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UNIVERSITY OF THE NATIONS, KONA, INC.

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAI'I

In the Matter of the Petition Of U of N BENCORP To Amend the Agricultural Land Use District to the Urban Land Use District for Approximately 62 Acres, Tax Map Key Nos.: (3) 7-5-010:085 and 7-5-017:006 situated at Wai'aha, North Kona, County and State of Hawai'i	DOCKET NO. A02-737 UNIVERSITY OF THE NATIONS, KONA, INC.'S FIRST SUPPLEMENTAL LIST OF EXHIBITS; DECLARATION OF DEREK B. SIMON; EXHIBITS 29 - 33; CERTIFICATE OF SERVICE

UNIVERSITY OF THE NATIONS, KONA, INC.'S FIRST SUPPLEMENTAL LIST OF EXHIBITS

University of the Nations, Kona, Inc., a Hawai'i nonprofit corporation ("**UNK**"), as successor-in-interest to Petitioner U of N Bencorp, to those certain parcels of land consisting of approximately 62 acres and currently identified by Tax Map Key Nos. (3) 7-5-010:85 and (3) 7-5-017:006, by and through its legal counsel, Carlsmith Ball LLP, hereby respectfully submits to the Land Use Commission of the State of Hawai'i, UNK's First Supplemental List of Exhibits.

UNK reserves the right to amend its First Supplemental List of Exhibits and identify additional exhibits not expressly noted herein in response to any pleadings, arguments, exhibits

or witnesses identified by any party.

DATED: Honolulu, Hawai'i, May 17, 2019.

STEVEN S.C. LIM
KATHERINE A. GARSON
DEREK B. SIMON

Attorneys for
UNIVERSITY OF THE NATIONS, KONA, INC.

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DECLARATION OF DEREK B. SIMON

I, DEREK B. SIMON, declare and state as follows:

1. I am an attorney with Carlsmith Ball LLP, attorneys for University of the Nations, Kona, Inc. ("**UNK**"), successor-in-interest to U of N Bencorp, the original Petitioner in Docket No. A02-737.

2. Attached hereto as **Exhibit 29** is a true and correct copy of the 2019 University of the Nations Expansion Development Plan, provided to Carlsmith Ball by UNK.

3. Attached hereto as **Exhibit 30** is a true and correct copy of UNK's 2019 Development - Historic Resources, provided to Carlsmith Ball by UNK.

4. Attached hereto as **Exhibit 31** is a true and correct copy of UNK's 2019 Development - Conformance with State/County Plans, provided to Carlsmith Ball by UNK.

5. Attached hereto as **Exhibit 32** is a true and correct copy of a Traffic Impact Analysis Report dated April 30, 2006, provided to Carlsmith Ball by UNK.

6. Attached hereto as **Exhibit 33** is a true and correct copy of UNK's Faith-Based Financing Model, provided to Carlsmith Ball by UNK.

DATED: Honolulu, Hawai'i, May 17, 2019.

DEREK. B. SIMON

LAND USE COMMISSION DOCKET NO. A02-737
PETITIONER UNIVERSITY OF THE NATIONS, KONA, INC.'S REBUTTAL LIST OF EXHIBITS

Exhibit No.	Description	Party Objections	Admit
29.	2019 Development Plan		
30.	2019 Development Plan – Historic Resources		
31.	2019 Development Plan – Conformance with State and County Plans		
32.	2006 Traffic Impact Analysis Report		
33.	Faith-Based Financing Model		

2019 University of the Nations Expansion Development Plan

EXHIBIT 29

PROJECT SUMMARY

A. PROJECT NAME: University of the Nations Expansion

B. PROJECT APPLICANT: University Of The Nations Kona Inc. Hawaii non-profit corporation

75-5851 Kuakini Hwy,

Kailua Kona, HI 96740

C. LOCATION AND OWNERSHIP:

Location: TMK: (3) 7-5-10:85 & 7-5-17:6, (see Figure 1.1 & 1.2 for TMK Maps) total project area of approximately 62 acres approximately one mile southeast of Kailua-Kona, County and State of Hawaii. The Property is located on the lower western slopes of Hualalai mountain, bordered by Kuakini Highway on the west, Hualalai Road to the east, the University of the Nations-Kona campus to the north and the Kona Hillcrest subdivision on the south. The Property rises in elevation from approximately 100 feet at Kuakini Highway to 325 feet at its highest point, with the steepest slopes on the upper Mauka side just below Hualalai Road. (See Figure 1.1 for Project Area Map.)

Ownership: In 2000 the University of Nations – Kona ("U of N Kona") purchased the subject TMKs working through U of N Bencorp ("Bencorp"), a Hawaii 501(c)(2) non-profit benefit corporation. Extensive plans were prepared for development of the subject TMKs, ostensibly to benefit U of N Kona financially. Several years later in 2004, a major shift of executive officers occurred and the U of N Kona decided to realign the development of the land to match it's mission purpose. Bencorp was dissolved and later the property was transferred to the U of N Kona in 2018. The U of N Kona intends to seek State and County approval to develop the reclassified area into a U of N Kona campus with staff and student housing and integrate into the existing U of N Kona Master Plan.

D. EXISTING USE: The land is currently vacant and undeveloped. Less than three acres is used as an educational experimental farm.

E. STATE LAND USE CLASSIFICATION: Urban

F. COUNTY OF HAWAII GENERAL PLAN: Medium Density Urban Development on the LUPAG map.

G. COUNTY OF HAWAII ZONING: TMK (3) 7-5-10:85, zoned A-1a
TMK (3) 7-5-17:06, split zoned RD-3.75 and R-7.5

H. TOTAL LAND AREA: Approximately 62 acres

I. LAND USE ALLOCATION: Residential: ± 15 acres
Recreation / Sports: ±16 acre
Roadway/Parking: ± 5 acres
Academic: ± 11 acres Open
Space: ± 15 acres

J. PROJECT COST: Total project costs are estimated at approximately $91 million inclusive of volunteer hard and soft costs savings. The figures are based upon 2019 building costs.

K. PROJECT DESCRIPTION: The project comprises three Phases which link the property to the original U of N Kona Campus Master Plan:

Hālau for Learning	1 building
Staff Housing	5 buildings
Student Housing	5 buildings
University Classrooms	4 buildings
K-12 Education Center	1 complex
Phase 1	3 buildings
Phase 2	4 buildings
Science Research Center	1 complex
Social Science	3 buildings
Natural Science	3 buildings
Visitor's Center	1 building
Sports Complex	1 large area

	Stadium facility	1 field house
	Gym	1 building
	Swimming	1 competition pool
		1 warm up pool
	Basketball	2 courts
	Tennis	6 courts
	Beach Volleyball	3 courts
Camp Area		1 complex
		(11 small buildings)
CERT / Security building		2 buildings
Campus Services Complex		1 complex
		(5 buildings)
Small Group Pavilion		1 building

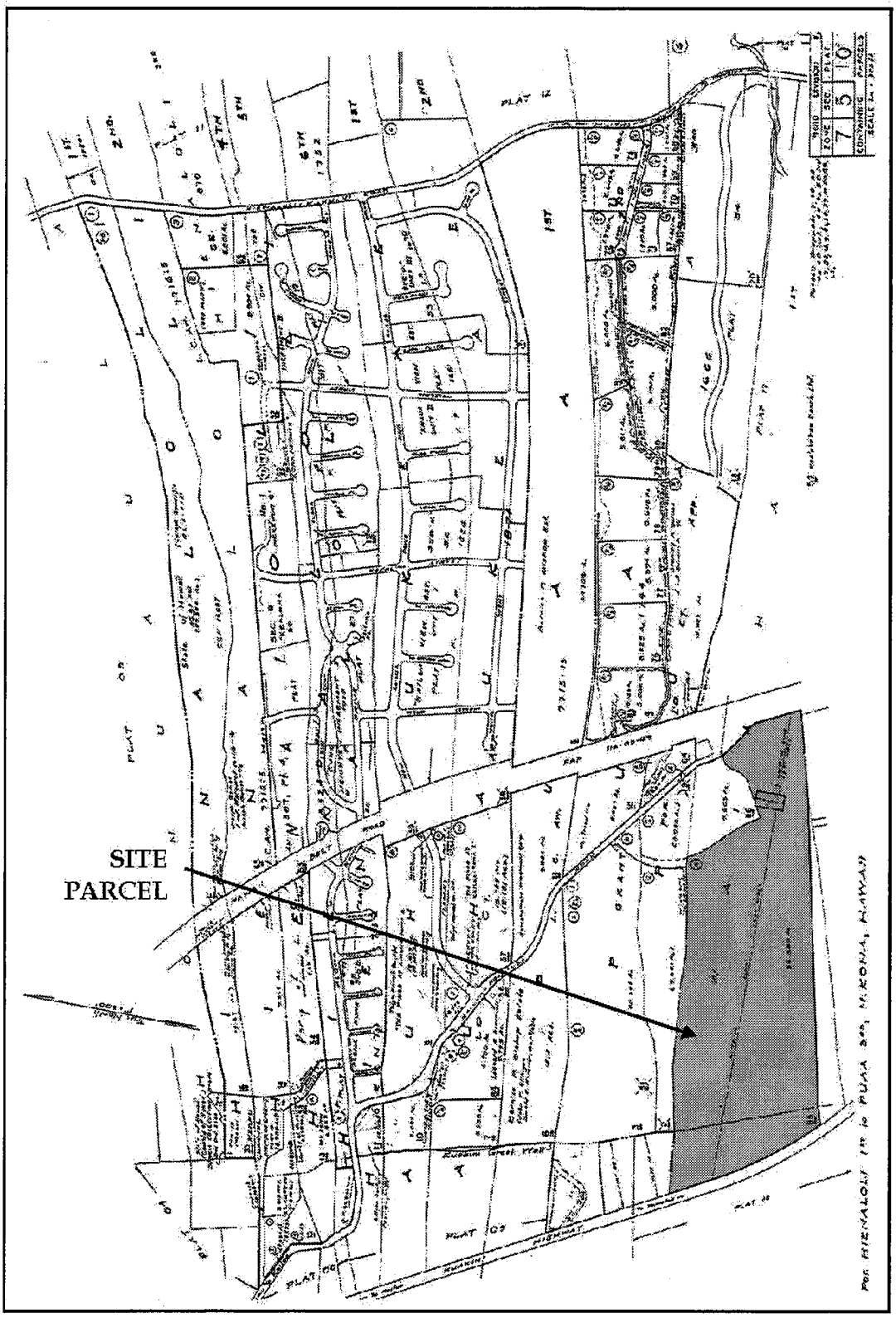


Figure 1.1

Tax Map Key Map (3) 7-5-10:85

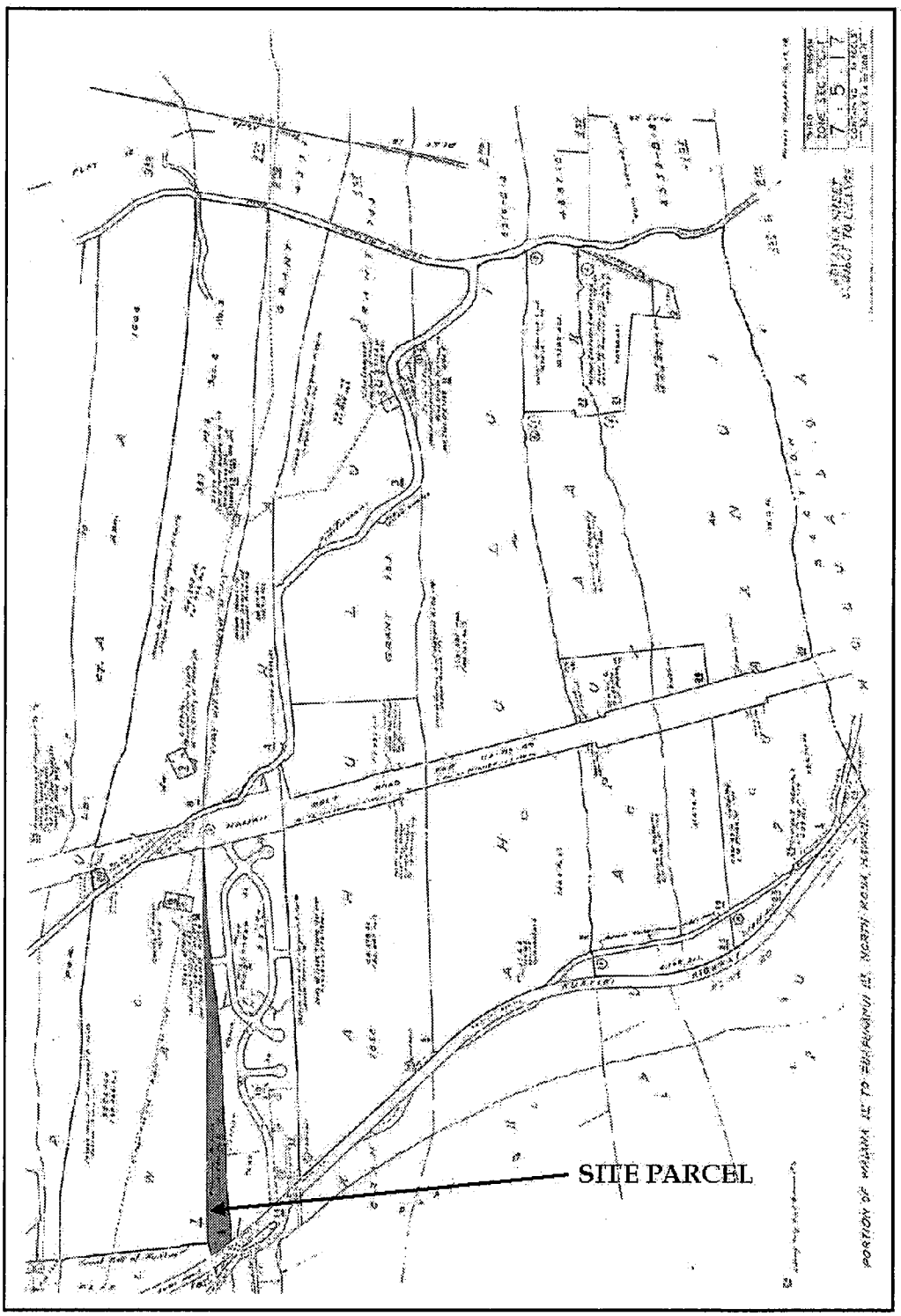


Figure 1.2

Tax Map Key Map (3) 7-5-17:06

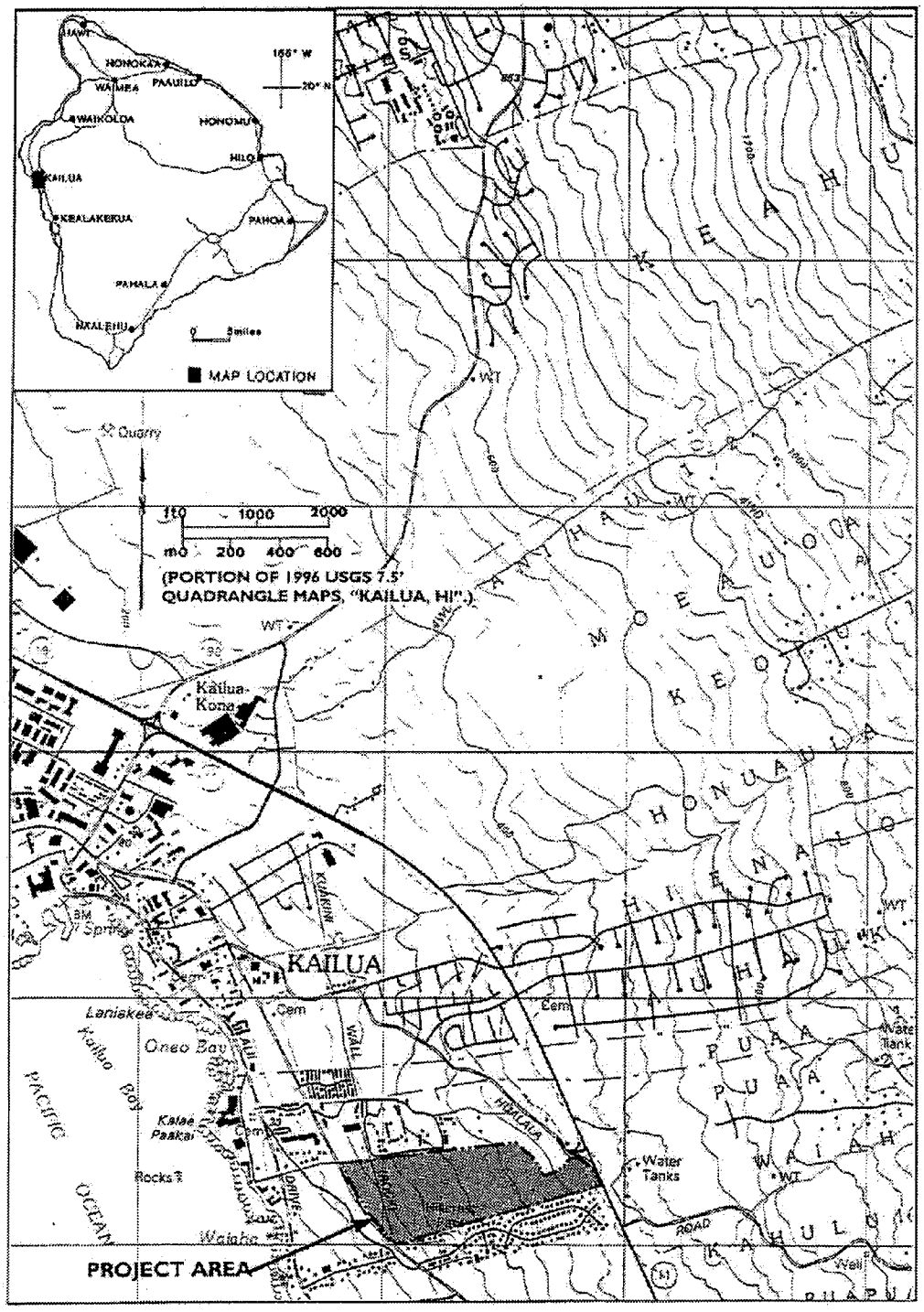


Figure 1.3

Project Area Map

A. Project Description

LOCATION AND OWNERSHIP

1. Location

The Property is located on the west coast of the Island of Hawaii, approximately one mile southeast of the town center of Kailua-Kona, on the lower western slopes of Mount Hualalai at an elevation ranging from approximately 100 to 325 feet. The Property is bordered by Kuakini Highway on the west, Queen Kaahumanu (Queen K) Highway and Hualalai Road on the east, the University of the Nations-Kona Campus on the north and the Kona Hillcrest subdivision on the south. The Property is generally gently sloped, with steeper slopes (approaching 25 percent) on the upper Mauka side just below Hualalai Road. The Property is located within the area covered by several public plans: the State of Hawaii General Plan, the West Hawaii Regional Plan, the Keahole to Kailua Development Plan, and the Kailua-Kona General Plan. The proposed development is consistent with the objectives and policies of all of these plans. See Section III. Conformance with State/County Plans.

The property comprises approximately 62 acres, and two tax map parcels: TMKs (3) 7-5- 10:85 & 7-5-17:6.

2. Ownership

The Property is owned in fee simple by University Of The Nations Kona Inc., non-profit corporation with offices at 75-5851 Kuakini Hwy, Kailua-Kona, HI 96740.

The U of N Kona is a Hawaii 501(c)(3) non-profit corporation and mission-based educational institution whose Kailua-Kona campus borders the Property to the north. U of N Kona's purpose is to educate men and women and prepare them spiritually, intellectually and culturally for Christian service throughout the world, but especially in the Pacific and Asia.

The U of N Kona is a mission-based educational institution, founded in Kona in the late 1970's and now actively involved in equipping men and women in more than 162 nations through field-driven course work within its seven colleges and focused centers. Unique in the field of higher education, this non-traditional, globally networked university offers viable university-level learning opportunities for emerging leaders in 162 nations and over 750 locations worldwide.

Over the last two decades, through both the educational and physical development of the campus, tens of thousands of lives have been impacted, and have in turn identified with and invested in the mission and vision of the University. This investment has generated parents who have sent their children, thousands of volunteers who have labored in the building of the facilities, and a growing constituency of small as well as substantial donors.

CONCEPTUAL PLAN

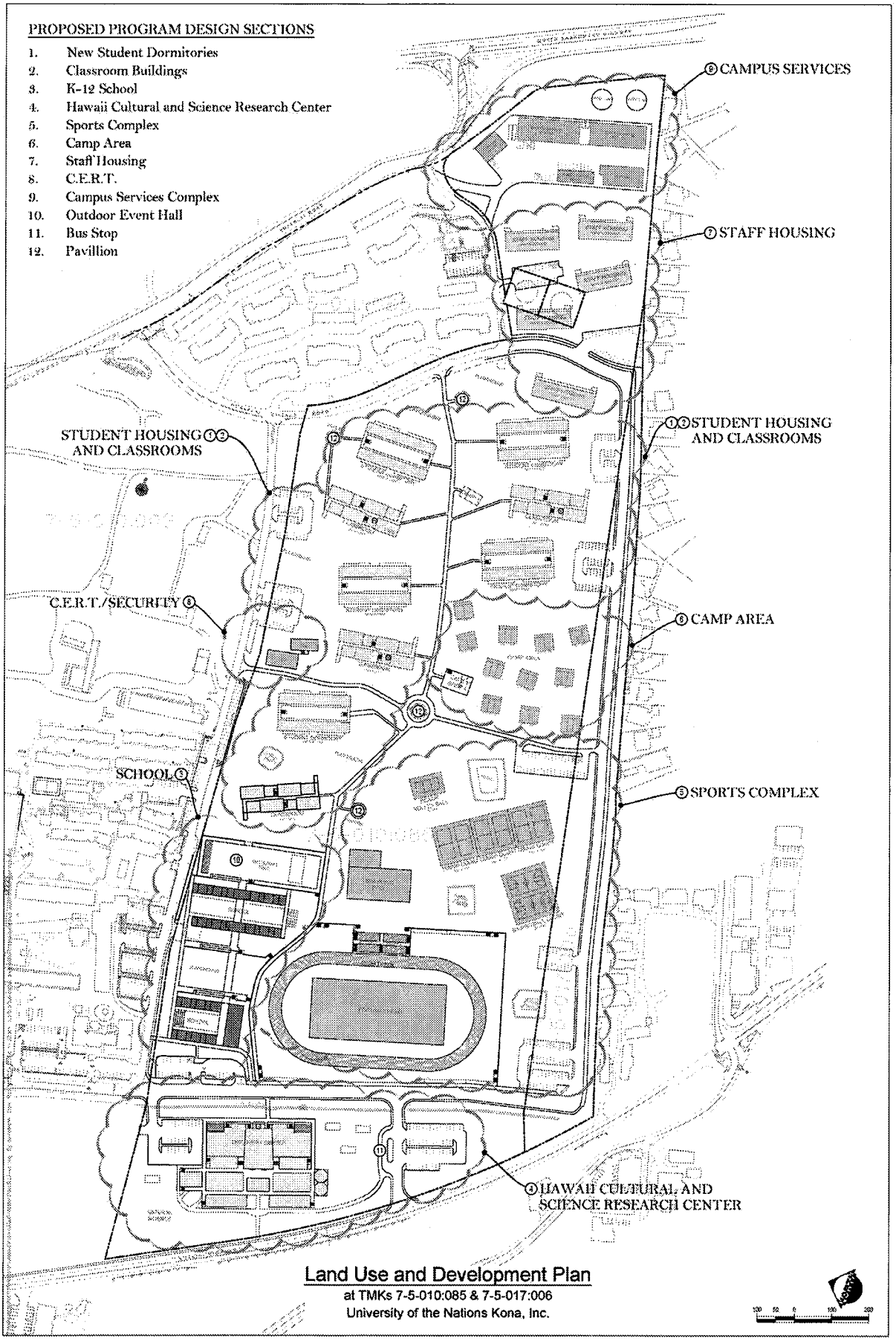
A previous Change of Zone Application was submitted for the subject parcels in September of 2003, however early in the spring of 2004 the University of Nations changed the plan for development of the 62 acres to better re-align with its mission and purpose. The University decided not to develop the land for primarily commercial purpose but rather preserve the land for future growth of the University campus. Figure 2.1 illustrates the proposed conceptual phased expansion and growth of the University Campus.

Until the summer of 2018, the reclassified land was owned by Ka Ohana Waiaha (KOW), a community land trust for YWAM/University of the Nations staff. KOW held the land in trust but had no means to develop it. In early 2019, U of N Kona leadership once again looked at moving forward to develop the land. Kumu Leina'Ala Fruen, a linenal descendent, was called for consultation in the current process on multiple occasions. She gave spiritual input as well as helped fashion the concept for the Halau for Learning. Local Kahu and Kupuna have also been kept up to date with these developments and have been invited to engage in the development process.

The current proposal puts the land to its best use by developing it consistent with the County of Hawaii General Plan's medium density urban designation. The land is within the geographic limits of the town of Kailua-Kona, the main population center on the west coast of the Island of Hawaii. In keeping with its high-quality design and respect for the Kona lifestyle, the proposed development program is considerably less dense than the medium-density urban designation. The parcel has sweeping views seaward and the proposed buildings are oriented to the site to catch daily Mauka-makai breezes utilizing passive cooling. Thus, the parcel is a particularly good place for the development proposed.

PROPOSED PROGRAM DESIGN SECTIONS

1. New Student Dormitories
2. Classroom Buildings
3. K-12 School
4. Hawaii Cultural and Science Research Center
5. Sports Complex
6. Camp Area
7. Staff Housing
8. C.E.R.T.
9. Campus Services Complex
10. Outdoor Event Hall
11. Bus Stop
12. Pavillion



Land Use and Development Plan

at TMKs 7-5-010:085 & 7-5-017:006

University of the Nations Kona, Inc.

1. **Archeological Resources**

There are 5 archeological sites slated for preservation on the reclassified area: 3 burial chambers, an agricultural heiau and the Kuakini Wall. The campus plan was developed to give maximum space around them to respect and preserve the sites but also to offer an interpretive program that offers education in Hawaiian and English as to the historical meaning of the sites to preserve them for the next generation. All 5 of these sites will be preserved in accordance with the preservation plan and any other professional recommendations. These sites will be preserved for posterity as a valuable part of the campus landscape and design. A twenty-foot buffer zone surrounding the sites will be established with the boundaries of the buffer zone defined by a stone wall constructed of local basalt boulders and cobbles. The wall would be built so as to be typically traditional Hawaiian in appearance. The archeological report allows for a widening of the Kuakini wall under supervision and to use the rocks to repair other parts of the wall that needs repair.

2. **Staff Housing**

Currently a large majority of the U of N Kona staff do not live on the campus because of the limited space available on the existing 42 acre campus. The alternative is the local housing supply. There is a great need for long term staff housing. The proposed plan has development for long term housing which will help alleviate the housing shortage in Kailua-Kona. The concept is that ownership of these housing units will be held in a community land trust similar to Ka Ohana Waiaha which allows staff to build and retain some equity. In each building there will be 6 studios; 9 one bedroom apartments, 6 two bedroom apartments. Five buildings are planned with a total of 105 units. The feel will be similar to the Hualalai Village Condominiums.

3. **Student Housing**

In keeping with the U of N Kona live-learn philosophy, the student residential area will seek to integrate living space with the learning environment. This acts as a catalyst for cohortive learning. Each dormitory will consist of two wings divided by a courtyard and offer a variety of residential units for a diverse student population. The units are designed with as much flexibility as possible. The residential design has a variety of units: 8 for couples; 22 for families or singles; 15 for singles; 6 ADA units; 2 multi-purpose classroom/recreation rooms. These will be complimented by laundry facilities; storage rooms; ground floor open air courtyard and 2 Outdoor seating areas. There are 255 student residential units currently on the plan.

4. **Academic and Recreation Facilities**

a. Wai'aha Hawaiian Legacy Learning Village

The Wai'aha Hawaiian Legacy Learning Village will be an open outdoor pavilion style gathering place with a covered Hō'ike pā (stage) and seating for up to 500 people. It will take the emphases of Henry 'Ōpūkaha'ia's life and train local Hawaiian community 'ohana to learn about the Hawaiian Language through the lens of 'Ōpūkaha'ia and his journey in being the first Hawaiian to translate the

book of Gensis in the bible- Kauoha (use as the guiding thought behind Hawaiian Bible teachings) and to establish Nā pō'ai o nā kupuna (Cultural pathways in the circle of the Esteem Elder in Hawaiian Lifestyles).

There will be training in Hawaiian culture, history and heritage in cultural aspects such as Hula the art of healing, Hāleo Hawaiian language (Kama'ilio with the elders), Hawaiian Artisans and practioneers, culture traditions, native plants and agriculture as well as training for Kahu (Kahuna Pule) and to foster engagement with other indigenous communities in Pacific island nations, Maori of Aotearoa, first nations people, and even Amazon tribes. The Hālau will influence other UofN Kona programs_(K-12, Associate, Bachelor, Masters level programs) by overseeing Hawaiian welcome protocols, celebrating Hawaiian culture and identity, training students to Mālama our Hawai'i Island community and respect the land.

b. K- 12 Education Center

The K-12 school will provide a much-needed facility for the diverse school programs currently run at the U of N Kona campus: the Learning Center (lab school focused on "profound learning concepts"), Wai'aha (homeschool co-op focused on fostering parent-child relationships), English and Korean Foundation Schools (serving the children of U of N Kona student families). This facility will also double as a learning environment for training teachers and interns. The total K-12 student population will be a maximum of 1,500 every year. Enrollment will be both from the children of staff and students as well as open to the wider community. Special consideration will be given to make the learning environment conducive for foster children and those with ADA needs. This education center will be built in two phases. Phase one will be comprised of 3 larger buildings with 16 open classrooms; 4 offices; 4 swing rooms for teacher training. Phase two will be comprised of 4 larger buildings: 30 open classrooms; 8 offices; 6 swing rooms for teacher training.

c. University Classrooms (Associates, Bachelor and Master Levels)

The U of N Kona training concept brings together academics as well as practical project development (or field assignments). The training will be fashioned around centers to bring positive change through the application of course content. There are 7 Colleges in the University of the Nations that offer Associate, Bachelor and Master levels. The training will include programs from those 7 Colleges and will seeks to have a positive effect on the Big Island community as well as in other nations. Examples: social work with a view to training students to serve local families with wrap around care; whole person healthcare (medical and counselling) where students will intern attending needs of the local community; community development where students apply concepts to developing increasing sustainability in regards to energy, food, water and shelter and much more. The facilities will be four University level training buildings with different size classrooms and office space. Each building will be 3 levels and will consist of 2

large lecture halls, 9 classrooms, 1 prayer room, 1 outdoor classroom, 3 conference rooms and 5 offices.

d. Science Research Center

The multi-complex plan has a wing for Social Science, Natural Science, and a combined wing with a Visitor Center, Museum and Auditorium. The Center brings together scientific research, applied sciences to aid community development (food, energy, shelter, water) as well as linguistics. The facility will have 7 connected buildings: 1 visitor center; 3 buildings for social sciences and 3 for the natural sciences.

5. **Sports Complex**

The sports complex will offer sports training in a variety of disciplines. The complex will include the following facilities: soccer field with integrated running track and stadium seating; an integrated field house with locker rooms and office space/ classrooms; olympic size swimming pool with a warm up pool; 6 tennis courts; 3 beach volleyball courts; 1 basketball court; 1 large gym area. The Sports Complex will be used by the K-12 school, students, staff and by invitation to the Kona community for sporting events.

6. **Camp Area**

The camp area has smaller, rustic housing spread out over the landscape. The housing is designed for short term stays including: summer camps; sports camps; teams returning from field assignments, and seminar participants. These camps will be open to local and off island youth. The camp area will be comprised of 11 buildings for dormitory style accommodation and 1 support building. There will be accomodation for a maximum 380 people.

7. **Campus Services Complex**

The Campus Service Complex will have technical shops for campus construction, maintenance and support of the sustainability plan. It will also include a trade school. The location at the top edge of the campus provides for direct road access and allows a generous distance from the classrooms and dormitories. The facility will include offices, storage, maintenance, classrooms and work space.

8. **Community Emergency Response Team Building (CERT) & Security**

The Community Emergency Response Team (CERT) and Campus Security facility will consist of 4 sleeping quarters; 3 meeting rooms; 1 large lecture room; emergency vehicle garage; a covered courtyard; 5 equipment storage rooms and 1 kitchen.

9. **Coffee Shop and Mini-Market**

A coffee shop and a mini market will be centrally located and adjacent to the sports complex. The mini market on the first floor will sell items such as toiletries, snack food,

drinks, books, and t-shirts. The coffee shop located on the 2nd floor will sell local Kona coffee and tea.

10. **Small Groups Pavilion**

The U of N Kona education philosophy seeks to facilitate a personal relationship between the lecturer and the student. Sometimes there is need to break a large class into small groups to process the concepts in a less formal environment hence the need for a small group pavilion. The pavilion will consist of 9 light and airy bays that are accessible from all directions; will have large overhangs and louvers to shade from the sun; will also have interior dividing features to hold multiple groups at a time.

B. Development Plan

The aforementioned facilities will be developed in a three phase process. (See the overview of the breakdown of the phases below with the estimation of the development cost in point C and D respectively).

The first phase is estimated to cost $11.2 million with consideration given to the savings made in soft and hard costs through donation of professional and trade services. We estimate that the first phase will realistically take 5 years to complete.

With respect to finances it should be noted that over the past 10 years the U of N Kona has spent $19.2 million on construction and capital expenditure on the current campus. The money was not raised using conventional financing but rather donor contributions for specific projects. After the campus recovered from the embezzlement 2014-2016, we have been able to cash flow about $1.5 million per year for capital developments. With that track record we will be able to fund the first phase of the development of the reclassified parcel through donations and cash flow. The University is also in a stable financial position, such that financial institutions are ready and willing to provide additional funding.

In terms of the timeframe to develop the reclassified area, the first phase will be receiving the requisite approvals from the State of Hawaii and the County of Hawaii. While this is ongoing we will take the opportunity to launch a capital fundraising program with our partners and donors to get the finances needed to complete the project. Initially the soft costs will be able to be covered out of our campus cash flow.

Currently we are already working on the reclassified area with respect to grubbing the land for a firebreak. We can also complete the survey and recording of the setbacks of the archaeological resources and continue the educational signage regarding their historical significance.

During 2019 we are working with the Hawaii State Land Use Commission for their approval of the modified plans with respect to allowing us to submit an "Amendment" to

the "Motion to Amend the Conditions" submitted in 2007. Once we receive the approval of our plan from the LUC, we will be able to move forward in the next phase of the development of the land.

During 2020-2021 we will work with the County of Hawaii to i.) rezone the reclassified area to the appropriate designation ii.) submit the plans to the Kona Village Design Committee iii.) submit the plans to the County of Hawaii Planning Department and iv.) pull the necessary permits to perform work on phase 1. This may take up to 2 years to get this process worked out. Once the various approvals are granted then we will move onto the next phase.

As soon as possible we would start with the necessary site work i.) perform necessary grading and excavation ii.) put in utilities: water, sewage, electric iii.) put in the roads for phase 1 iv.) erect a security fence/wall on the southern boundary. We estimate the time frame would be between 2020-2022.

After the site work has been performed, the facilities will be erected i.) Hālau for Learning ii.) K-12 School (part 1) iii.) Sport Grounds (soccer field, grass running track, tennis courts; volleyball court, bathrooms) iv.) Storage and Maintenance Area (part 1). The target date to complete phase one will be 2024.

C. Development Timetable

The University persevered through difficult times and has emerged with a strong financial position as well as clarified vision. The land will be developed in 3 phases. An overview is given below:

PHASE ONE (2019-2024)

- Archeological Preservation
- Grubbing land for firebreak and care of land
- State of Hawaii Land Use Commission approvals
- County of Hawaii rezoning from agricultural to approiate zone
- KVDC approvals
- County of Hawaii Planning approvals and permits
- Site work: grading, excavation, utilities (water, sewage, electric) and roads.
- South Security Fence/Wall
- Hālau for Learning
- K-12 Education Center (part 1)
- Sport Complex (soccer field, grass running track, tennis courts; volleyball court, bathrooms)
- Campus Services Complex (part 1)

PHASE TWO (2025-2034)

- K-12 Education Center (part 2)
- Sport Complex (Stadium Seating includes storage, locker room, bathroom,

gym; Swimming pool; Large Gym)
- Camp Area
- Student Housing (part 1)
- University Classrooms: (part 1)
- CERT/ Security Center
- Campus Services Complex (part 2)

PHASE THREE (2034-2040)
- Small Group Pavilion
- University Classrooms (part 2)
- Science Research Center
- Student Housing (part 2)
- Staff Housing

D. Project Development Costs

It is challenging to provide cost estimates for a project that will unfold over twenty- five years or longer, due to building cost inflation and other factors. Therefore, the following cost of project development is an estimation based upon today's costs:

PHASE 1	
1. Henry ʻŌpūkahaʻia Legacy Center	$1,225,000
2. K-12 School phase A	$2,856,900
3. South Security Wall	$530,000
4. Volleyball Courts	$115,500
5. Soccer Field and Track	$465,000
6. Tennis and basketball courts	$250,000
7. Restrooms	$239,000
8. Campus Services phase A	$2,660,000
9. Other infrastructure – sewer, water, power, etc.	$1,650,000
10. Roadways and Parking	$1,240,000
11. Landscaping, Furnishings Soft Cost & Contingency Included	
TOTAL PHASE 1 BUDGET:	**$11,231,400**
PHASE 2	
1. K-12 School phase B	$3,285,500
2. Campus Services phase B	$3,059,000
3. Stadium Seating / Sports Complex	$1,562,500
4. Olympic Swimming Pool	$1,771,875
5. Sports Camps	$1,400,000

6. Student Dorms phase A	$4,250,000
7. CERT	$1,818,900
8. Classrooms phase A	$11,573,140
9. Other infrastructure – sewer, water, power, etc.	$1,897,500
10. Roadways and Parking	$1,426,000
11. Landscaping, Furnishings Soft Cost & Contingency Included	
TOTAL PHASE 2 BUDGET	**$32,044,415**

PHASE 3

1. Classrooms phase B	$13,309,000
2. Discovery Center	$22,695,500
3. Student Dorms (50% of Master Plan)	$4,850,000
4. Staff Housing	$3,260,000
9. Other infrastructure – sewer, water, power, etc.	$1,897,500
10. Roadways and Parking	$1,426,000
11. Landscaping, Furnishings Soft Cost & Contingency Included	
TOTAL PHASE 3 BUDGET	**$47,438,000**

TOTAL PROJECT ESTIMATED COST – Approximately	**$90,713,815**

2019 DEVELOPMENT PLAN
HISTORIC RESOURCES

1. Archaeological Resources

Permanent settlement began in the Kailua-Kona area in approximately A.D. 1000-1200. Several large and densely populated centers were situated at several locations along the shoreline between Kailua and Honaunau, and included dwellings for rulers, chiefs and people, places of refuge, and other structures. Also present are large and small heiau, sporting areas, and burial clusters. Fishing and farming were the major economic activities. The zone of habitation was segmented makai to Mauka, a land division known as an ahupua'a, and included the shoreline inland to approximately 600 feet; the Kula, which extended approximately to 500 feet in elevation where some food growing occurred and where permanent habitations are more sparsely distributed, and several other zones demarcated primarily by elevation. The Property lies within the Kula zone.

Two levels of archaeological/historical reconnaissance were performed Paul H. Rosendahl, Ph.D. In April 2002, an initial field assessment survey was done to determine if any features of archaeological, cultural or historic importance were observable and to make a preliminary assessment of possible historic-preservation treatments appropriate or required by such features. The assessment survey identified 28 possible sites comprising approximately 53 features, including walls, terraces, mounds, modified outcrops, stone concentrations, platform, enclosures, and a lava blister cave. The functional types included boundary, temporary and permanent habitation, possible grave, possible ceremonial, clearing, ranching, and indeterminate. During this survey, as many as 30-35 component structural features at eleven different sites were tentatively identified as possible burial features. This tentative functional identification was based primarily on physical similarities to structural features previously identified on other survey projects and confirmed through excavation to contain human skeletal remains.[2]

Between October 29 and December 20, 2002, Rechtman Consulting, LLC conducted an intensive field survey of the entire subject property. Field crew members walked transects across the property with a spacing interval of 5 meters. The vegetation coverage varied from extremely dense to bare ground. All of the archaeological features that were encountered during this surface survey were cleared of vegetation and fully documented. A map was generated using GPS technology and the archaeological features were organized into sites based on spatial distribution. Preliminarily 84 sites containing nearly 300 features were defined. Upon further analysis some of the sites were combined. The sites include Historic Period ranching features (walls and corral), the Kuakini Wall, Pre-contact Period habitation and burial features, trail segments, possible agricultural shrines, and a wide distribution of agricultural features.

Subsurface testing was conducted at twenty-two features, including habitation, agricultural, and suspected burial features. All of the sites recorded during the study

were assessed for their significance based on criteria established and promoted by the DLNR–SHPD and contained in the draft Hawaii Administrative Rules 13 §13–284–6, dated 1998. These significance evaluations should be considered as preliminary until DLNR–SHPD provides concurrence. Ten sites were recommended for data recovery. Sites in this category should be protected until data recovery investigations are completed. The presence of burial human remains was confirmed at three platform features. DLNR–SHPD Burials Program has been notified of the discovery of human remains. The three sites were recommended for preservation. Sites in this category should be protected indefinitely, and perpetual easements established to ensure their long-term preservation. In cooperation with the State Historic Preservation Officer, a treatment and mitigation plan will be developed for all features determined to be archaeologically or historically significant. Please refer to Appendix G.

[2]Data and description for this section were derived from Paul H. Rosendahl, Ph.D., Archaeological Assessment Survey –U of N BENCORP Development—Lands of Waiaha 1 and 2, North Kona District, Island of Hawaii, April 2002; and Letter Report 2257-070302 from Paul H. Rosendahl, Inc. to Mark Spengler of U of N Bencorp, dated July 7, 2002, and from Matthew R. Clark and Robert B. Rechtman, Ph.D., An Archaeological Inventory Survey of TMKs: 3-7-5-10:85 and 3-7-5-17:06, February 2003.

2. Cultural/Historic Resources

Historical documentation indicates that as early as the 15th century during the reign of 'Ehukaimalino, the mokuoloko, the interior land district of Kona with its vast natural resources was a preferential location for royal residence, particularly between the regions of Lanihau to Keauhou. Numerous native oral traditions and foreign accounts illustrate that the ahupua'a of Wai'aha was part of a larger and significant political and population center that was primarily sustained by a variety of dry land agricultural practices. Wai'aha was also a favored retreat for Emma Naea Rooke and her husband, Alexander Kalanikualiholihokekapu 'Iolani (Kamehameha IV), who acquired land in the upland regions of the ahupua'a, and their son Prince Albert Edward Kauikeaouli Leiopapa a Kamehameha. Upon the king's death in 1865, the Dowager Queen Emma purchased the land of Wai'aha from the estate of her late husband, where she retained a home on the estate until her death in 1885. Two recorded oral accounts, one composed by the Queen herself, also speak of the verdant uplands of Wai'aha and the general Kona region in a poetic and honorific tribute. Këia mau kanikau, these lamentation chants marked the death of the young Prince Albert, who died at the age of four from acute appendicitis.

Sources suggest that by the late 1890s, much of the land within the Wai'aha ahupua'a was utilized by the Kona Sugar Company to support the sugarcane industry that was emerging within the region. Following the closure of the plantation in 1926, Manuel Gomes as part of an immense cattle and ranching operation purchased much of the land within Wai'aha, including a large portion of the project area.

Findings

Based upon the information obtained from the review of historical documentation, archaeological reports, oral traditions, informal discussions, and formal interviews, the following is a summary of findings. Please also see Appendix E.

- Since the early 15th Century, the mokuoloko of Kona was a recognized residential and political center whose population was sustained by a variety of agricultural activities and an abundant coastal resource base. Evidence of these traditional land use patterns are documented in remnant cultural properties and features of nä heiau ho'oulu 'ai, nä ko'a, nä kü'ula, springs, enclosures, and terraces of the once extensive Kona field system.
- During the late 1800s, the upper slopes of Wai'aha served as a summer residence for Emma Naea Rooke and Alexander Kalanikualiholihokekapu 'Iolani, who enjoyed the quiet repose of the uplands. These lands remained as a royal estate until the Queen's death in 1885. The ascription of Wai'aha in several kanikau (lamentation chants) composed by the Queen illustrates the exceptional affinity she felt for this place.
- Wai'aha, meaning "gathering water," has one major tributary system whose headwaters are situated in the upper slopes of Hualalai, near 'Umiahu and Kumukou. However, intermittent flow rates of the system historically influenced the development of dry land agriculture.
- Sources suggest that by the late 1890s, much of the land within the Wai'aha ahupua'a was utilized by the Kona Sugar Company to support the expanding sugarcane industry. Following the closure of the plantation and the mill site in 1926, much of the land within Wai'aha was purchased by Manuel Gomes as part of an immense ranching operation.
- Archaeological studies have identified three burial sites within the project site, which are to be preserved in-place. The applicable procedural requirements of HAR, Title 13, Chapter 300 will be administered. Additionally, in the event of an inadvertent discovery that requires that iwi kupuna (ancestral bones) be moved or touched, it is recommended that an identified cultural monitor, a lineal or cultural descendant, or someone of Hawaiian ancestry willing to accept the associative kuleana conducts this task.

It is recommended that the physical design, landscaping, and programmatic themes of the proposed development incorporate and reflect the collective cultural landscape features of Wai'aha and the applicable principles of traditional stewardship practices. The philosophy of the development is to "build to the land," avoiding major cuts and fills.

2019 DEVELOPMENT PLAN
I. CONFORMANCE WITH STATE/COUNTY PLANS

A. State Land Use Designation

In accordance with the State Land Use Commission hearings of March 5 & 6 and June 26 & 27, 2003 LUC Docket No. A02-737, approval has been made granting the State Land Use designation be changed from Agriculture to Urban District, making these parcels consistent in use with the surrounding parcels. The Property is surrounded on three sides by lands in the Urban classification. Abutting the Property on the north, the U of N-Kona is in the urban classification and zoned RM-4. Bordering the project area to the south is the Kona Hillcrest subdivision, classified urban and zoned RS-7.5; there is also a narrow parcel owned by U of N that is urban and split-zoned RD-3.75 and R-7.5. Across Kuakini Highway lies a 6.8-acre parcel classified urban and zoned RM-2; adjacent to that is a 7.8-acre parcel still classified agriculture and zoned AG-5. To the east across Queen Kaahumanu Highway lie parcels zoned commercial and RD-3.75; nearby, the planned Pualani Subdivision is classified urban and zoned RS 7.5. The Pualani Subdivision was granted a change in state land use designation in 1989; the project has broken ground and its development is underway.

B. Conformance To Chapter 205a, Coastal Zone Management & Special Management Area

Hawaii Revised Statutes Chapter 205A, describes Coastal Zone Management (CZM) objectives, policies and guidelines for all development in the State of Hawaii. It specifically sets guidelines for development in the Special Management Areas (SMAs), establishes guidelines for shoreline setbacks, and marine and coastal affairs. The subject Property is not within the Special Management Area established by the County of Hawaii pursuant to Chapter 205A, Hawaii Revised Statutes.

The proposed U of N expansion is consistent with the objectives, policies and guidelines established for the CZM. A detailed discussion of the relationship of the project to the Hawaii State Plan Chapter 205A, Hawaii Revised Statutes follows.

1. Historic Resources:

A. Identify and analyze significant archaeological resources;

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

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

Discussion: While the regulatory requirements of Act 50 are not triggered by the proposed project, the Cultural Impact Assessment (CIA), prepared by Group 70 International, Inc. for the former U of N Bencorp, was conducted in accordance with the substantive components in Chapter 343, Hawaii Revised Statutes, as amended by H.B. No. 2895, H.D. 1 of the State of Hawaii Twentieth Legislature and approved as the aforementioned Act.

The purpose of the Act includes a requirement that a disclosure of effects of a proposed action on the cultural practices of the community and State be provided. The CIA provides historical and ethnographic data related to the Waiaha ahupua'a and the greater Kona community, which includes a disclosure of identified traditional and contemporary land use patterns and uses through the investigation of: recorded native historical accounts; foreign journal logs; correspondence with knowledgeable individuals and organization; and a cursory overview of recorded oral traditions. The purpose of this investigation was to identify the potential cultural properties, features, resources, practices, and beliefs within or associated with the ahupua'a of Waiaha, and if applicable, within the project area. Please see Appendix C.

As a cultural landscape, the ahupua'a of Waiaha offers a kaleidoscope of historical and cultural features and properties. In the event of an inadvertent discovery of ancestral remains, the applicable processes outlined in existing State regulations, specifically those provided in the Hawaii Administrative Rules, Title 13, Chapter 300, Section 40 and Section 33, will be employed.

2. **Scenic and Open Space Resources:**

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

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

Discussion: The Property is located on the lower western slopes of Mount Hualalai, one of five shield volcanoes whose lava flows created the island of Hawaii. The Property is gently sloping, rising in elevation from approximately 100 feet at Kuakini Highway to 325 feet at its highest point, with the steepest slopes on the upper Mauka side just below Hualalai Road. Slopes average 5-10% but increase to as much as 25% just below Hualalai Rd. The slightly steeper slopes on the Mauka end afford the opportunity to provide sweeping ocean views from the Staff Housing complex. Some condominium units will have a view of Kailua Bay. The site plan conserves these views.

3. **Public Participation:**

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

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

Discussion: The U of N Expansion development is not situated in the SMA and therefore does not have coastal zone impacts that would be of concern to the public. However, the former U of N Bencorp has held public meetings for the residents of the adjacent housing developments and businesses alike to inform them of their plans for development and to address any concerns the community may have. These will continue to occur as development plans proceed.

C. Hawaii State Plan, Chapter 226, Hawaii Revised Statutes

Hawaii Revised Statutes Chapter 226, the Hawaii State Planning Act, serves as "a guide for the future long-range development of the State....", which identifies the goals, objectives, policies and priorities for the State to act as a basis for the allocation of limited natural and fiscal resources and to provide for integration of all major State and County activities. Functional Plans are plans that set forth the policies, guidelines and priorities within a specific field of activity. The proposed U of N Expansion Development conforms to the applicable goals, objectives and policies of the Hawaii State Plan and the applicable priority guidelines of the functional plan policies. A detailed discussion of the relationship of the project to the Hawaii State Plan and Functional Plans follows below.

1. Section 226-5: Objective and Policies for Population:

A. To achieve the population objective, it shall be the policy of this State to:

1. Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires.
2. Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.

Discussion: The staff and student housing represent a very minimal increase in the population of North Kona. The proposed expanded facilities will provide full- and part- time employment opportunities both during construction and while operated. The educational opportunities offered at U of N are available to the local community to pursue educational aspirations.

2. Section 226-6: Objectives and Policies for the Economy – In General:

A. Planning for the State's economy in general shall be directed toward achievement of the following objectives:

1. Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.
2. A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.

Discussion: The U of N expansion project will create temporary jobs in construction and ongoing jobs in operation of the facilities.

