Total %	1.1	17.7	-	18.8	28.5	32.3	-	60.7	0.0	17.4	3.1	-	20.5	-
PHF	0.667	0.917	-	0.938	0.946	0.897	-	0.961	0.000	0.866	0.833	-	0.874	0.963
Lights	24	390	-	414	633	712	-	1345	0	377	69	-	446	2205
% Lights	100.0	98.5	-	98.6	99.5	98.8	-	99.1	-	97.2	98.6	-	97.4	98.7
Mediums	0	6	-	6	3	9	-	12	0	11	1	-	12	30
% Mediums	0.0	1.5	-	1.4	0.5	1.2	-	0.9	-	2.8	1.4	-	2.6	1.3
Articulated Trucks	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
All Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The Traffic Management Consultant
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Peak Hour Data

03/15/2017 3:45 PM
Ending At
03/15/2017 4:45 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [Makai]

Exit	Enter	Total
736	446	1182
9	12	21
0	0	0
0	0	0
745	**458**	**1203**

RT	Th	LT	Ped
69	377	0	0
1	11	0	0
0	0	0	0
0	0	0	0
70	**388**	**0**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
702	414	1116
4	6	10
0	0	0
0	0	0
706	**420**	**1126**

LT	RT	Ped
24	390	0
0	6	0
0	0	0
0	0	0
24	**396**	**0**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Kuhio Hwy [Mauka]

LT	Th	Ped
633	712	0
3	9	0
0	0	0
0	0	0
636	**721**	**0**

Exit	Enter	Total
767	1345	2112
17	12	29
0	0	0
0	0	0
784	**1357**	**2141**

Turning Movement Peak Hour Data Plot (3:45 PM)

The Traffic Management Consultant
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808-536-0223 tmchawaii@aol.com

Turning Movement Peak Hour Data (7:00 AM)

	Kapaa Bypass Rd				Kuhio Hwy				Kuhio Hwy					
	Koko Head Bound				Mauka Bound				Makai Bound					
Start Time	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:00 AM	1	161	0	162	20	129	0	149	0	233	0	0	233	544
7:15 AM	1	184	0	185	25	155	0	180	0	200	1	0	201	566
7:30 AM	2	152	0	154	24	152	0	176	0	167	0	0	167	497
7:45 AM	1	155	1	156	33	180	0	213	0	135	0	0	135	504
Total	5	652	1	657	102	616	0	718	0	735	1	0	736	2111
Approach %	0.8	99.2	-	-	14.2	85.8	-	-	0.0	99.9	0.1	-	-	-
Total %	0.2	30.9	-	31.1	4.8	29.2	-	34.0	0.0	34.8	0.0	-	34.9	-
PHF	0.625	0.886	-	0.888	0.773	0.856	-	0.843	0.000	0.789	0.250	-	0.790	0.932
Lights	4	635	-	639	100	600	-	700	0	711	1	-	712	2051
% Lights	80.0	97.4	-	97.3	98.0	97.4	-	97.5	-	96.7	100.0	-	96.7	97.2
Mediums	1	14	-	15	2	16	-	18	0	23	0	-	23	56
% Mediums	20.0	2.1	-	2.3	2.0	2.6	-	2.5	-	3.1	0.0	-	3.1	2.7
Articulated Trucks	0	3	-	3	0	0	-	0	0	1	0	-	1	4
% Articulated Trucks	0.0	0.5	-	0.5	0.0	0.0	-	0.0	-	0.1	0.0	-	0.1	0.2
All Pedestrians	-	-	1	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

The Traffic Management Consultant
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Peak Hour Data

03/16/2017 7:00 AM
Ending At
03/16/2017 8:00 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [Makai]

Exit	Enter	Total
604	712	1316
17	23	40
0	1	1
0	0	0
621	**736**	**1357**

RT	Th	LT	Ped
1	711	0	0
0	23	0	0
0	1	0	0
0	0	0	0
1	**735**	**0**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
101	639	740
2	15	17
0	3	3
0	0	0
103	**657**	**760**

LT	RT	Ped
4	635	0
1	14	0
0	3	0
0	0	1
5	**652**	**1**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
100	600	0
2	16	0
0	0	0
0	0	0
102	**616**	**0**

Kuhio Hwy [Mauka]

Exit	Enter	Total
1346	700	2046
37	18	55
4	0	4
0	0	0
1387	**718**	**2105**

Turning Movement Peak Hour Data Plot (7:00 AM)

The Traffic Management Consultant
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Honolulu, Hawaii, United States 96813
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Turning Movement Peak Hour Data (4:15 PM)

	Kapaa Bypass Rd				Kuhio Hwy				Kuhio Hwy					
	Koko Head Bound				Mauka Bound				Makai Bound					
Start Time	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
4:15 PM	6	109	1	115	136	158	0	294	0	95	6	0	101	510
4:30 PM	6	96	1	102	143	174	0	317	0	78	2	0	80	499
4:45 PM	5	93	0	98	138	181	0	319	0	83	6	0	89	506
5:00 PM	2	98	0	100	146	204	0	350	0	85	3	0	88	538
Total	19	396	2	415	563	717	0	1280	0	341	17	0	358	2053
Approach %	4.6	95.4	-	-	44.0	56.0	-	-	0.0	95.3	4.7	-	-	-
Total %	0.9	19.3	-	20.2	27.4	34.9	-	62.3	0.0	16.6	0.8	-	17.4	-
PHF	0.792	0.908	-	0.902	0.964	0.879	-	0.914	0.000	0.897	0.708	-	0.886	0.954
Lights	19	385	-	404	558	710	-	1268	0	337	17	-	354	2026
% Lights	100.0	97.2	-	97.3	99.1	99.0	-	99.1	-	98.8	100.0	-	98.9	98.7
Mediums	0	11	-	11	5	7	-	12	0	4	0	-	4	27
% Mediums	0.0	2.8	-	2.7	0.9	1.0	-	0.9	-	1.2	0.0	-	1.1	1.3
Articulated Trucks	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
All Pedestrians	-	-	2	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Kuhio Hwy [Makai]

Exit	Enter	Total
729	354	1083
7	4	11
0	0	0
0	0	0
736	**358**	**1094**

RT	Th	LT	Ped
17	337	0	0
0	4	0	0
0	0	0	0
0	0	0	0
17	**341**	**0**	**0**

Peak Hour Data

03/16/2017 4:15 PM
Ending At
03/16/2017 5:15 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
575	404	979
5	11	16
0	0	0
0	0	0
580	**415**	**995**

Ped	RT	LT
0	385	19
0	11	0
0	0	0
2	0	0
2	**396**	**19**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
558	710	0
5	7	0
0	0	0
0	0	0
563	**717**	**0**

Exit	Enter	Total
722	1268	1990
15	12	27
0	0	0
0	0	0
737	**1280**	**2017**

Kuhio Hwy [Mauka]

Turning Movement Peak Hour Data Plot (4:15 PM)

The Traffic Management Consultant
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Honolulu, Hawaii, United States 96813
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Turning Movement Peak Hour Data (7:00 AM)

	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
Start Time	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:00 AM	1	131	0	132	17	133	0	150	0	219	1	0	220	502
7:15 AM	3	168	0	171	32	158	0	190	0	182	3	0	185	546
7:30 AM	1	125	0	126	40	146	0	186	0	166	2	0	168	480
7:45 AM	1	123	0	124	30	165	0	195	0	138	0	0	138	457
Total	6	547	0	553	119	602	0	721	0	705	6	0	711	1985
Approach %	1.1	98.9	-	-	16.5	83.5	-	-	0.0	99.2	0.8	-	-	-
Total %	0.3	27.6	-	27.9	6.0	30.3	-	36.3	0.0	35.5	0.3	-	35.8	-
PHF	0.500	0.814	-	0.808	0.744	0.912	-	0.924	0.000	0.805	0.500	-	0.808	0.909
Lights	5	535	-	540	113	569	-	682	0	688	6	-	694	1916
% Lights	83.3	97.8	-	97.6	95.0	94.5	-	94.6	-	97.6	100.0	-	97.6	96.5
Mediums	1	10	-	11	5	29	-	34	0	15	0	-	15	60
% Mediums	16.7	1.8	-	2.0	4.2	4.8	-	4.7	-	2.1	0.0	-	2.1	3.0
Articulated Trucks	0	2	-	2	1	4	-	5	0	2	0	-	2	9
% Articulated Trucks	0.0	0.4	-	0.4	0.8	0.7	-	0.7	-	0.3	0.0	-	0.3	0.5
All Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Peak Hour Data

03/17/2017 7:00 AM
Ending At
03/17/2017 8:00 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [Makai]

Exit	Enter	Total
574	694	1268
30	15	45
4	2	6
0	0	0
608	**711**	**1319**

RT	Th	LT	Ped
6	688	0	0
0	15	0	0
0	2	0	0
0	0	0	0
6	**705**	**0**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
119	540	659
5	11	16
1	2	3
0	0	0
125	**553**	**678**

LT	RT	Ped
5	535	0
1	10	0
0	2	0
0	0	0
6	**547**	**0**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
113	569	0
5	29	0
1	4	0
0	0	0
119	**602**	**0**

Exit	Enter	Total
1223	682	1905
25	34	59
4	5	9
0	0	0
1252	**721**	**1973**

Kuhio Hwy [Mauka]

Turning Movement Peak Hour Data Plot (7:00 AM)

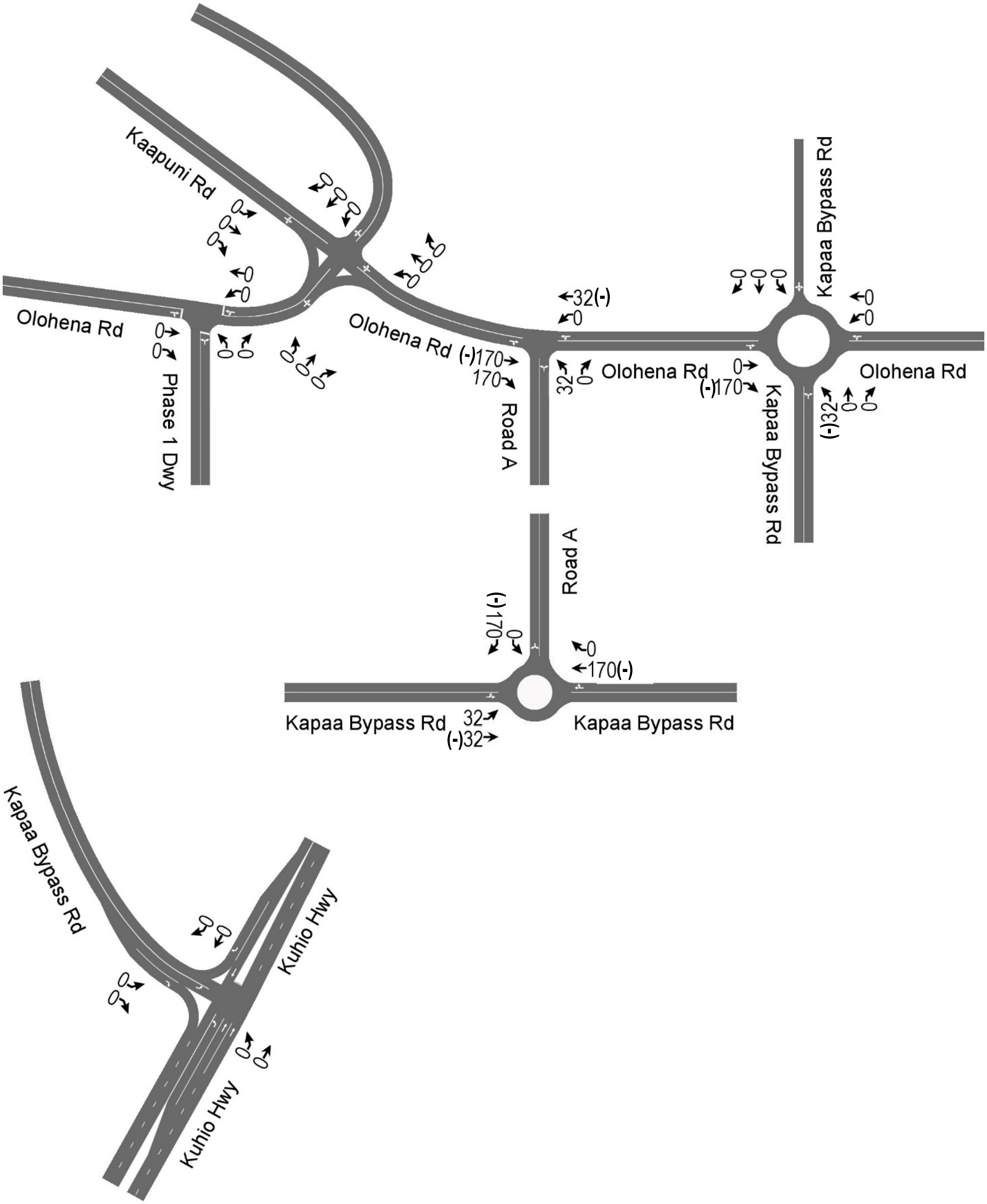

Figure 12.1 AM Peak Hour Diverted Traffic Assignment

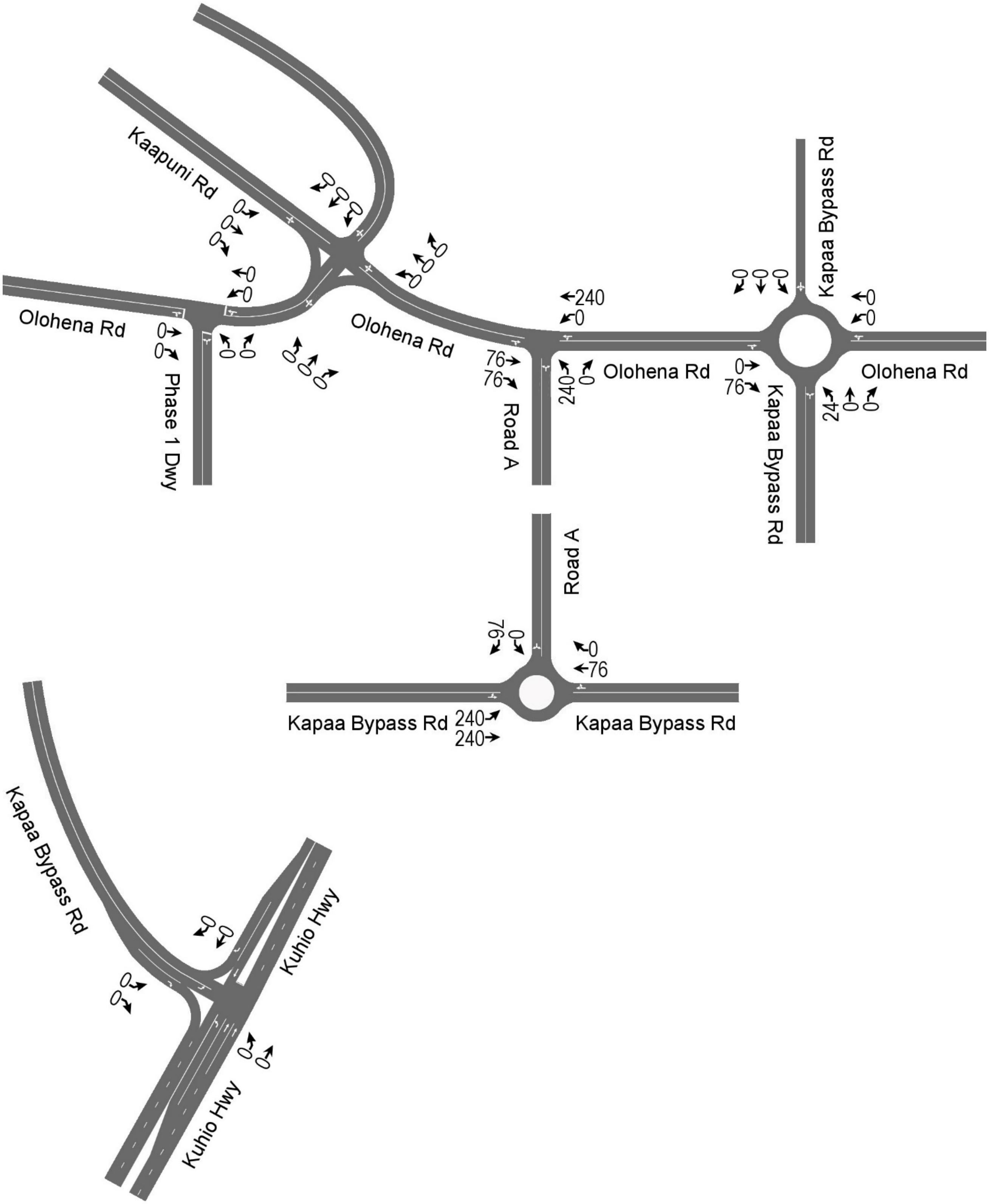

Figure 14.1 PM Peak Hour Diverted Traffic Assignment

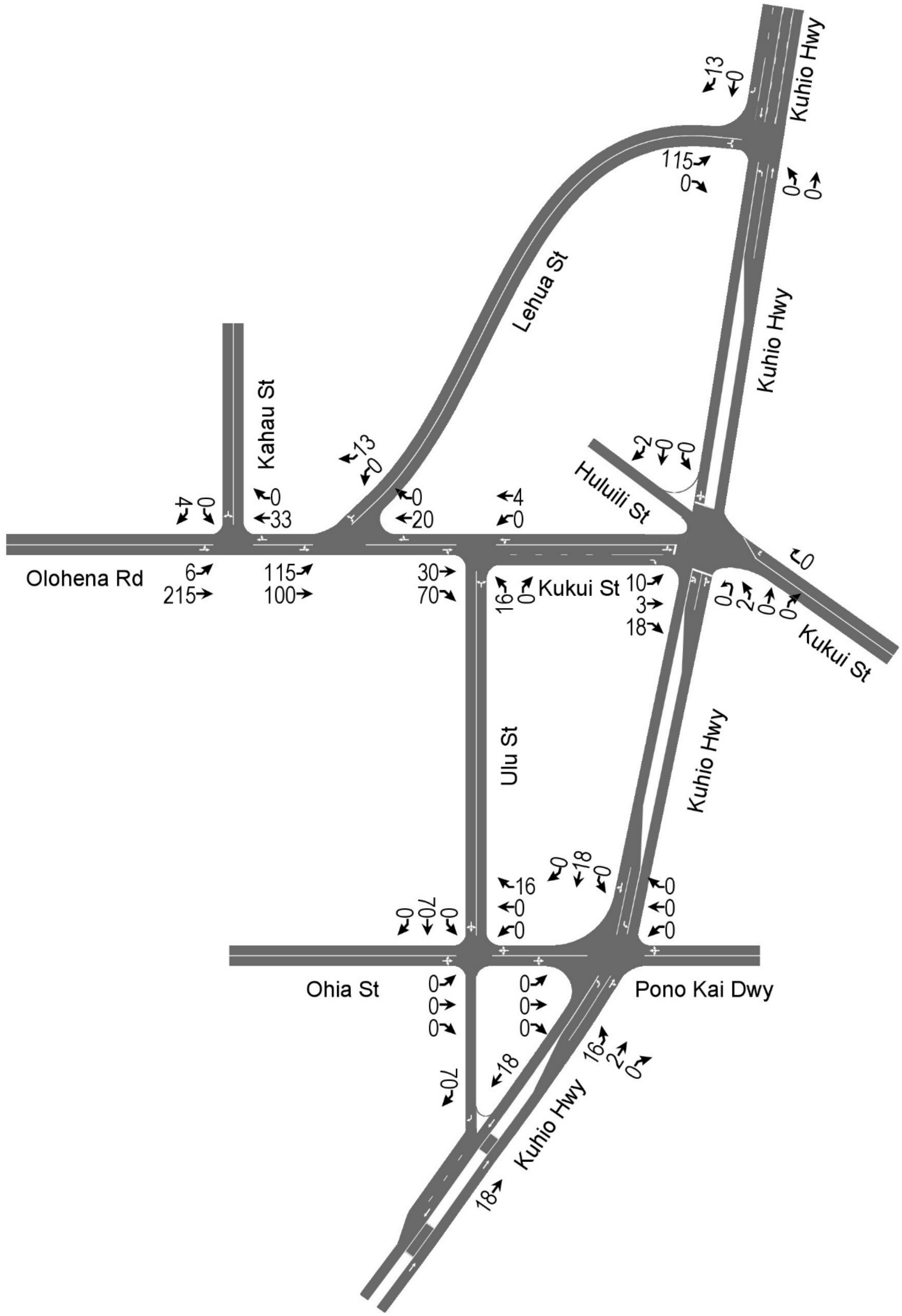

Figure 11. AM Peak Hour Site Traffic Assignment

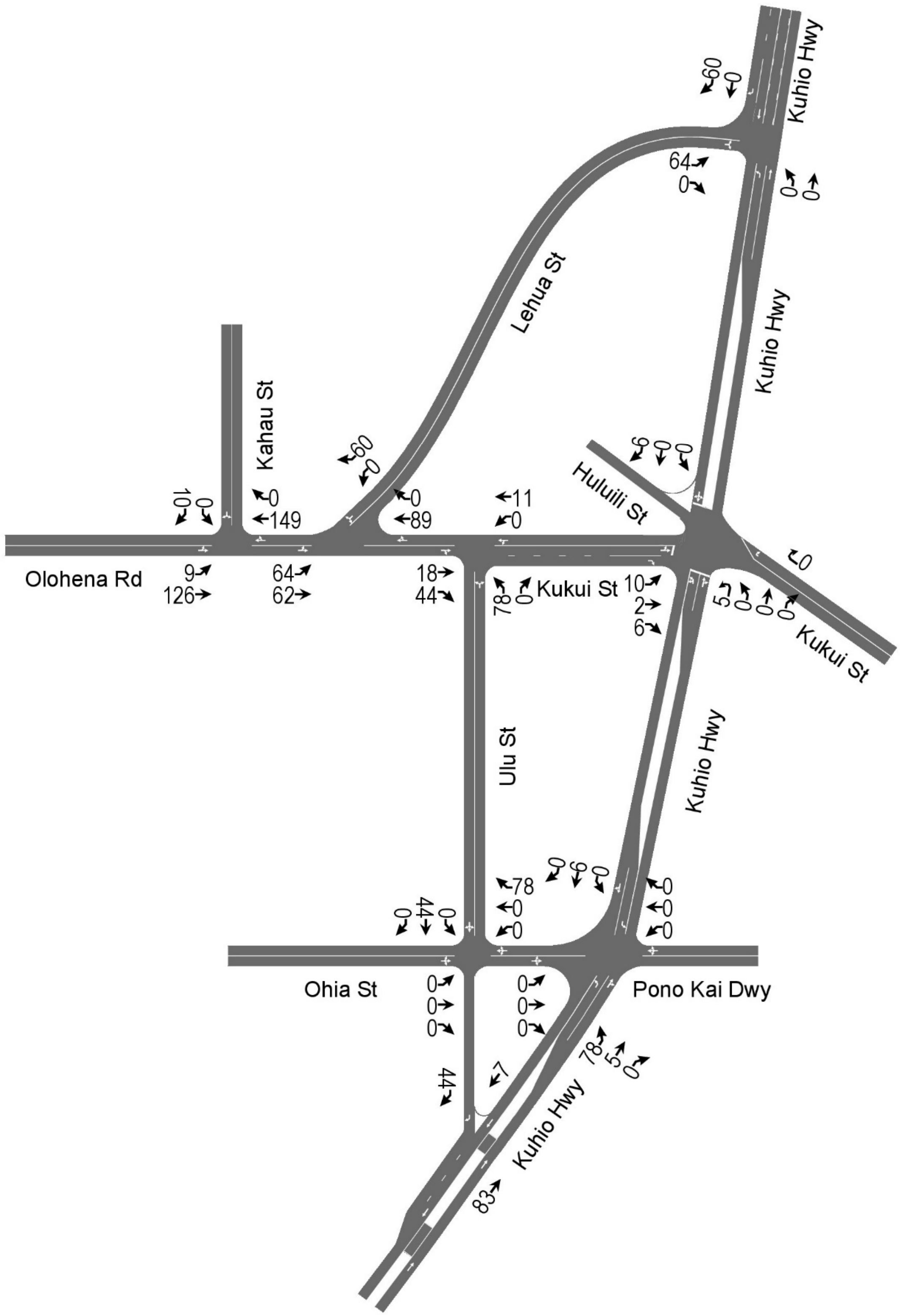

Figure 13. PM Peak Hour Site Traffic Assignment

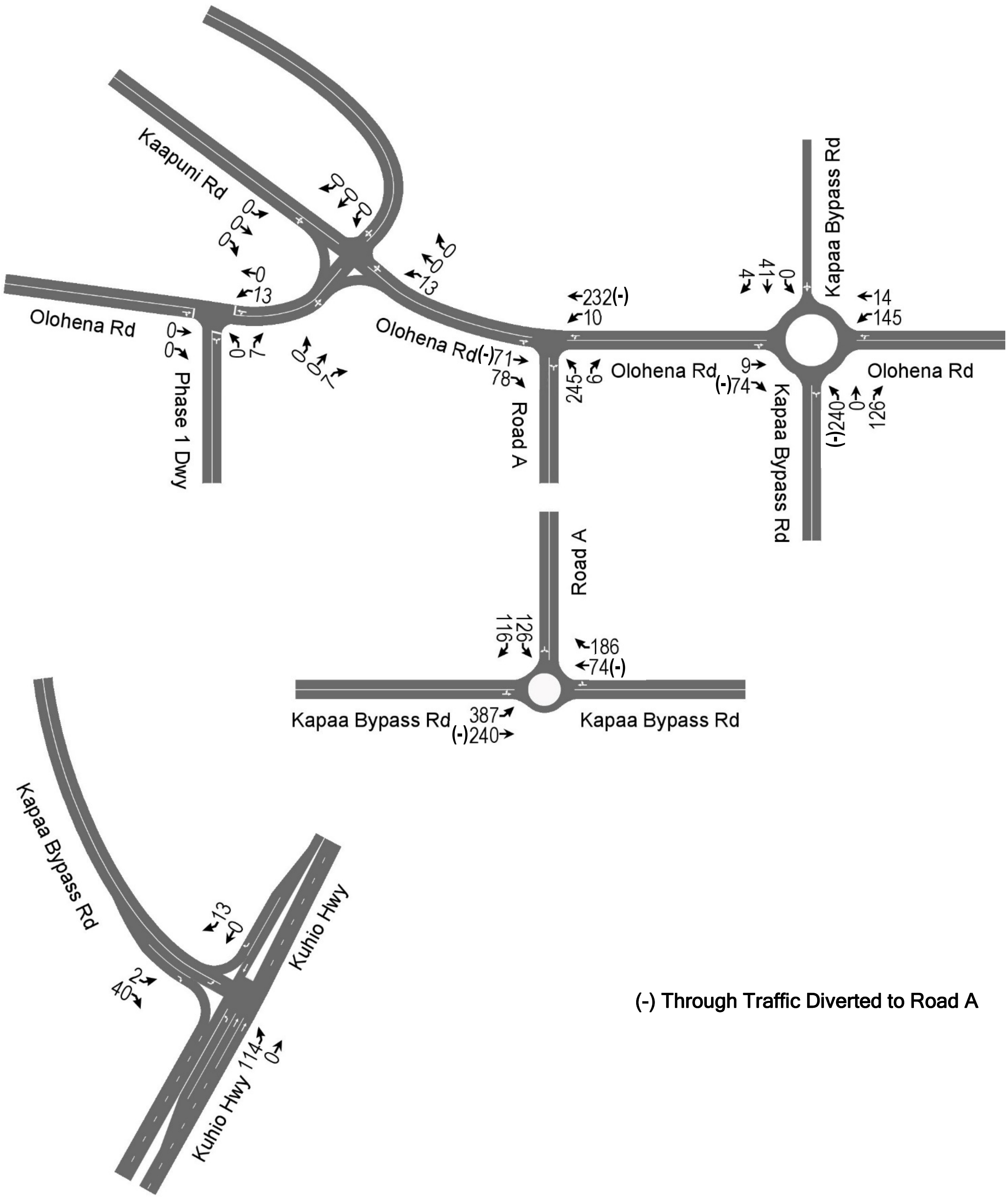

Figure 14. PM Peak Hour Site Traffic Assignment (Cont'd.)

Bernard P. Carvalho, Jr.
Mayor

Wallace G. Rezentes, Jr.
Managing Director

Lyle Tabata
Acting County Engineer

DEPARTMENT OF PUBLIC WORKS
County of Kaua'i, State of Hawai'i
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September 1, 2017

Randall S. Okaneku, P. E.
The Traffic Management Consultant
1188 Bishop Street, Suite 1907
Honolulu, Hawaii 96813

SUBJECT: Traffic Impact Analysis Report Update
For the Proposed Hokua Place
Kapa`a, Kawaihau District, Island of Kaua'i
TMK: (4) 4-3-03: Por. 001

Dear Mr. Okaneku:

The Engineering Division of the Department of Public Works received the subject Traffic Impact Analysis Report (TIAR) Update that was transmitted via email on June 15, 2017. We appreciate the opportunity to review the TIAR and offer the following comments on the TIAR:

1. **Introduction, Project Description:**
   a. The TIAR indicates that the driveway for phase 1 is proposed to be located on Olohena Road mauka of its intersection with Ka'apuni Road. We have concerns with a proposed intersection at this location, including the proximity to the intersection of Ka'apuni Road as well as concerns about intersection sight distance due to nearby horizontal and vertical curves. Prior to approval of a driveway at this location, additional information will need to be provided about this driveway location, to show that appropriate sight lines can be achieved and that no safety or other problems will be created by the proximity to the intersection of Olohena Road and Ka'apuni Road.
2. **Existing Conditions, Roadways:**
   a. The report states that the Kapa'a Bypass Road speed limit is reduced to 25 mph south of the proposed intersection with Road A. The report should also mention that further south the speed limit is again increased to 35 mph.
   b. The report incorrectly indicates that the posted speed limit for Olohena Road is reduced to 15 mph as it approaches Kapa'a Middle School. The correct statement should be that there is a 15 mph school zone within the vicinity of Kapa'a Middle School during school hours.
   c. Kukui Street and Ulu Street should both be described as collector streets.

3. **Existing Conditions, Existing Peak Hour Traffic Volumes and Operating Conditions:**
    a. The language throughout this segment of the TIAR indicates that intersections "operated at LOS…." However, if we understand correctly, the LOS values given are based on the analysis of the traffic conditions, not actual empirical observations of delay for vehicles at these intersections. The TIAR should instead use language such as "calculated to operate at LOS …." This is an important distinction given that observations of Kūhiō Highway during peak hours of traffic appear to show LOS along the highway worse than the LOS A for movements along Kūhiō Highway as reported in the TIAR, potentially due to other factors than the control delay at the intersections.
    b. Check the traffic volume of 1,500 shown on page 10 for Kūhiō Highway south of Ulu Street in the PM Peak. The volumes shown in Figure 6 do not match.
    c. Figure 6 (Existing PM Peak Hour Traffic) has an error for the southbound through movement on Kūhiō Highway at the Kapa'a Bypass Road. The figure shows an hourly volume of 38, which is way too low for this through movement. The data shown for this intersection in figure 6 does not appear to match either of the two PM peak hour traffic count plots (or their average) in the appendix.
    d. Related to comment "a" above recommending different language for the calculated LOS values, we recommend that the TIAR include some statements comparing the observed traffic conditions with the calculated delays and level of service, ideally offering explanations for the difference in observed level of service and calculated level of service.
4. **Future Traffic Conditions, Kapa'a Transportation Solutions:**
    a. Page 17 of the TIAR refers to removal of on-street parking on Kūhiō Highway. The Kapa'a Transportation Solutions study rejected any potential solutions that removed parking on Kūhiō Highway, since such a change would be detrimental to the economic vitality, multimodal, and safety goals of the study. Removal of parking should not be discussed in the TIAR, as HDOT is not considering removal of parking to add travel lanes or turn lanes.
    b. With respect to a new connector road in the approximate location of Road A, page 18 of the TIAR states, "The construction cost of the connector road was estimated at $25,824,000." The costs in the Kapa'a Transportation Solutions report include right-of-way costs as well as construction cost; therefore it is misleading to state that the full cost shown in the study is the estimated construction cost.
5. **Traffic Impact Analysis, Trip Generation Characteristics:**
    a. The project description in the TIAR's introduction states that there are 700 multi-family dwelling units, but the trip generation calculations are based on 800 multi-family dwelling units. This discrepancy must be corrected, and the accurate trip generation should be reflected in the study.
    b. The pass-by trip percentage of 81.2% is too high, especially given the relatively small amount of traffic traveling through the development on Road A. The diverted volume of 45 vehicles represents approximately 15% of the estimated through vehicles on Road A during the PM Peak Hour. The 8,000 square feet of the Hokua Place shopping center is outside of the sample size in the pass-by trip

chart for shopping centers in the ITE Trip Generation Handbook. A pass-by trip percentage of approximately 30% or 40% would be more reasonable, given the data available in the Trip Generation Handbook. It would also be reasonable for the TIAR to include a calculation of an internal capture rate for trips between the retail portion and the residential portion of the Hokua Place development. However, the combination of the traffic reduction for internal capture and pass-by trips should still be less than 81%.

6. **Traffic Impact Analysis, Site Access Improvements:**
    a. The recommendations for the stop controlled Tee-intersections of Olohena Road with Road A and the phase 1 driveway do not include any statements regarding the recommended lane assignments for these new intersections. The methodologies section of the report describes the use of AASHTO Left-Turn Lane Guidelines, but no such analyses are included in the TIAR for left turn lanes on Olohena Road at these intersections. We believe that at a minimum, a left turn lane would be necessary on Olohena Road at Road A, but analyses must be provided for both intersections. A median refuge lane should also be included on Olohena Road to facilitate the left-turn movement from Road A to Olohena Road. In addition, we believe that Road A should have two approach lanes at Olohena Road, one for right turn movements and one for left turn movements.
7. **Traffic Impact Analysis, Traffic Assignment:**
    a. In the previous TIAR for this project, no traffic was assigned to the left turn movement from southbound Road A to eastbound Kapa'a Bypass (and likewise for the right turn from the Kapa'a Bypass to Road A). In our earlier comments, we recommended that some traffic be assigned to these movements. In almost a complete reversal, the current TIAR assigned nearly all of the traffic to these movements. In the current TIAR, only about 5% to 10% of the project traffic that goes through the existing Kapa'a Bypass roundabout is assigned to go through the intersection of Road A and Olohena Road. A more equitable distribution of traffic should be made, to accurately represent the traffic impact on Olohena Road.
    b. The TIAR assigns no traffic between the project and Olohena Road or Ka'apuni Road north of the project (Wailua Homesteads and Upper Kapahi area). There are relatively few destinations on those roads for the residential traffic from the project, but a small amount of residential traffic is likely to travel to those areas. In addition, much of the traffic generated by the retail portion of the development would have its origin or destination in the residential areas of Wailua Homesteads and Upper Kapahi area. A reasonable (albeit small) amount of traffic must be assigned to those areas.
8. **Figures 11 Through 14 (Traffic Assignment)**
    a. For clarity, the TIAR must show the reassignment of existing traffic on separate figures from the figures for traffic assignment from this project.
    b. On Figure 11, the 989 vehicles shown for northbound Kūhiō Highway at Ulu Street is incorrect. It appears that this volume should be 20.
    c. On Figure 13, the 1,274 vehicles shown for northbound Kūhiō Highway at Ulu Street is incorrect. It appears that this volume should be 92.
    d. On Figure 14, the 30 vehicles shown for the Kapa'a Bypass Road left turn and the

447 vehicles for the Kapa'a Byapss Road right turn appear to be incorrect.

9. **Traffic Impact Analysis, PM Peak Hour Traffic Analysis With Project:**
    a. We recommend that the TIAR further analyze and discuss the impact of the project on the intersection of Kūhi'ō Highway and Lehua Street and recommend measures to mitigate this impact. The TIAR states that "Makai bound Lehua Street is expected to continue at LOS F at Kūhiō Highway during the PM peak hour of traffic with the proposed project." However, Table 7 shows the PM peak hour of traffic without the project to be LOS E. Additionally, while the AM peak hour of traffic with the project continues to be LOS F, the delay increases significantly.
10. **Recommendations and Conclusions, Recommended Traffic Improvements Without Project:**
    a. Item number 3 recommends restricting parking along Kūhiō Highway within Kapa'a Town in order to provide additional through lanes or left turn lanes on Kūhiō Highway. This should not be recommended in the TIAR, because HDOT is not considering removal of parking to add travel lanes. Removal of parking has been determined to be detrimental to businesses and the economic vitality of Kapa'a Town. Discussion of parking removal on Kūhiō Highway in Kapa'a Town should also be removed from other sections of the report, including the conclusions.
11. **Recommendations and Conclusions, Recommended Traffic Improvements With Project:**
    a. Our comments above include several concerns about the intersection of Road A and Olohena Road, including the possibility that additional traffic should be assigned to this intersection. We are concerned that the one-way stop control Tee-intersection proposed will not be sufficient to address traffic operations and safety at intersection. The installation of a roundabout at this intersection shall be evaluated as part of the TIAR, including traffic operations analysis for a roundabout as well as a safety comparison of a roundabout and a one-way stop control intersection. The federal Manual on Uniform Traffic Control Devices (MUTCD) does not include traffic warrants for roundabouts. However, evaluation of the MUTCD's multi-way stop control warrants and/or signal warrants would be instructive with respect to evaluating whether a one-way stop control intersection would be sufficient or if a roundabout is needed instead. Alternatively, we may also accept an evaluation of the need for a roundabout based on roundabout evaluation guidelines from another jurisdiction or research document.

       Consideration should also be given to the construction of a roundabout that combines the intersections of Olohena Road with Ka'apuni Road and Road A (with Kaehulua Road designed as a T intersection with either Ka'apuni Road or Olohena Road). Traffic operations analysis of a roundabout that combines these intersections shall be included in the TIAR.

The comments in this letter should not be construed to be inclusive of all County of Kaua'i recommendations for road improvements required to be constructed as part of the Hokua Place project. Recommendations and requirements for road improvements will be included as part of future review phases for the project, such as zoning amendments, subdivision applications, and construction plan review. If you have any questions or need additional information, please contact me at (808) 241-4891 or Stanford Iwamoto at (808) 241-4896.

Very truly yours,

MICHAEL MOULE, P.E.
Chief, Engineering Division

MM/SI

Copies to: DPW-Design & Permitting
Lyle Tabata, Acting County Engineer
Larry Dill, HDOT Kauaʻi District Engineer

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4) 4-3-03: 01

PREPARED FOR

HG KAUAI JOINT VENTURE, LLC

MAY 22, 2017

PREPARED BY

TMC

THE TRAFFIC MANAGEMENT CONSULTANT

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4)4-3-03: 01

PREPARED FOR

HG KAUAI JOINT VENTURE, LLC

MAY 22, 2017

RANDALL S. OKANEKU
LICENSED PROFESSIONAL ENGINEER
No. 4922-C
HAWAII, U.S.A.

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Table of Contents

Table of Contents (Cont'd.)

List of Figures

Page

EXECUTIVE SUMMARY

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

Project Description

The proposed Hokua Place will be developed into an 816-unit residential subdivision in Kapa`a, Kauai, Hawaii. The project is situated immediately to the south of Kapa`a Middle School and to the west (mauka) of Kapa`a Town. The primary access will be provided by a new connector roadway between Olohena Road, immediately mauka of Kapa`a Middle School, and the Kapa`a Bypass Road, southwest of its roundabout intersection with Olohena Road.

The Draft Environmental Impact Statement for the Proposed Hokua Place (DEIS) was published in May 2015. The Traffic Impact Assessment Report Kapa`a Highlands Subdivision, dated December 9, 2013, was attached to the DEIS. The purpose of this Traffic Impact Analysis Report Update is to update the DEIS traffic study, and to respond to comments received from the State of Hawaii Department of Transportation and the County of Kauai Department of Public Works, during their review of the DEIS traffic study.

Existing Traffic Conditions

The field investigation was conducted in March 2017, to update the existing traffic conditions from the DEIS traffic study. The study area was expanded to include Lehua Street and Ulu Street. The field investigation indicated that Lehua Street and Ulu Street were used as alternate routes between Kuhio Highway and Olohena Road/Kukui Street to avoid the delays at the intersection of Kuhio Highway and Kukui Street.

Since the preparation of the DEIS traffic study, the peak hour traffic at the roundabout intersection of the Kapa`a Bypass Road and Olohena Road increased by about 12 percent and 22 percent, during the AM and PM peak hours of traffic, respectively.

Trip Generation

Hokua Place is expected to generate 487 vehicle trips per hour (vph) and 560 vph, during the AM and PM peak hours of traffic, respectively. The AM and PM peak hour trip generation characteristics for Hokua Place were increased by about 90± vph over the DEIS traffic study, primarily due to the use of the average peak hour trip rates for the multi-family dwelling units.

Traffic Impact Analysis

The construction of the connector roadway through Hokua Place, between Olohena Road and the Kapa`a Bypass Road, is expected to mitigate the project's traffic impacts at the roundabout intersection of the Kapa`a Bypass Road and Olohena Road. The other intersections in the study area will require the following traffic improvements to mitigate the traffic impacts without and with the proposed project.

Recommendations Without Project

1. Widen Kuhio Highway between the Kapa`a Bypass Road (South Junction) and Kuamoo Road to provide two through lanes in each direction.
2. Restripe the median on the north leg of Kuhio Highway at the Kapa`a Bypass Road (South Junction) to provide a median refuge lane.
3. Restripe parking and shoulder lanes on Kuhio Highway through Kapa`a Town to provide additional through and/or left-turn lanes.
4. Modify the traffic signal operations at the intersection of Kuhio Highway and Kukui Street to reduce queuing and delays.
5. Add a right-turn bypass lane from southbound Kapa`a Bypass Road to mauka bound Olohena Road at their roundabout intersection.
6. Realign Kaehulua Road to intersect Olohena Road and Kaapuni Road to create a four-legged, channelized intersection.
7. Extend the median refuge lane/two-way left-turn lane on the north leg of Kuhio Highway at Lehua Street.

Recommendations With Project

1. Construct Road A from Olohena Road to the Kapa`a Bypass Road.
2. Construct a roundabout at the intersection of Road A and the Kapa`a Bypass Road.

Conclusions

The existing traffic congestion on Kuhio Highway through Kapa`a Town can be mitigated by restricting on-street parking and restriping the shoulder lanes to provide for additional through lanes/median left-turn lanes. The existing southbound traffic demand through Kapa`a Town is reduced by the Kapa`a Bypass Road. Dedication of the Kapa`a Bypass Road right-of-way along the Hokua Place frontage would assure the continued usage of the existing Kapa`a Bypass Road.

The construction of the proposed Road A will provide additional mauka-makai roadway capacity between Kapa`a Valley and the Kapa`a Bypass Road. Road A is expected to mitigate the Hokua Place traffic impacts at the roundabout intersection of the Kapa`a Bypass Road and Olohena Road. The Hokua Place access intersections on Olohena Road and on the Kapa`a Bypass Road are expected to operate at satisfactory Levels of Service, during the AM and PM peak hours of traffic.

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4) 4-3-03: 01

I. Introduction

A. Project Description

Hokua Place is planned as an 816-unit residential development in Kapa`a, Kauai, Hawaii. Hokua Place will consist of 116 single-family detached units, 700 multi-family condominiums, a neighborhood retail center consisting of 8,000 square feet of gross floor area (SFGFA), and a community park and recreation center. The project site is located on the southwest quadrant of the roundabout intersection of the Kapa`a Bypass Road and Olohena Road. The project is situated immediately to the south of Kapa`a Middle School and to the west (mauka) of Kapa`a Town. Figure 1 depicts the project location and vicinity map.

Phase 1 of Hokua Place will consist of 16 single-family detached units, which will be located on the mauka portion of the project site. The Phase 1 access driveway is proposed on Olohena Road, mauka of its intersection with Kaapuni Road. Phase 2 will consist of the remaining 800 dwelling units. Phase 2 access is proposed via a collector street between Olohena Road, immediately mauka of Kapa`a Middle School, and the Kapa`a Bypass Road, about 3,000 feet southwest of its intersection with Olohena Road (hereinafter referred to as Road A). The project site is depicted on Figure 2.

The construction of Hokua Place is expected to begin by the Year 2020. For the purpose of this Traffic Impact Analysis Report Update, full occupancy is assumed to occur by the Year 2030.

B. 2015 Draft Environmental Impact Statement

The Draft Environmental Impact Statement for the Proposed Hokua Place (DEIS) was published in May 2015. Hokua Place was formerly known as the Kapa`a Highlands Subdivision. The Traffic Impact Assessment Report Kapa`a Highlands Subdivision was prepared by Phillip Rowell and Associates, dated December 9, 2013, and was attached to the DEIS as Exhibit H.

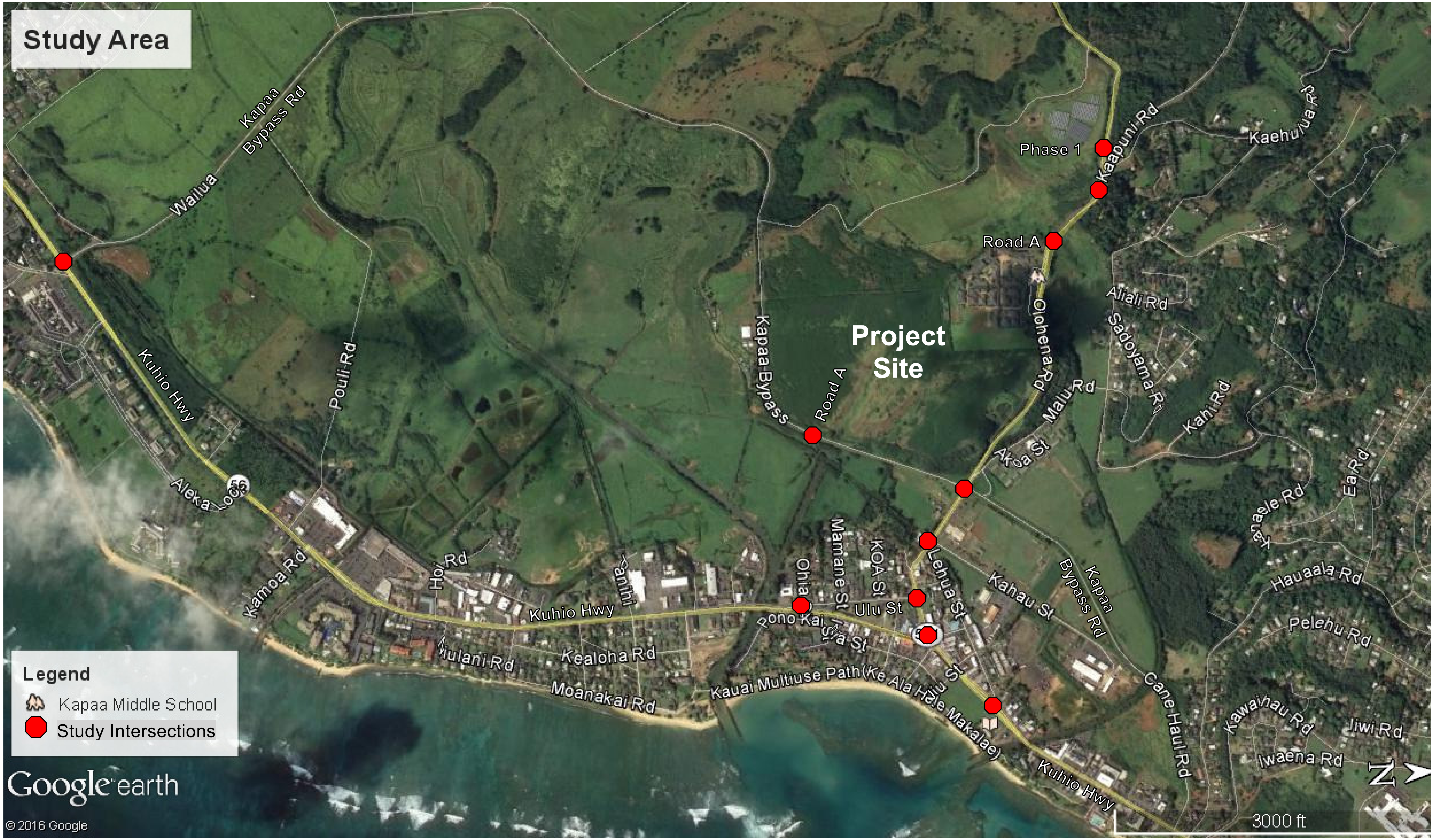

Figure 1. Location Map and Vicinity Map

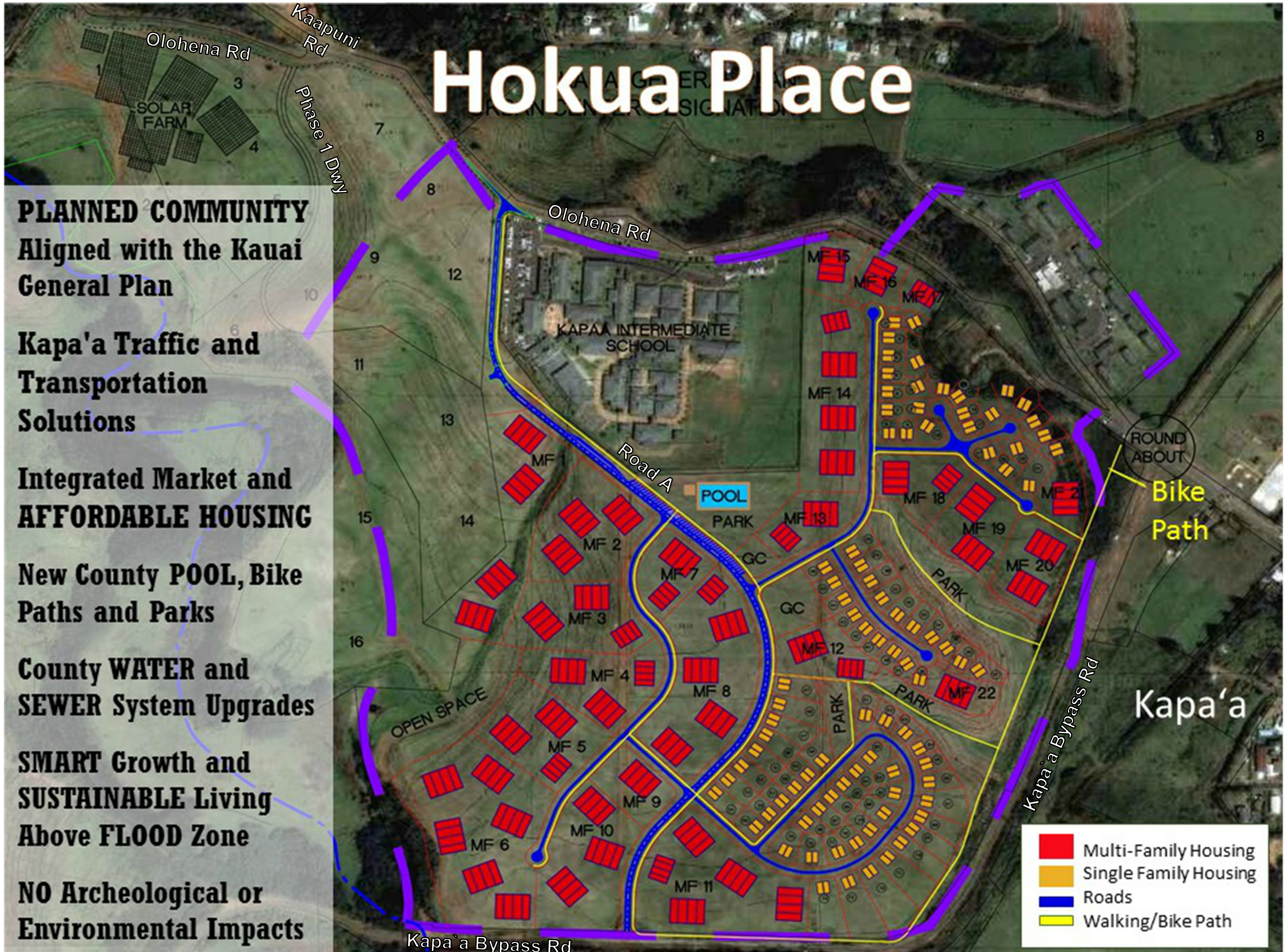

Figure 2. Proposed Site Plan

The State of Hawaii Department of Transportation (DOT) issued comments on the Rowell study in a letter dated March 26, 2014 (HWY-PS 2.6887). Responses to DOT's comments were transmitted via email from Mr. Greg Allen on April 9, 2014. The responses were acceptable to DOT per its letter, dated June 6, 2014 (HWY-PS 2.7311).

