Appendix S: Estimated Staffing and Operating Costs Report

Oahu Community Correctional Center

October 27, 2017

Reprinted from January 9, 2017

Prepared for:
State of Hawaii
Department of Accounting and General Services
Department of Public Safety

Prepared by:
Criminal Justice Planning Services
Olympia, Washington

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SUMMARY

The report predicts staffing efficiencies and operational savings will be achieved through modern jail design, technology and best practices in staffing. It begins by providing a national perspective on modern jail design and approaches to staffing for low-rise and multilevel facilities. As explained, modern jails include the use of contemporary technology to augment staffing while increasing public safety. Examples include video visiting, video surveillance, electronic records and limited video court. Today's housing units are generally larger than at OCCC and supervisory sergeants are assigned to broad areas of the facility versus each housing unit. Single officers work in general population housing units with an open work station. The officers are supported with the aforementioned technology as wells as a cadre of roving officers that respond when needed. In contrast to modern jails, the layout of OCCC forces the facility to operate like a state prison. Walking from building to building via sidewalks lined with recreation yards not connected to the housing units creates the need for additional staffing, as do separate program and visiting buildings. Additionally, it is highly unusual to see guard towers at today's jails.

In a separate report, the Interim Architectural (IA) Space Program estimates the spaces needed to meet the 10-year OCCC population forecast for males.[1] It serves as the source document of the housing unit requirements for the replacement facility. The detention forecast is almost flat while the pre-release forecast applies a two percent growth rate to the eligible pool of candidates.[2] Thus, the growth is entirely pre-release which is known throughout the corrections industry to be cost beneficial and reduce crime via reduced recidivism. The IA Space Program assumes the facility will be in a single location including pre-trial, sentenced and pre-release inmates. Changing that dynamic such as separating the pre-trial population by any significant amount of geography will likely require a duplication of services in areas such as administration, food service and health care.

OCCC's current staffing represents 87.5 percent of its operating cost. Therefore staffing immediately becomes the focus of the operating cost analysis. Security staffing represents 82.2 percent of all staffing and within security staffing, correctional sergeants and officers represent 94.2 percent. Since the IA Space Program defines the housing units, the heart of the analysis focuses on estimating security staffing for housing units as well as rover staffing and then comparing it to OCCC's current staffing. Other factors such as the location and floor plans of the replacement facility are unknown at this time, so it is not possible to adjust all of the remaining staffing. In order to develop a general staffing scenario for the replacement facility, the revised security staffing is added to OCCC's current non-security staffing.

A comparison of OCCC's current security staffing to those estimated for the IA Space Program conservatively estimates an annual savings of up to 51.2 full-time equivalencies (FTEs) for a single level facility and 39.6 FTEs for a multilevel facility. For a low-rise replacement facility, this translates to savings of $4.8 million annually or $143 million over a 30-year life cycle of the facility compared to the existing OCCC facility. A multilevel facility reduces the staff savings to $3.8 million annually or $115 million over 30 years comparatively.

In addition to saving FTEs and dollars, the replacement facility serves more people. In FY16, OCCC had 1,004 beds. The number of beds provided in the IA Space Program is 1,522.[3] This provides 518 additional beds,

1 Females will receive in-take services at the new OCCC, but will not reside there.

2 PSD reports there are currently 216 pre-release beds with about 300 inmates eligible at any given time.

3 See the Interim Architectural Space Program Housing Configuration section on page 12 for details.

most of which are low cost pre-release beds. The reason why pre-release beds cost less to operate is because the inmates are in minimum security which requires less staffing. This changes the adjusted operating cost per bed from $65,626 to $ 40,153 (-39 percent) for a low-rise facility and from $65,626 to about $40,770 (-38 percent) for a multilevel facility.[4] The current ratio of inmates to housing unit security staffing will change from 4.6 to 8.6. These results are similar to those in the 2009 DLR Group study referenced in the full report. There are likely to be other efficiencies once the layout of the facility and buildings are fully designed. For example, it is assumed there will be no guard towers at the replacement facility which currently represents ten positions at OCCC. However, at least some of these efficiencies will be off-set by non-staffing costs of the additional population.[5] Further study is required after a site is selected and after the buildings are designed for that site.

OCCC is Hawaii's largest and oldest community correction center. Failing to replace it will mean a lost opportunity to increase safety as well as take advantage of efficiencies gained through modern jail design and electronics that produce operational savings. It will also mean the continued maintenance of a facility that appears to be past its useful life cycle.

4 Parking and elevator maintenance costs are additional and may be significant. They cannot be estimated at this time.

5 Non-staffing costs represent 12.5 percent of the per capita cost.

1.0 INTRODUCTION

1.1 Scope

The consultant was asked to estimate future OCCC staffing and operating costs based on the space designs contained within the draft Interim Architectural (IA) Space Program.[6] The program addresses all spaces required for detention and pre-release beds. Examples include housing units, administration, health care, intake services, food service and maintenance.

It should be noted that females will receive intake services, but will not reside at the new OCCC. Furthermore, the program provides space proximities, but does not include the actual building design. This report is intended to inform decision-makers about various staffing and operating cost options of a replacement facility as compared to current OCCC operations. It is not intended to be a final staffing plan for future budget allocations.

1.2 Project Approach

Applying OCCC's current staffing patterns to the IA Space Program would not reflect the advantages of modern jail design and advances in technology. Therefore, the consultant worked with materials and professionals from the National Institute of Corrections to document best practices and apply them to the IA Space Program. Two individual jail managers were also contacted to provide examples of best practices.

Next data were gathered from PSD representatives regarding current staffing and operating costs of OCCC. The data were analyzed for determining the order of magnitude in terms of which items represent the greatest expenses. This served as a baseline for comparing two staffing and operating cost scenarios. The first option is a low-rise replacement facility and the second option is a multilevel replacement facility.

2.0 NATIONAL PERSPECTIVE ON JAIL STAFFING

2.1 National Institute of Corrections

The National Institute of Corrections (NIC) library provides many resources about types of jails, how to plan jails and how to staff them. The following information summarizes some of the information that is pertinent to the replacement of OCCC.

2.1.1 Three Primary Types of Jails

In a video available for downloading, NIC explains the three primary designs of jail housing units in the United States as:

1. Linear Intermittent Surveillance- Cells are lined up in rows at right angles to a staff corridor (similar to the segregation unit at OCCC.) Staff cannot see into the cell fronts without walking by. Staff observe inmates only at intervals, usually every 30 minutes, or so.
2. Podular Remote Supervision- Cells are arranged in a semi-circle so that officers can see into them, but the officers are in a locked control booth. The primary form of contact is via an intercom system. If there is a fight or other form of distress, officers usually find out about it after the fact.

[6] Draft Interim Architectural Program, Integrus Architecture, and August 31, 2016.

3. Podular Direct Supervision- Staff continuously interacts with inmates who are usually in a common day room versus locked cells. The officer can see into the cells from the day room and there is no physical barrier between the officer and the day room.[7] (This is similar to the general population modules at OCCC.)

Podular direct supervision works well for general population housing units because the officer can often intervene in behavior problems prior to their escalation. Exclusive podular direct supervision does not work well in maximum security housing units where inmates need more physical control.

2.1.2 Jail Design Guide

The Jail Design Guide provides extensive information on needs assessments, site selection, staffing considerations and more.[8] Key discussions on staffing include:

- Facility Location—When the jail is located some distance from the courts, full-time positions are often required to transport inmates to and from court. If the new OCCC is not collocated with the courts, use of video appearances and/or on-site courtrooms will mitigate the need for transport officers. Similarly, a facility located away from community medical services will require transport officers. [9]
- Single Level versus Multilevel Design—Moving people and services (food service and laundry, for example) becomes more time consuming and complicated in a multilevel facility. Required stairways and elevators present additional surveillance problems and security risks during the course of normal operations and during emergencies. Maintenance of elevators also drives staffing and costs. Finally, multilevel facilities reduce the ability to create direct sightlines between posts unless there is some sort of vertical connection such as a caged stairway. Direct sightlines allow staff from one unit to observe and at times support staff from another unit.
- Inmate Separation—The extent to which inmates are separated in the facility (gender, classification, legal status and special needs, for example) and the manner in which separation is achieved can translate into staffing requirements. Generally, the greater the number of distinct housing units a facility has driven up the number of staff positions needed to supervise the units.
- Surveillance/Supervision Methods—Remote observation and direct supervision methods require constant staffing and clear sightlines from established staff positions. It is not necessarily true that remote observation requires fewer staff positions than direct supervision because the officer in an enclosed booth cannot leave the booth. If the goal is to manage the behavior of inmates, there is still a need to provide sufficient staff to make continuous and frequent contact with the inmates. Remote observation adds a layer of surveillance, but it does not take the place of managing inmate behavior. On the other hand, video surveillance can allow for low risk inmates to move between designated areas without staff escort.

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7 Jails in America: A Report on Podular Direct Supervision, National Institute of Corrections, 2015.http://nicic.gov/library/030135

8 Jail Design Guide, Third Edition, NIC, Kimme, Bowker and Deichman, March 2011.

9 It may also be possible to use tele-medicine to reduce outside transports.

- Circulation and Movement—The design of the facility can either enhance or inhibit effective movement control and will influence the number of staff positions needed. Given the number of modules and the campus style layout of the current OCCC, staffing efficiencies can be gained through modern jail design that is more compact. Circulation patterns will be simple, corridors will be at least eight feet wide, adjacencies will be well planned to minimize travel distances within the jail, and routine services will be provided in housing units to minimize inmates having to travel to other buildings. Examples include food service, some health care, recreation, video visiting and offender change programs.
- Emergency Response—A constant minimal level of staffing is required to accomplish three key activities during an emergency:
  - Respond to the scene and implement intervention and/or suppression procedures (e.g. break up a disturbance or put out fire).
  - Possibly evacuate the housing area or the entire facility promptly and safely.
  - Provide containment and inmate supervision after suppression/evacuation.

2.1.3 Staffing Analysis Workbook for Jails

The Staffing Analysis Workbook for jails is in its third edition and provides a methodology for jail planners to achieve staffing that is based on the design of the facility and supervision requirements of inmates at various security levels. It provides a method for developing relief factors to fill-in for staff during their absences.[10]

Some elements of the workbook are used in this study including listing required housing and rover posts by shift and translating posts to full-time equivalencies based on PSD's relief factors. It is not possible to conduct a full staffing analysis until the facility is designed and its operating procedures for that design are known. A staffing analysis will require a team of people who document the various inmate supervision requirements throughout the facility.

The consultant contacted the author of the Staffing Analysis Workbook who agreed that best practices for staffing of new jails requires one officer per podular housing unit of approximately 72 general population inmates. This officer is supported by rovers who assist with inmate movement within the facility and respond to the units when needed. Sergeants are posted in zones throughout the facility, not in individual housing units.

The Staffing Analysis Workbook also addresses why staffing by ratio is generally considered poor practice among jail planners. Reasons include differences in facility mission, local practices, housing unit size and overall design. For example, a single story jail with ten general population housing units of 72 inmates each will require fewer officers than a multi-story jail with the same population. A more detailed discussion of the problems with staffing by ratio is included in this report as Appendix A.[11]

[10] Staffing Analysis Workbook for Jails. First two editions published by the National Institute for Corrections. Third edition published by Community Resource Services in June, 2016. Rod Miller is an author of all three editions.

[11] Ratios can be useful when comparing the efficiency of current staffing to future staffing, but should not be the basis of determining how many positions are required.

2.2 The Role of Staffing in Operating Costs

It is well known throughout the corrections industry that roughly three-fourths of the total operating budget can be attributed to staffing. As explained by the National Institute of Corrections, "Staff are the most costly and important resource in operating a jail. In many jails, staffing costs make up 70 to 80 percent of the annual budget. Without adequate staffing, jail security and the safety of staff, inmates, and the community are directly threatened and the possibility of costly litigation against the jail increases significantly."[12]Therefore, the efficiency of operating costs is highly dependent on staffing. Since the largest component of jail staffing is custody staffing, the focus of staffing efficiency centers on housing units and rovers that support the units and internal movement.

2.3 Specific Examples

The consultant contacted the following two jails in order to provide a couple of examples of security staffing of modern jails.

2.3.1 Scott County Jail in Davenport, Iowa

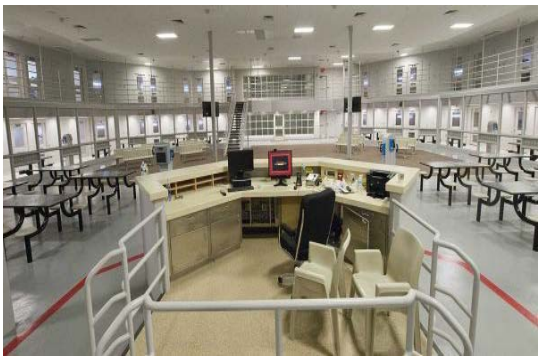
The Scott County Jail is featured in the aforementioned NIC video and in a number of other NIC publications. This mid-sized direct supervision jail (about 350 beds) opened in 2007 and is known for its efficiency with podular direct supervision housing units that range from 64 to 76 beds each.

The units are staffed with one officer on each shift. There are no sergeants assigned to housing units. This facility is an example of how the cost per inmate is less in the larger housing unit because the staffing patterns are the same for each. For example, if the officer costs per year for one unit are roughly $500,000 the housing security cost per inmate in the 64-bed unit is $7,813 annually ($500,000÷64=$7,813). Adding 12 inmates brings the housing unit security cost per inmate down to $6,579 annually ($500,000÷76=$6,579) which is a 19 percent less. The rule of thumb for any staffing scenario is: The larger the housing unit with one officer, the lower the cost per inmate.

[12] http://nicic.gov/training/nicwbt26, e-Training Module-Staffing Analysis for Jails, June 9, 2016.

2.3.2 Regional Justice Center, Kent, Washington

Although the Regional Justice Center (RJC) opened almost 20 years ago, it achieved many of the goals still considered to be best practices of modern jails. This includes 64-bed general population podular housing units with direct supervision by one officer.[13] The RJC does not publish interior photos. The photo below is of a similar housing unit.



There are no sergeants assigned to the units. Additionally, the 896-bed capacity jail has an open booking station, video visiting and sophisticated electronics that show the exact location of every officer in the facility at all times. The open booking station is similar to the photos below.

[13] The Federal Detention Center in Honolulu also has this housing unit staffing pattern.

The RJC is low-rise, so there is no need for elevators. It is commanded by a captain with two sergeants on day and swing shifts, and one sergeant on graveyard. Including relief officers to fill in when absences occur, sergeants assigned to the housing unit zone totals 10 FTEs. There are also four day shift sergeants assigned to booking, administration, maintenance/supply and court transportation detail. The total number of sergeants for the facility is 14. There are 152 officers for housing and booking with 16 more for court transportation detail.

3.0 CURRENT OCCC OPERATING COSTS AND STAFFING

It is the consultant's opinion that the layout of OCCC forces the facility to operate more like a state prison than a modern jail. Walking from building to building via sidewalks lined with recreation yards not connected to the housing units creates the need for additional staffing. Additionally, it is highly unusual to see guard towers at a jail. The following section starts with the big picture of OCCC and goes through several steps to determine where the focus should be in terms of efficient staffing and operating costs of the replacement facility.

3.1 Total Facility

The estimated operating cost for OCCC in FY16 was $67.3 million.[14] The following table shows the amounts by division.

The first item is the direct expenditure from the Institutions Division. The remaining four items are proportioned from statewide allocations that can be attributed to OCCC based on average daily population.

FY16 OCCC OPERATING COSTS	
Institutions- OCCC	$46,216,391
Corrections Prog Svcs	$3,460,359
Food Service	$3,894,037
Health Care	$8,933,553
Administration	$4,751,150
TOTAL	**$67,255,489**

The PSD budget office reports an end of month average of 1,199 inmates for FY16. The daily per capita cost is $153.68 ($67,255,489 ÷ 1,199 inmates ÷ 365 days = $153.68 per day).

Staffing represents 87.5 percent of the cost with 12.5 percent being non-staffing costs.[15]

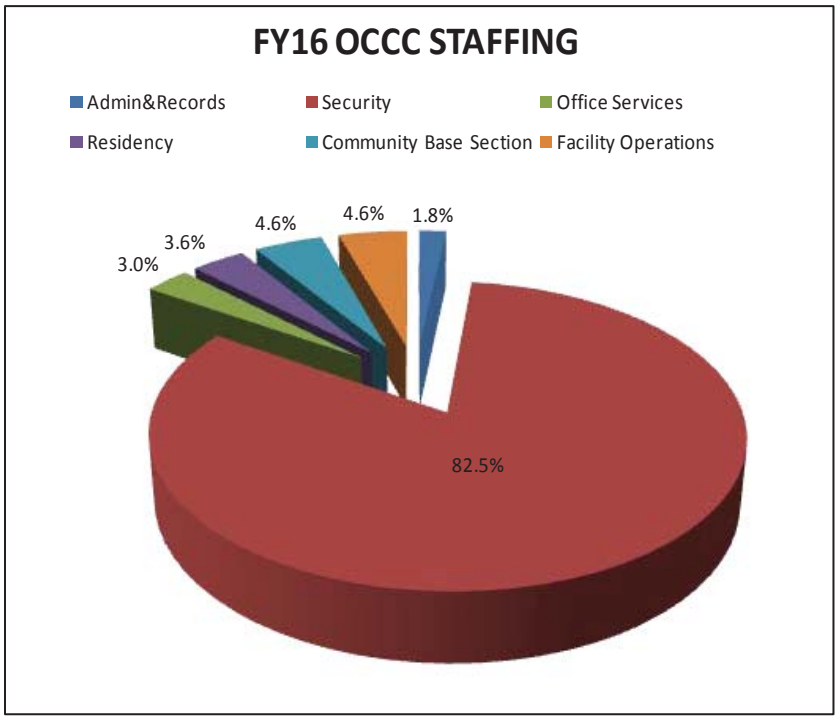
[14] The estimate is based on OCCC direct expenditures from the Institutions Division and per capita rates for CPS, Food Service, Health Care and Administration. Total per capita cost is $56,077.

[15] PSD Budget Office

This reinforces the notion that if efficiencies are to be gained, the focus should be on staffing. As shown in the table below, OCCC currently has 503 approved positions spread over six sections.

FY16 OCCC STAFFING	
SECTION	**POSITIONS**
Admin&Records	9
Security	415
Office Services	15
Residency	18
Community Base Section	23
Facility Operations	23
TOTAL	**503**

The pie chart shows the percentage each section represents.



A list of all positions is shown in Appendix B. By far, the majority of the staffing is security staffing, representing 82.5 percent of all staffing (415 ÷ 503 = 82.5 percent).

3.2 Security Staffing

The following table summarizes all security staffing positions. Of the 415 security positions, 391 or 94.2 percent of the total are sergeants and officers.

FY16 OCCC SECURITY STAFFING		
JOB CLASS	**POSITIONS**	**PERCENTAGE**
Adult Corrections Officer (ACO)VII (Chief of Security)	1	0.2%
Secretary 1	1	0.2%
OA III	2	0.5%
ACO VI-Captain	6	1.4%
ACO V- Lieutenant	14	3.4%
ACO IV- Sergeant	68	16.4%
ACO III- Officer	323	77.8%
Subtotal	**415**	**100%**

3.3 Housing Units and Rovers

To refine it further, a total of 59.4 sergeants (87 percent of all sergeants) and 163.4 officers (51 percent of all officers) are posted in housing units and rovers that support internal movement of inmates. These equals222.8positions.The specific assignments are shown below.

DETENTION BEDS			SERGEANTS (ACO IV)				OFFICERS (ACO III)				TOTAL FTEs
			POSTS			FTEs	POSTS			FTEs	
Module	Type	Capacity*	Shift 1	Shift 2	Shift 3		Shift 1	Shift 2	Shift 3		
1	Ment Hlth	42	1.0	1.0	1.0	5.0	1.0	1.0	1.0	5.0	9.9
2	Ment Hlth/Me	48	0.0	1.0	1.0	3.3	1.0	1.0	1.0	5.0	8.3
3	General	59	0.0	1.0	1.0	3.3	1.0	2.0	2.0	8.3	11.6
4	General	60	0.0	1.0	1.0	3.3	1.0	2.0	2.0	8.3	11.6
7	General	24	0.0	0.0	0.0	0.0	1.0	2.0	2.0	8.3	8.3
8	Ment Hlth	24	0.0	1.0	1.0	3.3	1.0	1.0	1.0	5.0	8.3
11	General	48	0.0	1.0	1.0	3.3	1.0	1.0	1.0	5.0	8.3
13	General	48	0.0	1.0	1.0	3.3	1.0	1.0	1.0	5.0	8.3
17	General	48	0.0	1.0	1.0	3.3	1.0	1.0	1.0	5.0	8.3
18	General	72	0.0	1.0	1.0	3.3	2.0	2.0	2.0	9.9	13.2
19	General	72	0.0	1.0	1.0	3.3	2.0	2.0	2.0	9.9	13.2
Annex-1	General	84	1.0	1.0	1.0	5.0	1.0	2.0	2.0	8.3	13.2
Mauka	General	36	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
Makai	General	36	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
Annex-2	General	84	1.0	1.0	1.0	5.0	2.0	3.0	3.0	13.2	18.2
Max/Holding	Short-term	36	1.0	1.0	1.0	5.0	2.0	3.0	3.0	13.2	18.2
Infirmary	Short-term	3	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
Rovers	Multi-purpos	0	0.0	0.0	0.0	0.0	3.0	4.0	3.0	16.5	16.5
	Subtotal	824	4.0	13.0	13.0	49.5	24.0	31.0	30.0	140.3	189.8
PRE-RELEASE BEDS											
Laumaka	Pre-Release	96	1.0	1.0	1.0	5.0	1.0	2.0	2.0	8.3	13.2
20	Pre-Release	84	1.0	1.0	1.0	5.0	3.0	3.0	3.0	14.9	19.8
	Subtotal	180	2.0	2.0	2.0	9.9	4.0	5.0	5.0	23.1	33.0
GRAND TOTAL		**1004**	**6.0**	**15.0**	**15.0**	**59.4**	**28.0**	**36.0**	**35.0**	**163.4**	**222.8**

* The total design capacity is 964 beds as stated by the Corrections Population Management Commission. The above total includes 40 temporary assignment beds for the infirmary and maximum security segregation cells.

3.4 Cost of Housing Unit and Rover Security Staffing

As shown in the table below, the cost of these positions is $18.9 million. This translates to a per bed cost of $18,863 annually for this portion of staffing ($18.9 million ÷ 1,004 beds = $18,863).[16] Also, a total of 222.8 uniformed positions with a capacity of 1,004 beds yields a ratio of 4.5 beds per custody officer (1,004 ÷ 222.8 = 4.5). These numbers become important when comparing the staffing efficiency of OCCC replacement facility options.[17]

ESTIMATED COST OF CURRENT OCCC HOUSING UNIT AND ROVER STAFFING			
TITLE	**PER FTE**	**FTEs**	**COST**
Sergeants	$95,154	59.4	$ 5,652,153
Officers	$81,336	163.4	$ 13,286,201
TOTAL		**222.8**	**$ 18,938,354**

Lieutenants typically serve in the role of assisting a captain and supervising sergeants. Although they are not attached to specific housing units, the number of lieutenants required is related to the number of sergeants being supervised. This also becomes important when comparing current OCCC costs to those of the replacement facility options. When adding the cost of the lieutenants, the above costs change to the following:

ESTIMATED SECURITY STAFFING COST OF CURRENT OCCC HOUSING UNITS, ROVERS AND LIEUTENANTS			
TITLE	**PER FTE**	**FTEs**	**COST**
Lieutenants	$107,770	14	$ 1,508,773
Sergeants	$95,154	59.4	$ 5,652,153
Officers	$81,336	163.4	$ 13,286,201
TOTAL	**N/A**	**236.8**	**$ 20,447,127**

16 Per bed costs are shown rather than per capita costs because all beds must be staffed and represent a cost. Per capita costs are shown later in the analysis.

17 FTE costs are estimates based on salary plus a fringe benefit rate of 49.54 percent as approved by the Department of Budget and Finance (B&F).

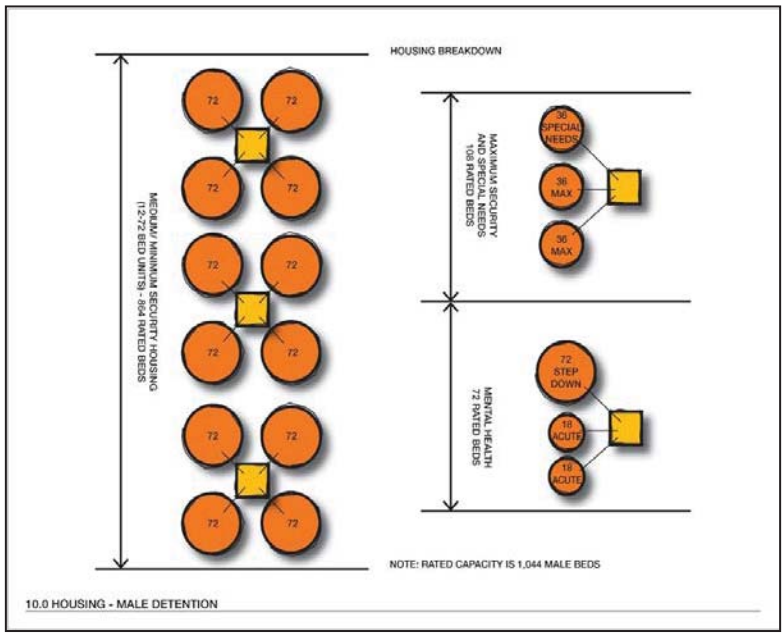
4.0 INTERIM ARCHITECTURAL SPACE PROGRAM HOUSING CONFIGURATION

The replacement facility is slated to have 1,044 rated detention beds. In addition to this, there are 46 non-capacity beds for temporary housing assignments that include infirmary, acute mental health, and segregation; although not rated beds, these require supervision therefore they are factored into the staffing estimate.[18] There are also 432 pre-release beds (96 existing pre-release beds at LWFC plus 336 new beds); this brings the total number of beds to be staffed to 1,522 (1,044 + 46 + 432).

4.1 Detention Housing

As shown in the diagram below, there will be three clusters of general population housing pods. Each cluster will have four 72-bed pods. Each pod will include a dayroom, outdoor recreation yard, and program spaces. In most cases meals will be prepared in the kitchen, transported to the units in carts, and served in dayrooms. The option of eating in the cell will be possible, if necessary. Other spaces will include showers, staff toilet, an officer's station, unit team offices, and storage. Medical screening and medication distribution will occur in a dedicated room adjacent to the dayroom. If more detailed medical services are required, the inmate will be moved to the Clinic. Library and video visitation will occur in the dayroom; video visitation will be the primary means of visiting. The squares shown below that adjoin the four pods will share a common control room, security electronics, staff toilet, and storage area.

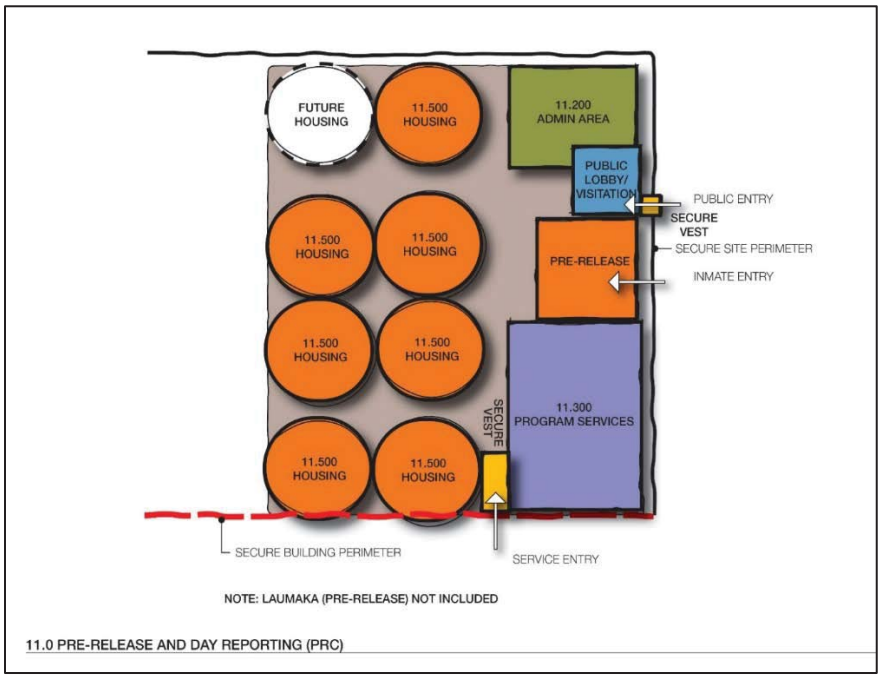
Specialized housing will include two clusters of units. The first will have a 36-bed Special Needs Unit and two 36-bed maximum security units. The second will have two 18-bed acute mental health care units and one mental health step-down unit. Each of the two clusters will have a shared common control room, security electronics, staff toilet and storage area.