3. **Section 226-7: Objectives and Policies for the Economy – Agriculture:**

Planning for the State's economy in general shall be directed toward achievement of the following objectives:

1. Viability of Hawaii's sugar and pineapple industries.
2. Growth and development of diversified agriculture throughout the State

3. An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.

To achieve the agriculture objectives, it shall be the policy of the State to:

1. Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.
2. Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawaii's economy.
3. Increase the attractiveness and opportunities for an agricultural education and livelihood.

Discussion: The proposed project will reclassify the approximately 62-acre parcel from Ag-1 to both R-4 and CV While the parcel has a history of use for cattle grazing, the land is poorly suited for agricultural production and is surrounded by urban lands on all sides.

D. Objectives and Policies for The Agricultural Economy

Discussion: The County of Hawaii had 1,214,732 acres of land in the Agricultural land use designation in 2000; North Kona had 158,853. The proposed reclassification of 62 acres to the urban land use district is a relatively insignificant change, especially in this case, where the land is poorly suited to agriculture.

1. **Section 226-11: Objectives and Policies for the Physical Environment – Land-Based, Shoreline, and Marine Resources:**

1. To achieve the land-based, shoreline and marine resources objectives, it shall be the policy of the State to:
2. Take into account the physical attributes of areas when planning and designing activities and facilities.
3. Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.
4. Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii
5. Pursue compatible relationships among activities, facilities, and natural resources

2. **Section 226-12: Objectives and Policies for the Physical Environment – Scenic, Natural Beauty, and Historic Resources**

1. Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.
2. To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:
3. Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.

4. Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.
5. Encourage the design of developments and activities that complement the natural beauty of the islands.

Discussion: The planning and design of the development reflects the history, location, topography and setting of the site. Prominent view corridors and major topographical features will be maintained and highlighted in its design. The historical setting of the region will be reflected in its traditionally based planning, architecture, site amenities and operation. The State Historic Preservation Division (SHPD) will be consulted regarding treatment of any historic sites that are identified within the property. No rare or endangered plant and animal species or habitats are present on-site. Native habitats do not exist on the site given its history as an agricultural parcel and the introduction of non-native species over time.

3. **Section 226-13: Objectives and Policies for the Physical Environment – Land, Air, and Water Quality**

1. To achieve the land, air, and water quality objective, it shall be the policy of this State to:
2. Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.
3. Encourage urban developments in close proximity to existing services and facilities.

Discussion: Developing the project parcel is consistent with the intent of this objective as the project site is adjacent to an existing community and commercial development. The project is intended to keep development clustered in this area. It is planned as a destination of compatible activities and facilities representative of the area's sense of place and unique setting.

4. **Section 226-14: Objectives and Policies for Facility Systems – In General:**

1. Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.
2. To achieve the general facility systems objective, it shall be the policy of this State to:
    1. Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.
    2. Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.
    3. Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.

4. Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.

Discussion: Existing roadway systems are generally adequate to accommodate the proposed project. Regional traffic improvements are needed in the area despite the U of N expansion.

The water system will tie into the County's water system. At the present time capacity seems sufficient to meet the projected demand as building slowly occurs over the next 20 years. Coordination with the County Board of Water Supply is underway.

The wastewater system will connect to the existing County system. System capacity is adequate to accommodate the projected loads. Drainage designs will meet County standards for runoff. No offsite impacts are expected.

II. PHYSICAL CHARACTERISTICS AND ENVIRONMENTAL SETTING OF THE PROPERTY AND SURROUNDING AREA

A. Physical Characteristics/ Environmental Setting

1. Description of Subject Property

The Property is currently vacant and undeveloped. It consists of approximately 62 acres and is located on the lower western slopes of Mount Hualalai, one of five shield volcanoes whose lava flows created the island of Hawaii. The Property is bordered by Kuakini Highway on the west, Hualalai Road and Queen Kaahumanu Highway to the east, the University of the Nations-Kona campus to the north and the Kona Hillcrest subdivision on the south. The Property is gently sloping, rising in elevation from approximately 100 feet at Kuakini Highway to 325 feet at its highest point, with the steepest slopes on the upper Mauka side just below Hualalai Road. Slopes average 5-10% but increase to as much as 25% just below Hualalai Rd. The slightly steeper slopes on the Mauka end afford the opportunity to provide sweeping ocean views from Hualalai Village. Some condominium units may have a view of Kailua Bay. The site plan conserves these views.

The climate of the Island of Hawaii is characterized by remarkable differences in rainfall over short distances, mild temperatures, persistent northeasterly trade winds, and distinct climatic regimes in locales sheltered from the prevailing winds. The property is on the leeward side of the Big Island, at a low elevation, and thus receives relatively little precipitation. Yearly rainfall at the nearest weather station (Hölualoa Beach) averages around 28 inches, spread relatively evenly throughout the year. At this station August, the month of greatest average precipitation, averages 3.33 inches and December, the month with least rainfall, 1.6 inches. The property is on the 750-mm isohyet, equal to approximately 29.5 inches per year. Temperatures are similarly fairly constant, with the daily highs averaging between 80 and 85 degrees (with the highest temperatures from August to October), and the lowest temperatures ranging from 64 to 70 degrees Fahrenheit, with the coolest temperatures in January and February. The local daily solar heating and nightly cooling results in ocean breezes flowing up the slopes in the daytime and cooling mountain breezes blowing toward the ocean in the evening. The site plan orients the buildings to catch these breezes and utilize passive cooling techniques.

2. Lava Hazard Zone

Hazard zones from lava flows are based chiefly on the location and frequency of both historic and prehistoric eruptions. "Historic eruptions" include those for which there are written records, beginning in the early 1800's, and those that are known from the oral traditions of the Hawaiian people. Our knowledge of prehistoric eruptions is based on geologic mapping and dating of the old flows of each volcano. The hazard zones also take into account the larger topographic. The island of Hawaii is divided into nine hazard zones according to the level and degree of potential hazards related to lava flows. "Zone 1" designated areas are considered to be areas of greatest potential hazard. These zones are determined primarily from the location and frequency of past eruptions.

In the last 3000 years, Hualalai has erupted near its summit, along the northwest and south-southeast rift zones, and from vents on the north flank of the volcano. Twenty-five percent of the volcano is covered by flows less than 1000 years old. Hualalai last erupted in 1800-1801 from several vents on the northwest rift zone. Large flows spilled down both sides of the ridge formed by the rift zone and quickly reached the ocean. One of these flows lies south of Kiholo Bay, and part of the Kona Village resort is built upon it. Another flow underlies the northern end of the Keahole (Kona) Airport. Other major eruptions occurred about 700 and 300 years ago, respectively. A large flow from the 700-year old eruption forms the north side of Keauhou Bay, south of Kailua-Kona.

The Kailua-Kona area is within Zone 4, indicating a moderate hazard. Zone 4 includes all of Hualalai, where the frequency of eruptions is lower than on Kilauea and Mauna Loa. Flows typically cover large areas. The dormant Hualalai last erupted in 1801 (Stearns and McDonald, 1946). Since 1800, five percent of the Hualalai area has been covered by lava. In the last 750 years, 15% has been covered. (See Figure 4.1 USGS Lava Flow Hazard Zone Map.)

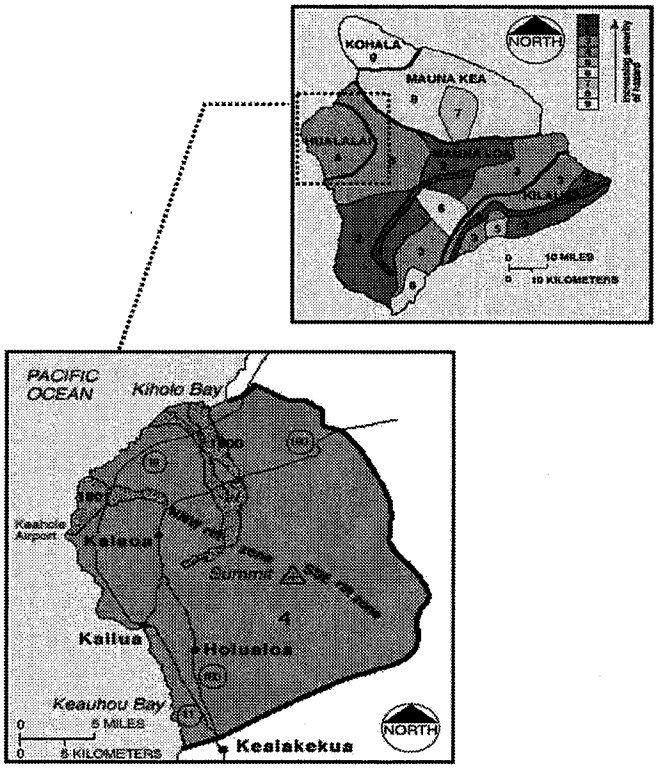


Figure 4-1
USGS Lava Flow Hazard Zone Map

3. Distance from Coastline

The subject Property is not within the Special Management Area established by the County of Hawaii pursuant to Chapter 205A, Hawaii Revised Statutes. Its location is approximately one-quarter mile inland from the coast and is sufficient to help reduce the possibility of any such impacts caused by rainfall runoff even from newly hard-topped areas. No impacts on coastal waters are anticipated. Rainfall in the area is generally quite low and evenly distributed throughout the year. Site design will minimize runoff and provide for its collection, including runoff from newly hard-topped areas, and for its dispersal through percolation from drywells. Adequate provision has been made for the 100-year flood event. No surface water is expected to reach the coast directly, or flow into drainage ways north or south of the property and so reach the coast. The management of surface water and drainage control measures during construction and subsequent operation will meet County of Hawaii and State Department of Health standards.

4. Agricultural Lands of Importance in the State of Hawaii (ALISH) Designation

Community Development Plan

The agricultural potential for the Property is generally poor because of the shallow, rocky soil type. None of the Property is classified as within "agricultural lands of importance to the state of Hawaii" (ALISH). The ALISH classification system contains four categories: prime, unique, other important agricultural lands, and unrated. The Property is classified as unrated. The nearest rated ALISH parcel is roughly three- quarters of a mile south. The Land Study Bureau map classification for the Property is "E"/Very Poor, or among the lowest levels of agricultural productivity. The County of Hawaii had 1,214,732 acres of land in the Agricultural land use designation in 2000; North Kona had 158,853. The reclassification of 62 acres to the urban land use district is a relatively insignificant change, especially in this case, where the land is poorly suited to agriculture.

5. U.S.D.A. Natural Resources Conservation Services Soil Service Report Soil Type

The Property comprises two soil groups. The Soil Conservation Service Soil Survey of the Island of Hawaii, State of Hawaii, locates a narrow band of Honuaulu extremely stony silty clay loam ("HVD") along the Mauka border of the property. The Honuaulu series consists of well-drained silty clay loams that formed in volcanic ash. The HVD soil subtype is generally found with stones covering 3-15% of the area and with slopes of 12-20%. Its typical use is for growing of coffee or macadamia nuts (at higher elevations than the Property), or pasturage.

The vast majority of the Property is Punaluÿu extremely rocky peat ("rPYD") with slopes of 6-20%. The Punaluÿu Series consists of well-drained, thin organic soils over pahoehoe lava bedrock. Soils of this type are used for pasturage. The peat is rapidly permeable; the underlying lava is very slowly permeable, with runoff slow and erosion hazard slight. On the Property, the ground surface is very broken with heaps of sharp broken lava rock appearing more like Aÿä than the smooth pahoehoe. These fragments have been piled, apparently by hand, to facilitate cattle grazing. As described below, the potential for agricultural productivity is low. (See Figure 4.2)

The short-term impact of the proposed action on soils is limited to the small potential for erosion during construction. All earthwork operations will be conducted in compliance with dust and erosion control requirements of the County of Hawaii.

Practicing strict erosion control and dust control measures, particularly those specified in the following, will mitigate the impact of construction activities on soils:

- County of Hawaii Grading Ordinance
- State of Hawaii, Hawaii Administrative Rules, Chapter 11-60.1, Air Pollution Control
- State of Hawaii, Hawaii Administrative Rules, Chapter 11-60.1-33, Fugitive Dust
- State of Hawaii, Department of Health, Water Quality Standards, Chapter 37-A, Public Health Requirements (1968)
- USDA Soil Conservation Service, Erosion and Sediment Control Guide for Hawaii (1968), State of Hawaii, Hawaii Administrative Rules, Chapters 11-55, Water Pollution Control

Primary fugitive dust control methods that will be implemented include providing an adequate source of water to regularly water exposed soil areas, good housekeeping on the job site, and prompt landscaping, covering or paving of bare soils in areas where construction is completed.

6. Land Study Bureau Soil Rating

The Land Study Bureau soil rating for the project site is E324. Land Types with an overall productivity rating or master productivity rating of E are considered very poor or the least suited for agricultural uses. Additionally, the Land Type number 324 indicates this land type is in a soil series of Regosol cones: Huikau, Apakuie and Kilohana, at a deep depth. The texture is unweathering cinders and the color is gray to black. The parent material is cinders. It is stony, well drained on a slope of 36 – 80%. The climate is cool, variable with a mean annual rainfall of 10 – 300 inches. Elevation for this Land Type is between 2,000 to 10,000 feet and is unsuited for machine till ability. (See Figure 4.2 Land Study Bureau Soil Rating Map.)

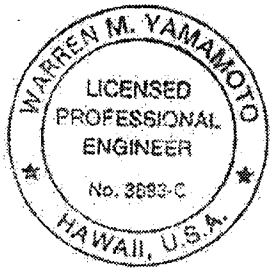
Appendix A

Traffic Impact Analysis Report (TIAR)

EXHIBIT 32

TRAFFIC IMPACT ANALYSIS REPORT

UNIVERSITY OF THE NATIONS
MASTER PLAN



THIS WORK WAS PREPARED BY ME
OR UNDER MY SUPERVISION

Expiration Date: 4/30/06

By:

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TRAFFIC IMPACT ANALYSIS REPORT
for the
UNIVERSITY of the NATIONS MASTER PLAN

A new master plan has been prepared for the University of the Nations in Kailua-Kona, Hawaii. This report documents a study that was conducted to identify the traffic impacts of the proposed project and to recommend any mitigating measures. This report describes the proposed project, the study methodology, results of the analysis, forecast of traffic impacts, and recommendations for mitigating measures.

PROJECT DESCRIPTION

The University of the Nations is a Christian, non-accredited institution granting Associates, Bachelors and Masters degrees. There are currently about 300 students and 200 to 250 staff members each quarter. As part of the education experience, the great majority of students live in the dormitory village on campus with about one-fourth of the staff. Many of the remaining staff reside in apartments within walking distance of the campus. The University of Nations is designed as a walking campus and only about 5% of the students have private vehicles.

The university has a current master plan for its original 41 acre site. The campus site is on tax map key parcel TMK (3)7-5-10:03, and is situated between Hualalai Road and Kuakini Highway. The primary access to this campus is through a roadway onto Kuakini Highway about 3600 feet south of the Kuakini Highway/Hualalai Road intersection. There is no access to Hualalai Road. The location of the campus in relationship to the Kailua-Kona roadway system is shown on Figure 1.

The current master plan includes the following major facilities:

- Conference Center
- Counseling and Health Care Center
- Design Center
- Early Children Education Center – A learning laboratory for teachers whose pupils are primarily the children of staff.

- Ohana Court
- Hale Ohana (dining facility)
- Administration Building
- Village 1
- Villages 2, 3 and 4 - Each village unit would have 48 student units that could accommodate 232 students, 40 staff units and classrooms. The staff units could house one or two staff members, since both spouses living in a campus unit must work on campus.
- Resource Center
- Classroom Laboratory Center

Only the first seven facilities and Village 1 have been developed to date. Village 2 is currently under construction and is expected to be ready for occupancy in Spring 2006. There is no development schedule for the balance of the current master plan since major improvements are made only as donations are received and funds become available. It is virtually impossible to forecast growth of any educational institution that is directly dependent upon demand. The uncertainty is even more severe for a Christian institution. The addition of new facilities is totally dependent upon philanthropy, the generosity of friends. To illustrate the above point, it was predicted in 1980 that the University of the Nations campus would be totally built out in about twenty years, by the year 2000. Now in the year 2005, the original campus master plan is only one-third built out.

In 2000, the University of the Nations purchased the 68-acre agricultural property directly south of the campus from Mr. Gomes. Working through a benefit corporation (Bencorp), extensive plans were prepared for development of the land, ostensibly to benefit the university financially. Early in the spring of 2004, the top administration of the University of the Nations decided to change direction in the planning for development of the former Gomes property. They decided it was a mistake to develop the land for primarily commercial purposes, including 400 condominium units (the Hualalai Village) and the Pacific Island Cultural Center.

A new master plan has been developed that incorporates the former Gomes property into the original campus master plan. The expanded campus site is on tax map key parcels TMK (3)7-5-10:85 and :86. The proposed master plan for the expanded campus is shown on Figure 2.

The new direction would complete only the first 103 units of Hualalai Village at the mauka end of the property. These units received separate zoning approval and are currently under construction. The first half of the project has been completed and is occupied. Access to the Hualalai Village is via a single roadway connecting to Hualalai Road about 1,100 feet northwest of the Queen Kaahumanu Highway Extension intersection. The project access point is shown in relation to the Kailua roadway system on Figure 1.

The remainder of the land would be preserved for the future growth of the university campus. The following facilities would be added on the remaining 62 acres:

- Student Village Apartments - Three Villages (5,6,and 7) with the same design concept as the earlier Villages.
- Low-cost staff housing community - Eventually up to 100 family units would be available for staff to purchase, including efficiencies, one-bedroom, two-bedroom, and three-bedroom condominiums. These would be similar to the Hualalai Village housing in character but would be much less in cost. They would be constructed as the need demands, slowly, over several years. The intended market would be the more senior staff who have "settled down." These units would be located adjacent to the Hualalai Village with vehicular access around the edge of the village.
- College of Arts and Communications - A performance theater to seat 400 people, plus a stage, studios and offices.
- College of Education - An elementary school for 300 pupils and 25 staff from kindergarten through 8th grade levels, with teaching laboratory, classrooms and offices. The students are expected to be primarily children of staff, with a limited number of students from the community.
- Soccer, football, track field - with bleacher seating for 200 people

- Common - A multi-purpose gymnasium/auditorium with balcony seating for 800 people to serve the campus and the community. The facility would be open to the community on a special needs basis, and not on a regular basis.
- Four tennis courts and two volleyball courts
- Olympic swimming pool
- Softball field

Vehicular access and parking for these proposed land uses would be via a mauka-makai service roadway on the south boundary of the property. The makai terminal of the roadway would intersect with Kuakini Highway about one-quarter mile south of the current University driveway. The mauka portion of the roadway would include two emergency access points and one controlled access point. The first emergency access point would intersect Hualalai Road near the Queen Kaahumanu Highway Extension intersection with a right turn in, right turn out design as approved by State DOT staff. The second emergency access point would be between Hualalai Village and the Kona Hillcrest subdivision, which does not have mauka access to Hualalai Road. These two access points would normally be closed and opened only during emergencies. When opened, Kona Hillcrest subdivision residents would have a direct route to Hualalai Road. The third controlled access point would allow Hualalai Village residents access to the mauka-makai service roadway. This controlled access point (whose specific control mechanism has not yet been identified) would allow Hualalai Village residents access to Kuakini Highway but not allow campus staff/students access to Hualalai Road. The controlled access would be opened in times of emergency so that the general public on Kuakini Highway could have a secondary evacuation route. This roadway access is expected to be available by 2008.

Throughout this campus expansion, the University intends to maintain their design as a walking campus. In addition to two mauka-makai vehicular roadways, there would also be perhaps two north-south connector roadways and a series of pedestrian walkways between the two roadways. A system of people mover shuttles utilizing golf cart technology that can travel on the walkways is envisioned

to keep the campus pedestrian oriented. It would be possible to go anywhere on the campus without having to use an automobile, although vehicular circulation would be available throughout the campus.

A previous paragraph discussed the difficulty with preparing development schedules for the University. For the purposes of this study, a tentative schedule identifying the starting dates of various facilities based upon assumptions and best guesses available is shown below:

- 2006 - Completion of Village 2.
- 2008 - Completion of Village 3; start of construction of Staff housing condominiums at a rate of 25 per year, with completion expected in 2012; and construction of mauka-makai service road.
- 2010 - Completion of Village 4; Soccer, football, track field.
- 2012 – Completion of Village 5; multi-purpose gym.
- 2014 – Completion of Village 6; tennis courts.
- 2016 – Completion of Village 7; Arts & Communications Center
- 2022 - Elementary School
- 2024 - Olympic pool
- 2028 - Other sports fields (softball)

The number of staff units available in the Villages and staff housing based on the above schedule is summarized below:

YEAR	VILLAGE	CUMULATIVE VILLAGE STAFF UNITS	STAFF HOUSING CUMULATIVE UNITS	TOTAL CUMULATIVE STAFF UNITS
2004	One	50		50
2006	Two	90		90
2008	Three	130	0	130
2010	Four	170	50	220
2012	Five	210	100	310
2014	Six	250	100	350
2016	Seven	290	100	390

Based on the current staff level of 250 of which about 75 live in the Villages, there are about 175 staff members who do not live in the Villages. This assumes that there are 1.5 staff members per staff unit. To determine the future number of commuting and non-commuting staff, it is assumed that total number of staff would increase by 40 each time a Village opened, and by 20 per year in those years Villages were not initially opened. Based on the proposed development schedule and the above assumptions, the cumulative student and staff (by Village, staff housing, and non-resident) populations are summarized below:

		STAFFING POPULATION			
YEAR	STUDENTS	VILLAGE	HOUSING	NON-RESIDENT	TOTAL
2004	300	75	0	175	250
2006	532	135	0	175	310
2008	764	195	0	175	370
2010	996	255	75	100	430
2012	1228	315	150	25	490
2014	1460	375	150	25	550
2016	1692	435	150	25	610

The above schedule assumes that University student and staff population will peak in 2016. The number of non-resident staff is forecast to remain steady to 2008, and then begin decreasing as more Villages and staff housing are built, to a level one-seventh the current population. This implies that the University would be "self-sufficient" by about 2012, with only a very small portion of the staff living off-campus.

STUDY METHODOLOGY

The first task is to identify the study area and time frame. Based on the location of the project and previous TIAR's performed for the site, the four major intersections which would be utilized by drivers to the project site are identified on Figure 1 and listed below:

- Queen Kaahumanu Highway Extension at Nani Kailua Drive
- Queen Kaahumanu Highway Extension at Hualalai Road
- Kuakini Highway at Hualalai Road
- Kuakini Highway at Oni Oni Street/Walua Road

Two future analysis years were selected based on the development schedules for the original and proposed master plan projects. The first analysis year is 2010 to coincide with completion of the original master plan. The second analysis year is 2016 when Village Seven is scheduled to be completed. The academic and athletic facilities proposed for the new campus were not considered in the timetable since they are not expected to be external trip generators. These facilities are primarily resources for use by the University staff and students, who would already be on campus.

EXISTING CONDITIONS

A survey of the existing roadway and traffic conditions was made.

Existing Roadways

The roadways of interest in the study area include the Queen Kaahumanu Highway Extension (a.k.a. Hawaii Belt Road), Kuakini Highway, Hualalai Road, Nani Kailua Drive, Oni Oni Street and Walua Road.

Queen Kaahumanu Highway Extension is the major north-south arterial passing through Kailua. It is a continuation of Queen Kaahumanu Highway that extends from Kawaihae Road in the north to the merge with Kuakini Highway in the south. The highway and extension are part of State Routes 11 and 19 that form part of the circle island route. Queen Kaahumanu Highway Extension is a two-lane highway but has two south bound lanes in the vicinity of Henry Street. There are traffic signals and separate turning lanes at major intersections along this route. The highway is posted for 35 miles per hour speed limit north of Nani Kailua Drive and 45 miles per hour south of Nani Kailua Drive. The Hawaii Department of Transportation has jurisdiction over this roadway.

Kuakini Highway is a two-lane highway under the jurisdiction of the County of Hawaii and is the middle of three north-south routes through Kailua-Kona. The highway previously served as the State's north-south highway until the completion of the Queen Kaahumanu Highway Extension. It has a 24-feet pavement width and is posted for 35 miles per hour speed limit.

Hualalai Road is a two-lane collector roadway that provides mauka-makai access from Ali'i Drive to Queen Kaahumanu Highway Extension and points mauka. Nani Kailua Drive is another two-lane collector road that provides access through the Pines subdivision between Queen Kaahumanu Highway Extension and Hualalai Road. It also serves the Kailua View Estates subdivision mauka of the highway extension. Oni Oni Street is a two-lane local road that is the only access into the Kona Hillcrest subdivision. Walua Road is a two-lane collector road that provides mauka-makai access between Ali'i Drive and Kuakini Highway. These roadways are identified on Figure 1.

Two of the study intersections are on Queen Kaahumanu Highway Extension. The Nani Kailua Drive intersection has four approaches and is signalized. There are single through lanes and separate left and right turn lanes on each of the highway approaches, while both Nani Kailua Drive approaches have a through/left turn lane and a separate right turn lane. The mauka and makai approaches of Hualalai Road to the highway are offset by several hundred yards from each other so that they operate as separate T-intersections. Only the makai approach was analyzed in this study. The Hualalai Road intersection is unsignalized with separate turning lanes on all approaches.

The Kuakini Highway/Hualalai Road intersection is the southernmost signalized intersection on Kuakini Highway in Kailua-Kona. Both of the Kuakini Highway approaches have separate left turn lanes. The Hualalai Road approaches have different lane configurations. The mauka bound approach has a separate left turn lane while the makai bound approach has a separate right turn lane.

Oni Oni Street and Walua Road intersect Kuakini Highway directly across from each other. Oni Oni Street intersects Kuakini Highway from mauka and has a one lane approach. Walua Road intersects from makai and has a through/left turn lane and a separate right turn lane. Both approaches of Kuakini Highway do not have left turn lanes. The intersection is not signalized and both side street approaches are stop sign controlled.

Traffic Volumes

The University of the Nations is expected to generate its peak traffic during the morning and afternoon commuter hours. Traffic counts taken at the four study intersections on Queen Kaahumanu Highway Extension and Kuakini Highway in 2004 during the morning and afternoon peaks for other proposed projects in the area were utilized. These counts, although one year old, are applicable to this study because of the long forecast time frames (5 and 11 years) of this study. Traffic counts were taken on Queen Kaahumanu Highway Extension on Tuesday and Wednesday, April 13 and 14. The traffic counts on Kuakini Highway were taken on Tuesday and Thursday, April 6 and 8.

Traffic turning movement counts require workers to station themselves by each study intersection and record each vehicle movement as through or turning movements by 15 minute intervals. The worksheets for the traffic counts are included in the Appendix.

The resultant peak hour movements are summarized on Figure 3, with traffic volumes over five vehicles per hour (vph) rounded to the nearest five. The predominant direction of travel on Queen Kaahumanu Highway Extension is north bound in the morning peak and south bound in the afternoon peak, although the afternoon north bound volumes are almost equal to the south bound volumes. The volumes of left turns at the Nani Kailua Drive intersection on the makai bound, south bound and mauka bound approaches are almost equal in the morning peak, and is highest on the south bound and mauka bound approaches in the afternoon.

The volume of left turns from Hualalai Road into Queen Kaahumanu Highway Extension is low, 1 vph in the morning peak and 5 vph in the afternoon peak. These small volumes indicate the level of difficulty in making this movement and show these turns are easier made at the nearby signal-controlled intersection at Nani Kailua Drive.

The dominant traffic volumes on Kuakini Highway are north bound in the morning and south bound in the afternoon. The Kuakini Highway/Hualalai Road intersection shows relatively high left turn movements on three of the four approaches: the north bound, south bound and mauka bound approaches. The north and south bound approaches have leading left turn traffic signal phases while the mauka bound approach has a leading green phase to accommodate the high volumes of left turns.

The 2004 traffic volumes are compared to the 2002 volumes counted for the "Traffic Impact Analysis Report for the U of N Bencorp Development" (First Revision, August 2003) by M&E Pacific, Inc., on Figure 4. The top graphic of each figure shows the 2002 volumes while the bottom graphic repeats the 2004 volumes shown on Figure 3. The bottom figure also shows the combined volumes on each approach, the change in volume between the two years, and the percent change.

The results for the two main north-south routes are mixed. For the morning peak volumes shown on Figure 4A, the north bound approach of Queen Kaahumanu Highway Extension increased 3% at Hualalai Road while decreasing 6% at Nani Kailua Drive. The north bound volumes on Kuakini Highway remained unchanged at Walua Road while increasing 24% at Hualalai road. During the afternoon peak, the south bound approach volumes on Queen Kaahumanu Highway Extension were relatively unchanged, decreasing 1% at Nani Kailua Drive while increasing 1% at Hualalai Road. The south bound volumes on Kuakini Highway showed larger changes, decreasing 6% at Hualalai Road while increasing 11% at Walua

Road. The north bound volumes at both intersections showed large decreases in traffic.

The results are also mixed for the mauka-makai side streets. Traffic on the makai bound approach of Nani Kailua Drive at Queen Kaahumanu Highway Extension increased 9% in the morning but decreased 21% in the afternoon. The mauka bound approach traffic volumes decreased 5% in the morning and increased 28% in the afternoon. The mauka bound approach traffic volumes of Walua Road at Kuakini Highway increased 27% in the morning but decreased 8% in the afternoon. Likewise, traffic volumes on the makai bound approach of Hualalai Road increased 7% in the morning but decreased 18% in the afternoon.

A traffic turning movement count was taken at the entrance to the University of the Nations on Kuakini Highway on January 13, 2005. The traffic volumes are shown on Figure 5 with volumes over five vph rounded to the nearest five. The inbound and outbound volumes are very low for what can be expected for a campus with 300 students and 250 staff. This is because the great majority of students live on campus and much of the staff either live on campus or within walking distance. The traffic counts showed a higher volume of inbound than outbound trips in the afternoon peak period, while the opposite should have been expected. University officials attributed this to resident staff returning to campus from personal errands and non-resident staff returning for dinner with the other staff and students.

Figure 5 also compares the morning and afternoon peak hour counts with similar counts taken in 2000. The right graphic also shows the combined approach volume for the campus roadway, and the volume change and percentage change. For the Kuakini Highway approaches, only the left and right turn volumes into the campus are compared. The comparison shows that traffic volumes into and out of the campus has changed only slightly in five years. During the morning peak, inbound traffic has increased from 95 vph in 2000 to 100 vph in 2005. Outbound traffic increased from 35 to 45 vph. Although the latter represents a 29% increase, there was only an increase of 10 vph. During the afternoon peak, inbound traffic

increased from 45 vph to 70 vph, which is only a 25 vph increase. Outbound traffic volumes remained the same at 55 vph. During this five year period, the enrollment remained the same at about 300 students. By comparison, peak hour, peak direction through traffic on Kuakini Highway increased by 200 vph (55%) in the morning and 65 vph (17%) in the afternoon.

The State Department of Transportation takes traffic counts every two years at selected roadway sections on Hawaii. Two of these count stations: the Queen Kaahumanu Highway Extension/Hualalai Road intersection and the Kuakini Highway/Hualalai Road intersection, are at the study intersections. The data shown on Figure 6 gives the historical trend of daily traffic on these roadways.

Daily two-way traffic volumes for the four approaches of the Kuakini Highway/Hualalai Road intersection are shown for 1992 to 2002. Traffic has increased 39% on the south leg of Kuakini Highway in ten years, with all of the growth in the last two year period. Traffic has remained constant on the west leg of Hualalai Road, dropped 33% on the east leg of Hualalai Road, and decreased 20% on the north leg of Kuakini Highway. Speculative reasons for the stable/decreasing traffic on the three approaches could be laid on the stagnant visitor market following the 9/11 incident. The increase on the south approach in the last two years could be attributed to the development of two commercial centers to the south of Hualalai Road with large parking lots fronting Kuakini Highway.

The traffic volumes on Queen Kaahumanu Highway from 1994 to 2004 shows constant growth, with an annual growth rate of 3.8% on the south leg and 2.7% on the north leg, an average growth rate of 3.2%. The daily two way traffic volumes on Hualalai Road have declined 12% in the ten year interval.

PROPOSED ROADWAY IMPROVEMENTS

The State of Hawaii Department of Transportation and the County of Hawaii each have roadway improvements planned in the study area. The Hawaii Department of Transportation is planning to widen Queen Kaahumanu Highway to a four lane

divided highway north of Henry Street, with design slated to begin in the spring of 2005. This change is not expected to affect traffic patterns in the study area. They also expect to initiate planning studies for the widening of Queen Kaahamanu Highway Extension and Kuakini Highway from Henry Street to Kamehameha III Road soon to determine the feasibility of this project. The State does not have a start date for the construction of this project.

The County of Hawaii has begun widening Kuakini Highway to four lanes between Palani Road and Hualalai Road and improving the traffic signals. These improvements would significantly increase the capacity of Kuakini Highway and add more lanes to Kuakini Highway at the Hualalai Road intersection. The northbound approach would have two through lanes in addition to the left turn and right turn lanes. A right turn lane would be added to the southbound approach. These improvements are expected to significantly improve the traffic operations at this intersection. As will be discussed later, these improvements in themselves would not change the traffic patterns in the study area, but combined with increased traffic congestion on Queen Kaahumanu Highway Extension and completion of the Kahaluu to Keauhou Parkway, some traffic diversion from Queen Kaahumanu Highway Extension to Kuakini Highway can be expected.

The County was planning to begin construction of the Kahalui to Keauhou Parkway (f.k.a. Ali'i Highway) between the Queen Kaahumanu Highway Extension and Keauhou in 2004. This new two lane roadway is intended to divert traffic from the Queen Kaahumanu Highway Extension, Kuakini Highway and Ali'i Drive to improve their traffic operations. The first segment between Lako Street extension and Keauhou was scheduled for completion by 2007. The second segment to Queen Kaahumanu Highway Extension was expected to be complete by 2009. However, litigation has delayed start of construction indefinitely and County officials cannot provide any revised completion dates.

When completed, this roadway improvement project can be expected to cause shifts in traffic between Queen Kaahumanu Highway Extension, Kuakini Highway

and Ali'i Drive in the study area. The "Kahului to Keauhou Parkway Traffic Analysis Report" (August 2000) prepared by Julian Ng, Inc., developed traffic forecasts for eight scenarios on roadway segments south of where the parkway would intersect Queen Kaahumanu Highway Extension. Comparison of "build" and "no build" traffic volumes showed that traffic would decrease 22% on Queen Kaahumanu Highway Extension, 47% on Kuakini Highway and 15% on Ali'i Drive with the parkway built. The Ng report did not address changes in traffic volumes on roadway segments north of the parkway intersection.

Due to the uncertainties associated with the Kahului to Keauhou Parkway and the widening of Queen Kaahumanu Highway Extension south of Henry Street, three different scenarios of roadway improvements were analyzed:

- Scenario 1 assumes that neither proposed roadway improvement would be built, so that this would represent the no-build case.
- Scenario 2 assumes that the Parkway would be built by 2010.
- Scenario 3 assumes that both the Parkway and the highway widening would be constructed by 2016. The highway widening project realistically could not be completed by 2010.

In all, there would be five combinations of three scenarios and two forecast years:

1. Scenario 1, no improvements, 2010
2. Scenario 1, no improvements, 2016
3. Scenario 2, parkway only, 2010
4. Scenario 2, parkway only, 2016
5. Scenario 3, parkway and highway widening, 2016.

TRAFFIC FORECAST

The new master plan is expected to take 20 years or more to fully implement. However, the major components that affect student enrollment and staff levels, the student Villages, are expected to be completed by 2016. As previously stated, this study analyzed traffic conditions for 2010 and 2016.

The traffic forecasting methodology consisted of three steps. The first step was to forecast ambient traffic representing traffic growth on the area roadways with the current campus in place. The second step was to forecast the traffic volumes that would be generated from the master plan elements in each of the two analysis years. The last step was to combine the ambient traffic with the project generated traffic to obtain the total with project traffic forecasts for the two analysis years. The traffic operations with the ambient and total with project forecasts were compared to identify traffic impacts, as described in the next section.

Ambient Traffic Forecast

Ambient traffic on the study area roadways can be expected to increase due to regional growth and new projects in the area. Ambient traffic forecasts were first prepared for 2010 and 2016 scenarios 1, and then adjusted to obtain the 2010 and 2016 scenarios 2 (with parkway) and 2016 scenario 3 (with parkway and 4 lane Hawaii Belt Highway) forecasts.

The 2010 scenario 1 forecast analysis year was calculated first. Traffic growth to 2010 was assumed to come from known future projects and general area growth. Ambient traffic forecasts at the four study intersections for the year 2006 were obtained from the "Traffic Impact Analysis Report Kona Oasis Condominium" (April 2004) and "Traffic Impact Analysis Report Kona Hale Alii" (May 2004), both prepared by M&E Pacific, Inc. The 2006 forecasts were calculated by increasing 2004 volumes (from Figure 3) by 5% (2-1/2%/year) on Kuakini Highway and 4% (2%/year) on Queen Kaahumanu Highway. To these volumes were added traffic that would be generated by the following new projects in the area that were identified with the assistance of County staff:

- Pualani residential subdivision on Hawaii Belt Road- 400 units in 2010.
- Hualalai Village on Hualalai Road- 103 condominium units that are under construction and are part of the new master plan.
- Pua'a elderly housing on Hualalai Road- 126 units.
- Apartment building on Hualalai Road- 164 units.

- Kona Hawaiian Village on Alii Drive and Kuakini Highway- 270 time share units.
- Kona Sea Ridge on Alii Drive- 137 multi-family units.
- Alii Cove on Alii Drive and Walua Road- 200 multi-family units.
- 100 other units on Alii Drive (assumed to include Kona Sea Villas).
- Hotel on Walua Road- 80-90 rooms.
- Commercial lots on Walua Road- 40,000 square feet of retail floor area assumed.

Traffic generated by the first four projects were assigned to Queen Kaahumanu Highway Extension and Kuakini Highway. Traffic from the remaining projects was assigned to Kuakini Highway via Hualalai Road and Walua Road. Traffic forecasts from traffic impact analysis reports were utilized when available. Otherwise, the traditional trip generation, distribution and assignment procedure was used to forecast the additional volume of trips on the study area roadways.

The resultant 2006 traffic forecast was then extended to 2010 by increasing by 8% (2%/year) on Queen Kaahumanu Highway Extension and Kuakini Highway, and 4% (1%/year) on all other roadways. Traffic volumes into and from Oni Oni Street were not increased since it serves a stable neighborhood. The resultant 2010 scenario 1 ambient traffic forecast is shown on Figure 7 with volumes over five vph rounded to the nearest five. The 2010 traffic forecast was then extended to 2016 by increasing by 12% (2%/year) on Queen Kaahumanu Highway Extension and Kuakini Highway, and 6% (1%/year) on all other roadways. The resultant 2016 scenario 1 ambient traffic forecast is shown on Figure 8 with volumes over five vph rounded to the nearest five.

For the scenarios 2 and 3 forecasts, it was assumed that through traffic volumes on Queen Kaahumanu Highway Extension and Kuakini Highway would change while traffic volumes into and from the side streets would remain unchanged. The changes would be relative to the ambient traffic volumes for scenario 1. The aforementioned "Kahului to Keauhou Parkway Traffic Analysis Report" shows AM and PM peak hour traffic volumes on Queen Kaahumanu Highway Extension,

Kuakini Highway, Ali'i Drive and the proposed parkway with various combinations of roadway improvements for 2020. The following scenarios from the report correspond to this study's scenarios 1,2 and 3, respectively:

- o No-Build 1 (Exhibit 3)
- o Build 1 with proposed parkway (Exhibit 7)
- o Build 2 with proposed parkway and 4 lane Hawaii Belt Hwy (Exhibit 8)

The peak hour traffic volumes for the 2020 no-build scenario from the parkway report are shown on Figure 9, for the 2020 build 1 scenario on Figure 10, and for the 2020 build 2 scenario on Figure 11. The Ng study did not forecast traffic volumes north of the parkway's intersection with Queen Kaahumanu Highway Extension and Kuakini Highway. Therefore, the traffic volumes on these roadways north of the parkway were extrapolated from the reported volumes and are shown as derived volumes on Figures 10 and 11. For the build 2 scenario which corresponds to this study's scenario 3, the volume of traffic on Kuakini Highway was thought to be too high; therefore, a portion of this traffic between the parkway and the Queen Kaahumanu Highway/Kuakini Highway junction was diverted to Queen Kaahumanu Highway. These adjusted volumes are shown as derived volumes on Figure 11.

By comparing the traffic volumes on Figures 10 and 11 with those on Figure 9, it was possible to estimate the relative changes in traffic on the two roadway facilities. The relative changes for scenarios 2 and 3 for 2020 are shown on Figures 10 and 11 as "Change from No build scenario" and are summarized below:

	RELATIVE CHANGES FOR 2020			
	SCENARIO 2		SCENARIO 3	
	AM	PM	AM	PM
Queen Kaahumanu Highway Northbound	-95	-120	+380	+190
Queen Kaahumanu Highway Southbound	-100	-155	+330	+420
Kuakini Highway Northbound	+150	+150	+290	+250
Kuakini Highway Southbound	+120	+165	-55	+350

These changes to 2020 traffic forecasts were then adjusted to this study's analysis years of 2010 and 2106, respectively. To develop these adjustment factors, the first step was to determine the change in traffic volumes from 2004 to 2010 relative to the change from 2004 to 2020 traffic volumes for scenario 1. This ratio was the growth ratio from 2004 to 2010. Likewise, the ratio of change from 2004 to 2016 over the change from 2004 to 2020 traffic volumes was calculated to obtain the growth ratios from 2004 to 2016. These growth ratios were calculated for both directions of each highway in the AM and PM peak hours and found to be similar for both directions; therefore, one growth ratio was used for each highway. The following growth ratios were obtained:

	2010		2016	
	AM	PM	AM	PM
Queen Kaahumanu Highway	34%	35%	66%	67%
Kuakini Highway	45%	48%	72%	74%

The positive volume changes in traffic were multiplied by the above growth ratios to obtain the change in traffic volumes for the year and scenario and analysis peak hour. The negative volumes changes were multiplied by the difference of 1 less the growth ratio, implying that traffic would decrease. The resultant relative change volumes for 2010 are shown below:

	RELATIVE CHANGES FOR 2010	
	SCENARIO 2	
	AM	PM
Queen Kaahumanu Highway Northbound	-72	-78
Queen Kaahumanu Highway Southound	-76	-101
Kuakini Highway Northbound	+68	+53
Kuakini Highway Southbound	+54	+58

The resultant relative change volumes for 2016 are shown below:

	RELATIVE CHANGES FOR 2016			
	SCENARIO 2		SCENARIO 3	
	AM	PM	AM	PM
Queen Kaahumanu Highway Northbound	-32	-40	+230	+125
Queen Kaahumanu Highway Southbound	-34	-51	+200	+280
Kuakini Highway Northbound	+108	+111	+210	+185
Kuakini Highway Southbound	+87	+122	-15	+260

The relative changes in volumes for scenario 2 show negative values on Queen Kaahumanu Highway Extension and positive values on Kuakini Highway . The relative change volumes for scenario 3 show generally positive values except for Kuakini Highway southbound in the AM peak hour.

These relative changes in volumes were then added to their respective through volumes on Queen Kaahumanu Highway Extension and Kuakini Highway for scenario 1 to obtain the adjusted ambient volumes for scenarios 2 and 3. The results are shown on Figure 12 for 2010 scenario 2, Figure 13 for 2016 scenario 2, and Figure 14 for 2016 scenario 3, with volumes over five vph rounded to the nearest five.

Project Generated Traffic

The traditional procedure of trip generation, distribution, and assignment was used to forecast the number of trips that would be generated by the proposed projects, the distribution of these trips, and the specific intersection turning movements at the study intersections that would be utilized.

The trip generation step forecasts the volume of vehicle trips that would be generated by the proposed projects during the two analysis periods. Due to the near self-sufficient nature of the University, the traditional trip generation rates from the Institute of Transportation Engineers Trip Generation Handbook (Sixth Edition, 1997) were not applicable to forecast AM and PM peak hour trips that would be

generated by the University. Rather, the existing traffic volumes entering and exiting the university were categorized into four components: commuting staff, resident staff trips, non-resident students and deliveries. The estimated composition of current trips is shown on Table 1 based on the traffic count taken at the University driveway to Kuakini Highway in January 2005.

To calculate the volume of trips that would be generated in 2010 and 2016, the different trip components were adjusted proportionally with their change in population. The number of trips by non-resident staff would decrease with the decline in their population. The non-resident student trips would disappear when non-residents are not permitted. The number of trips by the resident staff was based on trip generation rates: 0.4 in the AM peak and 0.5 in the PM peak hour. These rates are lower than conventional rates for townhouses, as discussed below. The proportion of inbound and outbound trips by resident staff in the PM peak hour is expected to become more balanced to 60% in the future rather than the current 83%. The number of deliveries in both peak hours is not expected to increase with the student population, since larger delivery vehicles or more non-peak hour trips could be utilized. The 2010 and 2016 trip generation analysis for the University of Nations is summarized on Table 1. The volume of inbound trips in the AM peak hour is expected to decline while the volume of outbound trips is expected to increase. During the PM peak hour, the volumes of inbound and outbound trips are forecast to increase slightly.

The forecast number of trips generated by the resident staff per staff residential unit (both Village and Staff Housing) is compared to the rates forecast for the Hualalai Village, Phase 1 below:

	TRIP GENERATION RATES	
	AM PEAK	PM PEAK
Staff Housing Units	0.40	0.50
Hualalai Village	0.51	0.61

The rates for the residential staff units are lower than a comparable multi-family unit since staff would not have to commute.

The trip distribution step divides the generated trips by directions of travel to/from the project site. The trip distribution factors were based on the existing distribution of traffic entering and leaving the University of the Nations driveway as shown on Figure 5, and updated for the future years. The results of this analysis are shown on Table 1.

The trip assignment step assigns the distributed trips as turning movements to the study intersections. The project generated trips were assigned to the north and south project driveways based on whether they were from the north campus or south campus. Trips from the Villages and staff housing were assumed to access Kuakini Highway. Trips from the Hualalai Village that originally access Kuakini Highway via Hualalai Road were diverted to the mauka-makai service road. These diverted trips are shown negative values on the trip assignments figures. The trips were then assigned to the turning movements at the adjoining intersections based on the current distribution of turning movements at these intersections. One trip assignment was made for 2010 and assumed applicable to scenarios 1 and 2 and is shown on Figure 15. The 2016 trip assignment was applicable for all three scenarios and is shown on Figure 16. The traffic volumes are not rounded.

Total Forecast Volumes

The 2010 project generated volumes from Figure 15 were added to the 2010 ambient traffic forecasts for scenarios 1 and 2 from Figures 7 and 12, respectively, to obtain the total with project traffic forecasts on Figures 17 and 19. Likewise, the 2016 project generated volumes from Figure 16 were added to the 2016 ambient traffic forecasts for scenarios 1, 2 and 3 from Figures 9, 13 and 14, respectively, to obtain the total with project traffic forecasts on Figures 18, 20 and 21. Traffic volumes over five vph are rounded to the nearest five.

LEVEL OF SERVICE ANALYSIS

The concept of level of service is used to quantify the quality of traffic flow on roadway facilities. The Transportation Research Board has developed procedures to calculate level of service value(s) by measuring traffic volumes against the capacities of different types of roadway facilities. Their Highway Capacity Manual (2000) describes the various procedures developed for freeways, highways, signalized and unsignalized intersections, etc. A comparison of levels of service for the different forecast scenarios can give an indication of the traffic impacts of ambient traffic growth and the proposed project. The levels of service for the total with project forecasts were compared to the levels of service for the corresponding ambient forecasts to determine if the proposed project would have an adverse traffic impact. A change in level of service to unacceptable levels would be one indication of an adverse traffic impact.

Unsignalized Intersection Analysis

The procedure used for analyzing unsignalized intersections calculates vehicle delays and levels of service based on the distribution of gaps in traffic on the major street and driver judgment in selecting gaps through which to execute turns. For two-way stop intersections where only the minor street approaches are controlled by a stop sign, levels of service are calculated for the critical turning movements including outbound movements from the stop-controlled approach, and left turns from the main road to the minor street. The procedure does not calculate an overall intersection level of service nor does it identify when the through traffic on the main road is over capacity.

The Highway Capacity Manual defines the relationship between level of service and delay (in seconds/vehicle) for unsignalized intersections as shown below:

LEVEL OF SERVICE	DELAY (SECONDS/VEHICLE)
A	<10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.1

Levels of service A to E are considered acceptable for unsignalized intersections. Level of service F (with average delays longer than 50 seconds) is considered undesirable and would indicate the probable need for mitigation. However, level of service F conditions may be tolerated for certain conditions when delays are not excessive and there are no real feasible mitigating measures.

Table 2 shows the levels of service for each critical turning movement at the unsignalized intersections for the AM and PM peak hours, for the existing, ambient and total with project forecast volumes. Scenario 1 analyses include the 2004 existing volumes, and 2010 and 2016 forecast volumes; scenario 2 includes the 2010 and 2016 forecasts; and scenario 3 only has the 2016 forecast.

The Queen Kaahumanu Highway Extension/Hualalai Road intersection currently shows a problem on one turning movement in both AM and PM analysis periods. The eastbound left turn movement from Hualalai Road is already at level of service F and would remain so for all forecast conditions. This poor level of service reflects the difficulty in making this movement and is the reason for the low volumes of these turns counted in both peak periods.

The levels of service on the other two intersection movements are currently at acceptable levels and would remain unchanged during the morning peak hour for the ambient and total with project forecasts for 2010 and 2016 scenarios 1 and 2. With the widening of Queen Kaahumanu Highway Extension for scenario 3, the Hualalai Road right turn would improve to level of service B while the left turn from

the highway into Hualalai Road would decline to level C in 2016. Level of service C is not acceptable for this left turn movement based on traffic observations. This would indicate that unsignalized intersection control would not be acceptable for scenario 3 in 2016.

During the afternoon peak, the northbound left turn from Queen Kaahumanu Highway Extension into Hualalai Road is currently at level of service B and is forecast to remain at that level for the 2010 scenario 1 and the 2010 and 2016 scenario 2 forecasts. However, it would change to an unacceptable level of service C for the 2016 scenarios 1 and 3 forecasts. The right turn from Hualalai Road is forecast to change to level of service E for the 2010 scenario 1 and 2016 scenario 2 forecasts, and to level F for the 2016 scenario 1 forecasts. This change is primarily due to the higher traffic volumes on the highway and less due to increases in traffic on Hualalai Road. Even if there were no increase in traffic from Hualalai Road, increased traffic volumes on the highway would cause the levels of service for the side street movements to decrease.

The above analysis indicates that mitigating measures would be needed at this intersection by 2016 due to increased ambient traffic volumes. The signalization of the intersection and widening of the highway (scenario 3) would be two long-term measures. The impact of signalizing the intersection is discussed in the next section. If the intersection remains unsignalized, the left turn movement from Hualalai Road onto Queen Kaahumanu Highway Extension should eventually be eliminated for traffic safety. The proposed project is expected to generate few trips through this intersection and is not expected to have any adverse impact upon its traffic operations.

Levels of service at the Oni Oni Street/Walua Road intersection on Kuakini Highway are currently at acceptable levels, although the mauka bound through/left turn movement from Walua Road is already at level of service D in both peak periods. With the traffic increases forecast with all three scenarios, the latter movement would change to level of service F by 2010 for all three scenarios due to

the increases in traffic on both Kuakini Highway and Walua Road. A review of the level of service calculation worksheets shows that traffic delays and queues on Walua Road would be considerable, indicating that this problem would require some form of mitigation. The 2016 forecast conditions were not analyzed since it was determined that unsignalized operations would not be feasible by this date.