The County of Kauai Department of Public Works (DPW) issued its comments on the DEIS in its letter dated June 22, 2015. This TIAR addresses DPW's comments on the DEIS.

C. Purpose and Scope of the Study

The purpose of this study is to update the traffic impact analysis resulting from the development of the proposed Hokua Place. This report presents the findings and recommendations of the study, the scope of which includes:

1. A description of the proposed project.
2. An evaluation of existing roadways and traffic conditions.
3. The analysis of the future traffic conditions without the proposed project.
4. The development of trip generation characteristics of the proposed project.
5. The identification and analysis of the traffic impacts resulting from the development of the proposed project.
6. The recommendation of roadway improvements, which would mitigate the traffic impacts identified in this study.

D. Methodologies

1. Capacity Analysis

The highway capacity analysis, performed in this study, is based upon procedures presented in the Highway Capacity Manual 6th Edition (HCM), published by the Transportation Research Board. HCM defines the Level of Service (LOS) as "a quantitative stratification of a performance measure or measures representing quality of service." HCM defines the six (6) Levels of Service from the traveler's perspective, ranging from the best LOS "A" to the worst LOS "F". LOS translates the complex mathematical results of highway capacity analysis into an A through F system for the purpose of simplifying the roadway performance for non-technical decision makers.

The HCM 6th Edition has updated the highway capacity analysis since the HCM 2010 methodology, utilized in the DEIS traffic study. The most significant change in the HCM 6th Edition occurred in the analysis of roundabouts. The widespread construction of roundabouts throughout the United States, since the development of the HCM 2010, resulted in changes in driver behavior, entering and exiting a roundabout.

The data collected at United States roundabouts improved the HCM 6th Edition methodology for analyzing roundabouts, where the calculated delays were reduced by about one half, when compared with the previous HCM 2010 methodology.

LOS's "A", "B", and "C" are considered satisfactory Levels of Service. LOS "D" is generally considered a "desirable minimum" operating Level of Service. LOS's "E" and "F" are undesirable conditions. Intersection LOS is primarily based upon average delay (d) in seconds per vehicle (sec/veh). The delays at unsignalized intersections, which includes stop-controlled intersections and roundabouts, are generally longer than signalized intersections, due to the drivers' expectation and acceptance of longer delays at higher-volume signalized intersections. Table 1 summarizes the HCM LOS criteria.

Table 1. Intersection Level of Service Criteria (HCM)

LOS	Signalized Control	Unsignalized Control	Description
	Delay d (sec/veh)		
A	d≤10	d≤10	Control delay is minimal.
B	10<d ≤20	10<d≤15	Control delay is not significant.
C	20<d≤35	15<d≤25	Stable operation. Queuing begins to occur.
D	35<d≤55	25<d≤35	Less stable condition. Increase in delays, decrease in travel speeds.
E	55<d≤80	35<d≤50	Unstable operation, significant delays.
F	d>80	d>50	High delays, extensive queuing.

HCM utilizes a peak hour factor (PHF) to convert the peak 15-minute traffic into an hourly volume. For the purpose of this study, the peak hour traffic analysis is based directly upon the peak 15-minute traffic flows entering the study intersection, which is multiplied by four (4) to convert the 15-minute peak volumes into the peak hour volumes.

Synchro is a traffic analysis software that was developed by Trafficware Corporation. Synchro is an intersection analysis program that is based upon the HCM 6th Edition methodology. Synchro was used to calculate the Levels of Service for the intersections in the study area. Worksheets for the capacity analysis, performed throughout this report, are compiled in the Appendix.

2. Trip Generation

The trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in Trip Generation Manual, 9th Edition, 2012. The ITE trip generation methodology has been updated since the Trip Generation, 7th Edition, utilized in the DEIS traffic study. The ITE trip rates were developed by correlating the total vehicle trip generation data with various land use activities/characteristics, such as the vehicle trips per hour (vph) per dwelling unit (DU).

A portion of the peak hour trips generated by a retail center is considered to be "pass-by" trips, i.e., traffic already on the roadway stopping by at a "secondary" destination enroute to its primary destination. The percentages of pass-by trips were compared with the gross leasable floor areas of the shopping centers, which were collected from traffic studies and compiled by ITE. The results of the analysis were published in the Trip Generation Handbook, 3rd Edition, dated August 2014. The percentage of pass-by trips is generally inversely proportional to the size of the shopping center, e.g., a regional shopping center is a primary destination with a low pass-by trip percentage, while a convenience store is a secondary destination with a high pass-by trip percentage. About 81.2 percent of the total PM peak hour trips generated by the proposed 8,000 square foot retail center are expected to be pass-by trips. The AM peak hour pass-by trip rate for a retail center was not published by ITE.

3. AASHTO Left-Turn Lane Guidelines

The left-turn lane assessment on a two-lane highway is based upon A Policy on Geometric Design of Highways and Streets, 2011, published by the American Association of State Highway and Transportation Officials (AASHTO). The AASHTO guide analyzes the combination of the left-turn volume (minimum 5%), the advancing volume (left-turn, through and right-turn volumes), the opposing volume (left-turn, through and right-turn volumes), and the operating speed. The AASHTO guide is based upon the "Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections", Highway Research Record 211, Highway Research Board, 1967, by M. D. Harmelink. The Harmelink left-turn volume warrant analyzes the probability of the arrival of an advancing vehicle slowing and/or stopping behind a vehicle, which is waiting to turn left from the through lane.

II. Existing Conditions

A. Roadways

Kuhio Highway is the primary arterial highway along the east coast of Kauai. Through Kapa`a Town, Kuhio Highway is a two-lane roadway with on-street parking on both sides of the roadway. Kuhio Highway is signalized at its intersection with Kukui Street.

Exclusive left-turn lanes are provided on Kuhio Highway at major intersections in Kapa`a Town. The posted speed limit on Kuhio Highway in Kapa`a Town is 25 miles per hour (mph).

The Kapa`a Bypass Road provides an alternative southbound route around Kapa`a Town. The Kapa`a Bypass Road is a one-lane, one-way, southbound roadway between its north junction at Kuhio Highway and Olohena Road, with a posted speed limit of 25 mph. The Kapa`a Bypass Road intersects Olohena Road at a single-lane roundabout. South of Olohena Road, the Kapa`a Bypass Road becomes a two-way, two-lane roadway, with a posted speed limit of 35 mph. A 3,700± foot section of the Kapa`a Bypass Road, south of Olohena Road, was constructed on a roadway easement, which is currently owned by the developer of Hokua Place. Hokua Place, LLC has a Memorandum of Understanding with the State of Hawaii Department of Transportation (DOT) to dedicate the roadway easement to State DOT upon the approval of the Hokua Place subdivision.

South of the proposed intersection with Road A, the posted speed limit on the Kapa`a Bypass Road is reduced to 25 mph. At its south junction, the Kapa`a Bypass Road intersects Kuhio Highway at an unsignalized Tee-intersection. The Kapa`a Bypass Road provides separate left-turn and right-turn lanes at its south junction with Kuhio Highway. Exclusive left-turn and right-turn lanes are provided on Kuhio Highway at the Kapa`a Bypass Road in the northbound and southbound directions, respectively. A median refuge lane is not delineated on the north leg of Kuhio Highway at the Kapa`a Bypass Road. However, the striped median provide sufficient refuge space for one vehicle turning left from the Kapa`a Bypass Road.

South of the Kapa`a Bypass Road, the center northbound lane of Kuhio Highway is coned to provide a southbound contra-flow lane, during the AM peak period of weekday traffic, resulting in two lanes in the southbound direction and one lane in the northbound direction. During the field investigation, the contra-flow operation occurred from 5:45 AM to 10:30 AM. The contra-flow lane provides a “free” right-turn movement from the Kapa`a Bypass Road onto southbound Kuhio Highway, during the AM peak period of weekday traffic.

Olohena Road is a two-way, two-lane collector roadway with a posted speed limit of 25 mph. The posted speed limit on Olohena Road is reduced to 15 mph as it approaches Kapa`a Middle School. Olohena Road intersects the Kapa`a Bypass Road at a single-lane roundabout. Makai of Lehua Street, Olohena Road continues as Kukui Street to Kuhio Highway.

Kaapuni Road is a two-way, two-lane, collector road which intersects Olohena Road at a stop-controlled, skewed Tee-intersection. The Kaapuni Road approach has a limited sight distance to the right, due to the vertical alignment of the mauka leg of Olohena Road. Immediately mauka of Olohena Road, the two-way, two-lane Kaehulua Road intersects Kaapuni Road at a stop-controlled, skewed Tee-intersection.

Kukui Street is a two-way, two-lane roadway between Kuhio Highway and Ulu Street with a posted speed limit of 15 mph. Kukui Street is signalized at its intersection with Kuhio Highway with a shared left-turn lane and exclusive right-turn lane.

Ulu Street is a two-way, two-lane local street between Kukui Street and Ohia Street. South of Ohia Street, Ulu Street becomes a one-lane, one-way southbound roadway to Kuhio Highway. Ohia Street is a local street, which intersects Ulu Street and Kuhio Highway at stop-controlled intersections. Exclusive left-turn lanes are provided in both directions on Kuhio Highway at Ohia Street/Pono Kai Driveway. Ulu Street provides an alternate route to the south between Kuhio Highway and Kukui Street.

Lehua Street is a two-way, two-lane local street between Olohena Road and Kuhio Highway. Lehua Street intersects Olohena Road at a stop-controlled Tee-intersection. Lehua Street intersects Kuhio Highway at a stop-controlled, channelized Tee-intersection. Lehua Street provides an alternate route to the north between Kuhio Highway and Olohena Road.

Kahau Street is a two-way, two-lane cul-de-sac street. Kahau Street intersects Olohena Road at a stop-controlled Tee-intersection, immediately mauka of Lehua Street.

B. Public Transit

The Kauai County Transportation Agency operates a public bus service in the region with a stop on Olohena Road at the Kapa`a New Town Park, between the Kapa`a Bypass Road and Kahau Street. The Kauai bus service also stops at Kapa`a Middle School. On Kuhio Highway, the Kauai Bus service stops at Lehua Street, at Ohia Street, and at the Coconut Marketplace near the Kapa`a Bypass Road (South Junction). The Kauai Bus service is provided at hourly intervals Monday through Friday from 6 AM to 9 PM and on weekends and holidays every two hours from 8 AM to 5 PM.

C. Existing Peak Hour Traffic Volumes and Operating Conditions

1. Field Investigation and Data Collection

Turning movement traffic count surveys were conducted at the following intersections in the study area, during the week of March 13, 2017:

a. Kapa`a Bypass Road and Olohena Road

b. Olohena Road and Kaapuni Road

c. Kaapuni Road and Kaehulua Road

d. Kuhio Highway and Kukui Street

e. Kuhio Highway and Kapa`a Bypass Road (South Junction)

f. Kuhio Highway and Lehua Street

g. Olohena Road and Lehua Street
h. Olohena Road and Kahau Street
i. Kukui Street and Ulu Street
j. Ulu Street and Ohia Street
k. Kuhio Highway and Ohia Street/Pono Kai Driveway
l. Kuhio Highway and Ulu Street

Each intersection was surveyed during the peak periods of traffic over a two-day period. On March 14, 2017, a stalled vehicle partially blocked the circulatory roadway of the roundabout intersection of Olohena Road and the Kapa`a Bypass Road from 3:00 PM to 4:00 PM. The blockage limited traffic flows, and this data were excluded from the analysis. Otherwise, the higher peak hour volumes on the survey days at each study intersection were selected for the analysis to establish the existing conditions. The peak hours of traffic varied from intersection to intersection and from day to day.

2. Existing AM Peak Hour Traffic

The existing AM peak hour of traffic in the study area generally occurred from 7:15 AM to 8:15 AM. Table 2 summarizes the changes in the AM peak hour traffic between the DEIS traffic study and the existing AM peak hour traffic data.

Table 2. AM Peak Hour Traffic Comparison

Study Intersection	Intersection Volumes (vph)		Increase (+) Decrease (-)
	2012-2013	2017	
Olohena Road/Kapa`a Bypass Road	1,447	1,628	+181
Kuhio Highway/Kukui Street	1,441	1,410	-31
Kuhio Hwy/Kapa`a Bypass Road	1,990	2,111	+121

In Kapa`a Town, Kuhio Highway carried about 1,400 vehicles per hour (vph), total for both directions, during the AM peak hour of traffic. South of Ulu Street, Kuhio Highway carried over 1,750 vph, total for both directions. The Kapa`a Bypass Road carried about 800 vph, total for both directions, south of Olohena Road. Mauka of the Kapa`a Bypass Road, Olohena Road carried about 1,000 vph, total for both directions. South of the Kapa`a Bypass Road (South Junction), Kuhio Highway carried about 2,100 vph.

The traffic signal timing cycle lengths at the intersection of Kuhio Highway and Kukui Street resulted in long delays on Kukui Street. Makai bound traffic on Olohena Road and Kukui Street were diverted to alternate routes to Kuhio Highway. About 54 percent of makai bound traffic on Olohena Road turned left onto Lehua Street to continue in the northbound direction. About 33 percent of makai bound traffic turned right onto Ulu Street to continue in the southbound direction. The remaining 13 percent of the makai bound traffic on Olohena Road continued onto Kukui Street to Kuhio Highway.

During the existing AM peak hour of traffic, the overall intersection of Kuhio Highway and Kukui Street operated at LOS “A”. However, the left-turn movement on makai bound Kukui Street operated at LOS “F”, with a relatively low traffic demand (32 vph). All the traffic movements in both directions on Kuhio Highway operated at LOS “A” at Kukui Street, during the existing AM peak hour of traffic.

The left-turn movement on makai bound Lehua Street operated at LOS “E” at Kuhio Highway, during the existing AM peak hour of traffic. Makai bound Ohia Street also operated at LOS “E” at Kuhio Highway at a very low volume.

Makai bound Olohena Road operated at LOS “D” at the Kapa`a Bypass Road. Kaapuni Road operated at LOS “D” at Olohena Road. The other intersections in the study area operated at satisfactory Levels of Service, i.e., LOS “C” or better, during the existing AM peak hour of traffic. Figures 3 and 4 depict the existing AM peak hour traffic data.

3. Existing PM Peak Hour Traffic

The existing PM peak hour of traffic in the study area varied between the hours of 3:00 PM and 6:00 PM. Table 3 summarizes the changes in the PM peak hour traffic between the DEIS traffic study and the existing (2017) PM peak hour traffic data.

Table 3. PM Peak Hour Traffic Comparison

Study Intersection	Intersection Volumes (vph)		Increase (+) Decrease (-)
	2012-2013	2017	
Olohena Rd/Kapa`a Bypass Rd	1,459	1,787	+328
Kuhio Hwy/Kukui St	1,370	1,295	-75
Kuhio Hwy/Kapa`a Bypass Rd	2,176	2,235	+62

During the existing PM peak hour of traffic, Kuhio Highway carried about 1,200 vph, total for both directions in Kapa`a Town. South of Ulu Street, Kuhio Highway carried over 1,500 vph, total for both directions. The Kapa`a Bypass Road carried over 1,000 vph, total for both directions, south of Olohena Road. Mauka of the Kapa`a Bypass Road, Olohena Road carried about 1,000 vph, total for both directions. Kuhio Highway carried over 2,100 vph, total for both directions, south of the Kapa`a Bypass Road.

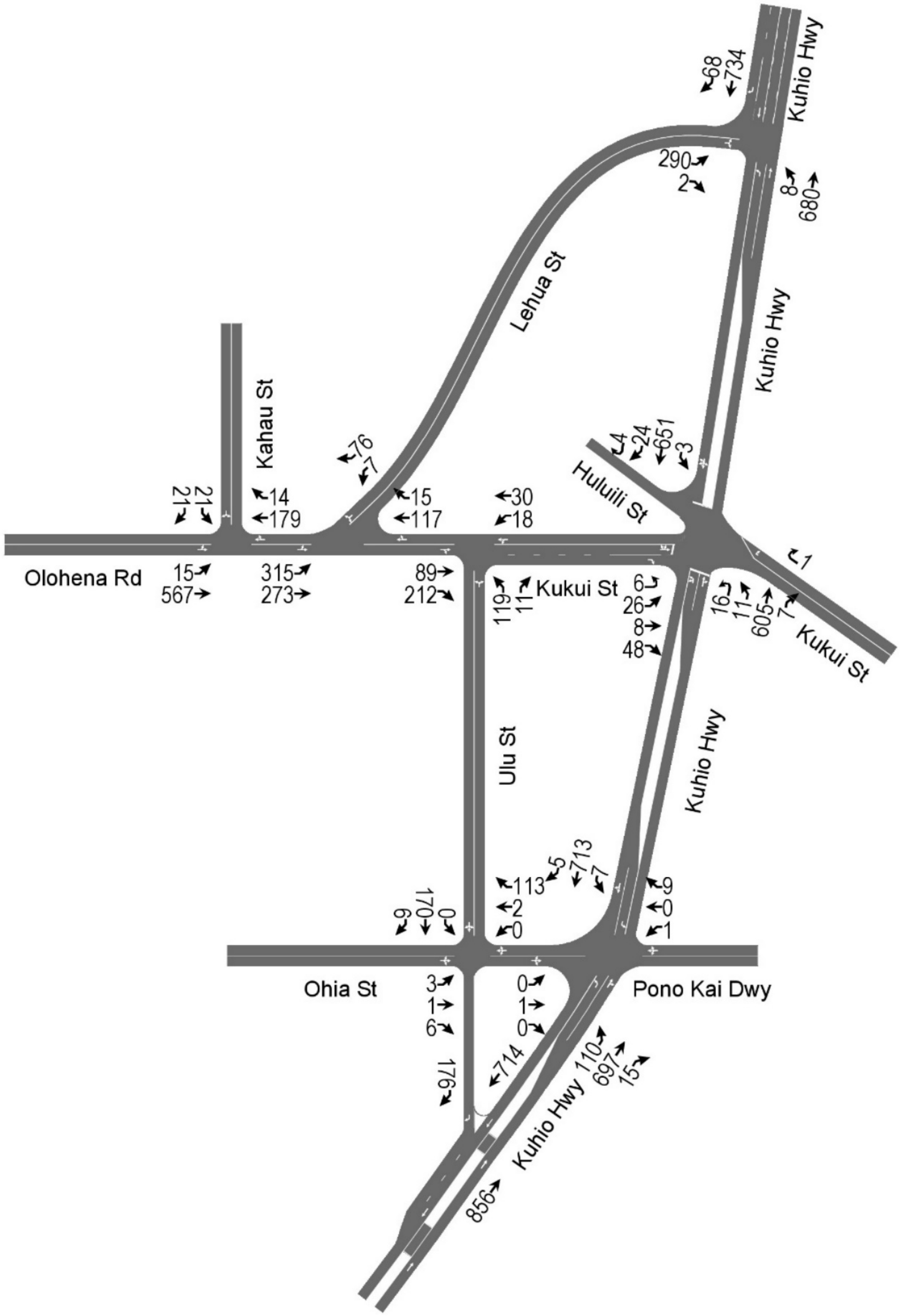

Figure 3. Existing AM Peak Hour Traffic

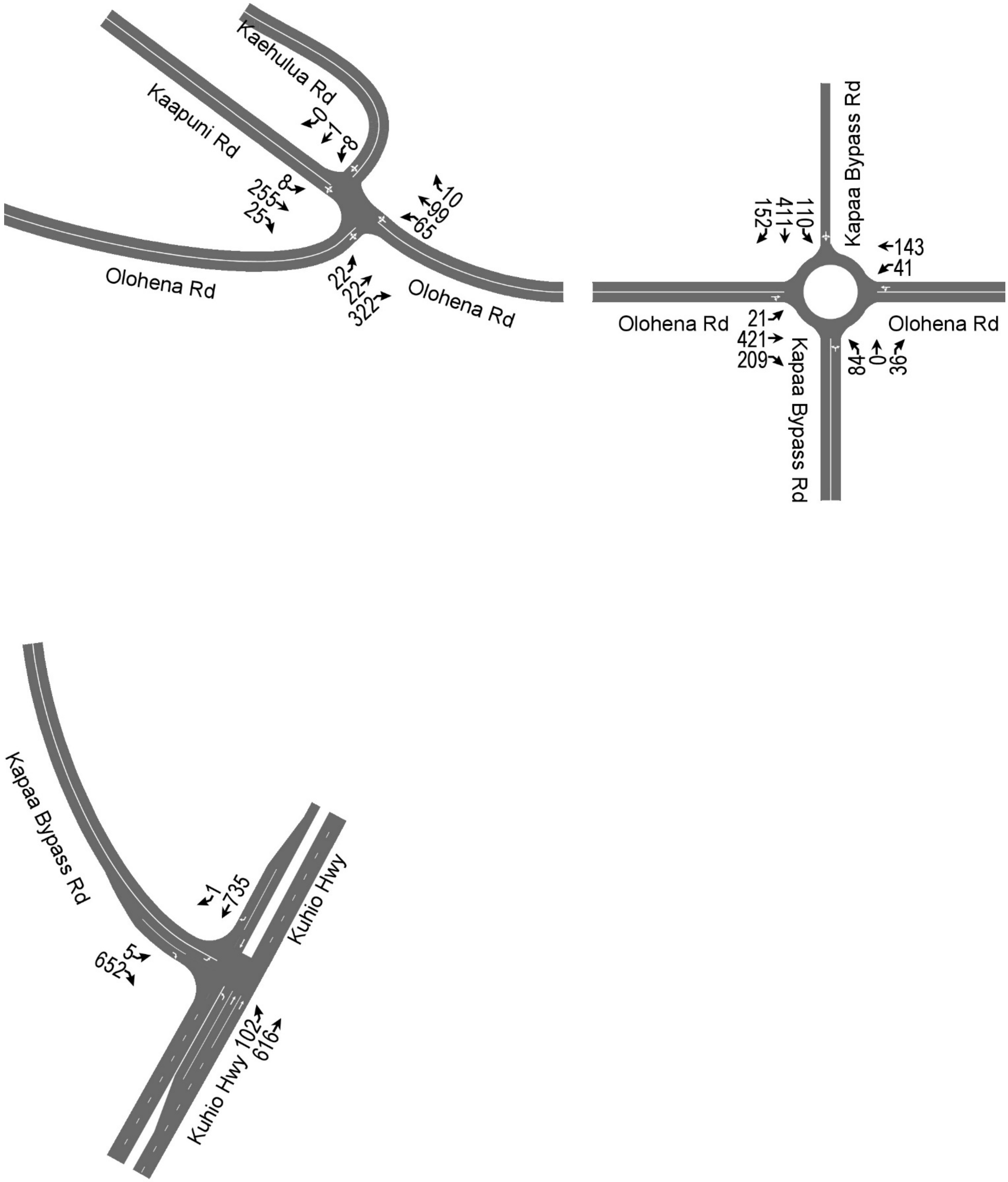

Figure 4. Existing AM Peak Hour Traffic (Cont'd.)

The northbound and southbound traffic on Kuhio Highway avoided the traffic signal delays at Kukui Street by diverting to alternate routes to Olohena Road. Less than 10 percent of the mauka bound traffic on Olohena Road at the Kapa`a Bypass Road turned from Kuhio Highway via Kukui Street. About 35 percent of the mauka bound traffic on Olohena Road turned right from Lehua Street to continue in the mauka bound direction, during the existing PM peak hour of traffic. About 55 percent of the mauka bound traffic turned left from Ulu Street onto Kukui Street to continue in the mauka bound direction on Olohena Road.

The overall intersection of Kuhio Highway and Kukui Street operated at LOS “A”, during the existing PM peak hour of traffic. The left-turn movement on makai bound Kukui Street operated at LOS “E” with a relatively low traffic demand (36 vph). The other traffic movements at the intersection operated at LOS “A”, during the existing PM peak hour of traffic.

The left-turn movement on makai bound Lehua Street operated at LOS “D” at Kuhio Highway, during the existing PM peak hour of traffic. Makai bound Ohia Street operated at LOS “F” at Kuhio Highway with a very low volume. The mauka bound Pono Kai Driveway operated at LOS “D”, also with a very low volume.

Southbound Lehua Street operated at LOS “E” at Olohena Road, during the existing PM peak hour of traffic. Southbound Kapa`a Bypass Road operated at LOS “D” at Olohena Road. The other intersections in the study area operated at satisfactory Levels of Service, during the existing PM peak hour of traffic. The existing PM peak hour traffic data are depicted on Figures 5 and 6.

III. Future Traffic Conditions

A. Background Growth in Traffic

The Kauai Long-Range Land Transportation Plan (KLRLTP) was prepared by the State of Hawaii Department of Transportation (DOT), in cooperation with the Kauai County Department of Public Works and Planning Department. The KLRLTP developed long-range travel forecasts for the island of Kauai. The KLRLTP anticipated that traffic in the Kapa`a area would increase by over 30 percent between the Base Year 2007 and the Horizon Year 2035. For the purpose of this analysis, an average growth factor of 1.14 was uniformly applied to the existing (Year 2017) AM and PM peak hour traffic volumes to estimate the Year 2030 peak hour traffic without the proposed project.

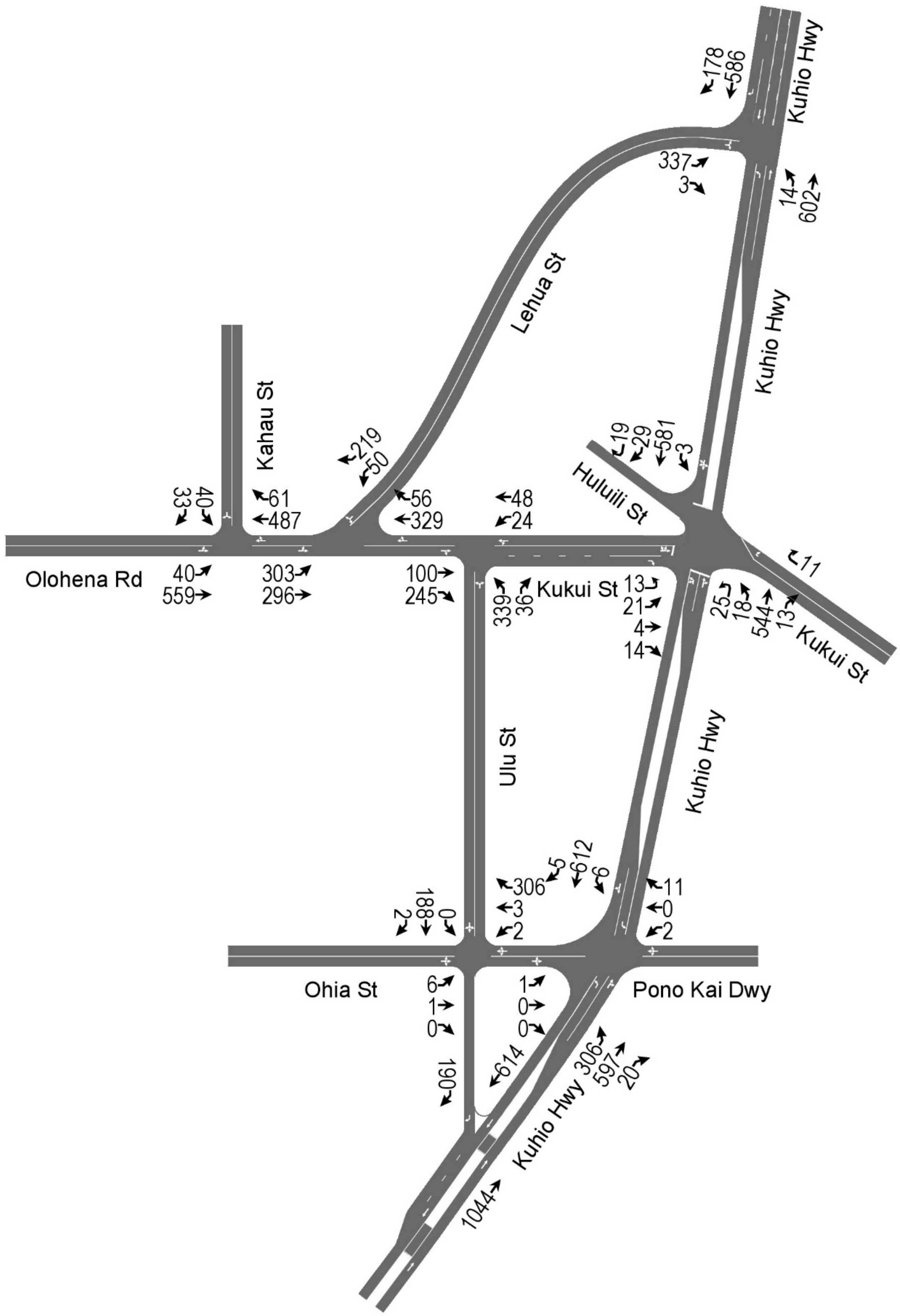

Figure 5. Existing PM Peak Hour Traffic

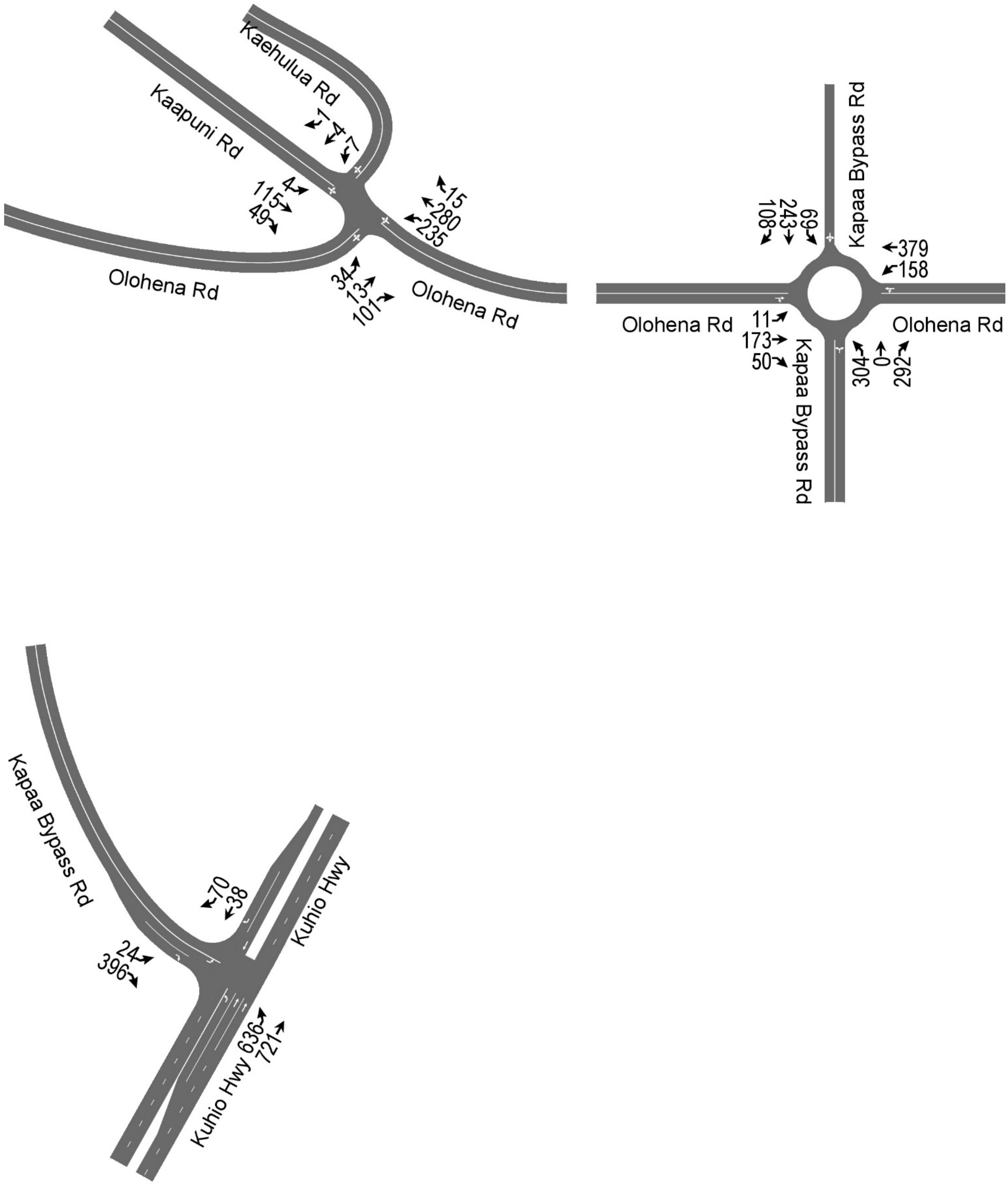

Figure 6. Existing PM Peak Hour Traffic (Cont'd.)

B. Daily and Seasonal Adjustment Factors

The existing peak hour traffic data were adjusted for the daily and seasonal variation in traffic in the region. The adjustment factors were based upon the 2016 traffic count data, which were collected at DOT's continuous traffic count station at Mile Post 2.4 on Kuhio Highway (Route 56) in Hanamaulu, which is located about 6 miles south of Kapa`a Town. Table 4 summarizes the adjustment factors, which were applied to the existing AM and PM peak hour traffic data, to account for the daily and seasonal variation in traffic from the annual average weekday traffic (AAWDT).

Table 4. Day of the Week and Seasonal Adjustment Factors

Date	Day	24-Hour Data	Adjustment Factors
3/14/2016	Monday	15,881	1.03
3/15/2016	Tuesday	15,824	1.03
3/16/2016	Wednesday	16,611	0.98
3/17/2016	Thursday	16,467	0.99
3/18/2016	Friday	16,652	0.98
	2016 AAWDT	16,301	1.00

C. Kuhio Highway Widening

The Final Environmental Assessment Kuhio Highway Short-Term Improvements Kuamoo Road to Temporary Bypass Road (Kuhio Highway EA), was prepared for DOT, by Wilson Okamoto Corporation, dated September 2009. The Kuhio Highway EA recommended the widening of Kuhio Highway from three lanes to four lanes to provide a permanent second southbound lane between the Kapa`a Bypass Road and Kuamoo Road. The additional lane will provide a "free" right-turn movement from the Kapa`a Bypass Road onto southbound Kuhio Highway throughout the day.

DOT is planning to complete the widening of Kuhio Highway by the Year 2019. The widening of Kuhio Highway from the Kapa`a Bypass Road to Kuamoo Road is included in this traffic impact analysis.

D. Kapa`a Transportation Solutions

The Kapa`a Transportation Solutions (KTS) was prepared for the State Department of Transportation, dated August 2015. The KTS was prepared for DOT in cooperation with the Kauai County Department of Public Works, Planning Department, and Transportation Agency, and the Federal Highways Administration. The KTS included input from the Kapa`a Citizens Advisory Committee, which is comprised of the Kapa`a Business Association, Kapa`a High School and Middle School, Wailua-Kapa`a Neighborhood Association, Kauai Visitors and Convention Bureau, and Kauai Path.

The KTS cited traffic congestion in the downtown/historic district of Kapa`a Town, which resulted from on-street parking in the curb lanes in both directions on Kuhio Highway. In addition, to the delays caused by vehicles maneuvering into and out of the parallel parking stalls along Kuhio Highway, the on-street parking occupies valuable highway space, which could otherwise provide additional through traffic lanes and/or median left-turn lanes. Table 5 summarizes the roadway improvements relevant to this traffic study, which were prioritized in the Kapa`a Transportation Solutions.

Table 5. Potential Traffic Solutions

Location	Description	Priority
Kapa`a Bypass Road	Widen the Kapa`a Bypass Road to provide one lane in the northbound direction from Olohena Road to Kuhio Highway.	<5 Years
Kuhio Highway and Kukui Street	Modify traffic signal timings.	<5 Years
Kuhio Hwy and Kapa`a Bypass Road	Intersection improvements.	<5 Years
Olohena Road at Kapa`a Middle School	Improve crosswalk.	<5 Years
Kapa`a Bypass Road and Olohena Road Roundabout	Add a separate (bypass) right-turn lane at the roundabout from makai bound Olohena Road to southbound Kapa`a Bypass Road.	<5 Years
Kuhio Highway	Provide an additional southbound lane on Kuhio Highway from Kapa`a Bypass Road to Kuamoo Road (scheduled for construction).	<5 Years
Kuhio Highway and Kukui Street	Close the makai leg of Kukui Street to provide business parking. Implement vehicular and pedestrian improvements on Kukui Street (mauka leg) and Huluili Street at Kuhio Highway.	5-10 Years
Kapa`a New Town Park	Provide direct access from the Kapa`a New Town Park to the Kapa`a Bypass Road.	5-10 Years
Kuhio Highway and Lehua Street	Improve the left-turn movement from Lehua Street onto Kuhio Highway.	5-10 Years
Kapa`a Bypass Rd and Kuhio Highway	Re-align the Kapa`a Bypass Road (South Junction) to intersect Kuhio Highway opposite Aleka Loop or Papaloa Road.	5-10 Years

Table 5. Potential Traffic Solutions (Cont'd.)		
Location	**Description**	**Priority**
Kapa`a Bypass Road South of Olohena Road	Improve the horizontal alignment and shoulders of the Kapa`a Bypass Road, south of Olohena Road, to Kuhio Highway.	5-10 Years
Kuhio Highway Between Kawaihau Road and Lehua Street	Provide a two-way median left-turn lane along Kuhio Highway.	5-10 Years
Olohena Rd at Kahau St and Lehua St	Implement intersection improvements and bicycle/pedestrian improvements to Kuhio Highway.	5-10 Years
Olohena Rd at Kaapuni Rd and Kaehulua Rd	Implement intersection improvements	5-10 Years
Kaapuni Road	Upgrade/improve Kaapuni Road to major collector standards, including bicycle lanes.	5-10 Years
Olohena Road Between Kuhio Highway and Kamalu Road	Improve Olohena Road to accommodate non-motorized modes.	5-10 Years
Kapa`a Bus Hub	Relocate the Kapa`a bus hub from its existing location near the skate park to a new location on or near the Kuhio Highway mainline, with amenities.	5-10 Years

Improving the horizontal alignment and providing shoulders on the Kapa`a Bypass Road, south of Olohena Road may impact the proposed Hokua Place frontage. Any widening and realignment should be coordinated with Hokua Place. The Kapa`a Transportation Solutions also identifies Road A as a new connector road between Olohena Road and the Kapa`a Bypass Road, which was prioritized beyond the 10-year time frame. The construction cost of the connector road was estimated at $25,824,000.

E. Peak Hour Traffic Analysis Without Project

1. AM Peak Hour Traffic Without Project

During the AM peak hour of traffic without the proposed project, the overall intersection of Kuhio Highway and Kukui Street is expected to continue to operate at LOS "A". The left-turn movement on makai bound Kukui Street is expected to continue to operate at LOS "F". The traffic movements in both directions on Kuhio Highway are expected to continue to operate at LOS "A" at Kukui Street, during the AM peak hour of traffic without the proposed project.

Makai bound Lehua Street is expected to operate at LOS "F" at Kuhio Highway, during the AM peak hour of traffic without the proposed project. Makai bound Ohia Street is expected to operate at LOS "E" at Kuhio Highway.

During the AM peak hour of traffic without the proposed project, makai bound Olohena Road is expected to operate at LOS "F" at the Kapa`a Bypass Road. Southbound Kapa`a Bypass Road is expected to operate at LOS "D" at Olohena Road. Kaapuni Road is expected to operate at LOS "F" at Olohena Road. The other intersections in the study area are expected to operate at satisfactory Levels of Service, during the AM peak hour of traffic without the proposed project. Figures 7 and 8 depict the AM peak hour volumes without the proposed project.

2. PM Peak Hour Traffic Without Project

The overall intersection of Kuhio Highway and Kukui Street is expected to operate at LOS "A", during the PM peak hour of traffic without the proposed project. The left-turn movement on makai bound Kukui Street is expected to continue to operate at LOS "E". The other traffic movements at the intersection are expected to operate at LOS "A", during the PM peak hour of traffic without the proposed project.

The left-turn movement on makai bound Lehua Street is expected to operate at LOS "E" at Kuhio Highway, during the PM peak hour of traffic without the proposed project. Makai bound Ohia Street also is expected to operate at LOS "F" at Kuhio Highway. Mauka bound Pono Kai Driveway is expected to operate at LOS "E", during the PM peak hour of traffic without the proposed project.

Southbound Lehua Street is expected to continue to operate at LOS "F" at Olohena Road, during the PM peak hour of traffic without the proposed project. Southbound Kapa`a Bypass Road is expected to operate at LOS "F" at Olohena Road. The right-turn movement from the Kapa`a Bypass Road onto Kuhio Highway is expected to operate LOS "D". The other intersections in the study area are expected to operate at satisfactory Levels of Service, during the PM peak hour of traffic without the proposed project.

The PM peak hour traffic demands at the intersection of Olohena Road and Kaapuni Road without the proposed project are expected to meet the AASHTO guideline for an exclusive left-turn lane on makai bound Olohena Road. The PM peak hour volumes without the proposed project is depicted on Figures 9 and 10.

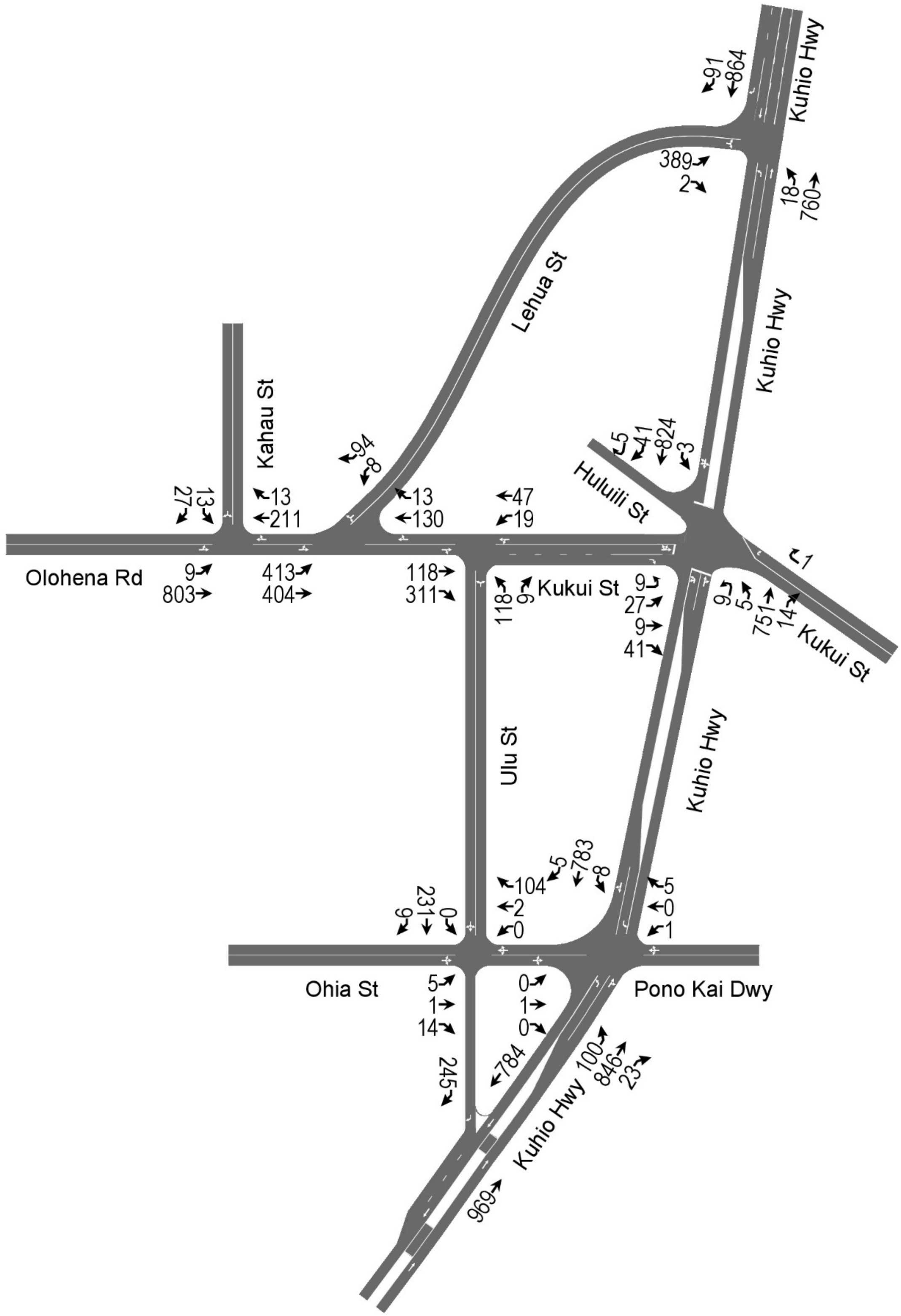

Figure 7. AM Peak Hour Volumes Without Project

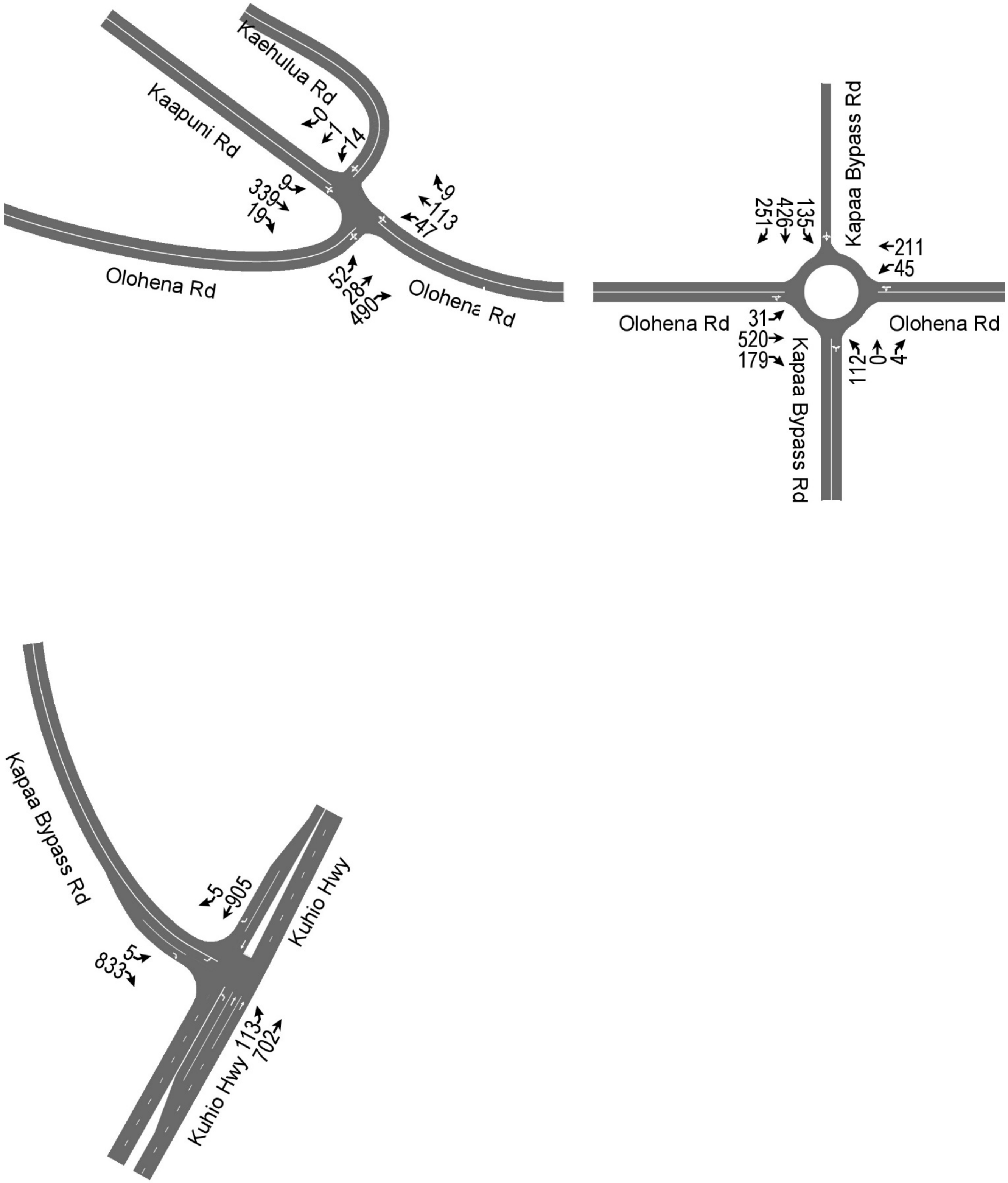

Figure 8. AM Peak Hour Volumes Without Project (Cont'd.)