[18] Non-capacity beds are temporary housing assignments for inmates needing specialized treatment and/or increased security.

4.2 Pre-Release Housing

The space program calls for seven 48-bed pre-release units for a total 336 new pre-release beds. There is also a placeholder for an additional unit, as shown in the following diagram.



As mentioned, the existing 96 pre-release beds at LWFC will continue to function. The total pre-release capacity will be 432 beds.

5.0 REPLACEMENT FACILITY STAFFING AND OPERATING COSTS

As the planning progresses for the replacement of OCCC, there are a number of alternatives to be considered for the site or sites. The three basic populations of OCCC include pre-trial, short-term sentenced and pre-release inmates. If all three are collocated on the same site, they would share basic support functions. Conversely, if the three are separated, each will require support functions which could lead to internal operational inefficiencies and duplication such as administration, food service and health care. The IA Space Program assumes collocation.[19]

[19] The Laumaka pre-release facility may be the exception.

A major difference between OCCC's current staffing and the best practices of staffing a modern jail pertains to the use of sergeants. OCCC currently posts sergeants alongside of a single officer for two shifts in general population housing units. It is reasonable to have two staff positions in an old facility where the housing units are physically separated and do not have the benefits of increased surveillance and control through the use of modern electronics. However, a modern jail with clustered housing units and programming space within those housing units is typically staffed with one officer and a sergeant that supports multiple units or in some cases, all units. The Scott County Jail and RJC facilities described above are two examples of the many throughout the country.

5.1 Comparative Analysis

Placing facilities in close relationship allows for efficiency in some program areas such as food service and health care. If they are distant from one another, travel distance could lead to two kitchens or two clinics. Construction and staffing are likely to cost more. The following options assume all services are in close enough proximity to function as a single facility. In this case, it can be assumed there will be one administration and shared services throughout.

The following analysis compares current OCCC staffing and operating costs to a low-rise replacement facility and a multilevel replacement facility according to the housing unit configuration contained in the IA Space Program. It should be noted that without a specific site and detailed building designs, the numbers below are estimates that are likely to change as buildings become further defined.

5.1.1 Option 1—Low-Rise Replacement Facility

A low-rise jail functions on a single level and the secure perimeter is typically the building exterior. The most efficient low-rise jails are a single building which limits travel time between housing units and the number of times staff and visitors pass through a secure perimeter. The use of fencing is limited to enclosing vehicle sally ports and exterior recreation areas. There is no fence surrounding the entire building and there are no guard towers.

The following table estimates required security staffing for housing and rovers according to the IA Space Program and best practices described above.

DETENTION BEDS			SERGEANT POSTS (ACO IV)				OFFICERS (ACO III)				TOTAL FTEs
			POSTS			FTEs	POSTS			FTEs	
Module	Type	Capacity	Shift 1	Shift 2	Shift 3		Shift 1	Shift 2	Shift 3		
1	Special Needs	36	1.0	1.0	1.0	5.0	1.0	1.0	1.0	5.0	9.9
2	Max	36	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
3	Max	36	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
4	Step-Down	72	1.0	1.0	1.0	5.0	1.0	1.0	1.0	5.0	9.9
5	Acute	18	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
6	Acute	18	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
7	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
8	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
9	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
10	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
11	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
12	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
13	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
14	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
15	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
16	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
17	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
18	General	72	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
	Infirmary	10	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
	Rovers		0.0	0.0	0.0	0.0	6.0	8.0	6.0	33.0	33.0
	Shift Sgt		1.0	1.0	1.0	5.0					5.0
	Subtotal	1090	3.0	3.0	3.0	14.9	25.0	27.0	25.0	127.1	141.9
PRE-RELEASE BEDS											
19	Laumaka	96	1.0	1.0	1.0	5.0	1.0	2.0	2.0	8.3	13.2
20	P R	48	1.0	1.0	1.0	5.0	1.0	1.0	1.0	5.0	9.9
21	P R	48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	P R	48	0.0	0.0	0.0	0.0	0.0	1.0	1.0	3.3	3.3
23	P R	48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	P R	48	0.0	0.0	0.0	0.0	1.0	1.0	1.0	5.0	5.0
25	P R	48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	P R	48	0.0	0.0	0.0	0.0	0.0	1.0	1.0	3.3	3.3
	Subtotal	432	2.0	2.0	2.0	9.9	3.0	6.0	6.0	24.8	34.7
GRAND TOTAL		**1,522**	**5.0**	**5.0**	**5.0**	**24.8**	**28.0**	**33.0**	**31.0**	**151.8**	**176.6**

For the detention population, sergeants are assigned to three zones: each of the two high security unit clusters and the general population units. The number of sergeants for detention would be 14.9 as opposed to the current 49.5. Rovers have been doubled from existing staffing to provide additional support to housing units and account for the increase in population. The number of rovers changes from 16.5 FTEs to 33 FTEs.[20]

Since the location of the replacement facility may be at a separate location from the existing Laumaka facility, shift sergeants are provided at Laumaka and the new pre-release compound at the replacement facility. In this case the number of sergeants is the same as the current number for OCCC pre-release at 9.9 FTEs. However, if all pre-release beds are at a single location, the required number of sergeant FTEs would be 5.0.

20 Video surveillance will also provide additional support to housing units.

Translating the above positions into costs, shows the following:[21]

ESTIMATED COST OF LOW-RISE HOUSING UNIT AND ROVER SECURITY STAFFING			
TITLE	**COST PER FTE**	**FTEs**	**COST**
Sergeants	$95,154	24.8	$2,355,064
Officers	$81,336	151.8	$12,346,773
TOTAL		**176.6**	**$14,701,836**

Staffing Efficiency

The 176.6 uniformed staff working as housing unit and rover officers with a total of 1,522 beds produces a ratio of 8.6 beds per custody officer (1522/176.6=8.6), almost double the current housing unit efficiency of 4.5 noted earlier.[22] Finding a comparison on a national level is difficult due to differences in design, population mix, crowding, operating procedures and reporting of numbers. The Federal Bureau of Prisons reports its detention facility ratio of 6.5 to one correctional officer.[23] It does not account for the above factors, and it should be assumed that a new facility will be more efficient than the combination of existing facilities.

Cost Efficiency

The current cost for these positions at OCCC was previously noted as $18,863 annually per bed. The cost for these positions at a low-rise replacement facility of 1,522 beds is $9,660 per bed annually ($14.7 million ÷1,522= $9,660), which is roughly 50 percent more efficient.

Potential Savings

There is also the likelihood of needing fewer lieutenants since there will be fewer sergeants for them to supervise. At an annual cost of roughly $108,000 per lieutenant and the need for five positions to cover one post on a 24/7 basis, potential savings are close to a million dollars annually when lieutenants are reduced by one 24/7 post. The following table includes the cost of lieutenants when one 24/7 post has been eliminated. The lieutenant FTEs change from the current 14 to 9.

ESTIMATED SECURITY STAFFING COST OF LOW-RISE REPLACEMENT FOR HOUSING UNITS, ROVERS AND LIEUTENANTS			
TITLE	**COST PER FTE**	**FTEs**	**COST**
Lieutenants	$107,770	9	$969,926
Sergeants	$95,154	24.8	$2,355,064
Officers	$81,336	151.8	$12,346,773
TOTAL	**N/A**	**185.6**	**$15,671,762**

21 Sergeant costs would be about $500,000 less annually if pre-release units were at a single location.

22 The Project Development Report and Site Selection Study for OCCC, AHL and DLR Group, June 2009 also showed a doubling of the inmate to officer ratio.

23 Census of Jails: Population Changes, 1999-2013, Todd Minton and colleagues, U.S. Department of Justice, December 2015, NCJ 248627.

When comparing this sub-set of staffing to OCCC's current staffing, the low-rise replacement facility shows significant potential savings while staffing an additional 518 beds most of which are pre-release beds. The following table shows annual savings of $4.8 million or $143.3 million over a 30-year life cycle.[24]

COMPARISON OF CURRENT AND LOW-RISE HOUSING UNIT AND ROVER SECURITY STAFFING		
FACILITY	**PER YEAR**	**30 YEARS**
Current OCCC	$20,447,127	$613,413,824
Low-Rise	$15,671,762	$470,152,866
Difference	**-$4,775,365**	**-$143,260,958**

Total Staffing of a Low-rise Replacement Facility

Security Staffing: The revised security staffing changes the FY16 security FTEs from 415 to 363.8.

LOW-RISE SECURITY STAFFING	
JOB CLASS	**POSITIONS**
Adult Corrections Officer (ACO)VII (Chief of Security)	1
Secretary 1	1
OA III	2
ACO VI-Captain	6
ACO V- Lieutenant	9
ACO IV- Sergeant	33.4
ACO III- Officer	311.5
Total	**363.8**

The net savings are 51.2 FTEs (415 – 363.8 = 51.2).

COMPARISON OF SECURITY STAFFING FTEs	
Current OCCC (FY16)	415
Low-Rise Replacement	363.8
Difference	**51.2**

Total Staffing: When applying the staffing above to the total facility staffing, the FTEs change from 503 to 452. (503 – 51 = 452) A list of all positions is shown in Appendix C.

There are likely to be additional staffing efficiencies in a modern jail simply because it will have electronics that off-set staffing through enhanced surveillance, electronic records systems throughout the facility, video visiting and to some extent video court hearings. Additionally, services brought to the inmates will not only save on internal movement of inmates, it will save on officer posts that are currently needed in separate buildings at OCCC. However, quantifying those savings is not possible without a specific facility design. A specific facility design

[24] Life cycle costs/savings are expressed in 2016 dollars and do not account for inflation and other financial considerations. A 30-year life cycle is referenced in the NIC Jail Design Guide.

cannot be developed without a specific site. A conservative approach is to under-estimate savings rather than over-estimate them. It can be assumed that the increased population may off-set further staffing efficiencies.

5.1.2 Option 2—Multilevel Replacement Facility

The primary difference between a single level and multilevel jail is the need for elevators. Once elevators are added, additional staff are needed operate and observe them.[25] Elevators need to be operational 24/7. It is estimated there would be an additional officer in central control on shifts 2 and 3. (Day and swing shifts) Similarly, there would also need to be one additional officer on shift 1 (graveyard) and two additional officers on shifts 2 and 3 to accommodate vertical inmate movement. This is a total of seven posts. Using a shift relief factor of 1.65 (for covering weekends and personal time off), the addition of seven posts requires 11.6 FTEs (1.65 x 7 = 11.6)

STAFFING IMPACT OF ELEVATORS					
Officers (AO III)	Shift 1	Shift 2	Shift 3	Total Posts	FTE's
Central Control	0	1	1	2	3.3
Escort	1	2	2	5	8.3
				7	**11.6**

At a cost of $81,336 per officer the total annual cost in 2016 dollars is an additional $939,438 (11.6*$81,336 = $939,438). The annual amount multiplied over a 30-year life cycle of the building equals $28.2 million without accounting for inflation and other financial factors.

Total Staffing of a Multilevel Replacement Facility

Security Staffing: The addition of 11.6 FTEs shown above changes the security staffing to the following configuration.

MULTILEVEL SECURITY STAFFING	
JOB CLASS	**POSITIONS**
Adult Corrections Officer (ACO)VII	1
Secretary 1	1
OA III	2
ACO VI-Captain	6
ACO V- Lieutenant	9
ACO IV- Sergeant	33.4
ACO III- Officer	323.0
Total	**375.4**

Total Staffing: When applying this to the total facility staffing of the low-rise replacement facility, the FTEs change from 452 to 463.4. A list of all positions is shown in Appendix D.

[25] City of Seattle, Comparative Study of the Cost of Low and High-Rise Jails, Carter Goble Lee, August 2008.

6.0 TOTAL OPERATING COST COMPARISON

It is important to develop apples to apples comparisons when comparing current costs to future costs. In order to do so, per bed cost comparisons must be made rather than by average daily population. There are several reasons.

1. The average daily population within any facility varies from year to year and it is unknown for the replacement facility.
2. Over the life cycle of the building, the jail may be crowded some years and under-filled other years. Unless the jail has enough empty beds to close one or more housing units, there is a cost to operating the beds. Because of this, a lower ADP does not necessarily equal fewer staff.
3. Crowding creates a built-in economy of scale particularly if no staff positions are added to a housing unit. Comparing a crowded facility to an un-crowded facility would not be an even comparison.

Therefore, the comparison of current costs to replacement facility costs is based on beds in operation, not ADP.

6.1 Cost per Bed at OCCC

As mentioned in Section 3.1, the budget office reports an end of month average of 1,199 inmates for FY16 which equates to a daily cost per inmate of $153.68 ($67,255,489 total OCCC cost ÷ 1,199 inmates ÷ 365 days = $153.68).

In order to achieve apples to apples comparisons to the new facility, the current operating cost must be adjusted to account for crowding. OCCC's capacity is 1,004 beds. This means it was crowded by 195 inmates (1,199 – 1,004 = 195). As noted earlier, the non-staffing costs at OCCC represent 12.5 percent of the total cost. The following table removes the cost of crowding from the FY16 cost which provides an estimated per bed cost when the facility is at capacity.

FY16 OCCC COST PER BED WITHOUT CROWDING	
FY16 per Capita Cost	$56,077
Non-Staffing Percentage	12.5%
Non-Staffing Cost per Inmate	$7,010
Inmates Over Capacity	195
FY16 Cost of Crowding	$1,366,887
FY16 OCCC Operating Cost	$67,255,489
Cost without Crowding	$65,888,603
Capacity	1004
Annual per Bed Cost	**$65,626**
Daily per Bed Cost	**$179.80**

6.2 Future Operating costs

This section applies the potential savings in security staffing calculated previously to the adjusted operating cost at OCCC. As mentioned, there are likely to be additional savings once a site is selected and the specific facility floor plan is designed. To avoid over-stating savings, it is best to be conservative at this point in time.

6.2.1 Low-Rise Facility

ESTIMATED LOW-RISE OPERATING COSTS	
Adjusted FY16 OCCC Operating Cost	$65,888,603
Estimated Staff Savings of Replacement Facility	-$4,775,365
Estimated Low-Rise Operating Cost	$61,113,238
Beds at Replacement Facility	1522
Annual Cost per Bed	$40,153
Daily per Bed	$110.01

6.2.2 Comparison of Current to Future costs

The following table compares OCCC's current costs to the annual and daily costs shown in the table for low-rise facility operating costs. This is a 39 percent reduction.[26]

DIFFERENCE BETWEEN CURRENT OCCC AND LOW-RISE FACILITY	
Annual Cost per Bed	**Dollars**
Adjusted FY16 Annual per Bed at OCCC	$65,626
Estimated Low-Rise Annual Cost per Bed	$40,153
Change in Annual Cost per Bed	**-$25,473**
Daily Cost per Bed	**Dollars**
Adjusted FY16 Daily Cost per Bed at OCCC	$179.80
Estimated Low-Rise Daily Cost per Bed	$110.01
Change in Daily Cost per Bed	**-$69.79**

[26] The Project Development Report and Site Selection Study for OCCC, AHL and DLR Group, June 2009 showed similar results at a 35 percent reduction.

6.2.3 Multilevel Facility

The following table shows the staffing cost impact of adding elevators to the replacement facility. In addition to staffing, there would be some additional inspection and maintenance costs that cannot be quantified at this time.

ESTIMATED MULTILEVEL OPERATING COSTS	
Operating Cost of Low-Rise	$61,113,238
Staffing Impact of Multilevel	$939,428
Operating Cost of Multilevel	$62,052,666
Beds at Replacement Facility	1,522
Annual Cost per Bed	**$40,770**
Daily per Bed	**$111.70**

When comparing the cost of the current OCCC to a multilevel replacement facility, savings are $3.8 million annually or $115 million over 30 years.

COST DIFFERENCE BETWEEN CURRENT OCCC AND MULTILEVEL REPLACEMENT FACILITY	
Adjusted FY16 OCCC Operating Cost	$65,888,603
Operating Cost of Multilevel	$62,052,666
Annual Cost Difference	-$3,835,937
30-Year Life Cycle	-$115,078,107

As shown in the following table, the multilevel replacement facility has a small impact on the overall percentage of cost. However, depending on the selected site, there are likely to be additional financial impacts such as increased land, site development and parking costs.

DIFFERENCE BETWEEN LOW-RISE AND MULTILEVEL REPLACEMENT FACILITY		
Annual Cost per Bed	**Dollars**	**% Change**
Low-Rise	$40,153	N/A
Multilevel	$40,770	N/A
Change in Annual Cost per Bed	**$617**	**1.5%**
Daily Cost per Bed		
Low-Rise	$110.01	N/A
Multilevel	$111.70	N/A
Change in Daily Cost per Bed	**$1.69**	**1.5%**

7.0 CONCLUSION

OCCC is Hawaii's largest and oldest community correction center. It is staffing and cost inefficient compared to today's newly designed jails. A replacement facility, as described above, will increase safety of staff, inmates and the public while producing significant savings in operating costs. It is not possible to calculate the full savings until the location is determined and the building design is complete. However, since most of the operating costs are in security staffing, and most of the security staffing is related to the housing module configuration, savings of at least between $3.8 million and $4.8 million annually are very likely. This translates to between $115 million and $143 million over a 30-year facility life cycle.

Failing to replace OCCC will mean a lost opportunity to increase safety as well as take advantage of modern jail design and electronics that produce operational savings. It will also mean the continued maintenance of a facility that appears to be past its useful life cycle.

Appendix A: The Myth of Staff to Inmate Ratios[27]

[27] Staffing Analysis Workbook for Jails, National Institute of Corrections, 2nd Edition, Liebert and Miller, March 2003.

Using a staffing ratio to compare one facility with another or to determine a staffing level for a facility produces inaccurate results. Many factors differ and cannot be accurately compared:

- Is the number of inmates used for the calculation the actual number, or the rated capacity of the facility?
- Which positions go into the calculation—security only, or all positions?
- Are contractual employees considered?
- Are hours worked by part-time employees considered?
- Are hours worked by full-time staff as overtime considered?
- Are some staff (such as maintenance or nursing) supplied by other county agencies (such as public works or public health)?

In addition to these factors, the characteristics of each jail need to be considered before applying figures from one facility to another:

- Type of inmates housed (level of security, gender, age, etc.).
- Design capacity versus actual population.
- Activities and programs, such as work release, work programs, education.
- Facility design.
- Facility condition.
- Staff qualifications and experience.

Staffing is based on operational philosophy and facility design. The most efficient staffing is possible when a facility is designed based on an operational philosophy. A facility with a program-oriented philosophy will have counselors, program, and recreation staff, in addition to custody and security staff. A facility with a philosophy of "warehousing" inmates may have only custody and security staff. If a facility's design is inadequate for its philosophy, staff may be used to compensate for facility shortcomings. Many design and operational factors will affect staffing, including:

- Whether the facility is designed for direct supervision, indirect supervision, or intermittent supervision.
- The types and size of housing units (cells versus dormitories).
- Facility sightlines.
- The types of security control systems and security perimeter.
- Whether inmates are escorted through the corridors.
- Whether programs and services are centralized or decentralized.
- Whether the facility is single-story or high-rise.
- Whether acceptable backup is available.

If people say they can build a 250-bed facility and already know how many staff it will take to operate it, do not believe them. Until a facility is adapted to the unique population and practices of a locality, staffing cannot be accurately determined. Forget the words "staff-to-inmate ratios"; they only confuse the issues.

Appendix B: FY16 OCCC Staffing

APPROVED STAFFING FOR OCCC-2016			
	SECTION	**POSITION TITLE**	**POSITION**
1	N/A	Corrections Manager(CM) IV (Warden)	1
		Secretary III	1
		Subtotal	**2**
2	N/A	CM II (Deputy Warden)	1
		Secretary III	1
		Office Assistant (OA) IIII	1
	Inmate Records	Clerical Supv II	1
		OA IV	3
		Subtotal	**7**
3	Security	Adult Corrections Officer (ACO)VII (Chief of Security-Major)	1
		Secretary 1	1
		OA III	2
		ACO VI-Captain	6
		ACO V- Lieutenant	14
		ACO IV- Sergeant	68
		ACO III- Officer	323
		Subtotal	**415**
4	Office Services	Business Manager V	1
		Receptionist	1
		Accountant III	1
		Account Clerk IV	2
		Account Clerk III	3
		Purchasing Technician I	1
		Human Resources(HR) Specialist IV	1
		HR Assistant IV	1
		OA V	1
		OA IV	3
		Subtotal	**15**
5	Residency	Corrections Supervisor (CS) II	1
		Secretary 1	1
		OA III	2
		CS I	2
		Human Services Professional (HSP)/So	9
		Social Services Assistant (SSA) V	1
		Corrections Recreation (CR) Specialist IV	1
		CR Specialist III	1
		Subtotal	**18**
6	Community Base Section	CS II	1
		Secretary II	1
		OA III	3
		CS II	2
		HSP/SW IV	9
		SSA V	6
		Substance Abuse Specialist III	1
		Subtotal	**23**
7	Facility Operations	Institution Facilities Supt II	1
		OA III	1
		General Constr & Maint Supv II	1
		Bldg Maint (BM) Supv I	1
		BM Worker II	3
		BM Helper	2
		A/C Mechanic II	1
		Automotive Mechanic II	1
		Maint Mechanic II	1
		Groundskeeper II	1
		Janitor Supervisor (JS) II	1
		JS I	4
		Laundry Manager	1
		Laundry Worker II	2
		Property & Services Supv	1
		Storekeeper I	1
		Subtotal	**23**
		GRAND TOTAL	**503**

Appendix C: Low-rise Replacement Facility Staffing

LOW-RISE REPLACEMENT FACILITY STAFFING			
	SECTION	POSITION TITLE	POSITIONS
1	N/A	Corrections Manager(CM) IV (Warden	1
		Secretary III	1
		Subtotal	**2**
2	N/A	CM II (Deputy Warden)	1
		Secretary III	1
		Office Assistant (OA) IIII	1
	Inmate Records	Clerical Supv II	1
		OA IV	3
		Subtotal	**7**
3	Security	Adult Corrections Officer (ACO)VII	1
		Secretary 1	1
		OA III	2
		ACO VI-Captain	6
		ACO V- Lieutenant	9
		ACO IV- Sergeant	33
		ACO III- Officer	311
		Subtotal	**364**
4	Office Services	Business Manager V	1
		Receptionist	1
		Accountant III	1
		Account Clerk IV	2
		Account Clerk III	3
		Purchasing Technician I	1
		Human Resources(HR) Specialist IV	1
		HR Assistant IV	1
		OA V	1
		OA IV	3
		Subtotal	**15**
5	Residency	Corrections Supervisor (CS) II	1
		Secretary 1	1
		OA III	2
		CS I	2
		Human Services Professional (HSP)	9
		Social Services Assistant (SSA) V	1
		Corrections Recreation (CR) Specialis	1
		CR Specialist III	1
		Subtotal	**18**
6	Community Base Section	CS II	1
		Secretary II	1
		OA III	3
		CS II	2
		HSP/SW IV	9
		SSA V	6
		Substance Abuse Specialist III	1
		Subtotal	**23**
7	Facility Operations	Institution Facilities Supt II	1
		OA III	1
		General Constr & Maint Supv II	1
		Bldg Maint (BM) Supv I	1
		BM Worker II	3
		BM Helper	2
		A/C Mechanic II	1
		Automotive Mechanic II	1
		Maint Mechanic II	1
		Groundskeeper II	1
		Janitor Supervisor (JS) II	1
		JS I	4
		Laundry Manager	1
		Laundry Worker II	2
		Property & Services Supv	1
		Storekeeper I	1
		Subtotal	**23**
		GRAND TOTAL	**452**

Appendix D: Multilevel Replacement Facility Staffing

MULTILEVEL REPLACEMENT FACILITY STAFFING			
	SECTION	**POSITION TITLE**	**POSITIONS**
1	N/A	Corrections Manager(CM) IV (Warden	1
		Secretary III	1
		Subtotal	**2**
2	N/A	CM II (Deputy Warden)	1
		Secretary III	1
		Office Assistant (OA) IIII	1
	Inmate Records	Clerical Supv II	1
		OA IV	3
		Subtotal	**7**
3	Security	Adult Corrections Officer (ACO)VII	1
		Secretary 1	1
		OA III	2
		ACO VI-Captain	6
		ACO V- Lieutenant	9
		ACO IV- Sergeant	33.4
		ACO III- Officer	323.0
		Subtotal	**375.4**
4	Office Services	Business Manager V	1
		Receptionist	1
		Accountant III	1
		Account Clerk IV	2
		Account Clerk III	3
		Purchasing Technician I	1
		Human Resources(HR) Specialist IV	1
		HR Assistant IV	1
		OA V	1
		OA IV	3
		Subtotal	**15**
5	Residency	Corrections Supervisor (CS) II	1
		Secretary 1	1
		OA III	2
		CS I	2
		Human Services Professional (HSP)	9
		Social Services Assistant (SSA) V	1
		Corrections Recreation (CR) Specialis	1
		CR Specialist III	1
		Subtotal	**18**
6	Community Base Section	CS II	1
		Secretary II	1
		OA III	3
		CS II	2
		HSP/SW IV	9
		SSA V	6
		Substance Abuse Specialist III	1
		Subtotal	**23**
7	Facility Operations	Institution Facilities Supt II	1
		OA III	1
		General Constr & Maint Supv II	1
		Bldg Maint (BM) Supv I	1
		BM Worker II	3
		BM Helper	2
		A/C Mechanic II	1
		Automotive Mechanic II	1
		Maint Mechanic II	1
		Groundskeeper II	1
		Janitor Supervisor (JS) II	1
		JS I	4
		Laundry Manager	1
		Laundry Worker II	2
		Property & Services Supv	1
		Storekeeper I	1
		Subtotal	**23**
		GRAND TOTAL	**463.4**

Appendix T: Traffic Impact Report

Oahu Community Correctional Center

October 27, 2017

Revised May 30, 2018

Prepared for:
State of Hawaii
Department of Accounting and General Services
Department of Public Safety

Prepared by:

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the proposed relocation of the existing Oahu Community Correctional Center (hereinafter referred to as "OCCC") in Kalihi on the island of Oahu. Four alternative sites are currently being considered as potential replacement locations for the new correctional facility. This study includes an assessment of each of the four alternative sites under consideration.