This analysis indicates the eventual need for mitigation at the Kuakini Highway/Oni Oni Street/Walua Road intersection with or without the proposed project. Traffic signalization when warranted would mitigate the through/left turn problem from Walua Road and also help the residents using Oni Oni Street. The impact of signalizing the intersection is discussed in the next section. Separate left turn lanes on Kuakini Highway should be considered to facilitate the higher through traffic volumes on the highway. When installed, this traffic signal should be coordinated with the proposed traffic signals at the Kuakini Highway/ Kahului to Keauhou Parkway intersection.

In addition, the traffic forecast volumes on Kuakini Highway for the 2016 scenarios 2 and 3 are near the capacity of a two lane urban highway. This would imply that Kuakini Highway should be widened to four lanes if the Kahului to Keauhou Parkway is built or the Queen Kaahumanu Highway Extension is widened to four lanes. Rather than recommend widening the Kuakini Highway for these scenarios, this study recommends that new traffic forecasts be prepared to determine the impacts of both roadway improvement projects on Kuakini Highway, and if the portion of Kuakini Highway between Hualalai Road and the parkway should be widened.

The outbound and inbound left turn movements at the current (north) University driveway on Kuakini Highway are forecast to have acceptable levels of service for both forecast years and three forecast scenarios. No mitigating measures are required but a separate south bound left turn lane on Kuakini Highway should be provided for enhanced traffic operations and safety.

The movements to the new (south) driveway that would serve the proposed mauka-makai service road are also forecast to operate at acceptable levels of service in 2010 and 2016 for all three scenarios. Mitigating measures other than the previously described separate left turn are not required.

As stated for the Kuakini Highway/Walua Road/Oni Oni Street intersection, the traffic volumes forecast for Kuakini Highway with the 2016 scenarios 2 and 3 are near the capacity of a two lane highway. New traffic forecasts are recommended to determine the impact building the parkway or widening the Queen Kaahumanu Highway would have on Kuakini Highway traffic, and if the portion of Kuakini Highway between Hualalai Road and the parkway should be widened.

Signalized Intersection Analysis

The methodology for analyzing signalized intersections calculates the levels of service for individual approaches and the intersection as a whole based on the average stopped delay per vehicle. The results range from level of service A (best with average delays less than ten seconds) to F (worst with average delays longer than 80 seconds), described as follows:

LEVEL OF SERVICE	COUNTS DELAY PER VEHICLE (SECONDS/VEHICLE)
A	<10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

Many jurisdictions consider levels of service A to D as acceptable for areas like Kailua, with level of service F indicating the need for mitigating measures. Level of service E, although considered undesirable, can be tolerated for minor movements such as left turns. The County of Hawaii recommends a minimum level of service

C for proposed projects, while recognizing that many of their signalized intersections are already at level of service D.

Table 3 shows the level of service for the overall intersection and for each approach at the signalized intersections for the AM and PM peak hours, for the existing, ambient and total with project forecast volumes. Scenario 1 analyses include the 2004 existing volumes, and 2010 and 2016 forecast volumes; scenario 2 includes the 2010 and 2016 forecasts; and scenario 3 only has the 2016 forecast. In addition to the current signalized intersections at Kuakini Highway/Hualalai Road and Queen Kaahumanu Highway Extension/Nani Kailua Drive, the currently unsignalized Queen Kaahumanu Highway Extension/Hualalai Road and Kuakini Highway/Walua Road/Oni Oni Street intersections were also analyzed since traffic signals were recommended as mitigating measures.

The Kuakini Highway/Hualalai Road intersection is currently at level of service C in both peak hours with the current design. It is forecast to remain at level of service C in the AM peak hour for all three scenarios with the improved roadway design. The additional capacity that would be brought about by the current widening of Kuakini Highway would offset the higher forecast volumes, resulting in the same level of service. These results imply that the proposed project would not have an adverse traffic impact during the AM peak hour.

The current and future PM peak hour volumes are higher than their corresponding AM peak hour volumes. As a result, the level of service during the PM peak hour would change from C to D for the total with project forecast for the 2016 scenario 1. Although this change in level of service could be attributed to the proposed project, it is not considered an adverse impact since level of service D is still considered acceptable. The levels of service for both ambient and total with project 2016 scenario 2 forecasts would be at D. The levels of service for both 2016 scenario 3 forecasts would be E. This indicates that the higher south bound through volumes on Kuakini Highway forecast for scenario 3 would require some form of mitigation with or without the proposed project.

One possible mitigating measure is to convert the southbound right turn only lane into a shared through/right turn lane and build a second receiving lane on the south side of the intersection. This second through lane would only need to be extended so that southbound traffic could merge together further downstream, since southbound traffic volumes decrease considerably. But as previously noted, this study recommends a new traffic forecast to determine the impact building the parkway or widening the Queen Kaahumanu Highway Extension would have on Kuakini Highway traffic, and if Kuakini Highway would have to be widened.

The intersection at Queen Kaahumanu Highway Extension and Nani Kailua Drive is currently at level of service C in both the morning and afternoon peak hours. The intersection levels of service would remain at C in 2010 and decrease to D in 2016 for scenarios 1 and 2 in the AM peak, which assumed no widening for Queen Kaahumanu Highway Extension. For both scenarios in 2016, the Nani Kailua Drive approaches would be at level of service F, indicating unacceptable conditions. The intersection would remain at level of service C for the 2016 scenario 3 due to the widening of Queen Kaahumanu Highway Extension.

During the afternoon peak hour, the intersection level of service with scenario 1 would decline to D in 2010 and to E in 2016 for both ambient and total with project forecasts. For scenario 2, the intersection level of service would remain at C in 2010 and decline to E in 2016. As in the AM peak, the Nani Kailua Drive approaches would be at level of service F for both scenarios in 2016, indicating unacceptable conditions. The intersection would remain at level of service C for the 2016 scenario 3 due to the widening of Queen Kaahumanu Highway Extension.

The above analysis indicates that mitigation is required by 2016, with or without the proposed project. The widening of Queen Kaahumanu Highway to four lanes would mitigate the problems forecast with scenarios 1 and 2. This finding corroborates the findings in the "Keahole to Honaunau Regional Circulation Plan" (February 2003) by Townscape, Inc., which stated, "Thus, by 2020, peak hour

volumes per lane will be similar to existing conditions even with the completion of the Mamalahoa Bypass and the Parkway as 2-lane roads. Construction of the two-lane Ke Aka o Keauhou (Ali'i Parkway) and Mamalahoa Bypass will thus alleviate traffic congestion over the next 10 to 20 years but will not accommodate 2020 needs for the region." The proposed project is expected to generate few trips through this intersection and is not expected to have any adverse impact upon its traffic operations.

The Queen Kaahumanu Highway Extension/Hualalai Road intersection is currently unsignalized but widening of the highway and traffic signals were recommended as mitigating measures by 2016. With traffic signals, the intersection would remain at level of service C during the AM peak hour for 2010 and 2016 scenario 1. With scenario 2, the intersection would be at level of service B in 2010 and C in 2016. With the highway widening for scenario 3 in 2016, the intersection level of service would be at B. Signalizing the intersection would also make the east bound left turn easier to make and would divert vehicles from the Nani Kailua Drive intersection; thereby, helping to improve the level of service at the latter intersection.

The growth in ambient traffic would have a greater impact during the PM peak hour at this intersection. The intersection would be at level of service C in 2010 and D in 2016 with scenario 1, but the Hualalai Road approach would be at an unacceptable level of service E. With scenario 2, the intersection would be at level of service B in 2010 and C in 2016, but the Hualalai Road approach would be at an unacceptable level of service E. With the highway widening for scenario 3 in 2016, the intersection level of service would be at B. The analysis of PM peak hour conditions indicates that a two lane Queen Kaahumanu Highway would not be sufficient by 2016, and that widening to four lanes would be a mitigating measure. This finding corroborates the findings for the Queen Kaahumanu Highway Extension/Nani Kailua Drive intersection that widening the highway to four lanes would be required by 2016.

The Kuakini Highway/Walua Road/Oni Oni Street intersection is currently unsignalized but traffic signals were recommended as a mitigating measure by 2010, or when warranted. With traffic signals and left turn lanes on Kuakini Highway, the intersection levels of service for both AM and PM peak hours in 2010 and 2016, and for all three scenarios would be at acceptable levels of C or better. This indicates that traffic signals and left turn lanes would be sufficient to mitigate the traffic problems forecast with the unsignalized intersection. The project generated trips passing through this intersection are not expected to have any adverse impact upon its traffic operations since there is no change between the ambient and total with project levels of service.

CONCLUSIONS

This study determined that the existing transportation network in the study region would need to be improved to accommodate future regional traffic growth. The current widening of Kuakini Highway between Palani Road and Hualalai Road and improvement of traffic signals will significantly improve traffic operations and provide additional north-south capacity that should accommodate traffic growth on that section of roadway beyond the 2016 study year.

The status of two other roadway improvement projects is uncertain at this time. Litigation has stopped the commencement of construction of the Kahului to Keauhou Parkway. The State of Hawaii Department of Transportation has only begun the planning process for the widening of Queen Kaahumanu Highway Extension to four lanes between Henry Street and Kamehameha III Road and there is no definite start of construction date. Three different forecast scenarios were evaluated to consider the uncertainty with implementing these two projects:

- Scenario 1 – No highway improvements, neither project is implemented in 2010 or 2016.
- Scenario 2 – The Kahului to Keauhou Parkway is implemented by 2010.
- Scenario 3 – Both the Parkway and the Queen Kaahumanu Highway widening are implemented by 2016.

Based on this study's analysis, the following improvements would be required with or without the proposed project.

1. The Walua Road approach to Kuakini Highway is forecast to be at level of service F by 2010 and in need of mitigation with or without the proposed project. The Kuakini Highway/Walua Road/Oni Oni Street intersection would have to signalized by 2010, or when warranted. In addition, it would be desirable to have separate left turn lanes on the Kuakini Highway approaches due to the increase in traffic forecast on Kuakini Highway.

2. The Queen Kaahumanu Highway Extension is forecast to be near and over capacity in the 2010 to 2016 period. Both the "Traffic Analysis for Kahului to Keauhou Parkway" and the "Keahole to Honaunau Regional Circulation Plan" identified capacity problems on Queen Kaahumanu Highway by 2020. In addition, the mauka bound approach of Nani Kailua Drive is forecast to be at unacceptable levels of service by 2016 without mitigation. The widening of the highway would mitigate both the above problems but is not expected before 2010. Until the highway is widened, some traffic would be diverted from Queen Kaahumanu Highway Extension to Kuakini Highway until the former highway is widened.

3. In conjunction with the widening of Queen Kaahumanu Highway Extension, the Hualalai Road intersection should be signalized. The intersection could be warranted for signals at an earlier date based on the volumes of eastbound right turns and northbound left turns.

4. A new traffic study should be made to determine the impact implementing the Kahului to Keauhou Parkway and widening the Queen Kaahumanu Highway Extension would have on traffic volumes in the portion of Kuakini Highway between Hualalai Road and the Parkway. This study would determine whether or not this section of highway should be widened. The

"Traffic Analysis for Kahului to Keauhou Parkway" did not address this particular issue.

5. If higher traffic volumes do materialize on Kuakini Highway, the capacity of the southbound approach of Kuakini Highway at Hualalai Road would have to be increased. This can be accomplished by converting the southbound right turn only lane into a shared through/right turn lane and building a second receiving lane on the south side of the intersection.

The proposed master plan for the University of the Nations would result in very few additional trips being generated. The large projected increase in student enrollment would be accompanied by a large increase in staff housing so that most of the staff would live on campus, either in the Villages or in the staff housing project. Although the staff is forecast to increase from the current 250 to 600+ in 2016, the number of non-resident staff who will have to commute will decrease from 175 to about 25. Several other actions will also serve to reduce the number of external trips. These actions include serving of communal meals for students and staff, providing preschool and elementary schools for children of staff, and maintaining a pedestrian friendly campus. The number of current and forecast external trips is summarized below:

YEAR	DIRECTION OF TRAVEL	AM PEAK	PM PEAK
2005	Inbound	100	70
	Outbound	45	55
2010	Inbound	100	90
	Outbound	65	80
2016	Inbound	100	130
	Outbound	90	95

Since this traffic would be split between two driveways in the future, the volumes at each would be at reasonable levels and would not require traffic signals. The traffic generated by this proposed project is not expected to have an adverse impact on traffic operations at the study intersections.

UofN BENCORP is willing to pay their pro rata fair share of costs for recommended traffic improvements in the vicinity.

Figures

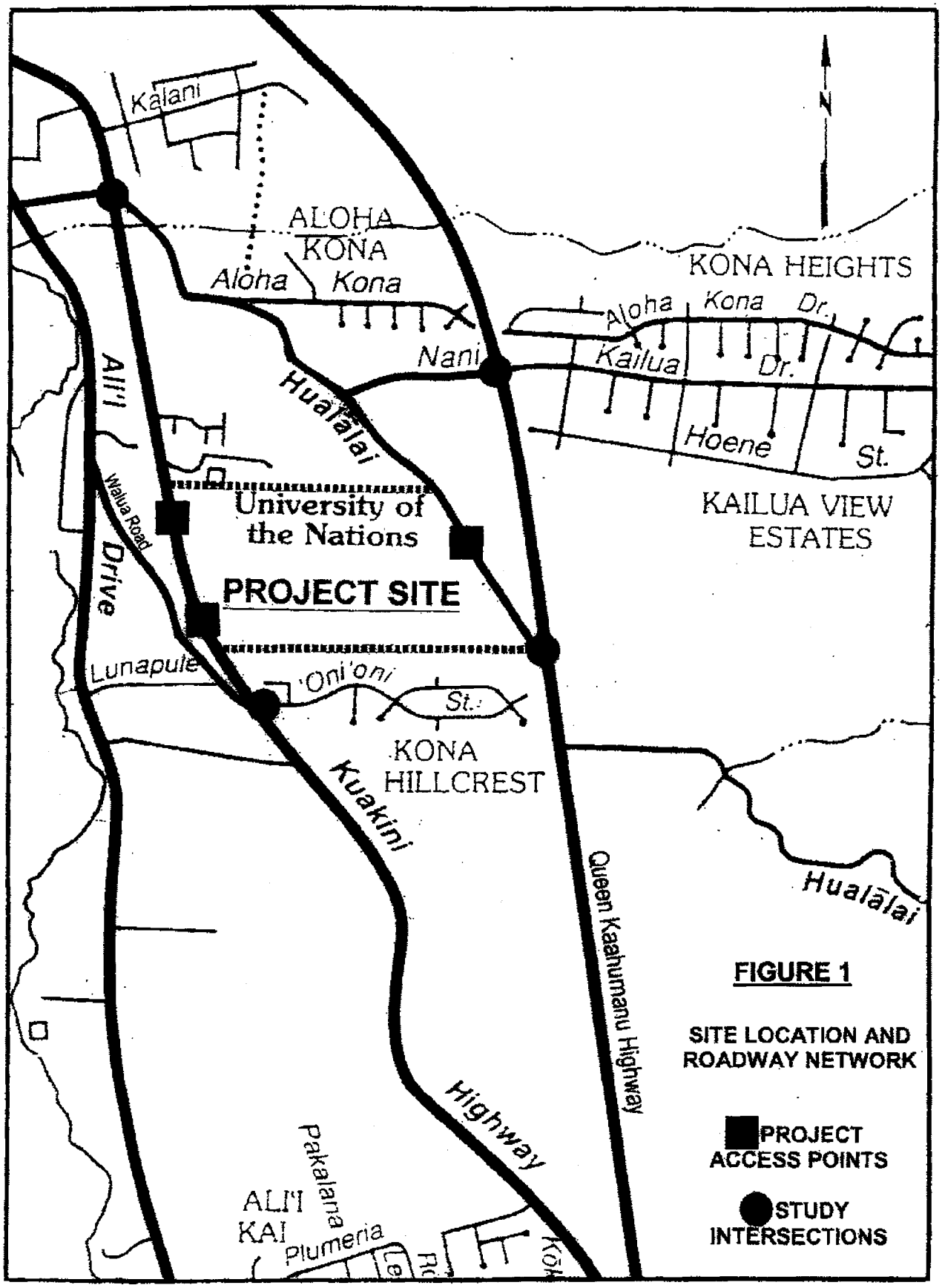
Kalani
ALOHA
KONA
Aloha
Kona
KONA HEIGHTS
Aloha
Kona
Dr.
Kailua
Dr.
Nani
Hualālai
Alii
Drive
Walua Road
Hoene
St.
KAILUA VIEW
ESTATES
University of
the Nations
PROJECT SITE
Lunapule
'Oni'oni
St.
KONA
HILLCREST
Kuakini
Highway
Queen Kaahumanu Highway
Hualālai
Pakalana
ALII
KAI
Plumeria
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FIGURE 1
SITE LOCATION AND
ROADWAY NETWORK
PROJECT
ACCESS POINTS
STUDY
INTERSECTIONS

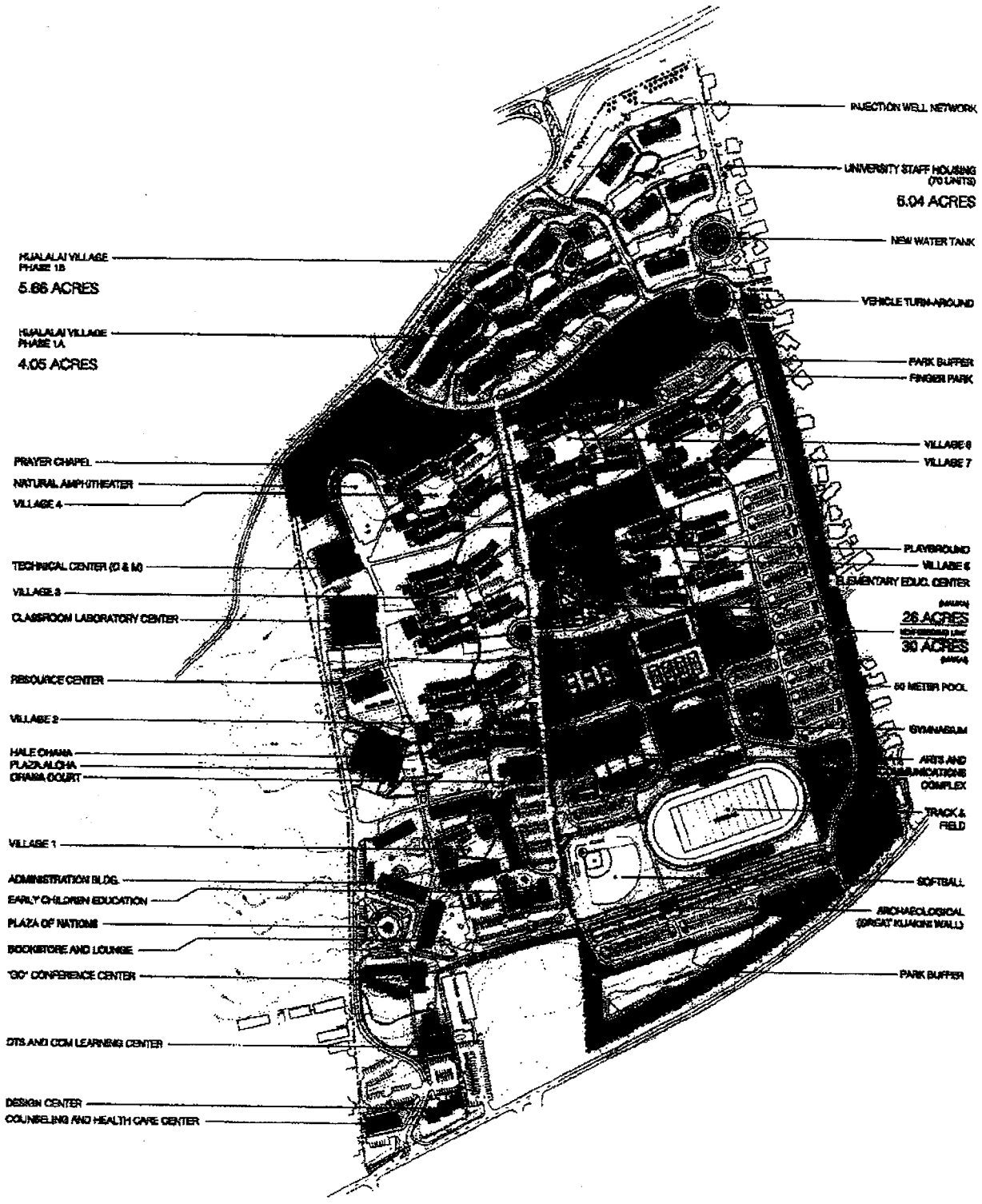
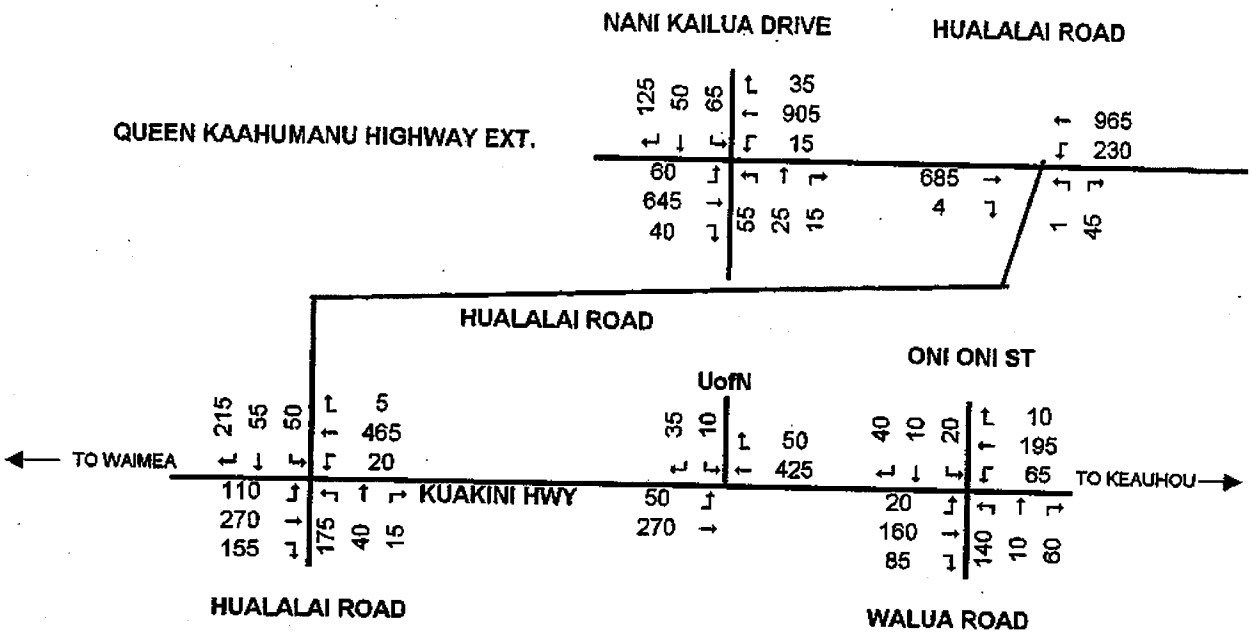
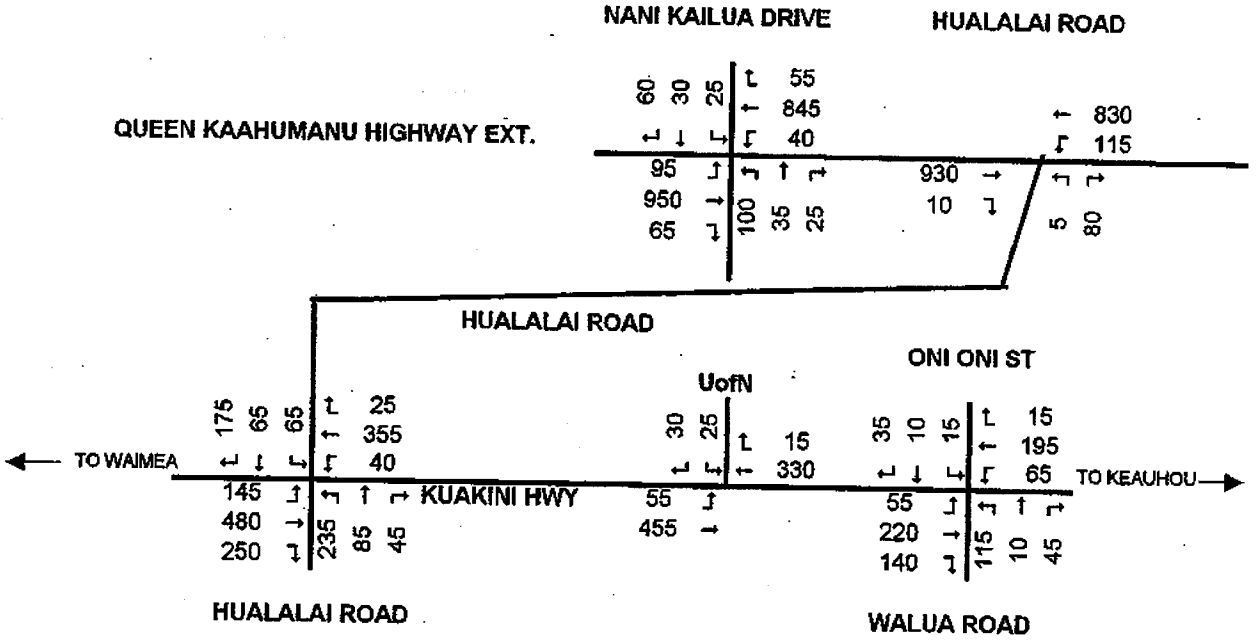


FIGURE 2

SITE PLAN



AM PEAK HOUR

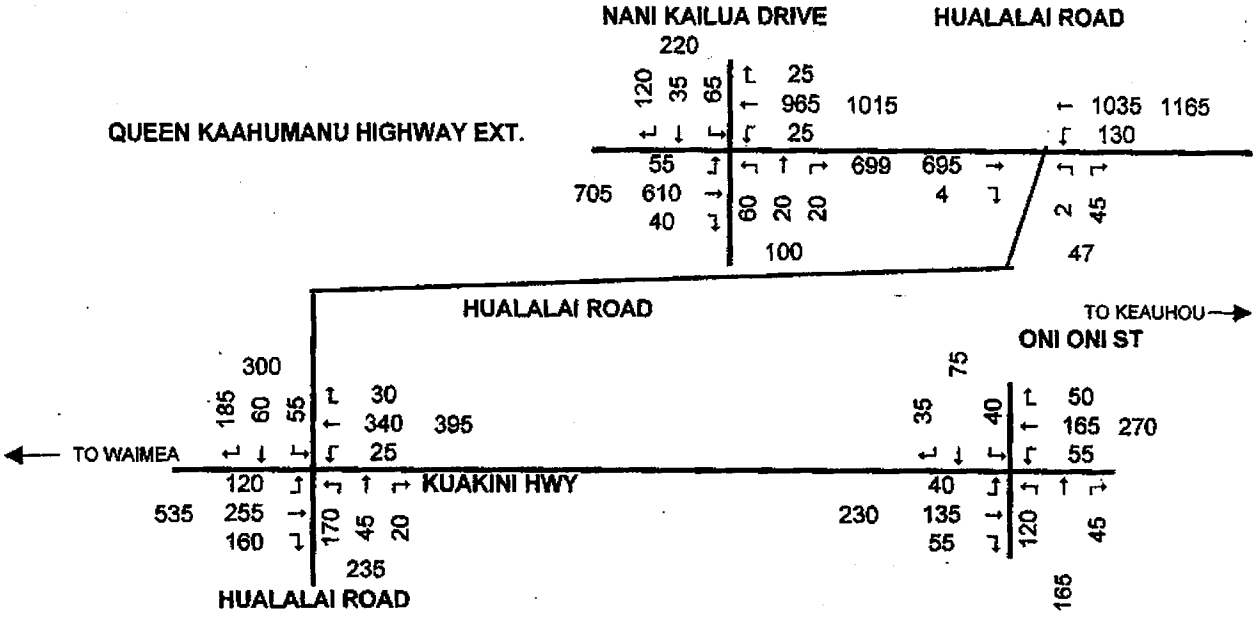


PM PEAK HOUR

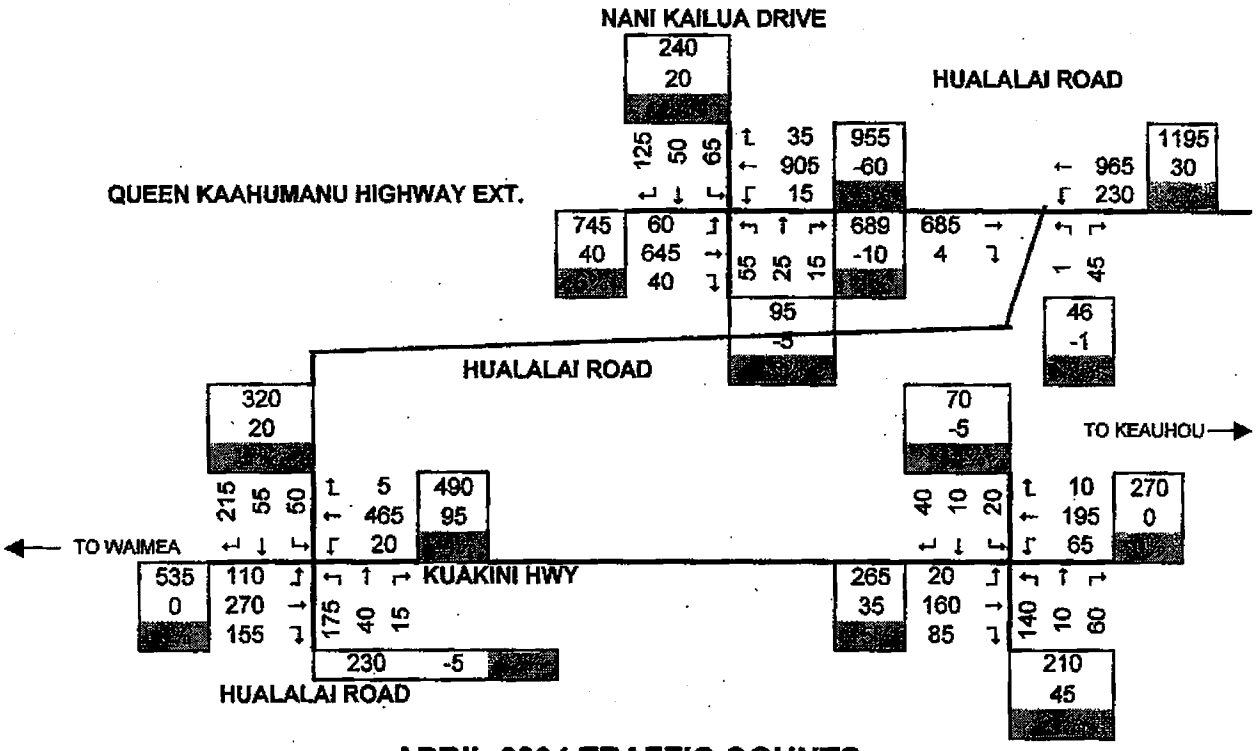
Not to Scale

EXISTING 2004 TRAFFIC VOLUMES

FIGURE 3



SEPTEMBER 2002 TRAFFIC COUNTS



APRIL 2004 TRAFFIC COUNTS

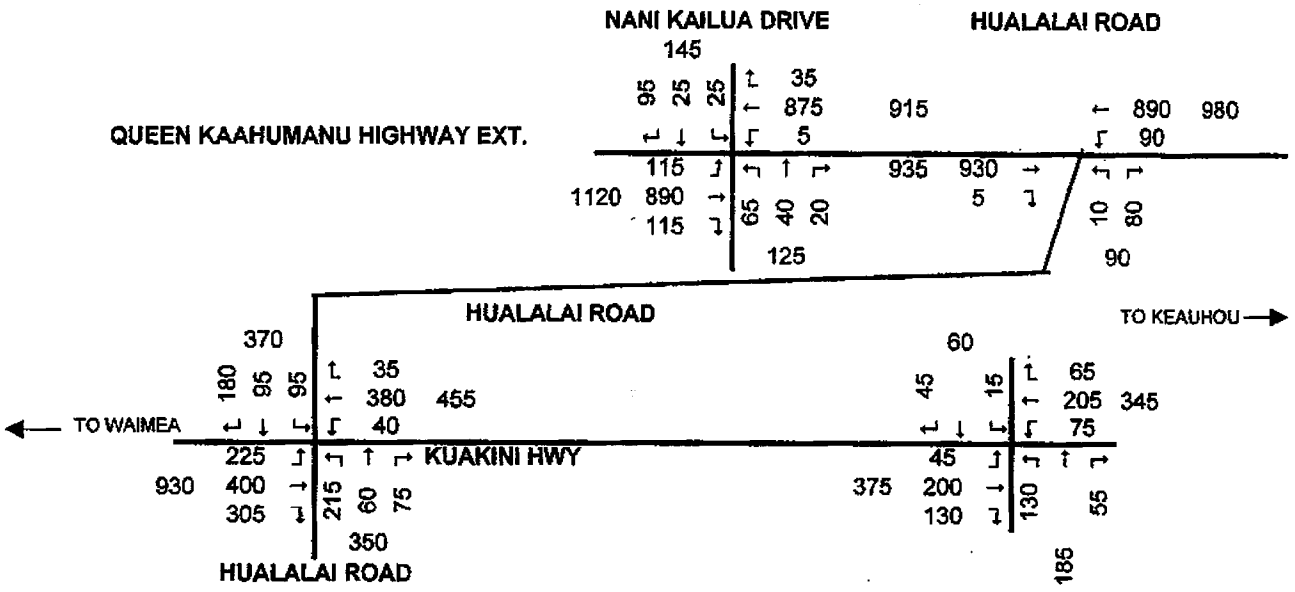
AM PEAK HOUR

Not to Scale

LEGEND

490	Combined approach volume
95	Volume change from 2002 to 2004
	Percent change from 2002 to 2004

COMPARISON OF 2002 AND 2004 TRAFFIC VOLUMES
FIGURE 4A



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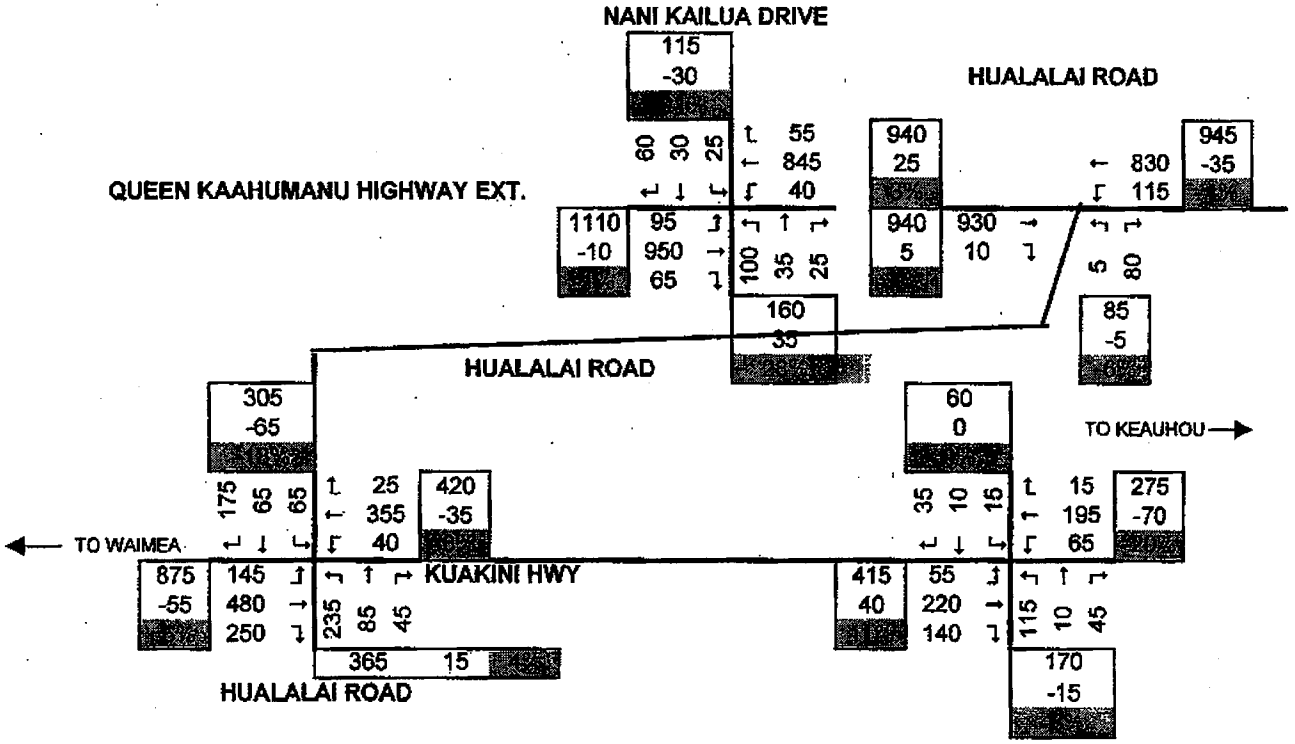


APRIL 2004 TRAFFIC COUNTS

PM PEAK HOUR

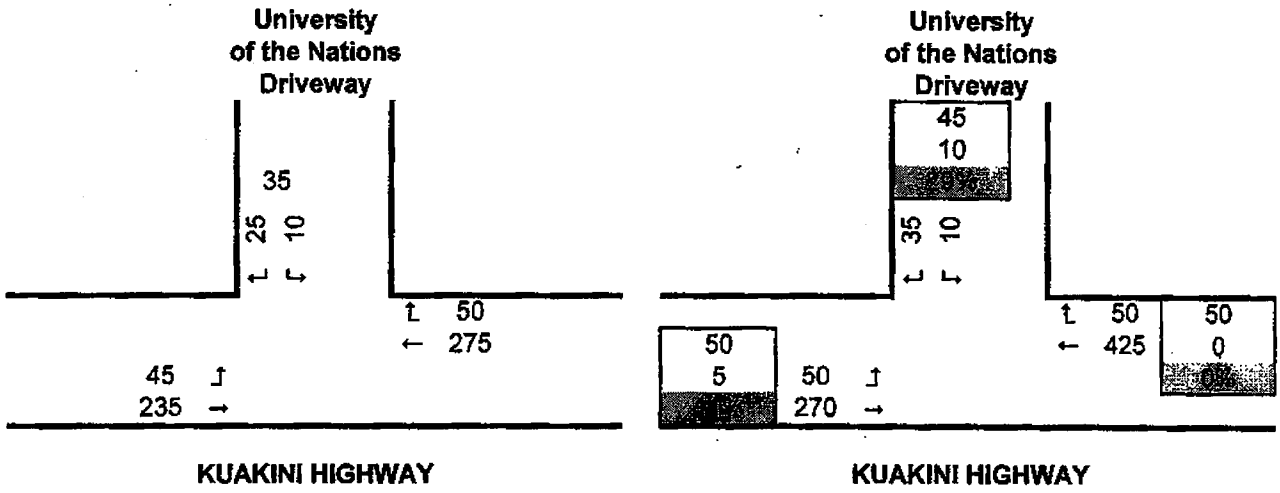
Not to Scale

LEGEND

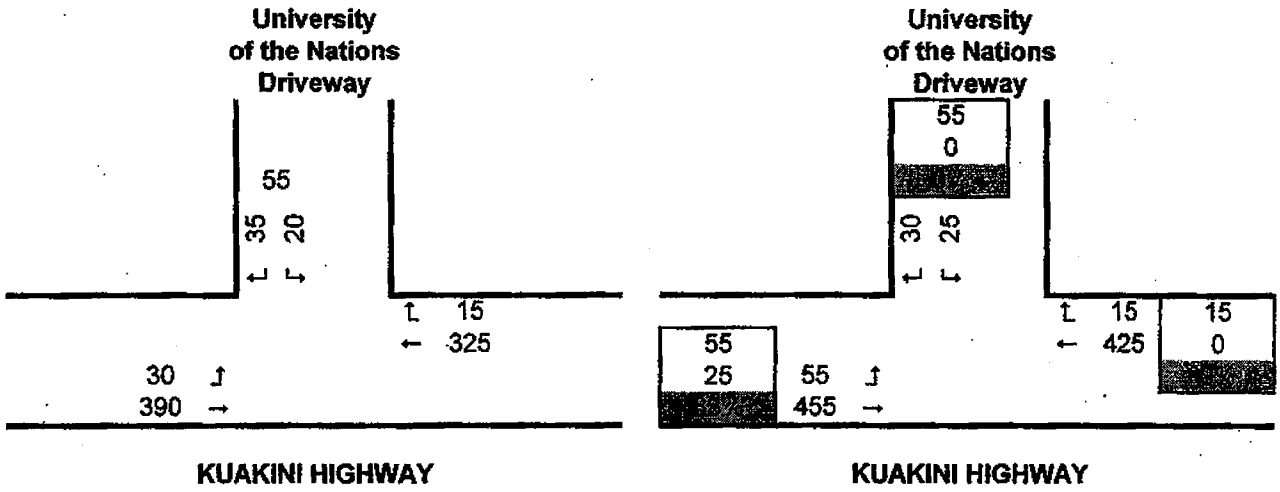
490	Combined approach volume
95	Volume change from 2002 to 2004
	Percent change from 2002 to 2004

COMPARISON OF 2002 AND 2004 TRAFFIC VOLUMES

FIGURE 4B



AM PEAK HOUR



PM PEAK HOUR

LEGEND

490	Movement/Combined approach volume
95	Volume change from 2000 to 2005
	Percent change from 2000 to 2005

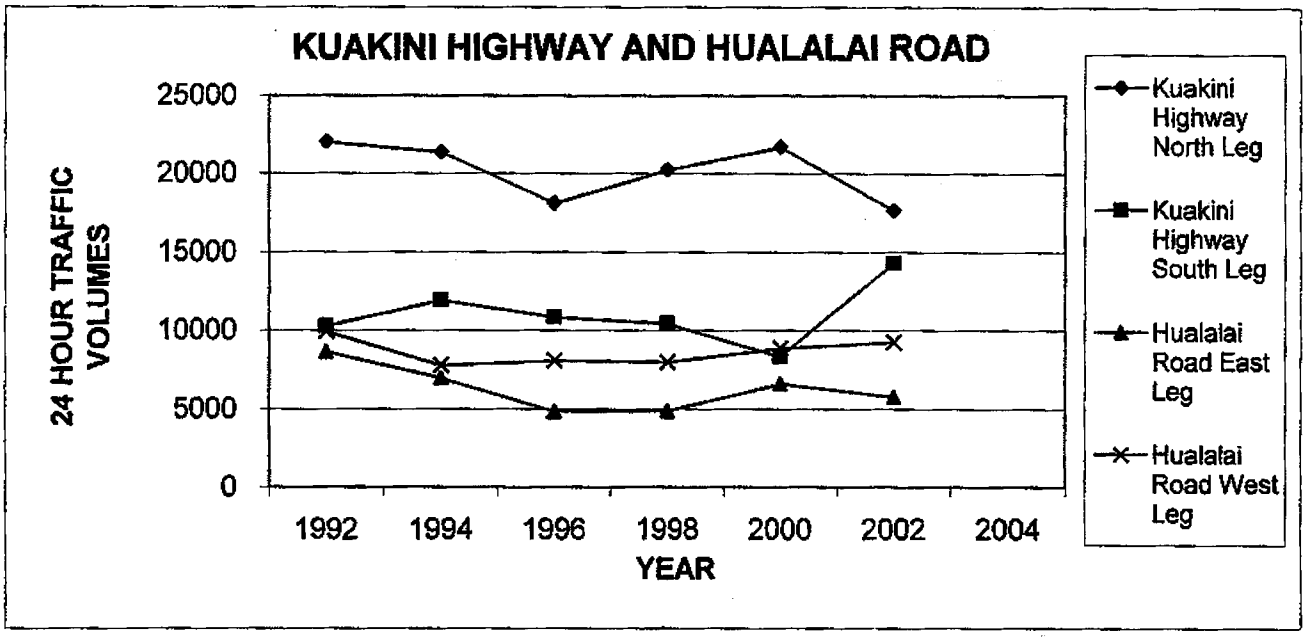
COMPARISON OF 2000 TO 2005 TRAFFIC COUNTS AT UNIVERSITY OF THE NATIONS ENTRANCE

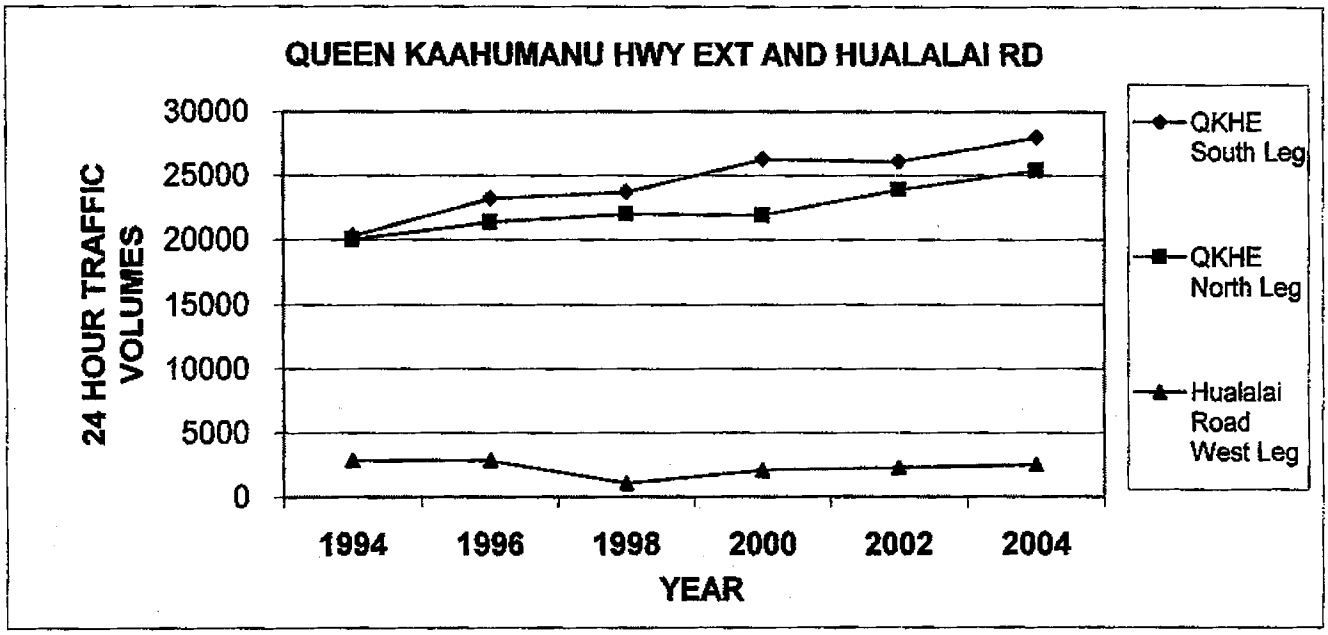
FIGURE 5

24 HOUR TWO WAY TRAFFIC VOLUMES

	STATION 8-K				STATION 9-BB			
	KUAKINI HIGHWAY		HUALALAI ROAD		HIGHWAY EXTENSION		HUALALAI ROAD	
YEAR	NORTH	SOUTH	EAST	WEST	SOUTH	NORTH	WEST	
1992	22022	10281	8660	9952				
1994	21360	11930	6996	7781	20301	20043	2874	
1996	18129	10848	4856	8105	23201	21371	2875	
1998	20254	10436	4884	8016	23732	22027	1079	
2000	21702	8345	6631	8890	26278	21887	2116	
2002	17698	14324	5794	9290	26072	23903	2317	
2004					27981	25419	2532	

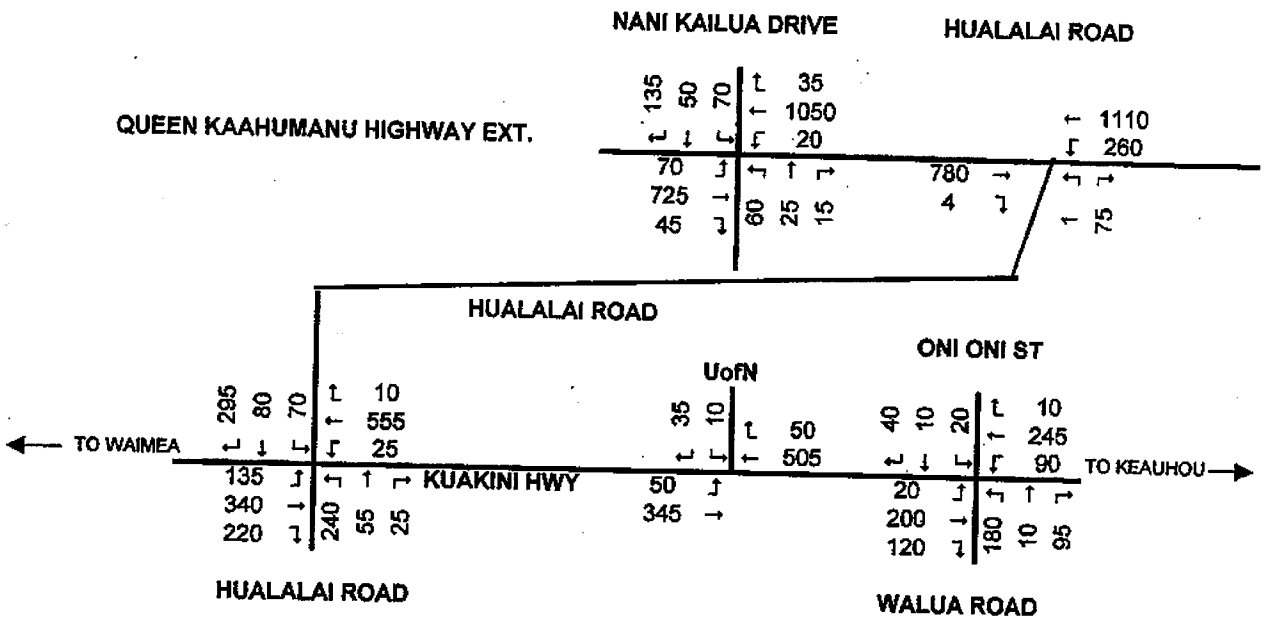
Source: State of Hawaii Department of Transportation