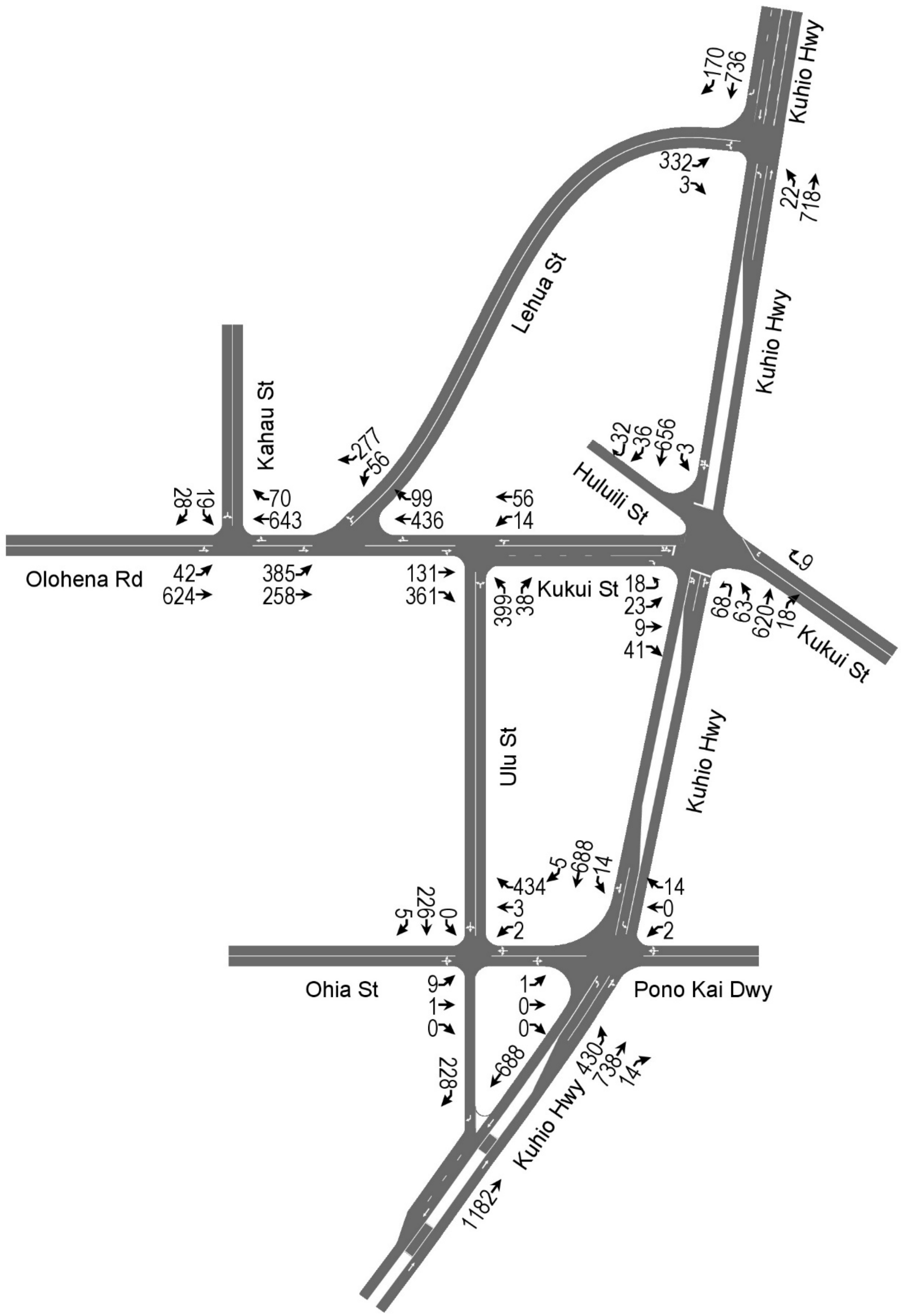

Figure 9. PM Peak Hour Volumes Without Project

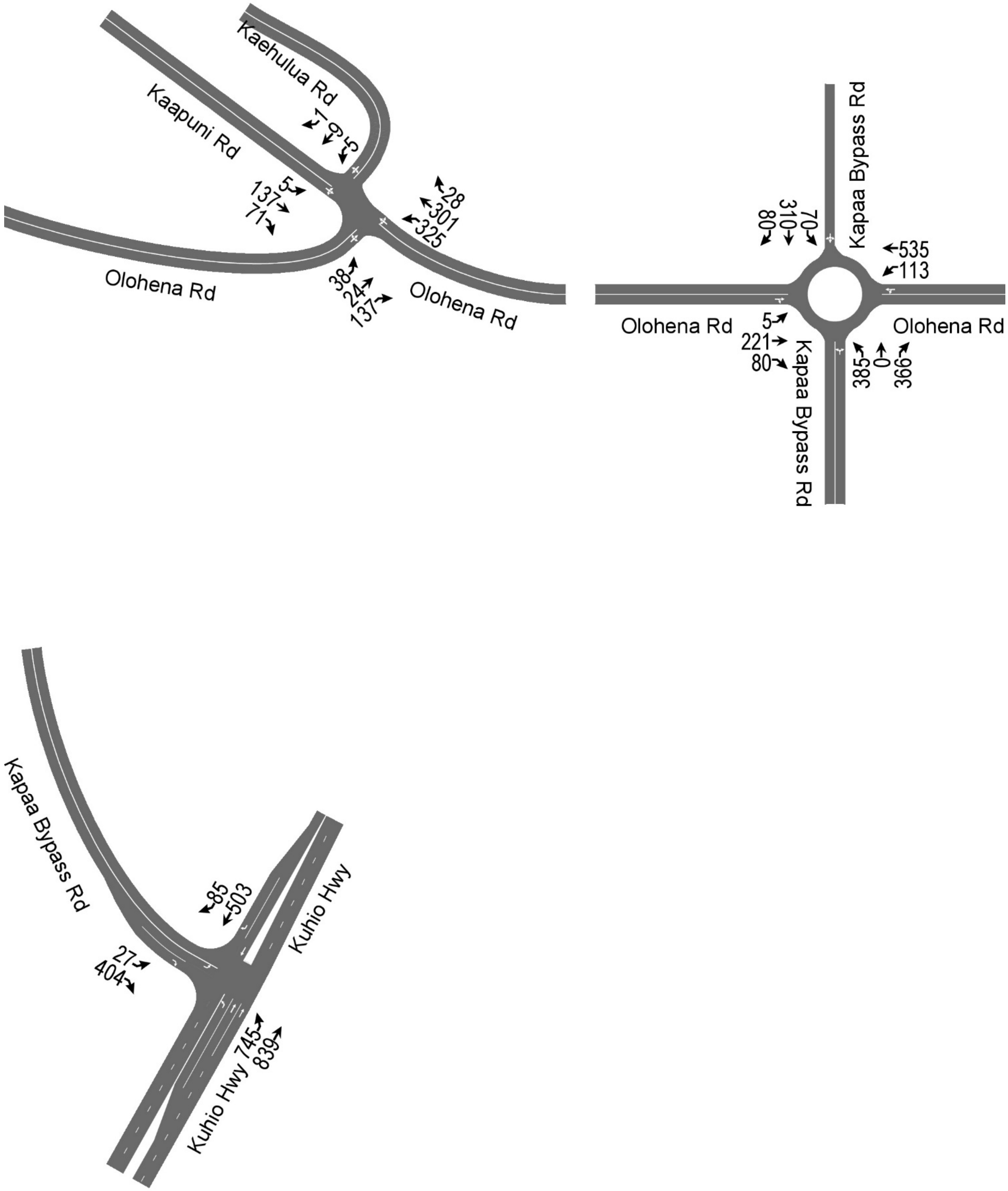

Figure 10. PM Peak Hour Volumes Without Project (Cont'd.)

IV. Traffic Impact Analysis

A. Trip Generation Characteristics

The trip generation characteristics were based upon the ITE trip rates for single-family detached dwelling units (DU) and residential condominium/townhouse units. The weekday ITE trip rates, during the AM peak hour and the PM peak hour of adjacent street traffic, were used for this traffic impact analysis. The ITE regression equations were used to derive the trip rates for the single-family detached dwellings in this analysis. Although ITE recommends the use of the regression equations to derive trip rates, the average peak hour trips rates for the residential condominium/townhouse were used in this analysis. The 800 DU is outside the range of the ITE trip generation data that were utilized to develop the regression equations for condominiums. Furthermore, the average condominium/townhouse rates are higher (more conservative) than the rates that are derived by the regression equations.

The ITE trip generation rates for a shopping center were developed from the regression equations to estimate the trip generation from the proposed 8,000 SFGFA retail center. The pass-by trip rate of 81.2 percent was applied to the PM peak hour trip generation. The ITE pass-by trip rate is reasonable given the size of Hokua Place and the volume of through traffic on Road A. Hokua Place is expected to generate totals of 487 vph and 560 vph, during the AM and PM peak hours of traffic, respectively. The trip generation characteristics for the proposed project are summarized in Table 6.

Table 6. Hokua Place Trip Generation Characteristics

Land Use (ITE Code)	Units	AM Peak Hour (vph)			PM Peak Hour (vph)		
		Enter	Exit	Total	Enter	Exit	Total
Single-Family Phase 1 (265)	16 DU	5	16	21	13	7	20
Single-Family Phase 2 (265)	100 DU	20	60	80	66	38	104
Condominium/ Townhouse (230)	800 DU	60	292	352	279	137	416
Retail Center (820)	8,000 SFGFA	21	13	34	53	57	110
	Pass-By	0	0	0	(-)45	(-)45	(-)90
Total External Trips		**106**	**381**	**487**	**366**	**194**	**560**

B. Site Access Improvements

A conventional channelized, Tee-intersection was considered at the intersection of Road A and the Kapa`a Bypass, with left-turn and right-turn deceleration/storage lanes and a median refuge lane on the Kapa`a Bypass Road. Under unsignalized traffic control, the left-turn lane from Road A onto the Kapa`a Bypass Road is expected to operate at LOS "F", during the PM peak hour of traffic. As an alternative to traffic signalization, a roundabout intersection is recommended Road A and the Kapa`a Bypass Road. The following site access improvements are recommended for the proposed project:

1. Construct a stop-controlled Tee-intersection between Road A and Olohena Road.
2. Construct a stop-controlled Tee-intersection between the Phase 1 Driveway and Olohena Road.
3. Construct a single-lane roundabout at the intersection of Road A and the Kapa`a Bypass Road.

C. Traffic Assignment

The traffic assignments were based upon the existing traffic patterns along Olohena Road and Kukui Street. The traffic assignments also included through traffic demands, which are expected to be diverted from makai bound Olohena Road and from northbound Kapa`a Bypass Road to the proposed Road A. Road A is expected to reduce the traffic demands at the roundabout intersection of the Kapa`a Bypass Road and Olohena Road. Figures 11 and 12 depict the AM peak hour traffic assignments. The PM peak hour traffic assignments are depicted on Figures 13 and 14.

D. AM Peak Hour Traffic Analysis With Project

The roundabout intersection of the Kapa`a Bypass Road and Road A is expected to operate at satisfactory Levels of Service, during the AM peak hour of traffic with the proposed project. Road A is expected to operate at LOS "C" at Olohena Road. The Phase 1 driveway on Olohena Road is expected to operate at LOS "B".

The overall intersection of Kuhio Highway and Kukui Street is expected to continue to operate at LOS "A", during the AM peak hour of traffic with the proposed project. The left-turn movement on makai bound Kukui Street is expected to continue to operate at LOS "F". The traffic movements in both directions on Kuhio Highway are expected to operate at LOS "A" at Kukui Street, during the AM peak hour of traffic with the proposed project.

Makai bound Lehua Street is expected to continue to operate at LOS "F" at Kuhio Highway, during the AM peak hour of traffic with the proposed project. Makai bound Ohia Street also is expected to operate at LOS "F" at Kuhio Highway. The Pono Kai Driveway is expected to operate at LOS "D".

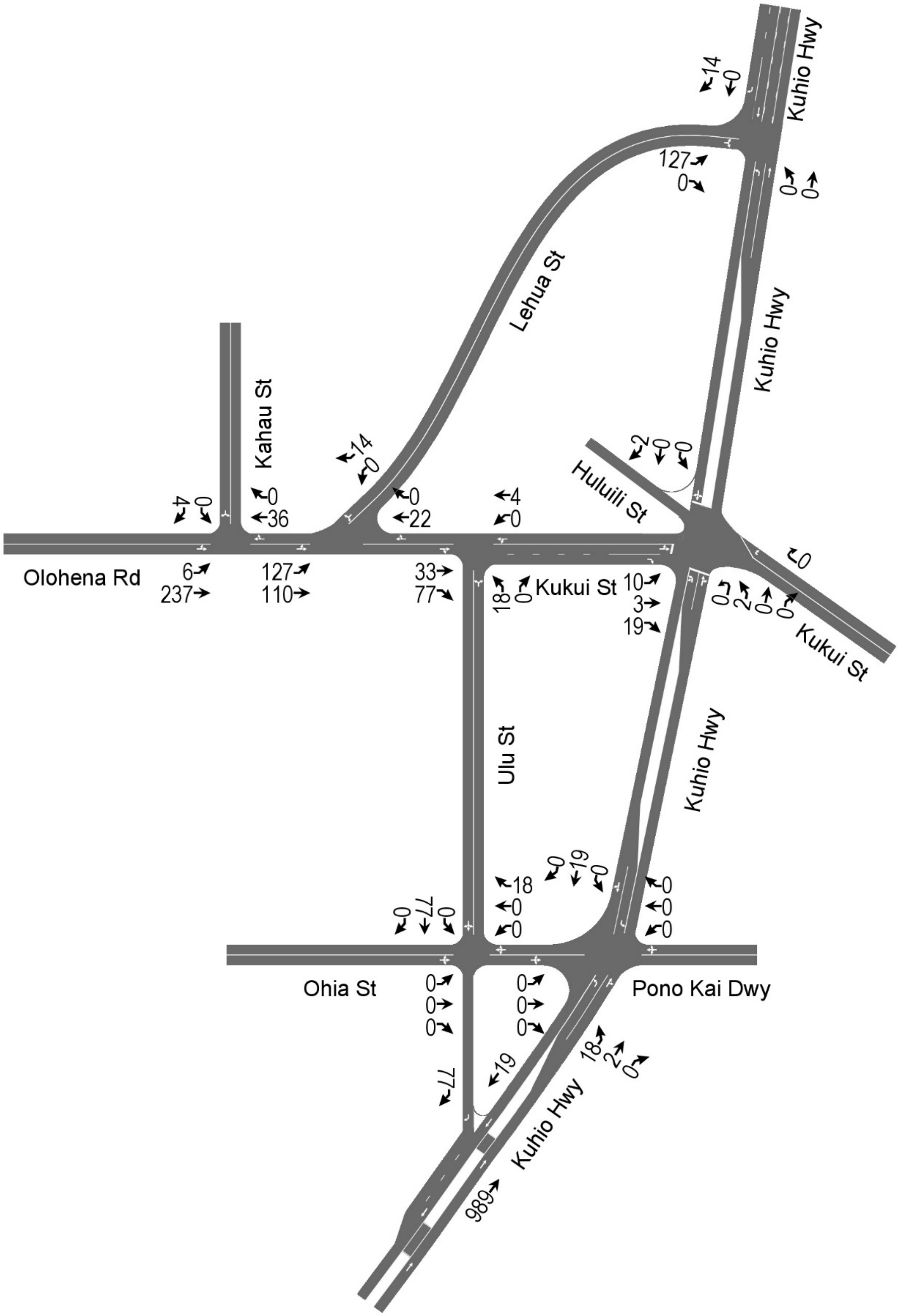

Figure 11. AM Peak Hour Site Traffic Assignment

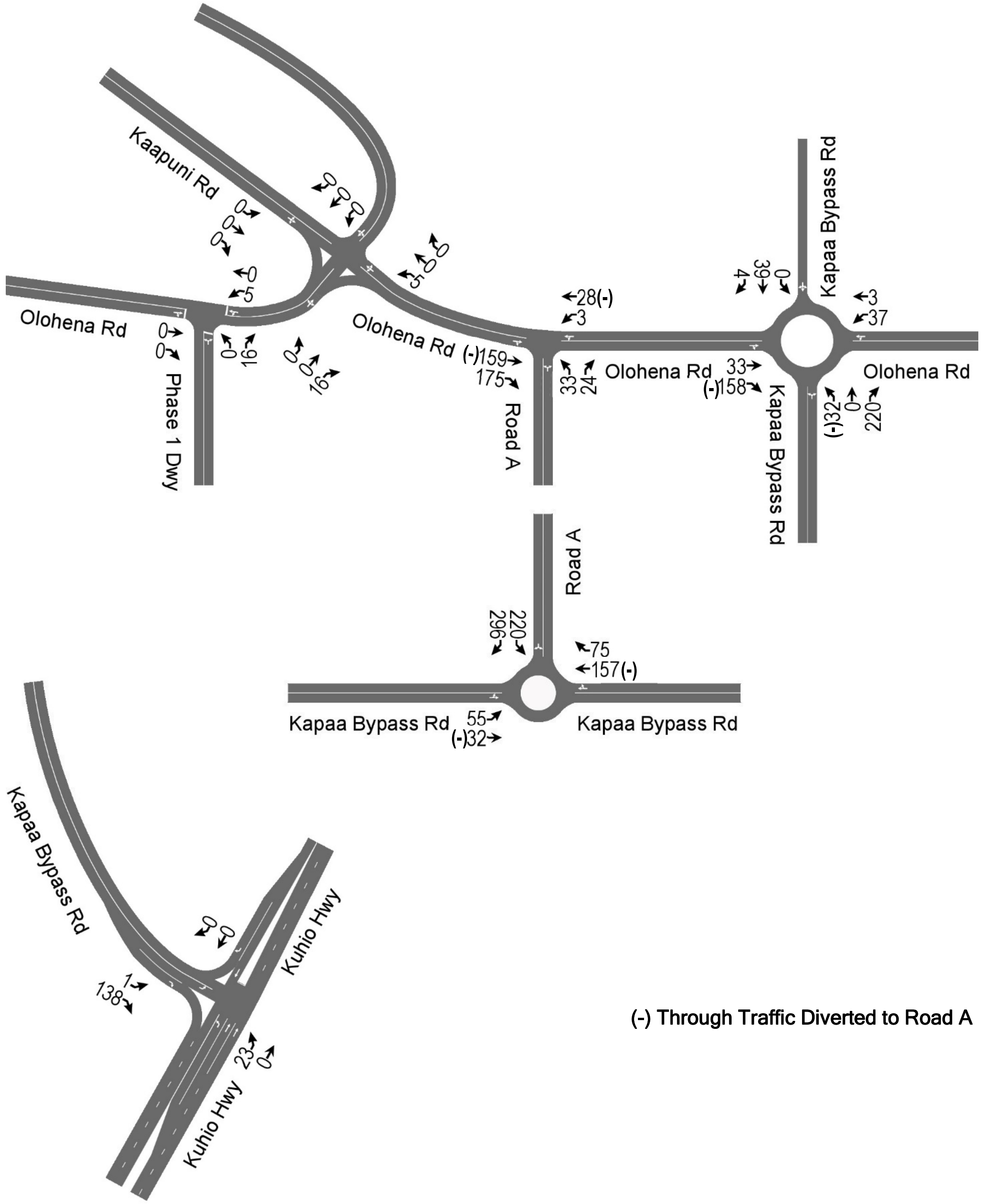

Figure 12. AM Peak Hour Site Traffic Assignment (Cont'd.)

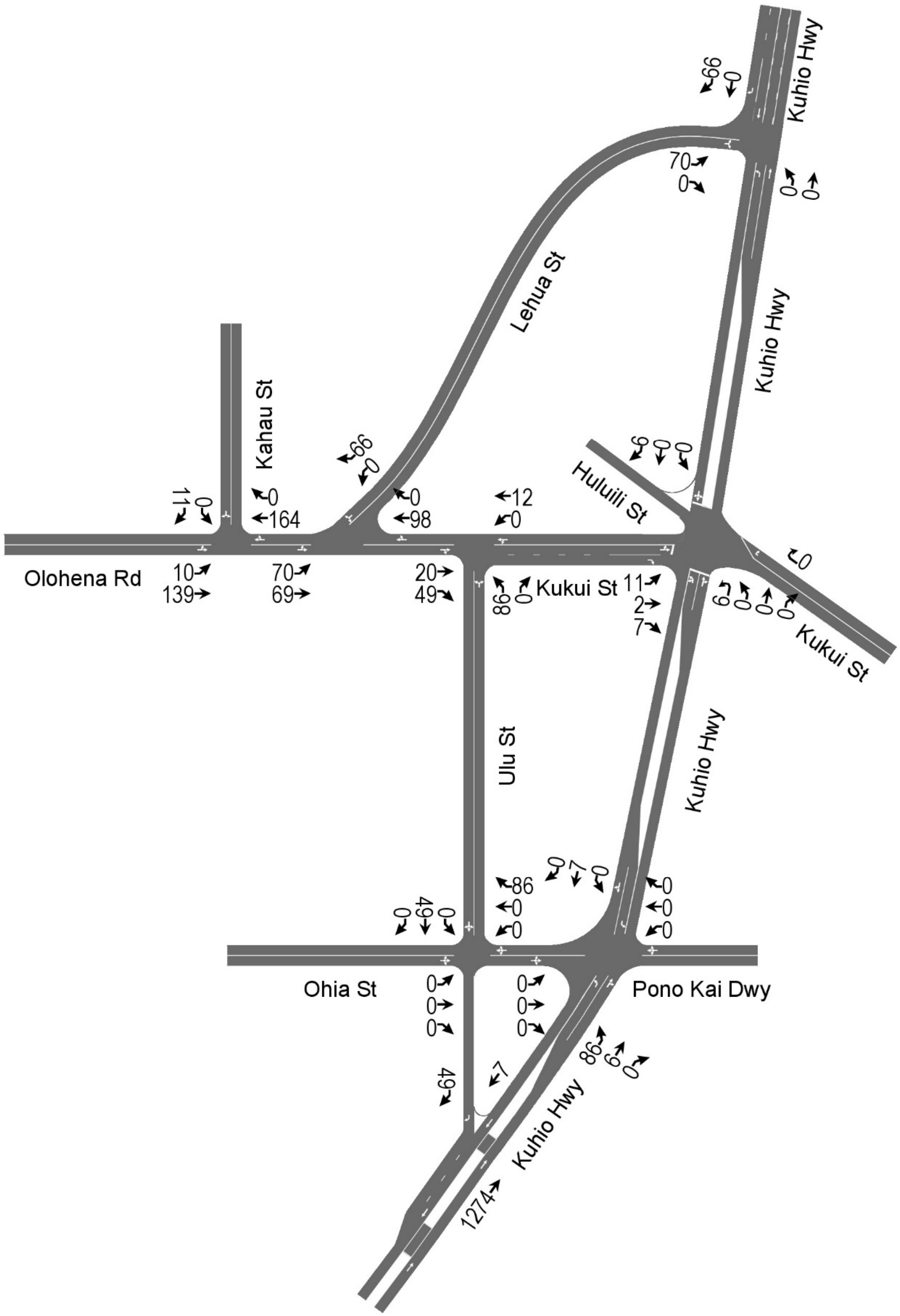

Figure 13. PM Peak Hour Site Traffic Assignment

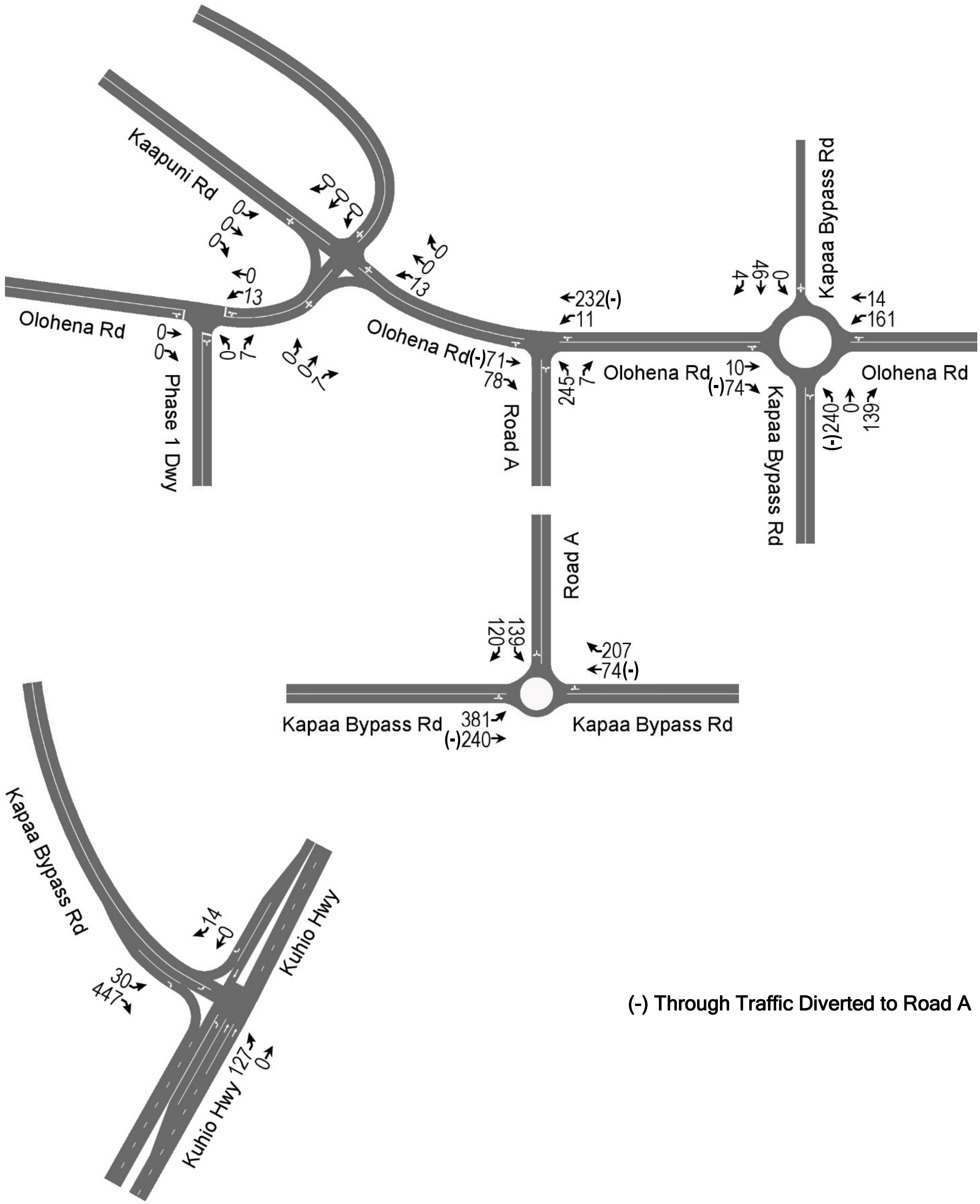

Figure 14. PM Peak Hour Site Traffic Assignment (Cont'd.)

During the AM peak hour of traffic with the proposed project, the overall roundabout intersection of the Kapa`a Bypass Road and Olohena Road is expected to improve from LOS “E” to LOS “D”, during the AM peak hour of traffic with the proposed project. Makai bound Olohena Road is expected to improve from LOS “F” to LOS “E”, due to the diversion of makai bound traffic to Road A. Southbound Kapa`a Bypass Road is expected to worsen from LOS “D” to LOS “E” at Olohena Road.

Kaapuni Road is expected to continue to operate at LOS “F” at Olohena Road. The left-turn movement from the Kapa`a Bypass Road onto Kuhio Highway is expected to operate at LOS “F”, during the AM peak hour of traffic with the proposed project. Figures 15 and 16 depict the AM peak hour volumes with the proposed project.

E. PM Peak Hour Traffic Analysis With Project

During the PM peak hour of traffic with the proposed project, the roundabout intersection of the Kapa`a Bypass Road and Road A is expected to operate at satisfactory Levels of Service. Road A is expected to operate at LOS “D” at Olohena Road. The Phase 1 driveway on Olohena Road is expected to operate at LOS “A”.

The overall intersection of Kuhio Highway and Kukui Street is expected to continue to operate at LOS “A”, during the PM peak hour of traffic with the proposed project. The left-turn movement on makai bound Kukui Street is expected to continue to operate at LOS “F”. The traffic movements in both directions on Kuhio Highway are expected to operate at LOS “A” at Kukui Street, during the PM peak hour of traffic with the proposed project.

Makai bound Lehua Street is expected to continue to operate at LOS “F” at Kuhio Highway, during the PM peak hour of traffic with the proposed project. Makai bound Ohia Street also is expected to operate at LOS “F” at Kuhio Highway. The Pono Kai Driveway is expected to operate at LOS “D” at Kuhio Highway.

During the PM peak hour of traffic with the proposed project, southbound Kapa`a Bypass Road is expected to continue to operate at LOS “F” at its roundabout intersection with Olohena Road. The left-turn and right-turn movements on the Kapa`a Bypass Road (South Junction) at Kuhio Highway are expected to operate at LOS “E” and LOS “D”, respectively. The other intersections in the study area are expected to operate at satisfactory Levels of Service, during the PM peak hour of traffic with the proposed project. Figures 17 and 18 depict the PM peak hour volumes with the proposed project.

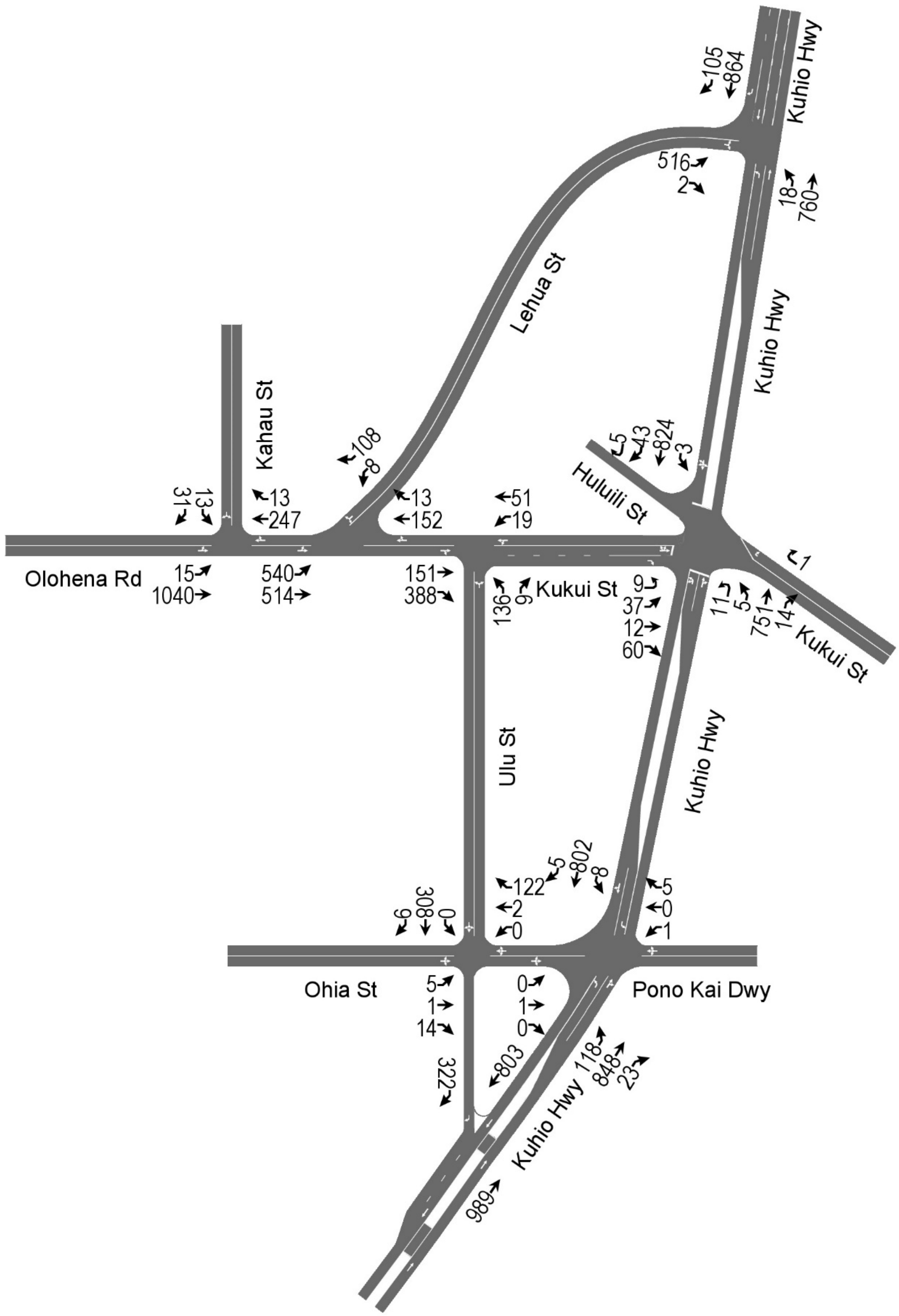

Figure 15. AM Peak Hour Volumes With Project

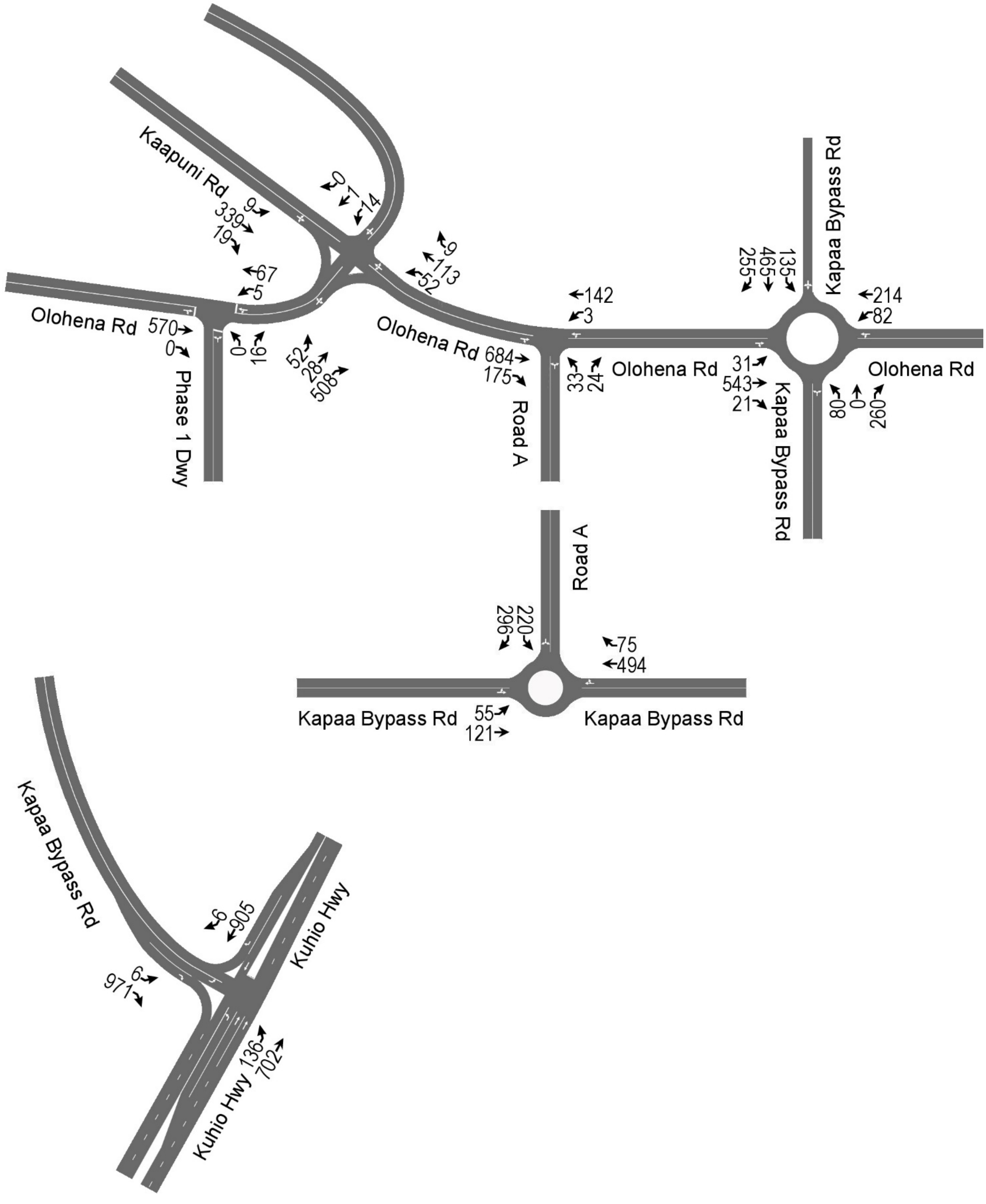

Figure 16. AM Peak Hour Volumes With Project (Cont'd.)

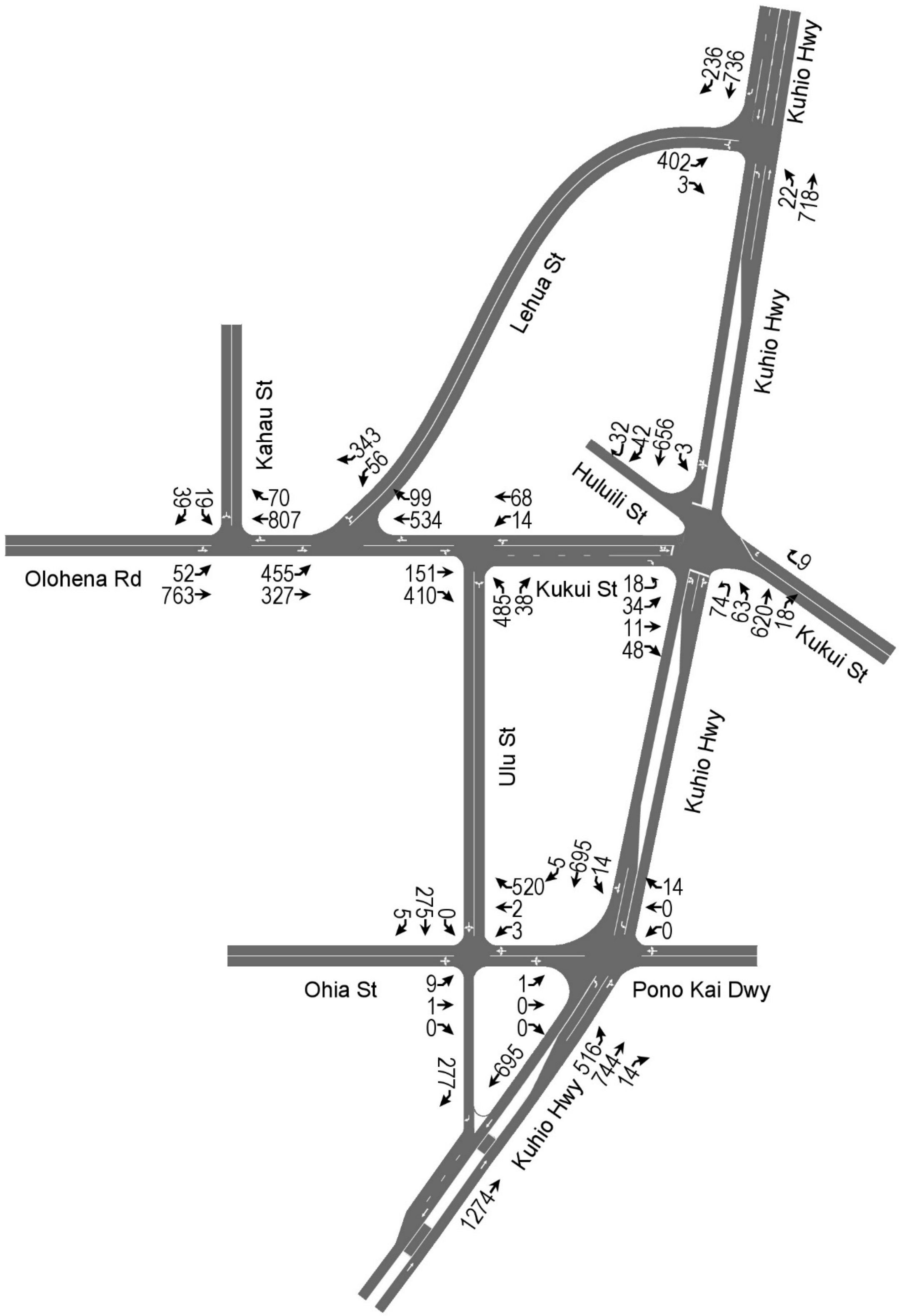

Figure 17. PM Peak Hour Volumes With Project

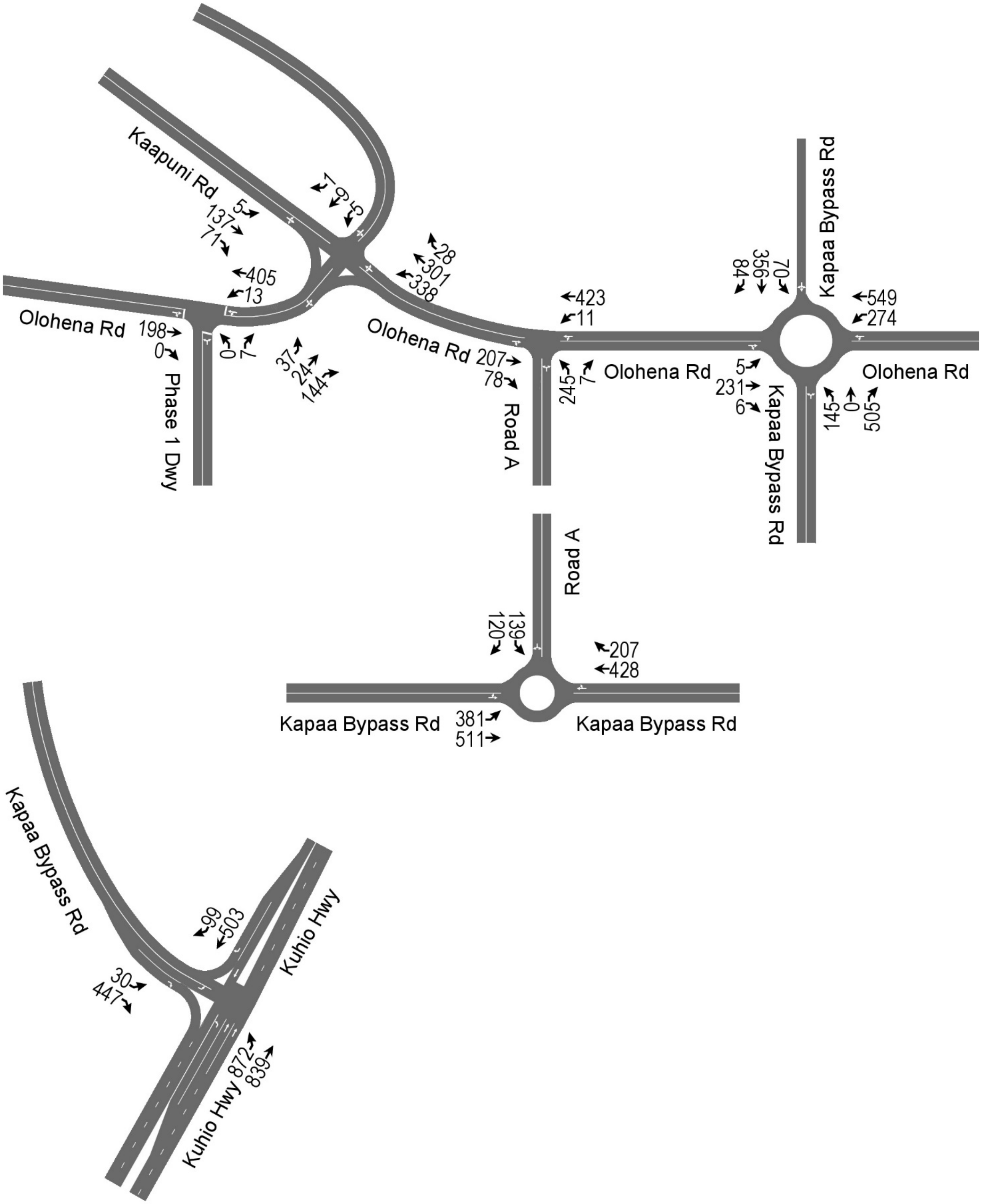

Figure 18. PM Peak Hour Volumes With Project (Cont'd.)

V. Recommendations and Conclusions

A. Recommended Traffic Improvements Without Project

The following traffic improvements expand upon the potential traffic solutions, which were cited in the Kapa`a Transportation Solutions, and are recommended to mitigate the existing and expected traffic congestion without the proposed project:

1. Widen Kuhio Highway between the Kapa`a Bypass Road (South Junction) and Kuamoo Road to provide two through lanes in each direction (DOT).
2. Restripe the median on the north leg of Kuhio Highway at the Kapa`a Bypass Road (South Junction) to provide a median refuge lane to facilitate the left-turn movement from the Kapa`a Bypass Road onto northbound Kuhio Highway.
3. Restrict on-street parking along Kuhio Highway within Kapa`a Town. Provide off-street business parking to replace the restricted parking along Kuhio Highway. Restripe Kuhio Highway to provide additional through and/or left-turn lanes.
4. Modify the traffic signal traffic operations at the intersection of Kuhio Highway and Kukui Street to reduce queuing and delays.
5. Add a right-turn bypass lane at the roundabout intersection from southbound Kapa`a Bypass Road to mauka bound Olohena Road.
6. Realign Kaehulua Road to intersect Olohena Road and Kaapuni Road opposite the mauka leg of Olohena Road to create a four-legged intersection with stop-controls on Kaehulua Road and the mauka leg of Olohena Road. Realign/channelize the mauka leg of Olohena Road to intersect Kaapuni Road and the makai leg of Olohena Road to improve the intersection sight distance. Channelize the right-turn movements on the makai bound approaches of Kaapuni Road and Olohena Road.
7. Extend the median refuge lane/two-way left-turn lane on Kuhio Highway from Lehua Street to Kawaihau Road.

DOT is in the process of widening Kuhio Highway from the Kapa`a Bypass Road to Kuamoo Road (Item No. 1 above). The above Item Nos. 2, 3, and 7 are expected to improve the capacity of Kuhio Highway through Kapa`a Town.

Consolidating the intersections of Olohena Road, Kaapuni Road, and Kaehulua Road (Item No. 6 above) into a single four-legged intersection is expected to improve the traffic operations and safety at the intersection. A roundabout intersection was considered for Olohena Road, Kaapuni Road, and Kaehulua Road. However, the existing roadway slopes would have required extensive grading to provide adequate sight distances at a roundabout intersection.

B. Recommended Traffic Improvements With Project

The following traffic improvements are recommended to mitigate traffic impacts with the proposed project:

1. Construct Road A from Olohena Road to the Kapa`a Bypass Road, as recommended in the Kapa`a Transportation Solutions.
2. Construct a single-lane roundabout at the intersection of Road A and the Kapa`a Bypass Road.

C. Conclusions

An interim solution to the existing traffic congestion in Kapa`a Town is recommended in the Kapa`a Transportation Solutions. Constructing additional off-street parking areas would provide the opportunity to restripe the existing on-street parking lanes and striped shoulders along Kuhio Highway to provide for additional through traffic lanes and/or median left-turn lanes.

The existing southbound traffic demand in Kapa`a Town is reduced by the Kapa`a Bypass Road. Dedication of the Kapa`a Bypass Road right-of-way along the Hokua Place frontage would assure the continued usage of the existing Kapa`a Bypass Road. Any horizontal realignment and/or widening of the Kapa`a Bypass Road along the project frontage should be coordinated with the development of Hokua Place. Widening of the north leg of the Kapa`a Bypass Road between Olohena Road and Kuhio Highway (North Junction) to provide at a two-way, two-lane roadway would provide additional capacity in the northbound direction.

The construction of the proposed Road A is recommended in the Kapa`a Transportation Solutions to provide additional mauka-makai roadway capacity between Kapa`a Valley and the Kapa`a Bypass Road. By diverting through traffic between Olohena Road and the Kapa`a Bypass Road, Road A is expected to mitigate the project's traffic impacts, during the AM and PM peak hour of traffic with the proposed project at the roundabout intersection of the Kapa`a Bypass Road and Olohena Road.

The roundabout at the intersection of the Kapa`a Bypass Road and Road A will increase the intersection capacity, in anticipation of the increase in demand resulting from the future two-lane widening of the Kapa`a Bypass Road between Olohena Road and Kuhio Highway (North Junction). The proposed roundabout intersection of the Kapa`a Bypass Road and Olohena Road is expected to operate at satisfactory Levels of Service, during the AM and PM peak hours of traffic with the proposed project. Table 7 summarizes the measures of effectiveness (MOE) from the traffic analysis of the intersections in the study area.