1.2 Scope of Study

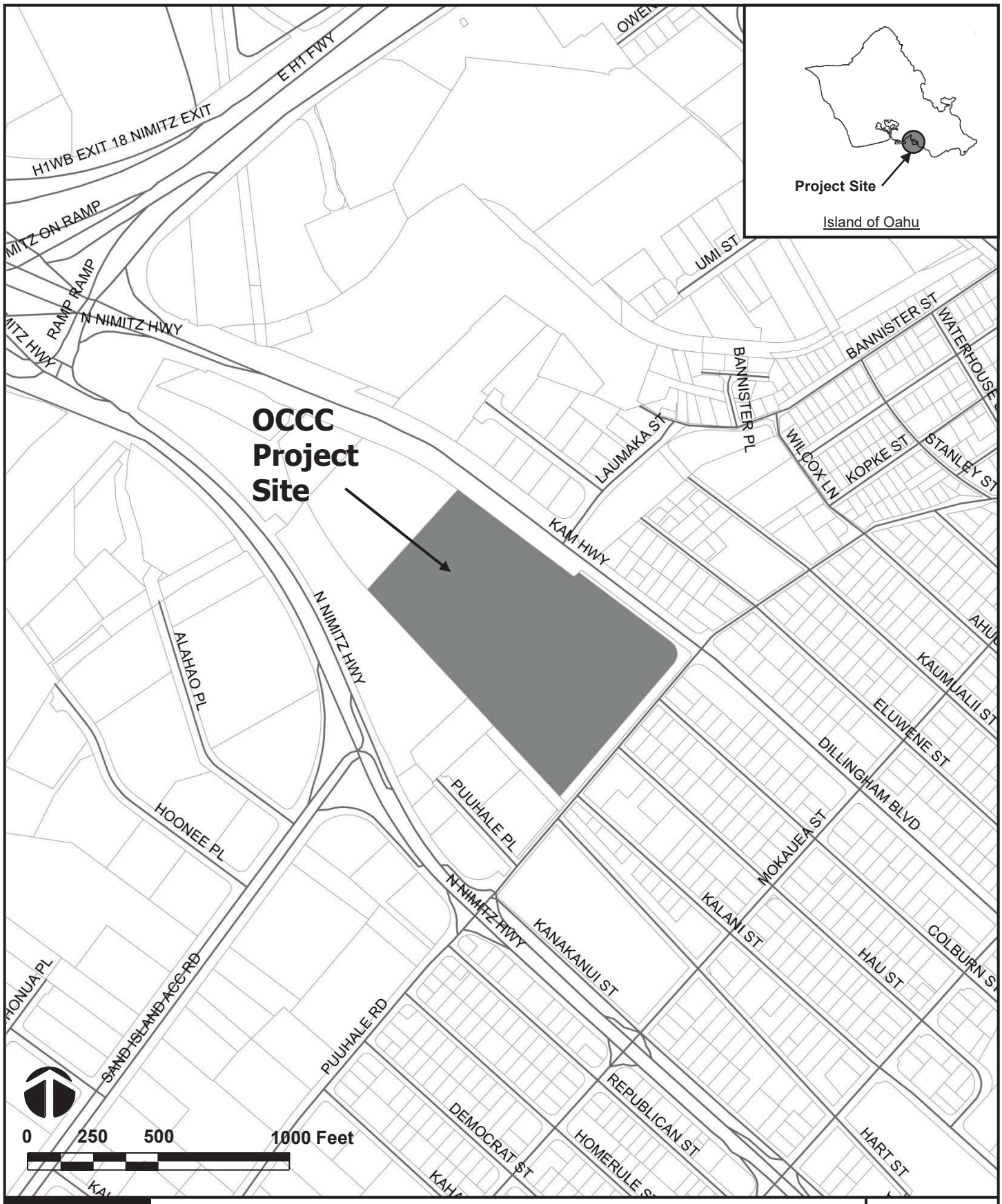
This report presents the findings and conclusions of the traffic study, the scope of which includes:

1. Description of the proposed project.
2. Evaluation of existing roadway and traffic operations in the vicinity.
3. Analysis of future roadway and traffic conditions without the proposed project.
4. Analysis and development of trip generation characteristics for the proposed project.
5. Superimposing site-generated traffic over future traffic conditions.
6. The identification and analysis of traffic impacts resulting from the proposed project.
7. Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

2.0 PROJECT DESCRIPTION

2.1 Location

The existing OCCC facility is located adjacent to Kamehameha Highway in Kalihi and is bounded by Kamehameha Highway to the north, Puuhale Road to the east, and industrial uses to the south and west (see Figure 1). The existing project site is further identified as Tax Map Keys (TMKs): 1-2-013: por. 002. The four alternative site locations under consideration include the existing OCCC facility; the Mililani Technology Park (hereinafter referred to as "MTP") in Mililani; the Halawa Correctional Facility (hereinafter referred to as "HCF"); and the Animal Quarantine Station both located in Aiea. The project site at the MTP location is adjacent to Kahelu Avenue in Mililani and is bounded by Kahelu Avenue to the north with industrial uses to the west (see Figure 2). This project site is further identified as Tax Map



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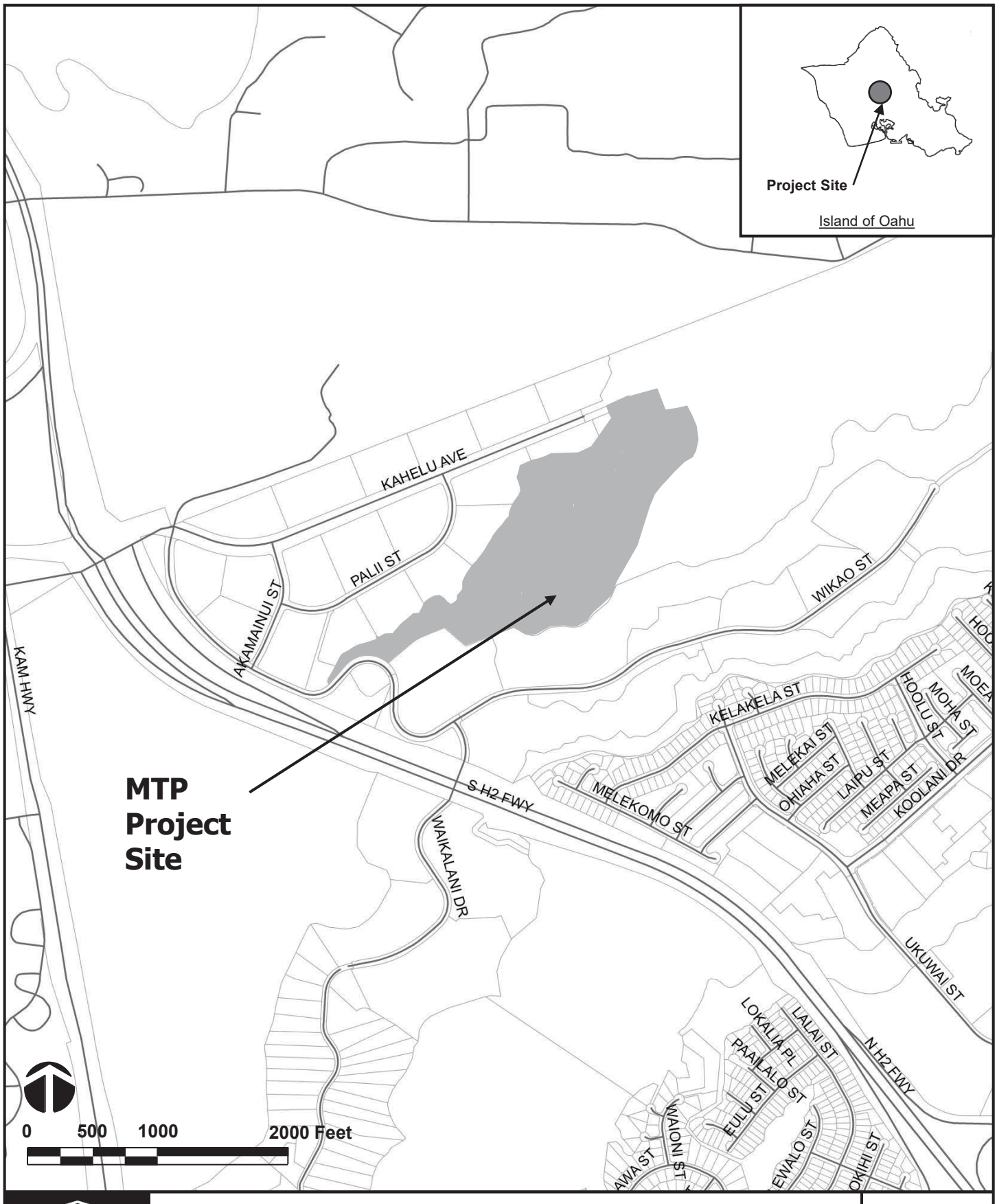
LOCATION MAP AND VICINITY MAP

FIGURE 1



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LOCATION MAP AND VICINITY MAP

FIGURE 2

Keys (TMKs): 9-5-046: 042. The project sites at the HCF and Animal Quarantine Station are both adjacent to Halawa Valley Street in Aiea (see Figures 3 and 4). The proposed site near HCF is expected to be located east of the existing prison and is identified as Tax Map Keys (TMKs): 9-9-010: por. 030, while the proposed site near the Animal Quarantine Station is bounded by Halawa Valley Street to the north, the Interstate H-3 Freeway to the west, and industrial uses to the south and east. That project site is further identified as Tax Map Keys (TMKs): 9-9-010: por. 006, 046, 057, and 058. In addition, it should be noted that a portion of inmates from the existing OCCC facility are expected to be transferred to the Women's Community Correctional Center (hereinafter referred to as "WCCC") regardless of which alternative site is selected. The existing WCCC facility is located adjacent to Kalanianaole Highway in Kailua and is bounded by Kalanianaole Highway to the south and residential uses to the west (see Figure 5). This project site is further identified as Tax Map Keys (TMKs): 4-2-003: 004.

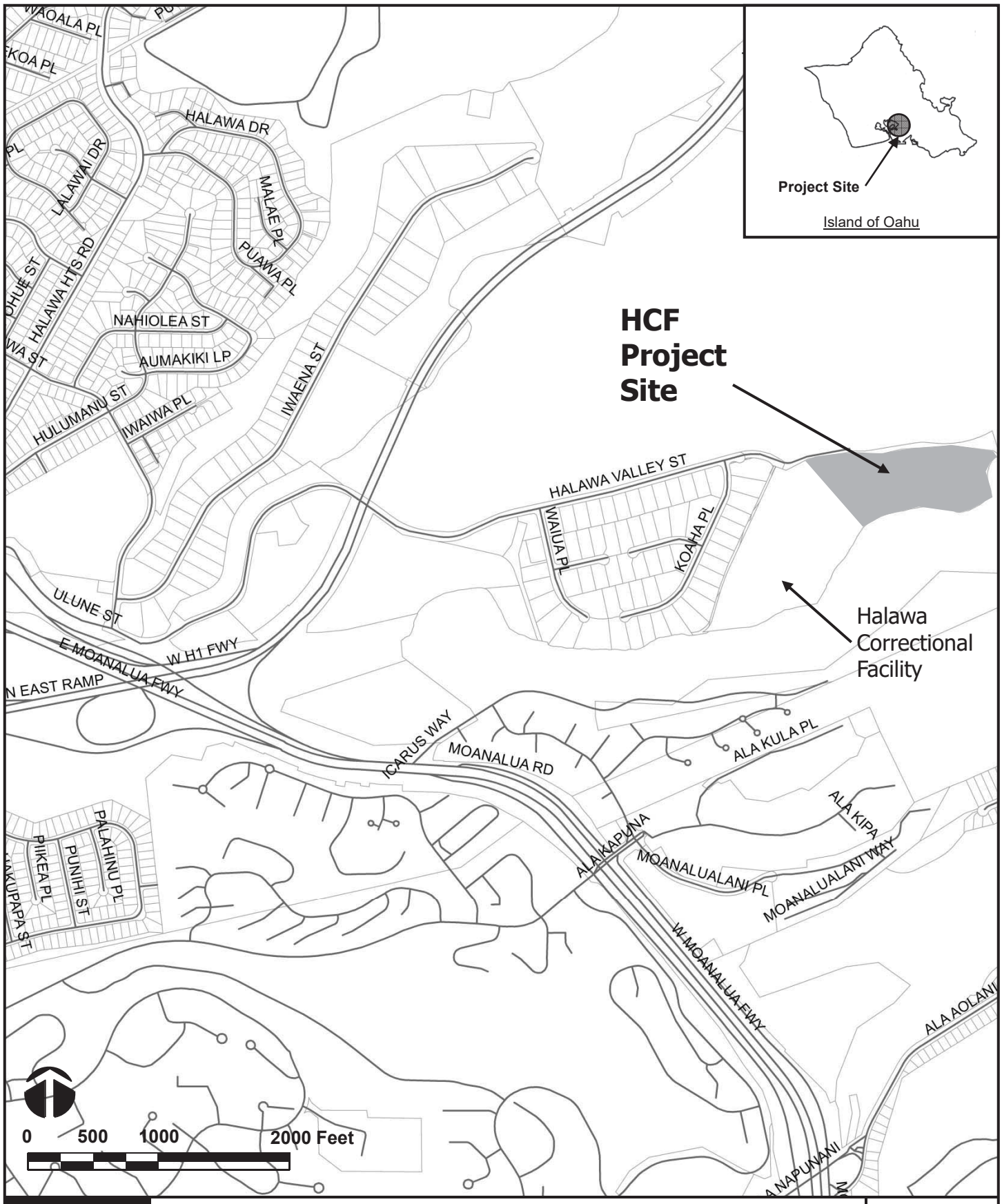
2.2 Project Characteristics

The existing Oahu Community Correctional Center is currently located on a 16-acre site in Kalihi and serves as the largest jail facility for pre-trial detainees in the State of Hawaii with an existing population of approximately 1,137 inmates. However, recent assessments of the facility have indicated that the OCCC facility is significantly overcrowded and functioning beyond its capacity. To adequately serve the facility's high demand and meet projected future needs, the Department of Public Safety (PSD) is currently considering the following alternatives:

- Redevelopment of the existing OCCC facility ("Alternative 1")

  This alternative entails the replacement of the existing OCCC facility and the construction of a new facility. Under Alternative 1, the existing square footage of the facility is expected to double and provide accommodation for approximately 1,480 inmates. Vehicular access to the project site is expected to continue to be provided via an existing driveway off Kamehameha Highway.
- Relocation to MTP site ("Alternative 2")

  Alternative 2 entails the construction of a new facility at the Mililani Tech Park in Mililani, Oahu. The new facility is expected to provide accommodations for approximately 1,380 inmates and would provide similar functions as the existing OCCC. Under this alternative, vehicular access is expected to be provided via new driveways off Kahelu Avenue.



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LOCATION MAP AND VICINITY MAP

FIGURE 3

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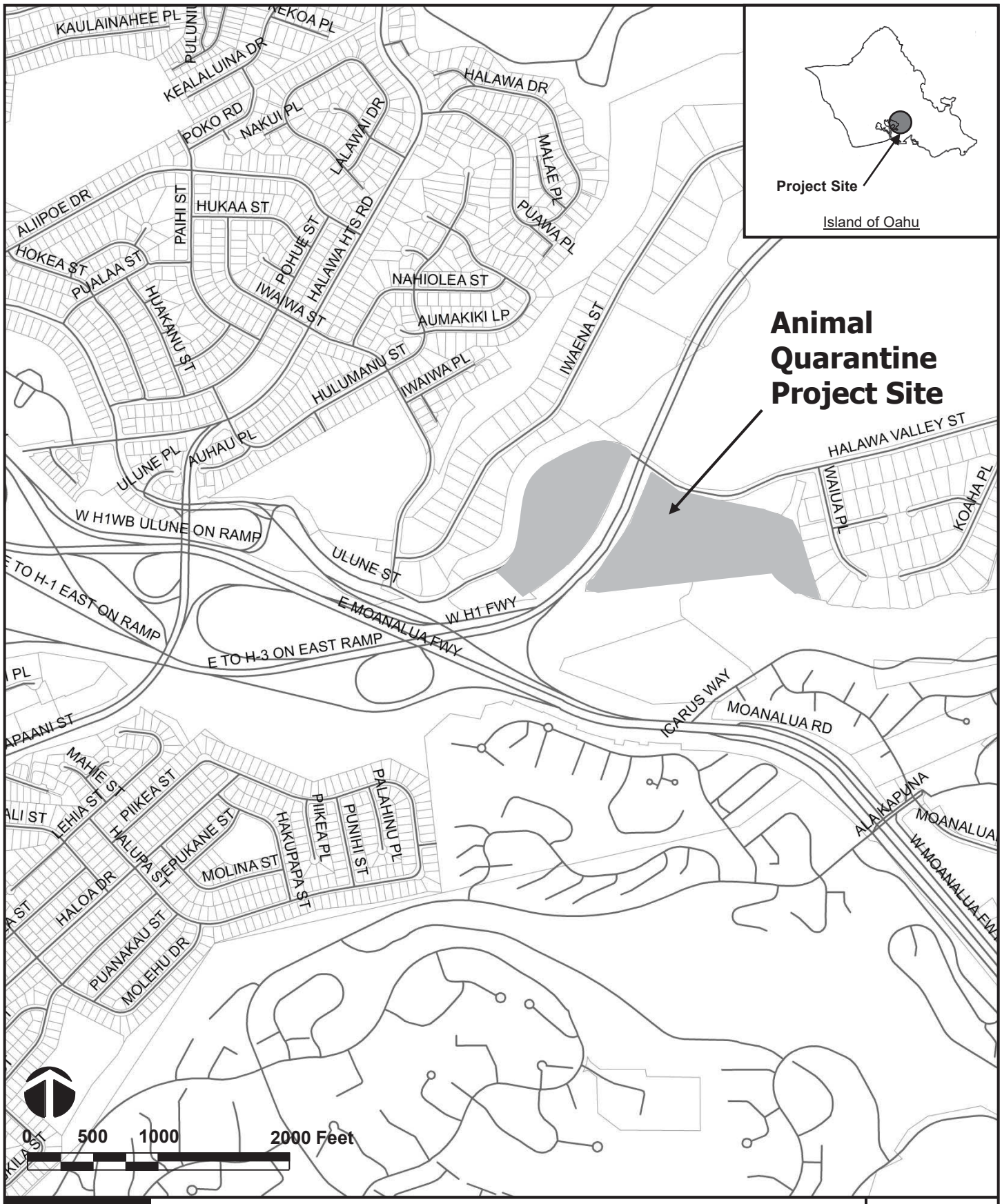

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LOCATION MAP AND VICINITY MAP

FIGURE 4

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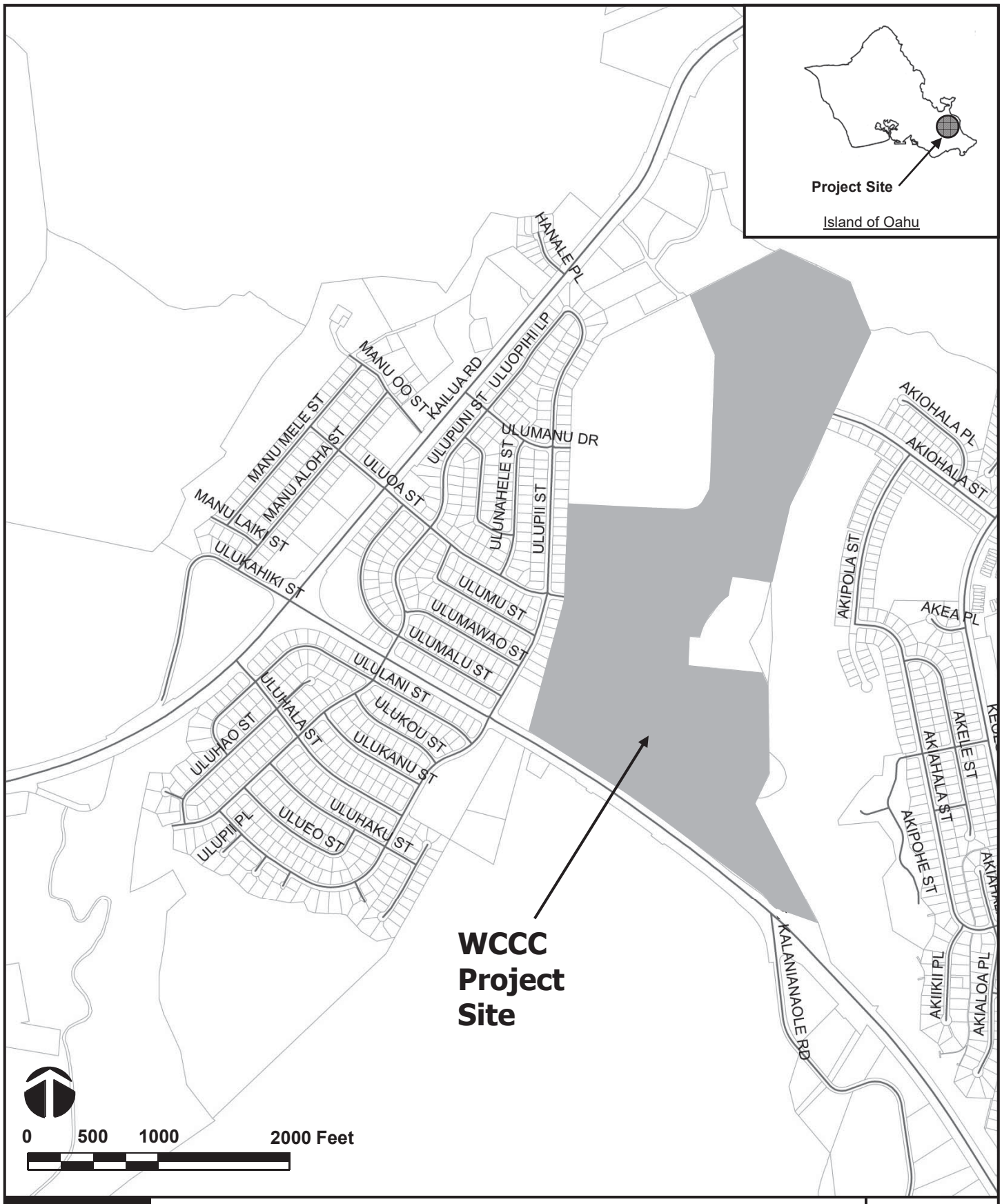

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LOCATION MAP AND VICINITY MAP

FIGURE 5

- Relocation to HCF site ("Alternative 3")

  Alternative 3 entails the addition of a new OCCC facility adjacent to the existing Halawa Correctional Facility which already includes a medium security prison. Similar to Alternative 2, the proposed replacement facility at HCF is also expected to provide accommodations for approximately 1,380 inmates and maintain similar functions and services provided at the existing OCCC facility in Kalihi. Vehicular access is expected to be provided via an existing driveway off Halawa Valley Street.

- Relocation to Animal Quarantine Station site ("Alternative 4")

  Alternative 4 entails the removal of the existing Animal Quarantine Station and development of a new OCCC on the portion of the property located east of the Interstate H-3 Freeway and development of a new Animal Quarantine Station west of the freeway. The new OCCC facility is expected to house approximately 1, 380 inmates. Similar to Alternatives 2 and 3, this location is also expected to provide the same services and functions offered at the existing OCCC location in Kalihi. Vehicular access is expected to be provided via new driveways off Halawa Valley Street.

In conjunction with the proposed project, all female inmates currently housed at the existing OCCC are to be relocated to the WCCC facility regardless of which alternative site is selected. WCCC will also be expanded to accommodate the addition of approximately 281 inmates to its existing inmate population. Access to the facility will continue to be provided via existing driveways off Kalanianaole Highway. The new expansion of WCCC and the replacement or reloaction of the existing OCCC facility are expected to be complete and occupied by the Year 2023 under all alternative scenarios. Figures 6 through 10 show the proposed project site plans for each alternative under consideration.

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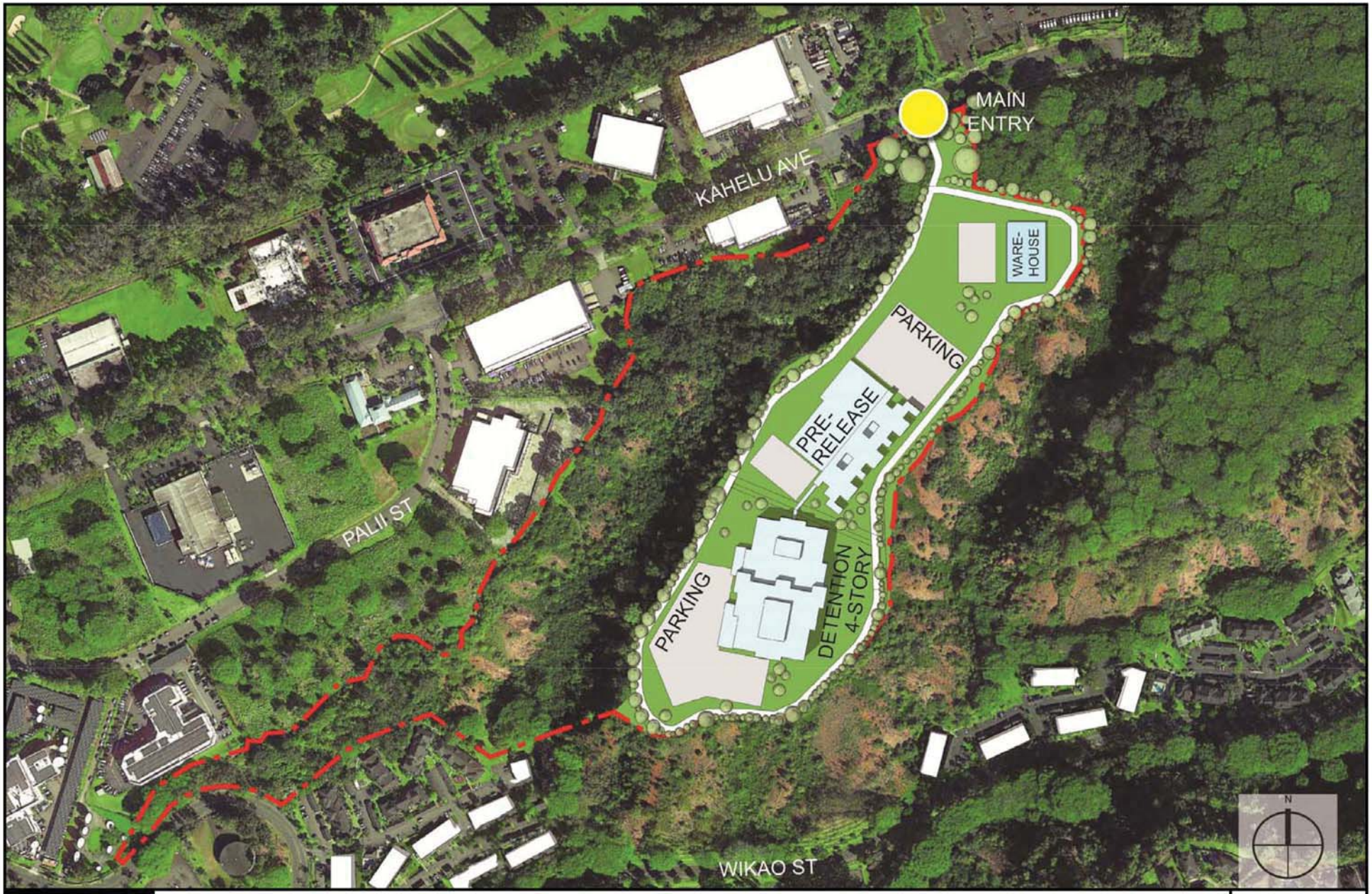
PROPOSED SITE PLAN (ALTERNATIVE 1)

FIGURE 6



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PROPOSED SITE PLAN (ALTERNATIVE 2)

FIGURE
7

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PROPOSED SITE PLAN (ALTERNATIVE 3)

FIGURE
8

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PROPOSED SITE PLAN (ALTERNATIVE 4)

FIGURE
9

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WCCC PROPOSED SITE PLAN

FIGURE 10

3.0 EXISTING TRAFFIC CONDITIONS

3.1 General

As previously mentioned, there are 4 alternatives under consideration for the replacement or relocation of the existing OCCC facility. Some of the study areas may overlap slightly; as such, the following section includes a description of all the study intersections.

3.1.1 Field Investigation

Field investigations were conducted on April 2017 and consisted of manual turning movement count surveys during the morning commuter peak hours between 6:00 AM and 9:00 AM, and the afternoon commuter peak hours between 3:00 PM and 6:00 PM.

For the Alternative 1, the field investigations were conducted at the following intersections:

- N. Nimitz Highway and Puuhale Road
- Kamehameha Highway, Dillingham Boulevard, and Puuhale Road
- Kamehameha Highway, Laumaka Street, and the OCCC driveway

For Alternative 2, field investigations were conducted at the following intersections:

- Kamehameha Highway and Leilehua Road
- Leilehua Road and the on-ramp to the Interstate H-2 Freeway
- Leilehua Road and the off-ramp from the Interstate H-2 Freeway
- Kahelu Avenue and Akamainui Street

As discussed previously, Alternatives 3 and 4 are both located in the vicinity of Halawa Valley Street. As such, field investigations were conducted at the following:

- Ulune Street and Halawa Valley Street
- Halawa Valley Street and Iwaiwa Street
- Halawa Valley Street and Waiua Place
- Halawa Valley Street and Koaha Place

It should be noted that although both Alternatives 3 and 4 are located along Halawa Valley Street, Alternative 3 is located east of Alternative 4. As such, for the purpose of analysis, the latter two intersections were included in the Alternative 3 scenario to account for the site-generated trips expected to travel to/from that proposed project site, but were not included in the Alternative 4 scenario.

In addition, regardless of which alternative is selected, a portion of the inmates currently residing at the OCCC will be relocated to the WCCC. As such, field investigations were also conducted at the following intersections:

- Kalanianaole Highway and Ulupii Street
- Kalanianaole Highway and the driveways for the WCCC facility and Olomana School

Appendix A includes the existing traffic count data.

3.1.2 Capacity Analysis Methodology

The highway capacity analyses performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2000, and the "Synchro" software, developed by Trafficware. The analysis is based on the concept of Level of Service (LOS) to identify the traffic impacts associated with traffic demands during the peak periods of traffic.

LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions.

"Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity. The LOS definitions are included in Appendix A.