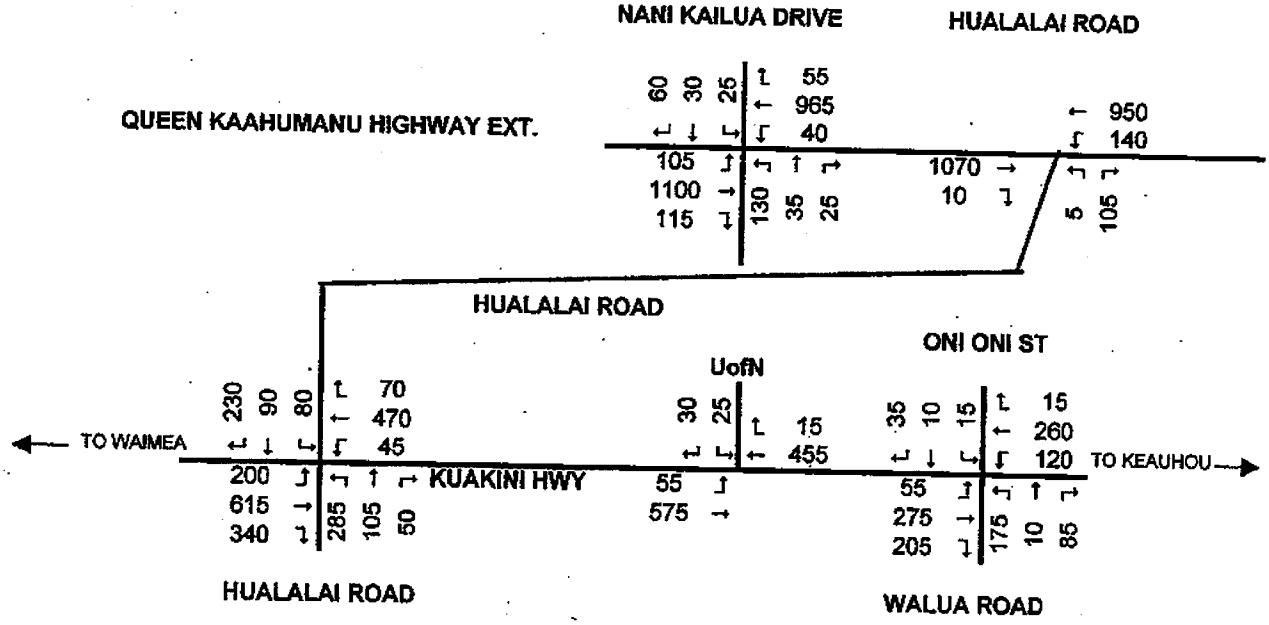


HISTORICAL TREND IN DAILY TRAFFIC VOLUMES

FIGURE 6



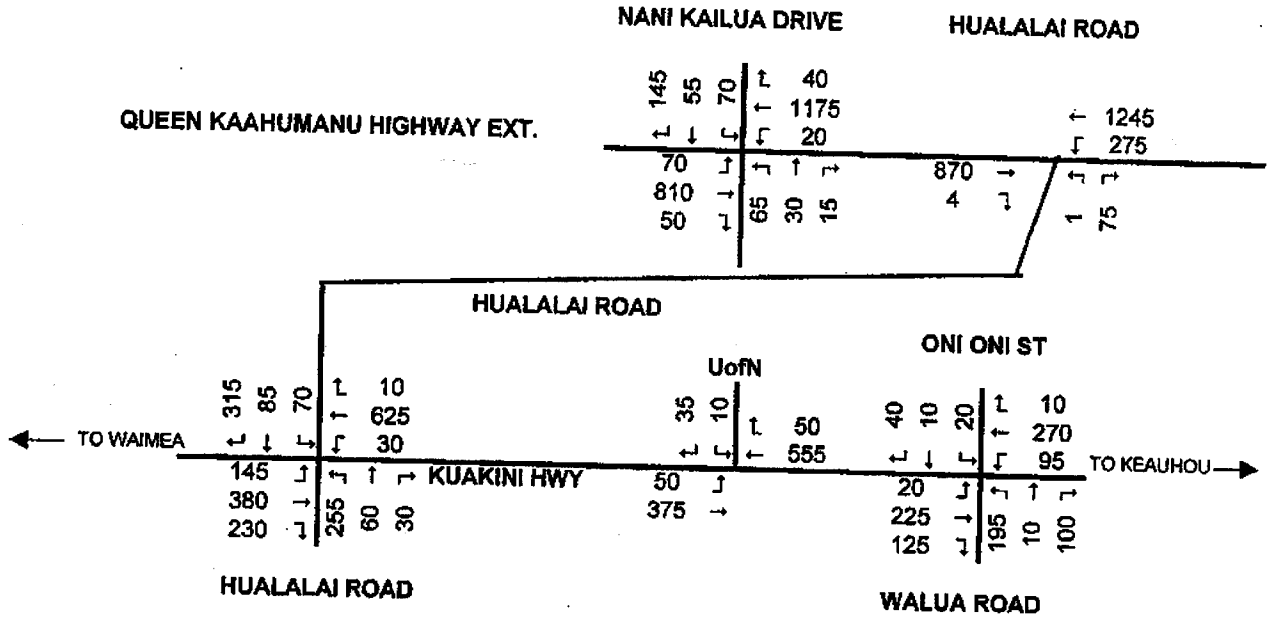
AM PEAK HOUR



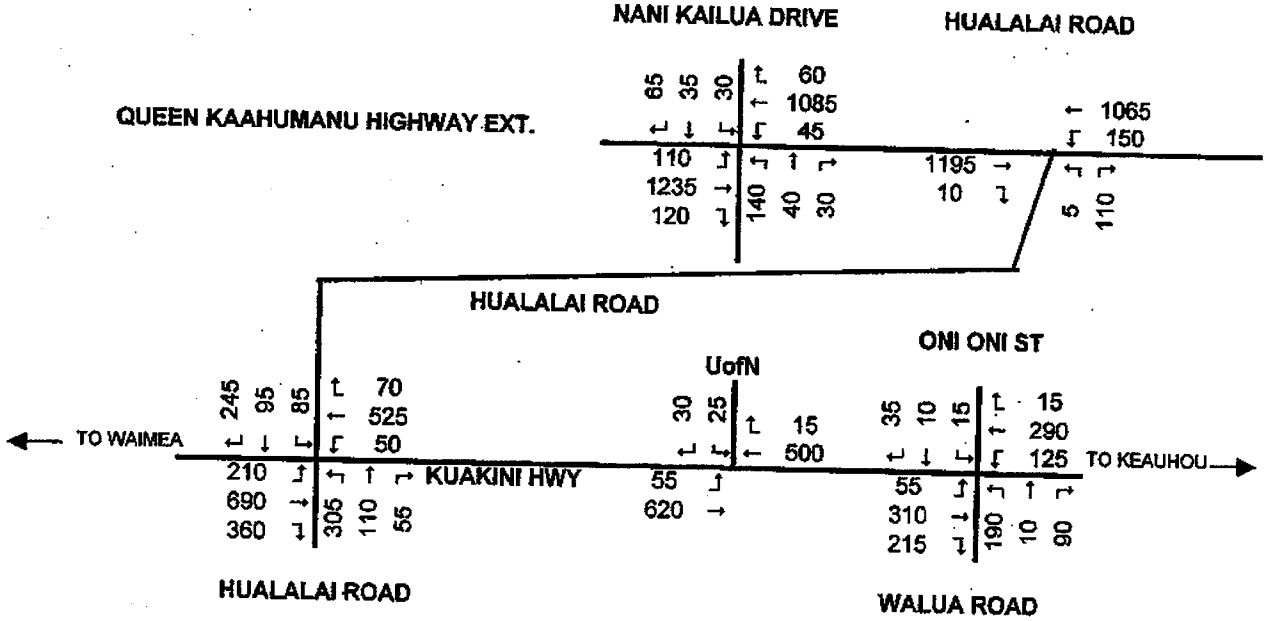
PM PEAK HOUR

Not to Scale

AMBIENT TRAFFIC FORECAST
2010 SCENARIO 1- NO HIGHWAY IMPROVEMENTS
FIGURE 7



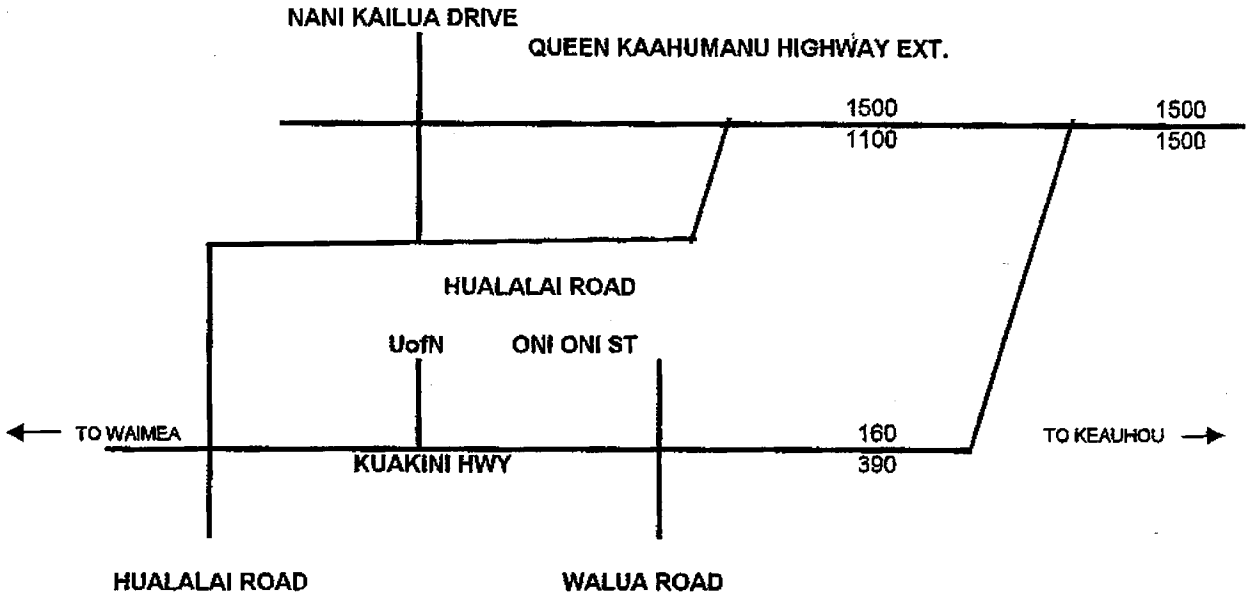
AM PEAK HOUR



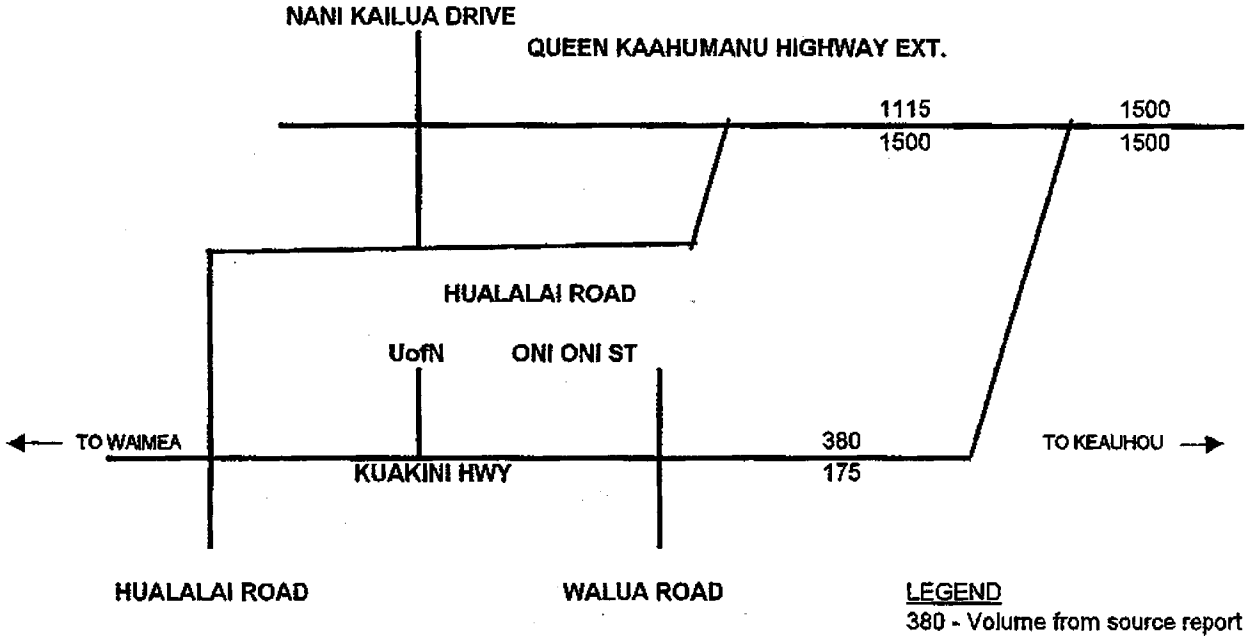
PM PEAK HOUR

Not to Scale

AMBIENT TRAFFIC FORECAST
2016 SCENARIO 1- NO HIGHWAY IMPROVEMENTS
FIGURE 8



AM PEAK HOUR

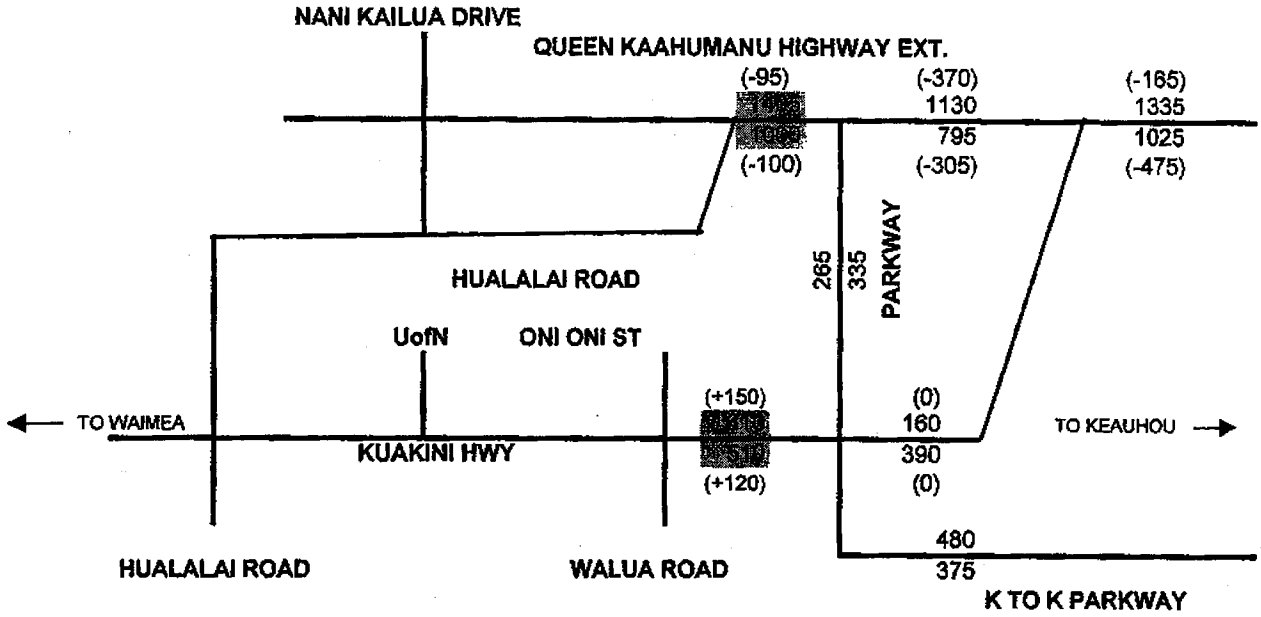


Not to Scale

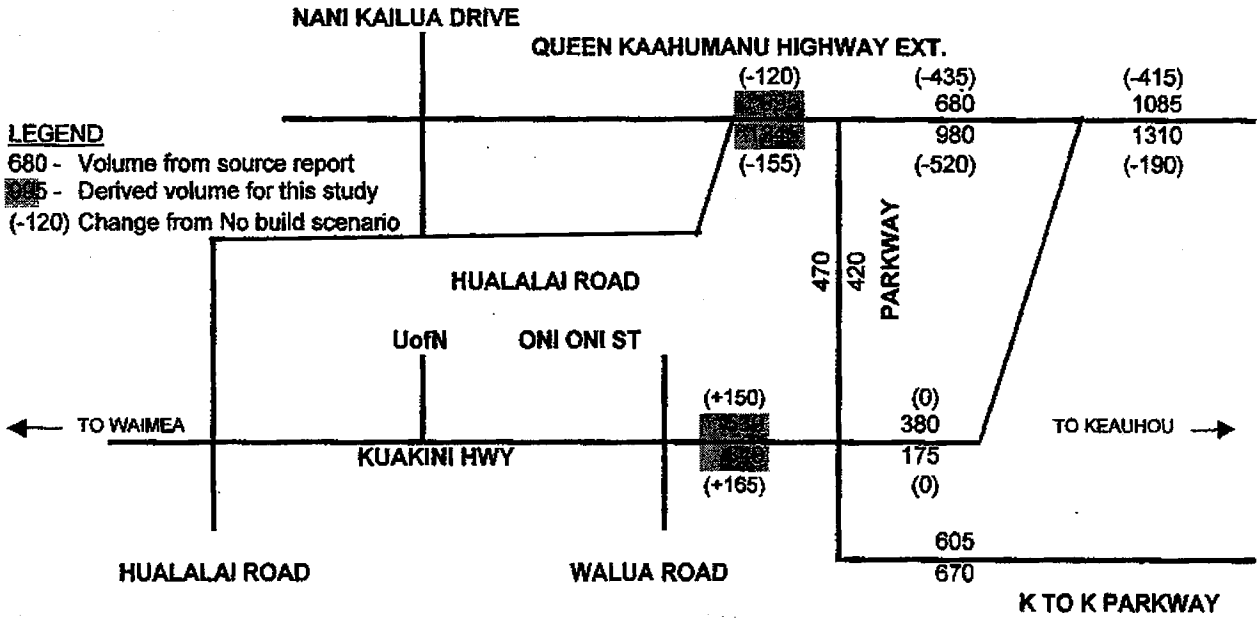
PM PEAK HOUR

Source: Kahalui to Keauhou Parkway Traffic Analysis Report (August 2000) by Julian Ng, Inc.

DERIVATION OF TRAFFIC FORECASTS FOR SCENARIO 1
2020 NO BUILD 1- NO HIGHWAY IMPROVEMENTS (EXHIBIT 3)
FIGURE 9



AM PEAK HOUR

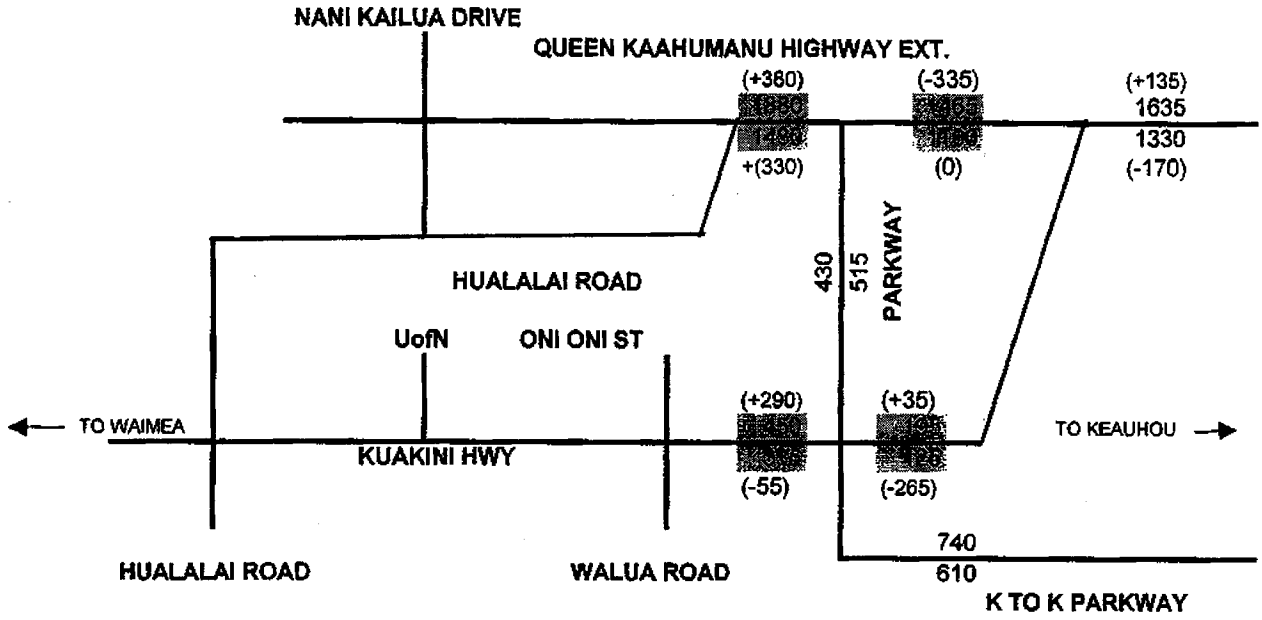


Not to Scale

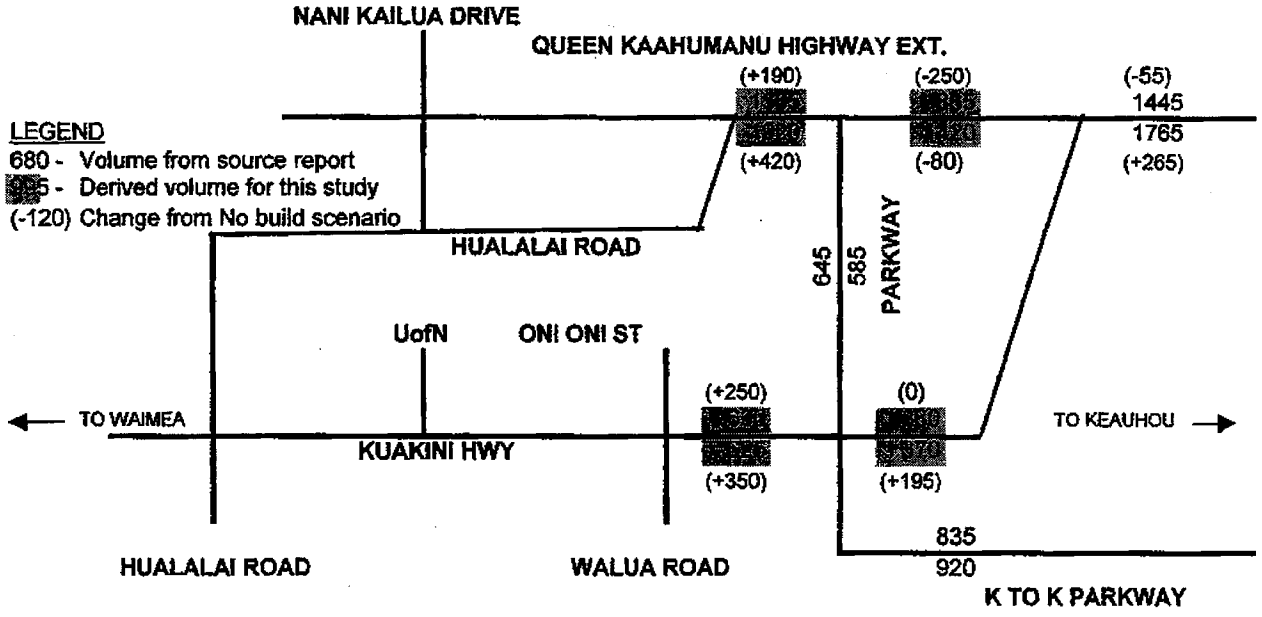
PM PEAK HOUR

Source: Kahalui to Keauhou Parkway Traffic Analysis Report (August 2000) by Julian Ng, Inc.

DERIVATION OF TRAFFIC FORECASTS FOR SCENARIO 2
2020 BUILD 1- WITH KAHALUI TO KEAUHOU PARKWAY (EXHIBIT 7)
FIGURE 10



AM PEAK HOUR

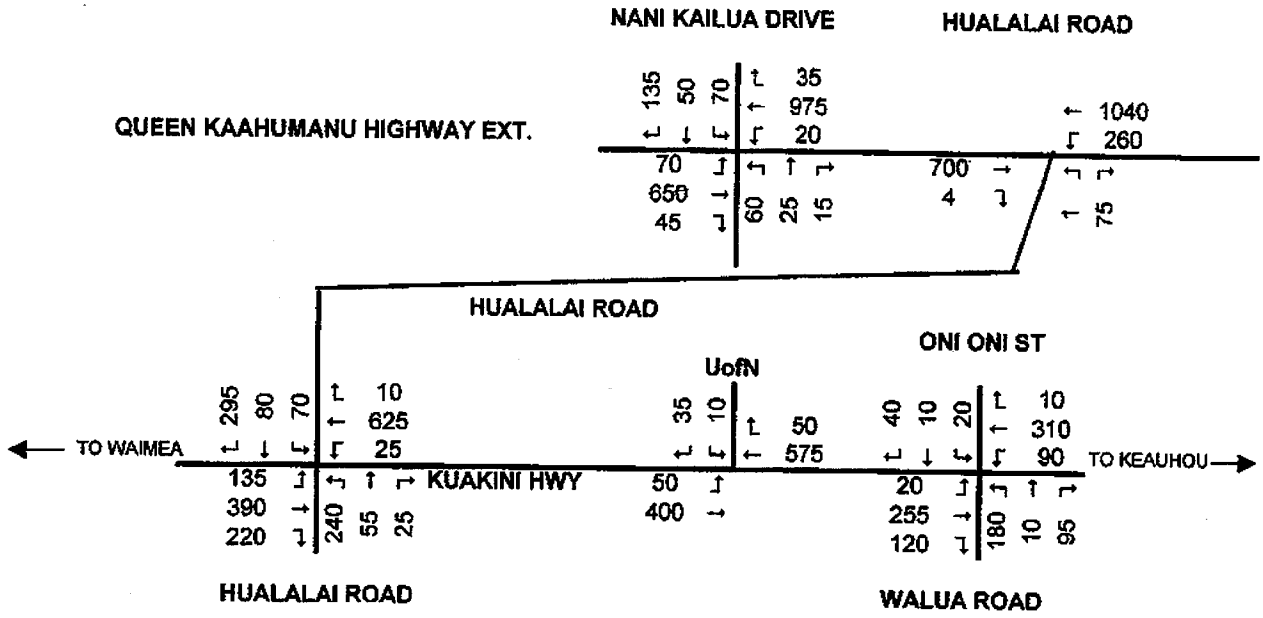


Not to Scale

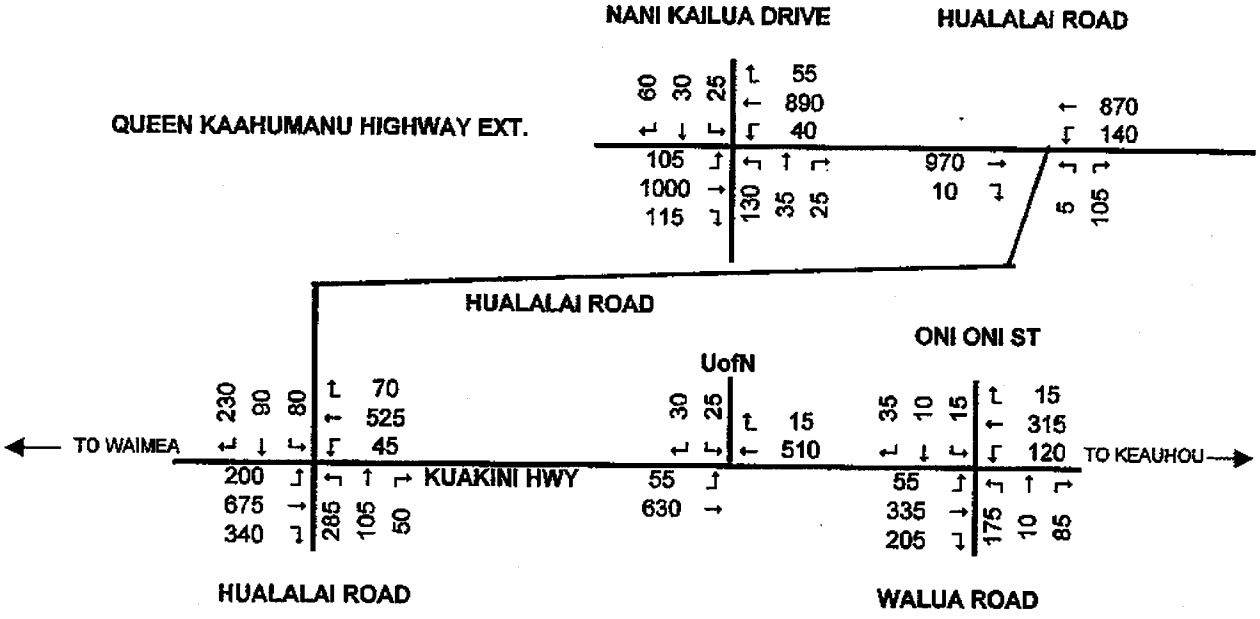
PM PEAK HOUR

Source: Kahalui to Keauhou Parkway Traffic Analysis Report (August 2000) by Julian Ng, Inc.