Table 7. Summary of Capacity Analysis															
Scenario	**Intersection**	**MOE**	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
Existing AM Peak Hour Traffic	**Kuhio Hwy & Kukui St & Huluili St**	**LOS**	F		C	N/A	N/A	A	A	A		A			A
		Delay	115.8		31.5	N/A	N/A	1.3	1.3	2.8		4.5			7.3
		v/c	0.49		0.34	N/A	N/A	0.02	0.02	0.42		0.48			0.49 (maximum)
	Ulu St & Kukui St	**LOS**	N/A	N/A	N/A	A	A	N/A	B			N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.3	0.0	N/A	11.3			N/A	N/A	N/A	2.6
		v/c	N/A	N/A	N/A	0.01	N/A	N/A	0.16			N/A	N/A	N/A	N/A
	Olohena Rd & Lehua St	**LOS**	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	8.3	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.7			4.4
		v/c	0.25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.15			N/A
	Olohena Rd & Kahau St	**LOS**	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	7.6	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13.2			0.6
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.08			N/A
	Kuhio Hwy & Lehua St	**LOS**	E			N/A	N/A	N/A	A	A	N/A	N/A	A	A	A
		Delay	46.6			N/A	N/A	N/A	9.3	0.0	N/A	N/A	0.0	0.0	8.7
		v/c	0.85			N/A	N/A	N/A	0.02	0.40	N/A	N/A	0.45	0.04	N/A
	Kuhio Hwy & Ohia St/Pono Kai Dwy	**LOS**	E			C			A	N/A	N/A	A	N/A	N/A	A
		Delay	48.9			23.7			9.60	N/A	N/A	9.4	N/A	N/A	0.7
		v/c	0.012			0.025			0.10	N/A	N/A	0.01	N/A	N/A	N/A
	Ulu St & Ohia St	**LOS**	B			A						A			A
		Delay	10			8.8						0.0			3.1
		v/c	0.023			0.089						N/A			N/A
	Kapa`a Bypass Rd & Olohena Rd	**LOS**	D			A			A			C			C
		Delay	30			5.1			7.1			18.2			20.0
		v/c	0.855			0.204			0.19			0.757			N/A
	Olohena Rd & Kaapuni Rd	**LOS**	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E			B
		Delay	7.7	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35.1			12.3
		v/c	0.05	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.751			N/A
	Kaapuni Rd & Kaehulua Rd	**LOS**	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	7.6	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.7			0.4
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.024			N/A
	Kuhio Hwy & Kapa`a Bypass Rd	**LOS**	C	N/A	A	N/A	N/A	N/A	B	N/A	N/A	N/A	N/A	N/A	A
		Delay	20.7	N/A	0.0	N/A	N/A	N/A	10.0	N/A	N/A	N/A	N/A	N/A	0.7
		v/c	0.02	N/A	N/A	N/A	N/A	N/A	0.12	N/A	N/A	N/A	N/A	N/A	N/A

Legend
EBL – Makai (East) Bound Left-Turn Movement
EBT – Makai (East) Bound Through Movement
EBR – Makai (East) Bound Right–Turn Movement
WBL – Mauka (West) Bound Left-Turn Movement
WBT – Mauka (West) Bound Through Movement
WBR – Mauka (West) Bound Right-Turn Movement
NBL – North Bound Left-Turn Movement
NBT – North Bound Through Movement
NBR – North Bound Right-Turn Movement
SBL – South Bound Left-Turn Movement
SBT – South Bound Through Movement
SBR – South Bound Right-Turn Movement

Table 7. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
Existing PM Peak Hour Traffic	Kuhio Hwy & Kukui St & Huluili St	LOS	E		A	N/A	N/A	A	A	A		A			A
		Delay	61.6		6.9	N/A	N/A	2.4	2.4	3.4		8.2			7.4
		v/c	0.39		0.22	N/A	N/A	0.18	0.18	0.36		0.48			0.48 (maximum)
	Ulu Street & Kukui Street	LOS	N/A	N/A	N/A	A	A	N/A	C			N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.2	0.0	N/A	17.4			N/A	N/A	N/A	7.7
		v/c	N/A	N/A	N/A	0.01	N/A	N/A	0.567			N/A	N/A	N/A	N/A
	Olohena Road & Lehua Street	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E			B
		Delay	9.8	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	47			12.9
		v/c	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.81			N/A
	Olohena Road & Kahau Street	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C			A
		Delay	9.1	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19.0			0.9
		v/c	0.04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.14			N/A
	Kuhio Hwy & Lehua Street	LOS	D			N/A	N/A	N/A	A	A	N/A	N/A	A	A	A
		Delay	29.2			N/A	N/A	N/A	9.0	0.0	N/A	N/A	0.0	0.0	5.0
		v/c	0.68			N/A	N/A	N/A	0.02	0.38	N/A	N/A	0.39	0.09	N/A
	Kuhio Hwy & Ohia St/Pono Kai Driveway	LOS	F			D			B	N/A	N/A	A	N/A	N/A	A
		Delay	143.4			33.1			11.3	N/A	N/A	9.0	N/A	N/A	3.0
		v/c	0.04			0.10			0.40	N/A	N/A	0.01	N/A	N/A	N/A
	Ulu Street & Ohia Street	LOS	C			B			N/A	N/A	N/A	A	N/A	N/A	A
		Delay	15.5			10.6			N/A	N/A	N/A	0.0	N/A	N/A	7.1
		v/c	0.03			0.38			N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Kapa`a Bypass Rd & Olohena Rd	LOS	A			B			B			D			B
		Delay	7.9			11.5			11.5			26.6			14.2
		v/c	0.32			0.57			0.61			0.73			N/A
	Olohena Rd & Kaapuni Rd	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C			B
		Delay	8.7	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17.3			4.1
		v/c	0.05	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.39			N/A
	Kaapuni Rd & Kaehulua Rd	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	7.9	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.7			0.4
		v/c	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.02			N/A
	Kuhio Hwy & Kapa`a Bypass Rd	LOS	B	N/A	C	N/A	N/A	N/A	B	N/A	N/A	N/A	N/A	N/A	A
		Delay	14.0	N/A	19.0	N/A	N/A	N/A	12.7	N/A	N/A	N/A	N/A	N/A	6.7
		v/c	0.06	N/A	N/A	N/A	N/A	N/A	0.59	N/A	N/A	N/A	N/A	N/A	N/A

Table 7. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
AM Peak Hour Traffic Without Project	Kuhio Hwy & Kukui Street & Huluili Street	LOS	F		C	N/A	N/A	A	A	A		A			A
		Delay	117.0		29.9	N/A	N/A	1.5	1.5	3.7		6.3			8.5
		v/c	0.52		0.36	N/A	N/A	0.03	0.03	0.49		0.57			0.57 (maximum)
	Ulu Street & Kukui Street	LOS	N/A	N/A	N/A	A	A	N/A	B			N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.5	0.0	N/A	12.2			N/A	N/A	N/A	2.7
		v/c	N/A	N/A	N/A	0.02	N/A	N/A	0.203			N/A	N/A	N/A	N/A
	Olohena Road & Lehua Street	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	8.5	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13.1			4.6
		v/c	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.19			N/A
	Olohena Road & Kahau Street	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	7.7	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14.2			0.6
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.09			N/A
	Kuhio Hwy & Lehua Street	LOS	F			N/A	N/A	N/A	A	A	N/A	N/A	A	A	B
		Delay	104.5			N/A	N/A	N/A	9.7	0.0	N/A	N/A	0.0	0.0	19.3
		v/c	1.33			N/A	N/A	N/A	0.02	0.45	N/A	N/A	0.51	0.06	N/A
	Kuhio Hwy & Ohia St/Pono Kai Driveway	LOS	F			D			B	N/A	N/A	A	N/A	N/A	A
		Delay	65			27.4			10.00	N/A	N/A	9.8	N/A	N/A	0.7
		v/c	0.016			0.036			0.12	N/A	N/A	0.01	N/A	N/A	N/A
	Ulu Street & Ohia Street	LOS	B			A			N/A	N/A	N/A	A	N/A	N/A	A
		Delay	10.3			8.8			N/A	N/A	N/A	0.0	N/A	N/A	3.1
		v/c	0.029			0.101			N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Kapa`a Bypass Rd & Olohena Rd	LOS	F			A			A			D			E
		Delay	64.9			5.4			7.4			30.1			38.7
		v/c	1.027			0.233			0.174			0.888			N/A
	Olohena Rd & Kaapuni Rd	LOS	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.4			7.8
		v/c	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.399			N/A
	Kaapuni Rd & Kaehulua Rd	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	7.6	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.6			0.4
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.031			N/A
	Kuhio Hwy & Kapa`a Bypass Rd	LOS	C	N/A	A	N/A	N/A	N/A	B	N/A	N/A	N/A	N/A	N/A	A
		Delay	24.0	N/A	0.0	N/A	N/A	N/A	10.7	N/A	N/A	N/A	N/A	N/A	0.8
		v/c	0.03	N/A	N/A	N/A	N/A	N/A	0.15	N/A	N/A	N/A	N/A	N/A	N/A

Table 7. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
PM Peak Hour Traffic Without Project	Kuhio Hwy & Kukui St & Huluili St	LOS	E		A	N/A	N/A	A	A	A		A			A
		Delay	62.1		8.6	N/A	N/A	2.7	2.7	3.9		9.6			8.3
		v/c	0.42		0.25	N/A	N/A	0.22	0.22	0.41		0.55			0.55 (maximum)
	Ulu Street & Kukui Street	LOS	N/A	N/A	N/A	A	A	N/A	C			N/A	N/A	N/A	B
		Delay	N/A	N/A	N/A	8.5	0.0	N/A	24.7			N/A	N/A	N/A	10.9
		v/c	N/A	N/A	N/A	0.01	N/A	N/A	0.72			N/A	N/A	N/A	N/A
	Olohena Road & Lehua Street	LOS	B	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F			E
		Delay	10.8	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	199.9			46.8
		v/c	0.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.30			N/A
	Olohena Road & Kahau Street	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C			A
		Delay	9.5	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	24.3			1.1
		v/c	0.05	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.20			N/A
	Kuhio Hwy & Lehua Street	LOS	E			N/A	N/A	N/A	A	A	N/A	N/A	A	A	B
		Delay	48.4			N/A	N/A	N/A	9.3	0.0	N/A	N/A	0.0	0.0	19.3
		v/c	0.85			N/A	N/A	N/A	0.03	0.42	N/A	N/A	0.43	0.10	N/A
	Kuhio Hwy & Ohia St/Pono Kai Driveway	LOS	F			E			B	N/A	N/A	A	N/A	N/A	A
		Delay	261.5			47.7			12.80	N/A	N/A	9.3	N/A	N/A	3.5
		v/c	0.067			0.16			0.48	N/A	N/A	0.02	N/A	N/A	N/A
	Ulu Street & Ohia Street	LOS	C			B			N/A	N/A	N/A	A	N/A	N/A	A
		Delay	17.5			11.1			N/A	N/A	N/A	0.0	N/A	N/A	7.4
		v/c	0.033			0.428			N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Kapa`a Bypass Rd & Olohena Rd	LOS	A			C			C			F			D
		Delay	9.8			16.8			16.9			72.9			27.7
		v/c	0.399			0.714			0.744			1.002			N/A
	Olohena Road & Kaapuni Road	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C			A
		Delay	9.1	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23.5			5.4
		v/c	0.07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.538			N/A
	Kaapuni Road & Kaehulua Road	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	8.1	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.6			0.4
		v/c	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.031			N/A
	Kuhio Hwy & Kapa`a Bypass Rd	LOS	C	N/A	D	N/A	N/A	N/A	C	N/A	N/A	N/A	N/A	N/A	A
		Delay	22.6	N/A	25.4	N/A	N/A	N/A	15.6	N/A	N/A	N/A	N/A	N/A	8.6
		v/c	0.12	N/A	N/A	N/A	N/A	N/A	0.70	N/A	N/A	N/A	N/A	N/A	N/A

Table 7. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
AM Peak Hour Traffic With Project	Kuhio Hwy & Kukui Street & Huluili Street	LOS	F		C	N/A	N/A	A	A	A		A			A
		Delay	118.9		26.1	N/A	N/A	1.8	1.8	4.1		7.0			10.0
		v/c	0.59		0.42	N/A	N/A	0.03	0.03	0.49		0.57			0.59 (maximum)
	Ulu Street & Kukui Street	LOS	N/A	N/A	N/A	A	A	N/A	B			N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.8	0.0	N/A	13.6			N/A	N/A	N/A	2.8
		v/c	N/A	N/A	N/A	0.02	N/A	N/A	0.257			N/A	N/A	N/A	N/A
	Olohena Road & Lehua Street	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C			A
		Delay	9.2	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19			5.4
		v/c	0.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.31			N/A
	Olohena Road & Kahau Street	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C			A
		Delay	7.8	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17.3			0.6
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.13			N/A
	Kuhio Hwy & Lehua Street	LOS	F			N/A	N/A	N/A	A	A	N/A	N/A	A	A	F
		Delay	237.5			N/A	N/A	N/A	9.7	0.0	N/A	N/A	0.0	0.0	54.4
		v/c	1.43			N/A	N/A	N/A	0.02	0.45	N/A	N/A	0.51	0.05	N/A
	Kuhio Hwy & Ohia Street/Pono Kai Driveway	LOS	F			D			B	N/A	N/A	A	N/A	N/A	A
		Delay	71.7			29.0			10.2	N/A	N/A	9.8	N/A	N/A	0.8
		v/c	0.02			0.04			0.15	N/A	N/A	0.01	N/A	N/A	N/A
	Ulu Street & Ohia Street	LOS	B			A			N/A	N/A	N/A	A	N/A	N/A	A
		Delay	11			8.9			N/A	N/A	N/A	0.0	N/A	N/A	2.9
		v/c	0.03			0.12			N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Kapa`a Bypass Rd & Olohena Rd	LOS	E			A			B			E			D
		Delay	42.1			5.7			14.5			40.7			31.9
		v/c	0.91			0.27			0.53			0.95			N/A
	Road A & Olohena Road	LOS	N/A	N/A	N/A	A	A	N/A	C			N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	9.6	0.0	N/A	17.9			N/A	N/A	N/A	1.0
		v/c	N/A	N/A	N/A	0.00	N/A	N/A	0.17			N/A	N/A	N/A	N/A
	Olohena Road & Kaapuni Road	LOS	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F			D
		Delay	7.8	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	106.1			35.5
		v/c	0.06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.078			N/A
	Kaapuni Rd & Kaehulua Rd	LOS	A	A	N/A	N/A	B	N/A	N/A	N/A	N/A	B			A
		Delay	7.6	0.0	N/A	N/A	12.6	N/A	N/A	N/A	N/A	12.6			0.4
		v/c	0.01	-	N/A	N/A	0.03	N/A	N/A	N/A	N/A	0.03			N/A
	Phase 1 Dwy & Olohena Rd	LOS	N/A	N/A	N/A	A	A	N/A	B			N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.6	0.0	N/A	12.1			N/A	N/A	N/A	0.4
		v/c	N/A	N/A	N/A	0.01	N/A	N/A	0.03			N/A	N/A	N/A	N/A

Table 7. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
AM Peak Hour Traffic With Project (Cont'd.)	Kapa`a Bypass Road & Road A	LOS	A			A			N/A			C			B
		Delay	4.8			7.3			N/A			15.1			10.1
		v/c	0.16			0.45			N/A			0.64			N/A
	Kuhio Hwy & Kapa`a Bypass Road	LOS	F	N/A	A	N/A	N/A	N/A	B	N/A	N/A	N/A	N/A	N/A	A
		Delay	51.1	N/A	0.0	N/A	N/A	N/A	10.9	N/A	N/A	N/A	N/A	N/A	1.0
		v/c	0.07	N/A	N/A	N/A	N/A	N/A	0.18	N/A	N/A	N/A	N/A	N/A	N/A
AM Peak Hour Traffic With Project - Improved	Kuhio Hwy & Kukui Street & Huluili Street	LOS	C		B	N/A	N/A	A	A	A		A			A
		Delay	32.8		11.4	N/A	N/A	0.0	3.8	7.0		8.2			.6
		v/c	0.31		0.27	N/A	N/A	N/A	0.03	0.56		0.63			0.63 (maximum)
	Kuhio Hwy & Lehua Street	LOS	F			N/A	N/A	N/A	A	A	N/A	N/A	A	A	E
		Delay	196.5			N/A	N/A	N/A	9.7	0.0	N/A	N/A	0.0	0.0	45.0
		v/c	1.34			N/A	N/A	N/A	0.02	0.45	N/A	N/A	0.51	0.06	N/A
	Kapa`a Bypass Rd & Olohena Rd	LOS	C			A			B			B		A	B
		Delay	23.9			5.4			11.1			12.1		0.0	12.9
		v/c	0.79			0.25			0.46			0.61		0.13	N/A
	Olohena Rd & Kaapuni Road & Kaehulua Road	LOS	A	A		A	A		D			E			B
		Delay	7.5	0.0		8.1	0.0		34.9			43.2			19.0
		v/c	0.01	N/A		0.04	-		0.87			0.14			N/A
	Kuhio Hwy & Kapa`a Bypass Road	LOS	C	N/A	A	N/A	N/A	N/A	B	A	N/A	N/A	A	A	A
		Delay	21.8	N/A	0.0	N/A	N/A	N/A	10.9	0.0	N/A	N/A	0.0	0.0	0.9
		v/c	0.03	N/A	N/A	N/A	N/A	N/A	0.18	N/A	N/A	N/A	N/A	N/A	N/A
PM Peak Hour Traffic With Project	Kuhio Hwy & Kukui Street & Huluili Street	LOS	E		B	N/A	N/A	A	A	A		B			A
		Delay	63.3		11.1	N/A	N/A	3.0	3.0	4.2		10.5			9.4
		v/c	0.48		0.27	N/A	N/A	0.23	0.23	0.42		0.56			0.56 (maximum)
	Ulu Street & Kukui Street	LOS	N/A	N/A	N/A	A	A	N/A	E			N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.7	0.0	N/A	49.9			N/A	N/A	N/A	22.5
		v/c	N/A	N/A	N/A	0.01	N/A	N/A	0.93			N/A	N/A	N/A	N/A
	Olohena Road & Lehua Street	LOS	B	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F			A
		Delay	12.7	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	714.0			160.2
		v/c	0.49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.45			N/A
	Olohena Road & Kahau Street	LOS	B	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E			A
		Delay	10.4	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36.5			1.5
		v/c	0.07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.34			N/A

<table>
<tr><th colspan="16">Table 7. Summary of Capacity Analysis (Cont'd.)</th></tr>
<tr><th>Scenario</th><th>Intersection</th><th>MOE</th><th>EBL</th><th>EBT</th><th>EBR</th><th>WBL</th><th>WBT</th><th>WBR</th><th>NBL</th><th>NBT</th><th>NBR</th><th>SBL</th><th>SBT</th><th>SBR</th><th>Intersection</th></tr>
<tr><td rowspan="30">PM Peak Hour Traffic With Project (Cont'd.)</td><td rowspan="3">Kuhio Hwy & Lehua Street</td><td>LOS</td><td colspan="3">F</td><td>N/A</td><td>N/A</td><td>N/A</td><td>A</td><td>A</td><td>N/A</td><td>N/A</td><td>A</td><td>A</td><td>B</td></tr>
<tr><td>Delay</td><td colspan="3">85.7</td><td>N/A</td><td>N/A</td><td>N/A</td><td>9.3</td><td>0.0</td><td>N/A</td><td>N/A</td><td>0.0</td><td>0.0</td><td>12.5</td></tr>
<tr><td>v/c</td><td colspan="3">1.03</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.03</td><td>0.42</td><td>N/A</td><td>N/A</td><td>0.43</td><td>0.14</td><td>N/A</td></tr>
<tr><td rowspan="3">Kuhio Hwy & Ohia St/Pono Kai Driveway</td><td>LOS</td><td colspan="3">F</td><td colspan="3">B</td><td>B</td><td>N/A</td><td>N/A</td><td>A</td><td>N/A</td><td>N/A</td><td>A</td></tr>
<tr><td>Delay</td><td colspan="3">401.7</td><td colspan="3">14.6</td><td>14.6</td><td>N/A</td><td>N/A</td><td>9.3</td><td>N/A</td><td>N/A</td><td>4.1</td></tr>
<tr><td>v/c</td><td colspan="3">0.10</td><td colspan="3">0.04</td><td>0.58</td><td>N/A</td><td>N/A</td><td>0.02</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="3">Ulu Street & Ohia Street</td><td>LOS</td><td colspan="3">C</td><td colspan="3">B</td><td>N/A</td><td>N/A</td><td>N/A</td><td>A</td><td>N/A</td><td>N/A</td><td>A</td></tr>
<tr><td>Delay</td><td colspan="3">21.7</td><td colspan="3">12.1</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.0</td><td>N/A</td><td>N/A</td><td>8.1</td></tr>
<tr><td>v/c</td><td colspan="3">0.04</td><td colspan="3">0.51</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="3">Kapa`a Bypass Rd & Olohena Rd</td><td>LOS</td><td colspan="3">B</td><td colspan="3">B</td><td colspan="3">B</td><td colspan="3">F</td><td>D</td></tr>
<tr><td>Delay</td><td colspan="3">11.3</td><td colspan="3">14.2</td><td colspan="3">13.3</td><td colspan="3">84.7</td><td>29.8</td></tr>
<tr><td>v/c</td><td colspan="3">0.39</td><td colspan="3">0.72</td><td colspan="3">0.65</td><td colspan="3">1.05</td><td>N/A</td></tr>
<tr><td rowspan="3">Road A & Olohena Road</td><td>LOS</td><td>N/A</td><td>N/A</td><td>N/A</td><td>A</td><td>A</td><td>N/A</td><td colspan="3">D</td><td>N/A</td><td>N/A</td><td>N/A</td><td>A</td></tr>
<tr><td>Delay</td><td>N/A</td><td>N/A</td><td>N/A</td><td>7.8</td><td>0.0</td><td>N/A</td><td colspan="3">26.7</td><td>N/A</td><td>N/A</td><td>N/A</td><td>7.0</td></tr>
<tr><td>v/c</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.01</td><td>N/A</td><td>N/A</td><td colspan="3">0.61</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="3">Olohena Road & Kaapuni Road</td><td>LOS</td><td>A</td><td>A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="3">C</td><td>D</td></tr>
<tr><td>Delay</td><td>9.1</td><td>0.0</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="3">24.5</td><td>5.5</td></tr>
<tr><td>v/c</td><td>0.07</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="3">0.55</td><td>N/A</td></tr>
<tr><td rowspan="3">Kaapuni Road & Kaehulua Road</td><td>LOS</td><td>A</td><td>A</td><td>N/A</td><td>N/A</td><td>B</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="3">B</td><td>A</td></tr>
<tr><td>Delay</td><td>8.1</td><td>0.0</td><td>N/A</td><td>N/A</td><td>12.6</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="3">12.6</td><td>0.4</td></tr>
<tr><td>v/c</td><td>0.00</td><td>-</td><td>N/A</td><td>N/A</td><td>0.03</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="3">0.03</td><td>N/A</td></tr>
<tr><td rowspan="3">Phase 1 Dwy & Olohena Road</td><td>LOS</td><td>N/A</td><td>N/A</td><td>N/A</td><td>A</td><td>A</td><td>N/A</td><td colspan="3">A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>A</td></tr>
<tr><td>Delay</td><td>N/A</td><td>N/A</td><td>N/A</td><td>7.6</td><td>0.0</td><td>N/A</td><td colspan="3">9.3</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.2</td></tr>
<tr><td>v/c</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.01</td><td>N/A</td><td>N/A</td><td colspan="3">0.01</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="3">Kapa`a Bypass Rd & Road A</td><td>LOS</td><td colspan="3">C</td><td colspan="3">C</td><td colspan="3">N/A</td><td colspan="3">A</td><td>B</td></tr>
<tr><td>Delay</td><td colspan="3">16.0</td><td colspan="3">16.1</td><td colspan="3">N/A</td><td colspan="3">7.4</td><td>14.8</td></tr>
<tr><td>v/c</td><td colspan="3">0.76</td><td colspan="3">0.70</td><td colspan="3">75</td><td colspan="3">0.30</td><td>N/A</td></tr>
<tr><td rowspan="3">Kuhio Hwy & Kapa`a Bypass Road</td><td>LOS</td><td>E</td><td>N/A</td><td>A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>C</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>B</td></tr>
<tr><td>Delay</td><td>44.7</td><td>N/A</td><td>0.0</td><td>N/A</td><td>N/A</td><td>N/A</td><td>21.1</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>12.0</td></tr>
<tr><td>v/c</td><td>0.25</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.81</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="6">PM Peak Hour Traffic With Project - Improved</td><td rowspan="3">Kuhio Hwy & Kukui Street & Huluili Street</td><td>LOS</td><td colspan="2">C</td><td>A</td><td>N/A</td><td>N/A</td><td>A</td><td>A</td><td colspan="2">A</td><td colspan="3">B</td><td>B</td></tr>
<tr><td>Delay</td><td colspan="2">32.0</td><td>1.8</td><td>N/A</td><td>N/A</td><td>0.1</td><td>4.0</td><td colspan="2">5.9</td><td colspan="3">16.7</td><td>11.4</td></tr>
<tr><td>v/c</td><td colspan="2">0.32</td><td>0.18</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.24</td><td colspan="2">0.46</td><td colspan="3">0.66</td><td>0.66 (maximum)</td></tr>
<tr><td rowspan="3">Kuhio Hwy & Lehua Street</td><td>LOS</td><td colspan="3">F</td><td>N/A</td><td>N/A</td><td>N/A</td><td>A</td><td>A</td><td>N/A</td><td>N/A</td><td>A</td><td>A</td><td>B</td></tr>
<tr><td>Delay</td><td colspan="3">65.9</td><td>N/A</td><td>N/A</td><td>N/A</td><td>9.3</td><td>0.0</td><td>N/A</td><td>N/A</td><td>0.0</td><td>0.0</td><td>12.7</td></tr>
<tr><td>v/c</td><td colspan="3">0.96</td><td>N/A</td><td>N/A</td><td>N/A</td><td>0.03</td><td>0.42</td><td>N/A</td><td>N/A</td><td>0.43</td><td>0.14</td><td>N/A</td></tr>
</table>

Table 7. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
PM Peak Hour Traffic With Project – Improved (Cont'd.)	Kapa`a Bypass Rd & Olohena Rd	LOS	A			B			B			D		A	B
		Delay	9.1			12.5			11.2			25.1		0.0	13.7
		v/c	0.33			0.68			0.60			0.72		0.04	N/A
	Olohena Rd & Kaapuni Road & Kaehulua Road	LOS	A	A		A	A		C			E			A
		Delay	7.9	0.0		8.2	0.0		21.3			36.0			7.1
		v/c	0.00	N/A		0.23	N/A		0.48			0.12			N/A
	Kuhio Hwy & Kapa`a Bypass Road	LOS	E	N/A	A	N/A	N/A	N/A	C	A	N/A	N/A	A	A	A
		Delay	44.9	N/A	0.0	N/A	N/A	N/A	22.4	0.0	N/A	N/A	0.0	0.0	8.9
		v/c	0.25	N/A	N/A	N/A	N/A	N/A	0.81	N/A	N/A	N/A	N/A	N/A	N/A

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4) 4-3-03: 01

APPENDIX A

TRAFFIC COUNT DATA

Study Name **Kuhio Hwy Kukui ST 3-15-17 to 3-17-17**
Start Date **3/15/17**
Start Time **3:00 PM**
Site Code **Hokua Place**

Start	Kukui St Makai Bound				Kukui St Mauka Bound				Kuhio Hwy Northbound				Kuhio Hwy Southbound				**Intersection**	
3/15/17	LT-Huluili	LT-Kuhio	Thru	Right-Turn	Left-Turn	Thru	Thru-Huluili	RT-Kuhio	LT-Kukui	LT-Huluili	Thru	Right-Turn	Left-Turn	Thru	RT-Kukui	RT-Huluili	15-Min Totals	Hourly Totals
3:00 PM	4	11	6	12	0	0	0	4	4	1	121	2	3	126	14	1	309	1160
3:15 PM	1	16	1	9	0	0	0	7	4	1	89	2	1	129	16	0	276	1136
3:30 PM	10	12	0	9	0	0	0	7	5	0	86	0	3	144	12	1	289	1142
3:45 PM	9	15	4	16	1	0	0	1	11	2	99	1	1	113	13	0	286	1125
4:00 PM	7	18	6	11	0	0	0	2	7	0	96	1	3	111	18	5	285	1136
4:15 PM	4	16	4	11	0	0	0	8	7	1	97	0	1	112	20	1	282	1123
4:30 PM	3	9	1	13	0	0	0	2	8	0	110	1	2	107	15	1	272	1153
4:45 PM	2	12	1	11	0	0	0	1	5	0	103	2	3	136	17	4	297	1177
5:00 PM	4	13	4	4	0	0	0	2	7	7	82	1	2	133	10	3	272	1144
5:15 PM	12	9	5	16	0	0	0	1	4	5	109	0	2	134	9	6	312	
5:30 PM	4	3	3	6	0	0	0	2	6	6	123	2	0	133	7	1	296	
5:45 PM	2	7	5	6	0	0	0	3	1	1	108	0	1	124	5	1	264	
3/16/17																		
7:00 AM	0	8	2	8	0	0	0	2	1	1	124	1	0	184	2	2	335	1397
7:15 AM	2	6	0	9	0	0	0	0	2	1	166	3	0	182	9	0	**380**	**1410**
7:30 AM	0	6	1	15	0	0	0	0	7	5	143	1	1	153	6	1	339	1367
7:45 AM	2	3	3	15	0	0	0	0	4	4	153	1	0	151	7	0	343	1399
8:00 AM	2	11	4	9	0	0	0	1	3	1	143	2	2	165	2	3	348	1397
8:15 AM	0	0	1	3	0	0	0	4	4	1	143	4	3	172	2	0	337	
8:30 AM	0	5	3	6	0	0	0	9	7	0	153	9	1	170	7	1	371	
8:45 AM	3	9	0	8	0	0	0	9	2	2	151	5	2	143	6	1	341	
3/16/17																		
3:00 PM	7	7	2	9	1	0	0	1	5	1	93	3	2	134	10	4	279	1182
3:15 PM	2	11	2	3	0	0	0	3	10	2	129	1	2	125	9	3	302	1203
3:30 PM	2	7	4	18	0	0	0	4	7	3	105	3	2	144	14	1	314	1160
3:45 PM	3	8	5	7	0	0	0	10	2	1	96	0	1	148	5	1	287	1160
4:00 PM	3	3	4	9	0	0	0	0	3	4	113	4	2	139	10	6	300	1162
4:15 PM	2	8	1	6	0	0	0	0	3	3	111	1	2	114	8	0	259	1176
4:30 PM	1	9	1	3	0	0	0	0	4	0	136	2	1	148	7	2	314	1269
4:45 PM	6	5	2	3	0	0	0	0	10	1	114	2	3	134	8	1	289	1281
5:00 PM	7	4	1	8	0	0	0	6	4	3	119	3	2	144	10	3	314	**1305**
5:15 PM	4	5	2	9	0	0	0	2	15	14	137	4	0	145	8	7	**352**	
5:30 PM	2	6	0	0	0	0	0	2	3	1	154	3	0	145	5	5	326	
5:45 PM	0	6	1	7	0	0	0	1	3	0	134	3	1	147	6	4	313	
3/17/17																		
6:45 AM	0	4	1	6	0	0	0	2	2	0	104	1	1	167	6	0	294	1326
7:00 AM	1	3	1	8	0	0	0	3	3	0	101	2	0	179	7	0	308	1386
7:15 AM	0	4	0	11	0	0	0	2	5	0	172	2	0	170	5	0	371	1415
7:30 AM	1	10	1	12	0	0	0	3	9	1	141	2	1	167	5	0	353	1395
7:45 AM	1	7	2	12	0	0	0	2	3	0	145	2	2	164	14	0	354	1364
8:00 AM	1	9	0	14	0	0	0	4	11	2	135	3	2	149	7	0	337	
8:15 AM	3	5	1	7	0	0	0	11	5	0	146	4	2	155	12	0	351	
8:30 AM	0	6	0	6	0	0	0	2	4	0	125	3	2	164	10	0	322	

AM Peak Hour Traffic			3/16/17														
7:15 AM	6	26	8	48	0	0	0	1	16	11	605	7	3	651	24	4	1410
PHF	0.75	1.08	N/A	1.33	N/A	N/A	N/A	N/A	2.00	2.75	0.91	0.58	N/A	0.89	0.67	N/A	0.93
PHV	8	24	0	36	0	0	0	0	8	4	664	12	0	728	36	0	1520
T Factor	0%	15%	0%	4%	N/A	N/A	N/A	0%	6%	9%	4%	0%	0%	1%	4%	0%	
PM Peak Hour Traffic			3/16/17														
5:00 PM	13	21	4	24	0	0	0	11	25	18	544	13	3	581	29	19	1305
PHF	0.81	1.05	0.50	0.67	N/A	N/A	N/A	1.38	0.42	0.32	0.99	0.81	N/A	1.00	0.91	0.68	0.93
PHV	16	20	8	36	0	0	0	8	60	56	548	16	0	580	32	28	1408
T Factor	0%	0%	0%	0%	N/A	N/A	N/A	0%	0%	0%	0%	0%	0%	1%	0%	0%	

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Count Name: Kuhio Hwy Lehua St 3-15-17 to 3-17-17
Site Code: Hokua Place
Start Date: 03/15/2017
Page No: 1

Turning Movement Data

Start Time	Lehua St Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:00 PM	71	3	1	74	2	142	0	144	0	140	59	0	199	417
3:15 PM	68	4	14	72	4	137	0	141	0	146	51	0	197	410
3:30 PM	75	2	8	77	2	136	0	138	0	154	56	0	210	425
3:45 PM	72	1	2	73	2	148	0	150	0	134	45	0	179	402
Hourly Total	286	10	25	296	10	563	0	573	0	574	211	0	785	1654
4:00 PM	69	4	6	73	1	145	1	146	0	135	54	0	189	408
4:15 PM	72	2	1	74	5	144	1	149	0	139	37	0	176	399
4:30 PM	75	2	5	77	3	143	0	146	0	130	45	0	175	398
4:45 PM	74	0	5	74	5	160	0	165	0	164	38	0	202	441
Hourly Total	290	8	17	298	14	592	2	606	0	568	174	0	742	1646
5:00 PM	82	0	5	82	0	134	0	134	0	140	55	0	195	411
5:15 PM	85	1	6	86	7	145	0	152	0	145	51	0	196	434
5:30 PM	96	2	3	98	2	163	0	165	0	137	34	0	171	434
5:45 PM	69	2	8	71	1	161	0	162	0	131	25	0	156	389
Hourly Total	332	5	22	337	10	603	0	613	0	553	165	0	718	1668
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7:00 AM	51	0	1	51	0	140	0	140	0	213	8	0	221	412
7:15 AM	86	0	2	86	4	168	0	172	0	191	20	0	211	469
7:30 AM	95	1	0	96	1	163	0	164	0	170	15	0	185	445
7:45 AM	64	1	2	65	1	180	0	181	0	184	15	0	199	445
Hourly Total	296	2	5	298	6	651	0	657	0	758	58	0	816	1771
8:00 AM	45	0	4	45	2	169	0	171	1	189	18	0	208	424
8:15 AM	29	1	3	30	10	145	0	155	0	194	12	0	206	391
8:30 AM	34	3	3	37	2	168	0	170	0	185	16	0	201	408
8:45 AM	41	1	10	42	5	161	0	166	0	150	21	0	171	379
Hourly Total	149	5	20	154	19	643	0	662	1	718	67	0	786	1602
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	85	2	3	87	3	131	0	134	0	153	49	0	202	423
3:15 PM	67	1	7	68	5	162	0	167	0	138	42	0	180	415
3:30 PM	71	4	4	75	6	145	0	151	0	155	55	0	210	436
3:45 PM	78	2	1	80	5	141	0	146	0	146	35	0	181	407
Hourly Total	301	9	15	310	19	579	0	598	0	592	181	0	773	1681
4:00 PM	71	0	0	71	4	148	0	152	0	163	51	0	214	437
4:15 PM	66	2	1	68	2	145	0	147	0	119	39	0	158	373
4:30 PM	68	3	0	71	1	175	0	176	0	158	45	0	203	450
4:45 PM	81	1	1	82	1	134	0	135	0	146	25	0	171	388
Hourly Total	286	6	2	292	8	602	0	610	0	586	160	0	746	1648
5:00 PM	80	1	1	81	3	140	0	143	0	163	34	0	197	421
5:15 PM	74	1	6	75	2	161	0	163	0	160	27	0	187	425
5:30 PM	50	2	0	52	4	167	0	171	0	158	28	0	186	409
5:45 PM	55	1	2	56	3	133	0	136	0	151	33	0	184	376
Hourly Total	259	5	9	264	12	601	0	613	0	632	122	0	754	1631
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6:45 AM	32	4	1	36	2	107	0	109	0	178	13	7	191	336
Hourly Total	32	4	1	36	2	107	0	109	0	178	13	7	191	336
7:00 AM	62	1	2	63	1	115	0	116	0	183	13	0	196	375
7:15 AM	62	0	1	62	0	170	0	170	0	188	12	0	200	432
7:30 AM	87	0	1	87	2	181	0	183	0	177	9	0	186	456
7:45 AM	69	0	0	69	1	173	0	174	0	195	18	0	213	456
Hourly Total	280	1	4	281	4	639	0	643	0	743	52	0	795	1719
8:00 AM	42	1	3	43	4	144	0	148	0	168	10	0	178	369
8:15 AM	35	1	2	36	1	156	0	157	0	189	21	0	210	403
8:30 AM	23	0	4	23	0	141	0	141	0	172	12	0	184	348
Grand Total	2611	57	129	2668	109	6021	2	6130	1	6431	1246	7	7678	16476
Approach %	97.9	2.1	-	-	1.8	98.2	-	-	0.0	83.8	16.2	-	-	-
Total %	15.8	0.3	-	16.2	0.7	36.5	-	37.2	0.0	39.0	7.6	-	46.6	-
Lights	2566	56	-	2622	109	5892	-	6001	1	6326	1180	-	7507	16130
% Lights	98.3	98.2	-	98.3	100.0	97.9	-	97.9	100.0	98.4	94.7	-	97.8	97.9
Mediums	43	1	-	44	0	120	-	120	0	99	64	-	163	327
% Mediums	1.6	1.8	-	1.6	0.0	2.0	-	2.0	0.0	1.5	5.1	-	2.1	2.0
Articulated Trucks	2	0	-	2	0	9	-	9	0	6	2	-	8	19
% Articulated Trucks	0.1	0.0	-	0.1	0.0	0.1	-	0.1	0.0	0.1	0.2	-	0.1	0.1
All Pedestrians	-	-	129	-	-	-	2	-	-	-	-	7	-	-
% All Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	-	100.0	-	-

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Kuhio Hwy [SB]

Exit	Enter	Total
8458	7507	15965
163	163	326
11	8	19
0	0	0
8632	**7678**	**16310**

RT	Th	LT	Ped
1180	6326	1	0
64	99	0	0
2	6	0	0
0	0	0	7
1246	**6431**	**1**	**7**

Lehua St [EB]

Exit	Enter	Total
1289	2622	3911
64	44	108
2	2	4
0	0	0
1355	**2668**	**4023**

Ped	RT	LT
0	56	2566
0	1	43
0	0	2
129	0	0
129	**57**	**2611**

03/15/2017 3:00 PM
Ending At
03/17/2017 8:45 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [WB]

Exit	Enter	Total
1	0	1
0	0	0
0	0	0
0	0	0
1	**0**	**1**

LT	Th	Ped
109	5892	0
0	120	0
0	9	0
0	0	2
109	**6021**	**2**

Exit	Enter	Total
6382	6001	12383
100	120	220
6	9	15
0	0	0
6488	**6130**	**12618**

Kuhio Hwy [NB]

Turning Movement Data Plot

The Traffic Management Consultant
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Turning Movement Peak Hour Data (4:45 PM)

Start Time	Lehua St Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
4:45 PM	74	0	5	74	5	160	0	165	0	164	38	0	202	441
5:00 PM	82	0	5	82	0	134	0	134	0	140	55	0	195	411
5:15 PM	85	1	6	86	7	145	0	152	0	145	51	0	196	434
5:30 PM	96	2	3	98	2	163	0	165	0	137	34	0	171	434
Total	337	3	19	340	14	602	0	616	0	586	178	0	764	1720
Approach %	99.1	0.9	-	-	2.3	97.7	-	-	0.0	76.7	23.3	-	-	-
Total %	19.6	0.2	-	19.8	0.8	35.0	-	35.8	0.0	34.1	10.3	-	44.4	-
PHF	0.878	0.375	-	0.867	0.500	0.923	-	0.933	0.000	0.893	0.809	-	0.946	0.975
Lights	332	3	-	335	14	598	-	612	0	581	173	-	754	1701
% Lights	98.5	100.0	-	98.5	100.0	99.3	-	99.4	-	99.1	97.2	-	98.7	98.9
Mediums	5	0	-	5	0	4	-	4	0	5	5	-	10	19
% Mediums	1.5	0.0	-	1.5	0.0	0.7	-	0.6	-	0.9	2.8	-	1.3	1.1
Articulated Trucks	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
All Pedestrians	-	-	19	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Kuhio Hwy [SB]

Exit	Enter	Total
930	754	1684
9	10	19
0	0	0
0	0	0
939	**764**	**1703**

RT	Th	LT	Ped
173	581	0	0
5	5	0	0
0	0	0	0
0	0	0	0
178	**586**	**0**	**0**

Lehua St [EB]

Exit	Enter	Total
187	335	522
5	5	10
0	0	0
0	0	0
192	**340**	**532**

Ped	RT	LT
0	3	332
0	0	5
0	0	0
19	0	0
19	**3**	**337**

Peak Hour Data

03/15/2017 4:45 PM
Ending At
03/15/2017 5:45 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [WB]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
14	598	0
0	4	0
0	0	0
0	0	0
14	**602**	**0**

Exit	Enter	Total
584	612	1196
5	4	9
0	0	0
0	0	0
589	**616**	**1205**

Kuhio Hwy [NB]

Turning Movement Peak Hour Data Plot (4:45 PM)

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Turning Movement Peak Hour Data (7:15 AM)

Start Time	Lehua St Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:15 AM	86	0	2	86	4	168	0	172	0	191	20	0	211	469
7:30 AM	95	1	0	96	1	163	0	164	0	170	15	0	185	445
7:45 AM	64	1	2	65	1	180	0	181	0	184	15	0	199	445
8:00 AM	45	0	4	45	2	169	0	171	1	189	18	0	208	424
Total	290	2	8	292	8	680	0	688	1	734	68	0	803	1783
Approach %	99.3	0.7	-	-	1.2	98.8	-	-	0.1	91.4	8.5	-	-	-
Total %	16.3	0.1	-	16.4	0.4	38.1	-	38.6	0.1	41.2	3.8	-	45.0	-
PHF	0.763	0.500	-	0.760	0.500	0.944	-	0.950	0.250	0.961	0.850	-	0.951	0.950
Lights	287	2	-	289	8	658	-	666	1	720	57	-	778	1733
% Lights	99.0	100.0	-	99.0	100.0	96.8	-	96.8	100.0	98.1	83.8	-	96.9	97.2
Mediums	3	0	-	3	0	20	-	20	0	13	10	-	23	46
% Mediums	1.0	0.0	-	1.0	0.0	2.9	-	2.9	0.0	1.8	14.7	-	2.9	2.6
Articulated Trucks	0	0	-	0	0	2	-	2	0	1	1	-	2	4
% Articulated Trucks	0.0	0.0	-	0.0	0.0	0.3	-	0.3	0.0	0.1	1.5	-	0.2	0.2
All Pedestrians	-	-	8	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Peak Hour Data

03/16/2017 7:15 AM
Ending At
03/16/2017 8:15 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [SB]

Exit	Enter	Total
945	778	1723
23	23	46
2	2	4
0	0	0
970	**803**	**1773**

RT	Th	LT	Ped
57	720	1	0
10	13	0	0
1	1	0	0
0	0	0	0
68	**734**	**1**	**0**

Lehua St [EB]

Total	Enter	Exit
354	289	65
13	3	10
1	0	1
0	0	0
368	**292**	**76**

LT	RT	Ped
287	2	0
3	0	0
0	0	0
0	0	8
290	**2**	**8**

Fake Approach [WB]

Exit	Enter	Total
1	0	1
0	0	0
0	0	0
0	0	0
1	**0**	**1**

Kuhio Hwy [NB]

LT	Th	Ped
8	658	0
0	20	0
0	2	0
0	0	0
8	**680**	**0**

Exit	Enter	Total
722	666	1388
13	20	33
1	2	3
0	0	0
736	**688**	**1424**

Turning Movement Peak Hour Data Plot (7:15 AM)

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Turning Movement Peak Hour Data (3:15 PM)

	Lehua St				Kuhio Hwy				Kuhio Hwy					
	Eastbound				Northbound				Southbound					
Start Time	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:15 PM	67	1	7	68	5	162	0	167	0	138	42	0	180	415
3:30 PM	71	4	4	75	6	145	0	151	0	155	55	0	210	436
3:45 PM	78	2	1	80	5	141	0	146	0	146	35	0	181	407
4:00 PM	71	0	0	71	4	148	0	152	0	163	51	0	214	437
Total	287	7	12	294	20	596	0	616	0	602	183	0	785	1695
Approach %	97.6	2.4	-	-	3.2	96.8	-	-	0.0	76.7	23.3	-	-	-
Total %	16.9	0.4	-	17.3	1.2	35.2	-	36.3	0.0	35.5	10.8	-	46.3	-
PHF	0.920	0.438	-	0.919	0.833	0.920	-	0.922	0.000	0.923	0.832	-	0.917	0.970
Lights	285	7	-	292	20	592	-	612	0	590	177	-	767	1671
% Lights	99.3	100.0	-	99.3	100.0	99.3	-	99.4	-	98.0	96.7	-	97.7	98.6
Mediums	2	0	-	2	0	4	-	4	0	11	6	-	17	23
% Mediums	0.7	0.0	-	0.7	0.0	0.7	-	0.6	-	1.8	3.3	-	2.2	1.4
Articulated Trucks	0	0	-	0	0	0	-	0	0	1	0	-	1	1
% Articulated Trucks	0.0	0.0	-	0.0	0.0	0.0	-	0.0	-	0.2	0.0	-	0.1	0.1
All Pedestrians	-	-	12	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

Peak Hour Data

03/16/2017 3:15 PM
Ending At
03/16/2017 4:15 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [SB]

Exit	Enter	Total
877	767	1644
6	17	23
0	1	1
0	0	0
883	**785**	**1668**

RT	Th	LT	Ped
177	590	0	0
6	11	0	0
0	1	0	0
0	0	0	0
183	**602**	**0**	**0**

Lehua St [EB]

Exit	Enter	Total
197	292	489
6	2	8
0	0	0
0	0	0
203	**294**	**497**

LT	RT	Ped
285	7	0
2	0	0
0	0	0
0	0	12
287	**7**	**12**

Fake Approach [WB]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
20	592	0
0	4	0
0	0	0
0	0	0
20	**596**	**0**

Kuhio Hwy [NB]

Exit	Enter	Total
597	612	1209
11	4	15
1	0	1
0	0	0
609	**616**	**1225**

Turning Movement Peak Hour Data Plot (3:15 PM)

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Turning Movement Peak Hour Data (7:00 AM)

	Lehua St				Kuhio Hwy				Kuhio Hwy					
	Eastbound				Northbound				Southbound					
Start Time	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:00 AM	62	1	2	63	1	115	0	116	0	183	13	0	196	375
7:15 AM	62	0	1	62	0	170	0	170	0	188	12	0	200	432
7:30 AM	87	0	1	87	2	181	0	183	0	177	9	0	186	456
7:45 AM	69	0	0	69	1	173	0	174	0	195	18	0	213	456
Total	280	1	4	281	4	639	0	643	0	743	52	0	795	1719
Approach %	99.6	0.4	-	-	0.6	99.4	-	-	0.0	93.5	6.5	-	-	-
Total %	16.3	0.1	-	16.3	0.2	37.2	-	37.4	0.0	43.2	3.0	-	46.2	-
PHF	0.805	0.250	-	0.807	0.500	0.883	-	0.878	0.000	0.953	0.722	-	0.933	0.942
Lights	276	1	-	277	4	614	-	618	0	729	42	-	771	1666
% Lights	98.6	100.0	-	98.6	100.0	96.1	-	96.1	-	98.1	80.8	-	97.0	96.9
Mediums	4	0	-	4	0	22	-	22	0	13	10	-	23	49
% Mediums	1.4	0.0	-	1.4	0.0	3.4	-	3.4	-	1.7	19.2	-	2.9	2.9
Articulated Trucks	0	0	-	0	0	3	-	3	0	1	0	-	1	4
% Articulated Trucks	0.0	0.0	-	0.0	0.0	0.5	-	0.5	-	0.1	0.0	-	0.1	0.2
All Pedestrians	-	-	4	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Kuhio Hwy [SB]

Exit	Enter	Total
890	771	1661
26	23	49
3	1	4
0	0	0
919	**795**	**1714**

RT	Th	LT	Ped
42	729	0	0
10	13	0	0
0	1	0	0
0	0	0	0
52	**743**	**0**	**0**

Lehua St [EB]

Exit	Enter	Total
46	277	323
10	4	14
0	0	0
0	0	0
56	**281**	**337**

LT	RT	Ped
276	1	0
4	0	0
0	0	0
0	0	4
280	**1**	**4**

Peak Hour Data

03/17/2017 7:00 AM
Ending At
03/17/2017 8:00 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [WB]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
4	614	0
0	22	0
0	3	0
0	0	0
4	**639**	**0**

Exit	Enter	Total
730	618	1348
13	22	35
1	3	4
0	0	0
744	**643**	**1387**

Kuhio Hwy [NB]

Turning Movement Peak Hour Data Plot (7:00 AM)

Study Name Kuhio Hwy Ulu St Ohia St 3-15-17 to 3-17-17
Start Date 3/15/17
Start Time 3:00 PM
Site Code Hokua Place