3.2 Alternative 1

3.2.1 Area Roadway System

In the vicinity of the proposed Alternative 1 project site, Nimitz Highway is a predominantly six lane, two-way roadway that serves as a major east-west corridor through the downtown Honolulu area. Contraflow operations are implemented along the roadway to provide an additional eastbound lane during the morning peak period. Southeast of the project site, Nimitz Highway intersects Puuhale Road. At this signalized intersection, both approaches of Nimitz Highway have an exclusive left-turn lane, two through lanes, and a shared through and right-turn lane. During the morning contraflow operations, the eastbound approach Nimitz Highway has an exclusive left-turn lane, three through lanes, and a shared through and right-turn lane while the westbound approach has one through lane and a shared through and right-turn lane. Puuhale Road originates at North King Street as a one-lane, one-way (southbound) roadway which transitions to a three-lane, two-way roadway south of the intersection with

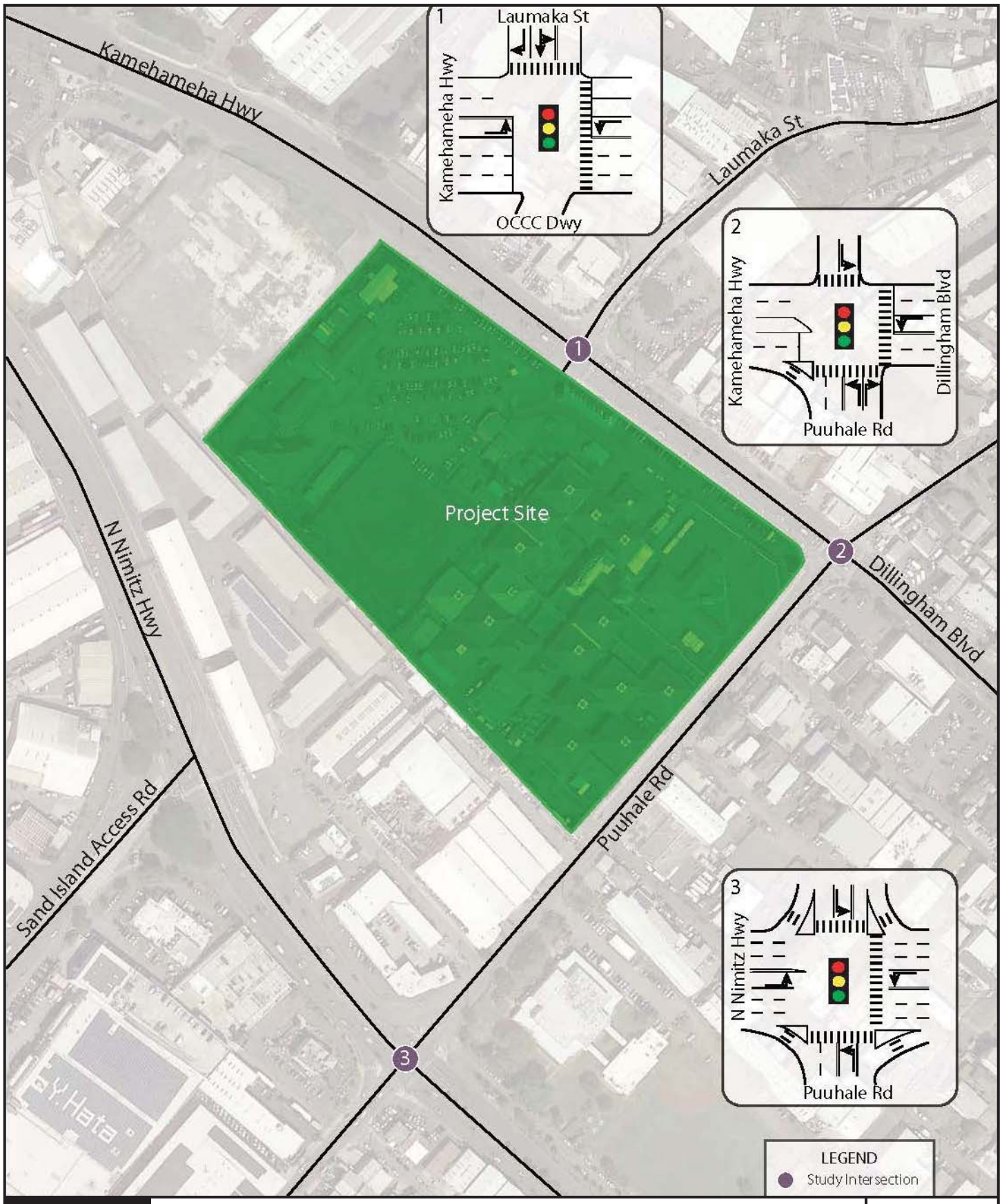
Kamehameha Highway and Dillingham Boulevard. At the intersection with Nimitz Highway, both approaches of Puuhale Road have an exclusive left-turn lane and a shared through and right-turn lane.

North of the intersection with Nimitz Highway, Puuhale Road intersects Kamehameha Highway and Dillingham Boulevard. At this signalized intersection, the northbound approach of Puuhale Road has exclusive lanes for left-turn and right-turn traffic movements while the southbound approach has an exclusive left-turn lane and a shared through and right-turn lane. Kamehameha Highway is a predominantly five-lane, two-way roadway which transitions to a four-lane, two-way roadway referred to as Dillingham Boulevard east of Puuhale Road. At the intersection with Puuhale Road, the eastbound approach of Kamehameha Highway has two through lanes and an exclusive right-turn lane while the westbound approach of Dillingham Boulevard has an exclusive left-turn lane and two through lanes.

West of the intersection with Puuhale Road, Kamehameha Highway intersects Laumaka Street. At this signalized intersection, the eastbound approach of the highway has an exclusive left-turn lane, two through lanes, and a shared through and right-turn lane while the westbound approach has an exclusive left-turn lane, one through lane, and a shared through and right-turn lane. Laumaka Street is a two-lane, two-way roadway generally oriented in the north-south direction between Bannister Street and Kamehameha Highway. At the intersection with Kamehameha Highway the southbound approach has a shared left-turn and through lane with an exclusive right-turn lane. The northbound approach is comprised of a driveway for the existing OCCC facility that has one lane which serves all traffic movements

3.2.2 Existing Peak Hour Traffic

Figures 11 and 12 show the existing lane use and peak hour traffic volumes. The morning peak hour of traffic in the vicinity of Alternative 1 generally occurs between 7:00 AM and 8:00 AM while the afternoon peak hour of traffic generally occurs between the hours of 4:00 PM and 5:00 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for each intersection may differ slightly. The analysis is based on these absolute commuter peak hour time periods to identify the traffic impacts resulting from the proposed project.



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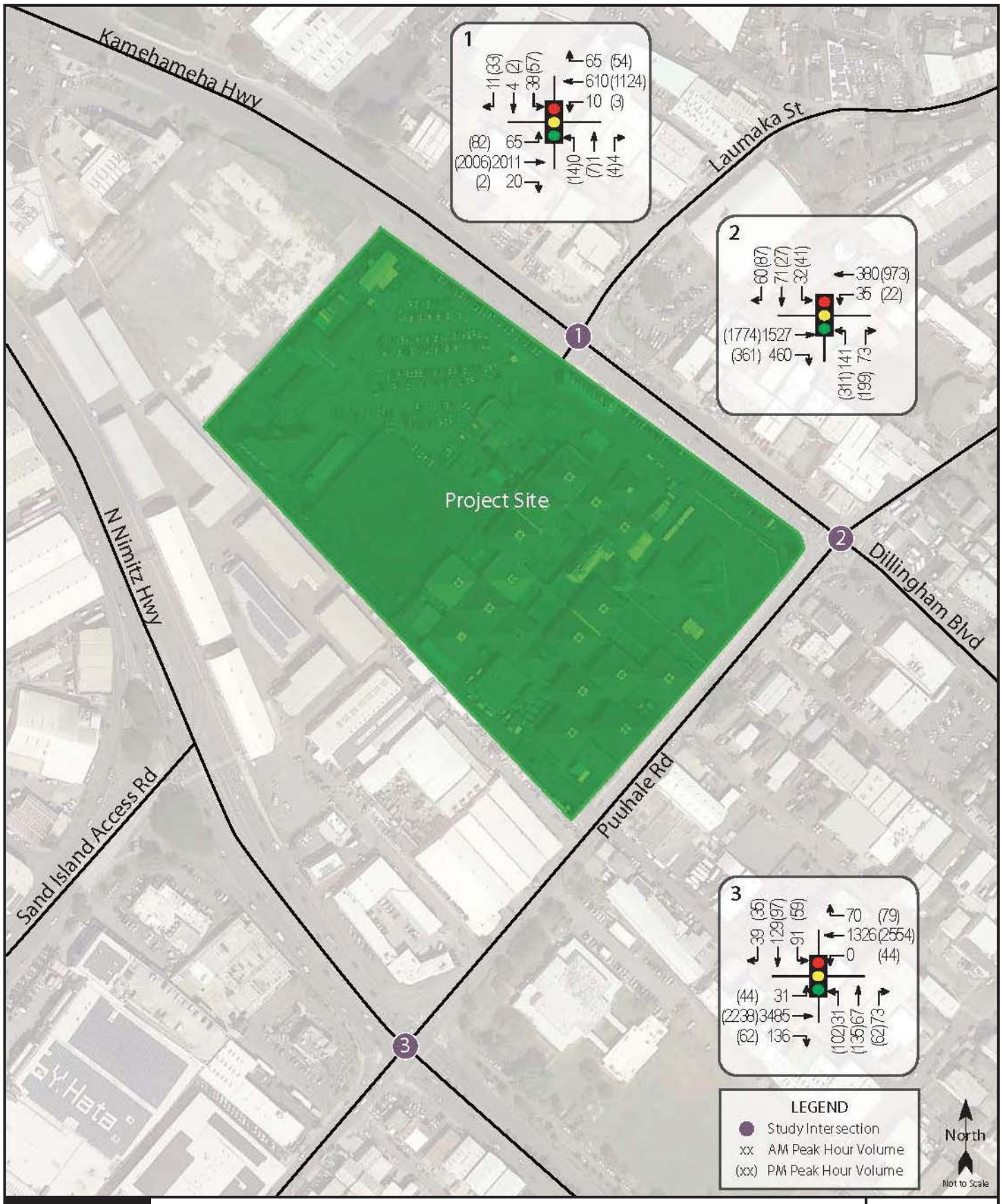
EXISTING LANE CONFIGURATIONS

FIGURE 11



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EXISTING PEAK HOURS OF TRAFFIC

FIGURE 12

3.2.3 Traffic Volumes and Conditions

3.2.3.1 Nimitz Highway and Puuhale Road

At the intersection with Puuhale Road, N. Nimitz Highway carries 3,652 vehicles eastbound and 1,396 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is lower with Nimitz Highway carrying 2,344 vehicles eastbound and 2,677 vehicles westbound. The eastbound approach of Nimitz Highway operates at LOS "B" during both peak periods, while the westbound approach operates at LOS "B" and LOS "C" during the AM and PM peak periods, respectively.

Puuhale Road carries 171 vehicles northbound and 259 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with Puuhale Road carrying 299 vehicles northbound and 191 vehicles southbound. The northbound approach of Puuhale Road operates at LOS "E" and LOS "F" during the AM and PM peak periods, respectively, while the southbound approach operates at LOS "F" during both peak periods. It should be noted that the low levels of service on the Puuhale Road approaches are primarily due to the high traffic demands resulting in long traffic signal cycle lengths at this intersection during the peak periods

3.2.3.2 Kamehameha Highway, Dillingham Boulevard, and Puuhale Road

At the intersection with Puuhale Road, Kamehameha Highway carries 1,987 vehicles eastbound while Dillingham Boulevard carries 415 vehicles westbound during the AM peak period. During the PM peak period, traffic volumes are higher with Kamehameha Highway and Dillingham Boulevard carrying 2,135 vehicles eastbound and 995 vehicles westbound, respectively. The eastbound approach of Kamehameha Highway operates at LOS "A" and LOS "C" during the AM and PM peak periods, respectively, while the westbound approach operates at LOS "A" and LOS "B" during the AM and PM peak periods, respectively.

Puuhale Road carries 214 vehicles northbound and 163 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with Puuhale Road carrying 510 vehicles northbound and 155 vehicles southbound. The northbound approach operates at LOS "D" during both peak periods while the southbound approach operates at LOS "C" during both peak periods.

3.2.3.3 Kamehameha Highway, Laumaka Street, and OCCC Driveway

At the intersection with Laumaka Street, Kamehameha Highway carries 2,096 vehicles eastbound and 685 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with Kamehameha Highway carrying 2,090 vehicles eastbound and 1,181 vehicles westbound. The eastbound approach of Kamehameha Highway operates at LOS "A" and LOS

"C" during the AM and PM peak periods, respectively, while the westbound approaches operates at LOS "A" and LOS "B" during the AM and PM peak periods, respectively.

Laumaka Street carries 53 vehicles southbound during the AM peak period and 92 vehicles during the PM peak period. This approach operates at LOS "D" during both peak periods. The northbound approach of the intersection is comprised of a driveway for the adjacent OCCC facility which carries a minimal volume of traffic during the AM and PM peak periods. 5 vehicles were observed on the approach during the AM peak period and 25 vehicles were observed on the approach during the PM peak period.

3.3 Alternative 2

3.3.1 Area Roadway System

In the vicinity of the proposed Alternative 2 project site, Kamehameha Highway is a predominantly four-lane, two-way roadway generally oriented in the north-south direction. West of the project site, Kamehameha Highway intersects Leilehua Road. At this signalized intersection, the northbound approach of Kamehameha Highway has two through lanes and an exclusive right-turn lane, while the southbound approach has an exclusive left-turn lane and two through lanes. Leilehua Road is a predominantly three-lane, two-way roadway which transitions to a four-lane, two-way roadway referred to as Kahelu Avenue east of the intersection with Wikao Street. At the intersection with Kamehameha Highway, the westbound approach of Leilehua Road has exclusive lanes for left-turn and right-turn traffic movements.

East of the intersection with Kamehameha Highway, Leilehua Road intersects the on-ramp to the Interstate H-2 (southbound) Freeway. At this unsignalized intersection, the eastbound approach of Leilehua Road has a shared through and right-turn lane while the westbound approach has an exclusive left-turn lane and one through lane. The south leg of the intersection is comprised of the on-ramp to the Interstate H-2 Freeway which has one (southbound) departure lane.

East of the intersection with the Interstate H-2 Freeway on-ramp, Leilehua Road intersects the off-ramp from the Interstate H-2 (northbound) Freeway. At this unsignalized intersection, the eastbound approach of Leilehua Road has one through lane while the westbound approach has two through lanes. The northbound approach of that intersection is comprised of the Interstate H-2 Freeway off-ramp which has exclusive lanes for left-turn and right-turn traffic movements.

East of the intersection with the Interstate H-2 Freeway off-ramp, Kahelu Avenue intersects Akamainui Street. At this unsignalized intersection, the eastbound approach of Kahelu Avenue has one

through lane and a shared through and right-turn lane while the westbound approach has an exclusive left-turn lane, one through lane, and a shared through and right-turn lane. Akamainui Street is a two-lane, two-way roadway generally oriented in the north-south direction between Kahelu Avenue and Wikao Street. At the intersection with Kahelu Avenue, the northbound approach of Akamainui Street has exclusive lanes for left-turn and right-turn traffic movements. In addition, a refuge lane is provided within the median along Kahelu Avenue to assist vehicles turning left from Akamainui Street. The southbound approach of the intersection is comprised of a driveway for an adjacent commercial property which has one lane that serves primarily right-turn traffic movements.

3.3.2 Existing Peak Hour Traffic

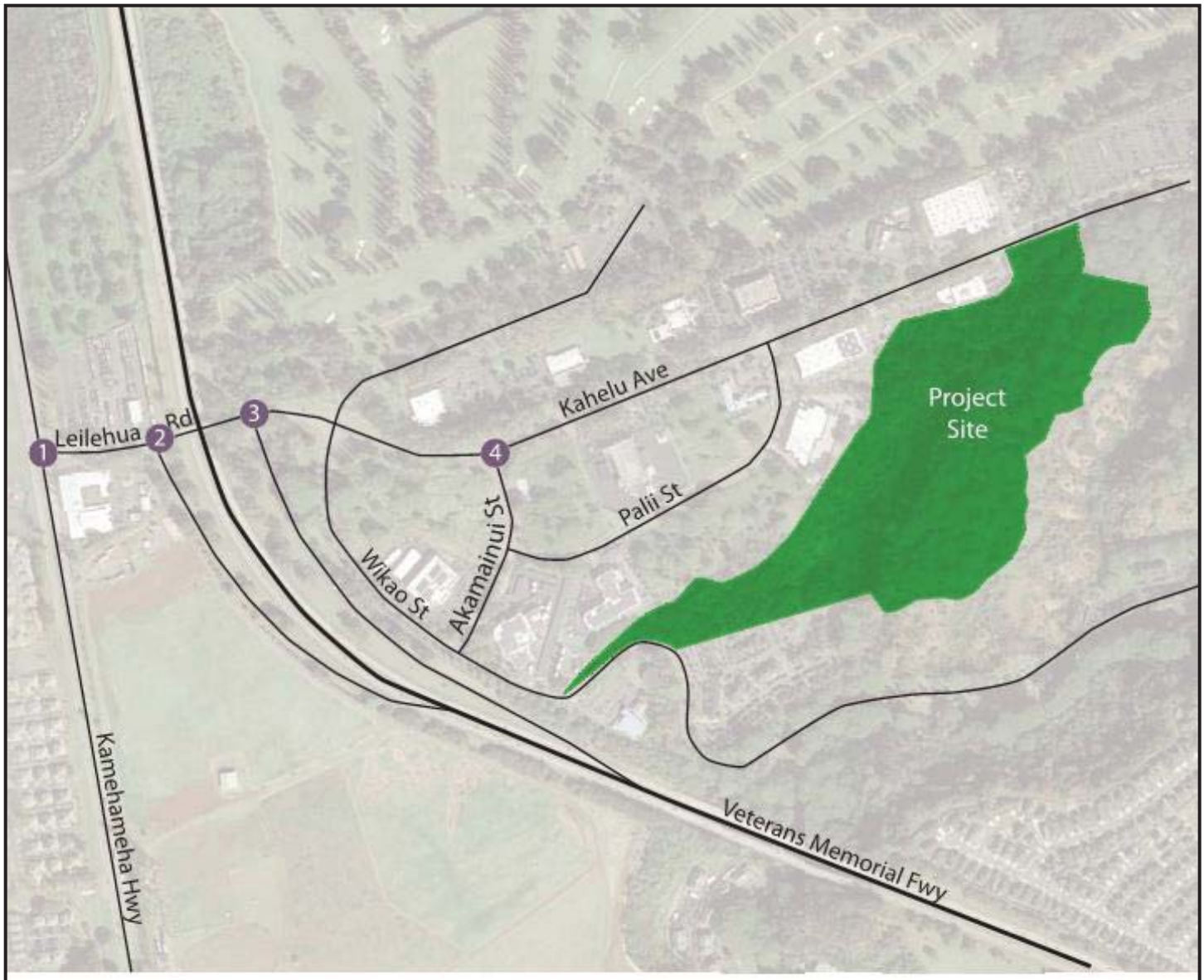
Figures 13 and 14 show the existing lane use and peak hour traffic volumes in the vicinity of the Alternative 2 site. The morning peak hour of traffic generally occurs between 7:15 AM and 8:15 AM while the afternoon peak hour of traffic generally occurs between the hours of 4:15 PM and 5:15 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for each intersection may differ slightly. The analysis is based on these absolute commuter peak hour time periods to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix B.

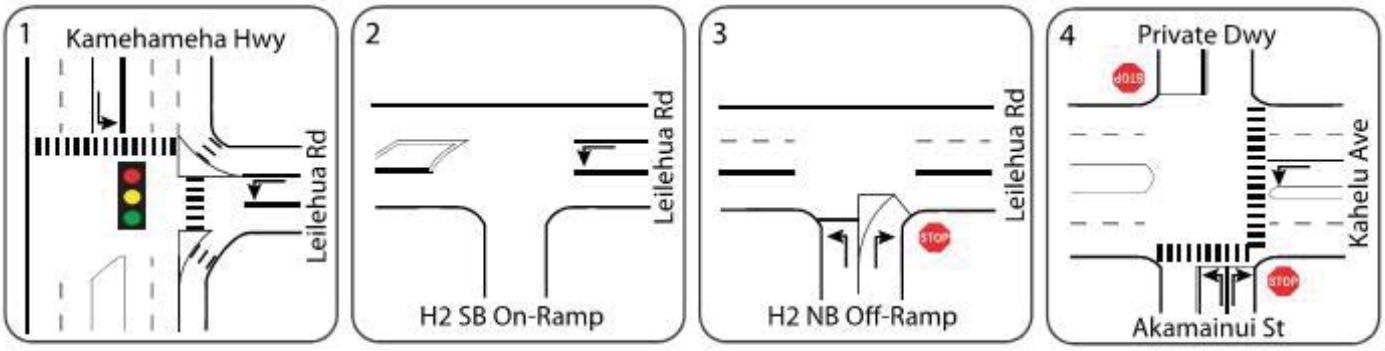
3.3.3 Traffic Volumes and Conditions

3.3.3.1 Kamehameha Highway and Leilehua Road

At the intersection with Leilehua Road, Kamehameha Highway carries 787 vehicles northbound and 800 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with ~~Puuhale Road~~ Leilehua Road carrying 554 vehicles northbound and 1,086 vehicles southbound. The northbound approach operates at LOS “B” and LOS “C” during the AM and PM peak periods, respectively, while the southbound approach operates at LOS “B” during both peak periods.

The westbound approach of Leilehua Road carries 1,987 vehicles during the AM peak period and 288 vehicles during the PM peak period. The Leilehua Road approach operates at LOS “C” during both the AM and PM peak periods.





LEGEND
● Study Intersection

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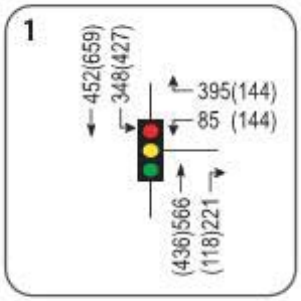
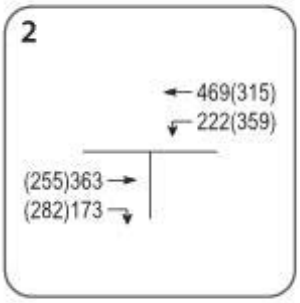
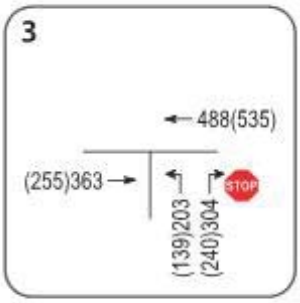
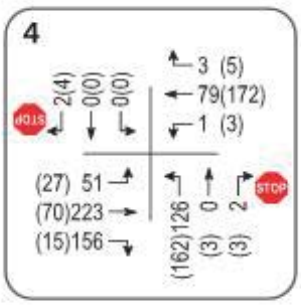
EXISTING LANE CONFIGURATIONS

FIGURE 13









LEGEND
- Study Intersection
- xx AM Peak Hour Volume
- (xx) PM Peak Hour Volume

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EXISTING PEAK HOURS OF TRAFFIC

FIGURE 14

3.3.3.2 Leilehua Road and the Interstate H-2 Freeway Ramps

At the intersection with the Interstate H-2 Freeway on-ramp, Leilehua Road carries 536 vehicles eastbound and 691 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with Leilehua Road carrying 537 vehicles eastbound and 674 vehicles westbound. The westbound left-turn traffic movement operates at LOS "A" and LOS "B" during the AM and PM peak periods, respectively.

At the intersection with Leilehua Road, the northbound approach of the Interstate H-2 Freeway off-ramp carries 507 vehicles during the AM peak period and 379 vehicles during the PM peak period. This approach operates at LOS "C" and LOS "B" during both the AM and PM peak periods, respectively.

3.3.3.3 Kahelu Avenue and Akamainui Street

At the intersection with Akamainui Street, Kahelu Avenue carries 430 vehicles eastbound and 83 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is lower with Kahelu Avenue carrying 112 vehicles eastbound and 180 vehicles westbound. Both approaches of Kahelue Avenue operates at LOS "A" during both peak periods.

The northbound approach of Akamainui Street carries 128 vehicles during the AM peak period and 168 vehicles during the PM peak period. This approach operates at LOS "C" and LOS "B" during the AM and PM peak periods, respectively. The southbound approach of the intersection is comprised of a private driveway which carries a minimal volume of traffic during the AM and PM peak periods. 2 vehicles were observed on the approach during the AM peak period and 4 vehicles were observed on the approach during the PM peak period. That approach operates at LOS "A" during both peak periods.

3.4 Alternatives 3 & 4

3.4.1 Area Roadway System

In the vicinity of the proposed project sites for Alternatives 3 and 4, Ulune Street is a three-lane, one-way (westbound) roadway which transitions to a five-lane, two-way roadway west of the intersection with Halawa Valley Street. West of the project sites, Ulune Street intersects Halawa Valley Street. At this signalized intersection, the eastbound approach of Ulune Street has exclusive turning lanes while the westbound approach has two through lanes and a shared through and right-turn lane. Halawa Valley Street is a three-lane, two-way roadway which transitions to a two-lane, two-way roadway east of the intersection with Iwaiwa Street. At the intersection with Ulune Street, the southbound approach of Halawa Valley Street has one through lane and an exclusive right-turn lane.

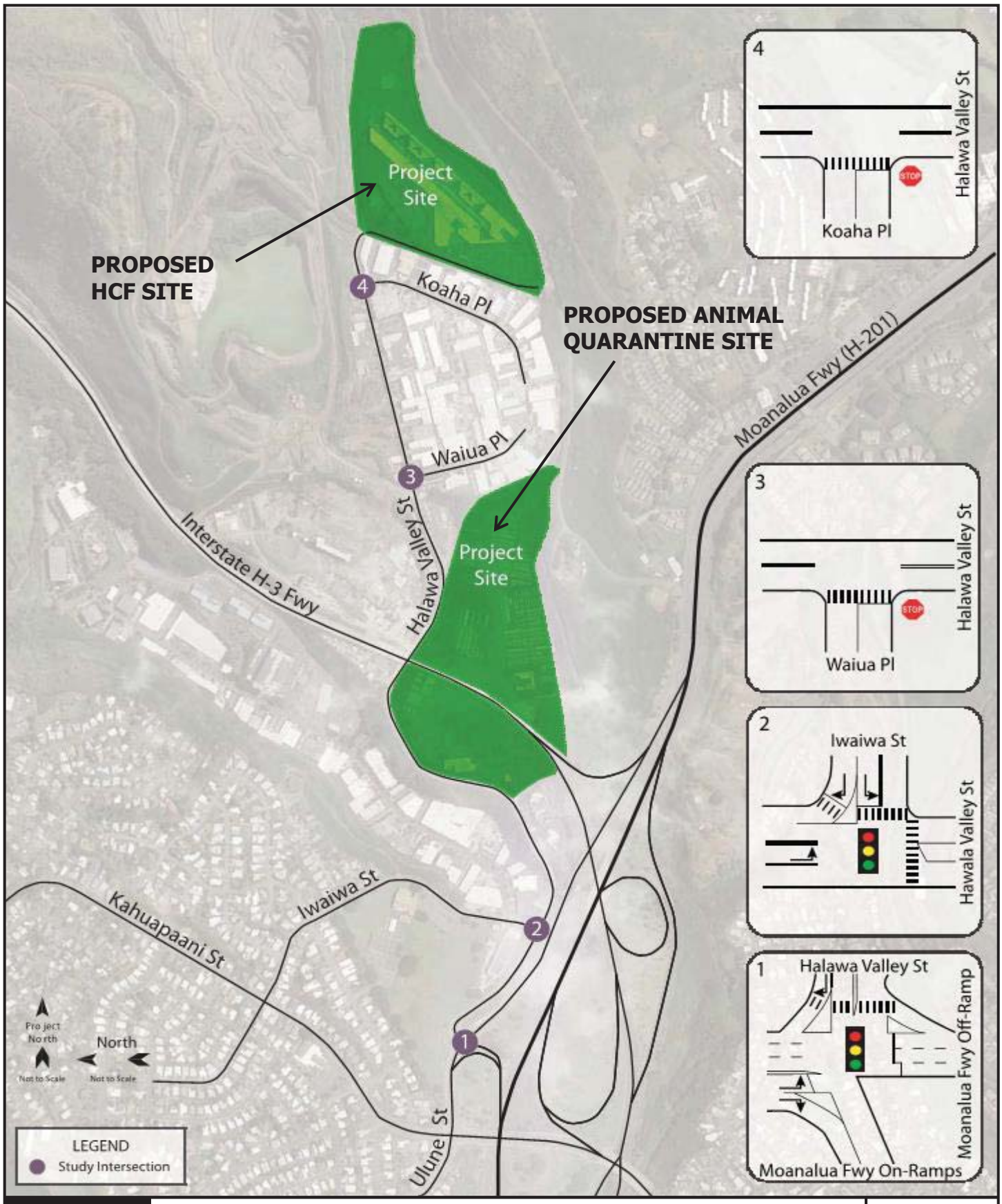
East of the intersection with Ulune Street, Halawa Valley Street intersects Iwaiwa Street. At this signalized T-intersection, the eastbound approach of Halawa Valley Street has an exclusive left-turn lane and one through lane while the westbound approach has a shared through and right-turn lane. Iwaiwa Street is a predominantly two-lane, two-way roadway generally oriented in the north-south direction. At the intersection with Halawa Valley Street, Iwaiwa Street has exclusive lanes for left-turn and right-turn traffic movements.

East of the intersection with Iwaiwa Street, Halawa Valley Street intersects Waiua Place. At this unsignalized T-intersection, the eastbound approach of Halawa Valley Street has a shared through and right-turn lane while the westbound approach has a shared left-turn and through lane. Waiua Place is a predominantly two-lane, two-way roadway which primarily serves the adjacent industrial uses. At the intersection with Halawa Valley Street, Waiua Place has one stop-controlled lane that serves left-turn and right-turn traffic movements. As previously mentioned, although both alternatives are located along Halawa Valley Street, the project site for Alternative 3 is located east of the Alternative 4 project site at the end of the corridor. As such, this intersection was included in the Alternative 3 scenario to account for the site-generated trips expected to travel to/from that proposed project site.