DERIVATION OF TRAFFIC FORECASTS FOR SCENARIO 3
2020 BUILD 2- WITH PARKWAY AND 4 LANE BELT HIGHWAY (EXHIBIT 8)
FIGURE 11



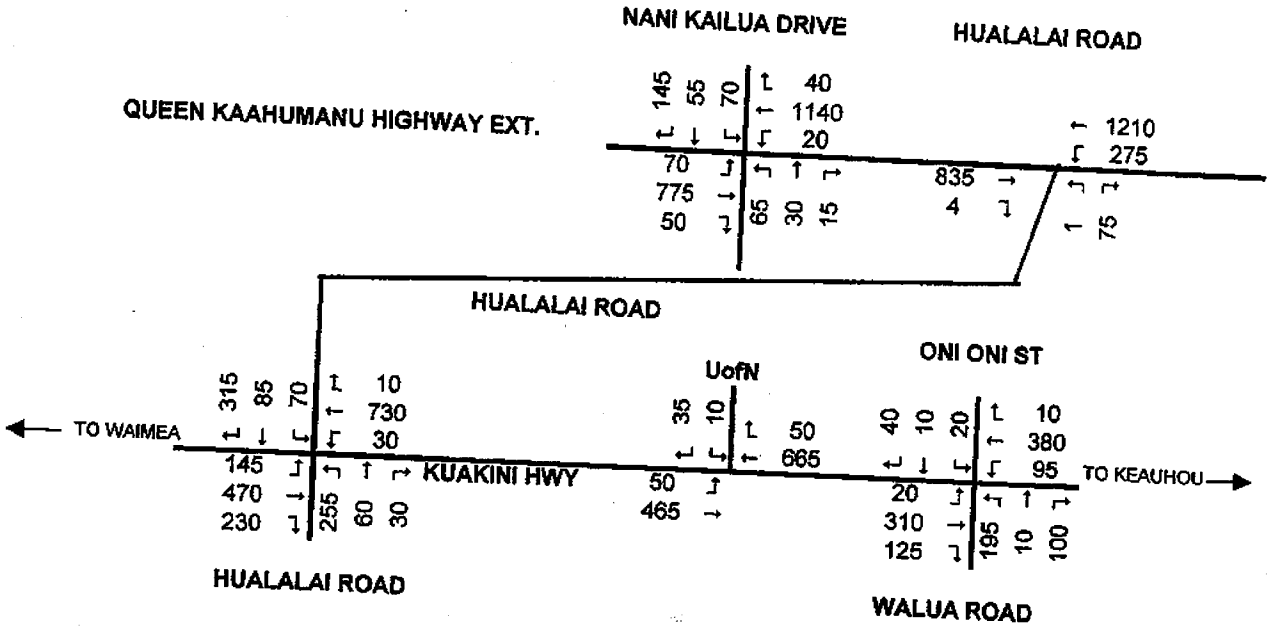
AM PEAK HOUR



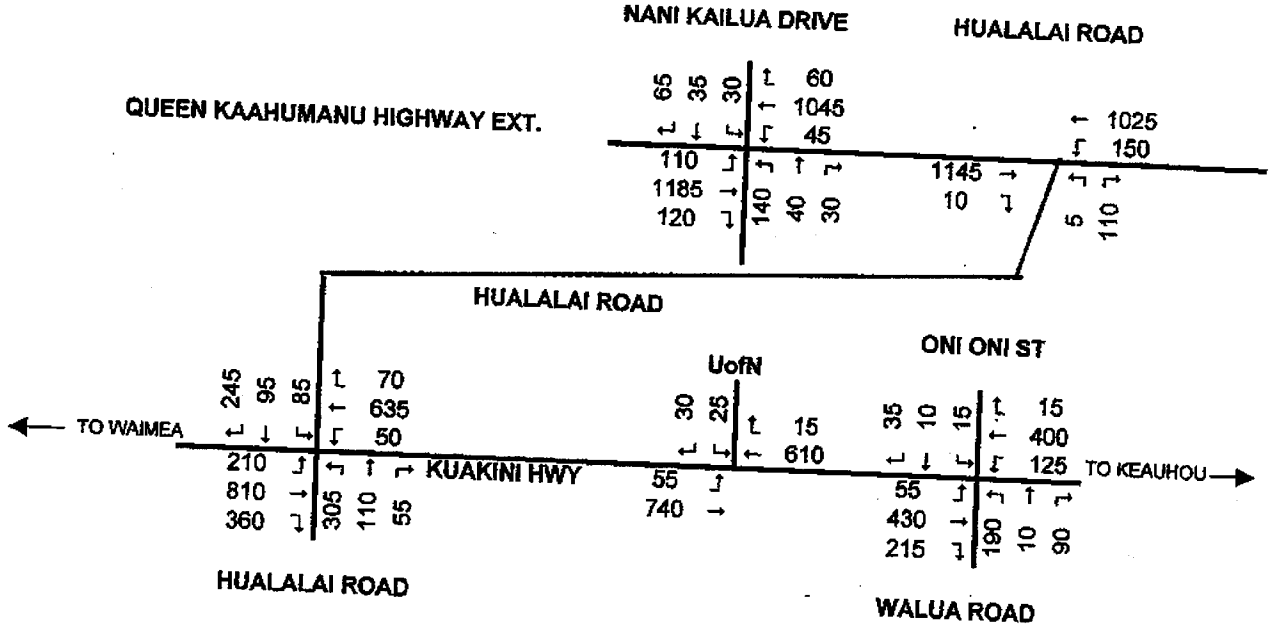
PM PEAK HOUR

Not to Scale

AMBIENT TRAFFIC FORECAST
2010 SCENARIO 2- WITH K TO K PARKWAY
FIGURE 12



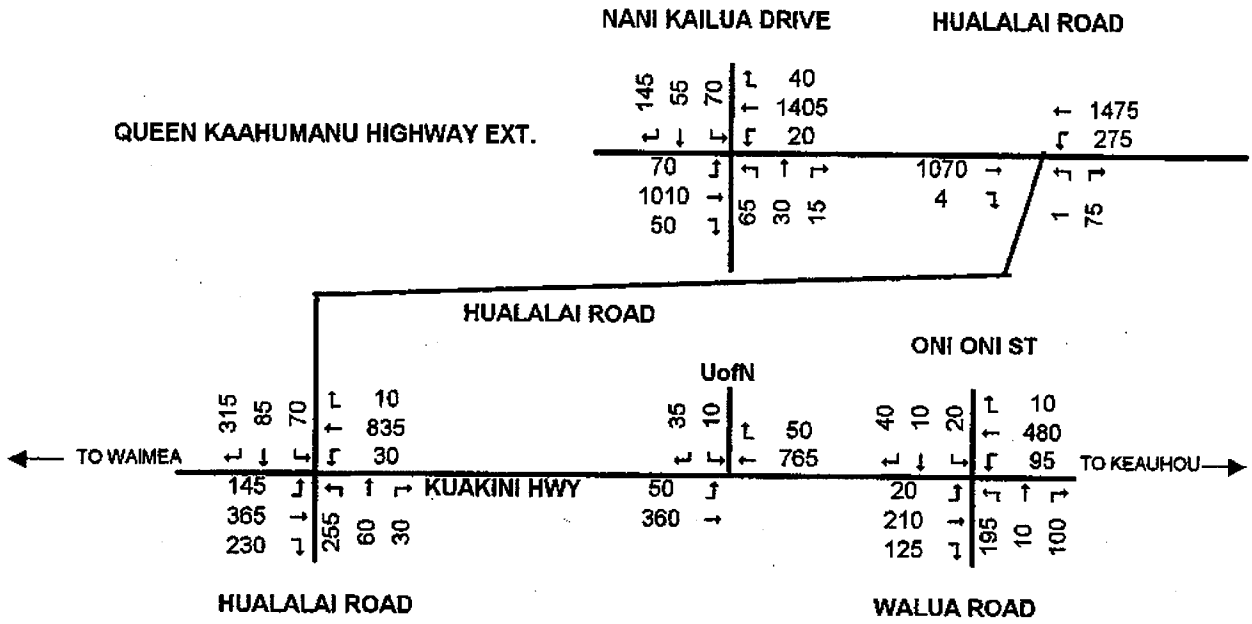
AM PEAK HOUR



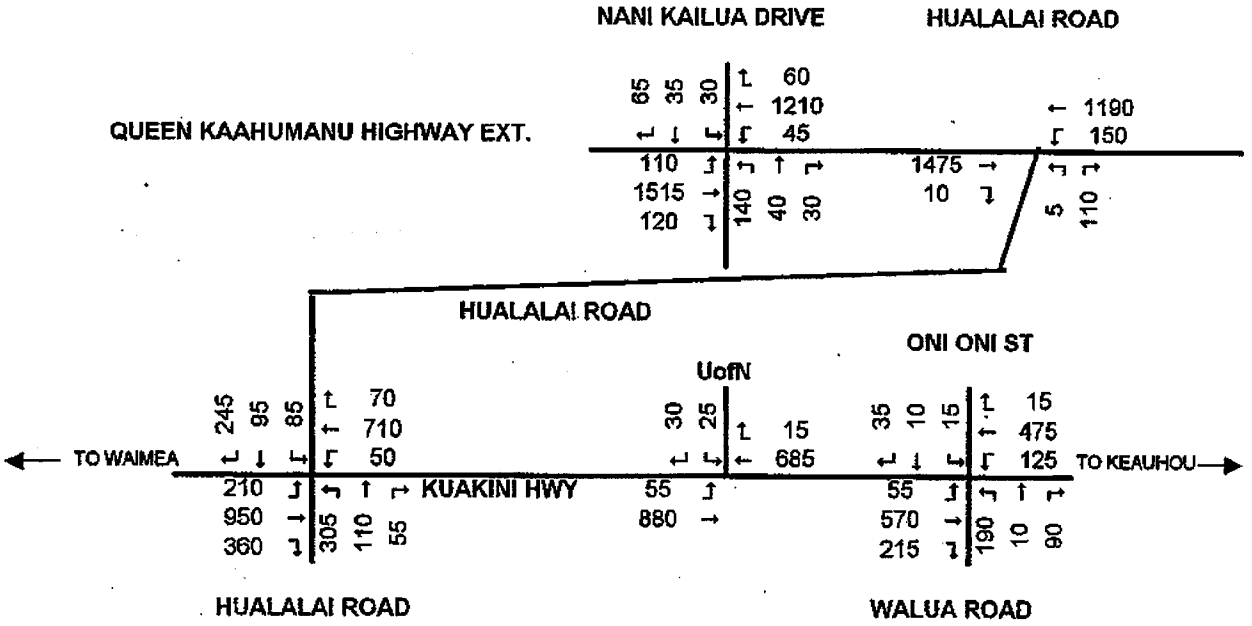
PM PEAK HOUR

Not to Scale

AMBIENT TRAFFIC FORECAST
2016 SCENARIO 2- WITH K TO K PARKWAY
FIGURE 13



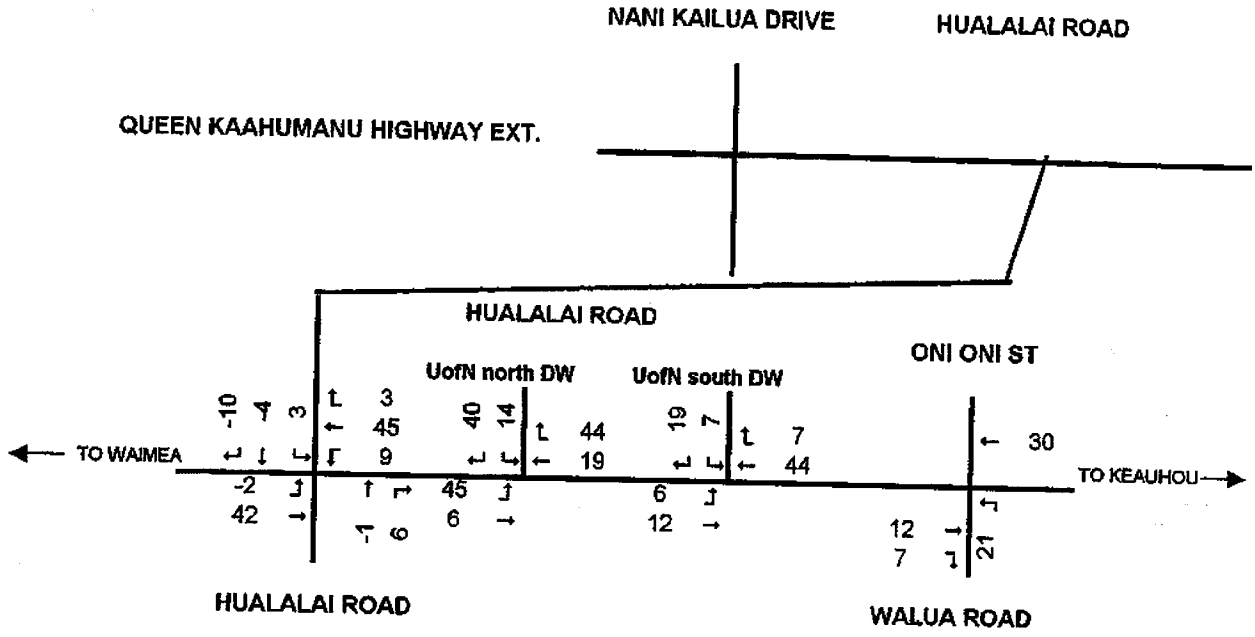
AM PEAK HOUR



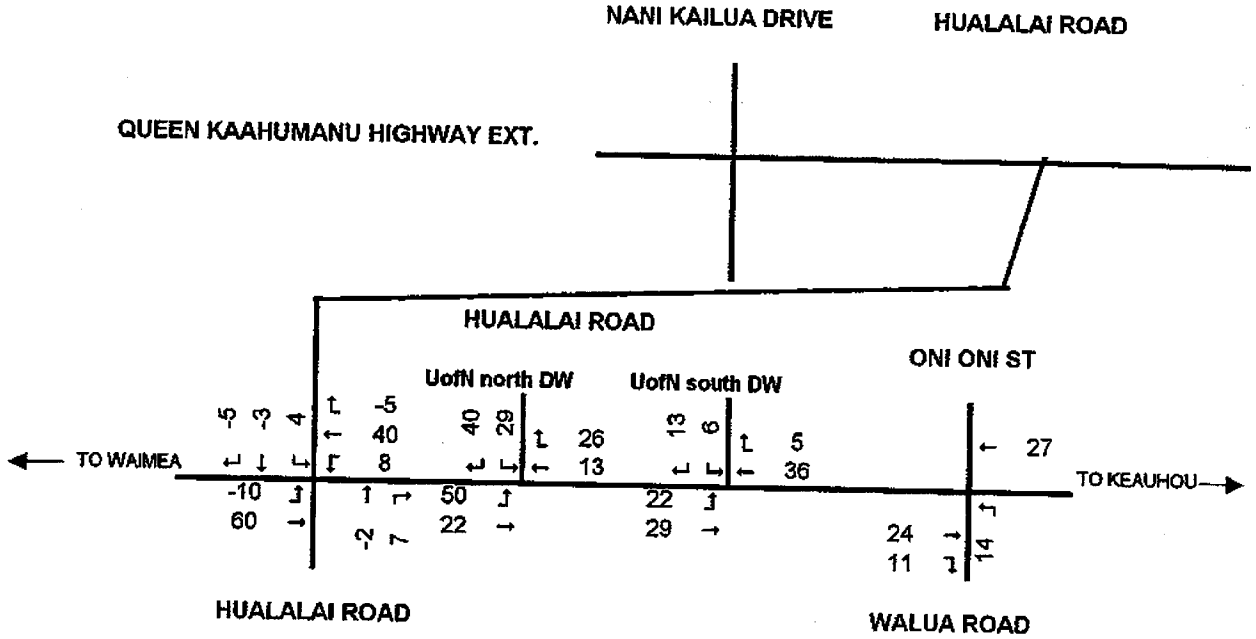
PM PEAK HOUR

Not to Scale

AMBIENT TRAFFIC FORECAST
2016 SCENARIO 3- PARKWAY & 4 LANE HI BELT HWY
FIGURE 14



AM PEAK HOUR

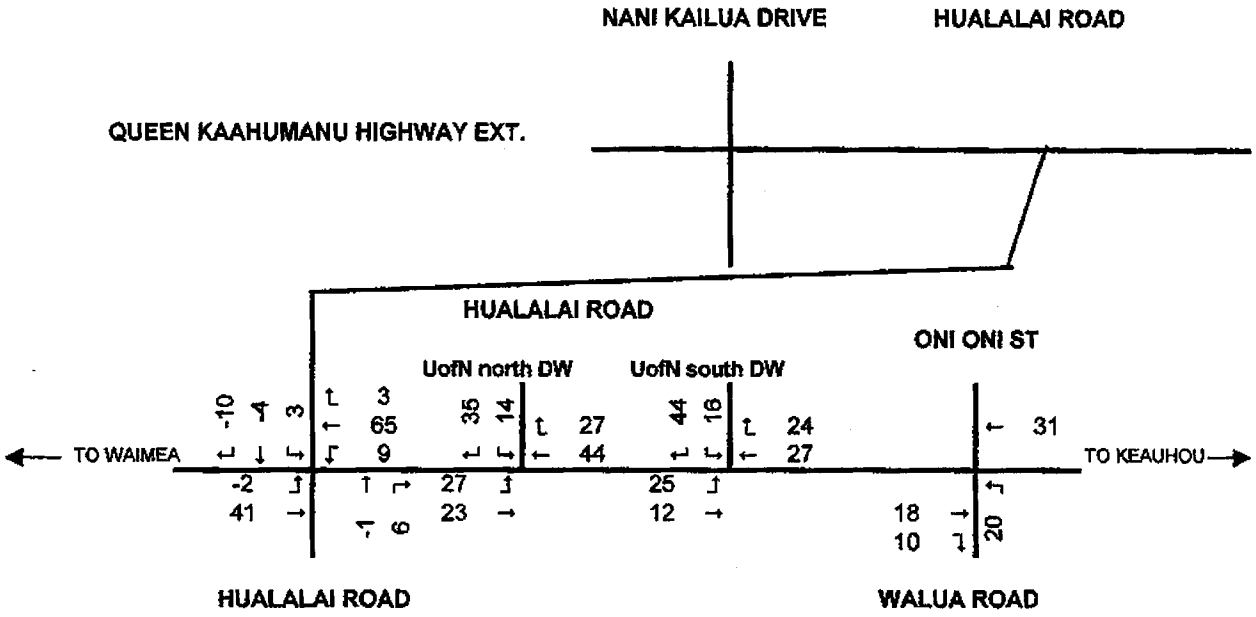


PM PEAK HOUR

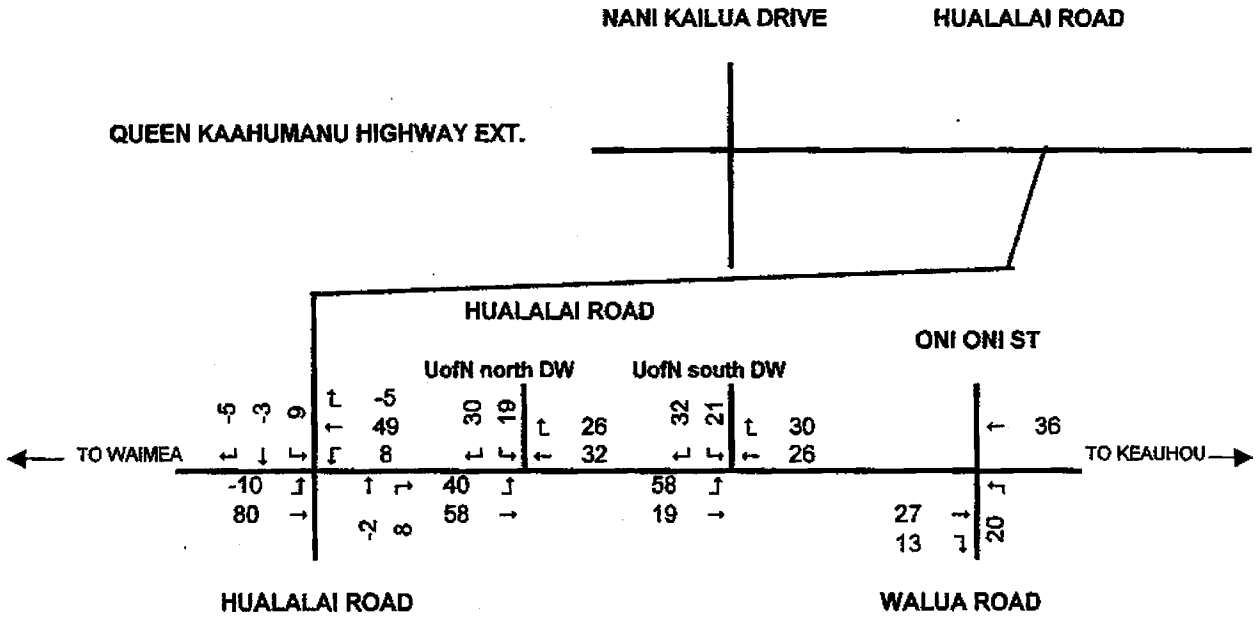
Not to Scale

2010 TRIP ASSIGNMENT FORECAST

FIGURE 15



AM PEAK HOUR

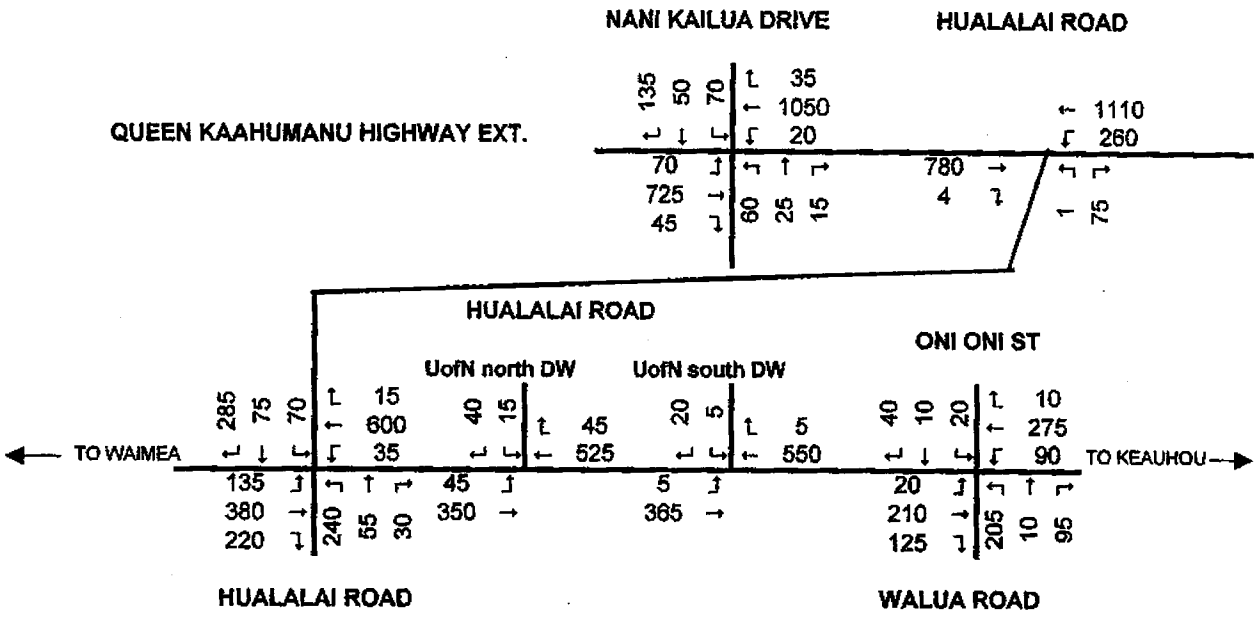


PM PEAK HOUR

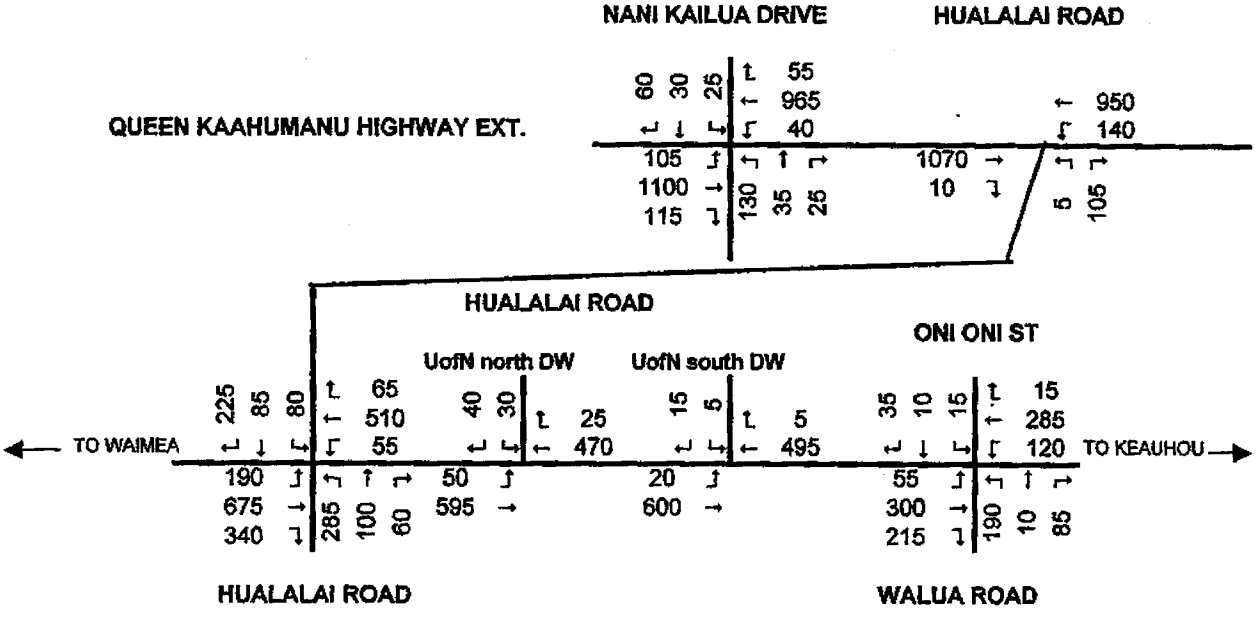
Not to Scale

2016 TRIP ASSIGNMENT FORECAST

FIGURE 16



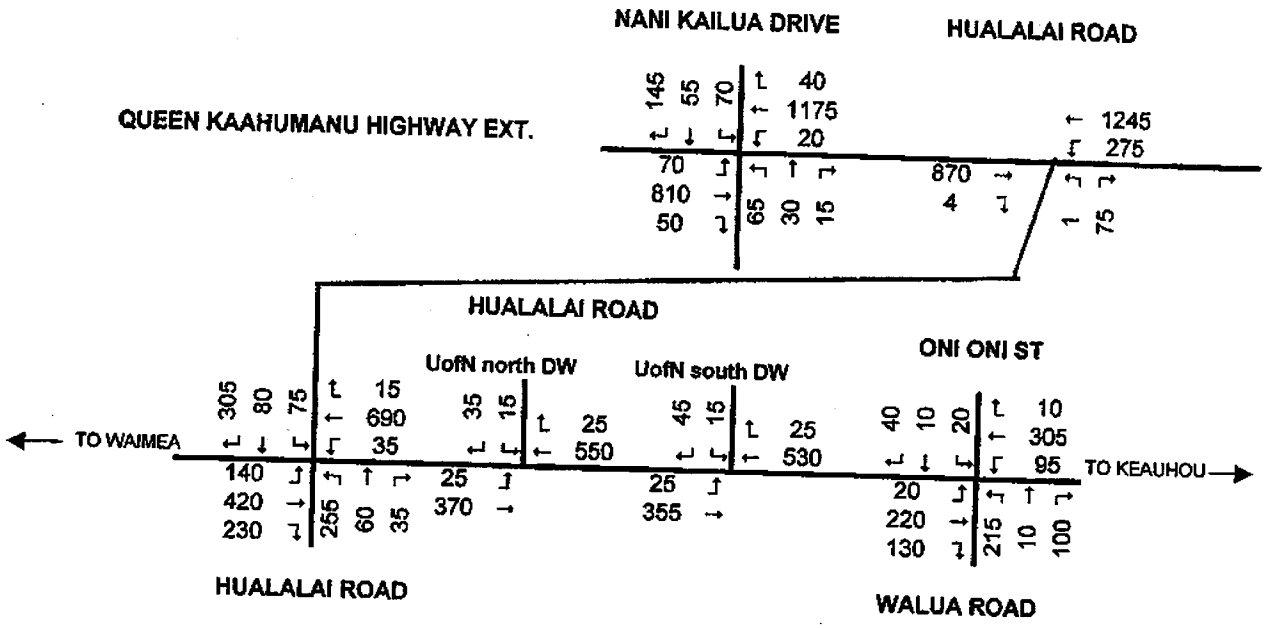
AM PEAK HOUR



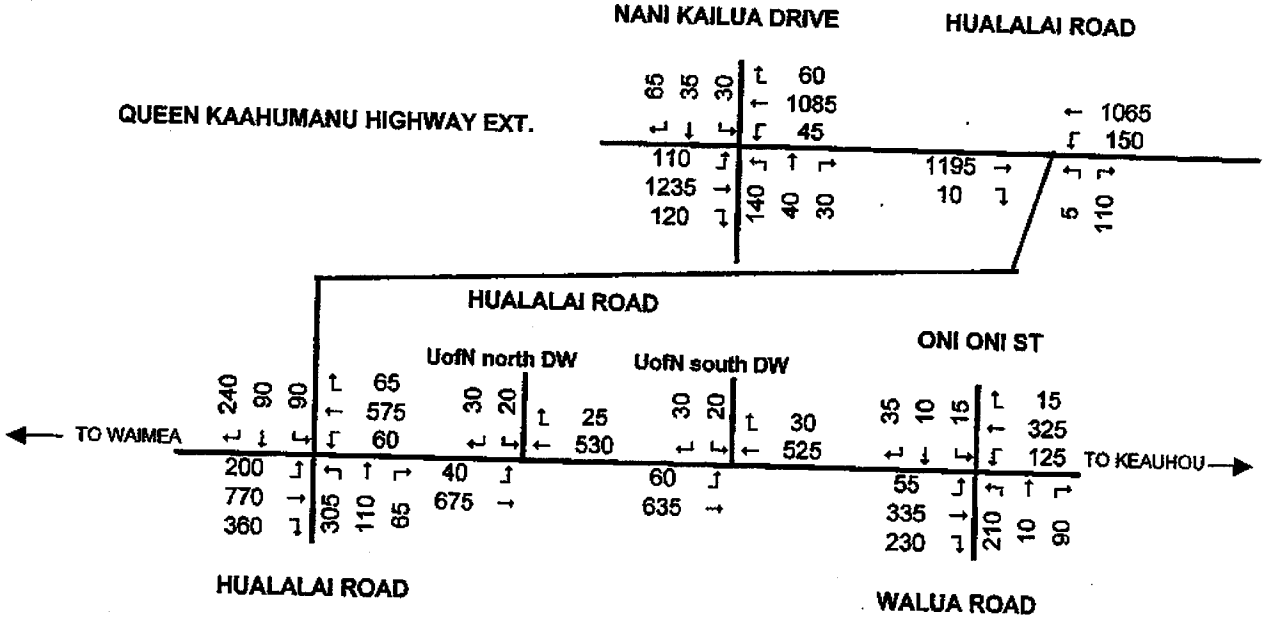
PM PEAK HOUR

Not to Scale

TOTAL TRAFFIC FORECAST
2010 SCENARIO 1- NO HIGHWAY IMPROVEMENTS
FIGURE 17



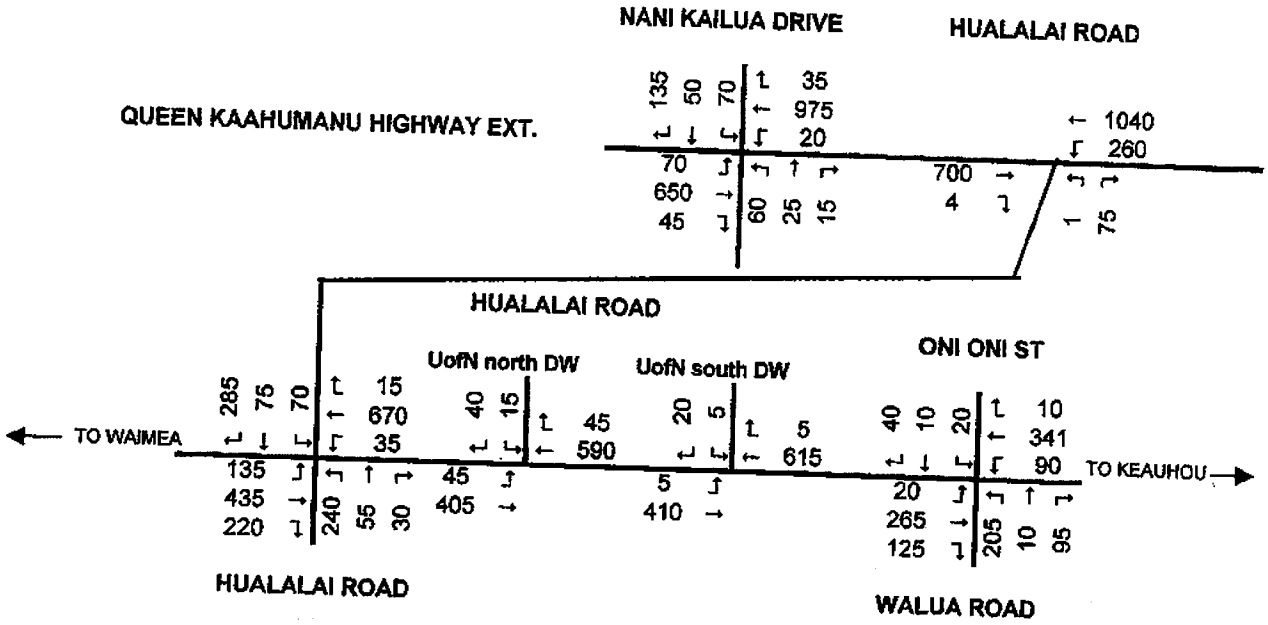
AM PEAK HOUR



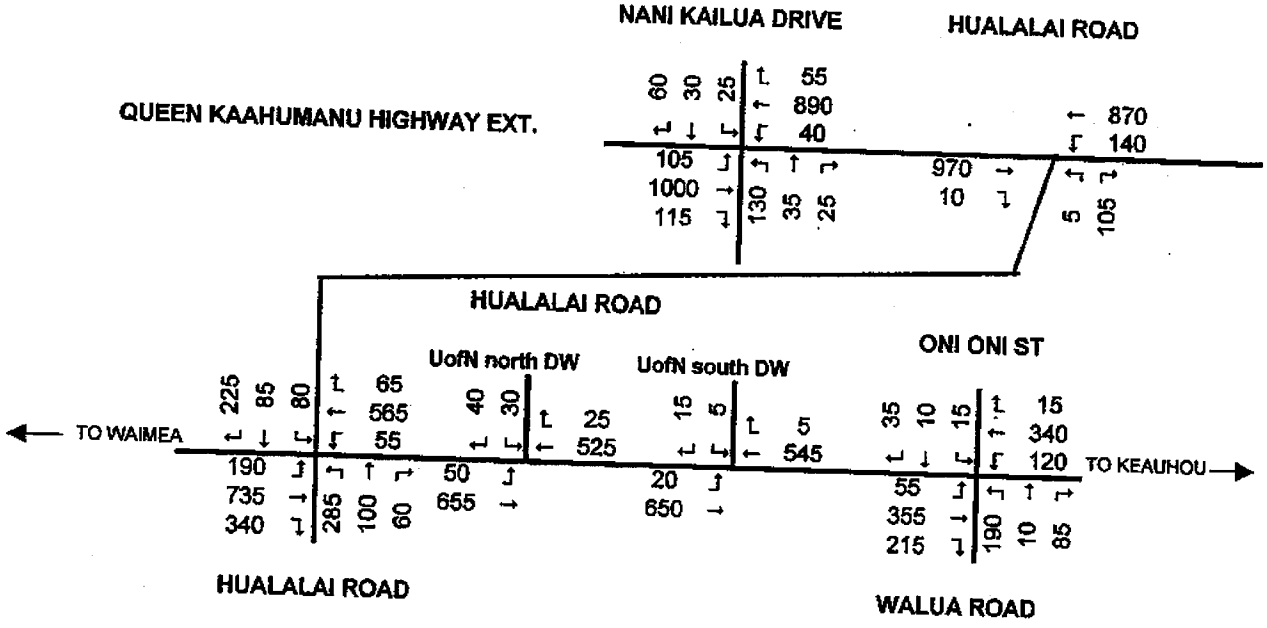
PM PEAK HOUR

Not to Scale

TOTAL TRAFFIC FORECAST
2016 SCENARIO 1- NO HIGHWAY IMPROVEMENTS
FIGURE 18



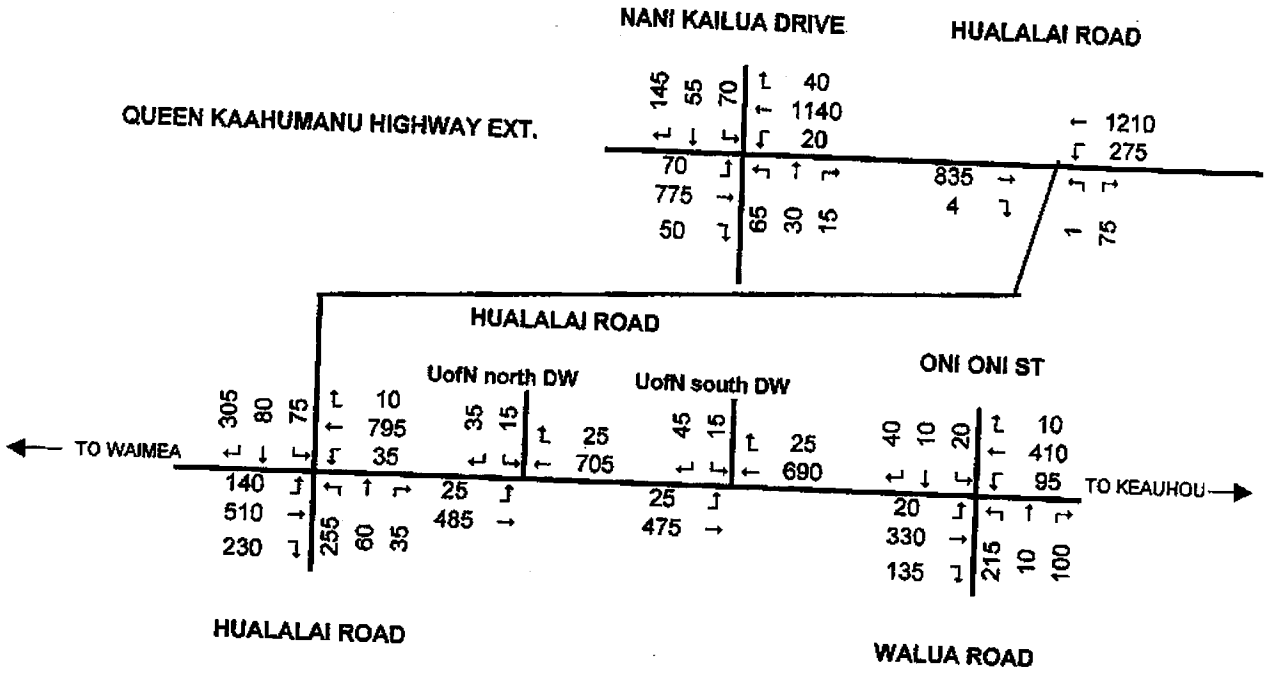
AM PEAK HOUR



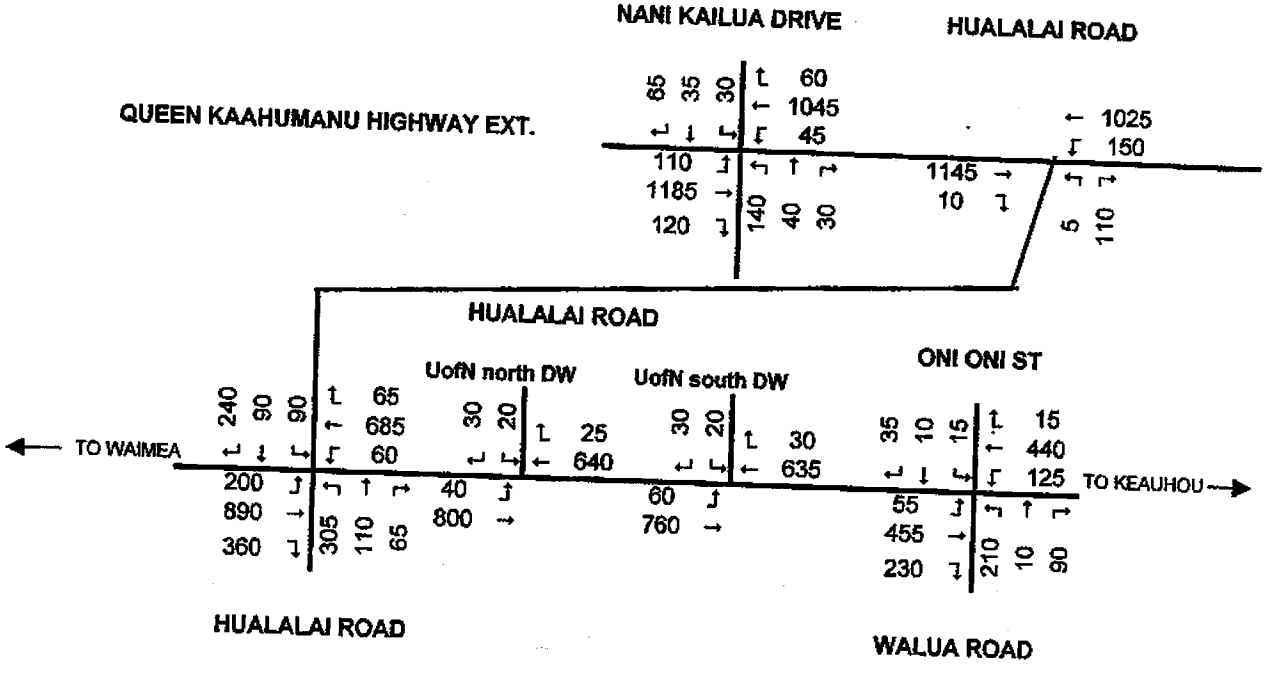
PM PEAK HOUR

Not to Scale

TOTAL TRAFFIC FORECAST
2010 SCENARIO 2- WITH K TO K PARKWAY
FIGURE 19



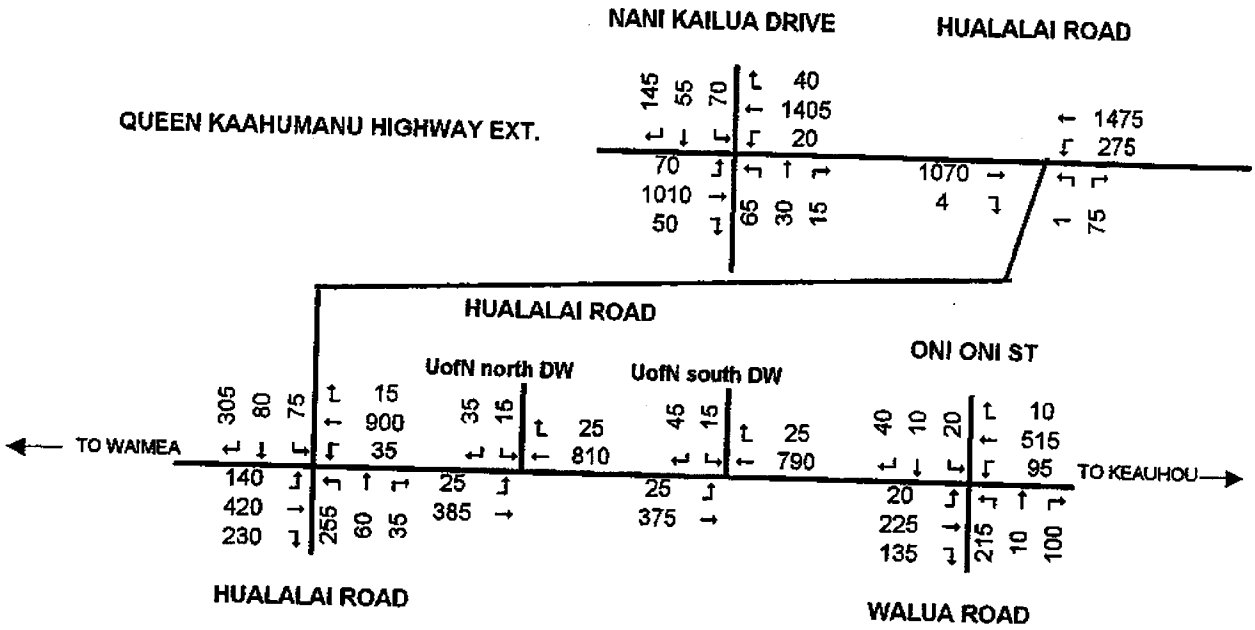
AM PEAK HOUR



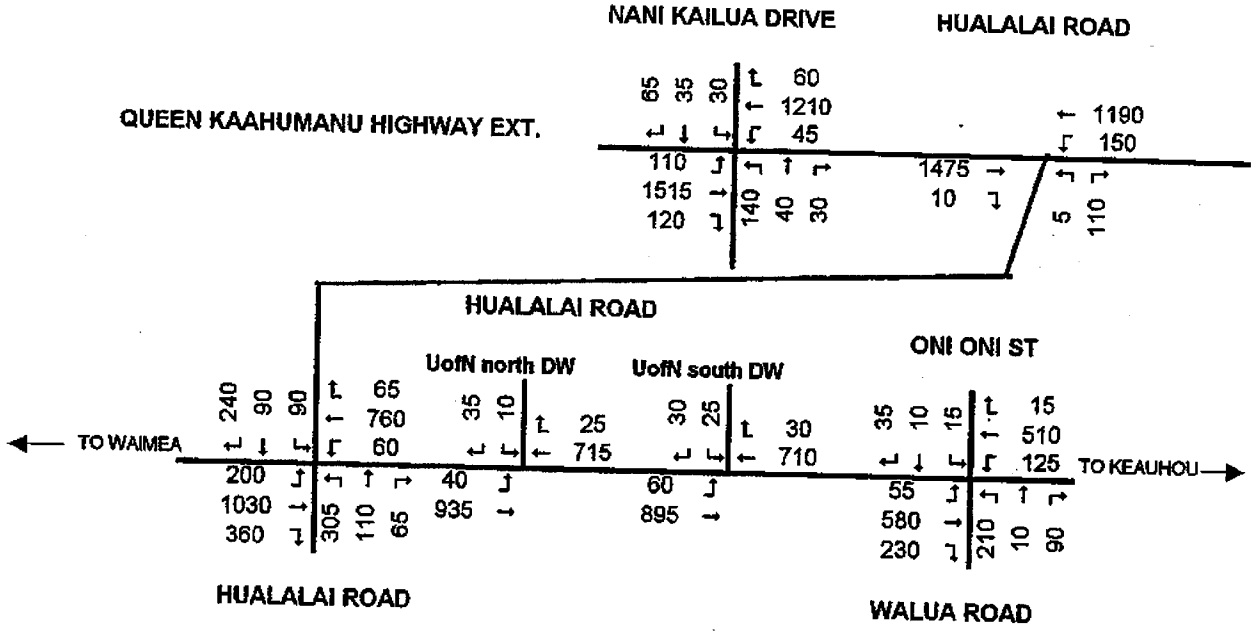
PM PEAK HOUR

Not to Scale

TOTAL TRAFFIC FORECAST
2016 SCENARIO 2- WITH K TO K PARKWAY
FIGURE 20



AM PEAK HOUR



PM PEAK HOUR

Not to Scale

TOTAL TRAFFIC FORECAST
2016 SCENARIO 3- PARKWAY & 4 LANE HI BELT HWY
FIGURE 21

Tables

TABLE 1
TRIP GENERATION AND DISTRIBUTION ANALYSIS

FORECAST YEAR TRIP COMPONENT	UNITS	AM PEAK HOUR		PM PEAK HOUR	
		INBOUND	OUTBOUND	INBOUND	OUTBOUND
2005					
TRIP GENERATION ANALYSIS					
Non-resident staff	175	60	15	25	30
Resident staff	75	10	10	25	5
Non-resident students	20	0	10	10	10
Deliveries		10	10	10	10
Total		100	45	70	55
TRIP DISTRIBUTION ANALYSIS					
North		50	35	55	30
South		50	10	15	25
2010					
TRIP GENERATION ANALYSIS					
Non-resident staff	100	45	10	15	25
Resident staff	220	45	45	65	45
Non-resident students	0	0	0	0	0
Deliveries		10	10	10	10
Total		100	65	90	80
TRIP DISTRIBUTION ANALYSIS					
North		50	45	60	45
South		50	20	30	35
2016					
TRIP GENERATION ANALYSIS					
Non-resident staff	25	10	5	5	5
Resident staff	390	75	80	115	80
Non-resident students	0	0	0	0	0
Deliveries		10	10	10	10
Total		95	95	130	95
TRIP DISTRIBUTION ANALYSIS					
North		48	65	85	55
South		47	30	45	40

TABLE 2
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

	AM PEAK HOUR					PM PEAK HOUR				
INTERSECTION	2004	2010		2016		2004	2010		2016	
Approach/Movement	EXST	AMB	TOT	AMB	TOT	EXST	AMB	TOT	AMB	TOT
QUEEN KAAHUMANU HWY/HUALALAI RD	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
Hualalai Rd EB RT	C	C	C	C	C	C	E	E	F	F
Hualalai Rd EB LT	F	F	F	F	F	F	F	F	F	F
Queen Kaahumanu Hwy NB LT	B	B	B	B	B	B	B	B	C	C
QUEEN KAAHUMANU HWY/HUALALAI RD	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
Hualalai Rd EB RT		C	C	C	C		D	D	E	E
Hualalai Rd EB LT		F	F	F	F		F	F	F	F
Queen Kaahumanu Hwy NB LT		B	B	B	B		B	B	B	B
QUEEN KAAHUMANU HWY/HUALALAI RD	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
Hualalai Rd EB RT				B	B				C	C
Hualalai Rd EB LT				F	F				F	F
Queen Kaahumanu Hwy NB LT				C	C				C	C
KUAKINI HIGHWAY/WALUA RD/ONIONI ST	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
Walua Rd EB RT	A	B	B	NA	NA	B	B	B	NA	NA
Walua Rd EB LTTH	D	F	F			D	F	F		
OniOni St WB	A	A	A			A	A	A		
Kuakini Hwy SB LT	A	A	A			A	A	A		
Kuakini Hwy NB LT	A	A	A			A	A	A		
KUAKINI HIGHWAY/WALUA RD/ONIONI ST	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
Walua Rd EB RT		B	B	NA	NA		B	B	NA	NA
Walua Rd EB LTTH		F	F				F	F		
OniOni St WB		A	A				A	A		
Kuakini Hwy SB LT		A	A				A	A		
Kuakini Hwy NB LT		A	A				A	A		
KUAKINI HIGHWAY/WALUA RD/ONIONI ST	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
Walua Rd EB RT				NA	NA				NA	NA
Walua Rd EB LTTH										
OniOni St WB										
Kuakini Hwy SB LT										
Kuakini Hwy NB LT										

TABLE 2
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

	AM PEAK HOUR					PM PEAK HOUR				
INTERSECTION	2004	2010		2016		2004	2010		2016	
Approach/Movement	EXST	AMB	TOT	AMB	TOT	EXST	AMB	TOT	AMB	TOT
KUAKINI HWY/UOFN NORTH DRIVEWAY	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
UofN WB driveway	B	B	B	C	B	B	C	C	C	C
Kuakini Hwy SB LT	A	A	A	A	A	A	A	A	A	A
KUAKINI HWY/UOFN NORTH DRIVEWAY	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
UofN WB driveway		C	C	C	C		C	C	C	C
Kuakini Hwy SB LT		A	A	A	A		A	A	A	A
KUAKINI HWY/UOFN NORTH DRIVEWAY	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
UofN WB driveway				C	C				D	E
Kuakini Hwy SB LT				B	B				A	A
KUAKINI HWY/UOFN SOUTH DRIVEWAY	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
UofN WB driveway			B		B			C		D
Kuakini Hwy SB LT			A		A			A		A
KUAKINI HWY/UOFN SOUTH DRIVEWAY	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
UofN WB driveway			C		C			C		C
Kuakini Hwy SB LT			A		A			A		A
KUAKINI HWY/UOFN SOUTH DRIVEWAY	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
UofN WB driveway					C					E
Kuakini Hwy SB LT					A					A

Delay measured in seconds/vehicle

LEGEND

NB = northbound
SB = southbound
EB = eastbound
WB = westbound
LT = left turn
RT = right turn
TH = through movement

EXST = Existing traffic conditions
AMB = Ambient traffic forecast conditions
TOT = Total with project traffic forecast conditions
NA = Not appropriate since unsignalized conditions are infeasible

TABLE 3
SIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

	AM PEAK HOUR					PM PEAK HOUR				
INTERSECTION	2004	2010		2016		2004	2010		2016	
Approach/Movement	EXST	AMB	TOT	AMB	TOT	EXST	AMB	TOT	AMB	TOT
	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
KUAKINI HWY/HUALALAI RD	C	C	C	C	C	C	C	C	C	D
Hualalai Rd EB	B	C	C	C	C	C	C	D	D	D
Hualalai Rd WB	D	C	C	C	C	C	C	D	D	D
Kuakini Hwy NB	C	B	B	B	C	B	C	C	C	C
Kuakini Hwy SB	B	B	B	B	C	B	C	C	C	D
	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
KUAKINI HWY/HUALALAI RD		C	C	C	C		C	C	D	D
Hualalai Rd EB		C	C	C	C		C	D	D	E
Hualalai Rd WB		C	C	C	C		D	D	D	E
Kuakini Hwy NB		B	C	C	C		C	C	C	C
Kuakini Hwy SB		B	C	C	C		C	C	D	D
	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
KUAKINI HWY/HUALALAI RD				C	C				E	E
Hualalai Rd EB				C	C				E	F
Hualalai Rd WB				C	C				E	F
Kuakini Hwy NB				C	C				D	C
Kuakini Hwy SB				C	C				E	E
	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
QUEEN KAAHUMANU HWY/NANI KAILUA DR	C	C	C	D	D	C	D	D	E	E
Nani Kailua Dr EB	D	D	D	F	F	C	D	D	F	F
Nani Kailua Dr WB	D	D	D	F	F	C	D	D	F	F
Queen Kaahumanu Hwy NB	C	C	C	C	C	B	D	D	C	C
Queen Kaahumanu Hwy SB	B	B	B	B	B	C	D	D	C	C
	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
QUEEN KAAHUMANU HWY/NANI KAILUA DR		C	C	D	D		C	C	E	E
Nani Kailua Dr EB		D	D	F	F		D	D	F	F
Nani Kailua Dr WB		D	D	F	F		D	D	F	F
Queen Kaahumanu Hwy NB		C	C	C	C		C	C	C	C
Queen Kaahumanu Hwy SB		B	B	B	B		C	C	C	C
	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
QUEEN KAAHUMANU HWY/NANI KAILUA DR				C	C				C	C
Nani Kailua Dr EB				D	D				D	D
Nani Kailua Dr WB				D	D				D	D
Queen Kaahumanu Hwy NB				B	B				C	C
Queen Kaahumanu Hwy SB				B	B				B	B

TABLE 3
SIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

	AM PEAK HOUR					PM PEAK HOUR				
INTERSECTION	2004	2010		2016		2004	2010		2016	
Approach/Movement	EXST	AMB	TOT	AMB	TOT	EXST	AMB	TOT	AMB	TOT
	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
KUAKINI HWY/WALUA RD/ONIONI ST		B	B	B	B		B	B	B	B
Walua Rd EB		D	D	D	D		D	D	D	D
OniOni St WB		C	C	C	C		C	C	C	C
Kuakini Hwy NB		A	A	A	B		A	A	A	B
Kuakini Hwy SB		B	B	B	B		B	B	B	B
	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
KUAKINI HWY/WALUA RD/ONIONI ST		B	B	B	C		B	B	B	C
Walua Rd EB		D	D	D	D		D	D	D	D
OniOni St WB		C	C	C	C		C	C	C	C
Kuakini Hwy NB		A	B	B	B		B	B	B	B
Kuakini Hwy SB		B	B	B	B		B	B	B	B
	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
KUAKINI HWY/WALUA RD/ONIONI ST				B	C				C	C
Walua Rd EB				D	D				D	D
OniOni St WB				C	C				C	C
Kuakini Hwy NB				B	B				B	B
Kuakini Hwy SB				B	B				C	C
	(SCENARIO 1, NO HIGHWAY IMPROVMENTS)									
QUEEN KAAHUMANU HWY/HUALALAI RD		C	C	C	C		C	C	D	D
Hualalai Rd EB		C	C	D	D		D	D	E	E
Queen Kaahumanu Hwy NB		C	C	C	C		B	B	C	C
Queen Kaahumanu Hwy NB LT		C	C	B	B		B	B	B	B
Queen Kaahumanu Hwy SB		C	C	C	C		D	D	D	D
	(SCENARIO 2, WITH KAHALUU TO KEAUHOU PARKWAY)									
QUEEN KAAHUMANU HWY/HUALALAI RD		B	B	C	C		B	B	C	C
Hualalai Rd EB		C	C	D	D		D	D	E	E
Queen Kaahumanu Hwy NB		B	B	C	C		A	A	B	B
Queen Kaahumanu Hwy NB LT		B	B	B	B		A	A	B	B
Queen Kaahumanu Hwy SB		B	B	B	B		C	C	C	C
	(SCENARIO 3, WITH PARKWAY AND 4 LANE HI BELT RD)									
QUEEN KAAHUMANU HWY/HUALALAI RD				B	B				B	B
Hualalai Rd EB				D	D				D	D
Queen Kaahumanu Hwy NB				B	B				B	B
Queen Kaahumanu Hwy NB LT				C	C				D	D
Queen Kaahumanu Hwy SB				C	C				C	C

Delay measured in seconds/vehicle

LEGEND

NB = northbound
SB = southbound
EB = eastbound
WB = westbound
LT = left turn

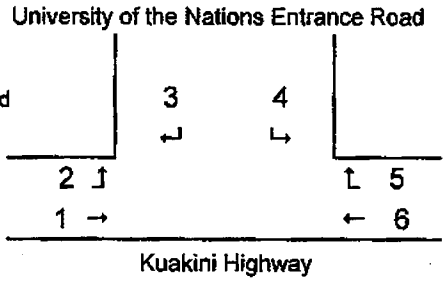
EXST = Existing traffic conditions
AMB = Ambient traffic forecast conditions
TOT = Total with project traffic forecast conditions

Appendix A

Traffic Turning Movement Counts

TRAFFIC TURNING MOVEMENT COUNT
UNIVERSITY OF THE NATIONS

LOCATION:	Kuakini Highway/University of the Nations Access Road
DATE:	January 13, 2005, Thursday
TIME:	6:30a.m.-8:30a.m./3:30p.m.-5:30p.m.
WEATHER:	Sunshine, Mixed with Few Clouds
RECORDER:	Thomas Lemanski

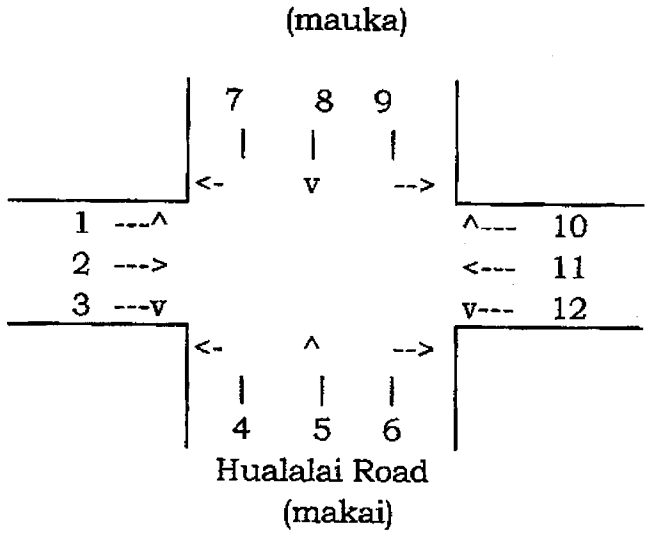


TIME	MOVEMENT NUMBER						
PERIOD	1	2	3	4	5	6	TOTAL
6:30-6:45a	20	3	3	0	3	43	72
6:45-7:00a	45	6	3	2	2	56	114
7:00-7:15a	37	5	5	1	3	77	128
7:15-7:30a	42	4	2	0	3	79	130
7:30-7:45a	65	16	5	1	8	95	190
7:45-8:00a	72	12	8	2	22	131	247
8:00-8:15a	68	10	14	5	14	117	228
8:15-8:30a	66	10	8	2	6	80	172
6:30-8:30a	415	66	48	13	61	678	1281
7:30-8:30a	271	48	35	10	50	423	444
PHF	0.95				0.77		

TIME	MOVEMENT NUMBER						
PERIOD	1	2	3	4	5	6	TOTAL
3:30-3:45p	115	8	13	2	3	89	230
3:45-4:00p	128	8	7	5	3	104	255
4:00-4:15p	103	3	4	6	2	77	195
4:15-4:30p	99	11	3	1	6	80	200
4:30-4:45p	130	12	7	7	3	93	252
4:45-5:00p	110	14	11	13	5	74	227
5:00-5:15p	117	19	8	4	2	84	234
5:15-5:30p	70	13	10	8	2	53	156
3:30p-5:30p	872	88	63	46	26	654	1749
4:15p-5:15p	456	56	29	25	16	331	913
PHF	0.98				0.90		

TRAFFIC TURNING MOVEMENT COUNT

LOCATION: Kuakini Hwy/Hualalai Rd
DATE: April 8, 2004, Thursday
TIME: 6:30a-8:30a/3:30p-5:30p
WEATHER: partly cloudy
RECORDER: R. Alberts, T. Lemanski

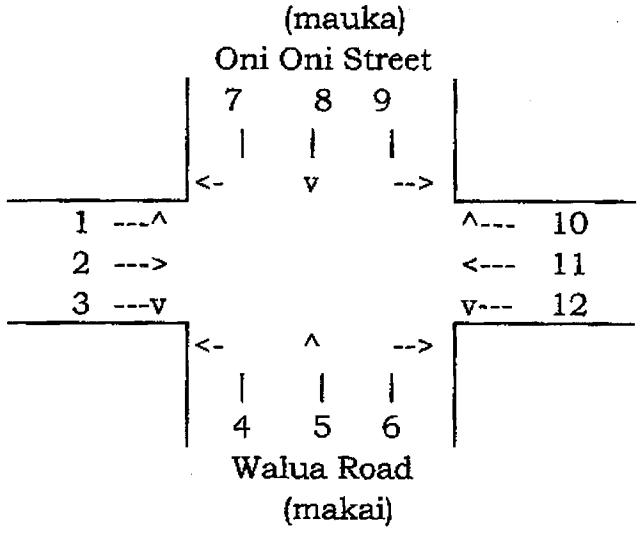


TIME	MOVEMENT NUMBER												
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
6:30-6:45	6	28	16	24	3	0	14	6	3	1	69	2	172
6:45-7:00	23	46	32	23	4	5	22	9	4	1	57	0	226
7:00-7:15	16	51	35	37	4	1	37	5	6	5	60	5	262
7:15-7:30	26	46	20	41	7	8	26	3	8	1	78	3	267
7:30-7:45	35	55	32	49	7	5	45	8	8	2	97	3	346
7:45-8:00	34	75	44	41	16	3	62	12	21	1	115	2	426
8:00-8:15	23	79	48	40	8	5	58	21	8	1	144	5	440
8:15-8:30	16	62	33	44	9	3	52	12	15	2	108	9	365
6:30-8:30	179	442	260	299	58	30	316	76	73	14	728	29	2504
7:30-8:30	108	271	157	174	40	16	217	53	52	6	464	19	1577
PHF	0.89			0.96			0.85			0.82			

TIME	MOVEMENT NUMBER												
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
3:30-3:45	37	151	100	95	39	15	45	16	15	10	113	12	648
3:45-4:00	39	105	53	49	16	10	42	18	18	5	96	14	465
4:00-4:15	45	133	47	47	13	9	50	18	17	6	80	7	472
4:15-4:30	25	92	50	43	15	9	40	13	16	3	66	5	377
4:30-4:45	29	104	55	40	11	7	44	22	17	4	100	8	441
4:45-5:00	22	118	56	39	11	6	48	21	13	6	109	19	468
5:00-5:15	25	131	57	38	15	9	39	25	20	2	115	8	484
5:15-5:30	13	114	62	29	9	7	38	12	16	8	104	8	420
3:30-5:30	235	948	480	380	129	72	346	145	132	44	783	81	3775
3:30-4:30	146	481	250	234	83	43	177	65	66	24	355	38	1962
PHF	0.76			0.6			0.91			0.77			

TRAFFIC TURNING MOVEMENT COUNT

LOCATION: Kuakini Hwy/Walua Rd/Oni Oni St.
DATE: April 6, 2004, Tuesday
TIME: 6:30a-8:30a/3:30p-5:30p
WEATHER: partly cloudy
RECORDER: R. Alberts, T. Lemanski

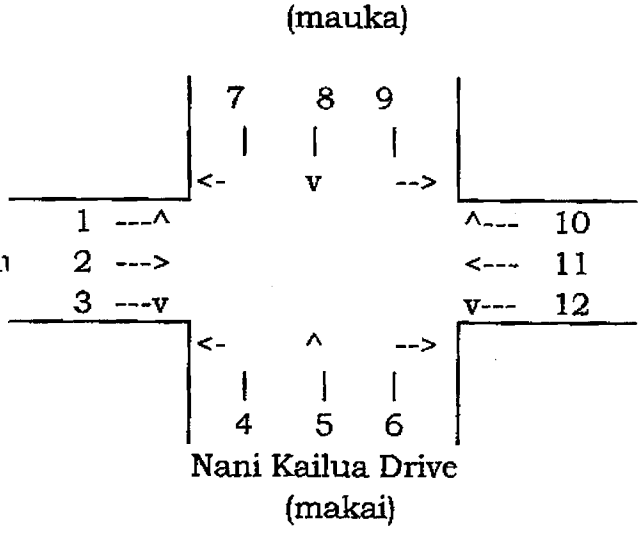


TIME	MOVEMENT NUMBER												
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTA
6:30-6:45	3	21	9	15	2	9	13	0	2	2	24	9	109
6:45-7:00	1	43	24	22	0	7	8	6	9	1	30	14	165
7:00-7:15	2	35	18	24	1	17	14	2	6	1	32	9	161
7:15-7:30	8	34	12	24	2	9	14	3	2	2	44	11	165
7:30-7:45	6	49	18	29	0	18	14	4	2	3	48	16	207
7:45-8:00	4	34	24	46	6	17	11	2	8	2	46	22	222
8:00-8:15	6	32	16	35	2	11	9	4	6	2	48	16	187
8:15-8:30	4	45	27	29	1	13	8	1	3	4	54	11	200
6:30-8:30	34	293	148	224	14	101	91	22	38	17	326	108	1416
7:30-8:30	20	160	85	139	9	59	42	11	19	11	196	65	816
PHF	0.87			0.75			0.9			0.97			

TIME	MOVEMENT NUMBER												
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTA
3:30-3:45	11	43	38	24	3	17	6	5	1	5	42	19	214
3:45-4:00	12	51	38	35	5	10	10	3	7	3	53	21	248
4:00-4:15	14	68	29	37	4	16	6	2	1	4	48	14	243
4:15-4:30	15	41	27	21	3	10	7	4	3	3	39	23	196
4:30-4:45	14	62	47	20	0	9	13	2	4	3	56	9	239
4:45-5:00	10	47	39	34	5	6	8	3	0	10	54	19	235
5:00-5:15	6	58	47	25	1	18	11	2	4	4	46	10	232
5:15-5:30	10	46	47	12	3	7	8	0	3	9	37	13	195
3:30-5:30	92	416	312	208	24	93	69	21	23	41	375	128	1802
3:45-4:45	55	222	141	113	12	45	36	11	15	13	196	67	926
PHF	0.85			0.75			0.82			0.9			

TRAFFIC TURNING MOVEMENT COUNT

LOCATION: Queen Kaahumanu Hwy Ext/Nani Kailua Dr
DATE: April 13, 2004, Tuesday
TIME: 6:30a-8:30a/3:30p-5:30p
WEATHER: cloudy
RECORDER: R. Alberts, T. Lemanski

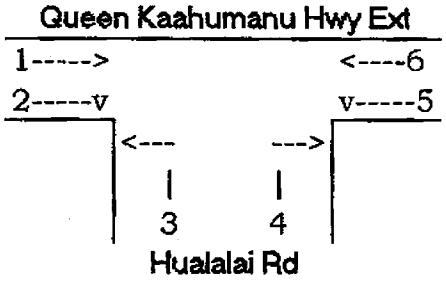


TIME	MOVEMENT NUMBER												
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTA
6:30-6:45	2	97	1	6	4	2	18	5	4	1	202	2	344
6:45-7:00	2	132	6	3	7	1	26	8	17	6	234	6	448
7:00-7:15	20	133	3	10	4	2	24	7	20	9	244	3	479
7:15-7:30	13	161	4	7	3	3	31	6	20	8	233	5	494
7:30-7:45	9	188	16	20	4	4	32	13	14	10	226	6	542
7:45-8:00	22	142	15	10	9	4	32	20	16	4	221	2	497
8:00-8:15	18	155	6	20	7	3	31	10	15	14	225	4	508
8:15-8:30	14	148	19	6	2	4	27	18	8	6	209	8	469
6:30-8:30	100	1156	70	82	40	23	221	87	114	58	1794	36	3781
7:15-8:15	62	646	41	57	23	14	126	49	65	36	905	17	2041
PHF	0.88			0.78			0.88			0.99			

TIME	MOVEMENT NUMBER												
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTA
3:30-3:45	19	196	40	21	8	10	26	2	6	20	235	13	596
3:45-4:00	25	246	13	17	11	7	12	8	8	20	222	15	604
4:00-4:15	19	245	15	29	6	6	8	8	6	15	213	7	577
4:15-4:30	21	211	24	28	8	3	22	7	9	7	177	8	525
4:30-4:45	31	249	11	25	11	8	19	7	2	11	233	10	617
4:45-5:00	28	219	10	20	7	7	15	7	8	7	183	7	518
5:00-5:15	31	230	13	23	10	17	18	3	5	7	192	5	554
5:15-5:30	13	175	14	12	11	4	16	2	5	9	159	2	422
3:30-5:30	187	1771	140	175	72	62	136	44	49	96	1614	67	4413
3:45-4:45	96	951	63	99	36	24	61	30	25	53	845	40	2323
PHF	0.98			0.97			0.76			0.92			

TRAFFIC TURNING MOVEMENT COUNT

LOCATION: Queen Kaahumanu Hwy Ext/Hualalai Rd
DATE: April 14, 2004, Wednesday
TIME: 6:30a-8:30a/3:30p-5:30p
WEATHER: cloudy
RECORDER: L Harris



TIME	MOVEMENT NUMBER						
PERIOD	1	2	3	4	5	6	TOTAL
6:30-6:45a	127	1	0	10	15	230	383
6:45-7:00a	128	0	0	19	22	222	391
7:00-7:15a	146	1	0	11	21	218	397
7:15-7:30a	192	0	1	11	43	246	493
7:30-7:45a	188	0	0	10	52	244	494
7:45-8:00a	146	3	0	8	76	247	480
8:00-8:15a	159	1	0	16	57	226	459
8:15-8:30a	176	0	0	12	28	217	433
6:30-8:30a	1262	6	1	97	314	1850	3530
7:15-8:15a	685	4	1	45	228	963	1866
PHF	0.90				0.92		
3:30-3:45p	231	3	0	16	28	239	517
3:45-4:00p	197	3	4	15	31	217	467
4:00-4:15p	254	1	1	24	29	186	495
4:15-4:30p	246	1	1	25	25	186	484
4:30-4:45p	251	0	3	23	17	189	483
4:45-5:00p	239	0	1	24	22	194	480
5:00-5:15p	256	1	1	32	8	167	465
5:15-5:30p	222	1	1	17	16	183	440
3:30-5:30p	1896	10	12	176	176	1561	3831
3:30-4:30p	928	8	6	80	113	828	1963
PHF	0.92				0.88		

Appendix B

Traffic Calculations
Signalized and Unsignalized Intersection
Level of Service (LOS) Calculations

Traffic Calculations

Signalized Intersection Level of Service (LOS) Calculations

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 4/22/04
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: EXISTING AM 2004 | NB/SB Street: KUAKINI HW
Comment: 2004 EXISTING AM

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	175	40	15	50	55	215	20	465	5	110	270	155
RTOR volume (veh/h)			5			30			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	7	14	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 75 | Lost time per cycle (s): 20 | Critical v/c Ratio: .77

Intersection Performance

	EB			WB			NB			SB		
	L	TR		LT	R	L	T	R	L	T	R	
Lane group configuration												
No. of lanes	1	1		1	1	1	1	1	1	1	1	
Flow rate (veh/h)	184	55		111	195	21	489	5	116	284	132	
Capacity (veh/h)	335	613		279	254	481	720	568	320	720	568	
Adjusted saturation flow (veh/h)	1770	1767		1497	1361	1770	1863	1469	1770	1863	1469	
v/c ratio	.519	.090		.396	.767	.044	.68	-.009	.362	.395	.232	
g/C ratio	.347	.347		.187	.187	.52	.387	.387	.92	.387	.387	
Average back of queue (veh)	3.3	3		2.2	4.7	.2	9.8	-.1	1.5	4.6	2	
Uniform delay (s)	18.3	16.5		26.8	29	9.2	14.1	14.1	11.5	16.6	15.5	
Incremental delay (s)	1.4	0		.2	14.3	0	2.6	0	0	.1	0	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	19.7	16.5		27	43.3	9.2	21.7	14.1	11.5	16.7	15.5	
LOS	B	B		C	D	A	C	B	B	B	B	
Approach delay (s)/LOS	19 / B			37.4 / D		21.3 / C			15.3 / B			
Intersection delay (s)/ LOS	22 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMB1 AM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 AMB AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	239	57	26	68	78	296	26	556	11	135	340	218
RTOR volume (veh/h)			5			30			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 20 | Critical v/c Ratio: .675