Start	Ohia St Eastbound					Pono Kai Dwy Westbound					Kuhio Hwy Northbound					Kuhio Hwy Southbound					Ulu St Southeast Bound					Intersection	
3/15/17	LT-Ulu	LT-Kuhio	Thru	RT-Kuhio	RT-Ulu	LT-Kuhio	LT-Ulu	Thru	RT-Ulu	RT-Kuhio	UT-Ulu	LT-Ohia	LT-Ulu	Thru	Right-Turn	Left-Turn	Thru	RT-Ulu	RT-Ohia	UT-Ulu	UT-Kuhio	LT-Dwy	RT-Kuhio	Thru	RT-Ohia	15-Min Totals	Hourly Totals
3:00 PM	2	0	0	0	0	0	0	0	0	3	0	0	74	154	6	0	154	0	0	2	0	0	0	55	0	450	1699
3:15 PM	4	0	0	0	0	0	0	0	0	3	1	0	61	124	18	3	128	0	0	5	0	0	0	74	3	424	1656
3:30 PM	3	0	0	0	0	0	0	0	0	2	0	1	77	106	4	3	138	0	0	3	0	0	0	67	0	404	1632
3:45 PM	1	0	0	0	2	0	0	0	0	0	0	1	75	123	11	2	136	0	0	4	0	0	0	63	3	421	1640
4:00 PM	3	0	1	0	0	0	0	0	0	2	0	0	66	118	8	1	139	0	2	2	0	0	0	63	2	407	1673
4:15 PM	2	1	0	0	0	0	0	0	0	1	0	0	55	121	12	1	126	0	0	3	0	0	0	76	2	400	1674
4:30 PM	0	0	1	0	0	0	0	0	0	3	0	0	66	137	12	0	125	0	0	1	0	1	0	65	1	412	1715
4:45 PM	1	0	0	0	0	0	0	0	0	2	1	0	70	136	14	1	166	0	0	1	0	0	0	62	0	454	1734
5:00 PM	1	0	0	0	0	1	0	0	0	1	0	0	91	120	10	3	132	0	1	3	0	0	0	44	1	408	1670
5:15 PM	0	1	0	0	1	0	0	0	0	2	1	1	78	131	12	1	156	0	1	1	0	0	0	54	1	441	
5:30 PM	2	0	0	0	2	0	0	0	0	2	0	0	68	157	9	2	152	0	3	0	0	0	0	34	0	431	
5:45 PM	2	0	0	0	1	0	0	0	0	3	0	1	64	131	8	1	138	0	1	1	0	0	0	35	4	390	
3/16/17																											
7:00 AM	2	0	0	0	2	0	0	0	0	3	0	0	16	135	1	0	200	0	3	2	0	0	0	46	3	413	1664
7:15 AM	1	1	0	0	1	0	0	0	0	0	0	3	24	162	1	0	182	0	2	0	2	0	0	39	2	420	1673
7:30 AM	5	4	0	0	2	0	0	0	0	0	0	0	23	165	5	2	162	0	0	0	0	0	0	50	1	419	1683
7:45 AM	1	0	0	0	1	0	0	0	0	2	0	0	27	157	3	1	159	0	1	2	0	0	0	57	1	412	1710
8:00 AM	0	0	0	0	0	0	0	0	0	3	0	0	32	158	4	4	180	0	2	0	0	0	0	38	1	422	**1743**
8:15 AM	0	0	1	0	2	0	0	0	0	2	0	0	27	164	2	1	195	0	0	1	0	0	0	34	1	430	
8:30 AM	1	0	0	0	3	0	0	0	0	1	0	0	22	187	5	0	173	0	0	1	0	0	0	51	2	**446**	
8:45 AM	2	0	0	0	1	1	0	0	0	3	0	0	29	188	4	2	165	0	0	1	0	0	0	47	2	445	
3/16/17																											
3:00 PM	1	0	0	0	1	1	0	0	0	1	1	0	57	124	8	0	152	0	0	0	0	0	0	42	2	390	1643
3:15 PM	2	0	0	0	0	0	0	0	0	2	0	0	76	145	13	0	140	0	0	0	0	0	0	39	1	418	1705
3:30 PM	0	0	0	0	2	0	0	0	0	2	0	0	67	142	10	3	164	0	0	0	0	0	0	38	1	429	1688
3:45 PM	1	0	0	0	0	0	0	0	0	1	0	0	81	118	9	4	155	0	0	0	0	0	0	36	1	406	1732
4:00 PM	3	0	0	0	0	0	0	0	0	1	0	0	71	147	6	3	162	0	0	0	0	0	0	57	2	452	1743
4:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	72	137	10	0	131	0	0	2	0	0	0	48	0	401	1714
4:30 PM	2	0	0	0	0	0	0	0	0	3	0	0	95	163	3	3	152	0	0	1	0	0	0	50	1	**473**	**1756**
4:45 PM	0	0	0	0	0	1	0	0	0	2	0	0	76	153	5	1	139	0	0	1	0	0	0	39	0	417	1704
5:00 PM	2	1	0	0	0	0	0	0	0	4	0	0	60	141	6	1	162	0	0	0	0	0	0	46	0	423	1695
5:15 PM	2	0	0	0	0	1	0	0	0	2	2	2	71	140	6	1	159	0	1	2	0	0	0	53	1	443	
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	58	163	5	1	150	0	0	0	0	0	0	43	0	421	
5:45 PM	1	0	0	0	1	0	0	0	0	2	0	1	53	139	5	1	156	0	0	1	0	0	0	47	1	408	
3/17/17																											
7:00 AM	2	1	0	0	1	0	0	0	0	1	0	1	19	123	0	1	185	0	2	0	0	0	0	48	2	386	1668
7:15 AM	1	1	0	0	0	0	0	0	0	0	0	0	25	182	2	3	172	0	1	0	1	0	0	45	1	434	1680
7:30 AM	5	1	0	0	1	0	0	0	0	0	0	0	21	162	2	2	176	0	1	0	0	0	0	50	0	421	1676
7:45 AM	4	1	0	0	0	1	0	0	0	2	0	0	25	145	3	1	172	0	0	3	0	0	0	67	3	427	1655
8:00 AM	0	1	0	0	0	0	0	0	0	0	1	0	24	148	4	1	170	0	1	1	0	0	0	45	2	398	1660
8:15 AM	0	0	0	0	0	0	0	0	0	4	0	0	27	174	7	0	159	0	1	0	0	0	0	56	2	430	
8:30 AM	0	2	0	0	0	1	0	0	0	2	0	1	30	126	1	3	178	0	0	1	0	0	0	52	3	400	
8:45 AM	0	2	0	0	1	0	0	0	0	4	0	2	21	166	4	1	181	0	0	2	0	0	0	46	2	432	
AM Peak Hour Traffic			3/16/17																								
8:00 AM	3	0	1	0	6	1	0	0	0	9	0	0	110	697	15	7	713	0	2	3	0	0	0	170	6	1743	
PHF	0.75	N/A	N/A	N/A	0.50	N/A	N/A	N/A	N/A	2.25	N/A	N/A	1.25	0.93	0.75	N/A	1.03	N/A	N/A	0.75	N/A	N/A	N/A	0.83	0.75	0.98	
PHV	4	0	0	0	12	0	0	0	0	4	0	0	88	748	20	0	692	0	0	4	0	0	0	204	8	1784	
T Factor	0%	N/A	0%	N/A	17%	0%	N/A	N/A	N/A	11%	N/A	N/A	5%	4%	0%	0%	3%	N/A	0%	0%	N/A	N/A	N/A	4%	17%		
													5	29	0		20										
														4%			3%										
PM Peak Hour Traffic			3/16/17																								
4:30 PM	6	1	0	0	0	2	0	0	0	11	2	2	302	597	20	6	612	0	1	4	0	0	0	188	2	1756	
PHF	0.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.92	N/A	N/A	0.79	0.92	1.67	0.50	1.01	N/A	N/A	1.00	N/A	N/A	N/A	0.94	0.50	0.93	
PHV	8	0	0	0	0	0	0	0	0	12	0	0	380	652	12	12	608	0	0	4	0	0	0	200	4	1892	
T Factor	0%	0%	N/A	N/A	N/A	0%	N/A	N/A	N/A	0%	0%	0%	1%	1%	0%	0%	0%	N/A	0%	0%	N/A	N/A	N/A	1%	0%		

Study Name **Olohena Rd Lehua St Kahau St 3-13-17 to 3-15-17**
Start Date **03/13/2017**
Start Time **3:00 PM**
Site Code **Hokua Place**

Start	Olohena Rd Eastbound			Olohena Rd Westbound			Kahau St Southbound			Lehua St Southwest Bound			Intersection	
3/13/17	LT-Kahau	LT-Lehua	Thru	Thru	RT-Kahau	RT-Lehua	UT-Lehua	LT-Olohena	Right-Turn	LT-Olohena	RT-Olohena	UT-Kahau	15-Min Totals	Hourly Totals
3:00 PM	12	55	88	79	3	12	9	8	16	8	38	9	337	**1326**
3:15 PM	12	90	70	52	9	10	3	9	6	18	44	11	334	1308
3:30 PM	9	80	53	86	7	21	2	2	6	12	51	8	**337**	1277
3:45 PM	7	60	63	86	7	13	4	3	5	12	51	7	318	1212
4:00 PM	18	68	56	77	8	11	5	8	4	8	42	14	319	1177
4:15 PM	22	59	42	82	9	12	0	4	3	8	43	19	303	
4:30 PM	19	49	65	72	3	7	4	6	3	8	33	3	272	
4:45 PM	9	71	38	81	7	11	2	7	6	11	33	7	283	
3/14/17														
6:30 AM	3	23	36	15	2	0	2	0	0	2	5	4	92	573
6:45 AM	2	40	41	13	7	0	5	4	0	0	10	4	126	698
7:00 AM	4	52	46	25	2	1	1	2	4	1	8	3	149	787
7:15 AM	6	84	57	29	5	3	0	5	1	3	12	1	206	818
7:30 AM	4	81	58	35	0	3	11	3	6	2	13	1	217	762
7:45 AM	4	66	94	28	2	1	0	3	3	0	13	1	215	
8:00 AM	2	38	81	28	1	3	3	2	2	0	18	2	180	
8:15 AM	8	35	49	31	3	4	1	2	5	1	8	3	150	
3/14/17														
3:30 PM	8	61	57	28	4	12	5	5	3	6	25	13	227	1158
3:45 PM	14	66	53	56	8	11	2	7	3	12	40	7	279	1229
4:00 PM	24	78	44	70	10	19	1	9	5	15	46	6	327	1223
4:15 PM	14	55	50	84	10	13	3	12	3	12	54	15	325	1149
4:30 PM	14	81	53	61	3	10	1	3	4	5	56	7	298	1079
4:45 PM	14	66	56	76	3	8	1	7	4	5	26	7	273	
5:00 PM	10	65	45	72	5	8	0	3	4	0	37	4	253	
5:15 PM	9	76	37	71	6	9	0	2	5	8	30	2	255	
3/15/17														
6:30 AM	4	18	27	9	5	0	2	2	1	2	6	6	82	602
6:45 AM	4	48	54	23	8	0	2	7	2	1	7	6	162	748
7:00 AM	1	53	54	23	1	1	1	3	1	0	9	1	148	829
7:15 AM	7	81	59	16	1	4	9	4	8	2	17	2	210	**839**
7:30 AM	2	95	59	35	5	6	0	2	5	1	18	0	228	793
7:45 AM	2	90	89	27	2	3	2	1	6	0	20	1	**243**	
8:00 AM	4	36	58	29	2	2	2	1	2	4	17	1	158	
8:15 AM	1	42	62	21	3	1	0	4	7	4	17	2	164	

AM Peak Hour Traffic			3/15/17										
7:15 AM	15	302	265	107	10	15	13	8	21	7	72	4	839
PHF	1.88	0.84	0.74	0.99	1.25	1.25	1.63	2.00	0.88	N/A	0.90	1.00	0.86
Peak Flow	8	360	356	108	8	12	8	4	24	7	80	4	972
T Factor	0%	1%	4%	3%	10%	0%	8%	50%	19%	0%	7%	25%	
PM Peak Hour Traffic		1.0%	3/13/17					23.8%			7.2%		
3:00 PM	40	285	274	303	26	56	18	22	33	50	184	35	1326
PHF	1.11	0.89	1.29	0.88	0.93	0.67	2.25	2.75	1.38	1.04	0.90	1.09	0.98
Peak Flow	36	320	212	344	28	84	8	8	24	48	204	32	1348
T Factor	13%	3%	4%	1%	0%	2%	0%	0%	6%	2%	2%	0%	

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Turning Movement Data

Start Time	Olohena Rd				Olohena Rd			Kapaa Bypass Rd			Kapaa Bypass Rd				
	Eastbound				Westbound			Northbound			Southbound				
	Left-Turn	Thru	Right-Turn	App. Total	Left-Turn	Thru	App. Total	Left-Turn	Right-Turn	App. Total	Left-Turn	Thru	Right-Turn	App. Total	Int. Total
3:00 PM	2	106	33	141	33	102	135	64	38	102	21	32	10	63	441
3:15 PM	4	65	17	86	29	73	102	67	65	132	33	63	28	124	444
3:30 PM	4	50	18	72	42	98	140	57	72	129	14	69	19	102	443
3:45 PM	1	49	11	61	32	118	150	77	57	134	19	46	29	94	439
Hourly Total	11	270	79	360	136	391	527	265	232	497	87	210	86	383	1767
4:00 PM	1	47	17	65	24	114	138	82	78	160	15	66	17	98	461
4:15 PM	2	48	17	67	10	126	136	83	64	147	16	61	10	87	437
4:30 PM	2	35	11	48	16	105	121	89	76	165	13	57	19	89	423
4:45 PM	3	40	12	55	17	109	126	80	64	144	11	41	19	71	396
Hourly Total	8	170	57	235	67	454	521	334	282	616	55	225	65	345	1717
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6:30 AM	0	46	37	83	7	16	23	5	4	9	10	40	4	54	169
6:45 AM	3	61	45	109	7	17	24	3	5	8	20	66	9	95	236
Hourly Total	3	107	82	192	14	33	47	8	9	17	30	106	13	149	405
7:00 AM	3	86	76	165	11	28	39	10	2	12	14	96	24	134	350
7:15 AM	3	107	59	169	10	33	43	23	12	35	30	119	31	180	427
7:30 AM	7	116	40	163	10	47	57	25	9	34	30	95	56	181	435
7:45 AM	8	112	34	154	10	35	45	26	13	39	36	101	41	178	416
Hourly Total	21	421	209	651	41	143	184	84	36	120	110	411	152	673	1628
8:00 AM	2	77	27	106	13	32	45	10	11	21	24	91	22	137	309
8:15 AM	1	65	21	87	12	32	44	12	5	17	20	68	14	102	250
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	3	142	48	193	25	64	89	22	16	38	44	159	36	239	559
3:30 PM	2	42	19	63	18	37	55	41	61	102	14	48	19	81	301
3:45 PM	3	46	6	55	37	86	123	93	84	177	14	46	20	80	435
Hourly Total	5	88	25	118	55	123	178	134	145	279	28	94	39	161	736
4:00 PM	2	38	17	57	36	104	140	66	74	140	22	70	44	136	473
4:15 PM	2	51	15	68	42	104	146	68	58	126	11	62	23	96	436
4:30 PM	4	38	12	54	43	85	128	77	76	153	22	65	21	108	443
4:45 PM	4	47	15	66	31	84	115	98	77	175	11	42	20	73	429
Hourly Total	12	174	59	245	152	377	529	309	285	594	66	239	108	413	1781
5:00 PM	5	41	18	64	21	106	127	98	69	167	15	55	28	98	456
5:15 PM	2	36	12	50	29	92	121	96	82	178	10	43	24	77	426
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	7	77	30	114	50	198	248	194	151	345	25	98	52	175	882
6:30 AM	0	38	43	81	8	9	17	3	1	4	9	51	6	66	168
6:45 AM	2	79	56	137	9	26	35	10	7	17	18	58	10	86	275
Hourly Total	2	117	99	218	17	35	52	13	8	21	27	109	16	152	443
7:00 AM	2	90	59	151	10	26	36	10	2	12	13	98	16	127	326
7:15 AM	1	108	62	171	17	24	41	26	6	32	24	107	45	176	420
7:30 AM	4	116	34	154	16	47	63	27	8	35	32	111	50	193	445
7:45 AM	10	126	45	181	13	45	58	25	12	37	39	83	47	169	445
Hourly Total	17	440	200	657	56	142	198	88	28	116	108	399	158	665	1636
8:00 AM	3	73	34	110	13	39	52	16	8	24	16	99	16	131	317
8:15 AM	4	86	21	111	15	30	45	9	8	17	15	72	10	97	270
Grand Total	96	2165	943	3204	641	2029	2670	1476	1208	2684	611	2221	751	3583	12141
Approach %	3.0	67.6	29.4	-	24.0	76.0	-	55.0	45.0	-	17.1	62.0	21.0	-	-
Total %	0.8	17.8	7.8	26.4	5.3	16.7	22.0	12.2	9.9	22.1	5.0	18.3	6.2	29.5	-
Lights	93	2104	922	3119	574	1982	2556	1459	1182	2641	598	2175	735	3508	11824
% Lights	96.9	97.2	97.8	97.3	89.5	97.7	95.7	98.8	97.8	98.4	97.9	97.9	97.9	97.9	97.4
Mediums	3	60	19	82	61	47	108	15	23	38	12	41	16	69	297
% Mediums	3.1	2.8	2.0	2.6	9.5	2.3	4.0	1.0	1.9	1.4	2.0	1.8	2.1	1.9	2.4
Articulated Trucks	0	1	2	3	6	0	6	2	3	5	1	5	0	6	20
% Articulated Trucks	0.0	0.0	0.2	0.1	0.9	0.0	0.2	0.1	0.2	0.2	0.2	0.2	0.0	0.2	0.2

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Kapaa Bypass Rd [SB]

Exit	Enter	Total
93	3508	3601
3	69	72
0	6	6
96	**3583**	**3679**

RT	Th	LT
735	2175	598
16	41	12
0	5	1
751	**2221**	**611**

Olohena Rd [EB]

Exit	Enter	Total
4176	3119	7295
78	82	160
2	3	5
4256	**3204**	**7460**

RT	Th	LT
922	2104	93
19	60	3
2	1	0
943	**2165**	**96**

03/13/2017 3:00 PM
Ending At
03/15/2017 8:30 AM

Lights
Mediums
Articulated Trucks

Olohena Rd [WB]

Exit	Enter	Total
3884	2556	6440
95	108	203
5	6	11
3984	**2670**	**6654**

Th	LT
1982	574
47	61
0	6
2029	**641**

LT	RT
1459	1182
15	23
2	3
1476	**1208**

Exit	Enter	Total
3671	2641	6312
121	38	159
13	5	18
3805	**2684**	**6489**

Kapaa Bypass Rd [NB]

Turning Movement Data Plot

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Turning Movement Peak Hour Data (3:15 PM)

Start Time	Olohena Rd Eastbound				Olohena Rd Westbound			Kapaa Bypass Rd Northbound			Kapaa Bypass Rd Southbound				
	Left-Turn	Thru	Right-Turn	App. Total	Left-Turn	Thru	App. Total	Left-Turn	Right-Turn	App. Total	Left-Turn	Thru	Right-Turn	App. Total	Int. Total
3:15 PM	4	65	17	86	29	73	102	67	65	132	33	63	28	124	444
3:30 PM	4	50	18	72	42	98	140	57	72	129	14	69	19	102	443
3:45 PM	1	49	11	61	32	118	150	77	57	134	19	46	29	94	439
4:00 PM	1	47	17	65	24	114	138	82	78	160	15	66	17	98	461
Total	10	211	63	284	127	403	530	283	272	555	81	244	93	418	1787
Approach %	3.5	74.3	22.2	-	24.0	76.0	-	51.0	49.0	-	19.4	58.4	22.2	-	-
Total %	0.6	11.8	3.5	15.9	7.1	22.6	29.7	15.8	15.2	31.1	4.5	13.7	5.2	23.4	-
PHF	0.625	0.812	0.875	0.826	0.756	0.854	0.883	0.863	0.872	0.867	0.614	0.884	0.802	0.843	0.969
Lights	10	201	59	270	118	399	517	280	270	550	79	232	92	403	1740
% Lights	100.0	95.3	93.7	95.1	92.9	99.0	97.5	98.9	99.3	99.1	97.5	95.1	98.9	96.4	97.4
Mediums	0	10	2	12	7	4	11	3	2	5	2	10	1	13	41
% Mediums	0.0	4.7	3.2	4.2	5.5	1.0	2.1	1.1	0.7	0.9	2.5	4.1	1.1	3.1	2.3
Articulated Trucks	0	0	2	2	2	0	2	0	0	0	0	2	0	2	6
% Articulated Trucks	0.0	0.0	3.2	0.7	1.6	0.0	0.4	0.0	0.0	0.0	0.0	0.8	0.0	0.5	0.3

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Kapaa Bypass Rd [SB]

Exit	Enter	Total
10	403	413
0	13	13
0	2	2
10	**418**	**428**

92	232	79
1	10	2
0	2	0
93	**244**	**81**
RT	Th	LT

Olohena Rd [EB]

Exit	Enter	Total
771	270	1041
8	12	20
0	2	2
779	**284**	**1063**

RT	Th	LT
59	201	10
2	10	0
2	0	0
63	**211**	**10**

Peak Hour Data

03/13/2017 3:15 PM
Ending At
03/13/2017 4:15 PM

Lights
Mediums
Articulated Trucks

Th	LT
399	118
4	7
0	2
403	**127**

Olohena Rd [WB]

Exit	Enter	Total
550	517	1067
14	11	25
0	2	2
564	**530**	**1094**

LT	RT
280	270
3	2
0	0
283	**272**

409	550	959
19	5	24
6	0	6
434	**555**	**989**
Exit	Enter	Total

Kapaa Bypass Rd [NB]

Turning Movement Peak Hour Data Plot (3:15 PM)

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Turning Movement Peak Hour Data (7:00 AM)

Start Time	Olohena Rd Eastbound				Olohena Rd Westbound			Kapaa Bypass Rd Northbound			Kapaa Bypass Rd Southbound				
	Left-Turn	Thru	Right-Turn	App. Total	Left-Turn	Thru	App. Total	Left-Turn	Right-Turn	App. Total	Left-Turn	Thru	Right-Turn	App. Total	Int. Total
7:00 AM	3	86	76	165	11	28	39	10	2	12	14	96	24	134	350
7:15 AM	3	107	59	169	10	33	43	23	12	35	30	119	31	180	427
7:30 AM	7	116	40	163	10	47	57	25	9	34	30	95	56	181	435
7:45 AM	8	112	34	154	10	35	45	26	13	39	36	101	41	178	416
Total	21	421	209	651	41	143	184	84	36	120	110	411	152	673	1628
Approach %	3.2	64.7	32.1	-	22.3	77.7	-	70.0	30.0	-	16.3	61.1	22.6	-	-
Total %	1.3	25.9	12.8	40.0	2.5	8.8	11.3	5.2	2.2	7.4	6.8	25.2	9.3	41.3	-
PHF	0.656	0.907	0.688	0.963	0.932	0.761	0.807	0.808	0.692	0.769	0.764	0.863	0.679	0.930	0.936
Lights	21	410	205	636	31	136	167	83	35	118	108	406	150	664	1585
% Lights	100.0	97.4	98.1	97.7	75.6	95.1	90.8	98.8	97.2	98.3	98.2	98.8	98.7	98.7	97.4
Mediums	0	10	4	14	9	7	16	1	0	1	2	4	2	8	39
% Mediums	0.0	2.4	1.9	2.2	22.0	4.9	8.7	1.2	0.0	0.8	1.8	1.0	1.3	1.2	2.4
Articulated Trucks	0	1	0	1	1	0	1	0	1	1	0	1	0	1	4
% Articulated Trucks	0.0	0.2	0.0	0.2	2.4	0.0	0.5	0.0	2.8	0.8	0.0	0.2	0.0	0.1	0.2

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Peak Hour Data

03/14/2017 7:00 AM
Ending At
03/14/2017 8:00 AM

Lights
Mediums
Articulated Trucks

Kapaa Bypass Rd [SB]

Exit	Enter	Total
21	664	685
0	8	8
0	1	1
21	**673**	**694**

RT	Th	LT
150	406	108
2	4	2
0	1	0
152	**411**	**110**

Olohena Rd [EB]

Exit	Enter	Total
369	636	1005
10	14	24
0	1	1
379	**651**	**1030**

RT	Th	LT
205	410	21
4	10	0
0	1	0
209	**421**	**21**

Olohena Rd [WB]

Exit	Enter	Total
553	167	720
12	16	28
2	1	3
567	**184**	**751**

Th	LT
136	31
7	9
0	1
143	**41**

LT	RT
83	35
1	0
0	1
84	**36**

Exit	Enter	Total
642	118	760
17	1	18
2	1	3
661	**120**	**781**

Kapaa Bypass Rd [NB]

Turning Movement Peak Hour Data Plot (7:00 AM)

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Turning Movement Peak Hour Data (3:45 PM)

Start Time	Olohena Rd Eastbound				Olohena Rd Westbound			Kapaa Bypass Rd Northbound			Kapaa Bypass Rd Southbound				
	Left-Turn	Thru	Right-Turn	App. Total	Left-Turn	Thru	App. Total	Left-Turn	Right-Turn	App. Total	Left-Turn	Thru	Right-Turn	App. Total	Int. Total
3:45 PM	3	46	6	55	37	86	123	93	84	177	14	46	20	80	435
4:00 PM	2	38	17	57	36	104	140	66	74	140	22	70	44	136	473
4:15 PM	2	51	15	68	42	104	146	68	58	126	11	62	23	96	436
4:30 PM	4	38	12	54	43	85	128	77	76	153	22	65	21	108	443
Total	11	173	50	234	158	379	537	304	292	596	69	243	108	420	1787
Approach %	4.7	73.9	21.4	-	29.4	70.6	-	51.0	49.0	-	16.4	57.9	25.7	-	-
Total %	0.6	9.7	2.8	13.1	8.8	21.2	30.1	17.0	16.3	33.4	3.9	13.6	6.0	23.5	-
PHF	0.688	0.848	0.735	0.860	0.919	0.911	0.920	0.817	0.869	0.842	0.784	0.868	0.614	0.772	0.945
Lights	11	168	47	226	149	374	523	301	285	586	69	234	107	410	1745
% Lights	100.0	97.1	94.0	96.6	94.3	98.7	97.4	99.0	97.6	98.3	100.0	96.3	99.1	97.6	97.6
Mediums	0	5	3	8	9	5	14	2	7	9	0	8	1	9	40
% Mediums	0.0	2.9	6.0	3.4	5.7	1.3	2.6	0.7	2.4	1.5	0.0	3.3	0.9	2.1	2.2
Articulated Trucks	0	0	0	0	0	0	0	1	0	1	0	1	0	1	2
% Articulated Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.0	0.4	0.0	0.2	0.1

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Peak Hour Data

03/14/2017 3:45 PM
Ending At
03/14/2017 4:45 PM

Lights
Mediums
Articulated Trucks

Kapaa Bypass Rd [SB]

Exit	Enter	Total
11	410	421
0	9	9
0	1	1
11	**420**	**431**

RT	Th	LT
107	234	69
1	8	0
0	1	0
108	**243**	**69**

Olohena Rd [EB]

Exit	Enter	Total
782	226	1008
8	8	16
1	0	1
791	**234**	**1025**

RT	Th	LT
47	168	11
3	5	0
0	0	0
50	**173**	**11**

Olohena Rd [WB]

Exit	Enter	Total
522	523	1045
12	14	26
0	0	0
534	**537**	**1071**

Th	LT
374	149
5	9
0	0
379	**158**

Kapaa Bypass Rd [NB]

LT	RT
301	285
2	7
1	0
304	**292**

Exit	Enter	Total
430	586	1016
20	9	29
1	1	2
451	**596**	**1047**

Turning Movement Peak Hour Data Plot (3:45 PM)

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Turning Movement Peak Hour Data (7:00 AM)

Start Time	Olohena Rd Eastbound				Olohena Rd Westbound			Kapaa Bypass Rd Northbound			Kapaa Bypass Rd Southbound				
	Left-Turn	Thru	Right-Turn	App. Total	Left-Turn	Thru	App. Total	Left-Turn	Right-Turn	App. Total	Left-Turn	Thru	Right-Turn	App. Total	Int. Total
7:00 AM	2	90	59	151	10	26	36	10	2	12	13	98	16	127	326
7:15 AM	1	108	62	171	17	24	41	26	6	32	24	107	45	176	420
7:30 AM	4	116	34	154	16	47	63	27	8	35	32	111	50	193	445
7:45 AM	10	126	45	181	13	45	58	25	12	37	39	83	47	169	445
Total	17	440	200	657	56	142	198	88	28	116	108	399	158	665	1636
Approach %	2.6	67.0	30.4	-	28.3	71.7	-	75.9	24.1	-	16.2	60.0	23.8	-	-
Total %	1.0	26.9	12.2	40.2	3.4	8.7	12.1	5.4	1.7	7.1	6.6	24.4	9.7	40.6	-
PHF	0.425	0.873	0.806	0.907	0.824	0.755	0.786	0.815	0.583	0.784	0.692	0.899	0.790	0.861	0.919
Lights	16	430	195	641	45	135	180	87	28	115	105	395	153	653	1589
% Lights	94.1	97.7	97.5	97.6	80.4	95.1	90.9	98.9	100.0	99.1	97.2	99.0	96.8	98.2	97.1
Mediums	1	10	5	16	9	7	16	1	0	1	2	4	5	11	44
% Mediums	5.9	2.3	2.5	2.4	16.1	4.9	8.1	1.1	0.0	0.9	1.9	1.0	3.2	1.7	2.7
Articulated Trucks	0	0	0	0	2	0	2	0	0	0	1	0	0	1	3
% Articulated Trucks	0.0	0.0	0.0	0.0	3.6	0.0	1.0	0.0	0.0	0.0	0.9	0.0	0.0	0.2	0.2

Peak Hour Data

03/15/2017 7:00 AM
Ending At
03/15/2017 8:00 AM

Lights
Mediums
Articulated Trucks

Kapaa Bypass Rd [SB]

Exit	Enter	Total
16	653	669
1	11	12
0	1	1
17	**665**	**682**

RT	Th	LT
153	395	105
5	4	2
0	0	1
158	**399**	**108**

Olohena Rd [EB]

Exit	Enter	Total
375	641	1016
13	16	29
0	0	0
388	**657**	**1045**

RT	Th	LT
195	430	16
5	10	1
0	0	0
200	**440**	**17**

Olohena Rd [WB]

Exit	Enter	Total
563	180	743
12	16	28
1	2	3
576	**198**	**774**

Th	LT
135	45
7	9
0	2
142	**56**

LT	RT
87	28
1	0
0	0
88	**28**

Exit	Enter	Total
635	115	750
18	1	19
2	0	2
655	**116**	**771**

Kapaa Bypass Rd [NB]

Turning Movement Peak Hour Data Plot (7:00 AM)

Study Name **Olohena Rd Kaapuni Rd Kaehulu Rd 3-13-17 to 3-15-17**
Start Date **03/13/2017**
Start Time **3:30 PM**
Site Code **Hokua Place**

Start	Olohena Rd Eastbound			Olohena Rd Westbound			Kaehulua Rd Southbound			Kaapuni Rd Southeast Bound			Intersection	
3/13/17	LT-Kaapuni	LT-Kaehulu	Thru	Thru	RT-Kaapuni	RT-Kaehulua	LT-Olohena	RT-Olohena	RT-Kaapuni	LT-Kaehulua	LT-Olohena	RT-Olohena	15-Min Totals	Hourly Totals
3:30 PM	4	5	33	38	70	3	0	0	0	0	28	5	186	811
3:45 PM	1	0	28	51	80	6	2	0	0	0	28	8	204	802
4:00 PM	4	0	37	54	84	3	2	0	0	0	21	5	210	797
4:15 PM	7	2	24	50	77	9	1	0	0	0	36	5	211	775
4:30 PM	6	0	18	49	64	5	0	0	1	0	25	9	177	744
4:45 PM	8	4	23	51	72	4	0	4	0	0	26	7	199	
5:00 PM	4	2	36	44	62	1	0	1	0	0	30	8	188	
5:15 PM	5	2	20	53	65	6	2	0	1	0	19	7	180	
3/14/17														
6:30 AM	4	1	36	10	6	0	2	2	0	0	52	5	118	702
6:45 AM	4	1	61	7	7	0	0	0	0	1	65	2	148	789
7:00 AM	3	1	79	14	15	2	2	0	0	1	78	3	198	**835**
7:15 AM	11	6	104	10	24	2	3	0	0	2	72	4	238	782
7:30 AM	3	9	86	17	28	4	1	1	0	5	45	6	205	674
7:45 AM	5	6	53	24	32	2	2	0	0	0	60	10	194	
8:00 AM	5	4	37	30	13	2	4	1	0	1	45	3	145	
8:15 AM	5	2	45	16	17	1	1	0	0	0	40	3	130	
3/14/17														
3:30 PM	6	2	30	33	35	2	0	3	1	2	42	4	160	800
3:45 PM	9	2	22	51	60	3	0	3	2	0	26	11	189	833
4:00 PM	8	5	29	69	64	6	1	2	0	1	29	15	229	**858**
4:15 PM	5	4	26	68	68	2	4	0	0	0	31	14	222	855
4:30 PM	10	0	19	60	63	3	0	2	1	2	24	9	193	834
4:45 PM	11	4	27	38	85	4	2	0	0	1	31	11	214	
5:00 PM	9	0	32	58	81	6	5	1	1	0	30	3	226	
5:15 PM	5	4	17	58	73	4	3	3	3	0	26	5	201	
3/15/17														
6:30 AM	2	1	33	9	2	0	2	3	0	0	49	2	103	658
6:45 AM	2	0	64	8	12	0	1	1	0	0	64	1	153	763
7:00 AM	2	2	83	11	9	2	2	0	0	0	73	9	193	824
7:15 AM	8	7	97	9	20	1	2	0	0	0	61	4	209	761
7:30 AM	10	7	82	21	23	4	1	0	0	0	54	6	208	699
7:45 AM	11	3	65	22	33	5	3	0	0	0	60	12	214	
8:00 AM	3	1	44	20	14	5	0	1	0	0	40	2	130	
8:15 AM	7	0	48	19	13	1	1	1	0	0	51	6	147	

AM Peak Hour Traffic			3/14/17										
7:00 AM	22	22	322	65	99	10	8	1	0	8	255	23	835
PHF	0.50	0.92	0.77	1.63	1.03	1.25	0.67	N/A	N/A	1.00	0.89	1.44	0.88
PHV	44	24	416	40	96	8	12	1	0	8	288	16	952
T Factor	9%	0%	1%	0%	2%	0%	0%	0%	N/A	0%	2%	0%	
PM Peak Hour Traffic			3/14/17										
4:00 PM	34	13	101	235	280	15	7	4	1	4	115	49	858
PHF	1.06	0.65	0.87	0.85	1.09	0.63	1.75	0.50	N/A	1.00	0.99	0.82	0.94
PHV	32	20	116	276	256	24	4	8	1	4	116	60	916
T Factor	0%	0%	2%	0%	1%	0%	0%	0%	0%	0%	2%	0%	

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Count Name: Kuhio Hwy Kapaa Bypass 3-15-17 to 3-17-17
Site Code: Hokua Place
Start Date: 03/15/2017
Page No: 1

Turning Movement Data

Start Time	Kapaa Bypass Rd Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:00 PM	1	105	0	106	99	191	0	290	0	106	5	0	111	507
3:15 PM	3	100	0	103	122	210	0	332	0	88	7	0	95	530
3:30 PM	8	93	0	101	120	207	0	327	0	73	8	0	81	509
3:45 PM	8	104	0	112	148	201	0	349	0	88	21	0	109	570
Hourly Total	20	402	0	422	489	809	0	1298	0	355	41	0	396	2116
4:00 PM	1	108	0	109	168	161	0	329	0	91	16	0	107	545
4:15 PM	9	94	0	103	154	172	0	326	0	97	14	0	111	540
4:30 PM	6	90	0	96	166	187	0	353	0	112	19	0	131	580
4:45 PM	2	95	0	97	146	176	0	322	0	112	15	0	127	546
Hourly Total	18	387	0	405	634	696	0	1330	0	412	64	0	476	2211
5:00 PM	5	88	0	93	149	232	0	381	0	138	27	0	165	639
5:15 PM	2	91	0	93	149	192	0	341	0	152	25	0	177	611
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	7	179	0	186	298	424	0	722	0	290	52	0	342	1250
6:30 AM	0	78	0	78	14	124	0	138	0	203	0	0	203	419
6:45 AM	2	116	0	118	8	124	0	132	0	190	1	0	191	441
Hourly Total	2	194	0	196	22	248	0	270	0	393	1	0	394	860
7:00 AM	1	161	0	162	20	129	0	149	0	233	0	0	233	544
7:15 AM	1	184	0	185	25	155	0	180	0	200	1	0	201	566
7:30 AM	2	152	0	154	24	152	0	176	0	167	0	0	167	497
7:45 AM	1	155	1	156	33	180	0	213	0	135	0	0	135	504
Hourly Total	5	652	1	657	102	616	0	718	0	735	1	0	736	2111
8:00 AM	0	150	0	150	24	187	0	211	0	132	1	0	133	494
8:15 AM	3	131	0	134	21	177	0	198	0	165	0	0	165	497
8:30 AM	3	130	0	133	33	191	0	224	0	161	1	0	162	519
8:45 AM	1	108	0	109	25	209	0	234	0	189	0	0	189	532
Hourly Total	7	519	0	526	103	764	0	867	0	647	2	0	649	2042
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	5	103	0	108	97	217	0	314	0	96	6	0	102	524
3:15 PM	8	117	0	125	131	156	0	287	0	84	9	0	93	505
3:30 PM	6	83	0	89	138	227	0	365	1	76	8	0	85	539
3:45 PM	2	87	1	89	119	182	0	301	0	76	7	0	83	473
Hourly Total	21	390	1	411	485	782	0	1267	1	332	30	0	363	2041
4:00 PM	2	122	0	124	126	152	0	278	0	96	7	0	103	505
4:15 PM	6	109	1	115	136	158	0	294	0	95	6	0	101	510
4:30 PM	6	96	1	102	143	174	0	317	0	78	2	0	80	499
4:45 PM	5	93	0	98	138	181	0	319	0	83	6	0	89	506
Hourly Total	19	420	2	439	543	665	0	1208	0	352	21	0	373	2020
5:00 PM	2	98	0	100	146	204	0	350	0	85	3	0	88	538
5:15 PM	4	113	0	117	121	159	0	280	0	92	2	0	94	491
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	6	211	0	217	267	363	0	630	0	177	5	0	182	1029
6:30 AM	0	82	0	82	11	115	0	126	0	185	0	0	185	393
6:45 AM	0	89	0	89	10	126	0	136	0	164	3	0	167	392
Hourly Total	0	171	0	171	21	241	0	262	0	349	3	0	352	785
7:00 AM	1	131	0	132	17	133	0	150	0	219	1	0	220	502
7:15 AM	3	168	0	171	32	158	0	190	0	182	3	0	185	546
7:30 AM	1	125	0	126	40	146	0	186	0	166	2	0	168	480
7:45 AM	1	123	0	124	30	165	0	195	0	138	0	0	138	457
Hourly Total	6	547	0	553	119	602	0	721	0	705	6	0	711	1985
8:00 AM	4	116	0	120	20	169	0	189	0	150	0	0	150	459
8:15 AM	1	125	0	126	28	158	0	186	0	133	2	0	135	447
Grand Total	116	4313	4	4429	3131	6537	0	9668	1	5030	228	0	5259	19356
Approach %	2.6	97.4	-	-	32.4	67.6	-	-	0.0	95.6	4.3	-	-	-
Total %	0.6	22.3	-	22.9	16.2	33.8	-	49.9	0.0	26.0	1.2	-	27.2	-
Lights	114	4214	-	4328	3083	6353	-	9436	1	4901	225	-	5127	18891
% Lights	98.3	97.7	-	97.7	98.5	97.2	-	97.6	100.0	97.4	98.7	-	97.5	97.6
Mediums	2	91	-	93	47	171	-	218	0	115	3	-	118	429
% Mediums	1.7	2.1	-	2.1	1.5	2.6	-	2.3	0.0	2.3	1.3	-	2.2	2.2
Articulated Trucks	0	8	-	8	1	13	-	14	0	14	0	-	14	36
% Articulated Trucks	0.0	0.2	-	0.2	0.0	0.2	-	0.1	0.0	0.3	0.0	-	0.3	0.2
All Pedestrians	-	-	4	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

Kuhio Hwy [SB]

Exit	Enter	Total
6467	5127	11594
173	118	291
13	14	27
0	0	0
6653	**5259**	**11912**

RT	Th	LT	Ped
225	4901	1	0
3	115	0	0
0	14	0	0
0	0	0	0
228	**5030**	**1**	**0**

Kapaa Bypass Rd [EB]

Total	Enter	Exit
7636	4328	3308
143	93	50
9	8	1
0	0	0
7788	**4429**	**3359**

LT	RT	Ped
114	4214	0
2	91	0
0	8	0
0	0	4
116	**4313**	**4**

03/15/2017 3:00 PM
Ending At
03/17/2017 8:30 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [WB]

Exit	Enter	Total
1	0	1
0	0	0
0	0	0
0	0	0
1	**0**	**1**

LT	Th	Ped
3083	6353	0
47	171	0
1	13	0
0	0	0
3131	**6537**	**0**

Exit	Enter	Total
9115	9436	18551
206	218	424
22	14	36
0	0	0
9343	**9668**	**19011**

Kuhio Hwy [NB]

Turning Movement Data Plot

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Kapaa Bypass Rd Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
4:30 PM	6	90	0	96	166	187	0	353	0	112	19	0	131	580
4:45 PM	2	95	0	97	146	176	0	322	0	112	15	0	127	546
5:00 PM	5	88	0	93	149	232	0	381	0	138	27	0	165	639
5:15 PM	2	91	0	93	149	192	0	341	0	152	25	0	177	611
Total	15	364	0	379	610	787	0	1397	0	514	86	0	600	2376
Approach %	4.0	96.0	-	-	43.7	56.3	-	-	0.0	85.7	14.3	-	-	-
Total %	0.6	15.3	-	16.0	25.7	33.1	-	58.8	0.0	21.6	3.6	-	25.3	-
PHF	0.625	0.958	-	0.977	0.919	0.848	-	0.917	0.000	0.845	0.796	-	0.847	0.930
Lights	15	358	-	373	607	778	-	1385	0	506	85	-	591	2349
% Lights	100.0	98.4	-	98.4	99.5	98.9	-	99.1	-	98.4	98.8	-	98.5	98.9
Mediums	0	5	-	5	3	9	-	12	0	7	1	-	8	25
% Mediums	0.0	1.4	-	1.3	0.5	1.1	-	0.9	-	1.4	1.2	-	1.3	1.1
Articulated Trucks	0	1	-	1	0	0	-	0	0	1	0	-	1	2
% Articulated Trucks	0.0	0.3	-	0.3	0.0	0.0	-	0.0	-	0.2	0.0	-	0.2	0.1
All Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Kuhio Hwy [SB]		
Exit	Enter	Total
793	591	1384
9	8	17
0	1	1
0	0	0
802	**600**	**1402**

85	506	0	0
1	7	0	0
0	1	0	0
0	0	0	0
86	**514**	**0**	**0**
RT	Th	LT	Ped

Kapaa Bypass Rd [EB]		
Exit	Enter	Total
692	373	1065
4	5	9
0	1	1
0	0	0
696	**379**	**1075**

0	358	15
0	5	0
0	1	0
0	0	0
0	**364**	**15**
Ped	RT	LT

Peak Hour Data

03/15/2017 4:30 PM
Ending At
03/15/2017 5:30 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [WB]		
Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
607	778	0
3	9	0
0	0	0
0	0	0
610	**787**	**0**

864	1385	2249
12	12	24
2	0	2
0	0	0
878	**1397**	**2275**
Exit	Enter	Total
Kuhio Hwy [NB]		

Turning Movement Peak Hour Data Plot (4:30 PM)

The Traffic Management Consultant
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Turning Movement Peak Hour Data (7:00 AM)

Start Time	Kapaa Bypass Rd Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:00 AM	1	161	0	162	20	129	0	149	0	233	0	0	233	544
7:15 AM	1	184	0	185	25	155	0	180	0	200	1	0	201	566
7:30 AM	2	152	0	154	24	152	0	176	0	167	0	0	167	497
7:45 AM	1	155	1	156	33	180	0	213	0	135	0	0	135	504
Total	5	652	1	657	102	616	0	718	0	735	1	0	736	2111
Approach %	0.8	99.2	-	-	14.2	85.8	-	-	0.0	99.9	0.1	-	-	-
Total %	0.2	30.9	-	31.1	4.8	29.2	-	34.0	0.0	34.8	0.0	-	34.9	-
PHF	0.625	0.886	-	0.888	0.773	0.856	-	0.843	0.000	0.789	0.250	-	0.790	0.932
Lights	4	635	-	639	100	600	-	700	0	711	1	-	712	2051
% Lights	80.0	97.4	-	97.3	98.0	97.4	-	97.5	-	96.7	100.0	-	96.7	97.2
Mediums	1	14	-	15	2	16	-	18	0	23	0	-	23	56
% Mediums	20.0	2.1	-	2.3	2.0	2.6	-	2.5	-	3.1	0.0	-	3.1	2.7
Articulated Trucks	0	3	-	3	0	0	-	0	0	1	0	-	1	4
% Articulated Trucks	0.0	0.5	-	0.5	0.0	0.0	-	0.0	-	0.1	0.0	-	0.1	0.2
All Pedestrians	-	-	1	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Kuhio Hwy [SB]

Exit	Enter	Total
604	712	1316
17	23	40
0	1	1
0	0	0
621	**736**	**1357**

RT	Th	LT	Ped
1	711	0	0
0	23	0	0
0	1	0	0
0	0	0	0
1	**735**	**0**	**0**

Kapaa Bypass Rd [EB]

Total	Enter	Exit
740	639	101
17	15	2
3	3	0
0	0	0
760	**657**	**103**

LT	RT	Ped
4	635	0
1	14	0
0	3	0
0	0	1
5	**652**	**1**

Peak Hour Data

03/16/2017 7:00 AM
Ending At
03/16/2017 8:00 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [WB]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
100	600	0
2	16	0
0	0	0
0	0	0
102	**616**	**0**

Exit	Enter	Total
1346	700	2046
37	18	55
4	0	4
0	0	0
1387	**718**	**2105**

Kuhio Hwy [NB]

Turning Movement Peak Hour Data Plot (7:00 AM)

The Traffic Management Consultant
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Turning Movement Peak Hour Data (4:15 PM)

Start Time	Kapaa Bypass Rd Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
4:15 PM	6	109	1	115	136	158	0	294	0	95	6	0	101	510
4:30 PM	6	96	1	102	143	174	0	317	0	78	2	0	80	499
4:45 PM	5	93	0	98	138	181	0	319	0	83	6	0	89	506
5:00 PM	2	98	0	100	146	204	0	350	0	85	3	0	88	538
Total	19	396	2	415	563	717	0	1280	0	341	17	0	358	2053
Approach %	4.6	95.4	-	-	44.0	56.0	-	-	0.0	95.3	4.7	-	-	-
Total %	0.9	19.3	-	20.2	27.4	34.9	-	62.3	0.0	16.6	0.8	-	17.4	-
PHF	0.792	0.908	-	0.902	0.964	0.879	-	0.914	0.000	0.897	0.708	-	0.886	0.954
Lights	19	385	-	404	558	710	-	1268	0	337	17	-	354	2026
% Lights	100.0	97.2	-	97.3	99.1	99.0	-	99.1	-	98.8	100.0	-	98.9	98.7
Mediums	0	11	-	11	5	7	-	12	0	4	0	-	4	27
% Mediums	0.0	2.8	-	2.7	0.9	1.0	-	0.9	-	1.2	0.0	-	1.1	1.3
Articulated Trucks	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
All Pedestrians	-	-	2	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Peak Hour Data

03/16/2017 4:15 PM
Ending At
03/16/2017 5:15 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [SB]		
Exit	Enter	Total
729	354	1083
7	4	11
0	0	0
0	0	0
736	**358**	**1094**

RT	Th	LT	Ped
17	337	0	0
0	4	0	0
0	0	0	0
0	0	0	0
17	**341**	**0**	**0**

Kapaa Bypass Rd [EB]		
Exit	Enter	Total
575	404	979
5	11	16
0	0	0
0	0	0
580	**415**	**995**

Ped	RT	LT
0	385	19
0	11	0
0	0	0
2	0	0
2	**396**	**19**

Fake Approach [WB]		
Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
558	710	0
5	7	0
0	0	0
0	0	0
563	**717**	**0**

Exit	Enter	Total
722	1268	1990
15	12	27
0	0	0
0	0	0
737	**1280**	**2017**
Kuhio Hwy [NB]		

Turning Movement Peak Hour Data Plot (4:15 PM)

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Turning Movement Peak Hour Data (7:00 AM)

Start Time	Kapaa Bypass Rd Eastbound				Kuhio Hwy Northbound				Kuhio Hwy Southbound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:00 AM	1	131	0	132	17	133	0	150	0	219	1	0	220	502
7:15 AM	3	168	0	171	32	158	0	190	0	182	3	0	185	546
7:30 AM	1	125	0	126	40	146	0	186	0	166	2	0	168	480
7:45 AM	1	123	0	124	30	165	0	195	0	138	0	0	138	457
Total	6	547	0	553	119	602	0	721	0	705	6	0	711	1985
Approach %	1.1	98.9	-	-	16.5	83.5	-	-	0.0	99.2	0.8	-	-	-
Total %	0.3	27.6	-	27.9	6.0	30.3	-	36.3	0.0	35.5	0.3	-	35.8	-
PHF	0.500	0.814	-	0.808	0.744	0.912	-	0.924	0.000	0.805	0.500	-	0.808	0.909
Lights	5	535	-	540	113	569	-	682	0	688	6	-	694	1916
% Lights	83.3	97.8	-	97.6	95.0	94.5	-	94.6	-	97.6	100.0	-	97.6	96.5
Mediums	1	10	-	11	5	29	-	34	0	15	0	-	15	60
% Mediums	16.7	1.8	-	2.0	4.2	4.8	-	4.7	-	2.1	0.0	-	2.1	3.0
Articulated Trucks	0	2	-	2	1	4	-	5	0	2	0	-	2	9
% Articulated Trucks	0.0	0.4	-	0.4	0.8	0.7	-	0.7	-	0.3	0.0	-	0.3	0.5
All Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Kuhio Hwy [SB]		
Exit	Enter	Total
574	694	1268
30	15	45
4	2	6
0	0	0
608	**711**	**1319**

6	688	0	0
0	15	0	0
0	2	0	0
0	0	0	0
6	**705**	**0**	**0**
RT	Th	LT	Ped

Kapaa Bypass Rd [EB]						
Total	659	16	3	0	**678**
Enter	540	11	2	0	**553**
Exit	119	5	1	0	**125**

5	1	0	0	**6**	LT
535	10	2	0	**547**	RT
0	0	0	0	**0**	Ped

Peak Hour Data

03/17/2017 7:00 AM
Ending At
03/17/2017 8:00 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

0	0	0	0	0	Exit	Fake Approach [WB]
0	0	0	0	0	Enter	
0	0	0	0	0	Total	

LT	Th	Ped
113	569	0
5	29	0
1	4	0
0	0	0
119	**602**	**0**

1223	682	1905
25	34	59
4	5	9
0	0	0
1252	**721**	**1973**
Exit	Enter	Total
Kuhio Hwy [NB]		

Turning Movement Peak Hour Data Plot (7:00 AM)

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4) 4-3-03: 01

APPENDIX B

CAPACITY ANALYSIS WORKSHEETS

EXISTING TRAFFIC CONDITIONS

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	24	8	36	1	8	4	664	12	3	728	36
Future Volume (vph)	8	24	8	36	1	8	4	664	12	3	728	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1621	1501	1589	0	1631	1760	0	0	1799	0
Flt Permitted			0.962				0.367				0.998	
Satd. Flow (perm)	0	0	1582	1420	1526	0	630	1760	0	0	1795	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				36	374							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1113			697	
Travel Time (s)			9.5					25.3			15.8	
Confl. Peds. (#/hr)	2	4		7	4	4	4		7	4		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	15%	0%	4%	0%	6%	9%	4%	0%	0%	1%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	40	36	1	0	12	676	0	0	771	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4				5				6	
Permitted Phases	4	4		4	8	5	2	2		6		
Detector Phase	4	4	4	4	8	5	5	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	3.0	3.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	7.0	7.0	26.0		34.0	34.0	
Total Split (s)	32.0	32.0	32.0	32.0	32.0	8.0	8.0	178.0		170.0	170.0	
Total Split (%)	15.2%	15.2%	15.2%	15.2%	15.2%	3.8%	3.8%	84.8%		81.0%	81.0%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		4.0	6.0			6.0	
Lead/Lag						Lead	Lead			Lag	Lag	
Lead-Lag Optimize?						Yes	Yes					
Recall Mode	None	None	None	None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)			10.9	10.9	10.9		191.7	190.9			187.0	
Actuated g/C Ratio			0.05	0.05	0.05		0.91	0.91			0.89	
v/c Ratio			0.49	0.34	0.00		0.02	0.42			0.48	
Control Delay			115.8	31.5	0.0		1.3	2.8			4.5	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			115.8	31.5	0.0		1.3	2.8			4.5	
LOS			F	C	A		A	A			A	
Approach Delay			75.8					2.8			4.5	