East of the intersection with Waiua Place, Halawa Valley Street intersects Koaha Place. At this unsignalized T-intersection, the eastbound approach of Halawa Valley Street has a shared through and right-turn lane while the westbound approach has a shared left-turn and through lane. Koaha Place is a predominantly two-lane, two-way roadway which also serves the adjacent industrial uses. At the intersection with Halawa Valley Street, Koaha Place has one stop-controlled lane that serves left-turn and right-turn traffic movements. Similar to the intersection of Iwaiwa Street with Halawa Valley Street, this intersection was only included in the Alternative 3 scenario.

3.4.2 Existing Peak Hour Traffic

Figures 15 and 16 show the existing lane use and peak hour traffic volumes. The morning peak hour of traffic generally occurs between 7:15 AM and 8:15 AM while the afternoon peak hour of traffic generally occurs between the hours of 3:15 PM and 4:15 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for each intersection may differ slightly. The analysis is based on these absolute commuter peak hour time periods to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.



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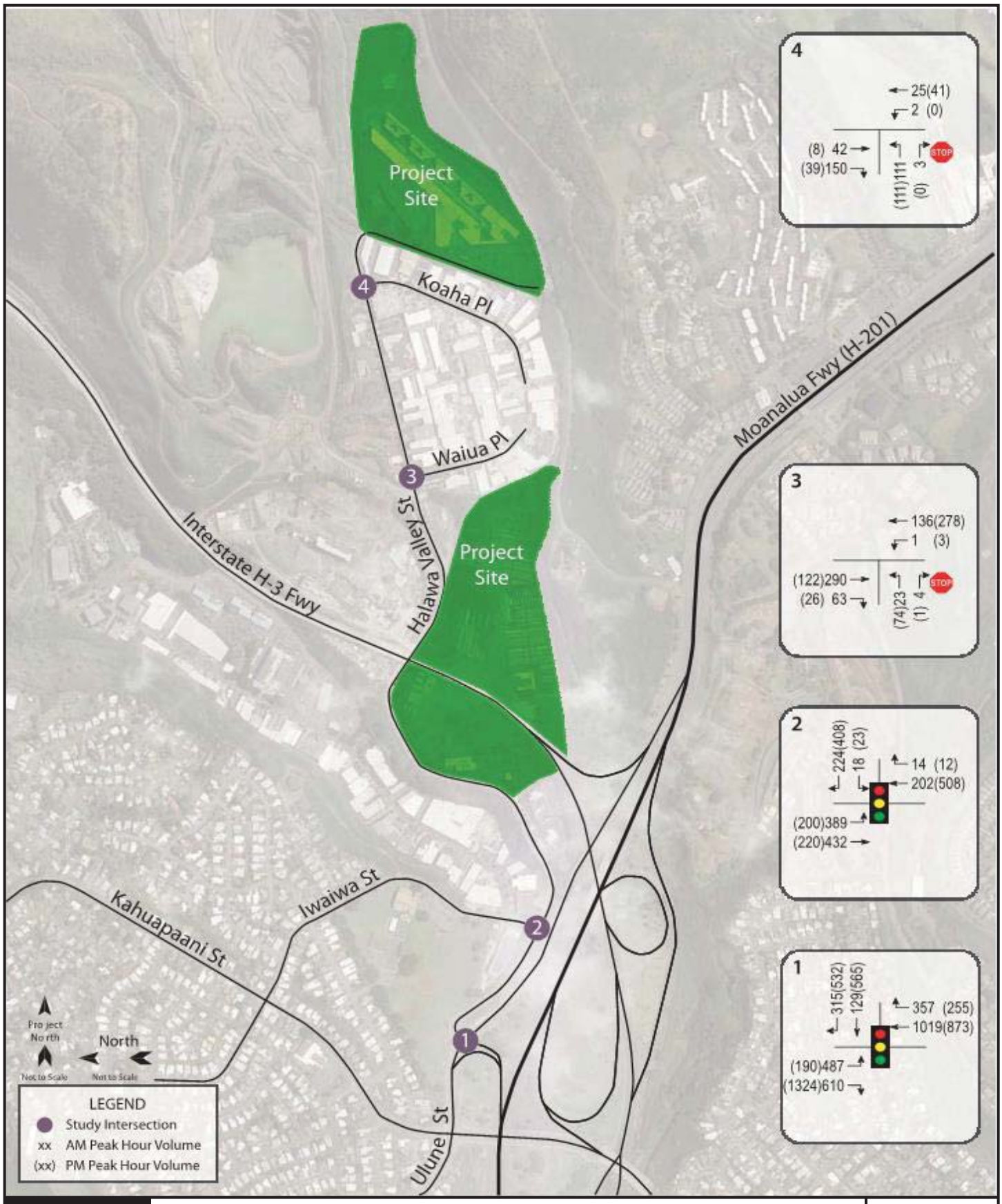
EXISTING LANE CONFIGURATIONS

FIGURE
15



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EXISTING PEAK HOURS OF TRAFFIC

FIGURE 16

3.4.3 Traffic Volumes and Conditions

3.4.3.1 Ulune Street and Halawa Valley Street

At the intersection with Halawa Valley Street, Ulune Street carries 1,097 vehicles eastbound and 1,376 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with Ulune Street carrying 1,514 vehicles eastbound and 1,128 vehicles westbound. The eastbound approach of Ulune Street operates at LOS "C" and LOS "B" during the AM and PM peak periods, respectively, while the westbound approach operates at LOS "D" during both peak periods. The Halawa Valley Street approach carries 444 vehicles southbound during the AM peak period and 1,097 vehicles during the PM peak period. This approach operates at LOS "D" during both the AM and PM peak periods.

3.4.3.2 Halawa Valley Street and Iwaiwa Street

At the intersection with Iwaiwa Street, Halawa Valley Street carries 821 vehicles eastbound and 216 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is lower with Halawa Valley carrying 420 vehicles eastbound and 520 vehicles westbound. The eastbound approach of Halawa Valley Street operates at LOS "B" during both peak periods, while the westbound approach operates at LOS "C" during both peak periods. The Iwaiwa Street approach carries 242 vehicles during the AM peak period and 431 vehicles during the PM peak period. This approach operates at LOS "C" during both the AM and PM peak periods.

3.4.3.3 Halawa Valley Street and Waiua Place

At the intersection with Waiua Place, Halawa Valley Street carries 353 vehicles eastbound and 137 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is lower with Halawa Valley carrying 148 vehicles eastbound and 281 vehicles westbound. The westbound approach of Halawa Valley Street operates at LOS "A" during both peak periods. The Waiua Place approach carries 27 vehicles northbound during the AM peak period and 75 vehicles during the PM peak period. This approach operates at LOS "B" during both the AM and PM peak periods.

3.4.3.4 Halawa Valley Street and Koaha Place

At the intersection with Koaha Place, Halawa Valley Street carries 192 vehicles eastbound and 27 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is lower with Halawa Valley carrying 47 vehicles eastbound and 41 vehicles westbound. The westbound approach of Halawa Valley Street operates at LOS "A" during both peak periods. The Koaha

Place approach carries 114 vehicles northbound during the AM peak period and 111 vehicles during the PM peak period. This approach operates at LOS "B" and LOS "A" during the AM and PM peak periods, respectively.

3.5 WCCC Facility

As previously mentioned, all female inmates currently housed at the existing OCCC are to be relocated to the WCCC facility regardless of which alternative site is selected. As such, traffic impacts in the vicinity of the WCCC facility were assessed in conjunction with Alternatives 1 thru 4.

3.5.1 Area Roadway System

In the vicinity of the proposed project site, Kalanianaole Highway is a predominantly four-lane, two-way roadway generally oriented in the east-west direction. West of the project site, Kalanianaole Highway intersects Ulupii Street. At this unsignalized intersection, both approaches of the highway have an exclusive left-turn lane, one through lane, and a shared through and right-turn lane. Ulupii Street is a predominantly two-lane, two-way roadway generally oriented in the north-south direction and primarily serves the adjacent residential community. At the intersection with Kalanianaole Highway, both approaches of Ulupii Street have one stop-controlled lane that serves all traffic movements. It should be noted that although a refuge lane is not provided, vehicles were observed to utilize the wide median to cross the highway in two-stages.

East of the intersection with Ulupii Street, Kalanianaole Highway intersects the project driveway for the Women's Community Correctional Center and the Olomana School driveway. At this unsignalized intersection, the eastbound approach of Kalanianaole Highway has an exclusive left-turn lane, two through lanes, and an exclusive right-turn lane while the westbound approach has an exclusive left-turn lane, one through lane, and a shared through and right-turn lane. The southbound approach is comprised of a driveway for the Women's Community Correctional Center which has one lane that serves all traffic movements. In addition, the northbound approach is comprised of a driveway for Olomana School which also has one lane that serves all traffic movements. It should be noted that although a refuge lane is not provided, vehicles were also observed to utilize the wide median to cross the highway in two-stages.

3.5.2 Existing Peak Hour Traffic

Figures 17 and 18 show the existing lane use and peak hour traffic volumes. The morning peak hour of traffic generally occurs between 7:15 AM and 8:15 AM while the afternoon peak hour of traffic generally occurs between the hours of 4:45 PM and 5:45 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for each intersection may differ slightly. The analysis is based on these absolute commuter peak hour time periods to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

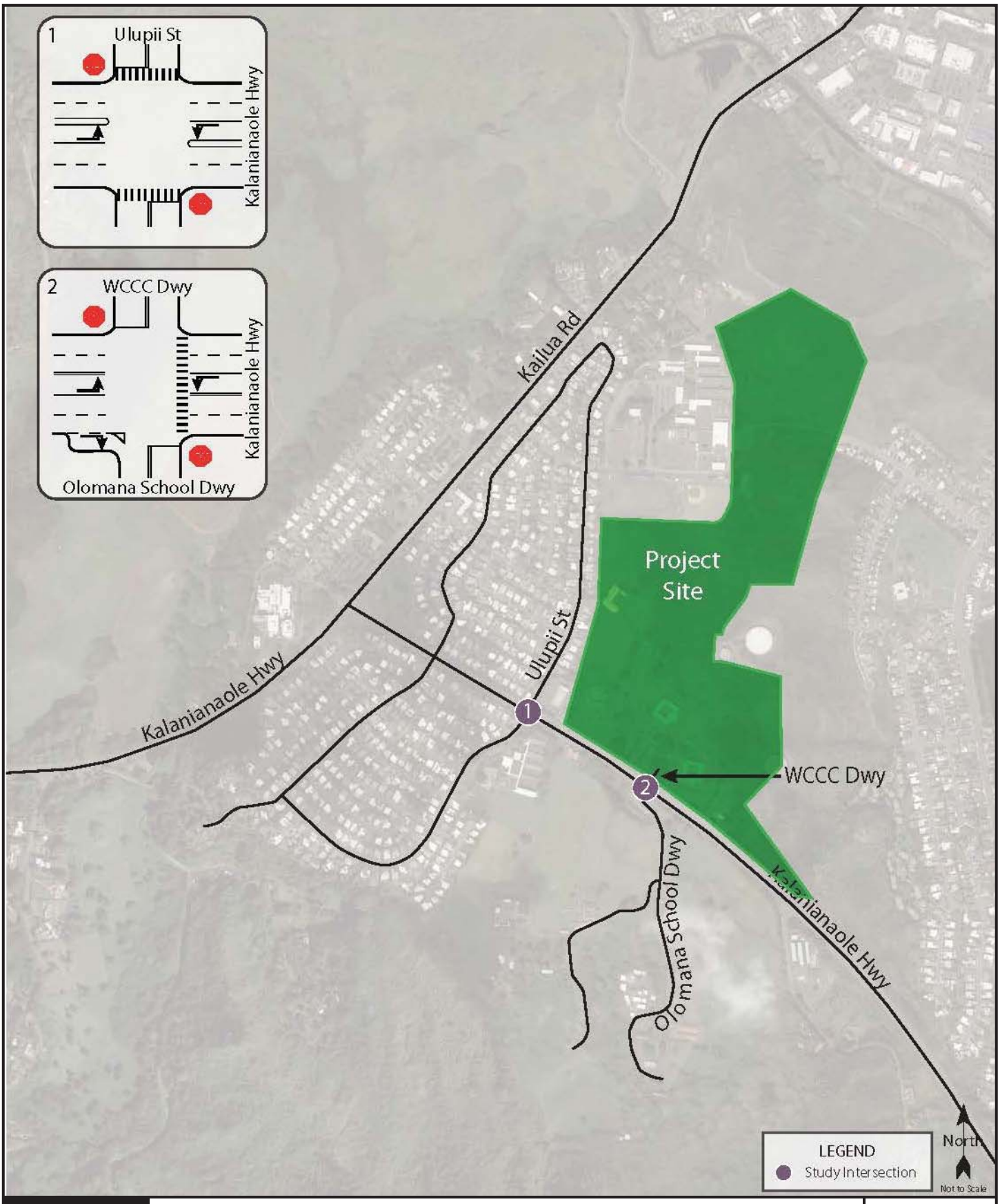
3.5.3 Traffic Volumes and Conditions

3.5.3.1 Kalanianaole Highway and Ulupii Street

At the intersection with Ulupii Street, Kalanianaole Highway carries 770 vehicles eastbound and 1,364 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with Kalanianaole Highway carrying 1,416 vehicles eastbound and 937 vehicles westbound. The eastbound and westbound left-turn traffic movements along Kalanianaole Highway operate at LOS “B” during both peak periods. Ulupii Street carries 94 vehicles northbound and 67 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is lower with Ulupii Street carrying 53 vehicles northbound and 68 vehicles southbound. The northbound approach operates at LOS “C” during both peak periods while the southbound approach operates at LOS “D” and LOS “C” during the AM and PM peak periods, respectively.

3.5.3.2 Kalanianaole Highway and the driveways for WCCC and Olomana School

At the intersection with the driveways for the WCCC facility and Olomana School, Kalanianaole Highway carries 815 vehicles eastbound and 1,284 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with Kalanianaole Highway carrying 1,427 vehicles eastbound and 841 vehicles westbound. The eastbound left-turn traffic movement operates at LOS “B” and LOS “A” during the AM and PM peak periods, respectively, while the westbound left-turn traffic movement operates at LOS “A” during both peak periods.



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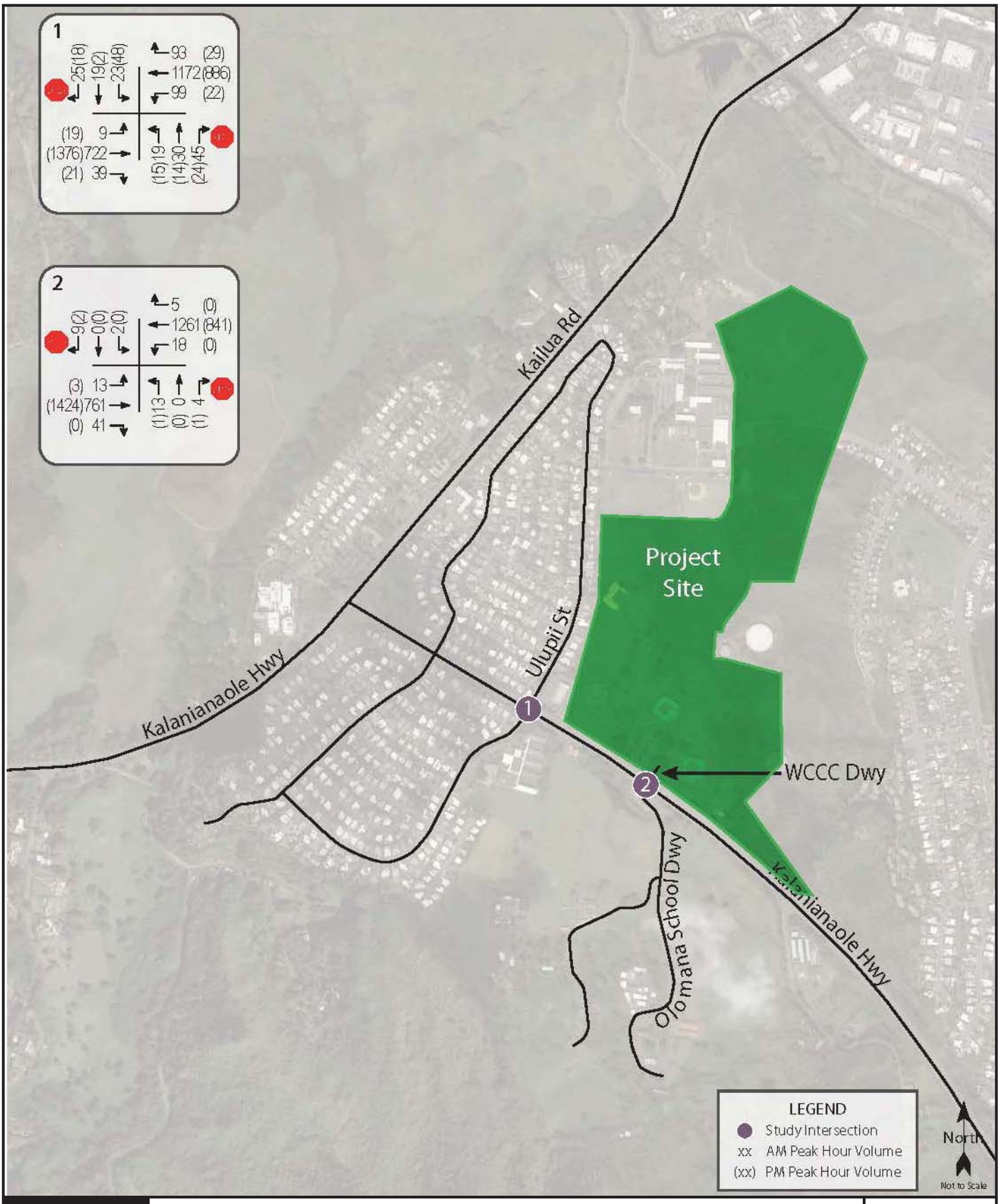
EXISTING LANE CONFIGURATIONS

FIGURE 17



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EXISTING PEAK HOURS OF TRAFFIC

FIGURE 18

The WCCC driveway carries 11 vehicles southbound during the AM peak period and 2 vehicles during the PM peak period. This approach operates at LOS "B" during both peak periods. However, although operating sufficiently based on vehicular traffic demands, turning maneuvers entering and exiting the project site driveway may be a safety hazard as result of the physical layout and configuration of the intersection at the vehicular conflict zones. The northbound approach of the intersection is comprised of a driveway for the adjacent Olomana School which carries a minimal volume of traffic during the AM and PM peak periods. 17 vehicles were observed on the approach during the AM peak period and 2 vehicles were observed on the approach during the PM peak period. This approach operates at LOS "C" during both peak periods.

4.0 PROJECTED TRAFFIC CONDITIONS

4.1 Site-Generated Traffic: Trip Generation Methodology

The trip generation methodology is typically based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 9th Edition," 2012. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per inmate. However, trip generation rates for prisons developed empirically are based on a small sample size and may not be an accurate representation of the proposed project conditions. As such, for the purpose of this report, two trip generation characteristics were used to represent a conservative analysis and both methods were applied to the AM and PM peak hours of traffic.

4.1.1 Trip Generation Method 1

The first method (referred to as "Method 1") uses trip generation rates based on the existing trip generation characteristics at the OCCC facility from the collected field data. Table 1 summarizes the trip generation characteristics related to the proposed project site alternatives, as well as the expansion of the WCCC facility, applied to the AM and PM peak hours of traffic.

Table 1: Peak Hour Trip Generation Method 1

LAND USE: INSTITUTIONAL		Alternative 1	Alternatives 2,3, and 4	WCCC
Independent Variable	# of Additional Inmates	343	1,380	281
AM PEAK	Enter	13	54	11
	Exit	5	18	4
	Total	18	72	15
PM PEAK	Enter	3	12	3
	Exit	9	35	7
	Total	12	47	10

4.1.2 Trip Generation Method 2

Alternatively, the second method (referred to as "Method 2") uses trip generation rates based on characteristics at the OCCC facility from employee data provided by the State of Hawaii Department of Public Safety (PSD). This data included information regarding work shift schedules and corresponding employees for each shift. Based on this data of actual operations at the existing OCCC facility, corresponding trip generation rates were developed for both the morning and afternoon peak traffic periods. These rates are applied to the varying proposed inmate population sizes to reflect the associated trip generating characteristic of each proposed alternative. Table 2 summarizes the trip generation characteristics related to the proposed project alternatives, as well as the expansion of the WCCC facility, applied to the AM and PM peak hours of traffic. Since the resulting traffic volumes based on the trip generation rates derived from Method 2 are generally greater than traffic volumes derived from Method 1, the projected traffic analyses hereinafter are based on projected traffic volume derived from Method 2. As such, the conservative analyses would potentially result in better traffic operations than reported and evaluated herein.

Table 2: Peak Hour Trip Generation Method 2

LAND USE: INSTITUTIONAL		Alternative 1	Alternatives 2,3, and 4	WCCC
Independent Variable	# of Additional Inmates	343	1,380	281
AM PEAK	Enter	41	163	34
	Exit	29	117	24
	Total	70	280	58
PM PEAK	Enter	1	2	1
	Exit	25	98	20
	Total	26	100	21

4.2 Alternative 1

4.2.1 Trip Distribution

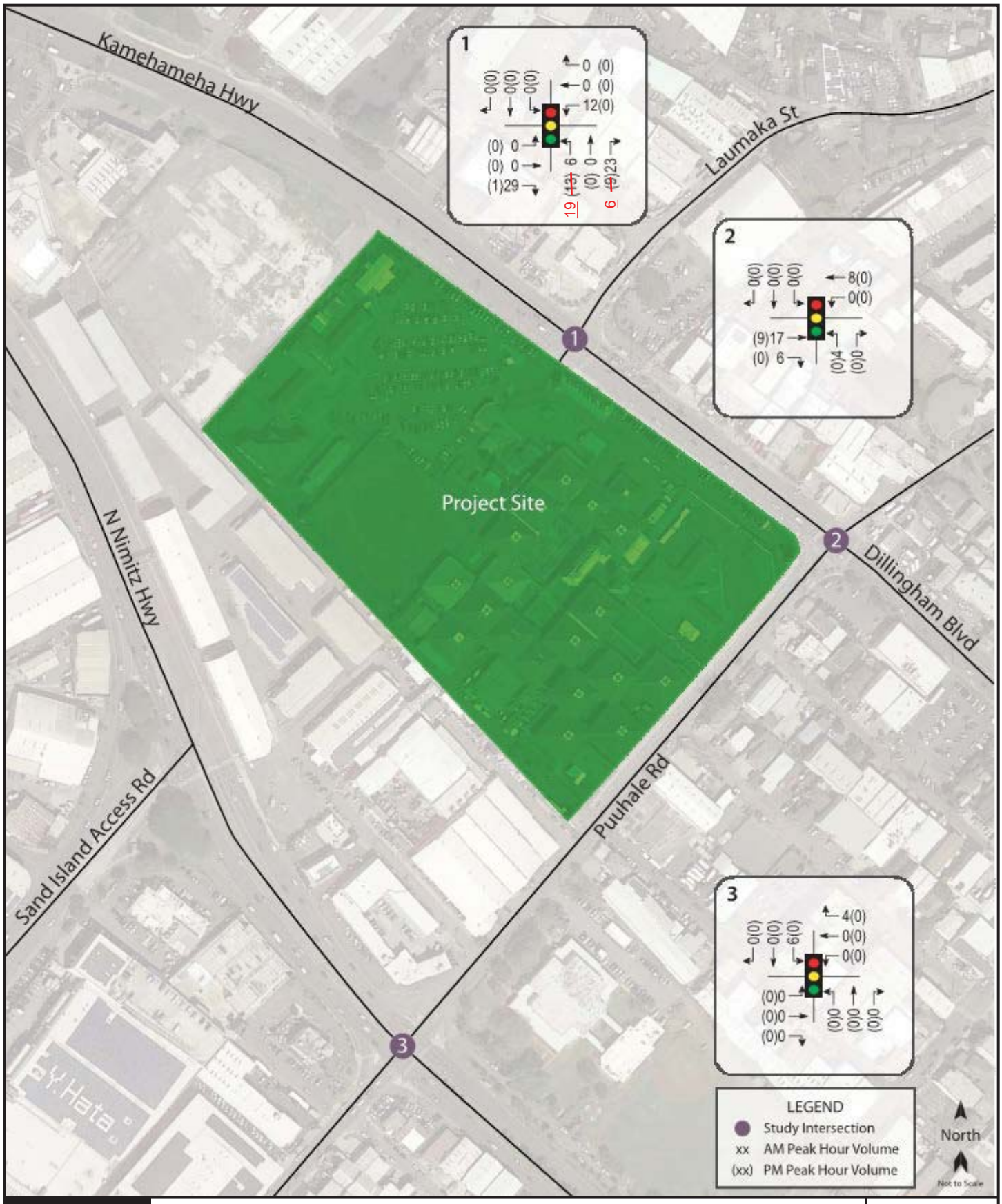
Figure 19 shows the distribution of site-generated traffic during the AM and PM peak periods. Primary access to the proposed site in Kalihi will be provided via the existing driveway off Kamehameha Highway at the intersection with Laumaka Street. The directional distribution at the intersection of Kamehameha Highway and Laumaka Street was assumed to remain similar to existing conditions. As such, 70% of entering trips were assumed to be traveling eastbound while 30% of entering trips were assumed to be traveling westbound during both peak periods. Similarly, 84% of exiting trips were assumed to be traveling eastbound with 16% assumed to be traveling westbound during the AM peak period. During the PM peak period, 24% of exiting trips were assumed to be traveling eastbound with 76% of exiting trips assumed to be traveling westbound.

4.2.2 Through Traffic Forecasting Methodology

The travel forecast is based upon historical traffic count data obtained from the State DOT, Highways Division at survey stations located along Nimitz Highway and Kamehameha Highway (Kalihi) in the vicinity of the proposed project site. The historical data indicates relatively stable traffic volumes along the study corridors and, as such, an annual traffic growth rate of approximately 0.5 % was conservatively assumed in the project vicinity. Using 2017 as the Base Year, a growth rate factor of 1.03 was applied to the existing traffic demands in the project vicinity to achieve the projected Year 2023 traffic demands.

4.2.3 Year 2023 Total Traffic Volumes Without Project

The projected Year 2023 AM and PM peak period traffic volumes and operating conditions without the implementation of Alternative 1 is shown in Figure 20 and summarized in Table 3. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.