Intersection Performance

	EB			WB			NB			SB		
	L	TR		LT	R	L	T	R	L	T	R	
Lane group configuration												
No. of lanes	1	1		1	1	1	2	1	1	3	1	
Flow rate (veh/h)	252	82		154	280	27	585	1	142	358	198	
Capacity (veh/h)	366	675		393	389	380	1286	530	345	675	530	
Adjusted saturation flow (veh/h)	1770	1743		1497	1481	1770	3547	1463	1770	1863	1463	
v/c ratio	.687	.122		.391	.72	.072	.455	.002	.412	.53	.373	
g/C ratio	.388	388		.263	263	.488	.363	.363	.488	.363	.363	
Average back of queue (veh)	5	1.2		3	6.6	3	5.6	0	2.1	6.8	3.5	
Uniform delay (s)	21.1	15.7		24.2	26.8	11.7	10.5	16.3	12.3	20.1	18.8	
Incremental delay (s)	5.5	0		.1	6.6	0	.2	0	.3	.8	0	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	26.6	15.7		24.3	33.4	11.7	19.7	16.3	12.6	20.9	18.8	
LOS	C	B		C	C	B	B	B	B	C	B	
Approach delay (s)/LOS	23.9 / C			30.2 / C		19.3 / B			18.6 / B			
Intersection delay (s)/ LOS	22.1 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: TOT1 AM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 TOT AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	239	56	32	71	74	296	35	601	14	133	382	218
RTOR volume (veh/h)			5			30			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 20 | Critical v/c Ratio: .707

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R	
No. of lanes	1	1		1	1	1	2	1	1	1	1	
Flow rate (veh/h)	252	87		153	280	37	633	4	140	402	198	
Capacity (veh/h)	367	667		387	389	345	1286	530	325	675	530	
Adjusted saturation flow (veh/h)	1770	1721		1474	1481	1770	3547	1463	1770	1863	1463	
v/c ratio	.686	.131		.395	.72	.107	.492	.008	.431	.595	.373	
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363	
Average back of queue (veh)	5	1.3		3	6.6	.5	6.2	.1	2.1	8	3.5	
Uniform delay (s)	21.1	15.8		24.3	26.8	12.1	19.8	16.3	12.4	20.7	18.8	
Incremental delay (s)	5.4	0		.2	6.6	0	.3	0	.5	1.4	0	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	26.5	15.8		24.5	33.4	12.1	20.1	16.3	12.9	22.1	18.8	
LOS	C	B		C	C	B	C	B	B	C	B	
Approach delay (s)/LOS	23.7	/	C	30.3	/	C	19.6	/	B	19.5	/	B
Intersection delay (s)/ LOS	22.3			/					C			

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMB1 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	253	60	28	72	83	314	28	623	12	143	381	231
RTOR volume (veh/h)			5			90			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 15 | Critical v/c Ratio: .671

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R	
No. of lanes	1	1		1	1	1	2	1	1	1	1	
Flow rate (veh/h)	266	87		163	236	29	656	1	151	401	212	
Capacity (veh/h)	358	674		391	389	346	1286	530	315	675	530	
Adjusted saturation flow (veh/h)	1770	1740		1489	1481	1770	3547	1463	1770	1863	1463	
v/c ratio	.745	.13		.417	.606	.055	.51	.004	.477	.594	.399	
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363	
Average back of queue (veh)	5.6	1.3		3.3	5.2	.4	6.5	0	2.4	8	3.8	
Uniform delay (s)	21.9	15.8		24.4	25.9	12.1	19.9	16.3	12.6	20.7	19	
Incremental delay (s)	8.7	0		.3	2.7	0	.3	0	1	1.4	.1	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	30.6	15.8		24.7	28.6	12.1	20.2	16.3	13.6	22.1	19.1	
LOS	C	B		C	C	B	C	B	B	C	B	
Approach delay (s)/LOS	26.9	/	C	27	/	C	19.9	/	B	19.6	/	B
Intersection delay (s)/ LOS	22.2			/					C			

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: TOT1 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 TOT AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	253	59	74	75	79	304	36	688	15	141	423	231
RTOR volume (veh/h)			5			90			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 15 | Critical v/c Ratio: .609

Intersection Performance

	EB			WB			NB			SB		
	L	TR		LT	R	L	T	R	L	T	R
Lane group configuration												
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	266	93		162	225	38	724	5	148	444	212
Capacity (veh/h)	359	666		385	389	313	1286	530	288	675	530
Adjusted saturation flow (veh/h)	1770	1720		1467	1481	1770	3547	1463	1770	1863	1463
v/c ratio	.743	.139		.421	.579	.121	.563	.01	.515	.638	.399
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363
Average back of queue (veh)	5.6	1.4		3.2	4.9	.5	7.4	.1	2.4	9.2	3.8
Uniform delay (s)	21.8	13.9		24.5	25.7	12.6	20.4	16.3	12.9	21.3	19
Incremental delay (s)	8.5	0		.3	2.2	0	.6	0	1.6	2.4	.1
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	30.3	15.9		24.8	27.9	12.6	21	16.3	14.5	23.7	19.1
LOS	C	B		C	C	B	C	B	B	C	B
Approach delay (s)/LOS	26.6	/	C	26.6	/ C	20.6	/	C	20.8	/	C
Intersection delay (s)/ LOS	22.6			/		C					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMB2 AM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 AMB AM SCEN2 W/ PARKWAY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	239	57	26	68	78	296	26	624	11	135	394	218
RTOR volume (veh/h)			5			30			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 20 | Critical v/c Ratio: .716

Intersection Performance

	EB			WB			NB			SB		
	L	TR		LT	R	L	T	R	L	T	R
Lane group configuration												
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	252	92		154	280	27	657	1	142	415	198
Capacity (veh/h)	366	675		393	389	336	1780	530	315	675	530
Adjusted saturation flow (veh/h)	1770	1743		1497	1481	1770	3547	1463	1770	1863	1463
v/c ratio	.687	.132		.391	.72	.082	.511	.002	.451	.614	.373
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363
Average back of queue (veh)	5	1.2		3	6.6	3	6.5	0	2.2	8.4	3.5
Uniform delay (s)	21.1	15.7		24.2	26.8	12.2	20	16.3	12.6	20.9	18.8
Incremental delay (s)	5.5	0		.1	6.6	0	.3	0	.7	1.7	0
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	26.6	15.7		24.3	33.4	12.2	20.3	16.3	13.3	22.6	18.8
LOS	C	B		C	C	B	C	B	B	C	B
Approach delay (s)/LOS	23.9	/	C	30.2	/ C	19.9	/	B	19.9	/	B
Intersection delay (s)/ LOS	22.5			/		C					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: TOT2 AM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 TOT AM SCEN2 W/PARKWAY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	239	56	32	71	74	286	35	669	14	133	436	218
RTOR volume (veh/h)			5			30			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal/Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 20 | Critical v/c Ratio: .738

Intersection Performance

	EB			WB		NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	252	87		153	269	37	704	4	140	459	198
Capacity (veh/h)	367	667		387	389	302	1286	530	296	675	530
Adjusted saturation flow (veh/h)	1770	1721		1474	1481	1770	3547	1463	1770	1863	1463
v/c ratio	.686	.131		.395	.693	.122	.548	.008	.473	.68	.373
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363
Average back of queue (veh)	5	1.3		3	6.2	.5	7.2	.1	2.2	9.7	3.5
Uniform delay (s)	21.1	15.8		24.3	26.6	12.7	20.3	16.3	12.8	21.6	18.8
Incremental delay (s)	5.4	0		.2	5.4	0	.5	0	1	3.8	0
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	26.5	15.8		24.5	32	12.7	20.8	16.3	13.8	24.4	18.8
LOS	C	B		C	C	B	C	B	B	C	B
Approach delay (s)/LOS	23.7	/	C	29.3	/	C	20.4	/	C	21.1	/	C
Intersection delay (s)/ LOS	22.8			/		C						

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMB2 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB AM SCEN2 W/PARKWAY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	253	60	28	72	83	314	28	731	12	143	468	231
RTOR volume (veh/h)			5			90			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal/Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 15 | Critical v/c Ratio: .731

Intersection Performance

	EB			WB		NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	266	87		163	236	29	769	2	151	493	212
Capacity (veh/h)	358	674		391	389	276	1286	530	272	675	530
Adjusted saturation flow (veh/h)	1770	1740		1489	1481	1770	3547	1463	1770	1863	1463
v/c ratio	.745	.13		.417	.606	.107	.599	.004	.554	.73	.399
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363
Average back of queue (veh)	5.6	1.3		3.3	5.2	.4	8.1	0	2.6	10.8	3.8
Uniform delay (s)	21.9	15.8		24.4	25.9	13.1	20.8	16.3	13.2	22.1	19
Incremental delay (s)	8.7	0		.3	2.7	0	.8	0	2.5	4.1	.1
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	30.6	15.8		24.7	28.6	13.1	21.6	16.3	15.7	26.2	19.1
LOS	C	B		C	C	B	C	B	B	C	B
Approach delay (s)/LOS	28.9	/	C	27	/	C	21.2	/	C	22.6	/	C
Intersection delay (s)/ LOS	23.5			/		C						

CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: TOT2 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 TOT AM SCEN2 W/ PARKWAY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	253	59	34	75	79	304	36	796	9	141	509	231
RTOR volume (veh/h)			5			90			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/h)		0			0			0			0	
Lt/Rt/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 15 | Critical v/c Ratio: .739

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R	
No. of lanes	1	1		1	1	1	2	1	1	1	1	
Flow rate (veh/h)	266	93		162	225	38	838	9	148	536	212	
Capacity (veh/h)	359	666		385	389	244	1286	530	248	675	530	
Adjusted saturation flow (veh/h)	1770	1720		1467	1481	1770	3547	1463	1770	1863	1463	
v/c ratio	.743	.139		.421	.579	.155	.632	.006	.599	.793	.399	
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363	
Average back of queue (veh)	5.6	1.4		3.2	4.9	.5	9.1	0	2.6	12.6	3.8	
Uniform delay (s)	21.8	15.9		24.5	25.7	13.8	21.3	16.2	13.7	22.8	19	
Incremental delay (s)	8.5	6		.3	2.2	0	1.2	0	4.1	6.8	.1	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	30.3	15.9		24.8	27.9	13.8	22.5	16.2	17.8	29.6	19.1	
LOS	C	B		C	C	B	C	B	B	C	B	
Approach delay (s)/LOS	26.6	/	C	26.6	/	C	22.1	/	C	25.2	/	C
Intersection delay (s)/ LOS	24.5		/		C							

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMB3 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB AM SCEN3 W/ PKWY &4LHWY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	253	60	28	72	83	314	28	853	12	143	366	231
RTOR volume (veh/h)			5			90			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/h)		0			0			0			0	
Lt/Rt/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 | Lost time per cycle (s): 15 | Critical v/c Ratio: .71

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R	
No. of lanes	1	1		1	1	1	2	1	1	1	1	
Flow rate (veh/h)	266	87		163	236	29	877	2	151	385	212	
Capacity (veh/h)	358	674		391	389	358	1286	530	235	675	530	
Adjusted saturation flow (veh/h)	1770	1740		1489	1481	1770	3547	1463	1770	1863	1463	
v/c ratio	.745	.13		.417	.606	.082	.682	.004	.641	.571	.399	
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363	
Average back of queue (veh)	5.6	1.3		3.3	5.2	.4	9.7	0	2.8	7.6	3.8	
Uniform delay (s)	21.9	15.8		24.4	25.9	11.9	21.6	16.3	14	20.5	19	
Incremental delay (s)	8.7	0		3	2.7	0	1.5	0	6	1.2	.1	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	30.6	15.8		24.7	28.6	11.9	23.1	16.3	20	21.7	19.1	
LOS	C	B		C	C	B	C	B	B	C	B	
Approach delay (s)/LOS	26.9	/	C	27	/	C	22.7	/	C	20.6	/	C
Intersection delay (s)/ LOS	23.4		/		C							

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT3 AM 2016
Comment: 2016 TOT 6AM SCEN3 W/ HKWY &4LHWY

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Field % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	253	59	34	75	79	304	36	898	15	141	422	231
RTOR volume (veh/h)			5			90			10			30
Peak-hour factor	.95	.93	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	5	21	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 80 Lost time per cycle (s): 15 Critical v/c Ratio: .733

Intersection Performance

	EB			WB			NB			SB		
	L	TR		LT	R	L	T	R	L	T	R	
Lane group configuration												
No. of lanes	1	1		1	1	1	2	1	1	1	1	
Flow rate (veh/h)	266	93		162	225	38	945	5	148	444	212	
Capacity (veh/h)	359	666		385	389	313	1286	530	213	675	530	
Adjusted saturation flow (veh/h)	1770	1720		1467	1481	1770	3567	1463	1770	1863	1463	
v/c ratio	.743	.139		.421	.579	.121	.735	.01	.695	.658	.399	
g/C ratio	.388	.388		.263	.263	.488	.363	.363	.488	.363	.363	
Average back of queue (veh)	5.6	1.8		3.2	4.9	.5	11	.1	2.9	9.2	3.8	
Uniform delay (s)	21.8	15.9		24.5	25.7	12.6	22.3	16.3	14.7	21.3	19	
Incremental delay (s)	8.5	0		3	2.2	0	2.3	0	9.9	2.4	.1	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	30.3	15.9		24.8	27.9	12.6	24.5	16.3	24.6	23.7	19.1	
LOS	C	B		C	C	B	C	B	C	C	B	
Approach delay (s)/LOS	26.6	/	C	26.6	/	C	24	/	C	22.7	/	C
Intersection delay (s)/ LOS	24.3			/					C			

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: EXISTING PM 2004
Comment: 2004 EXISTING PM

Jurisdiction/Date: 4/22/04
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Field % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	235	85	45	65	65	175	40	355	25	145	480	250
RTOR volume (veh/h)			5			30			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	L,TR	LTRP						
WB		LTRP						
NB			L	LTRP				
SB			L	LTRP				
Green (s)	6	16	5	29				
Yellow + All red (s)	5	5	5	5				

Cycle (s): 78 Lost time per cycle (s): 15 Critical v/c Ratio: .706

Intersection Performance

	EB			WB			NB			SB		
	L	TR		LT	R	L	T	R	L	T	R	
Lane group configuration												
No. of lanes	1	1		1	1	1	1	1	1	1	1	
Flow rate (veh/h)	247	132		137	153	42	374	16	153	505	232	
Capacity (veh/h)	337	611		297	291	299	711	560	400	711	560	
Adjusted saturation flow (veh/h)	1770	1720		1411	1384	1770	1863	1468	1770	1863	1468	
v/c ratio	.733	.215		.461	.524	.141	.526	.028	.383	.711	.413	
g/C ratio	.355	.355		.211	.211	.513	.382	.382	.513	.382	.382	
Average back of queue (veh)	5.1	2.1		2.8	3.2	.5	6.7	.2	2.1	10.3	3.9	
Uniform delay (s)	20.8	17.1		26.2	26.6	11.5	18.2	14.7	11	19.9	17.3	
Incremental delay (s)	8.4	0		8	1.7	0	.7	0	.1	3.4	.2	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	29.2	17.1		27	28.3	11.5	18.9	14.7	11.1	23.3	17.5	
LOS	C	B		C	C	B	B	B	B	C	B	
Approach delay (s)/LOS	25	/	C	27.7	/	C	18	/	B	19.7	/	B
Intersection delay (s)/ LOS	21.5			/					C			

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB1 PM 2010
Comment: 2010 AMD SCEN1 W/NO IMPROVEMENTS

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Field % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	286	104	52	78	88	229	47	490	68	198	616	338
RTOR volume (veh/h)			5			90			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.93	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	15	24	8	5	37			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 114 Lost time per cycle (s): 25 Critical v/c Ratio: .81

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	301	159		175	188	49	495	61	208	648	324
Capacity (veh/h)	388	666		295	563	409	1151	471	501	768	698
Adjusted saturation flow (veh/h)	1770	1726		1404	1459	1770	3547	1458	1770	1863	1476
v/c ratio	.776	.239		.591	.335	.121	.43	.13	.416	.844	.533
g/C ratio	.386	.386		.211	.386	.439	.325	.325	.526	.412	.412
Average back of queue (veh)	9.5	3.6		5.5	4.5	1	6.9	1.4	4.3	22	8.4
Uniform delay (s)	27.1	23.7		40.6	24.7	18.5	30.2	27.1	15.5	30.2	25.2
Incremental delay (s)	10.2	0		3.2	0	0	.1	0	.2	9.3	.5
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	37.3	23.7		43.8	24.7	18.5	30.3	27.1	15.7	39.5	26.1
LOS	D	C		D	C	B	C	C	B	D	C
Approach delay (s)/LOS	32.6	/	C	33.9	/	C	29	/	C	31.6	/	C
Intersection delay (s)/ LOS	31.5			/			C					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT1 PM 2010
Comment: 2010 TOT SCEN1 W/NO IMPROVEMENTS

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Field % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	286	103	59	82	85	224	55	510	63	188	676	338
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	15	24	5	8	40			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 117 Lost time per cycle (s): 25 Critical v/c Ratio: .852

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	301	164		176	183	58	537	56	198	712	324
Capacity (veh/h)	373	644		284	548	356	1213	498	492	844	672
Adjusted saturation flow (veh/h)	1770	1712		1382	1456	1770	3547	1456	1770	1863	1484
v/c ratio	.807	.255		.62	.334	.163	.443	.112	.402	.843	.482
g/C ratio	.376	.376		.205	.376	.427	.342	.342	.588	.453	.453
Average back of queue (veh)	10.1	3.9		5.8	4.5	1.2	7.6	1.3	4	24.2	8
Uniform delay (s)	28.7	25.2		42.3	26.1	19.8	29.9	26.3	15.2	28.3	22.4
Incremental delay (s)	13.5	0		4.2	0	0	.2	0	.2	8.4	.5
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	42.2	25.2		46.5	26.1	19.8	30.1	26.3	15.4	36.7	22.9
LOS	D	C		D	C	B	C	C	B	D	C
Approach delay (s)/LOS	36.2	/	D	36.1	/	D	28.8	/	C	29.7	/	C
Intersection delay (s)/ LOS	31.4			/			C					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMBI PM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	303	110	55	82	95	243	50	526	72	210	690	358
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right pedbik (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	19	24	5	12	44			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 128 | Lost time per cycle (s): 25 | Critical v/c Ratio: .858

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	319	168		185	203	53	554	65	221	726	345
Capacity (veh/h)	372	642		259	537	342	1210	497	510	881	704
Adjusted saturation flow (veh/h)	1770	1725		1393	1444	1770	3547	1436	1770	1863	1488
v/c ratio	.857	.262		.715	.378	.154	.458	.131	.433	.825	.491
g/C ratio	.372	.372		.186	.372	.419	.341	.341	.55	.473	.473
Average back of queue (veh)	12.6	4.4		7.2	5.7	1.2	8.7	1.7	5	26.1	9.2
Uniform delay (s)	32.5	28.2		49.3	29.6	22.5	33.2	29.3	16.3	29.4	23.3
Incremental delay (s)	20.7	0		9.5	.1	0	.2	0	.3	6.8	.5
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	53.2	28.2		58.8	29.7	22.5	33.4	29.3	16.6	36.2	23.8
LOS	D	C		E	C	C	C	C	B	D	C
Approach delay (s)/LOS	44.6 / D			43.6 / D		32.1 / C			29.5 / C		
Intersection delay (s)/ LOS	34.6 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: TOT1 PM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 TOT SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	303	108	63	92	90	238	58	575	67	200	770	338
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Left/right pedbik (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	21	24	5	12	48			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 135 | Lost time per cycle (s): 25 | Critical v/c Ratio: .94

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	319	175		192	198	61	605	60	211	811	345
Capacity (veh/h)	371	633		242	533	327	1261	519	488	897	717
Adjusted saturation flow (veh/h)	1770	1710		1362	1438	1770	3547	1461	1770	1863	1489
v/c ratio	.86	.276		.793	.371	.187	.48	.116	.432	.904	.481
g/C ratio	.37	.37		.178	.37	.43	.356	.356	.556	.481	.481
Average back of queue (veh)	13.3	4.8		8.2	5.8	1.5	9.9	1.6	4.9	34.6	9.4
Uniform delay (s)	34.3	29.8		53.1	31	22.7	33.8	29.2	16.9	32.1	23.6
Incremental delay (s)	21.5	0		18.1	0	0	.2	0	.3	14.8	.4
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	55.8	29.8		71.2	31	22.7	34	29.2	17.2	46.9	24
LOS	E	C		E	C	C	C	C	B	D	C
Approach delay (s)/LOS	46.6 / D			50.8 / D		32.7 / C			36.6 / D		
Intersection delay (s)/ LOS	39.1 / D											

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CHAPTER 18 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 PM 2010
Comment: 2010 AMB SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Fixed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	286	104	52	78	88	209	47	528	68	198	674	338
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (b/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	13	24	5	10	37			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 116 Lost time per cycle (s): 25 Critical v/c Ratio: .845

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	301	159		175	188	49	551	61	208	709	324
Capacity (veh/h)	378	655		290	553	341	1131	462	497	835	665
Adjusted saturation flow (veh/h)	1770	1726		1403	1457	1770	3547	1448	1770	1863	1483
v/c ratio	.795	.243		.602	.341	.145	.487	.132	.42	.85	.488
g/C ratio	.379	.379		.207	.379	.405	.319	.319	.534	.448	.448
Average back of queue (veh)	9.9	3.7		5.7	4.6	1	8.1	1.5	4.3	24.2	8
Uniform delay (s)	28.1	24.6		41.7	25.7	21.1	31.8	28.1	15.6	28.5	22.6
Incremental delay (s)	12.2	0		3.5	0	0	.3	0	.2	9	.3
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	40.3	24.6		45.2	25.7	21.1	32.1	28.1	15.8	32.5	23.1
LOS	D	C		D	C	C	C	C	B	D	C
Approach delay (s)/LOS	34.9	/	C	35.1	/	D	30.9	/	C	30.1	/	C
Intersection delay (s)/ LOS	31.8			/		C						

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CHAPTER 18 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT2 PM 2010
Comment: 2010 TOT SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Fixed % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	286	102	59	82	85	224	55	563	63	188	734	338
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	3	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (b/h)	0			0			0			0		
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	15	24	5	10	41			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 120 Lost time per cycle (s): 20 Critical v/c Ratio: .854

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	301	164		176	183	58	593	56	198	773	324
Capacity (veh/h)	360	627		276	533	338	1212	497	490	869	694
Adjusted saturation flow (veh/h)	1770	1713		1381	1453	1770	3547	1456	1770	1863	1487
v/c ratio	.836	.262		.636	.344	.171	.489	.112	.404	.889	.467
g/C ratio	.367	.367		.2	.367	.425	.342	.342	.55	.467	.467
Average back of queue (veh)	10.8	4.1		6	4.7	1.2	8.8	1.3	4.1	28.9	7.9
Uniform delay (s)	30.7	26.6		44	27.5	20.5	31.2	27	15.2	29.2	21.8
Incremental delay (s)	17.9	0		4.9	0	0	.3	0	.2	12.9	.4
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	48.6	26.6		48.9	27.5	20.5	31.5	27	15.4	42.1	22.2
LOS	D	C		D	C	C	C	C	B	D	C
Approach delay (s)/LOS	40.9	/	D	38	/	D	30.3	/	C	33	/	C
Intersection delay (s)/ LOS	34.3			/		C						

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMD2 PM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB PM SCEN2 W/ PARKWAY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	305	110	55	83	93	243	50	697	72	210	812	358
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N		N	N		N	N		N	N		N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	19	24	5	12	45			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 130 | Lost time per cycle (s): 25 | Critical v/c Ratio: .931

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R	
No. of lanes	1	1		1	1	1	2	1	1	1	1	
Flow rate (veh/h)	319	168		185	203	53	671	65	221	855	345	
Capacity (veh/h)	368	639		257	533	314	1228	505	466	888	710	
Adjusted saturation flow (veh/h)	1770	1734		1395	1443	1770	3547	1458	1770	1863	1489	
v/c ratio	.866	.285		.72	.381	.168	.546	.129	.475	.962	.486	
g/C ratio	.369	.369		.185	.369	.423	.346	.346	.554	.477	.477	
Average back of queue (veh)	12.9	4.5		7.2	5.7	1.2	11	1.7	5.2	41.7	9.2	
Uniform delay (s)	33.1	28.7		49.8	30.1	22.3	34.3	29.1	17.1	32.9	23.2	
Incremental delay (s)	22.8	0		10	.1	0	.5	0	.6	32.7	.5	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	55.9	28.7		59.8	30.2	22.3	34.8	29.1	17.7	65.6	23.7	
LOS	E	C		E	C	C	C	C	B	E	C	
Approach delay (s)/LOS	46.5	/ D		44.3	/ D	33.5	/ C		47.9	/ D		
Intersection delay (s)/ LOS	43.6	/ D										

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: TOT2 PM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 TOT PM SCEN2 W/ PARKWAY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	303	108	63	92	90	238	58	686	67	200	892	358
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N		N	N		N	N		N	N		N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	28	30	5	10	25			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 175 | Lost time per cycle (s): 25 | Critical v/c Ratio: .973

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R	
No. of lanes	1	1		1	1	1	2	1	1	1	1	
Flow rate (veh/h)	319	175		192	198	61	722	69	211	939	345	
Capacity (veh/h)	369	615		233	516	321	1520	634	436	979	787	
Adjusted saturation flow (veh/h)	1770	1709		1361	1434	1770	3547	1479	1770	1863	1496	
v/c ratio	.863	.264		.821	.383	.19	.475	.095	.483	.959	.439	
g/C ratio	.36	.36		.171	.36	.486	.429	.429	.583	.526	.526	
Average back of queue (veh)	17.1	6.4		10.8	7.6	1.7	14	1.8	6.3	57.6	11	
Uniform delay (s)	45.6	39.9		69.9	41.6	24	35.9	29.8	20.2	39.7	25.6	
Incremental delay (s)	22.2	0		23.7	.1	0	.2	0	.7	28.8	.2	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	67.8	39.9		93.6	41.7	24	36.1	29.8	20.9	68.5	25.8	
LOS	E	D		F	D	C	D	C	C	E	C	
Approach delay (s)/LOS	58	/ E		67.3	/ E	34.8	/ C		51.9	/ D		
Intersection delay (s)/ LOS	50.2	/ D										

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB3 PM 2016
Comment: 2016 AMB PM SCEN23W/ PKWY &4LHWY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other — Analysis period: 1 h — Signal type: Actuated-Field — % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	303	110	55	83	93	243	50	711	72	210	950	358
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/c/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	27	36	5	12	85			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 190 — Lost time per cycle (s): 25 — Critical v/c Ratio: .965

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	319	168		185	203	53	748	65	221	1000	345
Capacity (veh/h)	367	617		264	518	288	1587	664	423	1000	804
Adjusted saturation flow (veh/h)	1770	1723		1392	1447	1770	3547	1483	1770	1863	1498
v/c ratio	.87	.273		.703	.392	.183	.472	.098	.522	1	.429
g/C ratio	.358	.358		.189	.358	.5	.447	.447	.589	.537	.537
Average back of queue (veh)	18.5	8.6		10.3	8.5	1.6	15.4	2.1	7.4	76	11.7
Uniform delay (d)	49.6	43.4		72	45.6	24.7	36.8	30.3	21.6	44	26.5
Incremental delay (s)	23.8	0		8.5	.1	0	.2	0	1.2	56.9	.2
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	73.4	43.4		80.5	45.7	24.7	37	30.3	22.8	100.9	26.7
LOS	E	D		F	D	C	D	C	C	F	C
Approach delay (s)/LOS	63	/ E		62.3	/ E	35.7	/ D		73.5	/ E	
Intersection delay (s)/ LOS	60.3	/ E									

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT3 PM 2016
Comment: 2016 TOT PM SCEN23W/ PKWY &4LHWY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other — Analysis period: 1 h — Signal type: Actuated-Field — % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	303	108	63	92	90	238	58	760	67	200	1030	358
RTOR volume (veh/h)			5			50			10			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/c/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTR	LTRP						
WB	R	LTRP						
NB			L		LTRP			
SB			L	LTRP	LTRP			
Green (s)	27	36	5	12	105			
Yellow + All red (s)	5	5	5	5	5			

Cycle (s): 210 — Lost time per cycle (s): 20 — Critical v/c Ratio: 1.039

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L	TR		LT	R	L	T	R	L	T	R
No. of lanes	1	1		1	1	1	2	1	1	1	1
Flow rate (veh/h)	319	175		192	198	61	800	60	211	1084	345
Capacity (veh/h)	314	552		233	464	285	1773	746	427	1082	873
Adjusted saturation flow (veh/h)	1770	1704		1357	1434	1770	3547	1492	1770	1863	1503
v/c ratio	1.014	.317		.824	.426	.214	.451	.08	.493	1.002	.395
g/C ratio	.324	.324		.171	.324	.548	.5	.5	.629	.581	.581
Average back of queue (veh)	28.5	8.1		12.8	9.6	3.9	16.7	1.9	7	89.3	11.6
Uniform delay (d)	63.4	53.5		83.9	55.7	22.6	33.9	27.3	20	44	23.9
Incremental delay (s)	115.8	0		24.3	.3	0	.1	0	.9	56.5	.3
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0
Delay (s)	179.2	53.5		108.2	56	22.6	34	27.3	20.9	100.5	24
LOS	F	D		F	E	C	C	C	C	F	C
Approach delay (s)/LOS	134.7	/ F		81.7	/ F	32.8	/ C		74.2	/ E	
Intersection delay (s)/ LOS	72.6	/ E									

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: EXISTING AM 2004
Comment: 2004 EXISTING AM

Site Information

Jurisdiction/Date: 2/21/05
EB/WB Street: NANI KAILU
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Field % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	55	25	15	125	50	65	15	905	35	60	645	40
XTOR volume (veh/h)			10			40			10			20
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (b/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing/Timing

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	21	3	64					
Yellow + All red (s)	5.4	3.8	4.6					

Cycle (s): 102 Lost time per cycle (s): 14 Critical v/c Ratio: .83

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		87	5		190	27	16	984	27	65	701	21
Capacity (veh/h)		170	318		247	318	376	1169	986	181	1169	986
Adjusted saturation flow (veh/h)		826	1545		1199	1545	1770	1863	1571	1770	1863	1571
v/c ratio		.512	.017		.77	.085	.043	.842	.028	.361	.6	.022
g/C ratio		.206	.206		.206	.206	.704	.627	.627	.704	.627	.627
Average back of queue (veh)		2.5	.1		6.1	.7	.1	26.2	.3	8	13.1	.2
Uniform delay (s)		38.9	32.3		38.2	32.7	7.5	15	7.2	16.2	11.4	7.2
Incremental delay (s)		2.6	0		15.1	0	0	6	0	0	.9	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		38.5	32.3		53.3	32.7	7.5	21	7.2	16.2	12.3	7.2
LOS		D	C		D	C	A	C	A	B	B	A
Approach delay (s)/LOS	38.2 / D			50.8 / D			20.4 / C			12.4 / B		
Intersection delay (s)/ LOS	21.3 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB1 AM 2010
Comment: 2010 AMB AM&TOT SCENI W/NO IMPS

Site Information

Jurisdiction/Date: 3/1/05
EB/WB Street: NANI KAILU
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other Analysis period: 1 h Signal type: Actuated-Field % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	62	26	16	68	52	135	21	1048	36	68	724	47
XTOR volume (veh/h)			10			40			10			20
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (b/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing/Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	24	4	83					
Yellow + All red (s)	5.4	3.8	3.8					

Cycle (s): 126 Lost time per cycle (s): 15 Critical v/c Ratio: .831

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		93	6		126	100	22	1103	27	72	762	28
Capacity (veh/h)		182	294		223	294	375	1227	1035	140	1227	1035
Adjusted saturation flow (veh/h)		955	1542		1169	1542	1770	1863	1571	1770	1863	1571
v/c ratio		.509	.022		.567	.341	.059	.899	.026	.512	.621	.027
g/C ratio		.19	.19		.19	.19	.737	.659	.659	.737	.659	.659
Average back of queue (veh)		3.2	.2		4.5	3.2	.7	39.9	.4	1.2	17	.4
Uniform delay (s)		45.7	41.5		46.3	44.1	8.5	18	7.5	26	12.4	7.5
Incremental delay (s)		2.4	0		3.4	0	0	30.4	0	3.2	1	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		48.1	41.5		49.7	44.1	8.5	28.4	7.5	29.2	13.4	7.5
LOS		D	D		D	D	A	C	A	C	B	A
Approach delay (s)/LOS	47.7 / D			47.2 / D			27.5 / C			14.5 / B		
Intersection delay (s)/ LOS	25.5 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: NANI KAILU
Analysis Period/Year: AMB1 AM 2016 | NB/SB Street: QUEEN KAAH
Comment: 2016 AMB&TOT AM SCEN1 W/NO IMPS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	66	28	17	72	55	143	22	1174	38	72	811	50
RTOR volume (veh/h)			10			40			10			20
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	35	5	180					
Yellow + All red (s)	5.4	3.8	5.8					

Cycle (s): 235 | Lost time per cycle (s): 15 | Critical v/c Ratio: .884

Intersection Performance

	EB			WB			NB			SB		
	LT	R		LT	R	L	T	R	L	T	R	
Lane group configuration												
No. of lanes	1	1		1	1	1	1	1	1	1	1	
Flow rate (veh/h)	99	7		134	108	23	1236	29	76	854	32	
Capacity (veh/h)	103	228		139	228	431	1427	1205	162	1427	1205	
Adjusted saturation flow (veh/h)	695	1530		935	1530	1770	1863	1473	1770	1863	1573	
v/c ratio	.956	.032		.96	.476	.056	.866	.024	.467	.398	.026	
g/C ratio	.149	.149		.149	.149	.812	.766	.766	.812	.766	.766	
Average back of queue (veh)	9.4	.4		12.5	6.9	.3	65.1	.5	1.6	26.3	.5	
Uniform delay (s)	99.2	85.5		99.3	91.6	9.6	19.1	6.6	41.5	11.9	6.6	
Incremental delay (s)	132.4	0		113.4	1.3	0	6.3	0	1.6	.7	0	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	231.6	85.5		212.7	92.9	9.6	25.4	6.6	43.1	12.6	6.6	
LOS	F	F		F	F	A	C	A	D	B	A	
Approach delay (s)/LOS	221.5 / F			159.1 / F		24.7 / C			14.8 / B			
Intersection delay (s)/ LOS	41.6 / D											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: NANI KAILU
Analysis Period/Year: AMB2 AM 2010 | NB/SB Street: QUEEN KAAH
Comment: 2010 AMB AM&TOT SCEN2 W/ PARKWAY

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	62	26	16	68	52	135	21	976	36	68	648	47
RTOR volume (veh/h)			10			40			10			20
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	24	4	83					
Yellow + All red (s)	5.4	3.8	5.8					

Cycle (s): 126 | Lost time per cycle (s): 15 | Critical v/c Ratio: .785

Intersection Performance

	EB			WB			NB			SB		
	LT	R		LT	R	L	T	R	L	T	R	
Lane group configuration												
No. of lanes	1	1		1	1	1	1	1	1	1	1	
Flow rate (veh/h)	93	6		126	100	22	1027	27	72	682	38	
Capacity (veh/h)	182	294		223	294	431	1227	1035	193	1227	1035	
Adjusted saturation flow (veh/h)	953	1542		1169	1542	1770	1863	1571	1770	1863	1571	
v/c ratio	.509	.022		.567	.341	.051	.837	.026	.37	.556	.027	
g/C ratio	.19	.19		.19	.19	.737	.659	.659	.737	.659	.659	
Average back of queue (veh)	3.2	.2		4.5	3.2	.2	32.1	.3	1	14	.4	
Uniform delay (s)	45.7	41.5		46.3	44.1	7.2	16.4	7.5	19.5	11.6	7.5	
Incremental delay (s)	3.4	0		3.4	0	0	5.5	0	.1	.6	0	
Initial queue delay (s)	0	0		0	0	0	0	0	0	0	0	
Delay (s)	48.1	41.5		49.7	44.1	7.2	21.9	7.5	19.6	12.2	7.5	
LOS	D	D		D	D	A	C	A	B	B	A	
Approach delay (s)/LOS	47.1 / D			47.2 / D		21.2 / C			12.7 / B			
Intersection delay (s)/ LOS	22 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: NANI KAILU
Analysis Period/Year: AMP2 AM 2016 | NB/SB Street: QUEEN KAAH
Comment: 2016 AMB&TOT AM SCEN2 W/ PARKWAY

Intersection Basic

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	66	28	17	72	55	143	22	1142	38	72	777	50
RTOR volume (veh/h)			10			40			10			20
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	35	5	180					
Yellow + All red (s)	3.4	3.8	3.8					

Cycle (s): 235 | Lost time per cycle (s): 13 | Critical v/c Ratio: .865

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		99	7		134	108	23	1202	29	76	818	32
Capacity (veh/h)		103	228		139	228	434	1427	1205	186	1427	1205
Adjusted saturation flow (veh/h)		695	1520		935	1520	1770	1863	1573	1770	1863	1573
v/c ratio		.956	.032		.96	.476	.053	.843	.024	.408	.573	.026
g/C ratio		.149	.149		.149	.149	.612	.766	.766	.812	.766	.766
Average back of queue (veh)		9.4	.4		12.5	6.9	.3	59.4	.5	1.5	24.9	.5
Uniform delay (s)		99.2	85.5		99.3	91.6	8.8	18.1	6.6	35.4	11.5	6.6
Incremental delay (s)		132.4	0		113.4	1.3	0	5	0	.5	.6	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		231.6	85.5		212.7	92.9	8.8	23.1	6.6	35.9	12.1	6.6
LOS		F	F		F	F	A	C	A	D	B	A
Approach delay (s)/LOS	221.5	/	F	159.1	/	F	22.5	/	C	13.8	/	B
Intersection delay (s)/ LOS	40.8			/			D					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: NANI KAILU
Analysis Period/Year: AMB1AM 2016 | NB/SB Street: QUEEN KAAH
Comment: 2016 AMB&TOT AM SCEN3 W/ PKWY &41H

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	66	28	17	72	55	143	22	1404	38	72	1011	50
RTOR volume (veh/h)			10			40			10			20
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	35	5	90					
Yellow + All red (s)	5.4	3.8	5.8					

Cycle (s): 145 | Lost time per cycle (s): 15 | Critical v/c Ratio: .622

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	2	1	1	2	1
Flow rate (veh/h)		99	7		134	108	23	1478	29	76	1064	32
Capacity (veh/h)		263	372		305	377	307	2201	975	185	2201	975
Adjusted saturation flow (veh/h)		1038	1564		1256	1364	1770	3547	1571	1770	3547	1571
v/c ratio		.377	.02		.441	.287	.075	.671	.03	.41	.483	.032
g/C ratio		.241	.241		.241	.241	.695	.621	.621	.695	.621	.621
Average back of queue (veh)		3.6	.2		4.9	3.8	.3	22.4	.5	1.4	13.1	.5
Uniform delay (s)		45.9	41.9		46.7	44.8	9	17.9	10.6	14.8	14.9	10.6
Incremental delay (s)		.1	0		.6	0	0	8	0	.5	.1	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		46	41.9		47.3	44.8	9	18.7	10.6	15.3	15	10.6
LOS		D	D		D	D	A	B	B	B	B	B
Approach delay (s)/LOS	45.7	/	D	46.2	/	D	18.4	/	B	14.9	/	B
Intersection delay (s)/ LOS	20.2			/			C					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 2/21/05
Agency or Company: | EB/WB Street: NANI KAILU
Analysis Period/Year: EXISTING PM 2004 | NB/SB Street: QUEEN KAAH
Comment: 2004 EXISTING PM

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	100	35	25	25	30	60	40	845	55	95	950	95
RTOR volume (veh/h)			10			30			15			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	19	5	55					
Yellow + All red (s)	5.4	3.8	5.8					

Cycle (s): 94 | Lost time per cycle (s): 15 | Critical v/c Ratio: .826

Intersection Performance

	EB			WB			NB			SB		
		LT	R		LT	R	L	T	R	L	T	R
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		142	16		58	32	42	889	42	100	1000	68
Capacity (veh/h)		276	312		297	312	173	1090	919	244	1090	919
Adjusted saturation flow (veh/h)		1364	1544		1469	1544	1770	1863	1570	1770	1863	1570
v/c ratio		.516	.051		.195	.104	.243	.816	.046	.409	.918	.074
g/C ratio		.202	.202		.202	.202	.2	.585	.585	.7	.585	.585
Average back of queue (veh)		3.7	.4		1.5	.7	.5	21.6	.5	1.2	30.5	.8
Uniform delay (s)		33.4	30.2		31.1	30.5	17.9	15.5	8.3	13.7	17.3	8.5
Incremental delay (s)		1.7	0		0	0	0	5.1	0	.4	14.6	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		35.1	30.2		31.1	30.5	17.9	20.6	8.3	14.1	32.1	8.5
LOS		D	C		C	C	B	C	A	B	C	A
Approach delay (s)/LOS	34.6	/	C	30.9	/	C	19.9	/	B	29.1	/	C
Intersection delay (s)/ LOS	25.8			/			C					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: NANI KAILU
Analysis Period/Year: AMBI PM 2010 | NB/SB Street: QUEEN KAAH
Comment: 2010 AMB&TOT PM SCENI W/NO IMPS

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Field | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	130	36	26	26	31	62	42	967	57	104	1102	114
RTOR volume (veh/h)			10			30			15			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	P	LTRP				
SB		L	LTRP	LTRP				
Green (s)	32	3	6	83				
Yellow + All red (s)	5.4	3.8	3.8	5.8				

Cycle (s): 145.8 | Lost time per cycle (s): 18.8 | Critical v/c Ratio: .901

Intersection Performance

	EB			WB			NB			SB		
		LT	R		LT	R	L	T	R	L	T	R
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		175	17		60	34	44	1018	44	109	1160	88
Capacity (veh/h)		283	347		306	347	337	1083	912	417	1211	1021
Adjusted saturation flow (veh/h)		1263	1548		1366	1548	1770	1863	1570	1770	1863	1571
v/c ratio		.617	.049		.196	.097	.131	.94	.048	.932	.958	.087
g/C ratio		.224	.224		.224	.224	.643	.581	.581	.711	.65	.65
Average back of queue (veh)		6.9	.5		2	1.1	7	48.4	.8	5	57.5	1.4
Uniform delay (s)		49.9	43.5		45	43.9	9.3	27.6	12.9	32.8	23.2	9.3
Incremental delay (s)		4.1	0		0	0	0	20	0	102.6	24.2	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		54	43.5		45	43.9	9.3	47.6	12.9	135.4	47.4	9.3
LOS		D	D		D	D	A	D	B	F	D	A
Approach delay (s)/LOS	53.1	/	D	44.6	/	D	44.7	/	D	52	/	D
Intersection delay (s)/ LOS	48.9			/			D					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB1 PM 2016
Comment: 2016 AMB&TOT PM SCEN1 W/NO IMPS

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: NANI KAILU
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other — Analysis period: 1 h — Signal type: Actuated-Field — % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	138	38	28	28	33	66	45	1083	60	116	1334	121
RTOR volume (veh/h)			10			30			15			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	P	LTRP				
SB		L	LTRP	LTRP				
Green (s)	32	3	6	170				
Yellow + All red (s)	5.4	3.8	3.8	3.8				

Cycle (s): 229.8 — Lost time per cycle (s): 18.8 — Critical v/c Ratio: DEF

Intersection Performance

	EB			WB			NB			SB		
		LT	R		LT	R	L	T	R	L	T	R
Lane group configuration												
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		185	19		64	38	47	1140	47	116	1299	96
Capacity (veh/h)		145	213		88	213	346	1378	1163	199	1457	1251
Adjusted saturation flow (veh/h)		1038	1536		630	1536	1770	1863	1573	1770	1863	1573
v/c ratio		1.28	.089		.732	.178	.137	.827	.041	.581	.891	.078
g/C ratio		.139	.139		.139	.139	.778	.74	.74	.821	.782	.782
Average back of queue (veh)		33.7	1.1		4.7	2.2	.8	55.5	.9	2.7	70.5	1.5
Uniform delay (s)		98.9	86.2		94.8	87.3	5.9	20.1	8	34.3	18	5.8
Incremental delay (s)		559.9	0		30.6	0	0	4.5	0	4.5	8.1	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		654.8	86.2		125.4	87.3	5.8	24.6	8	38.6	26.1	5.8
LOS		F	F		F	F	A	C	A	D	C	A
Approach delay (s)/LOS	602 / F			111.3 / F			23.2 / C			25.7 / C		
Intersection delay (s)/ LOS	66.1 / E											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 PM 2010
Comment: 2010 AMB&TOT PM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: NANI KAILU
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other — Analysis period: 1 h — Signal type: Actuated-Field — % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	130	30	26	26	31	62	42	889	57	104	1001	114
RTOR volume (veh/h)			10			30			15			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	P	LTRP				
SB		L	LTRP	LTRP				
Green (s)	32	3	6	83				
Yellow + All red (s)	5.4	3.8	3.8	5.8				

Cycle (s): 142.8 — Lost time per cycle (s): 18.8 — Critical v/c Ratio: 835

Intersection Performance

	EB			WB			NB			SB		
		LT	R		LT	R	L	T	R	L	T	R
Lane group configuration												
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		175	19		60	34	44	936	44	109	1054	88
Capacity (veh/h)		283	347		306	347	369	1883	912	178	1211	1021
Adjusted saturation flow (veh/h)		1363	1548		1386	1548	1770	1863	1570	1770	1863	1571
v/c ratio		.617	.049		.196	.097	.12	.864	.048	.614	.87	.087
g/C ratio		.224	.224		.224	.224	.643	.581	.581	.711	.65	.65
Average back of queue (veh)		6.9	5		2	1.1	.7	36.9	.8	2.4	40	1.4
Uniform delay (s)		49.9	43.5		45	43.9	9.3	25.2	12.9	24.3	29.2	9.3
Incremental delay (s)		4.1	0		0	0	0	8.1	0	6.3	7.7	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		54	43.5		45	43.9	9.3	33.3	12.9	30.6	27.9	9.3
LOS		D	D		D	D	A	C	B	C	C	A
Approach delay (s)/LOS	53.1 / D			44.6 / D			31.3 / C			26.8 / C		
Intersection delay (s)/ LOS	31.2 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 PM 2016
Comment: 2016 AMB&TOT PM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: NANI KAILU
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Fixed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	138	38	28	28	33	66	45	1043	60	110	1153	121
RTOR volume (veh/h)			10			30			15			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right pocket (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Ped/b

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	P	LTRP				
SB		L	LTRP	LTRP				
Green (s)	32	3	6	170				
Yellow + All red (s)	5.4	3.8	3.8	5.8				

Cycle (s): 229.8 | Lost time per cycle (s): 18.8 | Critical v/c Ratio: .936

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	1	1	1	1	1
Flow rate (veh/h)		185	19		64	38	47	1098	47	116	1245	96
Capacity (veh/h)		145	213		88	213	363	1378	1163	228	1457	1231
Adjusted saturation flow (veh/h)		1039	1526		630	1526	1770	1863	1373	1770	1863	1573
v/c ratio		1.28	.089		.732	.178	.13	.797	.043	.508	.854	.078
g/C ratio		.139	.139		.139	.139	.278	.74	.74	.621	.782	.782
Average back of queue (veh)		33.7	1.1		4.7	2.2	.8	49.9	.9	2.4	60.4	1.5
Uniform delay (s)		98.9	86.2		94.8	87.3	5.8	18.9	8	28.5	16.4	5.8
Incremental delay (s)		555.9	0		30.6	0	0	3.5	0	1.9	5.5	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		654.8	86.2		125.4	87.3	5.8	22.4	8	30.4	21.9	5.8
LOS		F	F		F	F	A	C	A	C	C	A
Approach delay (s)/LOS	602 / F			111.3 / F			21.2 / C			21.5 / C		
Intersection delay (s)/ LOS	64.6 / E											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB3 PM 2016
Comment: 2016 AMB&TOT PM SC3 W/PKWY &4LHW

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: NANI KAILU
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other | Analysis period: 1 h | Signal type: Actuated-Fixed | % Back of queue: 70

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	138	38	28	28	33	66	45	1208	60	110	1514	121
RTOR volume (veh/h)			10			30			15			30
Peak-hour factor	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		10			10			10			10	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right pocket (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	P	LTRP				
SB		L	LTRP	LTRP				
Green (s)	40	3	6	90				
Yellow + All red (s)	5.4	3.8	3.8	5.8				

Cycle (s): 157.6 | Lost time per cycle (s): 18.8 | Critical v/c Ratio: .699

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LT	R	L	T	R	L	T	R
No. of lanes		1	1		1	1	1	2	1	1	2	1
Flow rate (veh/h)		185	19		64	38	47	1272	47	116	1594	96
Capacity (veh/h)		320	397		355	397	212	2023	895	203	2243	993
Adjusted saturation flow (veh/h)		1261	1565		1401	1565	1770	3547	1569	1770	3547	1571
v/c ratio		.58	.048		.181	.096	.223	.629	.053	.57	.71	.096
g/C ratio		.253	.253		.253	.253	.626	.57	.57	.688	.632	.632
Average back of queue (veh)		7.8	.7		2.3	1.3	.9	21.3	1	2.8	27.1	1.7
Uniform delay (s)		51.5	44.5		46.1	45.1	11.3	22.7	15	17.6	19.4	11.4
Incremental delay (s)		2.7	0		0	0	0	.6	0	3.8	1.1	0
Initial queue delay (s)		0	0		0	0	0	0	0	0	0	0
Delay (s)		54.2	44.5		46.1	45.1	11.3	23.3	15	21.4	20.5	11.4
LOS		D	D		D	D	B	C	B	C	C	B
Approach delay (s)/LOS	53.3 / D			45.7 / D			22.6 / C			20 / B		
Intersection delay (s)/ LOS	23.8 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: AMB1 AM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 AMB AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	182	10	94	20	10	40	88	249	10	20	200	120
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT Ped: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 | Lost time per cycle (s): 14 | Critical v/c Ratio: .471

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		209	102		76		96	275		22	348	
Capacity (veh/h)		294	346		331		600	1079		663	1010	
Adjusted saturation flow (veh/h)		1198	1411		1349		1779	1834		1779	1716	
v/c ratio		.711	.295		.23		.159	.255		.033	.344	
g/C ratio		.245	.245		.245		.667	.588		.667	.588	
Average back of queue (veh)		6.2	2.5		1.8		1	4		.2	5.5	
Uniform delay (s)		35.2	31.3		30.8		6.5	10.2		6	10.8	
Incremental delay (s)		7.8	0		0		0	0		0	0	
Initial queue delay (s)		0	0		0		0	0		0	0	
Delay (s)		43	31.3		30.8		6.5	10.2		6	10.8	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	39.2	/	D	30.8	/	C	9.2	/	A	10.6	/	B
Intersection delay (s)/ LOS	19.4			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: TOT1 AM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 TOT AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	203	10	94	20	10	40	88	273	10	20	212	127
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT Ped: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	55					
Yellow + All red (s)	5	4	5					