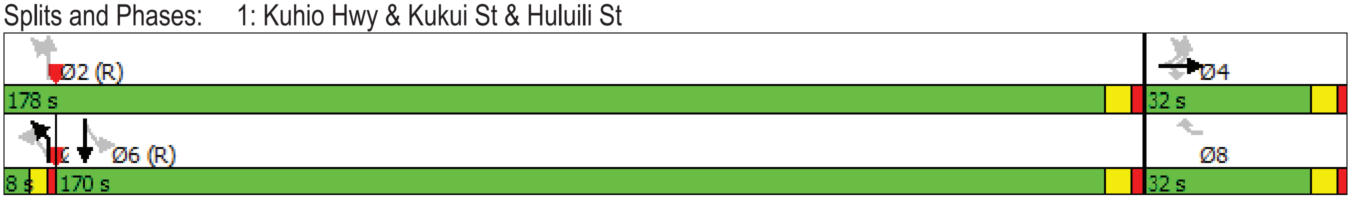
Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	4
Future Volume (vph)	4
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	4
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS			E					A			A	
Queue Length 50th (ft)			55	0	0		1	127			157	
Queue Length 95th (ft)			103	44	0		4	201			360	
Internal Link Dist (ft)			337					1033			617	
Turn Bay Length (ft)							60					
Base Capacity (vph)			195	207	516		602	1600			1598	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.21	0.17	0.00		0.02	0.42			0.48	

Intersection Summary

Area Type: Other
Cycle Length: 210
Actuated Cycle Length: 210
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 7.3 Intersection LOS: A
Intersection Capacity Utilization 66.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St



Lane Group	SBR2
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	100	264	16	40	100	8
Future Vol, veh/h	100	264	16	40	100	8
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	3	6	17	0	6	9
Mvmt Flow	100	264	16	40	100	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	364	0	305	232
Stage 1	-	-	-	-	232	-
Stage 2	-	-	-	-	73	-
Critical Hdwy	-	-	4.27	-	6.46	6.29
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.353	-	3.554	3.381
Pot Cap-1 Maneuver	-	-	1116	-	679	790
Stage 1	-	-	-	-	797	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1116	-	668	790
Mov Cap-2 Maneuver	-	-	-	-	668	-
Stage 1	-	-	-	-	785	-
Stage 2	-	-	-	-	939	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	676	-	-	1116	-
HCM Lane V/C Ratio	0.16	-	-	0.014	-
HCM Control Delay (s)	11.3	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	368	360	116	12	7	84
Future Vol, veh/h	368	360	116	12	7	84
Conflicting Peds, #/hr	7	0	0	7	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	5	20	0	0	8
Mvmt Flow	368	360	116	12	7	84

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	135	0	-	0	1225	129
Stage 1	-	-	-	-	129	-
Stage 2	-	-	-	-	1096	-
Critical Hdwy	4.11	-	-	-	6.4	6.28
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.372
Pot Cap-1 Maneuver	1456	-	-	-	199	905
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	323	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1447	-	-	-	134	899
Mov Cap-2 Maneuver	-	-	-	-	134	-
Stage 1	-	-	-	-	612	-
Stage 2	-	-	-	-	321	-

Approach	EB	WB	SW
HCM Control Delay, s	4.2	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1447	-	-	-	625
HCM Lane V/C Ratio	0.254	-	-	-	0.146
HCM Control Delay (s)	8.3	0	-	-	11.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	1	-	-	-	0.5

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	716	188	12	12	24
Future Vol, veh/h	8	716	188	12	12	24
Conflicting Peds, #/hr	6	0	0	6	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	4	14	24	19
Mvmt Flow	8	716	188	12	12	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	206	0	-	0	932	200
Stage 1	-	-	-	-	200	-
Stage 2	-	-	-	-	732	-
Critical Hdwy	4.1	-	-	-	6.64	6.39
Critical Hdwy Stg 1	-	-	-	-	5.64	-
Critical Hdwy Stg 2	-	-	-	-	5.64	-
Follow-up Hdwy	2.2	-	-	-	3.716	3.471
Pot Cap-1 Maneuver	1377	-	-	-	270	800
Stage 1	-	-	-	-	784	-
Stage 2	-	-	-	-	438	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1370	-	-	-	265	796
Mov Cap-2 Maneuver	-	-	-	-	265	-
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	436	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1370	-	-	-	477
HCM Lane V/C Ratio	0.006	-	-	-	0.075
HCM Control Delay (s)	7.6	0	-	-	13.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	344	2	16	672	764	68
Future Volume (Veh/h)	344	2	16	672	764	68
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	344	2	16	672	764	68
Pedestrians	8					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				697		
pX, platoon unblocked	0.93					
vC, conflicting volume	1476	772	772			
vC1, stage 1 conf vol	772					
vC2, stage 2 conf vol	704					
vCu, unblocked vol	1474	772	772			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	16	99	98			
cM capacity (veh/h)	409	400	846			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	346	16	672	764	68
Volume Left	344	16	0	0	0
Volume Right	2	0	0	0	68
cSH	409	846	1700	1700	1700
Volume to Capacity	0.85	0.02	0.40	0.45	0.04
Queue Length 95th (ft)	203	1	0	0	0
Control Delay (s)	46.6	9.3	0.0	0.0	0.0
Lane LOS	E	A			
Approach Delay (s)	46.6	0.2		0.0	
Approach LOS	E				

Intersection Summary			
Average Delay	8.7		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection												
Int Delay, s/veh	0.7											
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations												
Traffic Vol, veh/h	0	1	0	1	0	4	88	748	20	7	713	4
Future Vol, veh/h	0	1	0	1	0	4	88	748	20	7	713	4
Conflicting Peds, #/hr	3	0	0	0	0	3	0	0	16	16	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	11	5	4	0	2	2	2
Mvmt Flow	0	1	0	1	0	4	88	748	20	7	713	4
Major/Minor	**Minor2**			**Minor1**			**Major1**			**Major2**		
Conflicting Flow All	1668	1689	715	1680	1681	777	717	0	0	784	0	0
Stage 1	729	729	-	950	950	-	-	-	-	-	-	-
Stage 2	939	960	-	730	731	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.31	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.399	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	77	94	434	76	96	383	870	-	-	834	-	-
Stage 1	417	431	-	315	341	-	-	-	-	-	-	-
Stage 2	320	338	-	417	430	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	70	83	434	68	84	377	870	-	-	822	-	-
Mov Cap-2 Maneuver	70	83	-	68	84	-	-	-	-	-	-	-
Stage 1	375	427	-	279	302	-	-	-	-	-	-	-
Stage 2	284	299	-	412	426	-	-	-	-	-	-	-

Approach	**EB**	**WB**	**NB**	**SB**
HCM Control Delay, s	48.9	23.7	1	0.1
HCM LOS	E	C		

Minor Lane/Major Mvmt	**NBL**	**NBT**	**NBR**	**EBLn1**	**WBLn1**	**SBL**	**SBT**	**SBR**
Capacity (veh/h)	870	-	-	83	198	822	-	-
HCM Lane V/C Ratio	0.101	-	-	0.012	0.025	0.009	-	-
HCM Control Delay (s)	9.6	-	-	48.9	23.7	9.4	-	-
HCM Lane LOS	A	-	-	E	C	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	1	12	0	2	92	0	0	0	0	204	8
Future Vol, veh/h	4	1	12	0	2	92	0	0	0	0	204	8
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	0	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	17	0	0	5	0	0	0	0	4	17
Mvmt Flow	4	1	12	0	2	92	0	0	0	0	204	8

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	266	215	215	215	219	4				0	0	0
Stage 1	215	215	-	0	0	-				-	-	-
Stage 2	51	0	-	215	219	-				-	-	-
Critical Hdwy	7.1	6.5	6.37	7.1	6.5	6.25				4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	-	-	-				-	-	-
Critical Hdwy Stg 2	-	-	-	6.1	5.5	-				-	-	-
Follow-up Hdwy	3.5	4	3.453	3.5	4	3.345				2.2	-	-
Pot Cap-1 Maneuver	691	686	789	746	683	1071				-	-	-
Stage 1	792	729	-	-	-	-				-	-	-
Stage 2	-	-	-	792	726	-				-	-	-
Platoon blocked, %											-	-
Mov Cap-1 Maneuver	624	682	784	734	679	1067				-	-	-
Mov Cap-2 Maneuver	624	682	-	734	679	-				-	-	-
Stage 1	792	725	-	-	-	-				-	-	-
Stage 2	-	-	-	779	722	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	10	8.8	0
HCM LOS	B	A	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	733	1054	-	-	-
HCM Lane V/C Ratio	0.023	0.089	-	-	-
HCM Control Delay (s)	10	8.8	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0.3	-	-	-

Intersection	
Intersection Delay, s/veh	20.0
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	652	228	136	724
Demand Flow Rate, veh/h	669	247	138	732
Vehicles Circulating, veh/h	556	129	628	348
Vehicles Exiting, veh/h	524	637	597	28
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	30.0	5.1	7.1	18.2
Approach LOS	D	A	A	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LT	LTR	LTR
Assumed Moves	LTR	LT	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	669	247	138	732
Cap Entry Lane, veh/h	783	1210	727	968
Entry HV Adj Factor	0.975	0.922	0.986	0.989
Flow Entry, veh/h	652	228	136	724
Cap Entry, veh/h	763	1115	717	957
V/C Ratio	0.855	0.204	0.190	0.757
Control Delay, s/veh	30.0	5.1	7.1	18.2
LOS	D	A	A	C
95th %tile Queue, veh	10	1	1	7

Intersection	
Int Delay, s/veh	12.3

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	68	416	40	104	300	17
Future Vol, veh/h	68	416	40	104	300	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	9	1	0	2	2	0
Mvmt Flow	68	416	40	104	300	17

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	144	0	-	0	644	92
Stage 1	-	-	-	-	92	-
Stage 2	-	-	-	-	552	-
Critical Hdwy	4.19	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.281	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	1397	-	-	-	437	971
Stage 1	-	-	-	-	932	-
Stage 2	-	-	-	-	577	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1397	-	-	-	409	971
Mov Cap-2 Maneuver	-	-	-	-	409	-
Stage 1	-	-	-	-	873	-
Stage 2	-	-	-	-	577	-

Approach	EB	WB	SE
HCM Control Delay, s	1.1	0	35.1
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1
Capacity (veh/h)	1397	-	-	-	422
HCM Lane V/C Ratio	0.049	-	-	-	0.751
HCM Control Delay (s)	7.7	0	-	-	35.1
HCM Lane LOS	A	A	-	-	E
HCM 95th %tile Q(veh)	0.2	-	-	-	6.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	304	140	32	13	0
Future Vol, veh/h	8	304	140	32	13	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	11	0	0	0
Mvmt Flow	8	304	140	32	13	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	172	0	-	0	476	156
Stage 1	-	-	-	-	156	-
Stage 2	-	-	-	-	320	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1417	-	-	-	551	895
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	741	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1417	-	-	-	547	895
Mov Cap-2 Maneuver	-	-	-	-	547	-
Stage 1	-	-	-	-	871	-
Stage 2	-	-	-	-	741	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1417	-	-	-	547
HCM Lane V/C Ratio	0.006	-	-	-	0.024
HCM Control Delay (s)	7.6	0	-	-	11.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑↑	↑	↱
Traffic Vol, veh/h	4	736	100	620	800	4
Future Vol, veh/h	4	736	100	620	800	4
Conflicting Peds, #/hr	1	0	0	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	20	3	2	3	3	0
Mvmt Flow	4	736	100	620	800	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1312	-	801	0	-	0
Stage 1	801	-	-	-	-	-
Stage 2	511	-	-	-	-	-
Critical Hdwy	6.9	-	4.13	-	-	-
Critical Hdwy Stg 1	5.7	-	-	-	-	-
Critical Hdwy Stg 2	6.1	-	-	-	-	-
Follow-up Hdwy	3.69	-	2.219	-	-	-
Pot Cap-1 Maneuver	144	0	820	-	-	-
Stage 1	402	0	-	-	-	-
Stage 2	527	0	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	-	819	-	-	-
Mov Cap-2 Maneuver	233	-	-	-	-	-
Stage 1	353	-	-	-	-	-
Stage 2	526	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.7	1.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	819	-	233	-	-	-
HCM Lane V/C Ratio	0.122	-	0.017	-	-	-
HCM Control Delay (s)	10	-	20.7	0	-	-
HCM Lane LOS	B	-	C	A	-	-
HCM 95th %tile Q(veh)	0.4	-	0.1	-	-	-

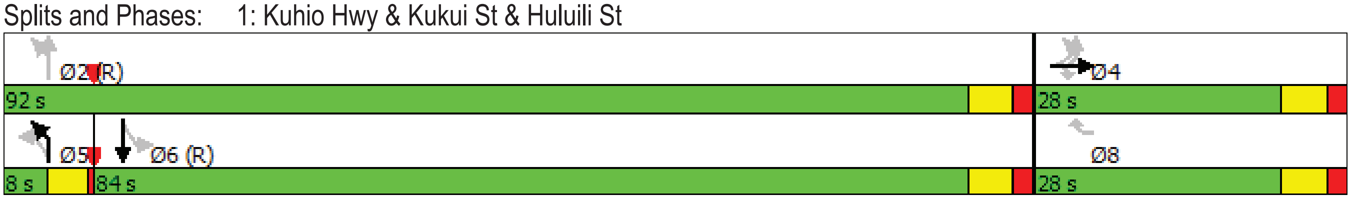
Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	20	8	36	8	60	56	548	16	3	580	32
Future Volume (vph)	16	20	8	36	8	60	56	548	16	3	580	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1765	1561	1589	0	1745	1821	0	0	1770	0
Flt Permitted			0.961				0.397				0.998	
Satd. Flow (perm)	0	0	1489	1324	1423	0	679	1821	0	0	1766	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				64	340							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1123			607	
Travel Time (s)			9.5					25.5			13.8	
Confl. Peds. (#/hr)	37	30		47	30	30	75		49	49		30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	44	36	8	0	116	564	0	0	643	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4				5				6	
Permitted Phases	4	4		4	8	5	2	2		6		
Detector Phase	4	4	4	4	8	5	5	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	4.0	4.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	8.0	8.0	26.0		34.0	34.0	
Total Split (s)	28.0	28.0	28.0	28.0	28.0	8.0	8.0	92.0		84.0	84.0	
Total Split (%)	23.3%	23.3%	23.3%	23.3%	23.3%	6.7%	6.7%	76.7%		70.0%	70.0%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.5	3.5	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	0.5	0.5	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		4.0	6.0			6.0	
Lead/Lag						Lead	Lead			Lag	Lag	
Lead-Lag Optimize?						Yes	Yes					
Recall Mode	None	None	None	None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)			9.3	9.3	9.3		103.3	102.5			90.5	
Actuated g/C Ratio			0.08	0.08	0.08		0.86	0.85			0.75	
v/c Ratio			0.39	0.22	0.02		0.18	0.36			0.48	
Control Delay			61.6	6.9	0.1		2.4	3.4			8.2	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			61.6	6.9	0.1		2.4	3.4			8.2	
LOS			E	A	A		A	A			A	
Approach Delay			37.0					3.2			8.2	

Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	28
Future Volume (vph)	28
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	35
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS			D					A			A	
Queue Length 50th (ft)			33	0	0		11	85			181	
Queue Length 95th (ft)			71	12	0		25	147			302	
Internal Link Dist (ft)			337					1043			527	
Turn Bay Length (ft)							60					
Base Capacity (vph)			272	295	538		645	1556			1332	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.16	0.12	0.01		0.18	0.36			0.48	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 7.4	Intersection LOS: A
Intersection Capacity Utilization 95.3%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St



Lane Group	SBR2
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	112	308	12	48	340	32
Future Vol, veh/h	112	308	12	48	340	32
Conflicting Peds, #/hr	0	4	4	0	0	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	4	4	6	1	0
Mvmt Flow	112	308	12	48	340	32

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	424	0	342	273
Stage 1	-	-	-	-	270	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	-	-	4.14	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.236	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1125	-	656	771
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	953	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1121	-	647	766
Mov Cap-2 Maneuver	-	-	-	-	647	-
Stage 1	-	-	-	-	767	-
Stage 2	-	-	-	-	953	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	17.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	656	-	-	1121	-
HCM Lane V/C Ratio	0.567	-	-	0.011	-
HCM Control Delay (s)	17.4	-	-	8.2	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	3.6	-	-	0	-

Intersection	
Int Delay, s/veh	12.9

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	328	220	372	84	48	236
Future Vol, veh/h	328	220	372	84	48	236
Conflicting Peds, #/hr	15	0	0	15	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	3	3	1	2	2	1
Mvmt Flow	328	220	372	84	48	236

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	471	0	-	0	1305	429
Stage 1	-	-	-	-	429	-
Stage 2	-	-	-	-	876	-
Critical Hdwy	4.13	-	-	-	6.42	6.21
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.227	-	-	-	3.518	3.309
Pot Cap-1 Maneuver	1086	-	-	-	177	628
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	407	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1072	-	-	-	112	620
Mov Cap-2 Maneuver	-	-	-	-	112	-
Stage 1	-	-	-	-	422	-
Stage 2	-	-	-	-	402	-

Approach	EB	WB	SW
HCM Control Delay, s	5.9	0	47
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1072	-	-	-	351
HCM Lane V/C Ratio	0.306	-	-	-	0.809
HCM Control Delay (s)	9.8	0	-	-	47
HCM Lane LOS	A	A	-	-	E
HCM 95th %tile Q(veh)	1.3	-	-	-	7

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	36	532	548	60	16	24
Future Vol, veh/h	36	532	548	60	16	24
Conflicting Peds, #/hr	2	0	0	2	0	58
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	13	3	1	0	0	6
Mvmt Flow	36	532	548	60	16	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	610	0	-	0	1184	638
Stage 1	-	-	-	-	580	-
Stage 2	-	-	-	-	604	-
Critical Hdwy	4.23	-	-	-	6.4	6.26
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.317	-	-	-	3.5	3.354
Pot Cap-1 Maneuver	917	-	-	-	211	469
Stage 1	-	-	-	-	564	-
Stage 2	-	-	-	-	550	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	915	-	-	-	198	444
Mov Cap-2 Maneuver	-	-	-	-	198	-
Stage 1	-	-	-	-	531	-
Stage 2	-	-	-	-	549	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	19
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	915	-	-	-	297
HCM Lane V/C Ratio	0.039	-	-	-	0.135
HCM Control Delay (s)	9.1	0	-	-	19
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	296	3	20	640	656	152
Future Volume (Veh/h)	296	3	20	640	656	152
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	296	3	20	640	656	152
Pedestrians	19					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	2					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				607		
pX, platoon unblocked	0.93					
vC, conflicting volume	1355	675	675			
vC1, stage 1 conf vol	675					
vC2, stage 2 conf vol	680					
vCu, unblocked vol	1344	675	675			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	32	99	98			
cM capacity (veh/h)	437	450	910			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	299	20	640	656	152
Volume Left	296	20	0	0	0
Volume Right	3	0	0	0	152
cSH	437	910	1700	1700	1700
Volume to Capacity	0.68	0.02	0.38	0.39	0.09
Queue Length 95th (ft)	126	2	0	0	0
Control Delay (s)	29.2	9.0	0.0	0.0	0.0
Lane LOS	D	A			
Approach Delay (s)	29.2	0.3		0.0	
Approach LOS	D				

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	0	2	0	12	380	652	12	12	608	5
Future Vol, veh/h	1	0	0	2	0	12	380	652	12	12	608	5
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	7	7	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	11	5	4	0	2	2	2
Mvmt Flow	1	0	0	2	0	12	380	652	12	12	608	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2060	2066	611	2060	2062	666	613	0	0	671	0	0
Stage 1	635	635	-	1425	1425	-	-	-	-	-	-	-
Stage 2	1425	1431	-	635	637	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.31	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.399	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	41	55	497	41	55	444	952	-	-	919	-	-
Stage 1	470	476	-	170	203	-	-	-	-	-	-	-
Stage 2	170	202	-	470	475	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	27	32	497	28	32	441	952	-	-	913	-	-
Mov Cap-2 Maneuver	27	32	-	28	32	-	-	-	-	-	-	-
Stage 1	282	470	-	101	121	-	-	-	-	-	-	-
Stage 2	99	121	-	464	469	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	143.4	33.1	4.1	0.2
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	952	-	-	27	142	913	-	-
HCM Lane V/C Ratio	0.399	-	-	0.037	0.099	0.013	-	-
HCM Control Delay (s)	11.3	-	-	143.4	33.1	9	-	-
HCM Lane LOS	B	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	1.9	-	-	0.1	0.3	0	-	-

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	1	0	3	2	384	0	0	0	0	200	4
Future Vol, veh/h	8	1	0	3	2	384	0	0	0	0	200	4
Conflicting Peds, #/hr	13	0	0	0	0	13	0	0	0	7	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	17	0	0	5	0	0	0	0	4	17
Mvmt Flow	8	1	0	3	2	384	0	0	0	0	200	4

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	424	225	218	210	227	20				7	0	0
Stage 1	218	218	-	7	7	-				-	-	-
Stage 2	206	7	-	203	220	-				-	-	-
Critical Hdwy	7.1	6.5	6.37	7.1	6.5	6.25				4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	-	-	-				-	-	-
Critical Hdwy Stg 2	-	-	-	6.1	5.5	-				-	-	-
Follow-up Hdwy	3.5	4	3.453	3.5	4	3.345				2.2	-	-
Pot Cap-1 Maneuver	544	678	786	752	676	1049				1627	-	-
Stage 1	789	726	-	-	-	-				-	-	-
Stage 2	-	-	-	804	725	-				-	-	-
Platoon blocked, %											-	-
Mov Cap-1 Maneuver	332	664	775	747	662	1031				1617	-	-
Mov Cap-2 Maneuver	332	664	-	747	662	-				-	-	-
Stage 1	789	716	-	-	-	-				-	-	-
Stage 2	-	-	-	803	715	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	15.5	10.6	0
HCM LOS	C	B	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	352	1025	1617	-	-
HCM Lane V/C Ratio	0.026	0.38	-	-	-
HCM Control Delay (s)	15.5	10.6	0	-	-
HCM Lane LOS	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	1.8	0	-	-

Intersection	
Intersection Delay, s/veh	14.2
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	260	552	640	392
Demand Flow Rate, veh/h	278	564	640	407
Vehicles Circulating, veh/h	439	333	262	892
Vehicles Exiting, veh/h	860	569	455	5
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.9	11.5	11.5	26.6
Approach LOS	A	B	B	D

Lane	Left	Left	Left	Left
Designated Moves	LTR	LT	LTR	LTR
Assumed Moves	LTR	LT	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	278	564	640	407
Cap Entry Lane, veh/h	882	983	1056	556
Entry HV Adj Factor	0.937	0.979	1.000	0.964
Flow Entry, veh/h	260	552	640	392
Cap Entry, veh/h	826	962	1056	536
V/C Ratio	0.315	0.574	0.606	0.733
Control Delay, s/veh	7.9	11.5	11.5	26.6
LOS	A	B	B	D
95th %tile Queue, veh	1	4	4	6

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	52	116	276	280	120	68
Future Vol, veh/h	52	116	276	280	120	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	0	1	2	0
Mvmt Flow	52	116	276	280	120	68

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	556	0	-	0	636	416
Stage 1	-	-	-	-	416	-
Stage 2	-	-	-	-	220	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	1025	-	-	-	442	641
Stage 1	-	-	-	-	666	-
Stage 2	-	-	-	-	817	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1025	-	-	-	418	641
Mov Cap-2 Maneuver	-	-	-	-	418	-
Stage 1	-	-	-	-	630	-
Stage 2	-	-	-	-	817	-

Approach	EB	WB	SE
HCM Control Delay, s	2.7	0	17.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1
Capacity (veh/h)	1025	-	-	-	478
HCM Lane V/C Ratio	0.051	-	-	-	0.393
HCM Control Delay (s)	8.7	0	-	-	17.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	1.9

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	176	288	44	12	1
Future Vol, veh/h	4	176	288	44	12	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	4	176	288	44	12	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	332	0	-	0	494	310
Stage 1	-	-	-	-	310	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1239	-	-	-	538	735
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	852	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1239	-	-	-	536	735
Mov Cap-2 Maneuver	-	-	-	-	536	-
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	852	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1239	-	-	-	547
HCM Lane V/C Ratio	0.003	-	-	-	0.024
HCM Control Delay (s)	7.9	0	-	-	11.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	24	360	664	748	446	78
Future Vol, veh/h	24	360	664	748	446	78
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	0	1	3	1
Mvmt Flow	24	360	664	748	446	78

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2148	446	446	0	-	0
Stage 1	446	-	-	-	-	-
Stage 2	1702	-	-	-	-	-
Critical Hdwy	6.6	6.23	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.319	2.2	-	-	-
Pot Cap-1 Maneuver	48	611	1125	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	136	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 20	611	1125	-	-	-
Mov Cap-2 Maneuver	426	-	-	-	-	-
Stage 1	266	-	-	-	-	-
Stage 2	136	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.7	6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1125	-	426	611	-	-
HCM Lane V/C Ratio	0.59	-	0.056	0.589	-	-
HCM Control Delay (s)	12.7	-	14	19	-	-
HCM Lane LOS	B	-	B	C	-	-
HCM 95th %tile Q(veh)	4	-	0.2	3.8	-	-

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

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4) 4-3-03: 01

APPENDIX C

CAPACITY ANALYSIS WORKSHEETS

PEAK HOUR TRAFFIC WITHOUT PROJECT

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	27	9	41	1	9	5	751	14	3	824	41
Future Volume (vph)	9	27	9	41	1	9	5	751	14	3	824	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1621	1501	1589	0	1630	1761	0	0	1800	0
Flt Permitted			0.962				0.320				0.998	
Satd. Flow (perm)	0	0	1602	1447	1542	0	547	1761	0	0	1797	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				76	246							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1113			697	
Travel Time (s)			9.5					25.3			15.8	
Confl. Peds. (#/hr)	2	4		7	4	4	4		7	4		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	15%	0%	4%	0%	6%	9%	4%	0%	0%	1%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	45	41	1	0	14	765	0	0	873	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4				5				6	
Permitted Phases	4	4		4	8	5	2	2		6		
Detector Phase	4	4	4	4	8	5	5	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	1.0	1.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	5.0	5.0	26.0		34.0	34.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	5.0	5.0	73.0		68.0	68.0	
Total Split (%)	27.0%	27.0%	27.0%	27.0%	27.0%	5.0%	5.0%	73.0%		68.0%	68.0%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		4.0	6.0			6.0	
Lead/Lag						Lead	Lead			Lag	Lag	
Lead-Lag Optimize?						Yes	Yes					
Recall Mode	None	None	None	None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)			8.6	8.6	8.6		84.0	83.2			81.2	
Actuated g/C Ratio			0.09	0.09	0.09		0.84	0.83			0.81	
v/c Ratio			0.33	0.21	0.00		0.03	0.52			0.60	
Control Delay			48.8	5.1	0.0		2.1	5.1			7.9	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			48.8	5.1	0.0		2.1	5.1			7.9	
LOS			D	A	A		A	A			A	
Approach Delay			27.9					5.1			7.9	
Approach LOS			C					A			A	
Queue Length 50th (ft)			28	0	0		1	134			168	
Queue Length 95th (ft)			61	10	0		5	241			480	
Internal Link Dist (ft)			337					1033			617	
Turn Bay Length (ft)							60					

Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	5
Future Volume (vph)	5
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	4
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)			336	363	518		520	1464			1458	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.13	0.11	0.00		0.03	0.52			0.60	

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 70.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St

Lane Group	SBR2
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	118	311	19	47	118	9
Future Vol, veh/h	118	311	19	47	118	9
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	3	6	17	0	6	9
Mvmt Flow	118	311	19	47	118	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	429	0	360	274
Stage 1	-	-	-	-	274	-
Stage 2	-	-	-	-	86	-
Critical Hdwy	-	-	4.27	-	6.46	6.29
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.353	-	3.554	3.381
Pot Cap-1 Maneuver	-	-	1055	-	631	748
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	927	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1055	-	619	748
Mov Cap-2 Maneuver	-	-	-	-	619	-
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	926	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	12.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	627	-	-	1055	-
HCM Lane V/C Ratio	0.203	-	-	0.018	-
HCM Control Delay (s)	12.2	-	-	8.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	413	404	130	13	8	94
Future Vol, veh/h	413	404	130	13	8	94
Conflicting Peds, #/hr	7	0	0	7	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	5	20	0	0	8
Mvmt Flow	413	404	130	13	8	94

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	150	0	-	0	1374	144
Stage 1	-	-	-	-	144	-
Stage 2	-	-	-	-	1230	-
Critical Hdwy	4.11	-	-	-	6.4	6.28
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.372
Pot Cap-1 Maneuver	1437	-	-	-	162	888
Stage 1	-	-	-	-	888	-
Stage 2	-	-	-	-	279	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1428	-	-	-	100	883
Mov Cap-2 Maneuver	-	-	-	-	100	-
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	277	-

Approach	EB	WB	SW
HCM Control Delay, s	4.3	0	13.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1428	-	-	-	547
HCM Lane V/C Ratio	0.289	-	-	-	0.186
HCM Control Delay (s)	8.5	0	-	-	13.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	1.2	-	-	-	0.7

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	803	211	13	13	27
Future Vol, veh/h	9	803	211	13	13	27
Conflicting Peds, #/hr	6	0	0	6	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	4	14	24	19
Mvmt Flow	9	803	211	13	13	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	230	0	-	0	1045	224
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	821	-
Critical Hdwy	4.1	-	-	-	6.64	6.39
Critical Hdwy Stg 1	-	-	-	-	5.64	-
Critical Hdwy Stg 2	-	-	-	-	5.64	-
Follow-up Hdwy	2.2	-	-	-	3.716	3.471
Pot Cap-1 Maneuver	1350	-	-	-	230	775
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	397	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1343	-	-	-	225	771
Mov Cap-2 Maneuver	-	-	-	-	225	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	395	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	14.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1343	-	-	-	431
HCM Lane V/C Ratio	0.007	-	-	-	0.093
HCM Control Delay (s)	7.7	0	-	-	14.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	389	2	18	760	864	91
Future Volume (Veh/h)	389	2	18	760	864	91
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	389	2	18	760	864	91
Pedestrians	8					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				697		
pX, platoon unblocked	0.84					
vC, conflicting volume	1668	872	872			
vC1, stage 1 conf vol	872					
vC2, stage 2 conf vol	796					
vCu, unblocked vol	1700	872	872			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	99	98			
cM capacity (veh/h)	359	350	776			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	391	18	760	864	91
Volume Left	389	18	0	0	0
Volume Right	2	0	0	0	91
cSH	359	776	1700	1700	1700
Volume to Capacity	1.09	0.02	0.45	0.51	0.05
Queue Length 95th (ft)	356	2	0	0	0
Control Delay (s)	107.8	9.7	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	107.8	0.2		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	19.9		
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	1	0	5	100	846	23	8	783	5
Future Vol, veh/h	0	1	0	1	0	5	100	846	23	8	783	5
Conflicting Peds, #/hr	3	0	0	0	0	3	0	0	16	16	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	11	5	4	0	2	2	2
Mvmt Flow	0	1	0	1	0	5	100	846	23	8	783	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1865	1887	786	1876	1878	877	788	0	0	885	0	0
Stage 1	802	802	-	1074	1074	-	-	-	-	-	-	-
Stage 2	1063	1085	-	802	804	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.31	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.399	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	56	71	395	55	72	335	818	-	-	765	-	-
Stage 1	381	399	-	269	299	-	-	-	-	-	-	-
Stage 2	272	295	-	381	398	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	49	61	395	48	62	329	818	-	-	754	-	-
Mov Cap-2 Maneuver	49	61	-	48	62	-	-	-	-	-	-	-
Stage 1	335	395	-	233	259	-	-	-	-	-	-	-
Stage 2	235	255	-	376	394	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	65	27.4	1	0.1
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	818	-	-	61	167	754	-	-
HCM Lane V/C Ratio	0.122	-	-	0.016	0.036	0.011	-	-
HCM Control Delay (s)	10	-	-	65	27.4	9.8	-	-
HCM Lane LOS	B	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	0.1	0.1	0	-	-

Intersection												
Int Delay, s/veh	3.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1	14	0	2	104	0	0	0	0	231	9
Future Vol, veh/h	5	1	14	0	2	104	0	0	0	0	231	9
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	0	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	17	0	0	5	0	0	0	0	4	17
Mvmt Flow	5	1	14	0	2	104	0	0	0	0	231	9

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	300	243	243	243	247	4				0	0	0
Stage 1	243	243	-	0	0	-				-	-	-
Stage 2	57	0	-	243	247	-				-	-	-
Critical Hdwy	7.1	6.5	6.37	7.1	6.5	6.25				4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	-	-	-				-	-	-
Critical Hdwy Stg 2	-	-	-	6.1	5.5	-				-	-	-
Follow-up Hdwy	3.5	4	3.453	3.5	4	3.345				2.2	-	-
Pot Cap-1 Maneuver	656	662	760	715	659	1071				-	-	-
Stage 1	765	708	-	-	-	-				-	-	-
Stage 2	-	-	-	765	706	-				-	-	-
Platoon blocked, %											-	-
Mov Cap-1 Maneuver	585	658	755	701	655	1067				-	-	-
Mov Cap-2 Maneuver	585	658	-	701	655	-				-	-	-
Stage 1	765	704	-	-	-	-				-	-	-
Stage 2	-	-	-	750	702	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	10.3	8.8	0
HCM LOS	B	A	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	699	1054	-	-	-
HCM Lane V/C Ratio	0.029	0.101	-	-	-
HCM Control Delay (s)	10.3	8.8	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0.3	-	-	-

Intersection	
Intersection Delay, s/veh	38.7
Intersection LOS	E

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	730	256	116	812
Demand Flow Rate, veh/h	750	278	117	822
Vehicles Circulating, veh/h	624	144	705	391
Vehicles Exiting, veh/h	589	678	669	31
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	64.9	5.4	7.4	30.1
Approach LOS	F	A	A	D

Lane	Left	Left	Left	Left
Designated Moves	LTR	LT	LTR	LTR
Assumed Moves	LTR	LT	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	750	278	117	822
Cap Entry Lane, veh/h	730	1191	672	926
Entry HV Adj Factor	0.974	0.922	0.991	0.988
Flow Entry, veh/h	730	256	116	812
Cap Entry, veh/h	711	1099	667	915
V/C Ratio	1.027	0.233	0.174	0.888
Control Delay, s/veh	64.9	5.4	7.4	30.1
LOS	F	A	A	D
95th %tile Queue, veh	18	1	1	12

Intersection	
Int Delay, s/veh	7.8

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Vol, veh/h	80	490	353	20	47	122
Future Vol, veh/h	80	490	353	20	47	122
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	9	1	2	0	0	2
Mvmt Flow	80	490	353	20	47	122

Major/Minor	Minor2		Major2	
Conflicting Flow All	216	122	0	0
Stage 1	216	-	-	-
Stage 2	0	-	-	-
Critical Hdwy	6.52	6.2	4.1	-
Critical Hdwy Stg 1	5.52	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	4.018	3.3	2.2	-
Pot Cap-1 Maneuver	682	935	-	-
Stage 1	724	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	0	935	-	-
Mov Cap-2 Maneuver	0	-	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-

Approach	SE	NW
HCM Control Delay, s	11.4	
HCM LOS	B	

Minor Lane/Major Mvmt	NWL	NWT	SELn1
Capacity (veh/h)	-	-	935
HCM Lane V/C Ratio	-	-	0.399
HCM Control Delay (s)	-	-	11.4
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	1.9

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	358	165	38	15	0
Future Vol, veh/h	8	358	165	38	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	11	0	0	0
Mvmt Flow	8	358	165	38	15	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	203	0	-	0	558	184
Stage 1	-	-	-	-	184	-
Stage 2	-	-	-	-	374	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1381	-	-	-	494	864
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	700	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1381	-	-	-	491	864
Mov Cap-2 Maneuver	-	-	-	-	491	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	700	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1381	-	-	-	491
HCM Lane V/C Ratio	0.006	-	-	-	0.031
HCM Control Delay (s)	7.6	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	833	113	702	905	5
Future Vol, veh/h	5	833	113	702	905	5
Conflicting Peds, #/hr	1	0	0	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	20	3	2	3	3	0
Mvmt Flow	5	833	113	702	905	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1484	-	906	0	-	0
Stage 1	906	-	-	-	-	-
Stage 2	578	-	-	-	-	-
Critical Hdwy	6.9	-	4.13	-	-	-
Critical Hdwy Stg 1	5.7	-	-	-	-	-
Critical Hdwy Stg 2	6.1	-	-	-	-	-
Follow-up Hdwy	3.69	-	2.219	-	-	-
Pot Cap-1 Maneuver	110	0	749	-	-	-
Stage 1	357	0	-	-	-	-
Stage 2	486	0	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	93	-	748	-	-	-
Mov Cap-2 Maneuver	194	-	-	-	-	-
Stage 1	303	-	-	-	-	-
Stage 2	486	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24	1.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	748	-	194	-	-	-
HCM Lane V/C Ratio	0.151	-	0.026	-	-	-
HCM Control Delay (s)	10.7	-	24	0	-	-
HCM Lane LOS	B	-	C	A	-	-
HCM 95th %tile Q(veh)	0.5	-	0.1	-	-	-

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	23	9	41	9	68	63	620	18	3	656	36
Future Volume (vph)	18	23	9	41	9	68	63	620	18	3	656	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1765	1561	1589	0	1745	1821	0	0	1770	0
Flt Permitted			0.961				0.362				0.998	
Satd. Flow (perm)	0	0	1488	1324	1423	0	626	1821	0	0	1766	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				64	301							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1123			607	
Travel Time (s)			9.5					25.5			13.8	
Confl. Peds. (#/hr)	37	30		47	30	30	75		49	49		30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	50	41	9	0	131	638	0	0	727	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4				5				6	
Permitted Phases	4	4		4	8	5	2	2		6		
Detector Phase	4	4	4	4	8	5	5	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	4.0	4.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	8.0	8.0	26.0		34.0	34.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	8.0	8.0	93.0		85.0	85.0	
Total Split (%)	22.5%	22.5%	22.5%	22.5%	22.5%	6.7%	6.7%	77.5%		70.8%	70.8%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.5	3.5	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	0.5	0.5	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		4.0	6.0			6.0	
Lead/Lag						Lead	Lead			Lag	Lag	
Lead-Lag Optimize?						Yes	Yes					
Recall Mode	None	None	None	None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)			9.7	9.7	9.7		102.9	102.1			89.8	
Actuated g/C Ratio			0.08	0.08	0.08		0.86	0.85			0.75	
v/c Ratio			0.42	0.25	0.02		0.22	0.41			0.55	
Control Delay			62.1	8.6	0.1		2.7	3.9			9.6	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			62.1	8.6	0.1		2.7	3.9			9.6	
LOS			E	A	A		A	A			A	
Approach Delay			38.0					3.7			9.6	
Approach LOS			D					A			A	
Queue Length 50th (ft)			38	0	0		13	105			226	
Queue Length 95th (ft)			77	18	0		29	184			385	
Internal Link Dist (ft)			337					1043			527	
Turn Bay Length (ft)							60					

Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	32
Future Volume (vph)	32
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	35
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)			260	284	497		602	1549			1321	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.19	0.14	0.02		0.22	0.41			0.55	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 8.3 Intersection LOS: A
Intersection Capacity Utilization 103.7% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St

Lane Group	SBR2
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	10.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	131	361	14	56	399	38
Future Vol, veh/h	131	361	14	56	399	38
Conflicting Peds, #/hr	0	4	4	0	0	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	4	4	6	1	0
Mvmt Flow	131	361	14	56	399	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	496	0	400	319
Stage 1	-	-	-	-	316	-
Stage 2	-	-	-	-	84	-
Critical Hdwy	-	-	4.14	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.236	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1058	-	608	726
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	942	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1054	-	598	722
Mov Cap-2 Maneuver	-	-	-	-	598	-
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	942	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	24.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	607	-	-	1054	-
HCM Lane V/C Ratio	0.72	-	-	0.013	-
HCM Control Delay (s)	24.7	-	-	8.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	6	-	-	0	-

Intersection	
Int Delay, s/veh	46.8

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	385	258	436	99	56	277
Future Vol, veh/h	385	258	436	99	56	277
Conflicting Peds, #/hr	15	0	0	15	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	3	3	1	2	2	1
Mvmt Flow	385	258	436	99	56	277

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	550	0	-	0	1529	501
Stage 1	-	-	-	-	501	-
Stage 2	-	-	-	-	1028	-
Critical Hdwy	4.13	-	-	-	6.42	6.21
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.227	-	-	-	3.518	3.309
Pot Cap-1 Maneuver	1015	-	-	-	129	572
Stage 1	-	-	-	-	609	-
Stage 2	-	-	-	-	345	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1002	-	-	-	69	565
Mov Cap-2 Maneuver	-	-	-	-	69	-
Stage 1	-	-	-	-	331	-
Stage 2	-	-	-	-	341	-

Approach	EB	WB	SW
HCM Control Delay, s	6.5	0	199.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1002	-	-	-	256
HCM Lane V/C Ratio	0.384	-	-	-	1.301
HCM Control Delay (s)	10.8	0	-	-	199.9
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	1.8	-	-	-	17

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	42	624	643	70	19	28
Future Vol, veh/h	42	624	643	70	19	28
Conflicting Peds, #/hr	2	0	0	2	0	58
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	13	3	1	0	0	6
Mvmt Flow	42	624	643	70	19	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	715	0	-	0	1388	738
Stage 1	-	-	-	-	680	-
Stage 2	-	-	-	-	708	-
Critical Hdwy	4.23	-	-	-	6.4	6.26
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.317	-	-	-	3.5	3.354
Pot Cap-1 Maneuver	837	-	-	-	159	411
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	492	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	836	-	-	-	146	390
Mov Cap-2 Maneuver	-	-	-	-	146	-
Stage 1	-	-	-	-	467	-
Stage 2	-	-	-	-	491	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	24.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	836	-	-	-	233
HCM Lane V/C Ratio	0.05	-	-	-	0.202
HCM Control Delay (s)	9.5	0	-	-	24.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	332	3	22	718	736	170
Future Volume (Veh/h)	332	3	22	718	736	170
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	332	3	22	718	736	170
Pedestrians	19					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	2					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				607		
pX, platoon unblocked	0.91					
vC, conflicting volume	1517	755	755			
vC1, stage 1 conf vol	755					
vC2, stage 2 conf vol	762					
vCu, unblocked vol	1519	755	755			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	16	99	97			
cM capacity (veh/h)	394	405	850			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	335	22	718	736	170
Volume Left	332	22	0	0	0
Volume Right	3	0	0	0	170
cSH	394	850	1700	1700	1700
Volume to Capacity	0.85	0.03	0.42	0.43	0.10
Queue Length 95th (ft)	202	2	0	0	0
Control Delay (s)	48.4	9.3	0.0	0.0	0.0
Lane LOS	E	A			
Approach Delay (s)	48.4	0.3		0.0	
Approach LOS	E				

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	64.0%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection												
Int Delay, s/veh	3.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	0	2	0	14	430	738	14	14	688	5
Future Vol, veh/h	1	0	0	2	0	14	430	738	14	14	688	5
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	7	7	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	11	5	4	0	2	2	2
Mvmt Flow	1	0	0	2	0	14	430	738	14	14	688	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2332	2338	691	2331	2333	753	693	0	0	759	0	0
Stage 1	719	719	-	1612	1612	-	-	-	-	-	-	-
Stage 2	1613	1619	-	719	721	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.31	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.399	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	26	37	448	26	37	395	888	-	-	852	-	-
Stage 1	423	436	-	133	165	-	-	-	-	-	-	-
Stage 2	132	164	-	423	435	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	15	19	448	16	19	392	888	-	-	847	-	-
Mov Cap-2 Maneuver	15	19	-	16	19	-	-	-	-	-	-	-
Stage 1	218	429	-	68	85	-	-	-	-	-	-	-
Stage 2	66	84	-	416	428	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	261.5	47.7	4.7	0.2
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	888	-	-	15	100	847	-	-
HCM Lane V/C Ratio	0.484	-	-	0.067	0.16	0.017	-	-
HCM Control Delay (s)	12.8	-	-	261.5	47.7	9.3	-	-
HCM Lane LOS	B	-	-	F	E	A	-	-
HCM 95th %tile Q(veh)	2.7	-	-	0.2	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	1	0	2	3	434	0	0	0	0	226	5
Future Vol, veh/h	9	1	0	2	3	434	0	0	0	0	226	5
Conflicting Peds, #/hr	13	0	0	0	0	13	0	0	0	7	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	17	0	0	5	0	0	0	0	4	17
Mvmt Flow	9	1	0	2	3	434	0	0	0	0	226	5

Major/Minor	Minor2			Minor1			Major2		
Conflicting Flow All	477	252	245	236	254	20	7	0	0
Stage 1	245	245	-	7	7	-	-	-	-
Stage 2	232	7	-	229	247	-	-	-	-
Critical Hdwy	7.1	6.5	6.37	7.1	6.5	6.25	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	6.1	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.453	3.5	4	3.345	2.2	-	-
Pot Cap-1 Maneuver	502	655	758	723	653	1049	1627	-	-
Stage 1	763	707	-	-	-	-	-	-	-
Stage 2	-	-	-	778	706	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	282	642	747	718	640	1031	1617	-	-
Mov Cap-2 Maneuver	282	642	-	718	640	-	-	-	-
Stage 1	763	697	-	-	-	-	-	-	-
Stage 2	-	-	-	777	696	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	17.5	11.1	0
HCM LOS	C	B	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	299	1025	1617	-	-
HCM Lane V/C Ratio	0.033	0.428	-	-	-
HCM Control Delay (s)	17.5	11.1	0	-	-
HCM Lane LOS	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	2.2	0	-	-

Intersection	
Intersection Delay, s/veh	27.7
Intersection LOS	D

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	306	648	751	460
Demand Flow Rate, veh/h	326	661	751	476
Vehicles Circulating, veh/h	514	391	307	1046
Vehicles Exiting, veh/h	1008	667	533	6
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.8	16.8	16.9	72.9
Approach LOS	A	C	C	F

Lane	Left	Left	Left	Left
Designated Moves	LTR	LT	LTR	LTR
Assumed Moves	LTR	LT	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	326	661	751	476
Cap Entry Lane, veh/h	817	926	1009	475
Entry HV Adj Factor	0.939	0.980	1.000	0.966
Flow Entry, veh/h	306	648	751	460
Cap Entry, veh/h	767	907	1009	458
V/C Ratio	0.399	0.714	0.744	1.002
Control Delay, s/veh	9.8	16.8	16.9	72.9
LOS	A	C	C	F
95th %tile Queue, veh	2	6	7	13

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	61	137	325	330	141	80
Future Vol, veh/h	61	137	325	330	141	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	0	1	2	0
Mvmt Flow	61	137	325	330	141	80

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	655	0	-	0	749	490
Stage 1	-	-	-	-	490	-
Stage 2	-	-	-	-	259	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	942	-	-	-	379	582
Stage 1	-	-	-	-	616	-
Stage 2	-	-	-	-	784	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	942	-	-	-	352	582
Mov Cap-2 Maneuver	-	-	-	-	352	-
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	784	-

Approach	EB	WB	SE
HCM Control Delay, s	2.8	0	23.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1
Capacity (veh/h)	942	-	-	-	411
HCM Lane V/C Ratio	0.065	-	-	-	0.538
HCM Control Delay (s)	9.1	0	-	-	23.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	3.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	207	339	52	14	1
Future Vol, veh/h	5	207	339	52	14	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	5	207	339	52	14	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	391	0	-	0	582	365
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	217	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1179	-	-	-	479	685
Stage 1	-	-	-	-	707	-
Stage 2	-	-	-	-	824	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1179	-	-	-	477	685
Mov Cap-2 Maneuver	-	-	-	-	477	-
Stage 1	-	-	-	-	703	-
Stage 2	-	-	-	-	824	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1179	-	-	-	487
HCM Lane V/C Ratio	0.004	-	-	-	0.031
HCM Control Delay (s)	8.1	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	8.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	27	404	745	839	503	85
Future Vol, veh/h	27	404	745	839	503	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	0	1	3	1
Mvmt Flow	27	404	745	839	503	85

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2413	503	503	0	-	0
Stage 1	503	-	-	-	-	-
Stage 2	1910	-	-	-	-	-
Critical Hdwy	6.6	6.23	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.319	2.2	-	-	-
Pot Cap-1 Maneuver	32	568	1072	-	-	-
Stage 1	612	-	-	-	-	-
Stage 2	104	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 10	568	1072	-	-	-
Mov Cap-2 Maneuver	231	-	-	-	-	-
Stage 1	187	-	-	-	-	-
Stage 2	104	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25.2	7.3	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1072	-	231	568	-	-
HCM Lane V/C Ratio	0.695	-	0.117	0.711	-	-
HCM Control Delay (s)	15.6	-	22.6	25.4	-	-
HCM Lane LOS	C	-	C	D	-	-
HCM 95th %tile Q(veh)	6	-	0.4	5.8	-	-

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

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4) 4-3-03: 01

APPENDIX D

CAPACITY ANALYSIS WORKSHEETS

PEAK HOUR TRAFFIC WITH PROJECT

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	37	12	60	1	11	5	751	14	3	824	43
Future Volume (vph)	9	37	12	60	1	11	5	751	14	3	824	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1613	1501	1589	0	1632	1760	0	0	1798	0
Flt Permitted			0.962				0.328				0.998	
Satd. Flow (perm)	0	0	1574	1420	1526	0	560	1760	0	0	1795	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				60	330							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1113			697	
Travel Time (s)			9.5					25.3			15.8	
Confl. Peds. (#/hr)	2	4		7	4	4	4		7	4		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	15%	0%	4%	0%	6%	9%	4%	0%	0%	1%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	58	60	1	0	16	765	0	0	875	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4				5				6	
Permitted Phases	4	4		4	8	5	2	2		6		
Detector Phase	4	4	4	4	8	5	5	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	1.0	1.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	5.0	5.0	26.0		34.0	34.0	
Total Split (s)	30.0	30.0	30.0	30.0	30.0	6.0	6.0	180.0		174.0	174.0	
Total Split (%)	14.3%	14.3%	14.3%	14.3%	14.3%	2.9%	2.9%	85.7%		82.9%	82.9%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		4.0	6.0			6.0	
Lead/Lag						Lead	Lead			Lag	Lag	
Lead-Lag Optimize?						Yes	Yes					
Recall Mode	None	None	None	None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)			13.1	13.1	13.1		186.9	184.9			179.0	
Actuated g/C Ratio			0.06	0.06	0.06		0.89	0.88			0.85	
v/c Ratio			0.59	0.42	0.00		0.03	0.49			0.57	
Control Delay			118.9	26.1	0.0		1.8	4.1			7.0	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			118.9	26.1	0.0		1.8	4.1			7.0	
LOS			F	C	A		A	A			A	
Approach Delay			71.7					4.0			7.0	
Approach LOS			E					A			A	
Queue Length 50th (ft)			80	0	0		2	180			342	
Queue Length 95th (ft)			136	56	0		6	284			505	
Internal Link Dist (ft)			337					1033			617	
Turn Bay Length (ft)							60					

Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	5
Future Volume (vph)	5
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	4
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)			179	215	466		527	1549			1529	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.32	0.28	0.00		0.03	0.49			0.57	

Intersection Summary	
Area Type: Other	
Cycle Length: 210	
Actuated Cycle Length: 210	
Offset: 202 (96%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 10.0	Intersection LOS: A
Intersection Capacity Utilization 70.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St

Lane Group	SBR2
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	2.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	151	388	19	51	136	9
Future Vol, veh/h	151	388	19	51	136	9
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	3	6	17	0	6	9
Mvmt Flow	151	388	19	51	136	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	539	0	435	345
Stage 1	-	-	-	-	345	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	-	-	4.27	-	6.46	6.29
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.353	-	3.554	3.381
Pot Cap-1 Maneuver	-	-	958	-	571	682
Stage 1	-	-	-	-	708	-
Stage 2	-	-	-	-	924	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	958	-	559	682
Mov Cap-2 Maneuver	-	-	-	-	559	-
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	923	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	565	-	-	958	-
HCM Lane V/C Ratio	0.257	-	-	0.02	-
HCM Control Delay (s)	13.6	-	-	8.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1	-	-	0.1	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	540	514	152	13	8	108
Future Vol, veh/h	540	514	152	13	8	108
Conflicting Peds, #/hr	7	0	0	7	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	5	20	0	0	8
Mvmt Flow	540	514	152	13	8	108

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	172	0	-	0	1760	166
Stage 1	-	-	-	-	166	-
Stage 2	-	-	-	-	1594	-
Critical Hdwy	4.11	-	-	-	6.4	6.28
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.372
Pot Cap-1 Maneuver	1411	-	-	-	94	863
Stage 1	-	-	-	-	868	-
Stage 2	-	-	-	-	185	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1402	-	-	-	43	858
Mov Cap-2 Maneuver	-	-	-	-	43	-
Stage 1	-	-	-	-	398	-
Stage 2	-	-	-	-	184	-

Approach	EB	WB	SW
HCM Control Delay, s	4.7	0	19
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1402	-	-	-	372
HCM Lane V/C Ratio	0.385	-	-	-	0.312
HCM Control Delay (s)	9.2	0	-	-	19
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	1.8	-	-	-	1.3

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	1040	247	13	13	31
Future Vol, veh/h	15	1040	247	13	13	31
Conflicting Peds, #/hr	6	0	0	6	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	4	14	24	19
Mvmt Flow	15	1040	247	13	13	31

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	266	0	-	0	1330	260
Stage 1	-	-	-	-	260	-
Stage 2	-	-	-	-	1070	-
Critical Hdwy	4.1	-	-	-	6.64	6.39
Critical Hdwy Stg 1	-	-	-	-	5.64	-
Critical Hdwy Stg 2	-	-	-	-	5.64	-
Follow-up Hdwy	2.2	-	-	-	3.716	3.471
Pot Cap-1 Maneuver	1310	-	-	-	153	739
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	299	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1303	-	-	-	147	735
Mov Cap-2 Maneuver	-	-	-	-	147	-
Stage 1	-	-	-	-	711	-
Stage 2	-	-	-	-	298	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	17.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1303	-	-	-	337
HCM Lane V/C Ratio	0.012	-	-	-	0.131
HCM Control Delay (s)	7.8	0	-	-	17.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	516	2	18	760	864	105
Future Volume (Veh/h)	516	2	18	760	864	105
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	516	2	18	760	864	105
Pedestrians	8					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				697		
pX, platoon unblocked	0.90					
vC, conflicting volume	1668	872	872			
vC1, stage 1 conf vol	872					
vC2, stage 2 conf vol	796					
vCu, unblocked vol	1686	872	872			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	99	98			
cM capacity (veh/h)	362	350	776			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	518	18	760	864	105
Volume Left	516	18	0	0	0
Volume Right	2	0	0	0	105
cSH	362	776	1700	1700	1700
Volume to Capacity	1.43	0.02	0.45	0.51	0.06
Queue Length 95th (ft)	669	2	0	0	0
Control Delay (s)	237.5	9.7	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	237.5	0.2		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	54.4		
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	0	1	0	5	118	848	23	8	802	5
Future Vol, veh/h	0	1	0	1	0	5	118	848	23	8	802	5
Conflicting Peds, #/hr	3	0	0	0	0	3	0	0	16	16	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	11	5	4	0	2	2	2
Mvmt Flow	0	1	0	1	0	5	118	848	23	8	802	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1922	1944	805	1933	1935	879	807	0	0	887	0	0
Stage 1	821	821	-	1112	1112	-	-	-	-	-	-	-
Stage 2	1101	1123	-	821	823	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.31	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.399	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	51	66	386	50	67	334	805	-	-	763	-	-
Stage 1	371	391	-	256	287	-	-	-	-	-	-	-
Stage 2	259	283	-	371	391	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	44	55	386	43	56	328	805	-	-	752	-	-
Mov Cap-2 Maneuver	44	55	-	43	56	-	-	-	-	-	-	-
Stage 1	316	387	-	215	241	-	-	-	-	-	-	-
Stage 2	217	238	-	366	387	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	71.7	29	1.2	0.1
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	805	-	-	55	156	752	-	-
HCM Lane V/C Ratio	0.147	-	-	0.018	0.038	0.011	-	-
HCM Control Delay (s)	10.2	-	-	71.7	29	9.8	-	-
HCM Lane LOS	B	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	0.1	0.1	0	-	-

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	5	1	14	0	2	122	0	0	0	0	308	9
Future Vol, veh/h	5	1	14	0	2	122	0	0	0	0	308	9
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	0	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	17	0	0	5	0	0	0	0	4	17
Mvmt Flow	5	1	14	0	2	122	0	0	0	0	308	9

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	386	320	320	320	324	4				0	0	0
Stage 1	320	320	-	0	0	-				-	-	-
Stage 2	66	0	-	320	324	-				-	-	-
Critical Hdwy	7.1	6.5	6.37	7.1	6.5	6.25				4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	-	-	-				-	-	-
Critical Hdwy Stg 2	-	-	-	6.1	5.5	-				-	-	-
Follow-up Hdwy	3.5	4	3.453	3.5	4	3.345				2.2	-	-
Pot Cap-1 Maneuver	576	600	687	637	597	1071				-	-	-
Stage 1	696	656	-	-	-	-				-	-	-
Stage 2	-	-	-	696	653	-				-	-	-
Platoon blocked, %											-	-
Mov Cap-1 Maneuver	504	596	683	623	593	1067				-	-	-
Mov Cap-2 Maneuver	504	596	-	623	593	-				-	-	-
Stage 1	696	652	-	-	-	-				-	-	-
Stage 2	-	-	-	681	649	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	11	8.9	0
HCM LOS	B	A	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	623	1053	-	-	-
HCM Lane V/C Ratio	0.032	0.118	-	-	-
HCM Control Delay (s)	11	8.9	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	0.4	-	-	-

Intersection	
Intersection Delay, s/veh	31.9
Intersection LOS	D

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	595	296	340	855
Demand Flow Rate, veh/h	611	327	349	866
Vehicles Circulating, veh/h	710	112	728	408
Vehicles Exiting, veh/h	564	965	593	31
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	42.1	5.7	14.5	40.7
Approach LOS	E	A	B	E

Lane	Left	Left	Left	Left
Designated Moves	LTR	LT	LTR	LTR
Assumed Moves	LTR	LT	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	611	327	349	866
Cap Entry Lane, veh/h	669	1231	657	910
Entry HV Adj Factor	0.973	0.906	0.974	0.988
Flow Entry, veh/h	595	296	340	855
Cap Entry, veh/h	651	1115	640	899
V/C Ratio	0.913	0.266	0.531	0.951
Control Delay, s/veh	42.1	5.7	14.5	40.7
LOS	E	A	B	E
95th %tile Queue, veh	12	1	3	15

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	176	569	516
Demand Flow Rate, veh/h	179	580	526
Vehicles Circulating, veh/h	224	56	504
Vehicles Exiting, veh/h	806	347	132
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.8	7.3	15.1
Approach LOS	A	A	C

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	179	580	526
Cap Entry Lane, veh/h	1098	1303	825
Entry HV Adj Factor	0.981	0.981	0.981
Flow Entry, veh/h	176	569	516
Cap Entry, veh/h	1077	1279	810
V/C Ratio	0.163	0.445	0.637
Control Delay, s/veh	4.8	7.3	15.1
LOS	A	A	C
95th %tile Queue, veh	1	2	5

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	684	175	3	142	33	24
Future Vol, veh/h	684	175	3	142	33	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	684	175	3	142	33	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	859	0	920	772
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	782	-	301	400
Stage 1	-	-	-	-	456	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	782	-	300	400
Mov Cap-2 Maneuver	-	-	-	-	300	-
Stage 1	-	-	-	-	454	-
Stage 2	-	-	-	-	880	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	17.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	335	-	-	782	-
HCM Lane V/C Ratio	0.17	-	-	0.004	-
HCM Control Delay (s)	17.9	-	-	9.6	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

Intersection	
Int Delay, s/veh	35.5

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	80	506	52	122	353	20
Future Vol, veh/h	80	506	52	122	353	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	9	1	0	2	2	0
Mvmt Flow	80	506	52	122	353	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	174	0	-	0	779	113
Stage 1	-	-	-	-	113	-
Stage 2	-	-	-	-	666	-
Critical Hdwy	4.19	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.281	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	1361	-	-	-	364	945
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	511	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1361	-	-	-	~ 334	945
Mov Cap-2 Maneuver	-	-	-	-	~ 334	-
Stage 1	-	-	-	-	837	-
Stage 2	-	-	-	-	511	-

Approach	EB	WB	SE
HCM Control Delay, s	1.1	0	106.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1
Capacity (veh/h)	1361	-	-	-	346
HCM Lane V/C Ratio	0.059	-	-	-	1.078
HCM Control Delay (s)	7.8	0	-	-	106.1
HCM Lane LOS	A	A	-	-	F
HCM 95th %tile Q(veh)	0.2	-	-	-	13.6

Notes

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

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	358	165	38	15	0
Future Vol, veh/h	8	358	165	38	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	11	0	0	0
Mvmt Flow	8	358	165	38	15	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	203	0	-	0	558	184
Stage 1	-	-	-	-	184	-
Stage 2	-	-	-	-	374	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1381	-	-	-	494	864
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	700	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1381	-	-	-	491	864
Mov Cap-2 Maneuver	-	-	-	-	491	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	700	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1381	-	-	-	491
HCM Lane V/C Ratio	0.006	-	-	-	0.031
HCM Control Delay (s)	7.6	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	570	0	5	67	0	16
Future Vol, veh/h	570	0	5	67	0	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	570	0	5	67	0	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	570	0	647	570
Stage 1	-	-	-	-	570	-
Stage 2	-	-	-	-	77	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1002	-	436	521
Stage 1	-	-	-	-	566	-
Stage 2	-	-	-	-	946	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1002	-	434	521
Mov Cap-2 Maneuver	-	-	-	-	434	-
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	946	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	12.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	521	-	-	1002	-
HCM Lane V/C Ratio	0.031	-	-	0.005	-
HCM Control Delay (s)	12.1	-	-	8.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	971	136	702	905	6
Future Vol, veh/h	6	971	136	702	905	6
Conflicting Peds, #/hr	1	0	0	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	20	3	2	3	3	0
Mvmt Flow	6	971	136	702	905	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1530	-	906	0	-	0
Stage 1	906	-	-	-	-	-
Stage 2	624	-	-	-	-	-
Critical Hdwy	6.9	-	4.13	-	-	-
Critical Hdwy Stg 1	5.7	-	-	-	-	-
Critical Hdwy Stg 2	6.1	-	-	-	-	-
Follow-up Hdwy	3.69	-	2.219	-	-	-
Pot Cap-1 Maneuver	103	0	749	-	-	-
Stage 1	357	0	-	-	-	-
Stage 2	459	0	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	84	-	748	-	-	-
Mov Cap-2 Maneuver	178	-	-	-	-	-
Stage 1	292	-	-	-	-	-
Stage 2	459	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25.9	1.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	748	-	178	-	-	-
HCM Lane V/C Ratio	0.182	-	0.034	-	-	-
HCM Control Delay (s)	10.9	-	25.9	0	-	-
HCM Lane LOS	B	-	D	A	-	-
HCM 95th %tile Q(veh)	0.7	-	0.1	-	-	-

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	34	11	48	9	74	63	620	18	3	656	42
Future Volume (vph)	18	34	11	48	9	74	63	620	18	3	656	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1763	1561	1589	0	1745	1821	0	0	1767	0
Flt Permitted			0.960				0.358				0.998	
Satd. Flow (perm)	0	0	1485	1324	1423	0	619	1821	0	0	1763	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				64	301							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1123			607	
Travel Time (s)			9.5					25.5			13.8	
Confl. Peds. (#/hr)	37	30		47	30	30	75		49	49		30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	63	48	9	0	137	638	0	0	733	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4				5				6	
Permitted Phases	4	4		4	8	5	2	2		6		
Detector Phase	4	4	4	4	8	5	5	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	4.0	4.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	8.0	8.0	26.0		34.0	34.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	8.0	8.0	93.0		85.0	85.0	
Total Split (%)	22.5%	22.5%	22.5%	22.5%	22.5%	6.7%	6.7%	77.5%		70.8%	70.8%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.5	3.5	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	0.5	0.5	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		4.0	6.0			6.0	
Lead/Lag						Lead	Lead			Lag	Lag	
Lead-Lag Optimize?						Yes	Yes					
Recall Mode	None	None	None	None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)			10.6	10.6	10.6		102.0	101.2			88.7	
Actuated g/C Ratio			0.09	0.09	0.09		0.85	0.84			0.74	
v/c Ratio			0.48	0.27	0.02		0.23	0.42			0.56	
Control Delay			63.3	11.1	0.1		3.0	4.2			10.5	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			63.3	11.1	0.1		3.0	4.2			10.5	
LOS			E	B	A		A	A			B	
Approach Delay			40.7					4.0			10.5	
Approach LOS			D					A			B	
Queue Length 50th (ft)			47	0	0		15	112			241	
Queue Length 95th (ft)			92	25	0		33	198			413	
Internal Link Dist (ft)			337					1043			527	
Turn Bay Length (ft)							60					

Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	32
Future Volume (vph)	32
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	35
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)			259	284	497		593	1535			1303	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.24	0.17	0.02		0.23	0.42			0.56	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.56	
Intersection Signal Delay: 9.4	Intersection LOS: A
Intersection Capacity Utilization 104.3%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St

Lane Group	SBR2
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	22.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	151	410	14	68	485	38
Future Vol, veh/h	151	410	14	68	485	38
Conflicting Peds, #/hr	0	4	4	0	0	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	4	4	6	1	0
Mvmt Flow	151	410	14	68	485	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	565	0	456	363
Stage 1	-	-	-	-	360	-
Stage 2	-	-	-	-	96	-
Critical Hdwy	-	-	4.14	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.236	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	997	-	564	686
Stage 1	-	-	-	-	708	-
Stage 2	-	-	-	-	930	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	994	-	554	682
Mov Cap-2 Maneuver	-	-	-	-	554	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	930	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	49.9
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	562	-	-	994	-
HCM Lane V/C Ratio	0.931	-	-	0.014	-
HCM Control Delay (s)	49.9	-	-	8.7	0
HCM Lane LOS	E	-	-	A	A
HCM 95th %tile Q(veh)	11.8	-	-	0	-

Intersection	
Int Delay, s/veh	160.2

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	455	327	534	99	56	343
Future Vol, veh/h	455	327	534	99	56	343
Conflicting Peds, #/hr	15	0	0	15	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	3	3	1	2	2	1
Mvmt Flow	455	327	534	99	56	343

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	648	0	-	0	1836	599
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	1237	-
Critical Hdwy	4.13	-	-	-	6.42	6.21
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.227	-	-	-	3.518	3.309
Pot Cap-1 Maneuver	933	-	-	-	83	503
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	274	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	921	-	-	-	~ 32	496
Mov Cap-2 Maneuver	-	-	-	-	~ 32	-
Stage 1	-	-	-	-	215	-
Stage 2	-	-	-	-	270	-

Approach	EB	WB	SW
HCM Control Delay, s	7.4	0	$ 714
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	921	-	-	-	163
HCM Lane V/C Ratio	0.494	-	-	-	2.448
HCM Control Delay (s)	12.7	0	-	-	$ 714
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	2.8	-	-	-	33.9

Notes

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

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	52	763	807	70	19	39
Future Vol, veh/h	52	763	807	70	19	39
Conflicting Peds, #/hr	2	0	0	2	0	58
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	13	3	1	0	0	6
Mvmt Flow	52	763	807	70	19	39

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	879	0	-	0	1711	902
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	867	-
Critical Hdwy	4.23	-	-	-	6.4	6.26
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.317	-	-	-	3.5	3.354
Pot Cap-1 Maneuver	724	-	-	-	101	331
Stage 1	-	-	-	-	425	-
Stage 2	-	-	-	-	415	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	723	-	-	-	88	314
Mov Cap-2 Maneuver	-	-	-	-	88	-
Stage 1	-	-	-	-	371	-
Stage 2	-	-	-	-	414	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	36.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	723	-	-	-	171
HCM Lane V/C Ratio	0.072	-	-	-	0.339
HCM Control Delay (s)	10.4	0	-	-	36.5
HCM Lane LOS	B	A	-	-	E
HCM 95th %tile Q(veh)	0.2	-	-	-	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	402	3	22	718	736	236
Future Volume (Veh/h)	402	3	22	718	736	236
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	402	3	22	718	736	236
Pedestrians	19					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	2					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				607		
pX, platoon unblocked	0.90					
vC, conflicting volume	1517	755	755			
vC1, stage 1 conf vol	755					
vC2, stage 2 conf vol	762					
vCu, unblocked vol	1519	755	755			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	99	97			
cM capacity (veh/h)	394	405	850			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	405	22	718	736	236
Volume Left	402	22	0	0	0
Volume Right	3	0	0	0	236
cSH	394	850	1700	1700	1700
Volume to Capacity	1.03	0.03	0.42	0.43	0.14
Queue Length 95th (ft)	326	2	0	0	0
Control Delay (s)	85.7	9.3	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	85.7	0.3		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	16.5		
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	0	0	0	14	516	744	14	14	695	5
Future Vol, veh/h	1	0	0	0	0	14	516	744	14	14	695	5
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	7	7	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	11	5	4	0	2	2	2
Mvmt Flow	1	0	0	0	0	14	516	744	14	14	695	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2517	2523	698	2516	2518	759	700	0	0	765	0	0
Stage 1	726	726	-	1790	1790	-	-	-	-	-	-	-
Stage 2	1791	1797	-	726	728	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.31	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.399	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	19	28	444	19	28	392	883	-	-	848	-	-
Stage 1	419	433	-	105	135	-	-	-	-	-	-	-
Stage 2	104	134	-	419	432	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	10	11	444	10	11	389	883	-	-	843	-	-
Mov Cap-2 Maneuver	10	11	-	10	11	-	-	-	-	-	-	-
Stage 1	174	426	-	43	56	-	-	-	-	-	-	-
Stage 2	42	55	-	412	425	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 401.7	14.6	5.9	0.2
HCM LOS	F	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	883	-	-	10	389	843	-	-
HCM Lane V/C Ratio	0.584	-	-	0.1	0.036	0.017	-	-
HCM Control Delay (s)	14.6	-	-	$ 401.7	14.6	9.3	-	-
HCM Lane LOS	B	-	-	F	B	A	-	-
HCM 95th %tile Q(veh)	3.9	-	-	0.3	0.1	0.1	-	-

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

Intersection	
Int Delay, s/veh	8.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	1	0	3	2	520	0	0	0	0	275	5
Future Vol, veh/h	9	1	0	3	2	520	0	0	0	0	275	5
Conflicting Peds, #/hr	13	0	0	0	0	13	0	0	0	7	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	17	0	0	5	0	0	0	0	4	17
Mvmt Flow	9	1	0	3	2	520	0	0	0	0	275	5

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	568	301	294	285	303	20				7	0	0
Stage 1	294	294	-	7	7	-				-	-	-
Stage 2	274	7	-	278	296	-				-	-	-
Critical Hdwy	7.1	6.5	6.37	7.1	6.5	6.25				4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	-	-	-				-	-	-
Critical Hdwy Stg 2	-	-	-	6.1	5.5	-				-	-	-
Follow-up Hdwy	3.5	4	3.453	3.5	4	3.345				2.2	-	-
Pot Cap-1 Maneuver	437	615	711	671	613	1049				1627	-	-
Stage 1	719	673	-	-	-	-				-	-	-
Stage 2	-	-	-	733	672	-				-	-	-
Platoon blocked, %											-	-
Mov Cap-1 Maneuver	211	603	701	666	601	1031				1617	-	-
Mov Cap-2 Maneuver	211	603	-	666	601	-				-	-	-
Stage 1	719	664	-	-	-	-				-	-	-
Stage 2	-	-	-	732	663	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	21.7	12.1	0
HCM LOS	C	B	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	226	1025	1617	-	-
HCM Lane V/C Ratio	0.044	0.512	-	-	-
HCM Control Delay (s)	21.7	12.1	0	-	-
HCM Lane LOS	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	3	0	-	-

Intersection	
Intersection Delay, s/veh	29.8
Intersection LOS	D

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	242	823	650	510
Demand Flow Rate, veh/h	253	847	650	528
Vehicles Circulating, veh/h	734	151	317	992
Vehicles Exiting, veh/h	786	816	670	6
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	11.3	14.2	13.3	84.7
Approach LOS	B	B	B	F

Lane	Left	Left	Left	Left
Designated Moves	LTR	LT	LTR	LTR
Assumed Moves	LTR	LT	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	253	847	650	528
Cap Entry Lane, veh/h	653	1183	999	502
Entry HV Adj Factor	0.956	0.971	1.000	0.965
Flow Entry, veh/h	242	823	650	510
Cap Entry, veh/h	624	1149	999	484
V/C Ratio	0.388	0.716	0.651	1.052
Control Delay, s/veh	11.3	14.2	13.3	84.7
LOS	B	B	B	F
95th %tile Queue, veh	2	7	5	16

Intersection	
Intersection Delay, s/veh	14.8
Intersection LOS	B

Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	892	635	259
Demand Flow Rate, veh/h	910	648	264
Vehicles Circulating, veh/h	142	389	437
Vehicles Exiting, veh/h	559	663	600
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	16.0	16.1	7.4
Approach LOS	C	C	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	910	648	264
Cap Entry Lane, veh/h	1194	928	884
Entry HV Adj Factor	0.980	0.981	0.981
Flow Entry, veh/h	892	635	259
Cap Entry, veh/h	1170	910	867
V/C Ratio	0.762	0.698	0.299
Control Delay, s/veh	16.0	16.1	7.4
LOS	C	C	A
95th %tile Queue, veh	8	6	1

Intersection	
Int Delay, s/veh	7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	207	78	11	423	245	7
Future Vol, veh/h	207	78	11	423	245	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	207	78	11	423	245	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	285	0	691	246
Stage 1	-	-	-	-	246	-
Stage 2	-	-	-	-	445	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1277	-	410	793
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	646	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1277	-	405	793
Mov Cap-2 Maneuver	-	-	-	-	405	-
Stage 1	-	-	-	-	786	-
Stage 2	-	-	-	-	646	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	26.7
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	411	-	-	1277	-
HCM Lane V/C Ratio	0.613	-	-	0.009	-
HCM Control Delay (s)	26.7	-	-	7.8	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	4	-	-	0	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	61	144	338	330	141	80
Future Vol, veh/h	61	144	338	330	141	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	0	1	2	0
Mvmt Flow	61	144	338	330	141	80

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	668	0	-	0	769	503
Stage 1	-	-	-	-	503	-
Stage 2	-	-	-	-	266	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	931	-	-	-	369	573
Stage 1	-	-	-	-	607	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	931	-	-	-	343	573
Mov Cap-2 Maneuver	-	-	-	-	343	-
Stage 1	-	-	-	-	564	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	SE
HCM Control Delay, s	2.7	0	24.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1
Capacity (veh/h)	931	-	-	-	401
HCM Lane V/C Ratio	0.066	-	-	-	0.551
HCM Control Delay (s)	9.1	0	-	-	24.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	3.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	207	339	52	14	1
Future Vol, veh/h	5	207	339	52	14	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	5	207	339	52	14	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	391	0	-	0	582	365
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	217	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1179	-	-	-	479	685
Stage 1	-	-	-	-	707	-
Stage 2	-	-	-	-	824	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1179	-	-	-	477	685
Mov Cap-2 Maneuver	-	-	-	-	477	-
Stage 1	-	-	-	-	703	-
Stage 2	-	-	-	-	824	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1179	-	-	-	487
HCM Lane V/C Ratio	0.004	-	-	-	0.031
HCM Control Delay (s)	8.1	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	198	0	13	405	0	7
Future Vol, veh/h	198	0	13	405	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	198	0	13	405	0	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	198	0	629	198
Stage 1	-	-	-	-	198	-
Stage 2	-	-	-	-	431	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1375	-	446	843
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	655	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1375	-	441	843
Mov Cap-2 Maneuver	-	-	-	-	441	-
Stage 1	-	-	-	-	825	-
Stage 2	-	-	-	-	655	-

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

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	843	-	-	1375	-
HCM Lane V/C Ratio	0.008	-	-	0.009	-
HCM Control Delay (s)	9.3	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	12

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	447	872	839	503	99
Future Vol, veh/h	30	447	872	839	503	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	0	1	3	1
Mvmt Flow	30	447	872	839	503	99

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2667	503	503	0	-	0
Stage 1	503	-	-	-	-	-
Stage 2	2164	-	-	-	-	-
Critical Hdwy	6.6	6.23	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.319	2.2	-	-	-
Pot Cap-1 Maneuver	~ 22	568	1072	-	-	-
Stage 1	612	-	-	-	-	-
Stage 2	75	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 4	568	1072	-	-	-
Mov Cap-2 Maneuver	120	-	-	-	-	-
Stage 1	114	-	-	-	-	-
Stage 2	75	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	31.7	10.7	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1072	-	120	568	-	-
HCM Lane V/C Ratio	0.813	-	0.25	0.787	-	-
HCM Control Delay (s)	21.1	-	44.7	30.8	-	-
HCM Lane LOS	C	-	E	D	-	-
HCM 95th %tile Q(veh)	9.5	-	0.9	7.4	-	-

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

TRAFFIC IMPACT ANALYSIS REPORT UPDATE

FOR THE PROPOSED

HOKUA PLACE

KAPA`A, KAUAI, HAWAII
TAX MAP KEY: (4) 4-3-03: 01

APPENDIX E

CAPACITY ANALYSIS WORKSHEETS

PEAK HOUR TRAFFIC WITH PROJECT

WITH IMPROVEMENTS

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	37	12	60	1	11	5	751	14	3	824	43
Future Volume (vph)	9	37	12	60	1	11	5	751	14	3	824	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1613	1501	1589	0	1632	1761	0	0	1800	0
Flt Permitted			0.962				0.347				0.998	
Satd. Flow (perm)	0	0	1598	1451	1545	0	594	1761	0	0	1797	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				60	198							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1113			697	
Travel Time (s)			9.5					25.3			15.8	
Confl. Peds. (#/hr)	2	4		7	4	4	4		7	4		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	15%	0%	4%	0%	6%	9%	4%	0%	0%	1%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	58	60	1	0	16	765	0	0	875	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4								6	
Permitted Phases	4	4		4	8	2	2	2		6		
Detector Phase	4	4	4	4	8	2	2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	26.0	26.0	26.0		34.0	34.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	53.0	53.0	53.0		53.0	53.0	
Total Split (%)	33.8%	33.8%	33.8%	33.8%	33.8%	66.3%	66.3%	66.3%		66.3%	66.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	Max	Max	Max		Max	Max	
Act Effct Green (s)			8.4	8.4	8.4		55.6	55.6			55.6	
Actuated g/C Ratio			0.12	0.12	0.12		0.77	0.77			0.77	
v/c Ratio			0.31	0.27	0.00		0.03	0.56			0.63	
Control Delay			32.8	11.4	0.0		3.8	7.0			8.2	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			32.8	11.4	0.0		3.8	7.0			8.2	
LOS			C	B	A		A	A			A	
Approach Delay			21.9					7.0			8.2	
Approach LOS			C					A			A	
Queue Length 50th (ft)			25	0	0		2	132			166	
Queue Length 95th (ft)			53	30	0		7	257			330	
Internal Link Dist (ft)			337					1033			617	
Turn Bay Length (ft)							60					

Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	5
Future Volume (vph)	5
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	4
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)			468	467	592		458	1359			1387	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.12	0.13	0.00		0.03	0.56			0.63	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 72	
Natural Cycle: 70	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 8.6	Intersection LOS: A
Intersection Capacity Utilization 70.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St

Lane Group	SBR2
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	516	2	18	760	864	105
Future Volume (Veh/h)	516	2	18	760	864	105
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	516	2	18	760	864	105
Pedestrians	8					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				697		
pX, platoon unblocked	0.79					
vC, conflicting volume	1668	872	872			
vC1, stage 1 conf vol	872					
vC2, stage 2 conf vol	796					
vCu, unblocked vol	1713	872	872			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	99	98			
cM capacity (veh/h)	388	350	776			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	518	18	760	864	105
Volume Left	516	18	0	0	0
Volume Right	2	0	0	0	105
cSH	387	776	1700	1700	1700
Volume to Capacity	1.34	0.02	0.45	0.51	0.06
Queue Length 95th (ft)	608	2	0	0	0
Control Delay (s)	196.5	9.7	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	196.5	0.2		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	45.0		
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	12.9
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	595	296	340	855
Demand Flow Rate, veh/h	611	327	349	866
Vehicles Circulating, veh/h	710	112	728	408
Vehicles Exiting, veh/h	306	965	593	31
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	23.9	5.4	11.1	8.5
Approach LOS	C	A	B	A

Lane	Left	Left	Left	Left	Bypass
Designated Moves	LTR	LT	LTR	LT	R
Assumed Moves	LTR	LT	LTR	LT	R
RT Channelized					Free
Lane Util	1.000	1.000	1.000	1.000	
Follow-Up Headway, s	2.535	2.535	2.535	2.535	
Critical Headway, s	4.328	4.328	4.328	4.328	258
Entry Flow, veh/h	611	327	349	608	1919
Cap Entry Lane, veh/h	777	1291	765	1004	0.990
Entry HV Adj Factor	0.973	0.906	0.974	0.987	255
Flow Entry, veh/h	595	296	340	600	1900
Cap Entry, veh/h	756	1170	745	991	0.134
V/C Ratio	0.787	0.253	0.456	0.606	0.0
Control Delay, s/veh	23.9	5.4	11.1	12.1	A
LOS	C	A	B	B	0
95th %tile Queue, veh	8	1	2	4	

Intersection	
Int Delay, s/veh	19

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	339	16	52	113	9	52	28	506	14	1	0
Future Vol, veh/h	9	339	16	52	113	9	52	28	506	14	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	0	0	2	2	9	2	1	2	2	2
Mvmt Flow	9	339	16	52	113	9	52	28	506	14	1	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	122	0	0	339	0	0	587	591	347	593	579	118
Stage 1	-	-	-	-	-	-	365	365	-	222	222	-
Stage 2	-	-	-	-	-	-	222	226	-	371	357	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.19	6.52	6.21	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.581	4.018	3.309	3.518	4.018	3.318
Pot Cap-1 Maneuver	1465	-	-	1231	-	-	411	420	698	417	426	934
Stage 1	-	-	-	-	-	-	640	623	-	780	720	-
Stage 2	-	-	-	-	-	-	765	717	-	649	628	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1465	-	-	1231	-	-	394	398	698	104	403	934
Mov Cap-2 Maneuver	-	-	-	-	-	-	394	398	-	104	403	-
Stage 1	-	-	-	-	-	-	635	618	-	774	688	-
Stage 2	-	-	-	-	-	-	730	685	-	169	623	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	2.4	34.9	43.2
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	676	1465	-	-	1231	-	-	109
HCM Lane V/C Ratio	0.867	0.006	-	-	0.042	-	-	0.138
HCM Control Delay (s)	34.9	7.5	0	-	8.1	0	-	43.2
HCM Lane LOS	D	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	10.2	0	-	-	0.1	-	-	0.5

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	971	136	702	905	6
Future Vol, veh/h	6	971	136	702	905	6
Conflicting Peds, #/hr	1	0	0	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	20	3	2	3	3	0
Mvmt Flow	6	971	136	702	905	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1530	-	906	0	-	0
Stage 1	906	-	-	-	-	-
Stage 2	624	-	-	-	-	-
Critical Hdwy	6.9	-	4.13	-	-	-
Critical Hdwy Stg 1	5.7	-	-	-	-	-
Critical Hdwy Stg 2	6.1	-	-	-	-	-
Follow-up Hdwy	3.69	-	2.219	-	-	-
Pot Cap-1 Maneuver	103	0	749	-	-	-
Stage 1	357	0	-	-	-	-
Stage 2	459	0	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	84	-	748	-	-	-
Mov Cap-2 Maneuver	220	-	-	-	-	-
Stage 1	292	-	-	-	-	-
Stage 2	459	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.8	1.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	748	-	220	-	-	-
HCM Lane V/C Ratio	0.182	-	0.027	-	-	-
HCM Control Delay (s)	10.9	-	21.8	0	-	-
HCM Lane LOS	B	-	C	A	-	-
HCM 95th %tile Q(veh)	0.7	-	0.1	-	-	-

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	34	11	48	9	74	63	620	18	3	656	42
Future Volume (vph)	18	34	11	48	9	74	63	620	18	3	656	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0		0			60		0	0		0
Storage Lanes		0		1			1		0	0		0
Taper Length (ft)		100					100			100		
Satd. Flow (prot)	0	0	1763	1561	1589	0	1745	1824	0	0	1777	0
Flt Permitted			0.960				0.322				0.998	
Satd. Flow (perm)	0	0	1601	1410	1479	0	573	1824	0	0	1773	0
Right Turn on Red				Yes	Yes				No			
Satd. Flow (RTOR)				109	184							
Link Speed (mph)			30					30			30	
Link Distance (ft)			417					1123			607	
Travel Time (s)			9.5					25.5			13.8	
Confl. Peds. (#/hr)	37	30		47	30	30	75		49	49		30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	63	48	9	0	137	638	0	0	733	0
Turn Type	Perm	Perm	NA	Perm	Perm	custom	custom	NA		Perm	NA	
Protected Phases			4				5				6	
Permitted Phases	4	4		4	8	5	2	2		6		
Detector Phase	4	4	4	4	8	5	5	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	4.0	4.0	7.0		7.0	7.0	
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	8.0	8.0	26.0		34.0	34.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	8.0	8.0	43.0		35.0	35.0	
Total Split (%)	38.6%	38.6%	38.6%	38.6%	38.6%	11.4%	11.4%	61.4%		50.0%	50.0%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.5	3.5	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	0.5	0.5	2.0		2.0	2.0	
Lost Time Adjust (s)			0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)			6.0	6.0	6.0		4.0	6.0			6.0	
Lead/Lag						Lead	Lead			Lag	Lag	
Lead-Lag Optimize?						Yes	Yes					
Recall Mode	None	None	None	None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)			8.5	8.5	8.5		54.1	53.3			44.1	
Actuated g/C Ratio			0.12	0.12	0.12		0.77	0.76			0.63	
v/c Ratio			0.32	0.18	0.03		0.24	0.46			0.66	
Control Delay			32.0	1.8	0.1		4.0	5.9			16.7	
Queue Delay			0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay			32.0	1.8	0.1		4.0	5.9			16.7	
LOS			C	A	A		A	A			B	
Approach Delay			18.9					5.5			16.7	
Approach LOS			B					A			B	
Queue Length 50th (ft)			26	0	0		13	96			218	
Queue Length 95th (ft)			57	3	0		31	187			#475	
Internal Link Dist (ft)			337					1043			527	
Turn Bay Length (ft)							60					

Lane Group	SBR2
Lane Configurations	
Traffic Volume (vph)	32
Future Volume (vph)	32
Ideal Flow (vphpl)	1900
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	No
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	35
Peak Hour Factor	1.00
Heavy Vehicles (%)	0%
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL2	EBL	EBT	EBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)			480	499	572		561	1387			1116	
Starvation Cap Reductn			0	0	0		0	0			0	
Spillback Cap Reductn			0	0	0		0	0			0	
Storage Cap Reductn			0	0	0		0	0			0	
Reduced v/c Ratio			0.13	0.10	0.02		0.24	0.46			0.66	

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 11.4	Intersection LOS: B
Intersection Capacity Utilization 104.3%	ICU Level of Service G
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Kuhio Hwy & Kukui St & Huluili St

Lane Group	SBR2
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	402	3	22	718	736	236
Future Volume (Veh/h)	402	3	22	718	736	236
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	402	3	22	718	736	236
Pedestrians	19					
Lane Width (ft)	11.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	2					
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				607		
pX, platoon unblocked	0.85					
vC, conflicting volume	1517	755	755			
vC1, stage 1 conf vol	755					
vC2, stage 2 conf vol	762					
vCu, unblocked vol	1520	755	755			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	5	99	97			
cM capacity (veh/h)	422	405	850			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	405	22	718	736	236
Volume Left	402	22	0	0	0
Volume Right	3	0	0	0	236
cSH	422	850	1700	1700	1700
Volume to Capacity	0.96	0.03	0.42	0.43	0.14
Queue Length 95th (ft)	283	2	0	0	0
Control Delay (s)	65.9	9.3	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	65.9	0.3		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	12.7		
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	13.7
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	242	823	650	510
Demand Flow Rate, veh/h	253	847	650	528
Vehicles Circulating, veh/h	734	151	317	992
Vehicles Exiting, veh/h	699	816	670	6
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.1	12.5	11.2	20.9
Approach LOS	A	B	B	C

Lane	Left	Left	Left	Left	Bypass
Designated Moves	LTR	LT	LTR	LT	R
Assumed Moves	LTR	LT	LTR	LT	R
RT Channelized					Free
Lane Util	1.000	1.000	1.000	1.000	
Follow-Up Headway, s	2.535	2.535	2.535	2.535	
Critical Headway, s	4.328	4.328	4.328	4.328	87
Entry Flow, veh/h	253	847	650	441	1976
Cap Entry Lane, veh/h	761	1249	1085	611	0.962
Entry HV Adj Factor	0.956	0.971	1.000	0.965	84
Flow Entry, veh/h	242	823	650	426	1900
Cap Entry, veh/h	727	1213	1085	590	0.044
V/C Ratio	0.333	0.678	0.599	0.722	0.0
Control Delay, s/veh	9.1	12.5	11.2	25.1	A
LOS	A	B	B	D	0
95th %tile Queue, veh	1	6	4	7	

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	137	71	338	301	28	38	24	144	5	9	1
Future Vol, veh/h	5	137	71	338	301	28	38	24	144	5	9	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	0	0	1	2	0	2	2	2	2	2
Mvmt Flow	5	137	71	338	301	28	38	24	144	5	9	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	329	0	0	137	0	0	1179	1188	173	1150	1138	315
Stage 1	-	-	-	-	-	-	183	183	-	991	991	-
Stage 2	-	-	-	-	-	-	996	1005	-	159	147	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1231	-	-	1459	-	-	169	188	871	175	201	725
Stage 1	-	-	-	-	-	-	823	748	-	296	324	-
Stage 2	-	-	-	-	-	-	297	319	-	843	775	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1231	-	-	1459	-	-	125	134	871	99	143	725
Mov Cap-2 Maneuver	-	-	-	-	-	-	125	134	-	99	143	-
Stage 1	-	-	-	-	-	-	819	744	-	295	232	-
Stage 2	-	-	-	-	-	-	204	228	-	678	771	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	4.2	21.3	36
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	426	1231	-	-	1459	-	-	131
HCM Lane V/C Ratio	0.484	0.004	-	-	0.232	-	-	0.115
HCM Control Delay (s)	21.3	7.9	0	-	8.2	0	-	36
HCM Lane LOS	C	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	2.7	0	-	-	0.9	-	-	0.4

Intersection	
Int Delay, s/veh	8.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	447	872	839	503	99
Future Vol, veh/h	30	447	872	839	503	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Yield
Storage Length	140	0	170	-	-	150
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	2	0	1	3	1
Mvmt Flow	30	447	872	839	503	99

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2667	-	503	0	-	0
Stage 1	503	-	-	-	-	-
Stage 2	2164	-	-	-	-	-
Critical Hdwy	6.6	-	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	-	2.2	-	-	-
Pot Cap-1 Maneuver	~ 22	0	1072	-	-	-
Stage 1	612	0	-	-	-	-
Stage 2	75	0	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 4	-	1072	-	-	-
Mov Cap-2 Maneuver	120	-	-	-	-	-
Stage 1	114	-	-	-	-	-
Stage 2	75	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	44.9	11.4	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1072	-	120	-	-	-
HCM Lane V/C Ratio	0.813	-	0.25	-	-	-
HCM Control Delay (s)	22.4	-	44.9	0	-	-
HCM Lane LOS	C	-	E	A	-	-
HCM 95th %tile Q(veh)	11.7	-	1	-	-	-

Notes

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

THE TRAFFIC MANAGEMENT CONSULTANT

Randall S. Okaneku, P.E., Principal * 1188 Bishop Street, Suite 1907 * Honolulu, Hawaii 96813
Telephone: (808) 536-0223 * Facsimile: (808) 537-2985 * Email: TMCHawaii@aol.com

TMC Job No. 201708
October 3, 2017

State of Hawaii
Department of Transportation
Highways Division-Kauai District
1720 Haleukana Street
Lihu`e, Kauai, Hawai`i 96766

Attn.: Mr. Larry Dill, P.E., District Engineer

Dear Mr. Dill:

Subject: Traffic Impact Analysis Report Update
For the Proposed Hokua Place
Tax Map Key: (4) 4-3-003: Portion of 001
Kapa`a, Kauai, Hawaii

Thank you for the review comments in your letter, dated September 29, 2017, on the subject traffic study. Our responses follow:

Comment No. 1

Noted.

Comment No. 2

Noted.

Comment No. 3

The AM and PM Peak Hour Traffic Without Project rows of Table 6 summarize the capacity analysis under existing roadway conditions. The AM and PM Peak Hour Traffic With Project rows of Table 6 summarize the capacity analysis with the recommended site access improvements under Section V.B. of the TIAR Update. The AM and PM Peak Hour Traffic With Project – Improved rows in Table 6 summarize the capacity analysis of the recommended traffic improvements under Section V.A. of the TIAR Update.

Comment No. 4

Noted.

Comment No. 5

Noted.

If you require clarification on any of the above material or have any other questions, please do not hesitate to call me.

Very truly yours,

The Traffic Management Consultant

By

Randall S. Okaneku, P. E.
Principal

DAVID Y. IGE
GOVERNOR

FORD N. FUCHIGAMI
DIRECTOR

Deputy Directors
JADE T. BUTAY
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
KAUAI DISTRICT
1720 HALEUKANA STREET
LIHUE, HAWAII 96766

IN REPLY REFER TO:

HWAY-K 4.170445

September 29, 2017

Randall S. Okaneku, P.E.
The Traffic Management Consultant
1188 Bishop Street, Suite 1907
Honolulu, Hawaii 96813

Dear Mr. Okaneku:

Subject: Traffic Impact Analysis Report Update
Hokua Place
Kapa'a, Kawaihau District, Island of Kaua'i
TMK: (4) 4-3-03: Por. 001

Thank you for submitting the updated Traffic Impact Analysis Report(TIAR) update that was transmitted via email on June 15, 2017. We have circulated the TIAR for comment through the Highways Division Planning Branch as well as the Traffic Branch. We have also reviewed the comments provided by the County of Kauai Department of Public Works Engineering Division on September 1, 2017.

The combined comments for the Hawaii Department of Transportation Highways Division are as follows:

1. The report discussed the projects that are proposed in the Kapaa Transportation Solutions Report dated August 2015. It should be noted that these projects may not be completed on schedule. Therefore, they should not be considered in this report.
2. It is understood that the proposed Road A will be funded and constructed by the developer.
3. Please clarify the scenarios in Table 7, Summary of Capacity Analysis. What assumed improvements are completed for AM/PM peak hour traffic without project, with project, and with project-improved.
4. Section V of the TIAR recommends traffic improvements without the project. Although these recommendations are appreciated, they are not a consideration for this development.
5. We concur with the comments provided by the County of Kauai Department of Engineering Division.

Please contact Raymond McCormick at 808-241-3015 by telephone or by email at Raymond.j.mccormick@hawaii.gov if you have comments or questions regarding this letter.

Sincerely,

Larry Dill, P.E.
District Engineer
For

THE TRAFFIC MANAGEMENT CONSULTANT

Randall S. Okaneku, P.E., Principal * 1188 Bishop Street, Suite 1907 * Honolulu, Hawaii 96813
Telephone: (808) 536-0223 * Facsimile: (808) 537-2985 * Email: TMCHawaii@aol.com

TMC Job No. 201708
October 3, 2017

Department of Public Works
County of Kauai
4444 Rice Street, Suite 275
Lihu`e, Kauai, Hawai`i 96766

Attn.: Mr. Michael Moule, P.E., Chief, Engineering Division

Dear Mr. Moule:

Subject: Traffic Impact Analysis Report Update
For the Proposed Hokua Place
Tax Map Key: (4) 4-3-003: Portion of 001
Kapa`a, Kauai, Hawaii

Thank you for the thorough review comments in your letter, dated September 1, 2017, on the subject traffic study. Our responses follow:

Comment No. 1 – Introduction, Project Description

a. Concur. The design of the intersection between the Phase 1 access road and Olohena Road, mauka of its intersection with Ka`apuni Road, will include the appropriate vertical and horizontal sight distances in accordance with the AASHTO A Policy on Geometric Design of Highways and Streets and the Hawaii Statewide Uniform Design Manual for Streets and Highways.

Comment No. 2 – Existing Roadways

a. Concur. The stated speed limits are intended to provide guidance to the design of the intersection of Road A and the Kapa`a Bypass Road.

b. Concur.

c. Concur.

Comment No. 3 – Existing Peak Hour Traffic Volumes and Operation Conditions

a. Noted. The traffic impact analysis is based upon the methodology presented in the Highway Capacity Manual (HCM). The HCM methodology consists of a series of mathematical calculations to determine roadway capacity, vehicle delay, vehicle queuing, etc. The LOS concept was defined in the HCM to translate the results of the complex calculations into a simplified "A" through "F" grading system.

b. Corrected. The second sentence in the last paragraph on Page 10 should read "South of Ulu Street, Kuhio Highway carried over 1,700 vph…".

c. Corrected. The revised Figure 6 is attached. The PM peak hour of traffic from 3:45 PM to 4:45 PM on March 15, 2015 was selected for the intersection of Kuhio Highway and the Kapa`a Bypass Road because it corresponded with of the commuter PM peak hour traffic at the intersections in Kapa`a Town. The revised traffic data sheets for the intersection of Kuhio Highway and Kapa`a Bypass Road also are attached.

d. LOS, by definition, is the result of a series of mathematical calculations. For the purpose of the traffic impact analysis, the HCM methodology provides a common basis for comparing future traffic conditions without the proposed project and future traffic conditions with the proposed project.

Comment No. 4 – Kapa`a Transportation Solutions

a. Noted. The Kapa`a Transportation Solutions, cited in the TIAR Update, is dated August 2015. Please transmit the latest version of the Kapa`a traffic study.

b. Noted.

Comment No. 5 – Trip Generation Characteristics

a. Noted. The revised Table 6 is shown below:

Table 1. Hokua Place Trip Generation Characteristics

Land Use (ITE Code)	Units	AM Peak Hour (vph)			PM Peak Hour (vph)		
		Enter	Exit	Total	Enter	Exit	Total
Single-Family Phase 1 (265)	16 DU	5	16	21	13	7	20
Single-Family Phase 2 (265)	100 DU	20	60	80	66	38	104
Condominium/ Townhouse (230)	700 DU	52	256	308	244	120	364
Retail Center (820)	8,000 SFGFA	21	13	34	53	57	110
	Pass-By	0	0	0	(-)45	(-)45	(-)90
Total External Trips		**98**	**345**	**443**	**331**	**177**	**509**

b. The ITE Trip Generation Handbook cites a 9,000-square foot retail center, where 20 percent of the trip generation were primary trips. Comparing the retail center to smaller convenience markets, the Trip Generation Handbook listed sites where the primary trip percentages ranged from 8 percent to 28 percent of the PM peak period trip generation. The retail center is described in the DEIS as a neighborhood-oriented commercial center. Therefore, it is reasonable to assume that a significant portion of the retail trips will be generated from within the proposed project, which can be defined as "internal capture" or "diverted trips".

Comment No. 6 – Site Access Improvements

a. Noted. The AM and PM peak hour traffic demands at the Olohena Road intersections at the Phase 1 Driveway and at Road A do not meet the AASHTO left-turn lane guidelines. During the AM peak hour of traffic, the advancing (mauka bound) volumes on Olohena Road do not meet the AASHTO minimum requirements. The left-turn demands at Road A and at the Phase 1 Driveway do not meet the AASHTO minimum left-turn volumes, during the PM peak hour of traffic. The Olohena Road intersections at Road A and the Phase 1 Driveway are expected to operate at satisfactory LOS during the AM peak hour of traffic. The Phase 1 Driveway also is expected to operate at satisfactory LOS at Olohena Road, during the PM peak hour of traffic. Road A is expected to operate at LOS "D", during the PM peak hour of traffic. However, the average delay of 26.7 seconds/vehicle on Road A is in the upper range of LOS "D". Therefore, a median refuge lane at Road A was not recommended at this time. Furthermore, separate left-turn and right-turn lanes on Road A would not improve the LOS.

Comment No. 7 – Traffic Assignment

a. The traffic assignment for the proposed project was primarily based upon the direction of peak hour traffic at the roundabout intersection of the Kapa`a Bypass Road and Olohena Road, where only about one third of Olohena Road traffic turns to/from the south leg of the Kapa`a Bypass Road. The Phase 2 development is concentrated on the makai half of the project site. Only the trips generated from the mauka-most portion of the site and the estimated AM peak hour school trips are expected to use the mauka access of Road A at Olohena Road.

b. The peak hour trip destinations, mauka of the Ka`apuni Road/Olohena Road intersection, are virtually nil, as observed in mauka bound/makai bound directional splits on Olohena Road. The retail trips generated from the mauka neighboring communities are represented in the "pass-by" trips using Road A.

Comment No. 8 – Figures 11 through 14 (Traffic Assignment)

a. The diverted peak hour trips on Road A are depicted on the attached Figures 12.1 and 14.1.

b. The revised Figure 11 is attached.

c. The revised Figure 13 is attached.

d. The revised Figure 14 is attached.