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DISTRIBUTION OF SITE-GENERATED VEHICLES WITH ALTERNATIVE 1

FIGURE 19

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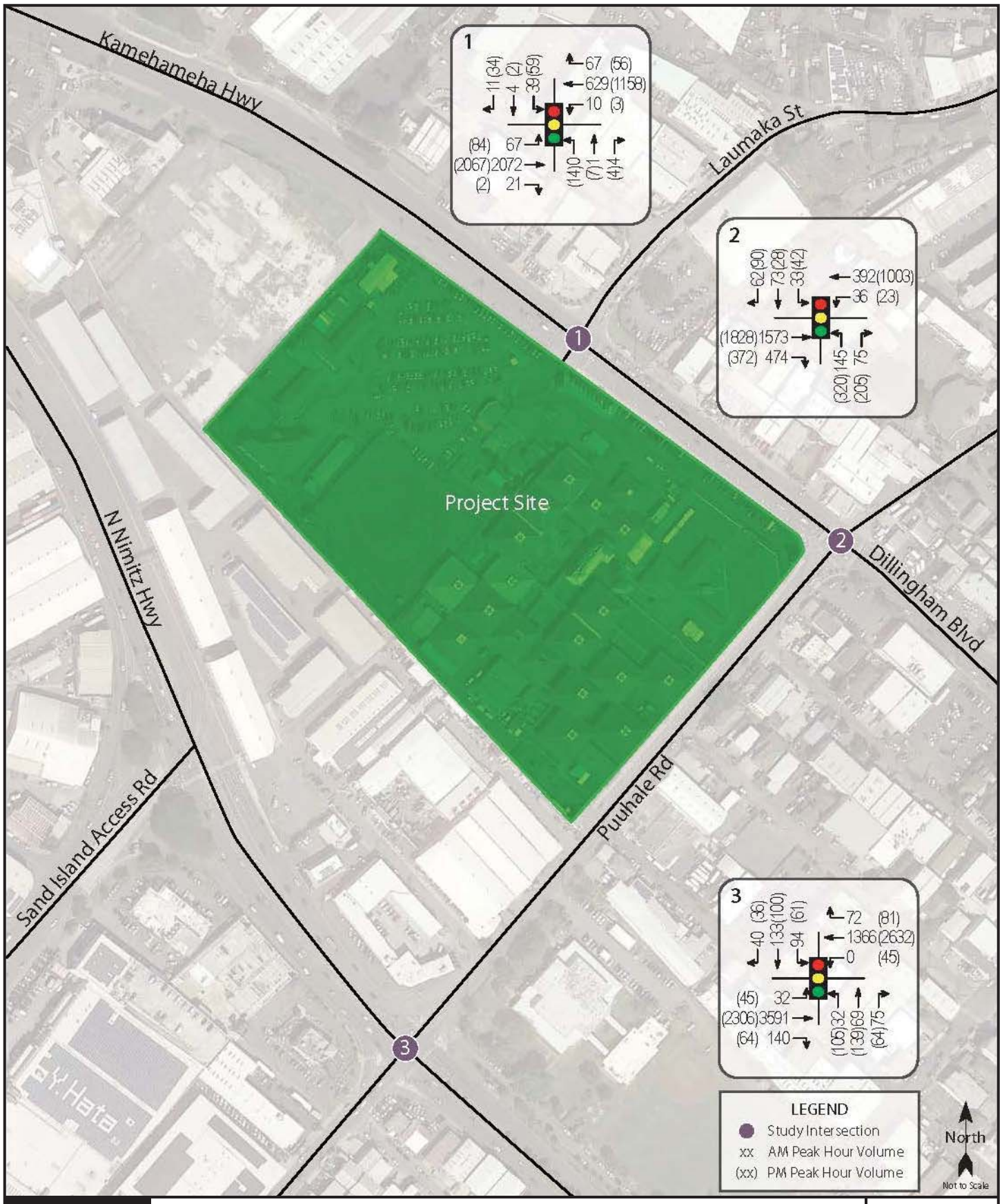

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YEAR 2023 PEAK HOURS OF TRAFFIC
WITHOUT ALTERNATIVE 1

FIGURE
20

Table 3: Existing and Projected Year 2023 (Without Project) LOS
Traffic Operating Conditions

Intersection	Approach	AM		PM	
		Exist	Year 2023 w/o Proj	Exist	Year 2023 w/o Proj
N. Nimitz Hwy/ Puuhale Rd.	Eastbound	B	B	B	B
	Westbound	B	B	C	C
	Northbound	E	E	F	F
	Southbound	F	F	F	F
Kamehameha Hwy/ Dillingham Blvd/ Puuhale Rd	Eastbound	A	A	C	C
	Westbound	A	A	B	B
	Northbound	D	D	D	D
	Southbound	C	C	C	C
Kamehameha Hwy/ Laumaka St/ OCCC Dwy	Eastbound	A	A	A	A
	Westbound	A	A	A	A
	Northbound	C	D	C	C
	Southbound	D	D	D	D

Under Year 2023 without project conditions, traffic operations are expected to remain similar to existing conditions. Near the existing OCCC facility, traffic operations at the intersection of N. Nimitz Highway and Puuhale Road are expected to continue operating at LOS “C” or better during both peak periods with the exception of the side street approaches which are expected to continue operating at LOS “F” during both peak periods. As previously discussed, the low levels of service along the side streets are primarily due to the long traffic signal cycle lengths along the highway. Along Kamehameha Highway and Dillingham Boulevard, traffic operations at the other study intersections are expected to operate at LOS “D” or better during both peak periods.

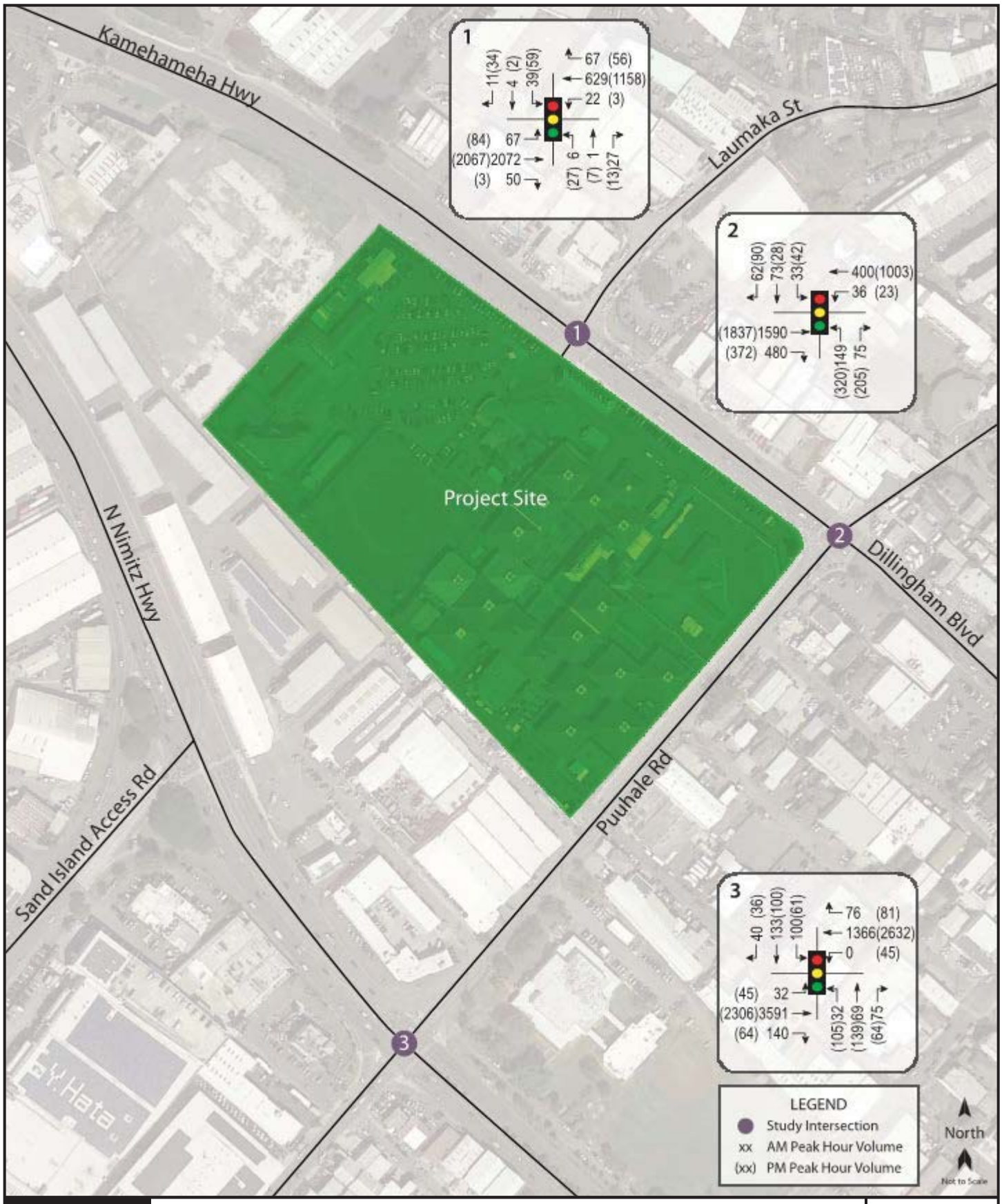
4.2.4 Year 2023 Total Traffic Volumes With Project

The Year 2023 cumulative AM and PM peak hour traffic conditions with the implementation of Alternative 1 are shown in Figures 21 and summarized in Table 4. The cumulative volumes consist of site-generated traffic superimposed over the Year 2023 projected traffic demands. The existing and projected Year 2023 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

Table 4: Existing and Projected Year 2023 (Without and With Alternative 1)
LOS Traffic Operating Conditions

Intersection	Approach	AM			PM		
		Exist	Year 2023		Exist	Year 2023	
			w/out Proj	w/ Project		w/out Proj	w/ Project
N. Nimitz Hwy/ Puuhale Rd.	Eastbound	B	B	A	B	B	B
	Westbound	B	B	A	C	C	B
	Northbound	E	E	E	F	F	F
	Southbound	F	F	E	F	F	F
Kamehameha Hwy/ Dillingham Blvd/ Puuhale Rd	Eastbound	A	A	A	C	C	C
	Westbound	A	A	A	B	B	B
	Northbound	D	D	D	D	D	D
	Southbound	C	C	C	C	C	C
Kamehameha Hwy/ Laumaka St/ OCCC Dwy	Eastbound	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A
	Northbound	C	D	D	C	C	D
	Southbound	D	D	D	D	D	D

Traffic operations with the implementation of Alternative 1 are generally expected to remain similar to without project conditions despite the addition of site-generated trips to the surrounding roadway network. Along Kamehameha Highway and Dillingham Boulevard, traffic operations at the intersection with Puuhale Road and at Laumaka Street and the OCCC driveway are expected to continue operating at LOS “D” or better during both the AM and PM peak periods. Near the existing OCCC facility, traffic operations along the N. Nimitz Highway approaches at the intersection with Puuhale Road are expected to improve to LOS “A” during the AM peak period and LOS “B” during the PM peak period. However, the northbound and southbound approaches along Puuhale Road are anticipated to continue operating at low levels of service. As previously discussed, the low levels of service along Puuhale Road are primarily due to the long traffic signal cycle lengths along the highway.



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YEAR 2023 PEAK HOURS OF TRAFFIC
WITH ALTERNATIVE 1

FIGURE
21

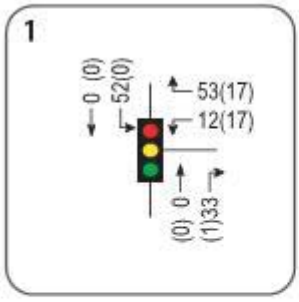
4.3 Alternative 2

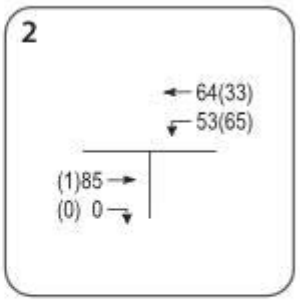
4.3.1 Trip Distribution

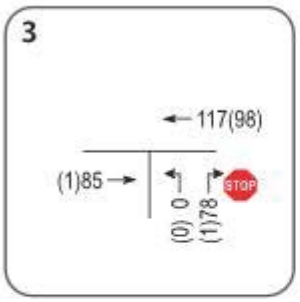
Figure 22 shows the distribution of site-generated traffic during the AM and PM peak periods under Alternative 2. Primary access to the proposed site in Mililani will be provided via a new driveway off Kahelu Avenue. The directional distribution at the intersections of Leilehua Road and the ramps to/from the Interstate H-2 Freeway were assumed to remain similar to existing conditions. As such, 48% of entering vehicles were assumed to utilize the Interstate H-2 (northbound) off-ramp with 45% of exiting trips assumed to use the Interstate H-2 southbound on-ramp during the AM peak period. Similarly, during the PM peak period, 49% of entering vehicles were assumed to utilize the Interstate H-2 northbound off-ramp with 67% of exiting trips assumed to use the Interstate H-2 southbound on-ramp.

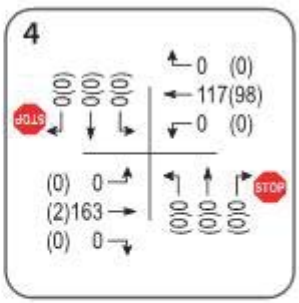
4.3.2 Through Traffic Forecasting Methodology

The travel forecast is based upon historical traffic count data obtained from the State DOT, Highways Division at survey stations located along Kamehameha Highway (Mililani) in the vicinity of the proposed project sites. The historical data indicates relatively stable traffic volumes along the study corridors and, as such, an annual traffic growth rate of approximately 0.5 % was conservatively assumed in the project vicinity. Using 2017 as the Base Year, a growth rate factor of 1.03 was applied to the existing traffic demands in the project vicinity to achieve the projected Year 2023 traffic demands.









LEGEND
- Study Intersection
- xx AM Peak Hour Volume
- (xx) PM Peak Hour Volume

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DISTRIBUTION OF SITE-GENERATED VEHICLES WITH ALTERNATIVE 2

FIGURE 22

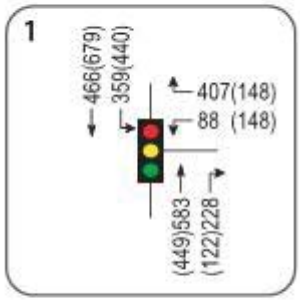
4.3.3 Year 2023 Total Traffic Volumes Without Project

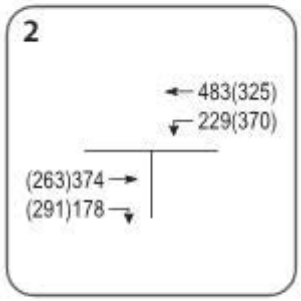
The projected Year 2023 AM and PM peak period traffic volumes and operating conditions without the implementation of Alternative 2 is shown in Figure 23 and summarized in Table 5. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix F.

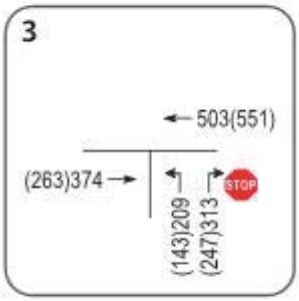
Table 5: Existing and Projected Year 2023 (Without Project) LOS Traffic Operating Conditions

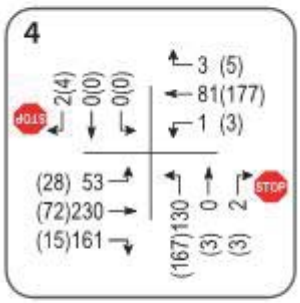
Intersection	Approach	AM		PM	
		Exist	Year 2023 w/o Proj	Exist	Year 2023 w/o Proj
Kamehameha Hwy/ Leilehua Rd.	Westbound	C	C	C	C
	Northbound	B	B	C	C
	Southbound	B	B	B	B
Leilehua Rd./ H-2 SB On-Ramp	Westbound	A	A	B	B
Leilehua Rd/ H-2 NB Off-Ramp	Northbound	C	C	B	B
Kahelu Ave/ Akamainui St	Eastbound	A	A	A	A
	Westbound	A	A	A	A
	Northbound	C	C	B	B
	Southbound	A	A	A	A

Under Year 2023 without project conditions, traffic operations are expected to remain similar to existing conditions. At the intersection of Kamehameha Highway and Leilehua Road near the proposed MTP site, traffic operations are expected to continue operating at LOS “C” or better during both peak periods, while those at the intersection of Kahelu Avenue and Akamainui Street are expected to continue operating at LOS “C” or better during the AM peak period and LOS “B” or better during the PM peak period. At the intersections of Leilehua Road and the ramps to/from the Interstate H-2 Freeway, traffic operations are expected to continue operating at LOS “C” or better during the AM peak period and LOS “B” or better during the PM peak period.









LEGEND
- Study Intersection
- xx AM Peak Hour Volume
- (xx) PM Peak Hour Volume

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YEAR 2023 PEAK HOURS OF TRAFFIC
WITHOUT ALTERNATIVE 2

FIGURE
23

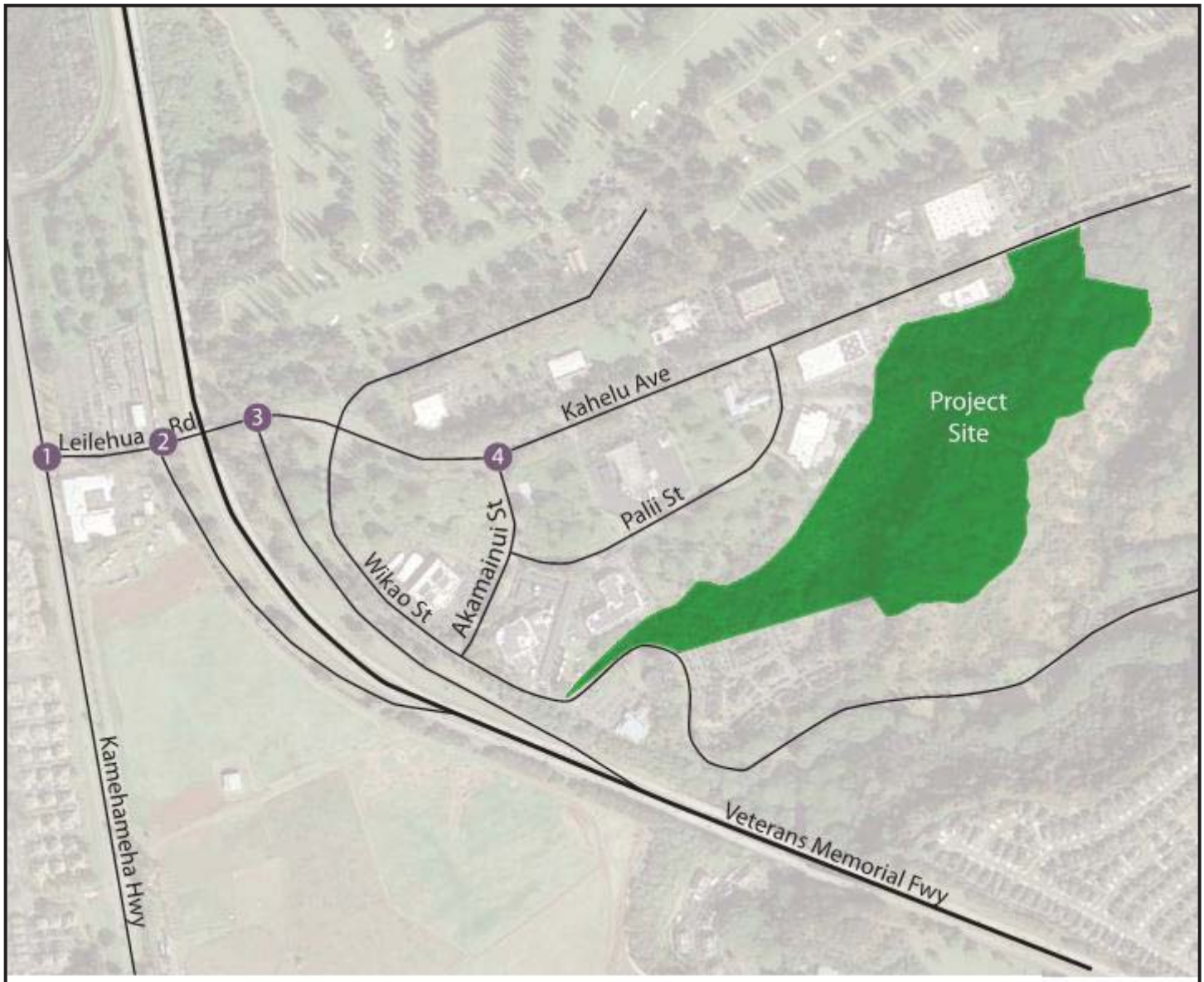
4.3.4 Year 2023 Total Traffic Volumes With Project

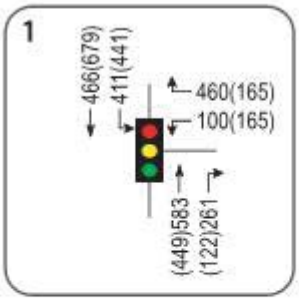
The Year 2023 cumulative AM and PM peak hour traffic conditions with the implementation of Alternative 2 is shown on Figure 24 and summarized in Table 6. The cumulative volumes consist of site-generated traffic superimposed over the Year 2023 projected traffic demands. The existing and projected Year 2023 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix G.

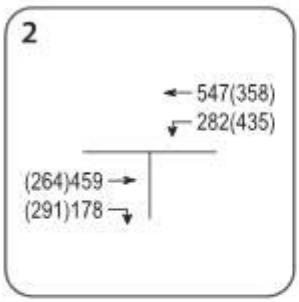
Table 6: Existing and Projected Year 2023 (Without and With Alternative 2)
LOS Traffic Operating Conditions

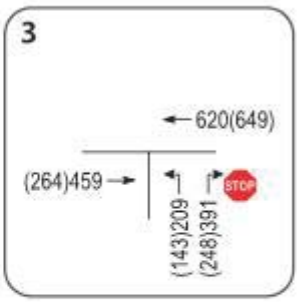
Intersection	Approach	AM			PM		
		Exist	Year 2023		Exist	Year 2023	
			w/out Proj	w/ Project		w/out Proj	w/ Project
Kamehameha Hwy/ Leilehua Rd.	Westbound	C	C	C	C	C	C
	Northbound	B	B	C	C	C	C
	Southbound	B	B	B	B	B	B
Leilehua Rd./ H-2 SB On-Ramp	Westbound	A	A	B	B	B	B
Leilehua Rd/ H-2 NB Off-Ramp	Northbound	C	C	D	B	B	B
Kahelu Ave/ Akamainui St	Eastbound	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A
	Northbound	C	C	D	B	B	B
	Southbound	A	A	A	A	A	A

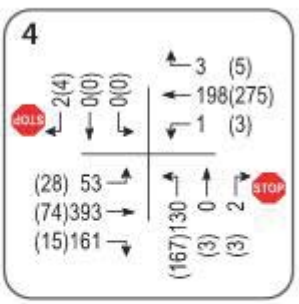
Traffic operations with the implementation of Alternative 2 are generally expected to remain similar to the without project conditions despite the addition of site-generated trips to the surrounding roadway network. Traffic operations along Leilehua Road at the intersection with Kamehameha Highway near the proposed MTP site are expected to continue operating at LOS "C" or better during both AM and PM peak periods. Along the H-2 On and Off-Ramps, traffic operations are expected to continue operating similar to without project conditions with the exception of the H-2 Northbound Off-Ramp where the northbound approach is expected to change from an LOS "C" to an LOS "D" during the AM peak period. During the PM peak period, all study intersections are anticipated to remain similar to existing and without project conditions.











LEGEND
- Study Intersection
- xx AM Peak Hour Volume
- (xx) PM Peak Hour Volume

WILSON OKAMOTO CORPORATION

OAHU COMMUNITY CORRECTIONAL CENTER

YEAR 2023 PEAK HOURS OF TRAFFIC WITH ALTERNATIVE 2

FIGURE 24

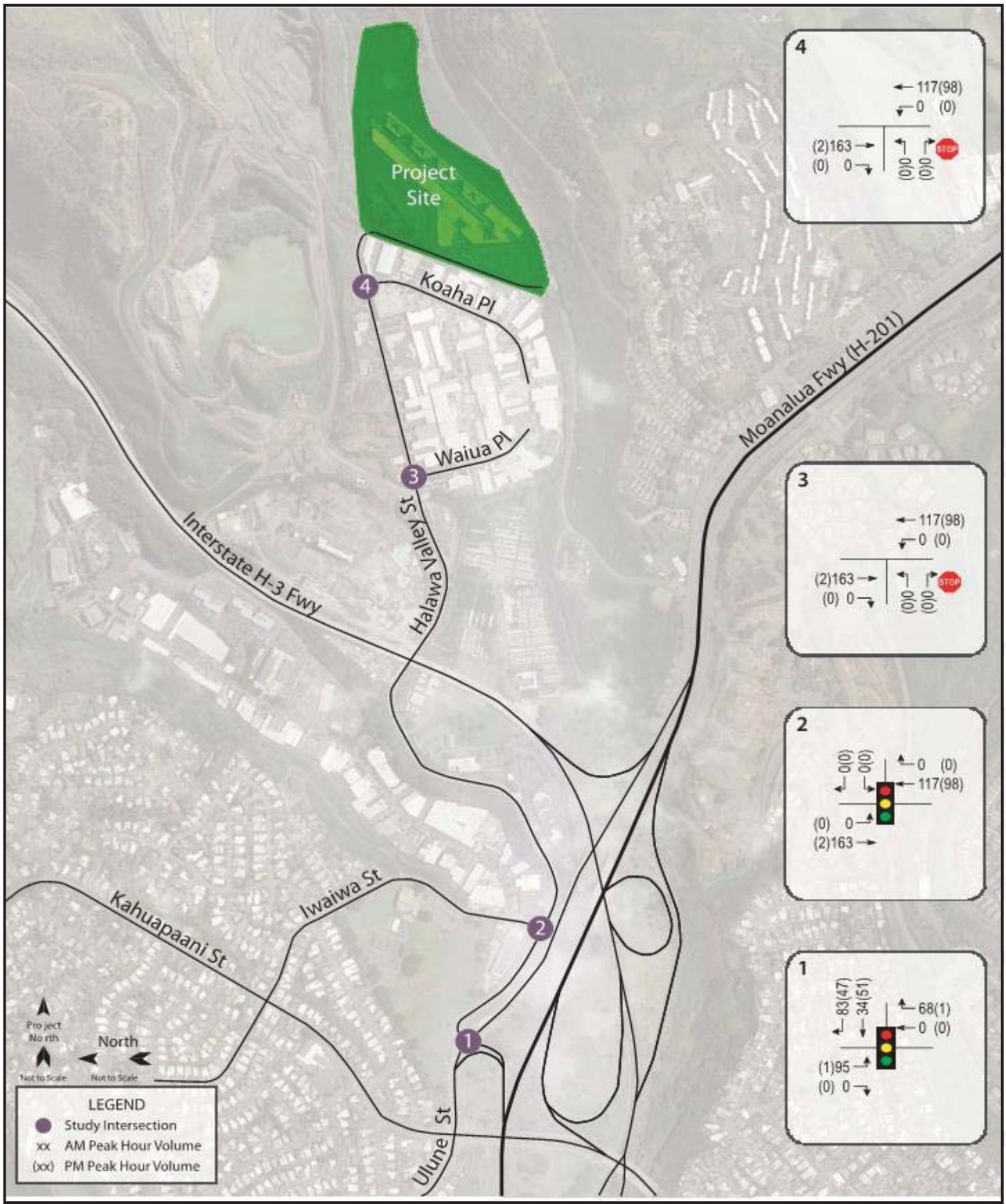
4.4 Alternative 3

4.4.1 Trip Distribution

Figure 25 shows the distribution of site-generated traffic during the AM and PM peak periods under Alternative 3. Primary access to the proposed HCF site will be provided via a new driveway off Halawa Valley Street. The directional distribution at the intersection of Ulune Street and Halawa Valley Street was assumed to remain similar to existing conditions. As such, 58% of entering trips were assumed to be traveling eastbound while 42% of entering trips were assumed to be traveling westbound during the AM peak period. Similarly, during the PM peak period, 43% of entering trips were assumed to be traveling eastbound while 57% were assumed to be traveling westbound. Exiting trips were also based on the existing directional distribution at the intersection of Ulune Street and Halawa Valley Street. As such, 71% of exiting trips were assumed to be traveling westbound at that intersection while 29% of exiting trips were assumed to be traveling southbound during the AM peak period. Similarly, during the PM peak period, 47% of exiting trips were assumed to be traveling westbound that intersection while 53% of exiting trips were assumed to be traveling southbound.

4.4.2 Through Traffic Forecasting Methodology

The travel forecast is based upon historical traffic count data obtained from the State DOT, Highways Division at survey stations located along Halawa Valley Street in the vicinity of the proposed project sites. The historical data indicates relatively stable traffic volumes along the study corridors and, as such, an annual traffic growth rate of approximately 0.5 % was conservatively assumed in the project vicinity. Using 2017 as the Base Year, a growth rate factor of 1.03 was applied to the existing traffic demands in the project vicinity to achieve the projected Year 2023 traffic demands.