Cycle (s): 97 | Lost time per cycle (s): 14 | Critical v/c Ratio: .514

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		232	102		76		96	308		22	368	
Capacity (veh/h)		307	366		347		562	1041		613	973	
Adjusted saturation flow (veh/h)		1192	1419		1347		1770	1836		1770	1716	
v/c ratio		.753	.279		.219		.17	.296		.035	.379	
g/C ratio		.258	.258		.258		.649	.567		.649	.567	
Average back of queue (veh)		6.7	2.4		1.7		1	4.6		.2	5.9	
Uniform delay (s)		33.2	28.8		28.3		7	10.9		6.4	11.6	
Incremental delay (s)		10.1	0		0		0	0		0	0	
Initial queue delay (s)		0	0		0		0	0		0	0	
Delay (s)		43.3	28.8		28.3		7	10.9		6.4	11.6	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	38.8	/	D	28.3	/	C	10	/	A	11.3	/	B
Intersection delay (s)/ LOS	19.6			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: AMB1 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	195	10	100	20	10	40	93	272	10	20	224	127
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Lot/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	3	4	5					

Cycle (s): 102 | Lost time per cycle (s): 14 | Critical v/c Ratio: .507

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		223	109		76		101	307		22	362	
Capacity (veh/h)		293	346		320		572	1080		635	1012	
Adjusted saturation flow (veh/h)		1196	1411		1307		1770	1896		1770	1721	
v/c ratio		.76	.314		.237		.177	.284		.034	.377	
g/C ratio		.245	.245		.245		.667	.585		.667	.588	
Average back of queue (veh)		6.9	2.7		1.8		1.1	4.6		.2	6.2	
Uniform delay (d)		35.7	31.5		30.9		6.7	10.4		6.1	11.1	
Incremental delay (d)		11	0		0		0	0		0	0	
Initial queue delay (d)		0	0		0		0	0		0	0	
Delay (d)		46.7	31.5		30.9		6.7	10.4		6.1	11.1	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	41.7	/	D	30.9	/	C	9.5	/	A	10.8	/	B
Intersection delay (s)/ LOS	20			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: TOT1 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 TOT AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	213	10	100	20	10	40	93	303	10	20	248	130
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)	50			50			50			50		
Approach bicycle volume (bic/h)	0			0			0			0		
Lot/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	26	3	55					
Yellow + All red (s)	5	4	5					

Cycle (s): 98 | Lost time per cycle (s): 14 | Critical v/c Ratio: .53

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		242	109		76		101	340		22	378	
Capacity (veh/h)		316	378		358		545	1031		577	963	
Adjusted saturation flow (veh/h)		1193	1422		1351		1770	1837		1770	1716	
v/c ratio		.766	.288		.212		.185	.33		.038	.393	
g/C ratio		.265	.265		.265		.643	.561		.643	.561	
Average back of queue (veh)		7.2	2.5		1.7		1.1	5.4		.2	6.3	
Uniform delay (d)		33.2	28.6		28		7.4	11.6		6.9	12.1	
Incremental delay (d)		10.7	0		0		0	0		0	.1	
Initial queue delay (d)		0	0		0		0	0		0	0	
Delay (d)		43.9	28.6		28		7.4	11.6		6.9	12.2	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	39.2	/	D	28	/	C	10.6	/	B	11.9	/	B
Intersection delay (s)/ LOS	20			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 AM 2010
Comment: 2010 AMB AM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	182	10	94	20	10	40	88	311	10	20	254	120
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 100 | Lost time per cycle (s): 14 | Critical v/c Ratio: .508

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		209	102		76		96	349		22	407	
Capacity (veh/h)		294	346		331		592	1081		599	1021	
Adjusted saturation flow (veh/h)		1194	1411		1349		1770	1839		1770	1735	
v/c ratio		.711	.295		.23		.173	.323		.036	.398	
g/C ratio		.245	.245		.245		.667	.588		.667	.588	
Average back of queue (veh)		6.2	2.5		1.8		1	5.4		.2	6.7	
Uniform delay (s)		35.2	31.3		30.8		6.8	10.7		6.2	11.3	
Incremental delay (s)		7.8	0		0		0	0		0	.1	
Initial queue delay (s)		0	0		0		0	0		0	0	
Delay (s)		43	31.3		30.8		6.8	10.7		6.2	11.4	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	39.2	/	D	30.8	/	C	9.8	/	A	11.1	/	B
Intersection delay (s)/ LOS	18.8			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT2 AM 2010
Comment: 2010 TOT AM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	203	10	94	20	10	40	88	341	10	20	266	127
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	58					
Yellow + All red (s)	5	4	5					

Cycle (s): 100 | Lost time per cycle (s): 14 | Critical v/c Ratio: .547

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		232	102		76		96	382		22	427	
Capacity (veh/h)		299	353		327		527	1066		564	1006	
Adjusted saturation flow (veh/h)		1394	1414		1308		1770	1838		1770	1734	
v/c ratio		.775	.289		.233		.182	.358		.039	.425	
g/C ratio		.25	.35		.25		.66	.58		.66	.58	
Average back of queue (veh)		7.1	2.5		1.8		1.1	6		.2	7.2	
Uniform delay (s)		34.9	30.3		29.9		7.1	11.1		6.5	11.7	
Incremental delay (s)		12.1	0		0		0	0		0	.1	
Initial queue delay (s)		0	0		0		0	0		0	0	
Delay (s)		47	30.3		29.9		7.1	11.1		6.5	11.8	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	41.9	/	D	29.9	/	C	10.3	/	B	11.5	/	B
Intersection delay (s)/ LOS	19.7			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: AMB2 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB AM SCEN2 W/ PARKWAY

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	193	10	100	20	10	40	93	380	10	20	311	157
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 | Lost time per cycle (s): 14 | Critical v/c Ratio: .566

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		223	109		76		101	424		22	476	
Capacity (veh/h)		293	346		320		496	1082		538	1027	
Adjusted saturation flow (veh/h)		1196	1413		1307		1770	1839		1770	1746	
v/c ratio		.76	.314		.237		.204	.392		.04	.464	
g/C ratio		.245	.245		.245		.667	.588		.667	.588	
Average back of queue (veh)		6.9	2.7		1.8		1.1	6.9		.2	8.3	
Uniform delay (d)		35.7	31.5		30.9		7.3	11.2		6.6	11.9	
Incremental delay (d)		11	0		0		0	.1		0	.2	
Initial queue delay (d)		0	0		0		0	0		0	0	
Delay (s)		46.7	31.5		30.9		7.3	11.3		6.6	12.1	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	41.7	/	D	30.9	/	C	10.6	/	B	11.8	/	B
Intersection delay (s)/ LOS	19.3			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: TOT2 AM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 TOT AM SCEN W/ PARKWAY

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	213	10	100	20	10	40	93	413	10	20	379	130
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 | Lost time per cycle (s): 14 | Critical v/c Ratio: .634

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		242	109		76		101	458		22	553	
Capacity (veh/h)		293	346		307		437	1082		511	1034	
Adjusted saturation flow (veh/h)		1195	1413		1291		1770	1846		1770	1758	
v/c ratio		.828	.314		.248		.231	.423		.043	.535	
g/C ratio		.245	.245		.245		.667	.588		.667	.588	
Average back of queue (veh)		7.9	2.7		1.9		1.2	7.7		.2	10.3	
Uniform delay (d)		36.5	31.5		30.9		7.9	11.5		6.8	12.6	
Incremental delay (d)		17.6	0		0		0	.1		0	.5	
Initial queue delay (d)		0	0		0		0	0		0	0	
Delay (s)		54.1	31.5		30.9		7.9	11.6		6.8	13.1	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	47.1	/	D	30.9	/	C	10.9	/	B	12.9	/	B
Intersection delay (s)/ LOS	20.8			/			C					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information / **Site Information**

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		EB/WB Street	WALUA RD/O
Analysis Period/Year	AMBE3AM 2016	NB/SB Street	KUAKINI HW
Comment	2016 AMB AM SCEN3 W/ PKWY &4LHWY		

Intersection Data

Area type: Other — Analysis period: .25 h — Signal type: Actuated-Field — % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	195	10	100	20	10	40	93	482	10	20	209	127
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	3	4	5					

Cycle (s): 102 — Lost time per cycle (s): 14 — Critical v/c Ratio: .587

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		223	109		76		101	535		22	365	
Capacity (veh/h)		293	346		320		586	1083		453	1009	
Adjusted saturation flow (veh/h)		1196	1411		1307		1770	1841		1770	1715	
v/c ratio		.76	.314		.237		.173	.494		.048	.362	
g/C ratio		.245	.245		.245		.667	.588		.667	.588	
Average back of queue (veh)		6.9	2.7		1.8		1.1	9.5		.2	5.8	
Uniform delay (d)		35.7	31.5		30.9		6.6	12.2		7.3	11	
Incremental delay (d)		11	0		0		0	.3		0	0	
Initial queue delay (d)		0	0		0		0	0		0	0	
Delay (d)		46.7	31.5		30.9		6.6	12.5		7.3	11	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	41.7 / D			30.9 / C			11.6 / B			10.8 / B		
Intersection delay (s)/ LOS	19.4 / B											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information / **Site Information**

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		EB/WB Street	WALUA RD/O
Analysis Period/Year	TOT3 AM 2016	NB/SB Street	KUAKINI HW
Comment	2016 TOT AM SCEN3 W/ PKWY &4LHWY		

Intersection Data

Area type: Other — Analysis period: .25 h — Signal type: Actuated-Field — % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	213	10	100	20	10	40	93	513	10	20	227	137
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Lane/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 — Lost time per cycle (s): 14 — Critical v/c Ratio: .627

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		242	109		76		101	568		22	396	
Capacity (veh/h)		293	346		307		561	1083		426	1009	
Adjusted saturation flow (veh/h)		1195	1411		1251		1770	1841		1776	1716	
v/c ratio		.828	.314		.248		.18	.525		.051	.392	
g/C ratio		.245	.245		.245		.607	.588		.667	.588	
Average back of queue (veh)		7.9	2.7		1.9		1.1	10.4		.2	6.5	
Uniform delay (d)		36.5	31.5		30.9		6.8	12.5		7.6	11.2	
Incremental delay (d)		17.6	0		0		0	.5		0	.1	
Initial queue delay (d)		0	0		0		0	0		0	0	
Delay (d)		54.1	31.5		30.9		6.8	13		7.6	11.3	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	47.1 / D			30.9 / C			12.1 / B			11.1 / B		
Intersection delay (s)/ LOS	20.9 / C											

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: AMBI PM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 AMB PM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Fixed | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	180	10	85	15	10	35	120	260	15	55	275	205
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 | Lost time per cycle (s): 14 | Critical v/c Ratio: .591

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		207	92		65		138	299		60	522	
Capacity (veh/h)		292	346		351		461	1076		642	999	
Adjusted saturation flow (veh/h)		1192	1411		1431		1770	1829		1770	1698	
v/c ratio		.707	.267		.186		.283	.278		.093	.522	
g/C ratio		.245	.245		.245		.667	.588		.667	.588	
Average back of queue (veh)		6.1	2.3		1.6		1.6	4.5		.6	9.6	
Uniform delay (s)		35.2	31.1		30.5		7.8	10.3		6.2	12.5	
Incremental delay (s)		7.6	.9		.0		.0	.0		.0	.5	
Initial queue delay (s)		.0	.0		.0		.0	.0		.0	.0	
Delay (s)		42.8	31.1		30.5		7.8	10.3		6.2	13	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	39.2	/	D	30.5	/	C	9.6	/	A	12.3	/	B
Intersection delay (s)/ LOS	18.1		/				B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: TOT1 PM 2010 | NB/SB Street: KUAKINI HW
Comment: 2010 TOT PM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Fixed | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	191	10	85	15	10	35	120	287	15	55	299	214
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 | Lost time per cycle (s): 14 | Critical v/c Ratio: .627

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		218	92		65		130	328		60	558	
Capacity (veh/h)		292	346		350		434	1077		617	1001	
Adjusted saturation flow (veh/h)		1190	1411		1428		1770	1831		1770	1702	
v/c ratio		.749	.267		.186		.301	.305		.097	.557	
g/C ratio		.245	.245		.245		.667	.588		.667	.588	
Average back of queue (veh)		6.7	2.3		1.6		1.6	5		.6	10.6	
Uniform delay (s)		35.6	31.1		30.5		8.2	10.5		6.3	12.9	
Incremental delay (s)		10.3	0		0		0	0		0	.7	
Initial queue delay (s)		0	0		0		0	0		0	0	
Delay (s)		45.9	31.1		30.5		8.2	10.5		6.3	13.6	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	41.5	/	D	30.5	/	C	9.9	/	A	12.9	/	B
Intersection delay (s)/ LOS	18.8		/				B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: AMP1 PM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 AMB PM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Fixed | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	185	80	88	15	10	35	127	291	15	55	308	215
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 | Lost time per cycle (s): 14 | Critical v/c Ratio: .627

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		212	96		65		138	333		60	568	
Capacity (veh/h)		292	346		350		426	1077		613	1082	
Adjusted saturation flow (veh/h)		1191	1411		1430		1770	1831		1770	1704	
v/c ratio		.726	.277		.186		.324	.309		.097	.567	
g/C ratio		.245	.245		.245		.667	.588		.667	.388	
Average back of queue (veh)		6.4	2.3		1.6		1.7	5.1		.6	10.9	
Uniform delay (s)		35.4	31.2		30.5		8.4	10.6		6.3	15	
Incremental delay (s)		8.7	0		0		0	0		0	.8	
Initial queue delay (s)		0	0		0		0	0		0	0	
Delay (s)		44.1	31.2		30.5		8.4	10.6		6.3	13.8	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	40.1	/	D	30.5	/	C	9.9	/	A	13.1	/	B
Intersection delay (s)/ LOS	18.5			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: WALUA RD/O
Analysis Period/Year: TOT1 PM 2016 | NB/SB Street: KUAKINI HW
Comment: 2016 TOT PM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Fixed | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	208	10	88	15	10	35	127	327	15	55	335	228
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	58					
Yellow + All red (s)	5	4	5					

Cycle (s): 100 | Lost time per cycle (s): 14 | Critical v/c Ratio: .584

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration		LT	R		LTR		L	TR		L	TR	
No. of lanes		1	1		1		1	1		1	1	
Flow rate (veh/h)		237	96		65		138	372		60	612	
Capacity (veh/h)		297	353		350		385	1063		572	989	
Adjusted saturation flow (veh/h)		1188	1414		1401		1770	1833		1770	1706	
v/c ratio		.798	.271		.186		.358	.35		.105	.619	
g/C ratio		.25	.25		.25		.66	.58		.66	.58	
Average back of queue (veh)		7.4	2.3		1.5		1.8	5.8		.6	12.3	
Uniform delay (s)		35.1	30.2		29.5		9.1	11.1		6.6	13.8	
Incremental delay (s)		14.2	0		0		0	0		0	1.2	
Initial queue delay (s)		0	0		0		0	0		0	0	
Delay (s)		49.3	30.2		29.5		9.1	11.1		6.6	15	
LOS		D	C		C		A	B		A	B	
Approach delay (s)/LOS	43.8	/	D	29.5	/	C	10.5	/	B	14.2	/	B
Intersection delay (s)/ LOS	19.9			/			B					

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2PM 2010
Comment: 2010 AMB PM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	180	10	85	15	10	35	120	313	15	55	338	205
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bf/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 Lost time per cycle (s): 14 Critical v/c Ratio: .63

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	LT	R	LTR		L	TR	L	TR
No. of lanes	1	1	1		1	1	1	1
Flow rate (veh/h)	207	92	65		130	357	60	585
Capacity (veh/h)	292	346	351		414	1078	593	1008
Adjusted saturation flow (veh/h)	1192	1431	1451		1770	1832	1770	1714
v/c ratio	.707	.267	.186		.315	.331	.101	.58
g/C ratio	.245	.245	.245		.667	.588	.667	.588
Average back of queue (veh)	6.1	2.3	1.6		1.6	5.5	.6	11.4
Uniform delay (s)	35.2	31.1	30.5		8.5	10.7	6.4	13.1
Incremental delay (s)	7.6	0	0		0	0	0	.8
Initial queue delay (s)	0	0	0		0	0	0	0
Delay (s)	42.8	31.1	30.5		8.5	10.7	6.4	13.9
LOS	D	C	C		A	B	A	B
Approach delay (s)/LOS	39.2 / D		30.5 / C		10.1 / B		13.2 / B	
Intersection delay (s)/ LOS	18.2 / B							

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT2 PM 2010
Comment: 2010 TOT PM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	191	10	85	15	10	35	120	340	15	55	357	214
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bf/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 Lost time per cycle (s): 14 Critical v/c Ratio: .686

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	LT	R	LTR		L	TR	L	TR
No. of lanes	1	1	1		1	1	1	1
Flow rate (veh/h)	218	92	65		130	386	60	621
Capacity (veh/h)	292	346	350		387	1078	569	1010
Adjusted saturation flow (veh/h)	1390	1411	1428		1770	1833	1770	1717
v/c ratio	.749	.267	.186		337	.358	.105	.615
g/C ratio	.245	.245	.245		.667	.588	.667	.588
Average back of queue (veh)	6.7	2.3	1.6		1.7	6.1	.6	12.5
Uniform delay (s)	35.6	31.1	30.5		9	11	6.6	13.5
Incremental delay (s)	10.3	0	0		0	0	0	1.1
Initial queue delay (s)	0	0	0		0	0	0	0
Delay (s)	45.9	31.1	30.5		9	11	6.6	14.6
LOS	D	C	C		A	B	A	B
Approach delay (s)/LOS	41.5 / D		30.5 / C		10.5 / B		13.9 / B	
Intersection delay (s)/ LOS	18.9 / B							

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMBZ PM 2016
Comment: 2016 AMB PM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	185	10	88	15	10	35	127	402	15	55	430	215
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	3	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 Lost time per cycle (s): 14 Critical v/c Ratio: .74

Intersection Performance

	EB		WB	NB		SB	
Lane group configuration	LT	R	LTR	L	TR	L	TR
No. of lanes	1	1	1	1	1	1	1
Flow rate (veh/h)	212	96	65	138	453	60	701
Capacity (veh/h)	292	346	350	329	1080	534	1018
Adjusted saturation flow (veh/h)	1191	1411	1430	1770	1833	1770	1731
v/c ratio	.726	.277	.186	.419	.42	.116	.689
g/C ratio	.245	.245	.245	.667	.588	.667	.588
Average back of queue (veh)	6.4	2.3	1.6	1.9	7.6	.6	15.3
Uniform delay (s)	35.4	31.2	30.5	10.5	11.5	6.9	14.5
Incremental delay (s)	8.7	0	0	.4	.1	0	2
Initial queue delay (s)	0	0	0	0	0	0	0
Delay (s)	44.1	31.2	30.5	10.9	11.6	6.9	16.5
LOS	D	C	C	B	B	A	B
Approach delay (s)/LOS	40.1 / D		30.5 / C	11.4 / B		13.8 / B	
Intersection delay (s)/ LOS	19.2 / B						

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT2 PM 2016
Comment: 2015 TOT PM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	208	10	88	15	10	35	127	438	15	55	457	228
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (bic/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 Lost time per cycle (s): 14 Critical v/c Ratio: .764

Intersection Performance

	EB		WB	NB		SB	
Lane group configuration	LT	R	LTR	L	TR	L	TR
No. of lanes	1	1	1	1	1	1	1
Flow rate (veh/h)	237	96	65	138	492	60	745
Capacity (veh/h)	291	346	337	299	1080	484	1018
Adjusted saturation flow (veh/h)	1188	1411	1375	1770	1836	1770	1731
v/c ratio	.814	.277	.194	.462	.456	124	.731
g/C ratio	.245	.245	.245	.667	.588	667	.588
Average back of queue (veh)	7.6	2.3	1.6	2	8.5	.6	17.2
Uniform delay (s)	36.3	31.2	30.5	11.5	11.8	7.2	15.2
Incremental delay (s)	16.1	0	0	.5	.2	0	2.7
Initial queue delay (s)	0	0	0	0	0	0	0
Delay (s)	52.4	31.2	30.5	12.3	12	7.2	17.9
LOS	D	C	C	B	B	A	B
Approach delay (s)/LOS	46.3 / D		30.5 / C	12.1 / B		17.1 / B	
Intersection delay (s)/ LOS	21.1 / C						

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AM83 PM 2016
Comment: 2016 AMB PM SCEN3 W/ PKWY & 4LHWY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	185	10	88	15	10	35	127	476	15	55	568	215
RTOR volume (veh/h)			0			0			0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 Lost time per cycle (s): 14 Critical v/c Ratio: .804

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	LT	R	LTR		L	TR	L	TR
No. of lanes	1	1	1		1	1	1	1
Flow rate (veh/h)	212	96	65		138	534	60	851
Capacity (veh/h)	292	346	350		215	1081	432	1038
Adjusted saturation flow (veh/h)	1191	1411	1430		1770	1837	1770	1931
v/c ratio	.726	.277	.186		.614	.494	.132	.826
g/C ratio	.245	.245	.245		.667	.588	.667	.588
Average back of queue (veh)	6.4	2.3	1.6		2.4	9.5	.6	22.5
Uniform delay (d)	35.4	31.2	30.5		15	12.2	7.5	16.8
Incremental delay (d)	8.7	0	0		4.9	3	0	5.6
Initial queue delay (d)	0	0	0		0	0	0	0
Delay (s)	44.1	31.2	30.5		19.9	12.5	7.5	22.4
LOS	D	C	C		B	B	A	C
Approach delay (s)/LOS	40.1 / D		30.5 / C		14 / B		21.4 / C	
Intersection delay (s)/ LOS	22.1 / C							

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: TOT3 PM 2016
Comment: 2016 TOT PM SCEN3 W/ PKWY & 4LHWY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: WALUA RD/O
NB/SB Street: KUAKINI HW

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	208	10	88	15	10	35	127	512	15	55	581	228
RTOR volume (veh/h)			0		0				0			0
Peak-hour factor	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92	.92
Heavy vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Start-up lost time, l_1 (s)	2	2	2	2	2	2	2	2	2	2	2	2
Extension of effective green, e (s)	2	2	2	2	2	2	2	2	2	2	2	2
Arrival type, AT	3	3	3	3	3	3	3	3	3	3	3	3
Approach pedestrian volume (p/h)		50			50			50			50	
Approach bicycle volume (b/h)		0			0			0			0	
Left/right parking (Y or N)	N	/	N	N	/	N	N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB	LTRP							
WB	LTRP							
NB		L	LTRP					
SB		L	LTRP					
Green (s)	25	3	60					
Yellow + All red (s)	5	4	5					

Cycle (s): 102 Lost time per cycle (s): 14 Critical v/c Ratio: .848

Intersection Performance

	EB		WB		NB		SB	
Lane group configuration	LT	R	LTR		L	TR	L	TR
No. of lanes	1	1	1		1	1	1	1
Flow rate (veh/h)	237	96	65		138	573	60	879
Capacity (veh/h)	291	346	337		205	1081	423	1029
Adjusted saturation flow (veh/h)	1188	1413	1375		1770	1838	1770	1749
v/c ratio	.814	.277	.194		.673	.53	.141	.855
g/C ratio	.245	.245	.245		.667	.588	.667	.588
Average back of queue (veh)	7.6	2.3	1.6		2.6	10.6	.6	24.3
Uniform delay (d)	36.3	31.2	30.5		16.3	12.6	7.9	17.8
Incremental delay (d)	16.1	0	0		6.3	.5	0	7.2
Initial queue delay (d)	0	0	0		0	0	0	0
Delay (s)	52.4	31.2	30.5		24.6	13.1	7.9	24.6
LOS	D	C	C		C	B	A	C
Approach delay (s)/LOS	46.3 / D		30.5 / C		15.3 / B		23.5 / C	
Intersection delay (s)/ LOS	24.6 / C							

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMBI AM 2010 | NB/SB Street: QUEEN KAAH
Comment: 2010 AMB AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	1		73				260	1111			778	4
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Lane/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	5	55	20					
Yellow + All red (s)	5	5	5					

Cycle (s): 95 | Lost time per cycle (s): 10 | Critical v/c Ratio: .781

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L		R				T	T			T	R
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	1		79				283	1208			846	4
Capacity (veh/h)	369		330				359	1275			1078	917
Adjusted saturation flow (veh/h)	1752		1567				1770	1863			1863	1583
v/c ratio	.003		.24				.797	.948			.784	.005
g/C ratio	.211		.211				.684	.684			.579	.579
Average back of queue (veh)	0		1.9				5.7	36.3			19.7	1
Uniform delay (s)	29.6		31.2				11.3	13.5			15.4	8.4
Incremental delay (s)	0		0				11.1	14.5			3.9	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	29.6		31.2				22.4	28			19.3	8.4
LOS	C		C				C	C			B	A
Approach delay (s)/LOS	31.2	/	C		/		26.9	/	C	19.3	/	B
Intersection delay (s)/ LOS	24.4				/			C				

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMBI AM 2016 | NB/SB Street: QUEEN KAAH
Comment: 2016 AMB AM SCEN1 W/NO IMPROVEMENTS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	1		77				276	1244			871	4
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Lane/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	10	95	25					
Yellow + All red (s)	5	5	5					

Cycle (s): 145 | Lost time per cycle (s): 10 | Critical v/c Ratio: .837

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L		R				L	T			T	R
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	1		84				300	1352			947	4
Capacity (veh/h)	302		270				425	1413			1220	1037
Adjusted saturation flow (veh/h)	1752		1567				1770	1863			1863	1583
v/c ratio	.004		.31				.706	.957			.776	.004
g/C ratio	.172		.172				.739	.739			.655	.655
Average back of queue (veh)	0		3.1				6.9	58.5			30	.1
Uniform delay (s)	49.7		52.5				9.7	15.4			17.5	8.6
Incremental delay (s)	0		0				5.3	14.9			3.2	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	49.7		52.5				15	30.3			20.7	8.6
LOS	D		D				B	C			C	A
Approach delay (s)/LOS	52.4	/	D		/		27.5	/	C	20.7	/	C
Intersection delay (s)/ LOS	25.9				/			C				

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 AM 2010
Comment: 2010 AMB AM SCEN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | %Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	1		73				260	1039			702	4
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Left/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	5	55	20					
Yellow + All red (s)	3	5	3					

Cycle (s): 95 | Lost time per cycle (s): 10 | Critical v/c Ratio: .734

Intersection Performance

	EB			WB			NB			SB		
	L		R				L	T			T	R
Lane group configuration												
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	1		79				283	1129			763	4
Capacity (veh/h)	369		330				392	1275			1078	917
Adjusted saturation flow (veh/h)	1752		1567				1770	1863			1863	1583
v/c ratio	.003		.24				.721	.886			.708	.005
g/C ratio	.211		.211				.684	.684			.579	.579
Average back of queue (veh)	0		1.9				5.1	28.9			16.1	.1
Uniform delay (s)	29.6		31.2				10.3	12			14.3	8.4
Incremental delay (s)	0		0				6.4	7.8			2.2	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	29.6		31.2				16.7	19.8			16.5	8.4
LOS	C		C				B	B			B	A
Approach delay (s)/LOS	31.2	/	C		/		19.2	/	B	16.4	/	B
Intersection delay (s)/ LOS	18.7				/					B		

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 AM 2016
Comment: 2016 AMB AM SCEN 2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Ejield | % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	1		77				276	1212			837	4
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Left/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	10	95	25					
Yellow + All red (s)	5	5	5					

Cycle (s): 145 | Lost time per cycle (s): 10 | Critical v/c Ratio: .817

Intersection Performance

	EB			WB			NB			SB		
	L		R				L	T			T	R
Lane group configuration												
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	1		84				300	1317			910	4
Capacity (veh/h)	302		270				439	1413			1230	1037
Adjusted saturation flow (veh/h)	1752		1567				1770	1863			1863	1583
v/c ratio	.004		.31				.684	.932			.745	.004
g/C ratio	.172		.172				.759	.759			.655	.655
Average back of queue (veh)	0		3.1				6.6	52.7			27.5	.1
Uniform delay (s)	49.7		52.5				9.3	14.4			16.9	8.6
Incremental delay (s)	0		0				4.4	11.4			2.5	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	49.7		52.5				13.7	25.8			19.4	8.6
LOS	D		D				B	C			B	A
Approach delay (s)/LOS	52.4	/	D		/		23.6	/	C	19.3	/	B
Intersection delay (s)/ LOS	23				/					C		

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMB3AM 2016 | NB/SB Street: QUEEN KAAH
Comment: 2016 AMB AM SC3 W/ PKWY & 4LHWY

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB				SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	1		77				276	1474			1071	4
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (b/h)		0						0			0	
Left/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	20	60	25					
Yellow + All red (s)	5	5	5					

Cycle (s): 120 | Lost time per cycle (s): 15 | Critical v/c Ratio: .627

Intersection Performance

	EB			WB			NB				SB		
	L		R				L	T			T	R
Lane group configuration												
No. of lanes	1		1				1	2			2	1
Flow rate (veh/h)	1		84				300	1602			1164	4
Capacity (veh/h)	365		327				424	2511			1773	792
Adjusted saturation flow (veh/h)	1752		1567				1770	3567			3547	1583
v/c ratio	.003		.256				.707	.638			.656	.005
g/C ratio	.208		.208				.708	.708			.5	.5
Average back of queue (veh)	0		2.3				6.7	16.6			16.6	.1
Uniform delay (s)	37.6		39.7				21.3	9.1			22.3	15
Incremental delay (s)	0		0				5.4	.5			.9	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	37.6		39.7				26.6	9.6			23.2	15
LOS	D		D				C	A			C	B
Approach delay (s)/LOS	39.7	/	D		/		12.5	/	B	23.2	/	C
Intersection delay (s)/ LOS	17.2				/					B		

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information | **Site Information**

Analyst: WY | Jurisdiction/Date: 3/7/05
Agency or Company: | EB/WB Street: HUALALAI R
Analysis Period/Year: AMB1 PM 2010 | NB/SB Street: QUEEN KAAH
Comment: 2010 AMB PM SCEN 1 W/NO IMPS

Intersection Data

Area type: Other | Analysis period: .25 h | Signal type: Actuated-Field | % Back of queue: 95

	EB			WB			NB				SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	5		104				140	950			1069	10
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (b/h)		0						0			0	
Left/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	5	70	20					
Yellow + All red (s)	5	5	5					

Cycle (s): 110 | Lost time per cycle (s): 15 | Critical v/c Ratio: .858

Intersection Performance

	EB			WB			NB				SB		
	L		R				L	T			T	R
Lane group configuration												
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	5		113				152	1033			1162	11
Capacity (veh/h)	319		285				296	1355			1185	1008
Adjusted saturation flow (veh/h)	1752		1567				1770	1863			1863	1583
v/c ratio	.017		.397				.513	.762			.98	.011
g/C ratio	.182		.182				.727	.727			.636	.636
Average back of queue (veh)	.1		3.3				2.2	22.1			44.1	.1
Uniform delay (s)	36.9		39.7				8.9	9.2			19.3	7.3
Incremental delay (s)	0		.2				1.5	2.6			21.4	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	36.9		39.9				10.4	11.8			40.7	7.3
LOS	D		D				B	B			D	A
Approach delay (s)/LOS	39.7	/	D		/		11.6	/	B	40.4	/	D
Intersection delay (s)/ LOS	26.6				/					C		

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB1 PM 2016
Comment: 2016 AMB PM SCEN1 W/NO IMPROVEMENTS

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	5		110				148	1064			1197	10
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Lane/right pooling (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	5	140	40					
Yellow + All red (s)	5	5	5					

Cycle (s): 200 Lost time per cycle (s): 15 Critical v/c Ratio: .865

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L		R				L	T			T	R
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	5		120				161	1157			1301	11
Capacity (veh/h)	350		314				274	1397			1304	1108
Adjusted saturation flow (veh/h)	1752		1567				1770	1863			1863	1583
v/c ratio	.016		.381				.587	.828			.998	.01
g/C ratio	.2		.2				.75	.75			.7	.7
Average back of queue (veh)	3		6.1				4.2	47.9			86.3	.2
Uniform delay (s)	64.2		69.3				12.1	16.5			29.8	9.1
Incremental delay (s)	0		.1				3.3	4.3			24.4	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	64.2		69.4				15.4	20.8			54.2	9.1
LOS	E		E				B	C			D	A
Approach delay (s)/LOS	69.2	/	E		/		20.1	/	C	53.9	/	D
Intersection delay (s)/ LOS	38.4				/			/		D		

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 PM 2010
Comment: 2010 AMB PM SCEN2 W/PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	5		104				140	872			968	10
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Lane/right pooling (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	5	70	20					
Yellow + All red (s)	5	5	5					

Cycle (s): 110 Lost time per cycle (s): 15 Critical v/c Ratio: .79

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L		R				L	T			T	R
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	5		113				152	948			1052	11
Capacity (veh/h)	319		285				329	3355			1185	1004
Adjusted saturation flow (veh/h)	1752		1567				1770	1863			1863	1583
v/c ratio	.017		.397				.462	.7			.889	.011
g/C ratio	.182		.182				.727	.727			.636	.636
Average back of queue (veh)	.1		3.5				2.1	18.2			32.1	.1
Uniform delay (s)	36.9		39.7				8.1	8.3			16.7	7.3
Incremental delay (s)	0		.2				.8	1.6			8.5	0
Initial queue delay (s)	0		0				0	0			0	0
Delay (s)	36.9		39.9				8.9	9.9			25.2	7.3
LOS	D		D				A	A			C	A
Approach delay (s)/LOS	39.7	/	D		/		9.8	/	A	25	/	C
Intersection delay (s)/ LOS	18.4				/			/		B		

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 PM 2016
Comment: 2016 AMB PM SCRN2 W/ PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Field % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	5		110				148	1024			1146	10
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Left/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	5	110	30					
Yellow + All red (s)	5	5	5					

Cycle (s): 150 Lost time per cycle (s): 15 Critical v/c Ratio: .843

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L		R				L	T			T	R
No. of lanes	1		1				1	1			1	1
Flow rate (veh/h)	5		120				161	1113			1246	11
Capacity (veh/h)	292		261				310	1449			1345	1144
Adjusted saturation flow (veh/h)	1752		1567				1720	1863			1863	1583
v/c ratio	.019		.458				.52	.768			.926	.01
g/C ratio	.167		.167				.778	.778			.722	.722
Average back of queue (veh)	.2		5.8				3.2	34.7			61.3	.2
Uniform delay (d)	62.7		67.7				8.7	11			21	7
Incremental delay (d)	0		.9				1.6	2.6			11.1	0
Initial queue delay (d)	0		0				0	0			0	0
Delay (s)	62.7		68.6				10.3	13.6			32.1	7
LOS	E		E				B	B			C	A
Approach delay (s)/LOS	68.3	/	E		/		18.2	/	B	31.8	/	C
Intersection delay (s)/ LOS	24.6				/				C			

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CHAPTER 16 - OPERATIONAL ANALYSIS - SUMMARY WORKSHEET

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB3 PM 2016
Comment: 2016 AMB PM SC3 W/PKWY & 4LHWY

Site Information

Jurisdiction/Date: 3/7/05
EB/WB Street: HUALALAI R
NB/SB Street: QUEEN KAAH

Intersection Data

Area type: Other Analysis period: .25 h Signal type: Actuated-Flield % Back of queue: 95

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (veh/h)	5		110				148	1189			1477	10
RTOR volume (veh/h)			0						0			0
Peak-hour factor	.92		.92				.92	.92			.92	.92
Heavy vehicles (%)	2		2				2	2			2	2
Start-up lost time, l_1 (s)	2		2				2	2			2	2
Extension of effective green, e (s)	2		2				2	2			2	2
Arrival type, AT	3		3				3	3			3	3
Approach pedestrian volume (p/h)		0						0			0	
Approach bicycle volume (bic/h)		0						0			0	
Left/right parking (Y or N)	N	/	N		/		N	/	N	N	/	N

Signal Phasing Plan

L: LT T: TH R: RT P: Peds

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
EB			LR					
WB								
NB	LT	LT						
SB		TR						
Green (s)	10	60	25					
Yellow + All red (s)	5	5	5					

Cycle (s): 110 Lost time per cycle (s): 15 Critical v/c Ratio: .718

Intersection Performance

	EB			WB			NB			SB		
Lane group configuration	L		R				L	T			T	R
No. of lanes	1		1				1	2			2	1
Flow rate (veh/h)	5		120				161	1292			1605	11
Capacity (veh/h)	398		356				229	2418			1935	864
Adjusted saturation flow (veh/h)	1752		1567				1770	3547			3547	1583
v/c ratio	.014		.336				704	.534			.83	.013
g/C ratio	.227		.227				.682	.682			.545	.545
Average back of queue (veh)	.1		3.3				3.6	11.4			24.7	.2
Uniform delay (d)	32.9		35.6				27.6	8.8			20.8	11.4
Incremental delay (d)	0		0				9.4	.2			3.2	0
Initial queue delay (d)	0		0				0	0			0	0
Delay (s)	32.9		35.6				37	9			24	11.4
LOS	C		D				D	A			C	B
Approach delay (s)/LOS	35.4	/	D		/		12.1	/	B	23.9	/	C
Intersection delay (s)/ LOS	19				/				B			

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Traffic Calculations
Unsignalized Intersection Level of Service (LOS) Calculations

CHAPTER 17 - TWSC- UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	2/21/05
Agency or Company		Major Street	QUBEN KAAHUMANU HWY EXT
Analysis Period/Year	EXISTING AM 2004	Minor Street	HUALALAI RD
Comment	2004 EXISTING AM		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	L	L	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		685	4	230	965		1		45			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		761	4	256	1072		1		50			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2: _____ ft Movement 5: _____ ft

Length of study period (h): 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	50	404	.124	<1	15.2	C	20.2
	2	L	2	28	.073	<1	145.6	F	
	3								C
WB	1								
	2								
	3								
		①							
		④	256	843	.303	1	11.1	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	QUBEN KAAHUMANU HWY EXT
Analysis Period/Year	AMB1 AM 2010	Minor Street	HUALALAI RD
Comment	2010 AMBIENT AM SCEN 1W/NO IMPS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	L	L	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		778	4	260	1111		1		73			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		864	4	289	1234		1		81			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2: _____ ft Movement 5: _____ ft

Length of study period (h): 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	81	352	.23	1	18.3	C	24.5
	2	L	2	15	.132	<1	278.1	F	
	3								C
WB	1								
	2								
	3								
		①							
		④	289	771	.375	2	12.5	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	QUEEN KAAHUMANU HWY EXT
Analysis Period/Year	AMB1 AM 2016	Minor Street	HUALALAI RD
Comment	2016 AMB AM SCEN 1 W/NO IMPS		

Site Information

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		R			T			R				
Lane 2		T			L			L				
Lane 3												

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		871	4	276	1244		1		77			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		2	3	3	3		3		3			
Flow rate		968	4	307	1382		1		86			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
SB	1	R	86	307	.28	1	21.3	C	32.6
	2	L	2	9	225	1	517.8	F	D
	3								
WB	1								
	2								
	3								
		①							
		④	307	705	.433	2	14	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	QUEEN KAAHUMANU HWY EXT
Analysis Period/Year	AMB2 AM 2030	Minor Street	HUALALAI RD
Comment	2030 AMB AM SCEN2 W/ PARKWAY		

Site Information

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		R			T			R				
Lane 2		T			L			L				
Lane 3												

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		702	4	260	1036		1		73			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		780	4	289	1151		1		81			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	81	394	.206	1	16.5	C	21
	2	L	2	20	.099	<1	203.2	F	C
	3								
WB	1								
	2								
	3								
		①							
		④	289	830	.348	2	11.7	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 AM 2016
Comment: 2016 AMB AM SCEN2 W/PARKWAY

Site Information

Jurisdiction/Date: 3/7/05
Major Street: QUEEN KAAHUMANU HWY EXT
Minor Street: HUALALAI RD

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	L	L	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		837	4	276	1212		1		77			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		930	4	307	1347		1		86			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2: _____ ft Movement 5: _____ ft
Length of study period (h): 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	86	323	.267	1	20.2	C	29.7
	2	L	2	10	.196	1	439.8	F	
	3								D
WB	1								
	2								
	3								
		①							
		④	307	729	421	2	13.5	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB3 AM 2016
Comment: 2016 AMB AM SCEN 3 W/PKWY &4L HWY

Site Information

Jurisdiction/Date: 3/7/05
Major Street: QUEEN KAAHUMANU HWY EXT
Minor Street: HUALALAI RD

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	T	L	
Lane 3	T	L		

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1071	4	276	1474		1		77			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		1190	4	307	1638		1		86			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2: _____ ft Movement 5: _____ ft
Length of study period (h): 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	86	445	.193	1	15	B	26.4
	2	L	2	9	.223	1	514.8	F	
	3								D
WB	1								
	2								
	3								
		①							
		④	307	575	.534	3	18.4	C	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information			Site Information		
Analyst	WY		Jurisdiction/Date		2/21/05
Agency or Company			Major Street	QUEEN KAAHUMANU HWY EXT	
Analysis Period/Year	EXISTING PM	2004	Minor Street	HUALALAI RD	
Comment	2004 EXISTING PM				

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	R			T			R					
Lane 2	T			L			L					
Lane 3												

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		930	10	115	830		5		80			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		1033	11	128	922		6		89			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	89	281	.317	1	23.7	C	35.8
	2	L	11	39	.283	1	133.4	F	
	3								E
WB	1								
	2								
	3								
		①							
		④	128	662	.193	1	11.7	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information			Site Information		
Analyst	WY		Jurisdiction/Date		3/7/05
Agency or Company			Major Street	QUEEN KAAHUMANU HWY EXT	
Analysis Period/Year	AMB1 PM	2010	Minor Street	HUALALAI RD	
Comment	2010 AMB PM SCEN1 WNO IMPROVEMENTS				

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	R			T			R					
Lane 2	T			L			L					
Lane 3												

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1069	10	140	950		5		104			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		1188	11	156	1056		6		116			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	116	228	.508	3	36.8	E	62.1
	2	L	11	21	.518	2	329.3	F	
	3								F
WB	1								
	2								
	3								
		①							
		④	156	579	.269	1	13.5	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB1 PM 2016
Comment: 2016 AMB PM SCEN1 W/NO IMPROVEMENTS

Site Information

Jurisdiction/Date: 3/7/05
Major Street: QUEEN KAAHUMANU HWY EXT
Minor Street: HUALALAI RD

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	L	L	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1197	11	148	1064		5		110			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		1330	12	164	1182		6		122			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2: ft Movement 5: ft
Length of study period (h): 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	122	188	.648	5	57.6	F	121.3
	2	L	11	13	.857	4	827.1	F	
	3								F
WB	1								
	2								
	3								
		7							
		4	164	510	.322	1	15.4	C	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst: WY
Agency or Company:
Analysis Period/Year: AMB2 PM 2019
Comment: 2019 AMB PM SCEN 2 W/PKWY IMSP

Site Information

Jurisdiction/Date: 3/7/05
Major Street: QUEEN KAAHUMANU HWY EXT
Minor Street: HUALALAI RD

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	L	L	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		968	10	140	872		5		104			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		1076	11	156	969		6		116			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2: ft Movement 5: ft
Length of study period (h): 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	116	265	.437	2	29	D	43.6
	2	L	11	29	.374	2	195.9	F	
	3								E
WB	1								
	2								
	3								
		7							
		4	156	638	.244	1	12.5	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	QUEEN KAAHUMANU HWY EXT
Analysis Period/Year	AM82 PM 2016	Minor Street	HUALALAI RD
Comment	2016 AMB PM SCEN 2 W/PKWY IMPS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	L	L	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1146	11	148	1024		5		110			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		1273	12	164	1138		6		122			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
SB	1	R	122	203	.6	4	48.4	E	91.7
	2	L	11	15	.72	3	396.2	F	
	3								F
WB	1								
	2								
	3								
		①							
		④	164	536	.307	1	14.7	B	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	QUEEN KAAHUMANU HWY EXT
Analysis Period/Year	AM83 PM 2016	Minor Street	HUALALAI RD
Comment	2016 AMB PM SC3 W/PKWY &4L HWY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	R	T	R	
Lane 2	T	T	L	
Lane 3	T	L		

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1477	11	148	1189		5		110			
PHF		.9	.9	.9	.9		.9		.9			
Proportion of heavy vehicles, HV		3	3	3	3		3		3			
Flow rate		1641	12	164	1321		6		122			
Flare storage (# of vehs)									0			
Median storage (# of vehs)							0					

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
SB	1	R	122	316	.386	2	23.5	C	52.6
	2	L	6	11	.557	2	642.5	F	
	3								F
WB	1								
	2								
	3								
		①							
		④	164	382	.431	2	21.5	C	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	4/22/04
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	EXISTING AM 2004	Minor Street	WALUA/ONIONI
Comment	2004 EXISTING AM		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	20	160	85	65	195	10	146	10	60	20	10	40
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	22	178	94	72	217	11	156	11	67	22	11	44
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft. Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	67	812	.083	<1	9.8	A	21.5
	2	LT	156	322	.484	3	26.5	D	
	3								C
WB	1	LTR	77	1463	.053	<1	7.6	A	7.6
	2								
	3								A
		④	22	1335	.017	<1	7.7	A	
		⑦	72	1285	.056	<1	8	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMBI AM 2010	Minor Street	WALUA/ONI ONI
Comment	2010 AMB AM SCEN1 W/NO IMPROVMENTS		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	20	200	120	88	243	10	182	10	94	20	10	40
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	22	222	133	98	270	11	202	11	104	22	11	44
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	106	748	.142	<1	10.6	B	58.8
	2	LT	200	238	.839	10	84.4	F	
	3								F
WB	1	LTR	99	1224	.081	<1	8.2	A	8.2
	2								
	3								A
		①	22	1276	.017	<1	7.9	A	
		④	98	1198	.082	<1	8.3	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT1 AM 2010	Minor Street	WALUAONI ONI
Comment	2010 TOT AM SCEN1 W/NO IMPROVMENTS		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	20	212	127	88	273	10	182	10	94	20	10	30
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	22	236	141	98	303	11	202	11	104	22	11	44
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	106	731	.145	1	10.8	B	86.9
	2	LT	200	211	.916	13	127.2	F	
	3								F
WB	1	LTR	99	1155	.086	<1	8.4	A	8.4
	2								
	3								A
		①	22	1240	.018	<1	8	A	
		④	98	1176	.083	<1	8.3	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB2 AM 2010	Minor Street	WALUA/ONI ONI
Comment	2010 AMB AM SCEN2 W/PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	20	254	120	88	311	10	182	10	94	20	10	40
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	22	282	133	98	346	11	202	11	104	22	11	44
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	104	692	.15	1	11.1	B	186.8
	2	LT	200	188	1.061	20	278.2	F	
	3								F
WB	1	LTR	99	1063	.093	<1	8.7	A	8.7
	2								
	3								A
		①	22	1196	.019	<1	8.1	A	
		④	98	1138	.086	<1	8.5	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/3/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT2 AM 2010	Minor Street	WALUA/ONI ONI
Comment	2010 TOT AM SCEN2 W/PARKWAY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LTR	LTR	R	LTR
Lane 2			LT	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	20	266	127	88	341	10	203	10	94	20	10	40
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	22	296	141	98	379	11	226	11	104	22	11	44
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	104	677	.154	1	11.3	B	439.4
	2	LT	226	172	1.313	36	665.6	F	
	3								F
WB	1	LTR	99	1004	.099	<1	9	A	9
	2								
	3								A
		①	22	1162	.019	<1	8.2	A	
		④	98	1118	.087	<1	8.5	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	2/21/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	EXISTING PM 2004	Minor Street	WALUA/ ONI ONI
Comment	2004 EXISTING PM		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LTR	LTR	R	LTR
Lane 2			LT	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	220	140	15	195	65	115	10	45	15	10	35
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	61	244	156	17	217	72	128	11	50	17	11	39
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	61	716	.085	<1	10.5	B	22.6
	2	LT	128	281	.456	2	28.4	D	
	3								C
WB	1	LTR	83	1346	.062	<1	7.9	A	7.9
	2								
	3								A
		①	61	1267	.048	<1	8	A	
		④	37	1133	.014	<1	8.2	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMBI PM 2010	Minor Street	WALUA/ONI ONI
Comment	2010 AMB PM SCEN1 WNO IMPROVEMENTS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LTR	LTR	R	LTR
Lane 2			LT	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	275	203	120	260	15	177	10	85	15	10	35
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	61	306	226	133	289	17	197	11	94	17	11	39
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	94	635	.149	1	11.7	B	670.9
	2	LT	209	135	1.485	40	980.8	F	F
	3								
WB	1	LTR	96	998	.096	<1	9	A	9
	2								A
	3								
		①	61	1250	.049	<1	8	A	
		④	133	1071	.124	<1	9	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT1 PM 2010	Minor Street	WALUA/ONI ONI
Comment	2010 TOT PM SCEN1 WNO IMPROVEMENTS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LTR	LTR	R	LTR
Lane 2			LT	
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	299	214	120	287	15	191	10	82	15	10	35
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	61	332	238	133	319	17	212	11	92	17	11	39
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	94	606	.155	1	12	B	1037.6
	2	LT	212	120	1.773	52	1492.3	F	F
	3								
WB	1	LTR	94	993	.1	<1	9.2	A	9.2
	2								A
	3								
		①	61	1218	.05	<1	8.1	A	
		④	133	997	.134	<1	9.2	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMBZ PM 2010	Minor Street	WALUA/ ONI ONI
Comment	2010 AMB PM SCEN 2 W/PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	332	203	120	313	15	177	10	83	15	10	35
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	61	370	226	133	348	17	197	11	92	17	11	39
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 ____ ft Movement 5 ____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	92	592	.156	1	12.4	B	1153.5
	2	LT	209	107	1.872	52	1628.4	F	F
	3								
WB	1	LTR	94	894	.105	<1	9.5	A	9.5
	2								A
	3								
		①	61	1169	.051	<1	8.2	A	
		④	133	975	.137	<1	9.3	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT2 PM 2010	Minor Street	WALUA/ ONI ONI
Comment	2010 TOT PM SCEN 2 W/PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LTR			LTR			R			LTR		
Lane 2							LT					
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	357	214	120	340	15	191	10	83	15	10	35
PHF	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Proportion of heavy vehicles, HV	3	3	3	3	3	3	3	3	3	3	3	3
Flow rate	61	397	238	133	378	17	212	11	92	17	11	39
Flare storage (# of vehs)									0			1
Median storage (# of vehs)							0			0		

Signal upstream of Movement 2 ____ ft Movement 5 ____ ft

Length of study period (h) 1

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1	R	92	557	.165	1	12.7	B	1641.8
	2	LT	212	94	2.244	64	2348.7	F	F
	3								
WB	1	LTR	94	845	.111	<1	9.8	A	9.8
	2								A
	3								
		①	61	1139	.053	<1	8.3	A	
		④	133	944	.141	<1	9.4	A	

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	2/2/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	EXISTING AM 2004	Minor Street	UOFN NORTH DRIVEWAY
Comment	2004 EXISTING AM		