Comment No. 9 – PM Peak Hour Traffic Analysis With Project

a. The recommendation of extending the median refuge lane/two-way left-turn lane in Section V.A.7. of the TIAR Update is expected to mitigate the "bottle-neck" on Kuhio Highway, north of Lehua Street. Ultimately, the improvement of the north leg of the Kapa`a Bypass Road from a one-way roadway to a two-way bypass road is expected to improve traffic operations in Kapa`a Town.

Comment No. 10 – Recommendation of Traffic Improvements Without Project

a. Noted.

Comment No. 11 – Recommendation of Traffic Improvements With Project

a. Noted. While the MUTCD does not provide warrants for roundabout intersections, it does advise that a roundabout intersection can be considered as an alternative to traffic signal control. Based upon the TIAR Update, the intersection of Olohena Road and Road A is not expected to warrant all-way stop controls or traffic signals. Therefore, a roundabout intersection was not considered. However, a reassessment of the traffic operations at the Road A intersection at Olohena Road may be considered after the project is fully built out and occupied. A roundabout intersection was considered at the intersection of Olohena Road, Ka`apuni Road, and Kaehulua Road. However, based upon a preliminary assessment of the horizontal and vertical alignments of the intersecting roadways, it was determined that a roundabout intersection would not be feasible. The realignment of Kaehulua Road to form a four-legged intersection with the Olohena Road and Ka`apuni Road was recommended in Section V.A.6.

If you require clarification on any of the above material or have any other questions, please do not hesitate to call me.

Very truly yours,

The Traffic Management Consultant

By

Randall S. Okaneku, P. E.
Principal

Attachments:
- Figure 6-Revised
- Kuhio Hwy Kapa`a Bypass Rd Traffic Count Data-Revised
- Figure 12.1
- Figure 14.1
- Figure 11-Revised
- Figure 13-Revised
- Figure 14-Revised

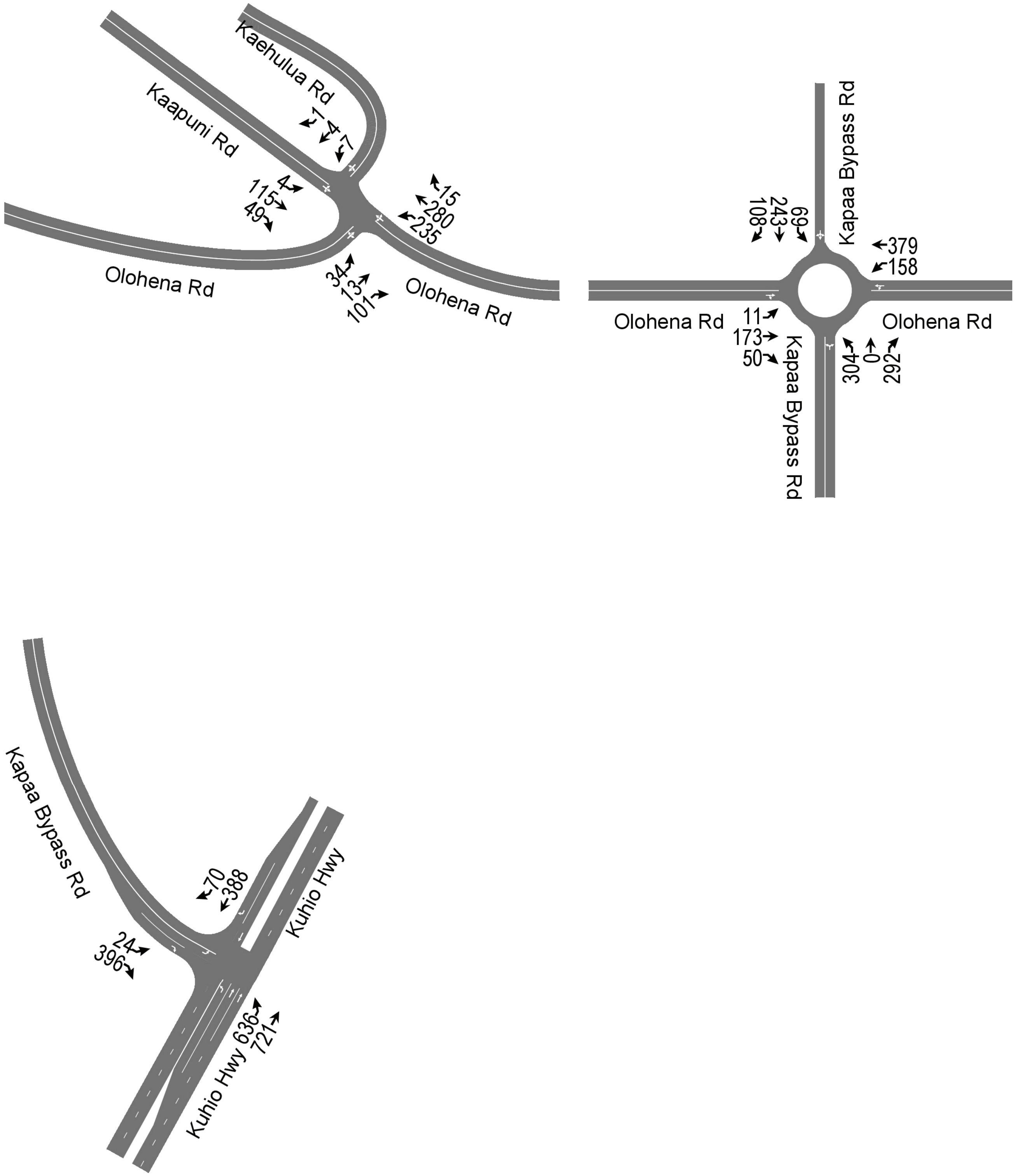


Figure 6. Existing PM Peak Hour Traffic (Cont'd.)

The Traffic Management Consultant
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Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Turning Movement Data

Start Time	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:00 PM	1	105	0	106	99	191	0	290	0	106	5	0	111	507
3:15 PM	3	100	0	103	122	210	0	332	0	88	7	0	95	530
3:30 PM	8	93	0	101	120	207	0	327	0	73	8	0	81	509
3:45 PM	8	104	0	112	148	201	0	349	0	88	21	0	109	570
Hourly Total	20	402	0	422	489	809	0	1298	0	355	41	0	396	2116
4:00 PM	1	108	0	109	168	161	0	329	0	91	16	0	107	545
4:15 PM	9	94	0	103	154	172	0	326	0	97	14	0	111	540
4:30 PM	6	90	0	96	166	187	0	353	0	112	19	0	131	580
4:45 PM	2	95	0	97	146	176	0	322	0	112	15	0	127	546
Hourly Total	18	387	0	405	634	696	0	1330	0	412	64	0	476	2211
5:00 PM	5	88	0	93	149	232	0	381	0	138	27	0	165	639
5:15 PM	2	91	0	93	149	192	0	341	0	152	25	0	177	611
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	7	179	0	186	298	424	0	722	0	290	52	0	342	1250
6:30 AM	0	78	0	78	14	124	0	138	0	203	0	0	203	419
6:45 AM	2	116	0	118	8	124	0	132	0	190	1	0	191	441
Hourly Total	2	194	0	196	22	248	0	270	0	393	1	0	394	860
7:00 AM	1	161	0	162	20	129	0	149	0	233	0	0	233	544
7:15 AM	1	184	0	185	25	155	0	180	0	200	1	0	201	566
7:30 AM	2	152	0	154	24	152	0	176	0	167	0	0	167	497
7:45 AM	1	155	1	156	33	180	0	213	0	135	0	0	135	504
Hourly Total	5	652	1	657	102	616	0	718	0	735	1	0	736	2111
8:00 AM	0	150	0	150	24	187	0	211	0	132	1	0	133	494
8:15 AM	3	131	0	134	21	177	0	198	0	165	0	0	165	497
8:30 AM	3	130	0	133	33	191	0	224	0	161	1	0	162	519
8:45 AM	1	108	0	109	25	209	0	234	0	189	0	0	189	532
Hourly Total	7	519	0	526	103	764	0	867	0	647	2	0	649	2042
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	5	103	0	108	97	217	0	314	0	96	6	0	102	524
3:15 PM	8	117	0	125	131	156	0	287	0	84	9	0	93	505
3:30 PM	6	83	0	89	138	227	0	365	1	76	8	0	85	539
3:45 PM	2	87	1	89	119	182	0	301	0	76	7	0	83	473
Hourly Total	21	390	1	411	485	782	0	1267	1	332	30	0	363	2041
4:00 PM	2	122	0	124	126	152	0	278	0	96	7	0	103	505
4:15 PM	6	109	1	115	136	158	0	294	0	95	6	0	101	510
4:30 PM	6	96	1	102	143	174	0	317	0	78	2	0	80	499
4:45 PM	5	93	0	98	138	181	0	319	0	83	6	0	89	506
Hourly Total	19	420	2	439	543	665	0	1208	0	352	21	0	373	2020
5:00 PM	2	98	0	100	146	204	0	350	0	85	3	0	88	538
5:15 PM	4	113	0	117	121	159	0	280	0	92	2	0	94	491
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	6	211	0	217	267	363	0	630	0	177	5	0	182	1029
6:30 AM	0	82	0	82	11	115	0	126	0	185	0	0	185	393
6:45 AM	0	89	0	89	10	126	0	136	0	164	3	0	167	392
Hourly Total	0	171	0	171	21	241	0	262	0	349	3	0	352	785
7:00 AM	1	131	0	132	17	133	0	150	0	219	1	0	220	502
7:15 AM	3	168	0	171	32	158	0	190	0	182	3	0	185	546
7:30 AM	1	125	0	126	40	146	0	186	0	166	2	0	168	480
7:45 AM	1	123	0	124	30	165	0	195	0	138	0	0	138	457
Hourly Total	6	547	0	553	119	602	0	721	0	705	6	0	711	1985
8:00 AM	4	116	0	120	20	169	0	189	0	150	0	0	150	459
8:15 AM	1	125	0	126	28	158	0	186	0	133	2	0	135	447
Grand Total	116	4313	4	4429	3131	6537	0	9668	1	5030	228	0	5259	19356
Approach %	2.6	97.4	-	-	32.4	67.6	-	-	0.0	95.6	4.3	-	-	-
Total %	0.6	22.3	-	22.9	16.2	33.8	-	49.9	0.0	26.0	1.2	-	27.2	-
Lights	114	4214	-	4328	3083	6353	-	9436	1	4901	225	-	5127	18891
% Lights	98.3	97.7	-	97.7	98.5	97.2	-	97.6	100.0	97.4	98.7	-	97.5	97.6
Mediums	2	91	-	93	47	171	-	218	0	115	3	-	118	429
% Mediums	1.7	2.1	-	2.1	1.5	2.6	-	2.3	0.0	2.3	1.3	-	2.2	2.2
Articulated Trucks	0	8	-	8	1	13	-	14	0	14	0	-	14	36
% Articulated Trucks	0.0	0.2	-	0.2	0.0	0.2	-	0.1	0.0	0.3	0.0	-	0.3	0.2
All Pedestrians	-	-	4	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

The Traffic Management Consultant
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Count Name: Kuhio Hwy Kapaa Bypass 3-15-17 to 3-17-17
Site Code: Hokua Place
Start Date: 03/15/2017

Kuhio Hwy [Makai]

Exit	Enter	Total
6467	5127	11594
173	118	291
13	14	27
0	0	0
6653	**5259**	**11912**

RT	Th	LT	Ped
225	4901	1	0
3	115	0	0
0	14	0	0
0	0	0	0
228	**5030**	**1**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
3308	4328	7636
50	93	143
1	8	9
0	0	0
3359	**4429**	**7788**

LT	RT	Ped
114	4214	0
2	91	0
0	8	0
0	0	4
116	**4313**	**4**

03/15/2017 3:00 PM
Ending At
03/17/2017 8:30 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Fake Approach [Ewa]

Exit	Enter	Total
1	0	1
0	0	0
0	0	0
0	0	0
1	**0**	**1**

LT	Th	Ped
3083	6353	0
47	171	0
1	13	0
0	0	0
3131	**6537**	**0**

Exit	Enter	Total
9115	9436	18551
206	218	424
22	14	36
0	0	0
9343	**9668**	**19011**

Kuhio Hwy [Mauka]

Turning Movement Data Plot

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Turning Movement Peak Hour Data (3:45 PM)

	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
Start Time	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:45 PM	8	104	0	112	148	201	0	349	0	88	21	0	109	570
4:00 PM	1	108	0	109	168	161	0	329	0	91	16	0	107	545
4:15 PM	9	94	0	103	154	172	0	326	0	97	14	0	111	540
4:30 PM	6	90	0	96	166	187	0	353	0	112	19	0	131	580
Total	24	396	0	420	636	721	0	1357	0	388	70	0	458	2235
Approach %	5.7	94.3	-	-	46.9	53.1	-	-	0.0	84.7	15.3	-	-	-
Total %	1.1	17.7	-	18.8	28.5	32.3	-	60.7	0.0	17.4	3.1	-	20.5	-
PHF	0.667	0.917	-	0.938	0.946	0.897	-	0.961	0.000	0.866	0.833	-	0.874	0.963
Lights	24	390	-	414	633	712	-	1345	0	377	69	-	446	2205
% Lights	100.0	98.5	-	98.6	99.5	98.8	-	99.1	-	97.2	98.6	-	97.4	98.7
Mediums	0	6	-	6	3	9	-	12	0	11	1	-	12	30
% Mediums	0.0	1.5	-	1.4	0.5	1.2	-	0.9	-	2.8	1.4	-	2.6	1.3
Articulated Trucks	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
All Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Peak Hour Data

03/15/2017 3:45 PM
Ending At
03/15/2017 4:45 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [Makai]

Exit	Enter	Total
736	446	1182
9	12	21
0	0	0
0	0	0
745	**458**	**1203**

RT	Th	LT	Ped
69	377	0	0
1	11	0	0
0	0	0	0
0	0	0	0
70	**388**	**0**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
702	414	1116
4	6	10
0	0	0
0	0	0
706	**420**	**1126**

LT	RT	Ped
24	390	0
0	6	0
0	0	0
0	0	0
24	**396**	**0**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
633	712	0
3	9	0
0	0	0
0	0	0
636	**721**	**0**

Exit	Enter	Total
767	1345	2112
17	12	29
0	0	0
0	0	0
784	**1357**	**2141**

Kuhio Hwy [Mauka]

Turning Movement Peak Hour Data Plot (3:45 PM)

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

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Turning Movement Peak Hour Data (7:00 AM)

Start Time	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:00 AM	1	161	0	162	20	129	0	149	0	233	0	0	233	544
7:15 AM	1	184	0	185	25	155	0	180	0	200	1	0	201	566
7:30 AM	2	152	0	154	24	152	0	176	0	167	0	0	167	497
7:45 AM	1	155	1	156	33	180	0	213	0	135	0	0	135	504
Total	5	652	1	657	102	616	0	718	0	735	1	0	736	2111
Approach %	0.8	99.2	-	-	14.2	85.8	-	-	0.0	99.9	0.1	-	-	-
Total %	0.2	30.9	-	31.1	4.8	29.2	-	34.0	0.0	34.8	0.0	-	34.9	-
PHF	0.625	0.886	-	0.888	0.773	0.856	-	0.843	0.000	0.789	0.250	-	0.790	0.932
Lights	4	635	-	639	100	600	-	700	0	711	1	-	712	2051
% Lights	80.0	97.4	-	97.3	98.0	97.4	-	97.5	-	96.7	100.0	-	96.7	97.2
Mediums	1	14	-	15	2	16	-	18	0	23	0	-	23	56
% Mediums	20.0	2.1	-	2.3	2.0	2.6	-	2.5	-	3.1	0.0	-	3.1	2.7
Articulated Trucks	0	3	-	3	0	0	-	0	0	1	0	-	1	4
% Articulated Trucks	0.0	0.5	-	0.5	0.0	0.0	-	0.0	-	0.1	0.0	-	0.1	0.2
All Pedestrians	-	-	1	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Peak Hour Data

03/16/2017 7:00 AM
Ending At
03/16/2017 8:00 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [Makai]

Exit	Enter	Total
604	712	1316
17	23	40
0	1	1
0	0	0
621	**736**	**1357**

RT	Th	LT	Ped
1	711	0	0
0	23	0	0
0	1	0	0
0	0	0	0
1	**735**	**0**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
101	639	740
2	15	17
0	3	3
0	0	0
103	**657**	**760**

Ped	RT	LT
0	635	4
0	14	1
0	3	0
1	0	0
1	**652**	**5**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
100	600	0
2	16	0
0	0	0
0	0	0
102	**616**	**0**

Exit	Enter	Total
1346	700	2046
37	18	55
4	0	4
0	0	0
1387	**718**	**2105**

Kuhio Hwy [Mauka]

Turning Movement Peak Hour Data Plot (7:00 AM)

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Turning Movement Peak Hour Data (4:15 PM)

Start Time	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
4:15 PM	6	109	1	115	136	158	0	294	0	95	6	0	101	510
4:30 PM	6	96	1	102	143	174	0	317	0	78	2	0	80	499
4:45 PM	5	93	0	98	138	181	0	319	0	83	6	0	89	506
5:00 PM	2	98	0	100	146	204	0	350	0	85	3	0	88	538
Total	19	396	2	415	563	717	0	1280	0	341	17	0	358	2053
Approach %	4.6	95.4	-	-	44.0	56.0	-	-	0.0	95.3	4.7	-	-	-
Total %	0.9	19.3	-	20.2	27.4	34.9	-	62.3	0.0	16.6	0.8	-	17.4	-
PHF	0.792	0.908	-	0.902	0.964	0.879	-	0.914	0.000	0.897	0.708	-	0.886	0.954
Lights	19	385	-	404	558	710	-	1268	0	337	17	-	354	2026
% Lights	100.0	97.2	-	97.3	99.1	99.0	-	99.1	-	98.8	100.0	-	98.9	98.7
Mediums	0	11	-	11	5	7	-	12	0	4	0	-	4	27
% Mediums	0.0	2.8	-	2.7	0.9	1.0	-	0.9	-	1.2	0.0	-	1.1	1.3
Articulated Trucks	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
All Pedestrians	-	-	2	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

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Peak Hour Data

03/16/2017 4:15 PM
Ending At
03/16/2017 5:15 PM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [Makai]

Exit	Enter	Total
729	354	1083
7	4	11
0	0	0
0	0	0
736	**358**	**1094**

RT	Th	LT	Ped
17	337	0	0
0	4	0	0
0	0	0	0
0	0	0	0
17	**341**	**0**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
575	404	979
5	11	16
0	0	0
0	0	0
580	**415**	**995**

LT	RT	Ped
19	385	0
0	11	0
0	0	0
0	0	2
19	**396**	**2**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
558	710	0
5	7	0
0	0	0
0	0	0
563	**717**	**0**

Exit	Enter	Total
722	1268	1990
15	12	27
0	0	0
0	0	0
737	**1280**	**2017**

Kuhio Hwy [Mauka]

Turning Movement Peak Hour Data Plot (4:15 PM)

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Turning Movement Peak Hour Data (7:00 AM)

Start Time	Kapaa Bypass Rd Koko Head Bound				Kuhio Hwy Mauka Bound				Kuhio Hwy Makai Bound					
	Left-Turn	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:00 AM	1	131	0	132	17	133	0	150	0	219	1	0	220	502
7:15 AM	3	168	0	171	32	158	0	190	0	182	3	0	185	546
7:30 AM	1	125	0	126	40	146	0	186	0	166	2	0	168	480
7:45 AM	1	123	0	124	30	165	0	195	0	138	0	0	138	457
Total	6	547	0	553	119	602	0	721	0	705	6	0	711	1985
Approach %	1.1	98.9	-	-	16.5	83.5	-	-	0.0	99.2	0.8	-	-	-
Total %	0.3	27.6	-	27.9	6.0	30.3	-	36.3	0.0	35.5	0.3	-	35.8	-
PHF	0.500	0.814	-	0.808	0.744	0.912	-	0.924	0.000	0.805	0.500	-	0.808	0.909
Lights	5	535	-	540	113	569	-	682	0	688	6	-	694	1916
% Lights	83.3	97.8	-	97.6	95.0	94.5	-	94.6	-	97.6	100.0	-	97.6	96.5
Mediums	1	10	-	11	5	29	-	34	0	15	0	-	15	60
% Mediums	16.7	1.8	-	2.0	4.2	4.8	-	4.7	-	2.1	0.0	-	2.1	3.0
Articulated Trucks	0	2	-	2	1	4	-	5	0	2	0	-	2	9
% Articulated Trucks	0.0	0.4	-	0.4	0.8	0.7	-	0.7	-	0.3	0.0	-	0.3	0.5
All Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Peak Hour Data

03/17/2017 7:00 AM
Ending At
03/17/2017 8:00 AM

Lights
Mediums
Articulated Trucks
All Pedestrians

Kuhio Hwy [Makai]

Exit	Enter	Total
574	694	1268
30	15	45
4	2	6
0	0	0
608	**711**	**1319**

RT	Th	LT	Ped
6	688	0	0
0	15	0	0
0	2	0	0
0	0	0	0
6	**705**	**0**	**0**

Kapaa Bypass Rd [KKHD]

Exit	Enter	Total
119	540	659
5	11	16
1	2	3
0	0	0
125	**553**	**678**

LT	RT	Ped
5	535	0
1	10	0
0	2	0
0	0	0
6	**547**	**0**

Fake Approach [Ewa]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

LT	Th	Ped
113	569	0
5	29	0
1	4	0
0	0	0
119	**602**	**0**

Exit	Enter	Total
1223	682	1905
25	34	59
4	5	9
0	0	0
1252	**721**	**1973**

Kuhio Hwy [Mauka]

Turning Movement Peak Hour Data Plot (7:00 AM)

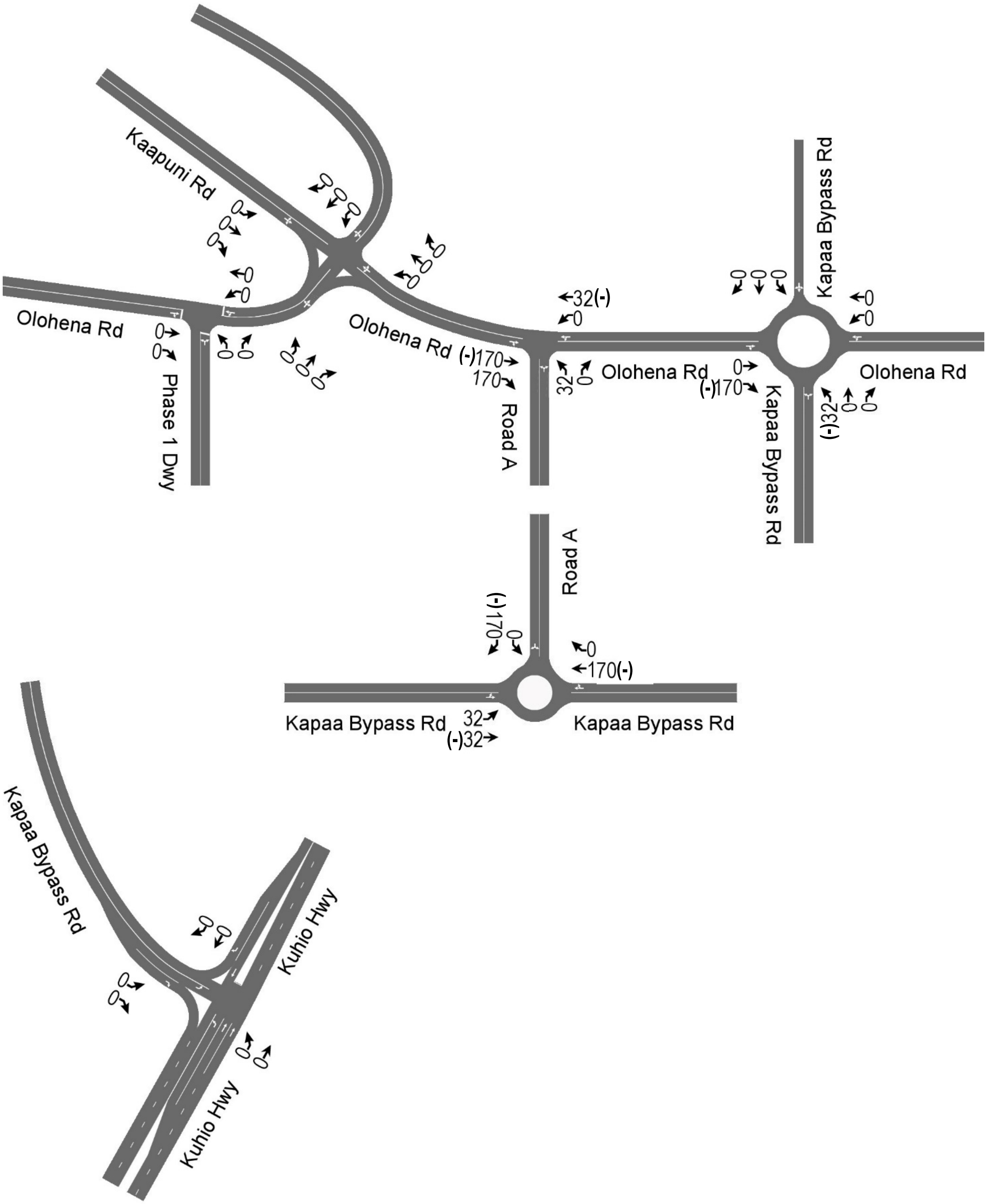


Figure 12.1 AM Peak Hour Diverted Traffic Assignment

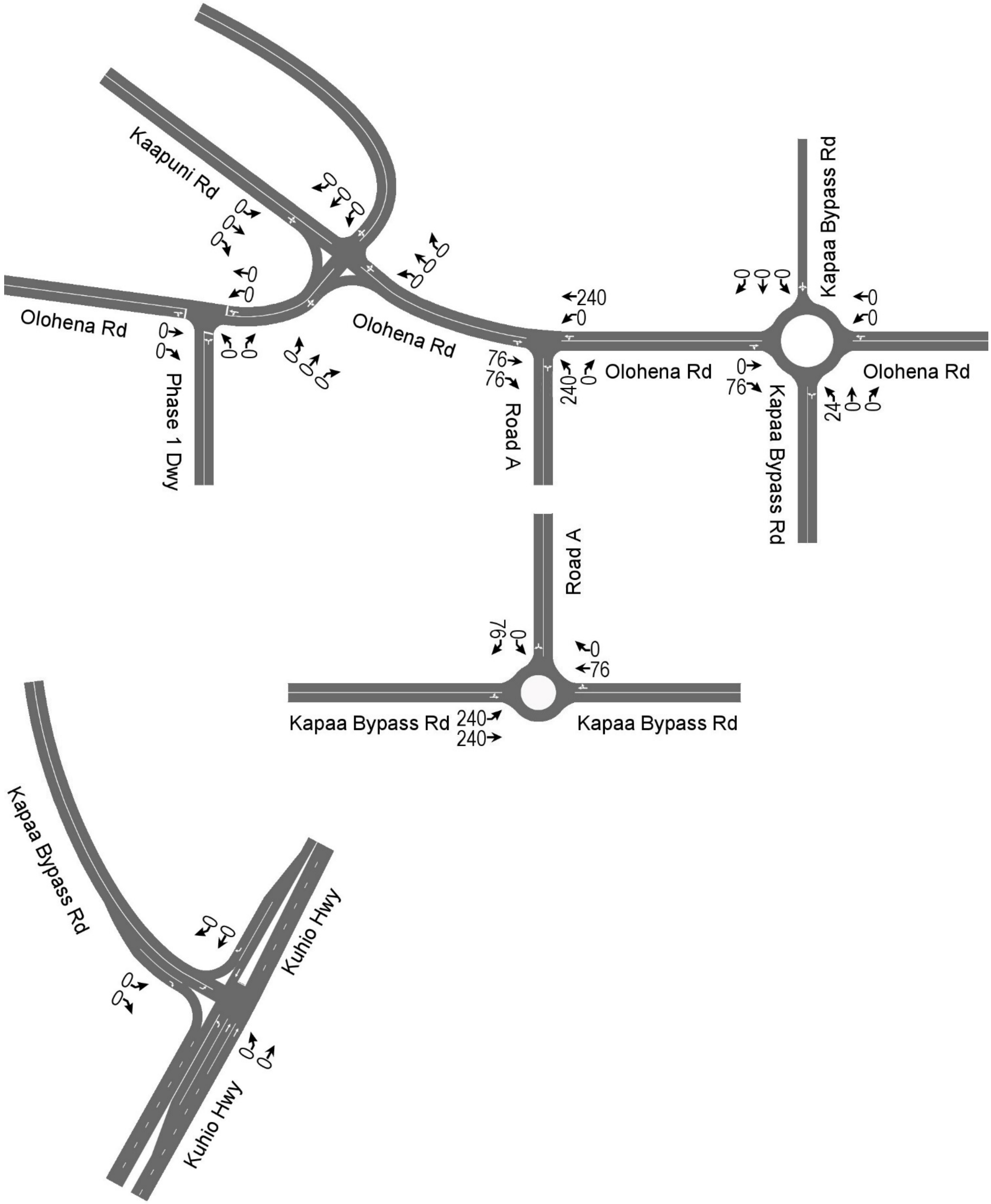


Figure 14.1 PM Peak Hour Diverted Traffic Assignment

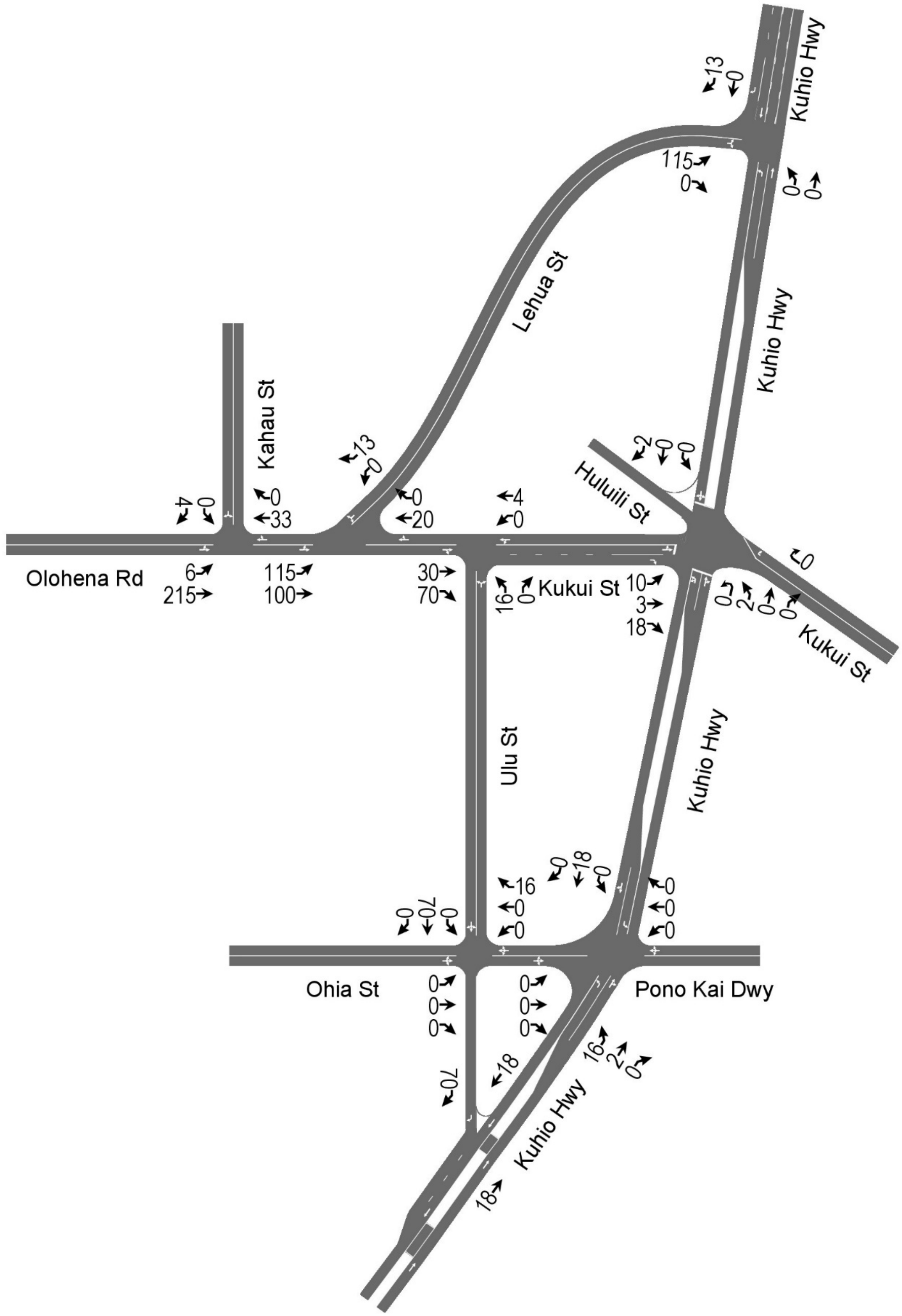


Figure 11. AM Peak Hour Site Traffic Assignment

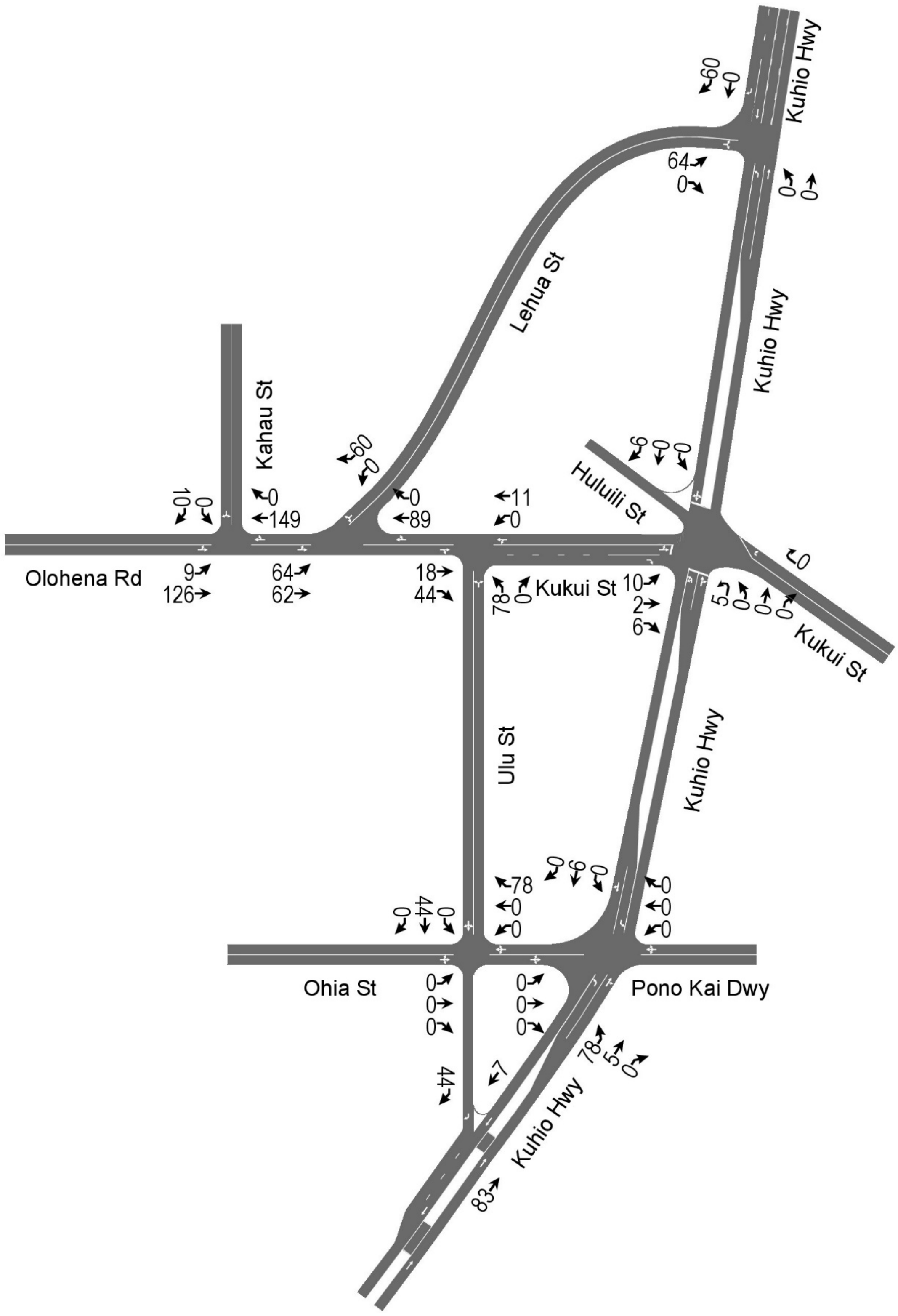
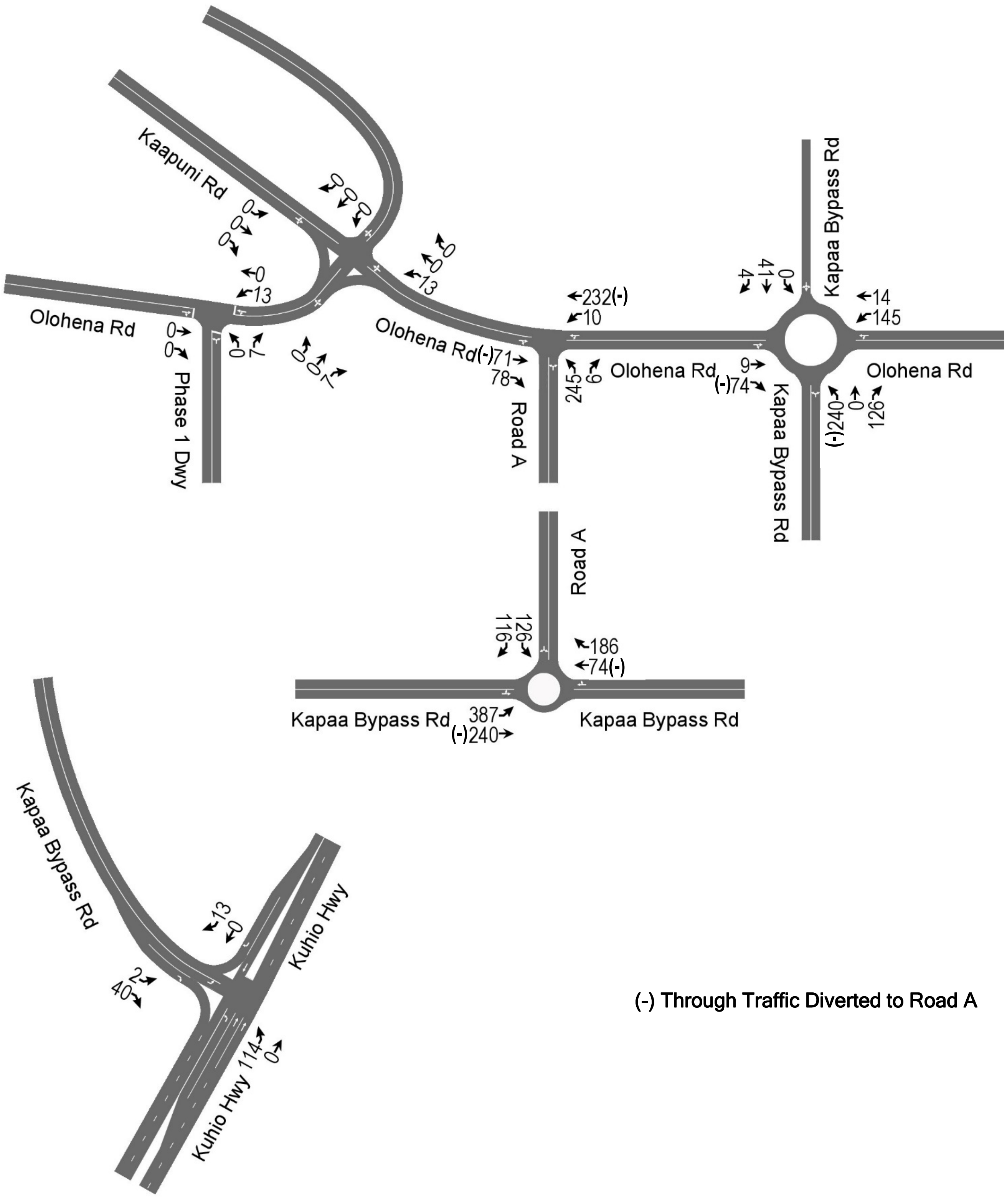


Figure 13. PM Peak Hour Site Traffic Assignment



(-) Through Traffic Diverted to Road A

Figure 14. PM Peak Hour Site Traffic Assignment (Cont'd.)

Bernard P. Carvalho, Jr.
Mayor

Wallace G. Rezentes, Jr.
Managing Director

Lyle Tabata
Acting County Engineer

DEPARTMENT OF PUBLIC WORKS
County of Kaua'i, State of Hawai'i
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September 1, 2017

Randall S. Okaneku, P. E.
The Traffic Management Consultant
1188 Bishop Street, Suite 1907
Honolulu, Hawaii 96813

SUBJECT: Traffic Impact Analysis Report Update
For the Proposed Hokua Place
Kapa`a, Kawaihau District, Island of Kaua'i
TMK: (4) 4-3-03: Por. 001

Dear Mr. Okaneku:

The Engineering Division of the Department of Public Works received the subject Traffic Impact Analysis Report (TIAR) Update that was transmitted via email on June 15, 2017. We appreciate the opportunity to review the TIAR and offer the following comments on the TIAR:

1. **Introduction, Project Description:**
    a. The TIAR indicates that the driveway for phase 1 is proposed to be located on Olohena Road mauka of its intersection with Ka'apuni Road. We have concerns with a proposed intersection at this location, including the proximity to the intersection of Ka'apuni Road as well as concerns about intersection sight distance due to nearby horizontal and vertical curves. Prior to approval of a driveway at this location, additional information will need to be provided about this driveway location, to show that appropriate sight lines can be achieved and that no safety or other problems will be created by the proximity to the intersection of Olohena Road and Ka'apuni Road.
2. **Existing Conditions, Roadways:**
    a. The report states that the Kapa'a Bypass Road speed limit is reduced to 25 mph south of the proposed intersection with Road A. The report should also mention that further south the speed limit is again increased to 35 mph.
    b. The report incorrectly indicates that the posted speed limit for Olohena Road is reduced to 15 mph as it approaches Kapa'a Middle School. The correct statement should be that there is a 15 mph school zone within the vicinity of Kapa'a Middle School during school hours.
    c. Kukui Street and Ulu Street should both be described as collector streets.

3. **Existing Conditions, Existing Peak Hour Traffic Volumes and Operating Conditions:**
    a. The language throughout this segment of the TIAR indicates that intersections "operated at LOS…." However, if we understand correctly, the LOS values given are based on the analysis of the traffic conditions, not actual empirical observations of delay for vehicles at these intersections. The TIAR should instead use language such as "calculated to operate at LOS …." This is an important distinction given that observations of Kūhiō Highway during peak hours of traffic appear to show LOS along the highway worse than the LOS A for movements along Kūhiō Highway as reported in the TIAR, potentially due to other factors than the control delay at the intersections.
    b. Check the traffic volume of 1,500 shown on page 10 for Kūhiō Highway south of Ulu Street in the PM Peak. The volumes shown in Figure 6 do not match.
    c. Figure 6 (Existing PM Peak Hour Traffic) has an error for the southbound through movement on Kūhiō Highway at the Kapa'a Bypass Road. The figure shows an hourly volume of 38, which is way too low for this through movement. The data shown for this intersection in figure 6 does not appear to match either of the two PM peak hour traffic count plots (or their average) in the appendix.
    d. Related to comment "a" above recommending different language for the calculated LOS values, we recommend that the TIAR include some statements comparing the observed traffic conditions with the calculated delays and level of service, ideally offering explanations for the difference in observed level of service and calculated level of service.
4. **Future Traffic Conditions, Kapa'a Transportation Solutions:**
    a. Page 17 of the TIAR refers to removal of on-street parking on Kūhiō Highway. The Kapa'a Transportation Solutions study rejected any potential solutions that removed parking on Kūhiō Highway, since such a change would be detrimental to the economic vitality, multimodal, and safety goals of the study. Removal of parking should not be discussed in the TIAR, as HDOT is not considering removal of parking to add travel lanes or turn lanes.
    b. With respect to a new connector road in the approximate location of Road A, page 18 of the TIAR states, "The construction cost of the connector road was estimated at $25,824,000." The costs in the Kapa'a Transportation Solutions report include right-of-way costs as well as construction cost; therefore it is misleading to state that the full cost shown in the study is the estimated construction cost.
5. **Traffic Impact Analysis, Trip Generation Characteristics:**
    a. The project description in the TIAR's introduction states that there are 700 multi-family dwelling units, but the trip generation calculations are based on 800 multi-family dwelling units. This discrepancy must be corrected, and the accurate trip generation should be reflected in the study.
    b. The pass-by trip percentage of 81.2% is too high, especially given the relatively small amount of traffic traveling through the development on Road A. The diverted volume of 45 vehicles represents approximately 15% of the estimated through vehicles on Road A during the PM Peak Hour. The 8,000 square feet of the Hokua Place shopping center is outside of the sample size in the pass-by trip

chart for shopping centers in the ITE Trip Generation Handbook. A pass-by trip percentage of approximately 30% or 40% would be more reasonable, given the data available in the Trip Generation Handbook. It would also be reasonable for the TIAR to include a calculation of an internal capture rate for trips between the retail portion and the residential portion of the Hokua Place development. However, the combination of the traffic reduction for internal capture and pass-by trips should still be less than 81%.

6. **Traffic Impact Analysis, Site Access Improvements:**
    a. The recommendations for the stop controlled Tee-intersections of Olohena Road with Road A and the phase 1 driveway do not include any statements regarding the recommended lane assignments for these new intersections. The methodologies section of the report describes the use of AASHTO Left-Turn Lane Guidelines, but no such analyses are included in the TIAR for left turn lanes on Olohena Road at these intersections. We believe that at a minimum, a left turn lane would be necessary on Olohena Road at Road A, but analyses must be provided for both intersections. A median refuge lane should also be included on Olohena Road to facilitate the left-turn movement from Road A to Olohena Road. In addition, we believe that Road A should have two approach lanes at Olohena Road, one for right turn movements and one for left turn movements.
7. **Traffic Impact Analysis, Traffic Assignment:**
    a. In the previous TIAR for this project, no traffic was assigned to the left turn movement from southbound Road A to eastbound Kapa‘a Bypass (and likewise for the right turn from the Kapa‘a Bypass to Road A). In our earlier comments, we recommended that some traffic be assigned to these movements. In almost a complete reversal, the current TIAR assigned nearly all of the traffic to these movements. In the current TIAR, only about 5% to 10% of the project traffic that goes through the existing Kapa‘a Bypass roundabout is assigned to go through the intersection of Road A and Olohena Road. A more equitable distribution of traffic should be made, to accurately represent the traffic impact on Olohena Road.
    b. The TIAR assigns no traffic between the project and Olohena Road or Ka‘apuni Road north of the project (Wailua Homesteads and Upper Kapahi area). There are relatively few destinations on those roads for the residential traffic from the project, but a small amount of residential traffic is likely to travel to those areas. In addition, much of the traffic generated by the retail portion of the development would have its origin or destination in the residential areas of Wailua Homesteads and Upper Kapahi area. A reasonable (albeit small) amount of traffic must be assigned to those areas.
8. **Figures 11 Through 14 (Traffic Assignment)**
    a. For clarity, the TIAR must show the reassignment of existing traffic on separate figures from the figures for traffic assignment from this project.
    b. On Figure 11, the 989 vehicles shown for northbound Kūhiō Highway at Ulu Street is incorrect. It appears that this volume should be 20.
    c. On Figure 13, the 1,274 vehicles shown for northbound Kūhiō Highway at Ulu Street is incorrect. It appears that this volume should be 92.
    d. On Figure 14, the 30 vehicles shown for the Kapa‘a Bypass Road left turn and the

447 vehicles for the Kapa'a Byapss Road right turn appear to be incorrect.

9. Traffic Impact Analysis, PM Peak Hour Traffic Analysis With Project:

a. We recommend that the TIAR further analyze and discuss the impact of the project on the intersection of Kūhi'ō Highway and Lehua Street and recommend measures to mitigate this impact. The TIAR states that "Makai bound Lehua Street is expected to continue at LOS F at Kūhiō Highway during the PM peak hour of traffic with the proposed project." However, Table 7 shows the PM peak hour of traffic without the project to be LOS E. Additionally, while the AM peak hour of traffic with the project continues to be LOS F, the delay increases significantly.

10. Recommendations and Conclusions, Recommended Traffic Improvements Without Project:

a. Item number 3 recommends restricting parking along Kūhiō Highway within Kapa'a Town in order to provide additional through lanes or left turn lanes on Kūhiō Highway. This should not be recommended in the TIAR, because HDOT is not considering removal of parking to add travel lanes. Removal of parking has been determined to be detrimental to businesses and the economic vitality of Kapa'a Town. Discussion of parking removal on Kūhiō Highway in Kapa'a Town should also be removed from other sections of the report, including the conclusions.

11. Recommendations and Conclusions, Recommended Traffic Improvements With Project:

a. Our comments above include several concerns about the intersection of Road A and Olohena Road, including the possibility that additional traffic should be assigned to this intersection. We are concerned that the one-way stop control Tee-intersection proposed will not be sufficient to address traffic operations and safety at intersection. The installation of a roundabout at this intersection shall be evaluated as part of the TIAR, including traffic operations analysis for a roundabout as well as a safety comparison of a roundabout and a one-way stop control intersection. The federal Manual on Uniform Traffic Control Devices (MUTCD) does not include traffic warrants for roundabouts. However, evaluation of the MUTCD's multi-way stop control warrants and/or signal warrants would be instructive with respect to evaluating whether a one-way stop control intersection would be sufficient or if a roundabout is needed instead. Alternatively, we may also accept an evaluation of the need for a roundabout based on roundabout evaluation guidelines from another jurisdiction or research document.

Consideration should also be given to the construction of a roundabout that combines the intersections of Olohena Road with Ka'apuni Road and Road A (with Kaehulua Road designed as a T intersection with either Ka'apuni Road or Olohena Road). Traffic operations analysis of a roundabout that combines these intersections shall be included in the TIAR.

The comments in this letter should not be construed to be inclusive of all County of Kaua'i recommendations for road improvements required to be constructed as part of the Hokua Place project. Recommendations and requirements for road improvements will be included as part of future review phases for the project, such as zoning amendments, subdivision applications, and construction plan review. If you have any questions or need additional information, please contact me at (808) 241-4891 or Stanford Iwamoto at (808) 241-4896.

Very truly yours,

MICHAEL MOULE, P.E.
Chief, Engineering Division

MM/SI

Copies to: DPW-Design & Permitting
Lyle Tabata, Acting County Engineer
Larry Dill, HDOT Kaua'i District Engineer