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OAHU COMMUNITY CORRECTIONAL CENTER

DISTRIBUTION OF SITE-GENERATED VEHICLES WITH ALTERNATIVE 3

FIGURE 25

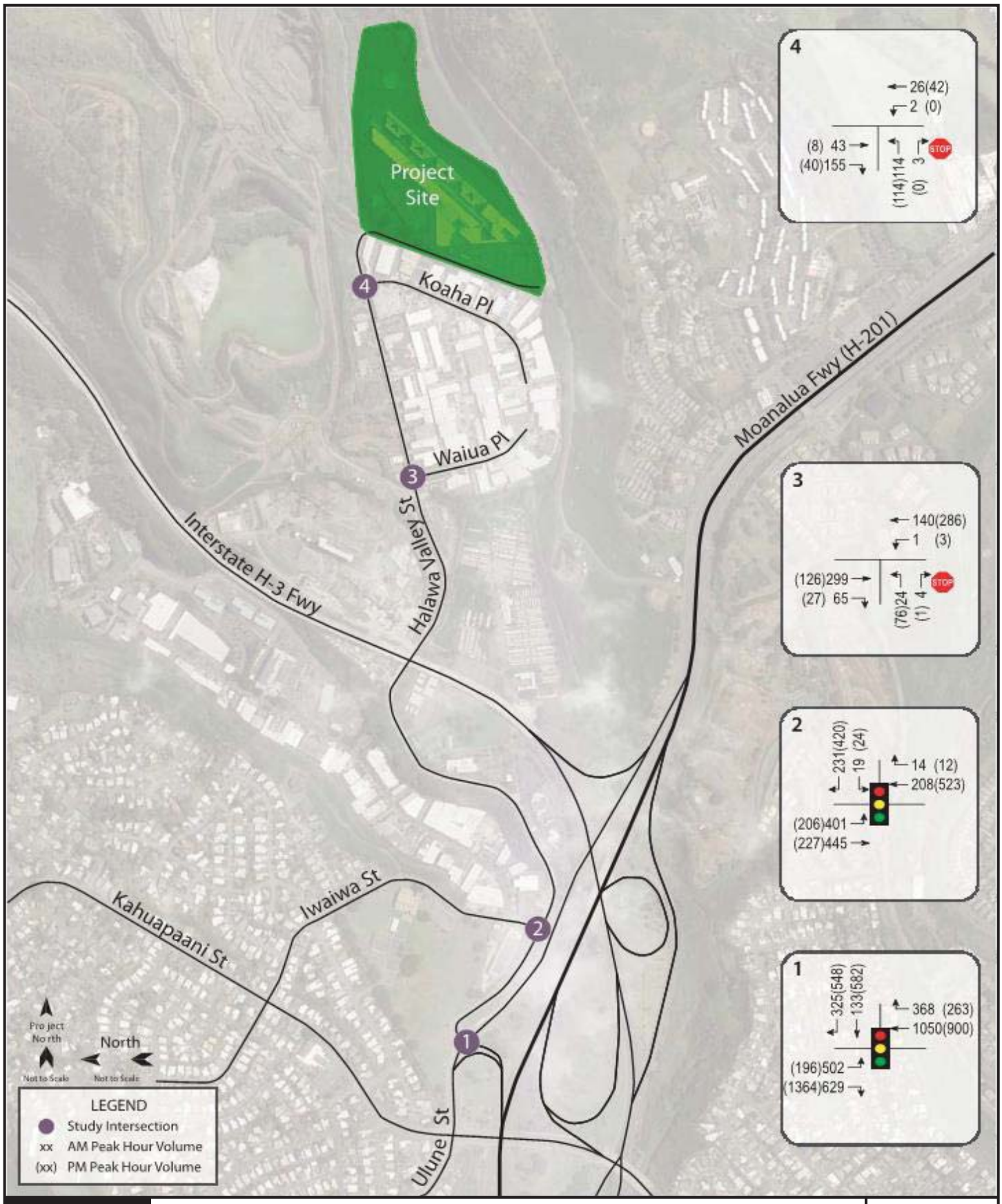
4.4.3 Year 2023 Total Traffic Volumes Without Project

The projected Year 2023 AM and PM peak period traffic volumes and operating conditions without the implementation of Alternative 3 is shown in Figure 26, and summarized in Table 7. The cumulative volumes consist of site-generated traffic previously shown in Tables 1 and 2 superimposed over the Year 2023 projected traffic demands. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix H.

Table 7: Existing and Projected Year 2023 (Without Project) LOS Traffic Operating Conditions

Intersection	Approach	AM		PM	
		Exist	Year 2023 w/o Proj	Exist	Year 2023 w/o Proj
Ulune St/ Halawa Valley St	Eastbound	C	C	B	C
	Westbound	D	D	D	D
	Southbound	D	D	D	D
Halawa Valley St/ Iwaiwa St	Eastbound	B	B	B	B
	Westbound	C	C	C	C
	Southbound	C	C	C	C
Halawa Valley St/ Waiua Pl	Westbound	A	A	A	A
	Northbound	B	B	B	B
Halawa Valley St/ Koaha Pl	Westbound	A	A	-	-
	Northbound	B	B	A	A

Under Year 2023 without project conditions, traffic operations are expected to remain generally similar to existing conditions. At the intersection of Ulune Street and Halawa Valley Street near the proposed HCF site, traffic operations are expected to continue operating at LOS “D” or better during both peak periods with the exception of the eastbound approach which is expected to deteriorate from LOS “B” to LOS “C” during the PM peak period. Along Halawa Valley Street, traffic operations at the intersection with Iwaiwa Street are expected to operate at LOS “C” or better during both peak periods, while those at the intersections with Waiua Place and Koaha Place are expected to operate at LOS “B” or better during both peak periods. It should be noted that a level of service was not included in the westbound approach of the intersection of Halawa Valley Street and Koaha Place as no vehicles were counted executing a left-turn movement at this approach



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OAHU COMMUNITY CORRECTIONAL CENTER

YEAR 2023 PEAK HOURS OF TRAFFIC
WITHOUT ALTERNATIVE 3

FIGURE
26

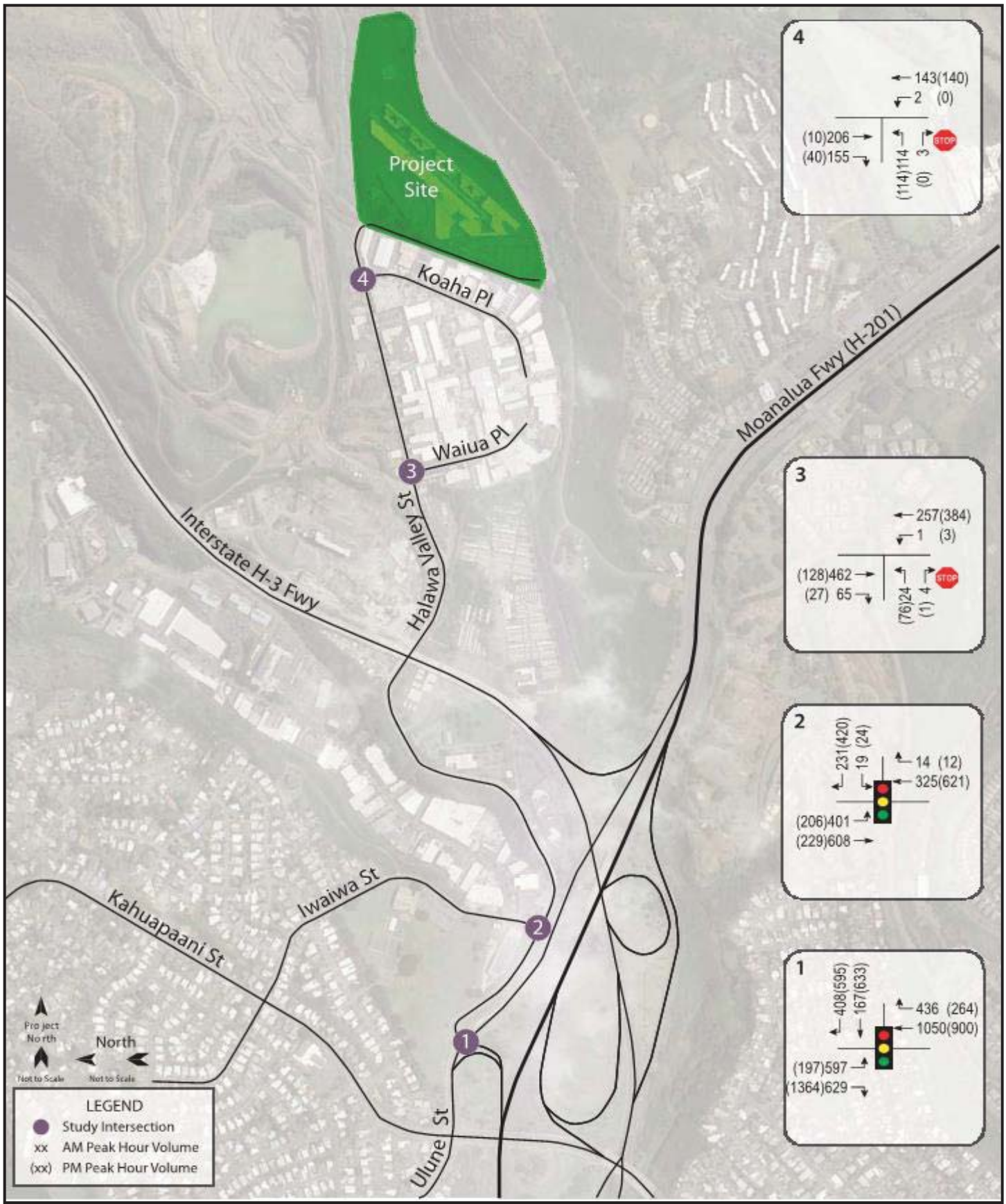
4.4.4 Year 2023 Total Traffic Volumes With Project

The Year 2023 cumulative AM and PM peak hour traffic conditions with the implementation of Alternative 3 are shown on Figure 27 and summarized in Table 8. The existing and projected Year 2023 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix I.

Table 8: Existing and Projected Year 2023 (Without and With Alternative 3)
LOS Traffic Operating Conditions

Intersection	Approach	AM			PM		
		Exist	Year 2023		Exist	Year 2023	
			w/out Proj	w/ Project		w/out Proj	w/ Project
Ulune St/ Halawa Valley St	Eastbound	C	C	C	B	C	B
	Westbound	D	D	D	D	D	D
	Southbound	D	D	D	D	D	D
Halawa Valley St/ Iwaiwa St	Eastbound	B	B	B	B	B	B
	Westbound	C	C	C	C	C	C
	Southbound	C	C	C	C	C	C
Halawa Valley St/ Waiua Pl	Westbound	A	A	A	A	A	A
	Northbound	B	B	C	B	B	B
Halawa Valley St/ Koaha Pl	Westbound	A	A	A	-	-	-
	Northbound	B	B	B	A	A	B

Traffic operations with the implementation of Alternative 3 are generally expected to remain similar to without project conditions despite the addition of site-generated trips. At the intersection of Ulune Street and Halawa Valley Street near the proposed HCF site, traffic operations are expected to continue operating at LOS “D” or better during both peak periods, while those at the intersection of Halawa Valley Street and Iwaiwa Street are expected to continue operating at LOS “C” or better during both peak periods. The other study intersections along Halawa Valley are expected to continue operating similar to without project conditions during both peak periods with the exception of Waiua Place where the northbound approach is expected to change from an LOS “B” to a slightly lower, but still acceptable LOS “C” during the AM peak period. It should be noted that a level of service was not included in the westbound approach of the intersection of Halawa Valley Street and Koaha Place as no vehicles were counted executing a left-turn movement at this approach



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OAHU COMMUNITY CORRECTIONAL CENTER

YEAR 2023 PEAK HOURS OF TRAFFIC
WITH ALTERNATIVE 3

FIGURE
27

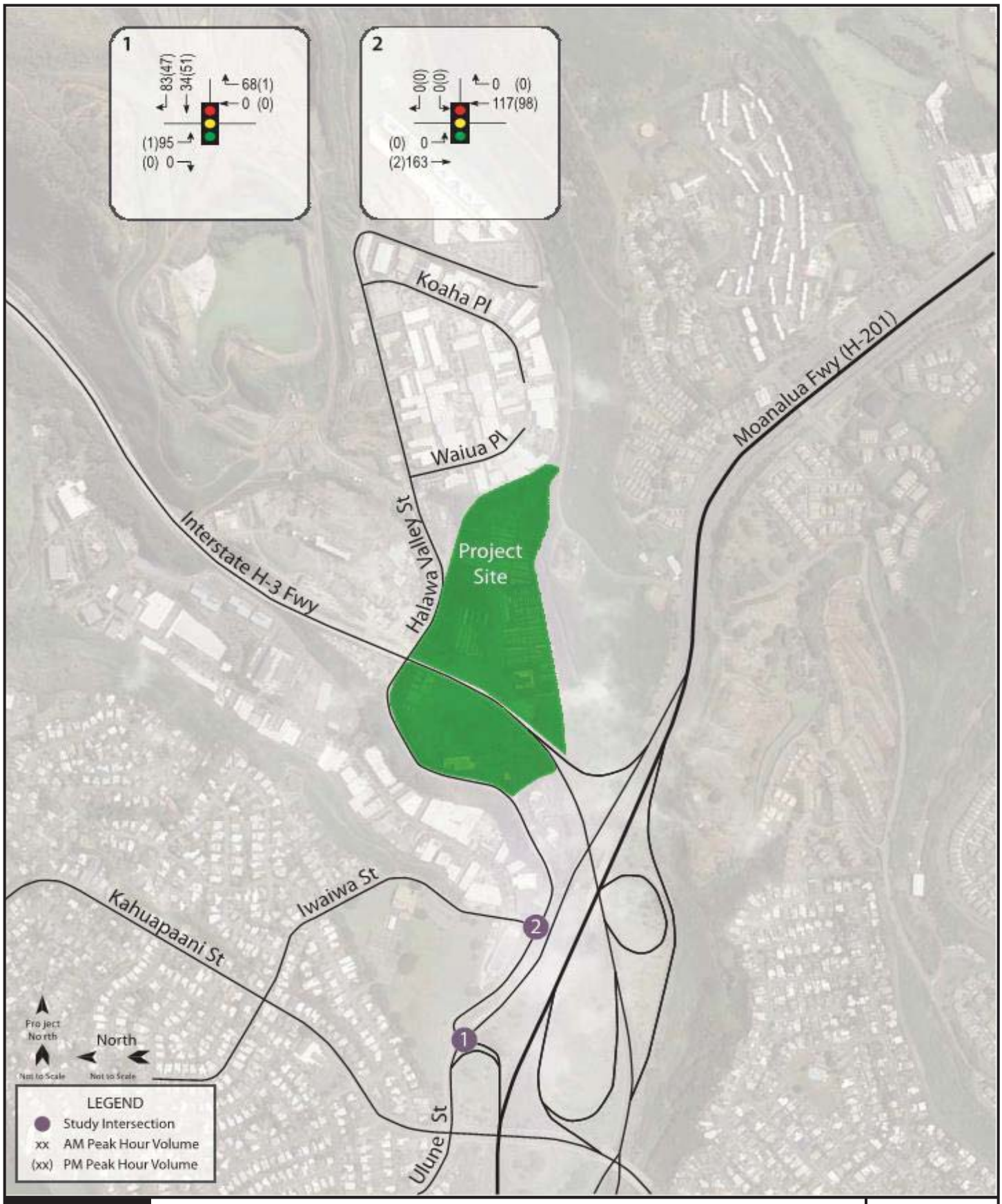
4.5 Alternative 4

4.5.1 Trip Distribution

Figure 28 shows the distribution of site-generated traffic during the AM and PM peak periods under Alternative 4. Primary access to the proposed Animal Quarantine Station site will be provided via a new driveway off Halawa Valley Street. It should be noted that the distribution of site-generated vehicles for Alternative 3 and Alternative 4 are expected to be similar due to the close proximity of the two sites, as well as the limited access points and available routes along Halawa Valley Street. The directional distribution at the intersection of Ulune Street and Halawa Valley Street was assumed to remain similar to existing conditions. As such, 58% of entering trips were assumed to be traveling eastbound while 42% of entering trips were assumed to be traveling westbound during the AM peak period. Similarly, during the PM peak period, 43% of entering trips were assumed to be traveling eastbound while 57% were assumed to be traveling westbound. Exiting trips were also based on the existing directional distribution at the intersection of Ulune Street and Halawa Valley Street. As such, 71% of exiting trips were assumed to be traveling westbound at that intersection while 29% of exiting trips were assumed to be traveling southbound during the AM peak period. Similarly, during the PM peak period, 47% of exiting trips were assumed to be traveling westbound that intersection while 53% of exiting trips were assumed to be traveling southbound

4.5.2 Through Traffic Forecasting Methodology

The travel forecast is based upon historical traffic count data obtained from the State DOT, Highways Division at survey stations located along Halawa Valley Street in the vicinity of the proposed project sites. The historical data indicates relatively stable traffic volumes along the study corridors and, as such, an annual traffic growth rate of approximately 0.5 % was conservatively assumed in the project vicinity. Using 2017 as the Base Year, a growth rate factor of 1.03 was applied to the existing traffic demands in the project vicinity to achieve the projected Year 2023 traffic demands.



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OAHU COMMUNITY CORRECTIONAL CENTER

DISTRIBUTION OF SITE-GENERATED VEHICLES WITH ALTERNATIVE 4

FIGURE 28

4.5.3 Year 2023 Total Traffic Volumes Without Project

The projected Year 2023 AM and PM peak period traffic volumes and operating conditions without the implementation of Alternative 4 is shown in Figure 29, and summarized in Table 9. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix J.

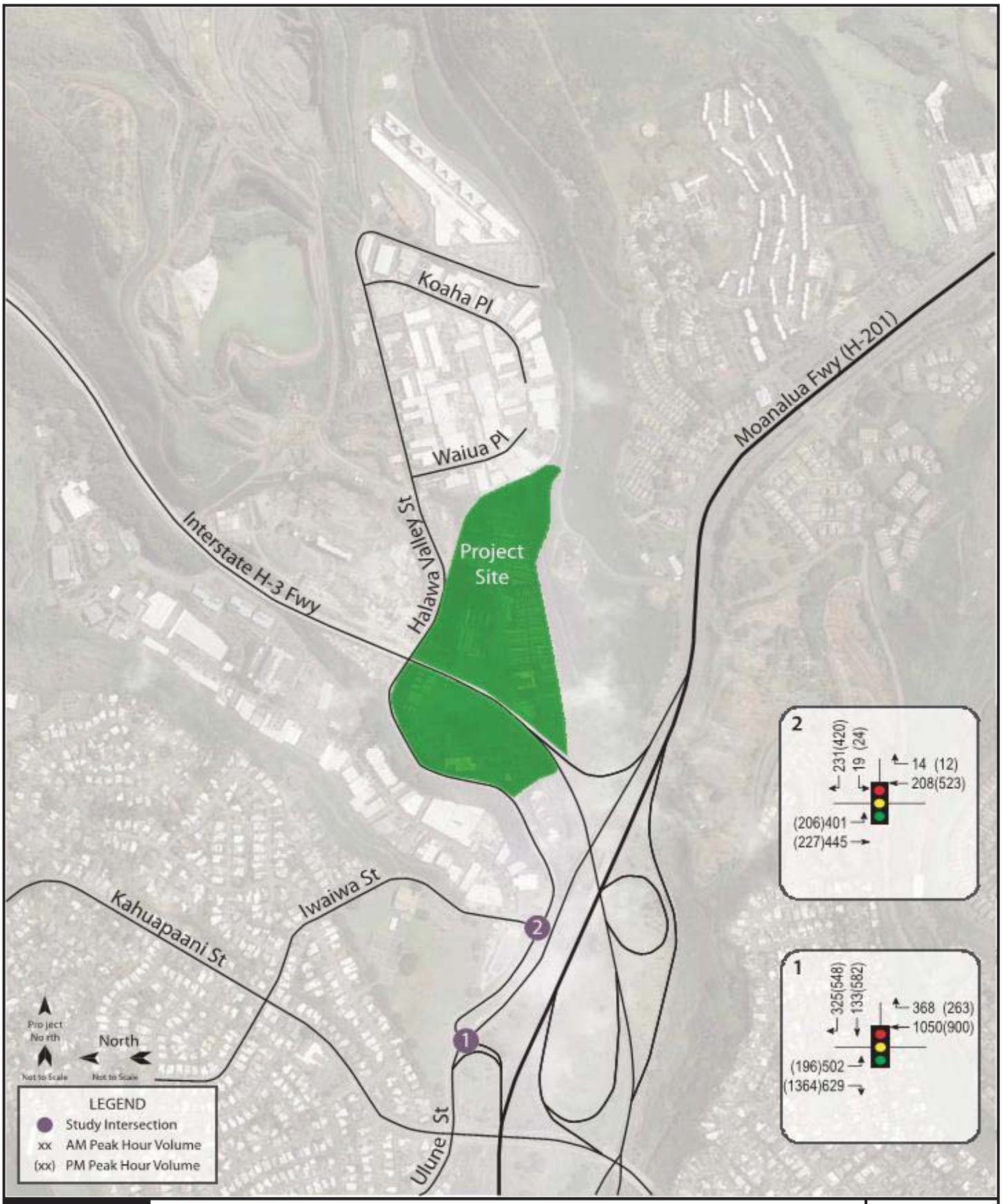
Table 9: Existing and Projected Year 2023 (Without Project) LOS Traffic Operating Conditions

Intersection	Approach	AM		PM	
		Exist	Year 2023 w/o Proj	Exist	Year 2023 w/o Proj
Ulune St/ Halawa Valley St	Eastbound	C	C	C	B
	Westbound	D	D	D	D
	Southbound	D	D	D	D
Halawa Valley St/ Iwaiwa St	Eastbound	B	B	B	B
	Westbound	C	C	C	C
	Southbound	C	C	C	C

Under Year 2023 without project conditions, traffic operations are expected to remain generally similar to existing conditions. At the intersection of Ulune Street and Halawa Valley Street near the proposed Animal Quarantine Station site, traffic operations are expected to continue operating at LOS "D" or better during both peak periods with the exception of the eastbound approach which is expected to change from LOS "B" to LOS "C" during the PM peak period. Along Halawa Valley Street, traffic operations at the intersection with Iwaiwa Street are expected to continue operating at LOS "C" or better during both peak periods.

4.5.4 Year 2023 Total Traffic Volumes With Project

The Year 2023 cumulative AM and PM peak hour traffic conditions with the implementation of Alternative 4 are shown in Figure 30 and summarized in Table 10. The cumulative volumes consist of site-generated traffic superimposed over the Year 2023 projected traffic demands. The existing and projected Year 2023 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix K.

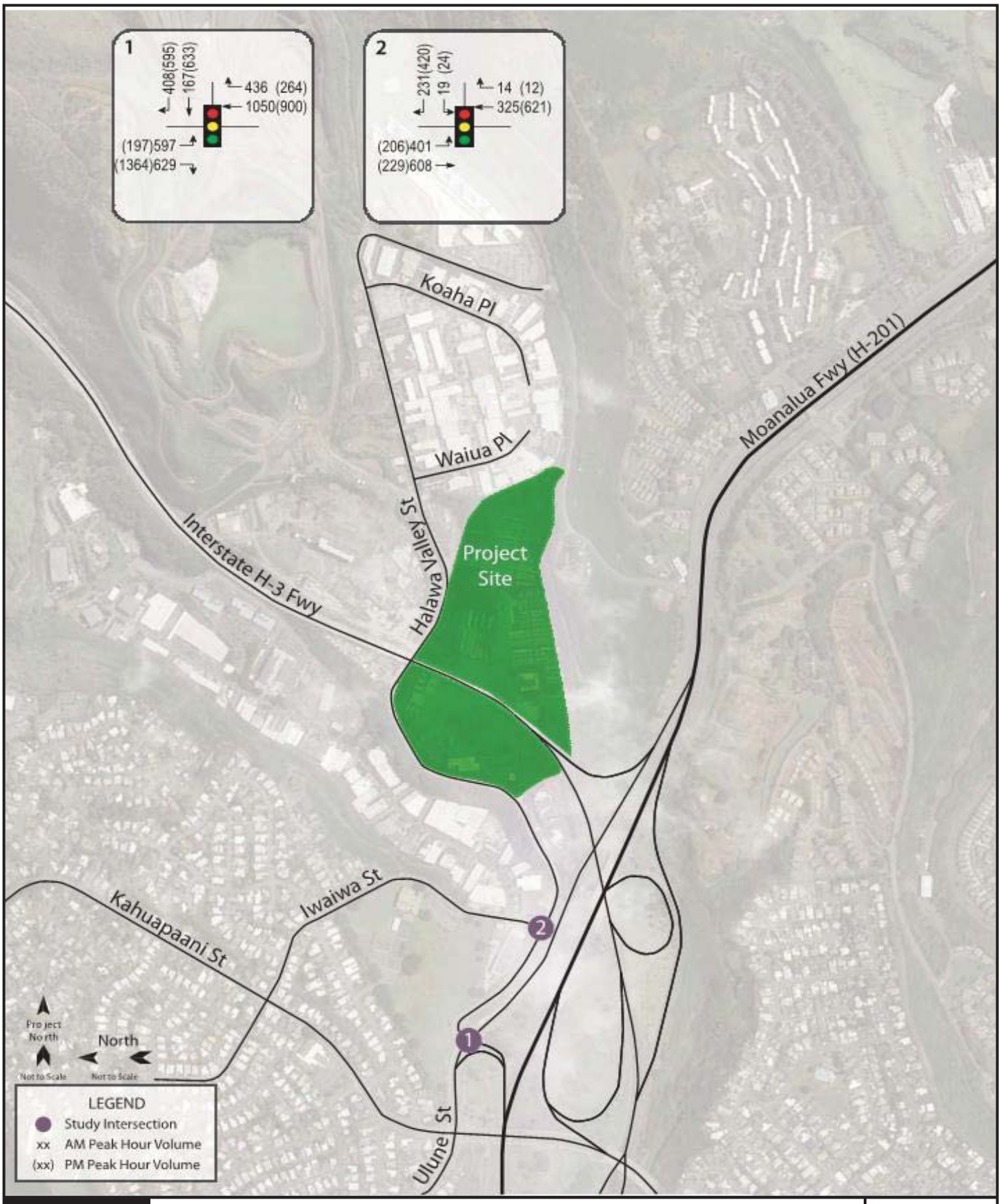


WILSON OKAMOTO CORPORATION

OAHU COMMUNITY CORRECTIONAL CENTER

YEAR 2023 PEAK HOURS OF TRAFFIC
WITHOUT ALTERNATIVE 4

FIGURE
29



WILSON OKAMOTO CORPORATION

OAHU COMMUNITY CORRECTIONAL CENTER

YEAR 2023 PEAK HOURS OF TRAFFIC
WITH ALTERNATIVE 4

FIGURE
30

Table 10: Existing and Projected Year 2023 (Without and With Alternative 4)
LOS Traffic Operating Conditions

Intersection	Approach	AM			PM		
		Exist	Year 2023		Exist	Year 2023	
			w/out Proj	w/ Project		w/out Proj	w/ Project
Ulune St/ Halawa Valley St	Eastbound	C	C	C	B	C	B
	Westbound	D	D	D	D	D	D
	Southbound	D	D	D	D	D	D
Halawa Valley St/ Iwaiwa St	Eastbound	B	B	B	B	B	B
	Westbound	C	C	C	C	C	C
	Southbound	C	C	C	C	C	C

Traffic operations with the implementation of Alternative 4 are generally expected to remain similar to without project conditions despite the addition of site-generated trips determined from Methods 1 and 2. At the intersection of Ulune Street and Halawa Valley Street near the proposed Animal Quarantine Station site, traffic operations are expected to continue operating at LOS "D" or better during both peak periods, while those at the intersection of Halawa Valley Street and Iwaiwa Street are expected to continue operating at LOS "C" during both peak periods.

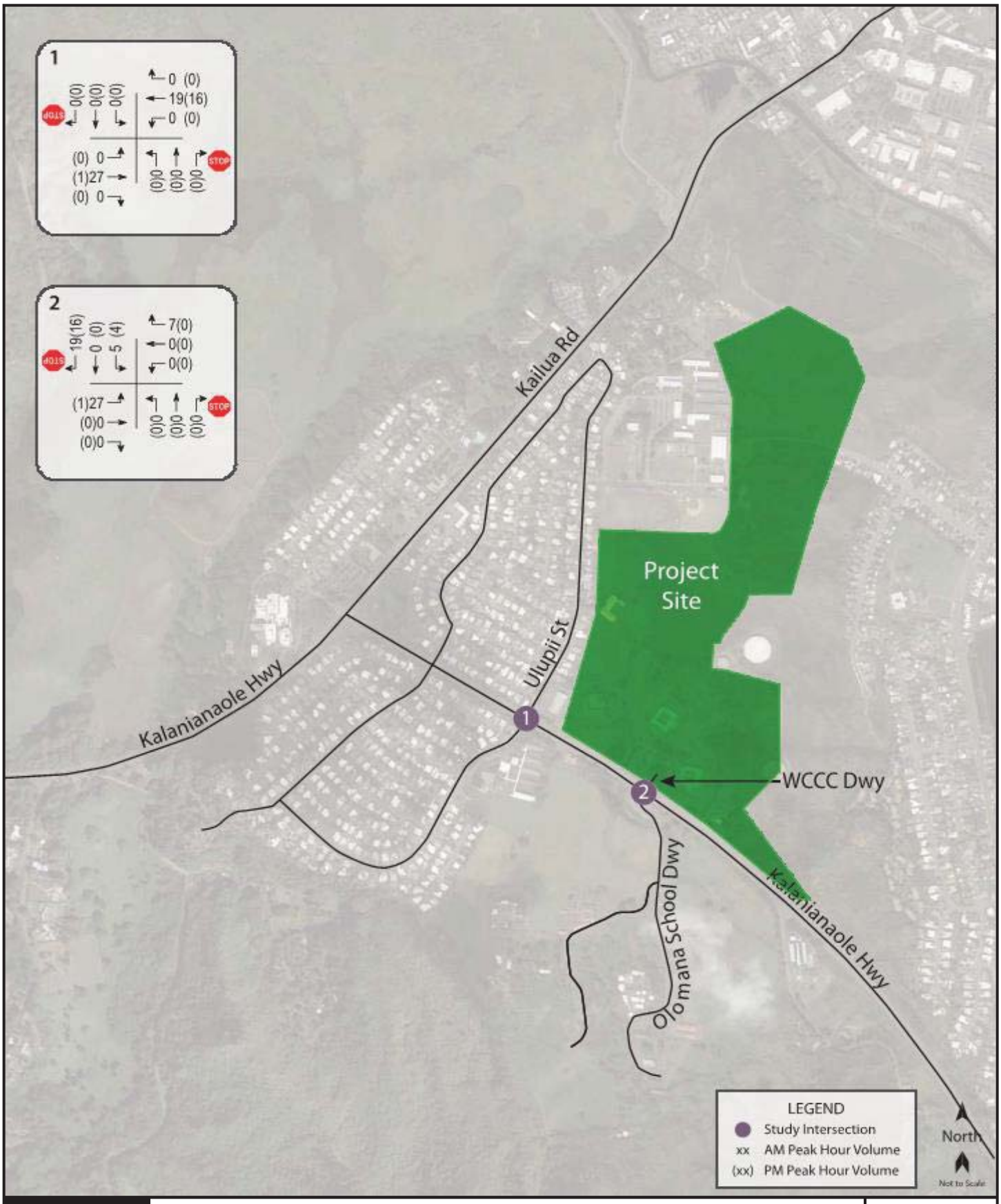
4.6 WCCC Facility

4.6.1 Trip Distribution

Figure 31 shows the distribution of site-generated traffic during the AM and PM peak periods with the proposed expansion of the WCCC facility. Primary access to the WCCC facility in Kailua will continue to be provided via the existing driveway off Kalanianaole Highway. The directional distribution at the intersection of Kalanianaole Highway and the WCCC driveway was assumed to remain similar to existing conditions. As such, 80% were assumed to be traveling to/from the west via Kalanianaole Highway while 20% were assumed to be traveling to/from the east during the AM peak period. Similarly, during the PM peak period, 86% were assumed to be traveling to/from the west via Kalanianaole Highway while 14% were assumed to be traveling to/from the east.