Site Information

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	270			425	50				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	300			472	56				11		39
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	569	069	<1	11.8	B	13.1
	2	L	10	287	.035	<1	18	C	B
	3								
		①	56	1034	054	<1	8.7	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	2/2/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMBI AM 2010	Minor Street	UOFN NORTH DRIVEWAY
Comment	2010 AMB AM SCENI W/NO IMPROVEMENTS		

Site Information

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	345			425	50				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	383			472	56				11		39
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	569	069	<1	11.8	B	13.4
	2	L	10	256	.039	<1	19.6	C	B
	3								
		①	56	1034	054	<1	8.7	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT1 AM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 TOT AM SCEN1 WNO IMPROVEMENTS		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		LT			TR						R	
Lane 2											L	
Lane 3												

	SB				NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	45	351			524	44				14		40
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	50	390			582	49				16		44
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	44	491	089	<1	13	B	14.6
	2	L	10	522	019	<1	21.9	C	
	3								B
		①	50	947	053	<1	9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB1 AM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 AMB AM SCEN1 WNO IMPROVEMENTS		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		LT			TR						R	
Lane 2											L	
Lane 3												

	SB				NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	376			595	50				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	418			661	56				11		39
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	444	088	<1	13.9	B	16.2
	2	L	10	186	054	<1	25.5	D	
	3								C
		①	56	879	063	<1	9.4	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT1 AM 2015	Minor Street	UOFN NORTH DRIVEWAY
Comment	2015 TOT AM SCEN1 W/NO IMPROVEMENTS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	27	348			549	27				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	30	409			610	30				11		39
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	483	.081	<1	13.1	B	14.8
	2	L	10	228	.044	<1	21.5	C	B
	3								
		①	30	939	.032	<1	9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB2 AM 2010	Minor Street	UOFN NORTH DRIVEWAY
Comment	2010 AMB AM SCEN2 W/ PARKWAY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	399			573	58				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	443			637	58				11		39
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	459	.085	<1	13.6	B	16
	2	L	10	186	.054	<1	23.5	D	C
	3								
		①	50	898	.062	<1	9.3	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT2 AM 2010	Minor Street	UOFN NORTH DRIVEWAY
Comment	2010 TOT AM SCEN2 W/ PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LT			TR						R		
Lane 2										L		
Lane 3												

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	45	405			592	44				14		40
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	50	450			658	49				16		44
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	44	448	.098	<1	13.9	B	16.1
	2	L	18	184	.054	<1	25.2	D	
	3								C
		①	50	883	.056	<1	9.3	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	1/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB2AM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 AMB AM SCEN3 W/ PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)	LT			TR						R		
Lane 2										L		
Lane 3												

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	483			663	50				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	514			737	56				11		39
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	402	.097	<1	14.9	B	18.2
	2	L	17	146	.069	<1	31.5	D	
	3								C
		①	56	824	.067	<1	9.5	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Intersection/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT2 AM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 TOT AM SCEN 1 W/ PARKWAY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	27	466			707	27				14		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	30	540			786	30				16		39
Free storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 ____ 0 Movement 5 ____ 0

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	283	.102	<1	15.9	C	18.6
	2	L	16	345	.065	<1	31.1	D	C
	3								
		①	30	808	.031	<1	9.6	A	
		②							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Intersection/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB3AM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 AMB AM SCEN3 W/PKWY & 4LHWY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	361			765	50				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	401			850	56				11		39
Free storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 ____ 0 Movement 5 ____ 0

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
SB	1								
	2								
	3								
WB	1	R	39	346	.113	<1	16.3	C	19.8
	2	L	10	344	.029	<1	31.8	D	C
	3								
		①	50	747	.024	<1	10.3	B	
		②							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	2/23/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT3AM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 TOT AM SCEN3 W/PKWY & 4LHWY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	361			765	50				10		35
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	401			850	56				11		39
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 ____ ft Movement 5 ____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	39	346	113	<1	16.7	C	19.8 C
	2	L	10	144	069	<1	31.8	D	
	3								
		①	56	247	.074	<1	10.2	B	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	2/23/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	EXISTING PM 2004	Minor Street	UOFN NORTH DRIVEWAY
Comment	2004 EXISTING PM		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	455			330	15				25		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	61	506			367	17				28		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 ____ ft Movement 5 ____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	569	.046	<1	10.7	B	12.8 B
	2	L	10	253	.039	<1	19.8	C	
	3								
		①	61	1179	.052	<1	8.2	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Intersection/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMBI PM 2010	Minor Street	UOFN NORTH DRIVEWAY
Comment	2010 AMB PM SCEN1 W/NO IMPROVMENTS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	35	573			470	15				25		38
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	61	637			522	17				28		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	545	.06	<1	12	B	15.6
	2	L	19	169	.059	<1	27.6	D	
	3								C
		①	61	1024	.06	<1	8.7	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Intersection/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOTL PM 2010	Minor Street	UOFN NORTH DRIVEWAY
Comment	2010 TOT PM SCEN1 W/NO IMPROVMENTS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	50	595			470	26				29		48
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	661			523	29				32		44
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	84	545	.081	<1	12.2	B	15.2
	2	L	10	165	.061	<1	28.2	D	
	3								C
		①	56	1014	.055	<1	8.8	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB1 PM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 AMB PM SCEN1 WIND IMPROVMENTS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	59	618			530	16				25		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	61	687			589	17				28		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	501	066	<1	12.7	B	17.2 C
	2	L	10	143	.07	<1	32.1	D	
	3								
		①	61	965	063	<1	9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT1 PM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	2016 TOT PM SCEN1 WIND IMPROVMENTS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	40	676			539	26				19		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	44	751			589	29				21		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	493	066	<1	12.8	B	17.6 C
	2	L	10	138	072	<1	33.1	D	
	3								
		①	84	957	.088	<1	8.9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMBZ PM 2010	Minor Street	UOPN NORTH DRIVEWAY
Comment	2010 AMB PM SCENZ W/ PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		LT			TR						R	
Lane 2											L	
Lane 3												
		SB			NB			EB			WB	
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	631			555	13				25		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	61	701			617	17				28		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 1: ____ ft Movement 6: ____ ft

Length of study period (h): .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	488	.068	<1	13	B	17.9
	2	L	10	134	.074	<1	33.9	D	C
	3								
		①	61	945	.065	<1	9.1	A	
		④							

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Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT2 PM 2010	Minor Street	UOPN NORTH DRIVEWAY
Comment	2010 TOT PM SCENZ W/ PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		LT			TR						R	
Lane 2											L	
Lane 3												
		SB			NB			EB			WB	
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	58	653			523	26				29		40
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	56	726			581	29				32		44
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2: ____ ft Movement 5: ____ ft

Length of study period (h): .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	44	502	.088	<1	12.9	B	16.6
	2	L	10	139	.072	<1	33	D	C
	3								
		①	56	964	.058	<1	9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information | **Site Information**

Analyst	WY	Jurisdiction/Date	8/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB2 PM 2016	Minor Street	UOPN NORTH DRIVEWAY
Comment	2016 AMB PM SCEN1 W/ PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		LT			TR						R	
Lane 2											L	
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	740			618	15				25		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	61	822			678	17				28		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	446	.074	<1	13.7	B	20.6
	2	L	10	104	.097	<1	43.5	E	C
	3								
		①	61	896	.068	<1	9.3	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information | **Site Information**

Analyst	WY	Jurisdiction/Date	8/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT2 PM 2016	Minor Street	UOPN NORTH DRIVEWAY
Comment	2016 TOT PM SCEN1 W/ PARKWAY		

Input Data

Lane Configuration	SB			NB			EB			WB		
Lane 1 (curb)		LT			TR						R	
Lane 2											L	
Lane 3												
	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	40	798			642	26				19		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	44	887			713	29				21		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	822	.078	<1	14.3	B	21.9
	2	L	10	95	.105	<1	43.3	E	E
	3								
		①	44	860	.052	<1	9.4	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	AMB3 PM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	20 AMB PM SC3 W/ PKWY & 4 LANE HWY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	55	878			684	15				25		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	61	976			760	17				28		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	405	.083	<1	14.8	B	25.7
	2	L	30	74	.136	<1	61.5	F	D
	3								
		①	61	835	.073	<1	9.7	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/7/05
Agency or Company		Major Street	KUAKINI HWY
Analysis Period/Year	TOT3 PM 2016	Minor Street	UOFN NORTH DRIVEWAY
Comment	20 TOT PM SC3 W/ PKWY & 4 LANE HWY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	LT	TR		R
Lane 2				L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	40	936			716	26				19		30
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	44	1040			796	29				21		33
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	33	378	.087	<1	15.4	C	40.9
	2	L	33	67	.311	1	80.8	F	E
	3								
		①	84	801	.055	<1	9.8	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT1 AM 2010	Minor Street	KUAKINI HWY
Comment	2010 TOT AM SCEN 1 W/ NO IMPS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	6	265			540	7				7		19
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	7	406			610	8				8		21
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	21	493	.043	<1	12.6	B	14.3
	2	L	7	236	.027	<1	19.5	C	B
	3								
		①	7	957	.007	<1	8.8	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT1 AM 2016	Minor Street	KUAKINI HWY
Comment	2016 TOT AM SCEN 1 W/ NO IMPS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	25	357			532	24				16		44
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	28	397			591	27				18		49
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	49	505	.097	<1	12.9	B	14.8
	2	L	16	245	.065	<1	20.7	C	B
	3								
		①	28	957	.029	<1	8.9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOTZ AM 2010	Minor Street	KUAKINI HWY
Comment	2010 TOT AM SCEN 2 W/ PARKWAY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	6	441			617	7				7		19
PHF	.9	.9			.9	9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	7	490			686	8				8		21
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	21	446	.047	<1	13.5	B	13.9
	2	L	7	305	.034	<1	23.2	C	C
	3								
		①	7	897	.007	<1	9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOTZ AM 2016	Minor Street	KUAKINI HWY
Comment	2016 TOT AM SCEN 2 W/ PARKWAY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	25	475			690	24				16		44
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	28	528			767	27				18		49
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	49	401	.122	<1	15.2	C	18.9
	2	L	16	160	.1	<1	30.1	D	C
	3								
		①	28	823	.034	<1	9.5	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT3 AM 2016	Minor Street	KUAKINI HWY
Comment	2016 TOT AM SCEN 3 W/ PKWY & 4L HWY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	25	373			792	24				16		44
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	28	414			880	27				18		49
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	49	345	.142	<1	17.2	C	20.4
	2	L	16	159	.101	<1	30.2	D	C
	3								
		①	28	746	.037	<1	10	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT1 PM 2010	Minor Street	KUAKINI HWY
Comment	2010 TOT PM SCEN 1 W/ NO IMPS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	22	602			493	5				6		13
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	24	669			548	6				7		14
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	14	534	.026	<1	11.9	B	16.5
	2	L	7	181	.039	<1	25.2	D	C
	3								
		①	24	1012	.024	<1	8.6	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT2 PM 2016	Minor Street	KUAKINI HWY
Comment	2016 TOT PM SCEN 2 W/ PARKWAY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	58	759			636	30				21		32
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	64	843			707	33				23		36
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
SB	1								
	2								
	3								
WB	1	R	36	434	.083	<1	14	B	28.3
	2	L	21	96	.219	1	52.2	F	D
	3								
		①	64	862	.075	<1	9.5	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT2 PM 2031	Minor Street	KUAKINI HWY
Comment	2016 TOT PM SCEN 2 W/ PARKWAY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	22	650			546	9				6		13
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	24	722			607	6				7		14
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) 25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
SB	1								
	2								
	3								
WB	1	R	14	495	.028	<1	12.5	B	18.1
	2	L	7	155	.045	<1	29.4	D	C
	3								
		①	24	962	.025	<1	8.8	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT1 PM 2016	Minor Street	KUAKINI HWY
Comment	2016 TOT PM SCEN 1 W/ NO IMPS		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	58	657			525	30				21		32
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	64	708			583	33				23		36
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	36	510	.071	<1	12.6	B	21
	2	L	23	140	.15	1	35.3	E	C
	3								
		①	64	958	.067	<1	9	A	
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	3/8/05
Agency or Company		Major Street	U OF N SOUTH DRIVEWAY
Analysis Period/Year	TOT3 PM 2016	Minor Street	KUAKINI HWY
Comment	2016 TOT PM SCEN 3 W PKWY & 4LHWY		

Input Data

Lane Configuration	SB	NB	EB	WB
Lane 1 (curb)	T	R		R
Lane 2	L	T		L
Lane 3				

	SB			NB			EB			WB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)	58	897			710	30				21		32
PHF	.9	.9			.9	.9				.9		.9
Proportion of heavy vehicles, HV	3	3			3	3				3		3
Flow rate	64	997			789	33				23		36
Flare storage (# of vehs)												0
Median storage (# of vehs)										0		

Signal upstream of Movement 2 _____ ft Movement 5 _____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
EB	1								
	2								
	3								
WB	1	R	36	389	.093	<1	15.2	C	39
	2	L	23	68	.309	1	79.9	F	E
	3								
		①	64	803	.08	<1	9.9	A	
		④							

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Appendix B

Introduction, Purpose, Conclusion – Drainage Report for Hualālai Village (U of N Bencorp)

DRAINAGE REPORT

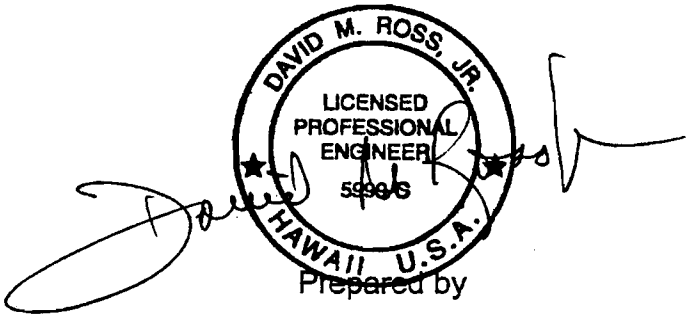
FOR

HUALALAI VILLAGE
[U OF N BENCORP]

TMK: (3) 7-5-10:86; (3) 7-5-17:6,7

WAIAHA 1ST, PUAA 2ND & 3RD
NORTH KONA, HAWAII

SEPTEMBER 2002



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HUALALAI VILLAGE DRAINAGE STUDY
WAIAHA 1ST, PUAA 2ND & 3RD, NORTH KONA
TMK: 7-5-10:86; 7-5-17:6,7

INTRODUCTION

The subject property is located in Waiaha 1st, North Kona, between Queen Kaahumanu Highway and Kuakini Highway (Figures 1 & 2). The area of the property is approximately 67 acres, and is designated by Tax Map Keys 7-5-10:86; 7-5-17:6,7, 3rd Division (Figure 3). The Owner, University of the Nations Bencorp (U of N Bencorp), has commissioned the study for Phase 1 of Hualalai Village (TMK 7-5-10:86; ~9.66 Ac), as well as for future phases envisioned on TMK: 7-5-17:6,7 (~62Ac).

PURPOSE OF THE STUDY

The purpose of this report is to analyze the off-site drainage conditions affecting the property and to propose drainage collection and disposal features. The regional drainage conditions have been reviewed in the Kailua-Kona Master Plan (KKMP), 1994, which includes a "PROPOSED DRAINAGE SYSTEM" (Figure 4). The master plan proposes two backbone drainage systems for the project area below Queen Kaahumanu between the Hienaloli and the Waiaha watershed boundaries. The area adjacent or south of the Hienaloli watershed is referred to as Auhaukeae. The area adjacent to and south of Auhaukeae is referred to as Puaa. This study makes a detailed analysis of the drainage area which impacts the subject site, compares the results with those of the KKMP, and recommends alternate storm drainage improvements to address and mitigate the impacts of 100-year flood waters in the subject area.

CONCLUSION

The drainage system for Hualalai Village, Phase 1 has been designed to mitigate project-generated runoff through the use of drywells and sumps. Impacts from off-site runoff for Phases 2-4 will be mitigated through the construction of retention basins with drywells. The retention basins will be designed with the potential to increase capacity should it be warranted in the future. In addition, emergency overflow from the retention basins will be directed toward the street and driveway drainage systems.

Appendix C

Cultural Impact Assessment – 3.0 Findings and Recommendations

3.0 FINDINGS AND RECOMMENDATIONS

3.1 SUMMARY OF FINDINGS & PROPOSED RECOMMENDATIONS

Based upon the information obtained from the review of historical documentation, archaeological reports, oral traditions, informal discussions, and formal interviews, the following is a summary of findings.

1) Regarding the native Hawaiian epistemological approach to "land use," three prevalent and generally applied principles that continue to be perpetuated are:

a) Recognizing that all ʻāina (literally translated as "that which feeds", but commonly applied as a definition for "land") is born of Papahānaumoku (Earth Mother). This guiding principle is the foundation from which the cultural values of aloha ʻāina and mālama ʻāina are derived.

b) Acknowledging that although traces of a physical imprint and its integrity of traditional cultural properties, resources, features, beliefs, and practices either may no longer remain, there is a thriving spiritual imprint that remains in the form of mana, the spiritual essence of those kūpuna and nā mea loea that have come before.

c) Understanding that place names, like Waiʻaha, illustrate a collective history of a geographical region, reiterate community and familial genealogy, characterize and describe the natural resources within a prescribed physical space, and define recognized cultural mores and values of the existing community.

As such, it is recommended that the proposed development of the cultural center incorporate the guiding cultural principles in the physical design of the facility and the surrounding landscape in the selection of appropriate plantings and exterior features. Consideration should be given to applying these principles in the development of the center's programmatic themes.

2) The mokuoloko was a recognized residence and political center for ruling aliʻi as early as the 15th century. The mauka region of Waiʻaha, west of the existing project area, includes the cultural landscape that once defined the royal residence of Kamehameha IV and Queen Emma and the former site of the old Kona sugar mill. Portions of the project area illustrate the influence of the cattle and ranching industry that emerged within the region. The coastal waters along the makai portion of the ahupuaʻa are part of two traditional surfing grounds, called Koʻokā and Kahopuka, which extended from the ahupuaʻa of Puaʻa, situated just north of Waiʻaha. Additionally, several other traditional and historic sites including identified springs, enclosures, and mounds, which have been recorded within the general vicinity of the project area.

As a cultural landscape, the ahupua'a of Wai'aha reveals a kaleidoscope of historical and cultural features and properties. It is recommended that programmatic themes for the proposed cultural center incorporate the unique historical and cultural legacy specific to the Wai'aha ahupua'a and the greater Kona region.

3) Previously conducted archaeological work has identified (6) possible burial sites within the project area, which will require further investigation. An archaeological inventory survey is currently being conducted by Tom Dye and Associates, which will provide a more complete assessment of those six sites. Prior to the establishment of the burial laws (specifically the Native American Graves Protection and Repatriations Act of 1990 and State of Hawai'i burial laws (1990)), there was no generally agreed upon methodology to the effective treatment of both identified burial sites and inadvertent discoveries. However, the establishment of these laws has helped to facilitate a process that provides a guideline for agencies and communities to derive an appropriate plan of action in the protection and preservation of ancestral remains.

If it is determined from the further investigation of Tom Dye and Associates that any of the six sites contain burials or are representative of a burial site, the appropriate effectual treatment of any identified burial sites and inadvertent discovery will be applied. The following recommendations speak to cultural concerns that were expressed by those in the Hawaiian community of Kona regarding protocols in properly handling iwi, ancestral remains, as well as consultation with appropriate parties and final disposition of any burial. It is stressed that utmost sensitivity, caring and understanding be employed when dealing with burial issues and iwi.

1. In the event of an inadvertent discovery of ancestral remains, the applicable processes outlined in existing State regulations, specifically those provided in the Hawai'i Administrative Rules, Title 13, Chapter 300, Section 40 and Section 33, will be employed.

2. If, for some reason, iwi must be moved or touched, it is highly recommended that an identified cultural monitor, a lineal/cultural descendant or someone of Hawaiian ancestry, conduct this task. It is highly recommended that the U of N Bencorp coordinate the selection of a cultural monitor with known and potential lineal and cultural descendants as well as other appropriate cultural entities or organizations.

3. Notify and consult with known and potential lineal and cultural descendants as it relates to any burial relocation or inadvertent discovery.

4. Consult with the appropriate agencies and organizations including: State Department of Land and Natural Resources, Historic Preservation Division (DLNR/SHPD), SHPD Burial staff, the Hawai'i Island Burial Council (HIBC), the Office of Hawaiian Affairs (OHA), Hui Mālama I Nā Kupuna o Hawai'i Nei, and other interested Hawaiian organizations.

5. Prepare and implement a Burial Treatment Plan to be developed in consultation with the above agencies, as well as the appropriate organizations and parties wishing to be consulted, including lineal and/or cultural descendants.

3.2 HISTORICAL & CULTURAL SYNOPSIS

Historical documentation indicates that as early as the 15th century during the reign of 'Ehukaimalino, the mokuoloko, the interior land district of Kona with its vast natural resources was a preferential location for royal residence, particularly between the regions of Lanihau to Keauhou. Numerous native oral traditions and foreign accounts illustrate that the ahupua'a of Wai'aha was part of a larger and significant political and population center that was primarily sustained by a variety of dryland agricultural practices.

Wai'aha was also a favored retreat for Emma Naea Rooke and her husband, Alexander Kalanikualiholihokekapu 'Iolani (Kamehameha IV), who acquired land in the upland regions of the ahupua'a, and their son Prince Albert Edward Kauikeaouli Leiopapa a Kamehameha. Upon the king's death in 1865, the Dowager Queen Emma purchased the land of Wai'aha from the estate of her late husband, where she retained a home on the estate until her death in 1885. Several recorded oral accounts, one composed by the Queen herself, speak of the verdant uplands of Wai'aha and the general Kona region in a poetic and honorific tribute through the compositions of nā kanikau, lamentation chants that marked the death of the young Prince Albert, who died at the age of four from acute appendicitis.

Sources suggest that by the late 1890s, much of the land within the Wai'aha ahupua'a was utilized by the Kona Sugar Company to support the sugarcane industry that was emerging within the region. Following the closure of the plantation and the mill site in 1926, much of the land within Wai'aha, including a large portion of the project area, was purchased by Manuel Gomes as part of an immense cattle and ranching operation.

The upper slopes of Wai'aha are utilized today for ranching and diversified agriculture and coffee production. The coastal regions are part of an immense industry that is primarily focused on tourism with a wide variety of vacation timeshares and visitor accommodations, serving as a venue for major sporting events like the Billfish Tournament and Ironman Triathlon.

Appendix D

HELCO Letter to the Hawaii Public Utilities Commission

Hawaii Electric Light Company, Inc. • PO Box 1027 • Hilo, HI 96721

Warren H. W. Lee, P.E.
President

January 31, 2003

FILED
2003 JAN 31 P 3:45
PUBLIC UTILITIES COMMISSION

The Honorable Chairman and Members of the
Hawaii Public Utilities Commission
465 South King Street
Kekuanaoa Building, 1st Floor
Honolulu, Hawaii 96813

Dear Commissioners:

Subject: Adequacy of Supply
Hawaii Electric Light Company, Inc.

In accordance with paragraph 5.3a of General Order No. 7, the following information is respectfully submitted.

HELCO's 2002 total system capability was 233,700 kW net (238,100 kW gross) and included firm capacity power purchases of 5,600 kW from Puna Geothermal Venture ("PGV")[1], 22,000 kW from Hilo Coast Power Company ("HCPC"), and 60,000 kW from Hamakua Energy Partners, L.P. ("HEP")[2]. Four 1,000 kW dispersed diesel generators (D24-27), which were installed in 1997 as part of HELCO's contingency plan, are now included as firm capacity since they are expected to remain in service until they are no longer needed to maintain reliability. HELCO's system peak of 177,900 kW net (182,200 kW gross) occurred on December 30, 2002, at approximately 6:30 p.m. The 2002 reserve margin was 31.4% over the system peak[3].

At the time of the system peak, HELCO had in place 27 load management contracts totaling 6,600 kW under Rider M and Schedule U, which reduced the evening peak by approximately 6,000 kW. In addition, HELCO had residential and commercial & industrial demand side management ("DSM") programs in place, which reduced the system peak by an

[1] PGV's normal rating is 30,000 kW. Since April 2002, its normal top load rating was reduced to an average of 5,600 kW due to blockage of a source well and decreasing steam quality from another source well. The average rating for all of 2002 was 8,500 kW. PGV is in the process of drilling additional source wells and a re-injection well to restore its output to 30,000 KW. PGV anticipates that it will be fully restored to 30 MW by mid-2003.

[2] HEP's normal rating is 60,000 kW. At the time of the December 30, 2002 system peak, HEP was temporarily derated to 57,000 kW due to vibration on the steam turbine generator. An outage is being scheduled for March 2003 to address the vibration problem.

[3] 2002 reserve margin is calculated using the formula: $\frac{2002 Total Capacity - 2002 Peak}{2002 Peak}$

estimated 4,900 net kW (net of free riders). These programs include a Residential Efficient Water Heating Program, Commercial & Industrial Energy Efficiency Program, Commercial & Industrial New Construction Program, and Commercial & Industrial Customized Rebate Program. Without the DSM and off-peak rider agreements, the system peak would have been approximately 188,800 kW net, with a 23.8% reserve margin. HELCO's expected reserve margins for the three-year period covered by this report (2003-2005) are adequate based on the assumptions listed below, as shown in Attachment 1. HELCO will have sufficient capacity available on its system to cover the projected annual system peaks with scheduled maintenance and loss of the largest unit for the three-year period based on the assumptions listed below.

HELCO's adequacy of supply projections for the years 2003, 2004, and 2005 are based on the following assumptions: -

- The Forecast Planning Committee's Forecast of Sales, Peak and Sales Load Factor, dated March 5, 2002.
- The Net Reserve Ratings for HELCO units and firm capacity power purchases listed in Attachment 2.
- Continuation of the HCPC Second Amended and Restated PPA, as amended by Amendment No. 1[4], under which HCPC provides HELCO with 22,000 kW of firm capacity to December 31, 2004[5].
- PGV continues to operate under its existing PPA, which provides for PGV to supply 30,000 kW of firm capacity to HELCO.[6]
- Installations of Keahole units CT-4 and CT-5 are projected to occur during mid-2004. For the purpose of conducting resource planning analysis, the installation

[4] The terms of the Second Amended and Restated PPA runs from January 1, 2000 through December 31, 2004 (subject to HELCO's right of early termination). After 2004, the contract continues on a year-to-year basis, subject to termination by either HELCO or HCPC upon written termination notice issued by May 30 of the termination year. In the year that termination notice is given, HCPC would have the right to not use its September overhaul in the year notice is given, and would be permitted to shut down as of midnight, November 30, of such year. Any decision to give notice of termination would be based on the facts and circumstances at the time. For the purposes of this analysis it is assumed that the HCPC Second Amended and Restated PPA will be terminated on December 31, 2004 with early shutdown on November 30, 2004.

[5] HCPC will provide HELCO with the firm capacity 5 days per week during a 14-hour daily on-peak period. HCPC must use its "reasonable best efforts" to provide HELCO with energy outside of the on-peak period, upon HELCO's request.

[6] PGV has been providing an average of 5,600 kW since April 2002 due to source well problems. PGV is working on a plan to restore its facility to its full rating of 30,000 kW by June 2003.

dates for CT-4 and CT-5 are assumed to be June 2004[7], as explained in Attachment 1.

- Shipman 1 and Waimea D8-10 were retired in February 2002 and are not included as firm capacity from 2002.

- Dispersed diesels D24-27 are now included as firm capacity. They were installed in 1997 as mitigation measures. They are now expected to remain in service until they are no longer needed to maintain reliability.

- The following capacity planning criteria was used to determine the need for additional generation:

  The sum of the reserve ratings of all available units, minus the reserve rating of the largest available unit, minus the reserve ratings of any units on maintenance, must be equal to or greater than the system peak load to be supplied[8].

Very truly yours,

Warren Lee

Attachments

cc: Division of Consumer Advocacy

[7] The construction of Keahole CT-4 and CT-5 has been suspended due to a September 2002 Circuit Court ruling. HELCO has filed appeals with the Hawaii State Supreme Court in order to continue construction. Because the matter is still in litigation, the service dates for CT-4 and CT-5 are subject to change.

[8] HELCO will be evaluating whether and to what extent reserve margins higher than those produced by application of the capacity planning criteria should be targeted based on factors (such as unit availabilities) not explicitly considered by the criteria.

Table 1
Adequacy of Supply

Year	System Capability (net kW) [A]	Notes	Without Future DSM (Includes Acquired DSM) [1] System Peak (net kW) [B] [3]	Without Future DSM (Includes Acquired DSM) [1] Reserve Margin (%) [[A-B]/B] [8]	With Future DSM (Includes Acquired DSM) [2] System Peak (net kW) [B] [3]	With Future DSM (Includes Acquired DSM) [2] Reserve Margin (%) [[A-B]/B] [8]
Recorded						
2002	233,700	(4)	177,900	31.4%	N/A	N/A
Future						
2003	258,100	(5)	180,400	43.1%	179,400	43.9%
2004	267,700	(6)	184,200	45.3%	182,700	46.5%
2005	267,700	(7)	188,100	42.3%	186,100	43.8%

Notes:

(1) System Peaks (Without Future Peak Reduction Benefits of DSM Programs):
Implementation of full-scale DSM programs began in the first quarter of 1996 following Commission approval of the programs. The forecasted system peak values for the years 2003-2005 include the actual peak reduction benefits acquired in 1996-2001 and the estimated peak reduction benefits acquired in 2002, as well as the benefits of the Rider M and Schedule U contracts.

(2) System Peaks (With Future Peak Reduction Benefits of DSM Programs):
The forecasted system peaks for 2003-2005 include the peak reduction benefits of the DSM programs (acquired and future) and the Rider M and Schedule U contracts.

(3) The 2003-2005 annual forecasted system peaks are based on HELCO's 2002-2007 Sales and Peak Forecast, dated March 5, 2002.

(4) System Capability for 2002 includes:

- HELCO units at a total of 146,100 kW net (150,500 kW gross) with the four 1,000 kW dispersed generators. Shipman 1 and Waimea D8-10 were retired in February 2002.
- Firm power purchase contracts with a combined net total of 87,600 kW for 2002 from PGV (5,600 kW), [1] HCPC (22,000 kW) and HEP (60,000 kW).

[1] PGV generally exported to HELCO 5,600 kW at top load since April 2002 due to well blockage. PGV plans to restore its facility to 30,000 kW in mid-2003.

(5) System Capability for 2003 includes:

- HELCO units at a total of 146,100 kW net with the four 1,000 kW dispersed generators.

- Firm power purchase contracts with a combined net total of 112,000 kW from PGV (30,000 kW), HCPC (22,000 kW) and HEP (60,000 kW).

(6) System Capability for 2004 includes:

- HELCO units at a total of 177,700 kW net with the four 1,000 kW dispersed generators. This includes the installation of Keahole CT-4 and CT-5 (39,800 kW net) in June 2004. With the installation of CT-4 and CT-5, Keahole D18- D20 (8,250 kW net reserve rating) will be retired. Kanoelehua CT-1, D11, D15-17, Waimea D12-14, and Keahole D21-23 (38,250 kW total) will be kept in service until the units are no longer needed to maintain system reliability or to maintain quick start capability.[2] The status of CT-4 and CT-5 is as follows:

  On March 25, 2002, the Board of Land and Natural Resources ("BLNR") granted HELCO's request for an extension to complete construction under its land use entitlement. In April 2002, after the Circuit Court granted HELCO's motion to lift a stay on construction, HELCO resumed construction on CT-4 and CT-5. However, in September 2002, construction was suspended as a result of a Circuit Court Order, which reversed the March 25, 2002 BLNR decision to allow construction to proceed through December 31, 2003. The installation of CT-4 and CT-5 was 85% completed when construction stopped. HELCO has filed an Appeal and Motion for Stay of this judgment with the Hawaii State Supreme Court. HELCO has also appealed a previous ruling by the Circuit Court from November 2000, which first determined that HELCO's land use entitlement expired in April 1999. HELCO's other permits (i.e., air permit, building permits, etc.) for construction of CT-4 and CT-5 remain active and valid at this time. At this time it is estimated that CT-4 and CT-5 could be in service by mid-2004. For the purposes of this analysis, it is assumed that their service dates are June 2004. Since this matter is still in litigation, the service dates are subject to change.

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[2] The diesel units have fast-starting capability and can be on line within 90 seconds from when they are started. The fast-start diesel units are used to balance generation and load during post-contingency situations such as a generating unit trip or a transmission line outage, and have been helpful given the operational issues with the HEP facility.

In addition, HELCO is expecting to add a substantial amount of wind generation to its system. The fast-start diesel units provide flexibility in adjusting the amount of firm capacity and regulating capacity HELCO has to have on line to match system load and maintain system frequency and voltage, which can fluctuate instantaneously depending on the amount and intermittent nature of the as-available energy being provided to the system. HELCO will review whether and to what extent this flexibility will still be needed after the new Keahole combustion turbines are commercially operational and new wind generation is added.

- Firm power purchase contracts with a combined net total of 90,000 kW from PGV (30,000 kW) and HEP (60,000 kW). It is assumed for purposes of this adequacy of supply analysis that the HCPC Second Amended and Restated PPA will be terminated as of December 31, 2004 (with early shutdown on November 30, 2004). If notice of termination is provided by May 30, 2004, HCPC has the right not to use its planned September overhaul and to shut down as of midnight, November 30, 2004 as permitted by the agreement. Any decision to terminate would depend on the facts and circumstances at the time.

- The reserve margins of 46.5% and 45.3% (with and without future DSM, respectively) apply only in December 2004, after Keahole CT-4 and CT-5 are installed in June 2004, Keahole D18-20 are retired, and after HCPC is shutdown at the end of November 2004. Prior to the installation of CT-4 and CT-5, the reserve margins will be 41.3% and 40.1% (with and without future DSM, respectively)[3]. If CT-4 and CT-5 have not been installed, Keahole D18-20 will not be retired and it is assumed that the HCPC Second Amended and Restated PPA will not be terminated. Under the circumstances, the reserve margins will be 41.3% and 40.1% (with and without DSM, respectively).

(7) System Capability for 2005 includes:

- HELCO units at a total of 177,700 kW net with four 1,000 kW dispersed generators. HELCO plans to keep Kanoelehua CT-1, D11, D15-17, Waimea D12-14, and Keahole D21-23, totaling 38,250 kW, in service until the units are no longer needed to maintain system reliability or to maintain quick-start capability.

- Firm power purchase contracts with a combined net total of 90,000 kW from PGV (30,000 kW) and HEP (60,000 kW).

- The reserve margins of 43.8% and 42.3% (with and without DSM, respectively) assume that, in 2004, CT-4 and CT-5 are installed, Keahole D18-20 are retired, and the HCPC Second Amended and Restated PPA is terminated. If CT-4 and CT-5 have not been installed, Keahole D18-20 will not be retired and it is assumed that the HCPC Second Amended and Restated PPA will not be terminated. Under the circumstances, the reserve margins will be 38.7% and 37.2% (with and without DSM, respectively).

(8) Reserve Margin

The reserve margins shown for 2003-2005 assume that HEP, PGV, and HCPC (when included) are at full ratings. These purchased power units have been derated in recent months but the deratings are not expected to affect HELCO's ability to serve load.

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[3] The reserve margins were calculated based on the 2004 forecasted peak and 2004 capacity prior to installing Keahole CT-4 and CT-5 and retiring Keahole D18-20.

HELCO Adequacy of Supply
2002 Unit Ratings (Firm Capacity)

Unit	(Gross MW) Reserve Rating (MW)		(Gross MW) NTL Rating (MW)		(Net MW) Reserve Rating (MW)		(Net MW) NTL Rating (MW)	
Shipman 1	0.00	(1)	0.00	(1)	0.00	(1)	0.00	(1)
Shipman 3	7.50	(2)	7.50	(2)	7.10	(2)	7.10	(2)
Shipman 4	7.70	(2)	7.70	(2)	7.30	(2)	7.30	(2)
Hill 5	14.10		14.10		13.50		13.50	
Hill 6	21.40		21.40		20.20		20.20	
Puna	15.50		15.50		14.10		14.10	
Waimea D8	0.00	(1)	0.00	(1)	0.00	(1)	0.00	(1)
Waimea D9	0.00	(1)	0.00	(1)	0.00	(1)	0.00	(1)
Waimea D10	0.00	(1)	0.00	(1)	0.00	(1)	0.00	(1)
Kanoelehua D11	2.00		2.00		2.00		2.00	
Waimea D12	2.75		2.50		2.75		2.50	
Waimea D13	2.75		2.50		2.75		2.50	
Waimea D14	2.75		2.50		2.75		2.50	
Kanoelehua D15	2.75		2.50		2.75		2.50	
Kanoelehua D16	2.75		2.50		2.75		2.50	
Kanoelehua D17	2.75		2.50		2.75		2.50	
Keahole D18	2.75		2.50		2.75		2.50	
Keahole D19	2.75		2.50		2.75		2.50	
Keahole D20	2.75		2.50		2.75		2.50	
Keahole D21	2.75		2.50		2.75		2.50	
Keahole D22	2.75		2.50		2.75		2.50	
Keahole D23	2.75		2.50		2.75		2.50	
Kanoelehua CT1	11.50		11.50		11.50		11.50	
Keahole CT2	13.00		13.00		13.00		13.00	
Puna CT3	20.80		20.80		20.40		20.40	
Keahole CT-4	0.00	(3)	0.00	(3)	0.00	(3)	0.00	(3)
Keahole CT-5	0.00	(3)	0.00	(3)	0.00	(3)	0.00	(3)
Panaewa D24	1.00	(4)	1.00	(4)	1.00	(4)	1.00	(4)
Ouli D25	1.00	(4)	1.00	(4)	1.00	(4)	1.00	(4)
Punaluu D26	1.00	(4)	1.00	(4)	1.00	(4)	1.00	(4)
Kapua D27	1.00	(4)	1.00	(4)	1.00	(4)	1.00	(4)
HELCO Total	150.50		147.50		146.10		143.10	
HCPC	22.00		22.00		22.00		22.00	
PGV	5.60	(5)	5.60	(5)	5.60	(5)	5.60	(5)
HEP	60.00	(6)	60.00	(6)	60.00	(6)	60.00	(6)
IPP Total	87.60		87.60		87.60		87.60	
System Total	238.10		235.10		233.70		230.70	

Notes:
(1) Shipman 1 and Waimea D8-10 were retired in February 2002.
(2) HELCO is temporarily restricting the outputs of Shipman 3 and 4 to 6.7 MW and 6.8 MW, respectively.
(3) Keahole CT-4 and CT-5 were not installed in 2002.
(4) Panaewa D24, Ouli D25, Punaluu D26, Kapua D27 are now counted as firm capacity since they have been in operation since 1997, and are not expected to be retired in the near future.
(5) PGV has been exporting an average of 5.6 MW since April 2002 due to well problems.

(6) HEP's normal rating is 60 MW. At the time of the December 30, 2002 system peak, HEP was temporarily derated to 57 MW due to vibration on the steam turbine generator. An outage is being scheduled for March 2003 to address the vibration problem.

HELCO Adequacy of Supply
2003 Unit Ratings (Firm Capacity)

	(Gross MW)		(Net MW)	
Unit	Reserve Rating (MW)	NTL Rating (MW)	Reserve Rating (MW)	NTL Rating (MW)
Shipman 1	0.00	0.00	0.00	0.00
Shipman 3	7.50 (1)	7.50 (1)	7.10 (1)	7.10 (1)
Shipman 4	7.70 (1)	7.70 (1)	7.30 (1)	7.30 (1)
Hill 5	14.10	14.10	13.50	13.50
Hill 6	21.40	21.40	20.20	20.20
Puna	15.50	15.50	14.10	14.10
Waimea D8	0.00	0.00	0.00	0.00
Waimea D9	0.00	0.00	0.00	0.00
Waimea D10	0.00	0.00	0.00	0.00
Kanoelehua D11	2.00	2.00	2.00	2.00
Waimea D12	2.75-	2.50	2.75	2.50
Waimea D13	2.75	2.50	2.75	2.50
Waimea D14	2.75	2.50	2.75	2.50
Kanoelehua D15	2.75	2.50	2.75	2.50
Kanoelehua D16	2.75	2.50	2.75	2.50
Kanoelehua D17	2.75	2.50	2.75	2.50
Keahole D18	2.75 (2)	2.50 (2)	2.75 (2)	2.50 (2)
Keahole D19	2.75 (2)	2.50 (2)	2.75 (2)	2.50 (2)
Keahole D20	2.75 (2)	2.50 (2)	2.75 (2)	2.50 (2)
Keahole D21	2.75	2.50	2.75	2.50
Keahole D22	2.75	2.50	2.75	2.50
Keahole D23	2.75	2.50	2.75	2.50
Kanoelehua CT1	11.50	11.50	11.50	11.50
Keahole CT2	13.00	13.00	13.00	13.00
Puna CT3	20.80	20.80	20.40	20.40
Keahole CT-4	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
Keahole CT-5	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
Panaewa D24	1.00	1.00	1.00	1.00
Ouli D25	1.00	1.00	1.00	1.00
Punaluu D26	1.00	1.00	1.00	1.00
Kapua D27	1.00	1.00	1.00	1.00
HELCO Total	150.50	147.50	146.10	143.10
HCPC	22.00	22.00	22.00	22.00
PGV	30.00 (3)	30.00 (3)	30.00 (3)	30.00 (3)
HEP	60.00 (4)	60.00 (4)	60.00 (4)	60.00 (4)
IPP Total	112.00	112.00	112.00	112.00
System Total	262.50	259.50	258.10	255.10

Notes:
(1) HELCO is temporarily restricting the outputs of Shipman 3 and 4 to 6.7 MW and 6.8 MW, respectively.
(2) Keahole CT-4 and CT-5 are not installed in 2003. Keahole D18-20 are not retired in 2003.
(3) PGV expects to be restored to 30 MW by June 2003.
(4) HEP was temporarily derated to 57 MW due to vibration on its steam turbine generator. A steam turbine outage to address the problem is scheduled for March 2003.

HELCO Adequacy of Supply
2004 Unit Ratings (Firm Capacity)

	(Gross MW)		(Net MW)	
Unit	Reserve Rating (MW)	NTL Rating (MW)	Reserve Rating (MW)	NTL Rating (MW)
Shipman 1	0.00	0.00	0.00	0.00
Shipman 3	7.50 (1)	7.50 (1)	7.10 (1)	7.10 (1)
Shipman 4	7.70 (1)	7.70 (1)	7.30 (1)	7.30 (1)
Hill 5	14.10	14.10	13.50	13.50
Hill 6	21.40	21.40	20.20	20.20
Puna	15.50	15.50	14.10	14.10
Waimea D8	0.00	0.00	0.00	0.00
Waimea D9	0.00	0.00	0.00	0.00
Waimea D10	0.00	0.00	0.00	0.00
Kanoelehua D11	2.00	2.00	2.00	2.00
Waimea D12	2.75	2.50	2.75	2.50
Waimea D13	2.75	2.50	2.75	2.50
Waimea D14	2.75	2.50	2.75	2.50
Kanoelehua D15	2.75	2.50	2.75	2.50
Kanoelehua D16	2.75	2.50	2.75	2.50
Kanoelehua D17	2.75	2.50	2.75	2.50
Keahole D18	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
Keahole D19	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
Keahole D20	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
Keahole D21	2.75	2.50	2.75	2.50
Keahole D22	2.75	2.50	2.75	2.50
Keahole D23	2.75	2.50	2.75	2.50
Kanoelehua CT1	11.50	11.50	11.50	11.50
Keahole CT2	13.00	13.00	13.00	13.00
Puna CT3	20.80	20.80	20.40	20.40
Keahole CT-4	19.90 (2)	19.90 (2)	19.90 (2)	19.90 (2)
Keahole CT-5	19.90 (2)	19.90 (2)	19.90 (2)	19.90 (2)
Panaewa D24	1.00	1.00	1.00	1.00
Ouli D25	1.00	1.00	1.00	1.00
Punaluu D26	1.00	1.00	1.00	1.00
Kapua D27	1.00	1.00	1.00	1.00
HELCO Total	182.05	179.80	177.65	175.40
HCPC	0.00 (3)	0.00 (3)	0.00 (3)	0.00 (3)
PGV	30.00	30.00	30.00	30.00
HEP	60.00	60.00	60.00	60.00
IPP Total	90.00	90.00	90.00	90.00
System Total	272.05	269.80	267.65	265.40

Notes:

(1) HELCO is temporarily restricting the outputs of Shipman 3 and 4 to 6.7 MW and 6.8 MW, respectively.

(2) Keahole CT-4 and CT-5 are assumed to be installed in mid-2004. D18-20 are to be retired with the installation of CT-4 and CT-5. Since CT-4 and CT-5 are in litigation, the service dates are subject to change.

(3) HCPC to be terminated on December 31, 2004 (with early shutdown on November 30, 2004) for purposes of this analysis. Any decision to terminate HCPC would depend on the facts and circumstances at the time.

HELCO Adequacy of Supply
2005 Unit Ratings (Firm Capacity)

Unit	(Gross MW) Reserve Rating (MW)		(Gross MW) NTL Rating (MW)		(Net MW) Reserve Rating (MW)		(Net MW) NTL Rating (MW)	
Shipman 1	0.00		0.00		0.00		0.00	
Shipman 3	7.50	(1)	7.50	(1)	7.10	(1)	7.10	(1)
Shipman 4	7.70	(1)	7.70	(1)	7.30	(1)	7.30	(1)
Hill 5	14.10		14.10		13.50		13.50	
Hill 6	21.40		21.40		20.20		20.20	
Puna	15.50		15.50		14.10		14.10	
Waimea D8	0.00		0.00		0.00		0.00	
Waimea D9	0.00		0.00		0.00		0.00	
Waimea D10	0.00		0.00		0.00		0.00	
Kanoelehua D11	2.00		2.00		2.00		2.00	
Waimea D12	2.75		2.50		2.75		2.50	
Waimea D13	2.75		2.50		2.75		2.50	
Waimea D14	2.75		2.50		2.75		2.50	
Kanoelehua D15	2.75		2.50		2.75		2.50	
Kanoelehua D16	2.75		2.50		2.75		2.50	
Kanoelehua D17	2.75		2.50		2.75		2.50	
Keahole D18	0.00		0.00		0.00		0.00	
Keahole D19	0.00		0.00		0.00		0.00	
Keahole D20	0.00		0.00		0.00		0.00	
Keahole D21	2.75		2.50		2.75		2.50	
Keahole D22	2.75		2.50		2.75		2.50	
Keahole D23	2.75		2.50		2.75		2.50	
Kanoelehua CT1	11.50		11.50		11.50		11.50	
Keahole CT2	13.00		13.00		13.00		13.00	
Puna CT3	20.80		20.80		20.40		20.40	
Keahole CT-4	19.90		19.90		19.90		19.90	
Keahole CT-5	19.90		19.90		19.90		19.90	
Panaewa D24	1.00		1.00		1.00		1.00	
Ouli D25	1.00		1.00		1.00		1.00	
Punaluu D26	1.00		1.00		1.00		1.00	
Kapua D27	1.00		1.00		1.00		1.00	
HELCO Total	182.05		179.80		177.65		175.40	
HCPC	0.00		0.00		0.00		0.00	
PGV	30.00		30.00		30.00		30.00	
HEP	60.00		60.00		60.00		60.00	
IPP Total	90.00		90.00		90.00		90.00	
System Total	272.05		269.80		267.65		265.40	

Notes:
(1) HELCO is temporarily restricting the outputs of Shipman 3 and 4 to 6.7 MW and 6.8 MW, respectively.

Faith Based Model

Founded on biblical principles, University of the Nations, Kona (YWAM Kona) fulfills its commitment to Christ and His Great Commission by equipping men and women with spiritual, cultural, intellectual and professional training, and inspiring them to both continually grow in their personal relationship with God while also seeking to make Him known among all peoples in all nations.

To fulfill its purpose YWAM Kona uses a faith based model. It says in Hebrews 11:6 that 'without faith it is impossible to please God'. We can trust in God to provide our needs because He is faithful and says in Haggai 2:8 'The silver is mine and the gold is mine.' Therefore, we know that 'God's work done in God's way will not lack God's supply'. This faith based model applies to YWAM Kona staff who support/train students and campus development which provides dorms and classrooms for students.

YWAM Kona has over 500 staff including doctors, lawyers, CPAs, teachers, architects, builders, and other professional and administrative staff who all serve for no salary. All staff are required to have faith and raise their support. Support is raised thru donations made to YWAM Kona and other not-for-profit organizations such as other YWAM campuses and churches. Over $9 million in donations was received by YWAM Kona in Fiscal Year 2018 related to support of staff associated with YWAM Kona.

In the business model when funds are needed for expansion it is typical to borrow. YWAM Kona does not believe it is wrong to borrow; however, we agree with Proverbs 22:7 where is says: "The rich rule over the poor, and the borrower is slave to the lender." Thus, we have chosen to fund our campus development thru faith/donations and not thru borrowing.

With the faith based model the YWAM Kona campus is now valued at close to $100 million. We do have just under $5 million in debt related to the time when we followed the business model, but we are paying this off and hope to be debt-free in the near future.

In the last 35 years with a faith based model the following improvements and buildings have been added to YWAM Kona. The amounts are estimates based upon new building costs.

8 Dormitories (approx. 100 beds each)	$ 27.456,000
5 Building (64 Units) in Hualalai Village	17,316,000
Site Improvements	10,000,000+
Cafeteria Building (under construction)	9,000,000+
GO Center	6,330,000
Design Center – Admissions Office	2,356,000
Counseling & Healthcare Center	2,326,000
Early Childhood Education Center	1,590,000
Ohana Court	1,290,000
Library & Recording Studio	767,000
Total	$78,431,000+

EXHIBIT 33

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAI'I

In the Matter of the Petition Of U of N BENCORP To Amend the Agricultural Land Use District to the Urban Land Use District for Approximately 62 Acres, Tax Map Key Nos.: (3) 7-5-010:085 and 7-5-017:006 situated at Wai'aha, North Kona, County and State of Hawai'i	DOCKET NO. A02-737 CERTIFICATE OF SERVICE

CERTIFICATE OF SERVICE

I hereby certify that a filed copy of the foregoing document was served upon the following by either hand delivery or depositing the same in the U.S. Postal Service by regular or certified mail as noted:

MICHAEL YEE, DIRECTOR Department of Planning, County of Hawai'i Aupuni Center 101 Pauahi Street, Suite 3 Hilo, HI 96720	U.S. MAIL, POSTAGE PREPAID
JOSEPH K. KAMELAMELA, ESQ. Corporation Counsel Department of the Corporation Counsel County of Hawai'i Hilo Lagoon Centre, 101 Aupuni Street, Unit 325 Hilo, HI 96720 Attorneys for County of Hawai'i Department of Planning	U.S. MAIL, POSTAGE PREPAID

Mary Alice Evans Director Office of Planning, State of Hawai'i 235 S. Beretania Street, Suite 600 Honolulu, HI 96813	HAND DELIVERY
DAWN TAKEUCHI APUNA, ESQ. Deputy Attorney General Department of the Attorney General, State of Hawai'i 425 Queen Street Honolulu, HI 96813 Attorneys for Office of Planning, State of Hawai'i	HAND DELIVERY

DATED: Honolulu, Hawai'i, May 17, 2019.

STEVEN S.C. LIM
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Attorneys for
UNIVERSITY OF THE NATIONS, KONA, INC.