4.6.2 Through Traffic Forecasting Methodology

The travel forecast is based upon historical traffic count data obtained from the State DOT, Highways Division at survey stations located along Kalanianaole Highway (Kailua) in the vicinity of the proposed project site. The historical data indicates relatively stable traffic volumes along the study



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OAHU COMMUNITY CORRECTIONAL CENTER

DISTRIBUTION OF SITE-GENERATED VEHICLES WITH PROJECT

FIGURE 31

corridors and, as such, an annual traffic growth rate of approximately 0.5 % was conservatively assumed in the project vicinity. Using 2017 as the Base Year, a growth rate factor of 1.03 was applied to the existing traffic demands in the project vicinity to achieve the projected Year 2023 traffic demands.

4.6.3 Year 2023 Total Traffic Volumes Without Project

The projected Year 2023 AM and PM peak period traffic volumes and operating conditions without the expansion of WCCC is shown in Figure 32, and summarized in Table 11. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix L.

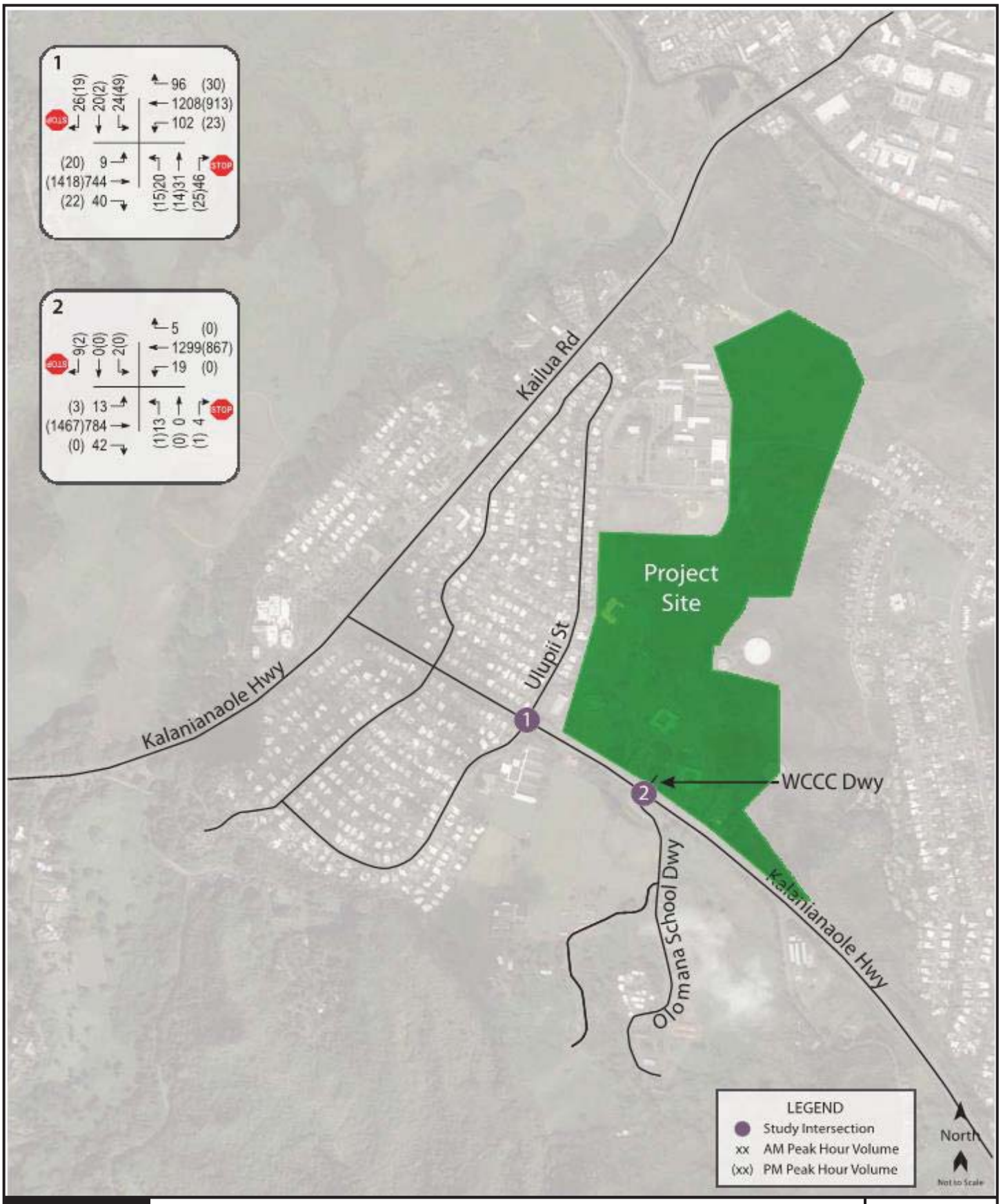
Table 11: Existing and Projected Year 2023 (Without Project) LOS Traffic Operating Conditions

Intersection	Approach	AM		PM	
		Exist	Year 2023 w/o Proj	Exist	Year 2023 w/o Proj
	~~Southbound~~	~~D~~	~~D~~	~~D~~	~~D~~
Kalanianaole Hwy/ Ulupii St	Eastbound	B	B	B	B
	Westbound	B	B	B	B
	Northbound	C	C	C	C
	Southbound	D	D	C	C
Kalanianaole Hwy/WCCC Dwy	Eastbound	B	B	A	A
	Westbound	A	A	-	-
	Northbound	C	C	C	C
	Southbound	B	B	B	B

In the vicinity of the existing WCCC facility, traffic operations at the intersections along Kalanianaole Highway are expected to continue operating at LOS “D” or better during the AM peak period and LOS “C” or better during the PM peak period. It should be noted that a level of service has not been included for the westbound approach of the intersection of Kalanianaole Highway and the WCCC Driveway during the PM peak period because no vehicles were observed executing a left-turn maneuver from this approach during the PM peak period.

4.6.4 Year 2023 Total Traffic Volumes With Project

The Year 2023 cumulative AM and PM peak hour traffic conditions with the expansion of the WCCC facility is shown in Figure 33 and summarized in Table 12. The cumulative volumes consist of site-generated traffic superimposed over the Year 2023 projected traffic demands. The existing and projected Year 2023 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix M.

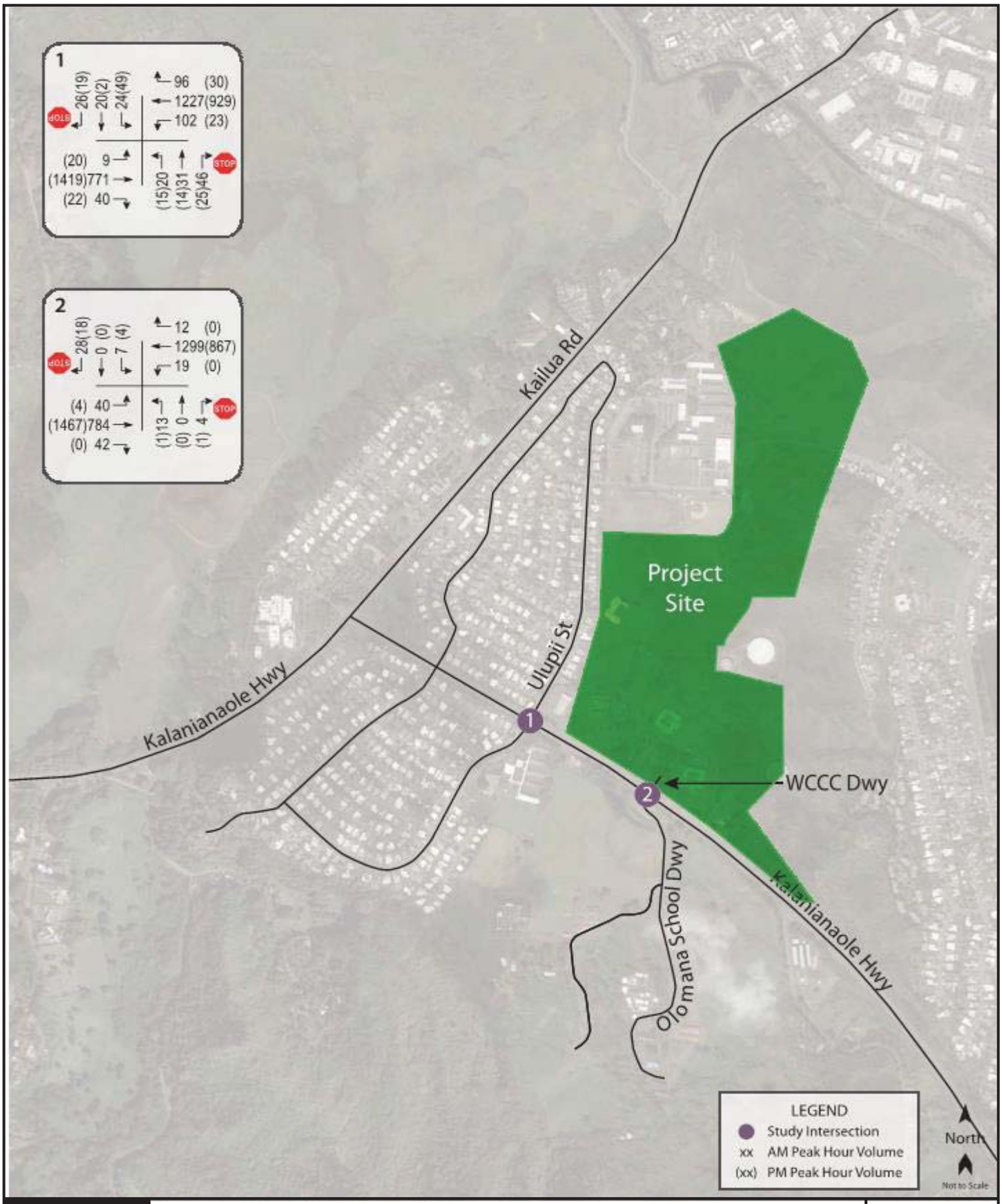


WILSON OKAMOTO CORPORATION

OAHU COMMUNITY CORRECTIONAL CENTER

YEAR 2023 PEAK HOURS OF TRAFFIC
WITHOUT PROJECT

FIGURE
32



WILSON OKAMOTO CORPORATION

OAHU COMMUNITY CORRECTIONAL CENTER

YEAR 2023 PEAK HOURS OF TRAFFIC
WITH PROJECT

FIGURE
33

Table 12: Existing and Projected Year 2023 (Without and With Alternative 4)
LOS Traffic Operating Conditions

Intersection	Approach	AM			PM		
		Exist	Year 2023		Exist	Year 2023	
			w/out Proj	w/ Project		w/out Proj	w/ Project
Kalanianaole Hwy/ Ulupii St	Eastbound	B	B	B	B	B	B
	Westbound	B	B	B	B	B	B
	Northbound	C	C	C	C	C	C
	Southbound	D	D	D	C	C	C
Kalanianaole Hwy/ WCCC Dwy	Eastbound	B	B	B	A	A	B
	Westbound	A	A	B	-	-	-
	Northbound	C	C	C	C	C	C
	Southbound	B	B	C	B	B	C

With the implementation of the proposed project at the WCCC facility traffic operations are generally expected to remain similar to without project conditions despite the addition of site-generated trips. In the vicinity of the existing WCCC facility, traffic operations at the intersections along Kalanianaole Highway are expected to continue operating at LOS "D" or better during the AM peak period and LOS "C" or better during the PM peak period. It should be noted that a level of service has not been included for the westbound approach of the intersection of Kalanianaole Highway and the WCCC Driveway during the PM peak period because no vehicles were observed executing a left-turn maneuver from this approach during the PM peak period.

5.0 RECOMMENDATIONS

Based on the analysis of the traffic data, the following are the recommendations of this study to be incorporated in the project design under each alternative.

1. Maintain sufficient sight distance for motorists to safely enter and exit all project driveways.
2. Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.
3. Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.
4. Provide sufficient turning radii at all project driveways to avoid vehicle encroachments to oncoming traffic lanes.

5. Provide adequate on-site parking with clear way-finding instructions to properly direct employees, visitors, delivery trucks, etc.

6. If access at the entrance to the selected site is controlled, provide sufficient storage for entering vehicles at the parking area access controls (i.e., automatic gate, etc.) to ensure that queues do not extend onto the adjacent public roadways.

7. Update the Traffic Impact Report for the Oahu Community Correctional Center 6-9 months after the project is completed and occupied to verify trip generation, trip distribution, and projected operating conditions.

Based on the analysis of the traffic data and field operations, the following recommendation should be considered during the design phase for the expansion of the WCCC facility.

1. Consider providing acceleration and deceleration lanes on Kalanianole Highway at the project access driveway to maintain through traffic movements on the highway as well as to facilitate turning maneuvers entering and exiting the project site. The specific dimensions and configuration of such shall be coordinated with the State Department of Transportation during the design phase of the project.

6.0 CONCLUSION

The Department of Public Safety is currently considering several alternatives for the Oahu Community Correctional Center to alleviate the facility's overcapacity and anticipate future needs. The alternatives under consideration include either replacing the existing OCCC facility in Kalihi, or constructing a new facility either in the Mililani Technology Park, next to the existing Halawa Correctional Facility, or at the existing Animal Quarantine Station. In addition, each alternative is also expected to transfer a portion of inmates to the existing Women's Community Correctional Center in Kailua. With the implementation of the aforementioned recommendations, each of the four alternatives for the proposed Oahu Community Correctional Center are not expected to have a significant impact on traffic operations in the project vicinity. However, although traffic operations are expected to be similar to without project conditions, an update to the traffic study is recommended to be prepared 6-9 months after the completion of the proposed project to verify projected conditions.

APPENDIX A

EXISTING TRAFFIC COUNT DATA

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: AH, YS
Counter: TU-1958, TU-0652
Weather: Clear

File Name : DillPuu AM
Site Code : 00000000
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Puuhale Road Southbound					Dillingham Boulevard Westbound					Puuhale Road Northbound					Kamehameha Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	5	14	10	0	29	12	72	0	2	86	14	0	13	17	44	0	214	58	0	272	431
06:15 AM	2	17	20	0	39	5	79	0	2	86	17	0	9	13	39	0	219	68	0	287	451
06:30 AM	7	8	12	0	27	7	113	0	2	122	30	0	13	6	49	0	269	76	0	345	543
06:45 AM	4	15	12	0	31	7	95	0	1	103	29	0	14	14	57	0	340	71	0	411	602
Total	18	54	54	0	126	31	359	0	7	397	90	0	49	50	189	0	1042	273	0	1315	2027
07:00 AM	3	14	10	0	27	6	85	0	3	94	24	0	15	4	43	0	374	99	0	473	637
07:15 AM	6	24	16	0	46	7	92	0	6	105	45	0	19	13	77	0	362	84	0	446	674
07:30 AM	10	19	20	0	49	12	87	0	5	104	31	0	18	20	69	0	382	160	0	542	764
07:45 AM	13	17	14	0	44	10	107	0	2	119	27	0	17	11	55	0	387	112	0	499	717
Total	32	74	60	0	166	35	371	0	16	422	127	0	69	48	244	0	1505	455	0	1960	2792
08:00 AM	3	11	10	0	24	6	94	0	2	102	38	0	19	6	63	0	396	104	0	500	689
08:15 AM	9	13	10	0	32	12	102	0	2	116	52	0	21	5	78	0	289	72	0	361	587
08:30 AM	2	8	11	0	21	12	122	0	2	136	32	0	18	14	64	0	255	49	0	304	525
08:45 AM	3	8	11	0	22	7	120	0	0	127	29	0	21	5	55	0	240	74	0	314	518
Total	17	40	42	0	99	37	438	0	6	481	151	0	79	30	260	0	1180	299	0	1479	2319
Grand Total	67	168	156	0	391	103	1168	0	29	1300	368	0	197	128	693	0	3727	1027	0	4754	7138
Apprch %	17.1	43	39.9	0		7.9	89.8	0	2.2		53.1	0	28.4	18.5		0	78.4	21.6	0		
Total %	0.9	2.4	2.2	0	5.5	1.4	16.4	0	0.4	18.2	5.2	0	2.8	1.8	9.7	0	52.2	14.4	0	66.6	

	Puuhale Road Southbound				Dillingham Boulevard Westbound				Puuhale Road Northbound				Kamehameha Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	6	**24**	16	46	7	92	0	99	**45**	0	**19**	**64**	0	362	84	446	655
07:30 AM	10	19	**20**	**49**	**12**	87	0	99	31	0	18	49	0	382	**160**	**542**	**739**
07:45 AM	**13**	17	14	44	10	**107**	0	**117**	27	0	17	44	0	387	112	499	704
08:00 AM	3	11	10	24	6	94	0	100	38	0	19	57	0	**396**	104	500	681
Total Volume	32	71	60	163	35	380	0	415	141	0	73	214	0	1527	460	1987	2779
% App. Total	19.6	43.6	36.8		8.4	91.6	0		65.9	0	34.1		0	76.8	23.2		
PHF	.615	.740	.750	.832	.729	.888	.000	.887	.783	.000	.961	.836	.000	.964	.719	.917	.940

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: AH, YS
Counter: TU-1958, TU-0652
Weather: Clear

File Name : DillPuu PM
Site Code : 00000000
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Puuhale Road Southbound					Dillingham Boulevard Westbound					Puuhale Road Northbound					Kamehameha Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	6	5	20	0	31	4	218	0	1	223	45	0	30	7	82	0	249	34	0	283	619
03:15 PM	4	4	10	0	18	5	181	0	10	196	31	0	21	9	61	0	277	57	0	334	609
03:30 PM	9	5	28	0	42	11	207	0	1	219	53	0	37	18	108	0	395	99	0	494	863
03:45 PM	5	6	23	0	34	9	233	0	2	244	58	0	37	10	105	0	479	87	0	566	949
Total	24	20	81	0	125	29	839	0	14	882	187	0	125	44	356	0	1400	277	0	1677	3040
04:00 PM	7	6	19	0	32	2	192	0	2	196	51	0	42	15	108	0	405	110	0	515	851
04:15 PM	10	2	22	0	34	7	238	0	4	249	75	0	41	7	123	0	480	118	0	598	1004
04:30 PM	16	13	22	0	51	7	240	0	5	252	70	0	79	14	163	0	459	105	0	564	1030
04:45 PM	8	6	24	0	38	6	303	0	2	311	115	0	37	4	156	0	430	28	0	458	963
Total	41	27	87	0	155	22	973	0	13	1008	311	0	199	40	550	0	1774	361	0	2135	3848
05:00 PM	11	11	28	0	50	0	201	30	3	234	64	0	34	11	109	0	394	45	0	439	832
05:15 PM	4	6	13	0	23	3	262	0	0	265	49	0	16	8	73	0	321	42	0	363	724
05:30 PM	8	6	12	0	26	3	208	0	3	214	46	0	20	7	73	0	203	18	0	221	534
Grand Total	88	70	221	0	379	57	2483	30	33	2603	657	0	394	110	1161	0	4092	743	0	4835	8978
Apprch %	23.2	18.5	58.3	0		2.2	95.4	1.2	1.3		56.6	0	33.9	9.5		0	84.6	15.4	0		
Total %	1	0.8	2.5	0	4.2	0.6	27.7	0.3	0.4	29	7.3	0	4.4	1.2	12.9	0	45.6	8.3	0	53.9	

	Puuhale Road Southbound				Dillingham Boulevard Westbound				Puuhale Road Northbound				Kamehameha Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	7	6	19	32	2	192	0	194	51	0	42	93	0	405	110	515	834
04:15 PM	10	2	22	34	**7**	238	0	245	75	0	41	116	0	**480**	**118**	**598**	993
04:30 PM	**16**	**13**	22	**51**	7	240	0	247	70	0	**79**	149	0	459	105	564	**1011**
04:45 PM	8	6	**24**	38	6	**303**	0	**309**	**115**	0	37	**152**	0	430	28	458	957
Total Volume	41	27	87	155	22	973	0	995	311	0	199	510	0	1774	361	2135	3795
% App. Total	26.5	17.4	56.1		2.2	97.8	0		61	0	39		0	83.1	16.9		
PHF	.641	.519	.906	.760	.786	.803	.000	.805	.676	.000	.630	.839	.000	.924	.765	.893	.938

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: DY, EV
Counter: TU-0654, D4-3888
Weather: Clear

File Name : KamLau AM
Site Code : 00000001
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Laumaka Street Southbound					Kamehameha Highway Westbound					OCCC Driveway Northbound					Kamehameha Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	1	0	1	0	2	5	94	6	1	106	13	1	10	0	24	12	254	3	1	270	402
06:15 AM	9	2	1	6	18	3	97	17	5	122	7	1	7	0	15	16	283	8	0	307	462
06:30 AM	4	1	1	0	6	0	141	13	2	156	2	2	4	1	9	14	337	7	0	358	529
06:45 AM	8	2	2	1	13	1	124	19	1	145	6	0	0	1	7	26	394	5	0	425	590
Total	22	5	5	7	39	9	456	55	9	529	28	4	21	2	55	68	1268	23	1	1360	1983
07:00 AM	8	0	2	4	14	3	110	13	9	135	1	0	2	0	3	19	476	3	0	498	650
07:15 AM	9	1	3	6	19	3	162	12	5	182	0	0	2	0	2	13	517	4	0	534	737
07:30 AM	15	1	3	5	24	2	150	16	3	171	0	0	0	0	0	16	511	6	0	533	728
07:45 AM	9	1	2	0	12	2	160	21	7	190	0	0	1	0	1	18	494	6	0	518	721
Total	41	3	10	15	69	10	582	62	24	678	1	0	5	0	6	66	1998	19	0	2083	2836
08:00 AM	5	1	3	2	11	3	138	16	10	167	0	1	1	0	2	18	489	4	0	511	691
08:15 AM	14	0	3	3	20	4	147	15	5	171	1	1	1	0	3	12	359	4	0	375	569
08:30 AM	12	1	4	7	24	4	146	16	8	174	1	1	3	0	5	10	318	2	0	330	533
08:45 AM	10	0	4	1	15	6	127	20	3	156	1	0	3	0	4	15	296	2	0	313	488
Total	41	2	14	13	70	17	558	67	26	668	3	3	8	0	14	55	1462	12	0	1529	2281
Grand Total	104	10	29	35	178	36	1596	184	59	1875	32	7	34	2	75	189	4728	54	1	4972	7100
Apprch %	58.4	5.6	16.3	19.7		1.9	85.1	9.8	3.1		42.7	9.3	45.3	2.7		3.8	95.1	1.1	0		
Total %	1.5	0.1	0.4	0.5	2.5	0.5	22.5	2.6	0.8	26.4	0.5	0.1	0.5	0	1.1	2.7	66.6	0.8	0	70	

	Laumaka Street Southbound				Kamehameha Highway Westbound				OCCC Driveway Northbound				Kamehameha Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	9	**1**	**3**	13	**3**	**162**	12	177	0	0	**2**	**2**	13	**517**	4	**534**	**726**
07:30 AM	**15**	1	3	**19**	2	150	16	168	0	0	0	0	16	511	**6**	533	720
07:45 AM	9	1	2	12	2	160	**21**	**183**	0	0	1	1	**18**	494	6	518	714
08:00 AM	5	1	3	9	3	138	16	157	0	**1**	1	2	18	489	4	511	679
Total Volume	38	4	11	53	10	610	65	685	0	1	4	5	65	2011	20	2096	2839
% App. Total	71.7	7.5	20.8		1.5	89.1	9.5		0	20	80		3.1	95.9	1		
PHF	.633	1.00	.917	.697	.833	.941	.774	.936	.000	.250	.500	.625	.903	.972	.833	.981	.978

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: DY, FS
Counter: TU-0654, D4-3888
Weather: Clear

File Name : KamLau PM
Site Code : 00000002
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Laumaka Street Southbound					Kamehameha Highway Westbound					OCCC Driveway Northbound					Kamehameha Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	10	0	8	4	22	3	249	22	5	279	6	0	3	0	9	11	277	0	0	288	598
03:15 PM	13	0	12	2	27	1	215	16	1	233	3	2	2	0	7	13	385	0	0	398	665
03:30 PM	9	0	5	8	22	1	272	28	1	302	1	2	0	0	3	22	487	1	0	510	837
03:45 PM	15	1	8	0	24	0	255	12	4	271	6	2	2	1	11	20	496	0	0	516	822
Total	47	1	33	14	95	5	991	78	11	1085	16	6	7	1	30	66	1645	1	0	1712	2922
04:00 PM	14	1	11	4	30	0	274	11	3	288	1	1	0	0	2	23	514	0	0	537	857
04:15 PM	15	0	6	2	23	3	281	19	2	305	2	4	2	0	8	16	504	1	0	521	857
04:30 PM	13	0	8	3	24	0	314	12	5	331	5	0	0	0	5	23	492	1	0	516	876
04:45 PM	16	0	9	4	29	3	268	14	1	286	6	0	1	0	7	15	351	2	0	368	690
Total	58	1	34	13	106	6	1137	56	11	1210	14	5	3	0	22	77	1861	4	0	1942	3280
05:00 PM	13	1	9	1	24	1	321	15	2	339	5	0	1	0	6	14	365	1	0	380	749
05:15 PM	15	0	7	2	24	1	263	13	3	280	2	0	3	2	7	13	276	1	0	290	601
05:30 PM	14	1	5	0	20	5	284	12	1	302	3	0	4	0	7	15	225	1	0	241	570
05:45 PM	11	0	4	0	15	1	234	12	14	261	2	0	1	0	3	16	176	1	0	193	472
Total	53	2	25	3	83	8	1102	52	20	1182	12	0	9	2	23	58	1042	4	0	1104	2392
Grand Total	158	4	92	30	284	19	3230	186	42	3477	42	11	19	3	75	201	4548	9	0	4758	8594
Apprch %	55.6	1.4	32.4	10.6		0.5	92.9	5.3	1.2		56	14.7	25.3	4		4.2	95.6	0.2	0		
Total %	1.8	0	1.1	0.3	3.3	0.2	37.6	2.2	0.5	40.5	0.5	0.1	0.2	0	0.9	2.3	52.9	0.1	0	55.4	

	Laumaka Street Southbound				Kamehameha Highway Westbound				OCCC Driveway Northbound				Kamehameha Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	**15**	**1**	8	24	0	255	12	267	**6**	2	**2**	**10**	20	496	0	516	817
04:00 PM	14	1	**11**	**26**	0	274	11	285	1	1	0	2	**23**	**514**	0	**537**	850
04:15 PM	15	0	6	21	**3**	281	**19**	303	2	**4**	2	8	16	504	**1**	521	853
04:30 PM	13	0	8	21	0	**314**	12	**326**	5	0	0	5	23	492	1	516	**868**
Total Volume	57	2	33	92	3	1124	54	1181	14	7	4	25	82	2006	2	2090	3388
% App. Total	62	2.2	35.9		0.3	95.2	4.6		56	28	16		3.9	96	0.1		
PHF	.950	.500	.750	.885	.250	.895	.711	.906	.583	.438	.500	.625	.891	.976	.500	.973	.976

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: PA
Counter: D4-5677
Weather: Clear

File Name : KamOCCC AM
Site Code : 00000005
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Kamehameha Highway Westbound					OCCC Visitor Parking Driveway Northbound					Kamehameha Highway Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	2
06:15 AM	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	2
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	2	0	2	0	4	0	0	1	0	1	5
07:00 AM	0	1	0	0	0	1	1	0	0	0	1	0	0	4	0	4	6
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	3
07:45 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	3	0	3	4
Total	0	2	0	0	0	2	1	0	0	0	1	0	0	11	0	11	14
08:00 AM	0	0	0	0	0	0	1	0	3	0	4	0	0	2	0	2	6
08:15 AM	0	1	0	0	0	1	0	0	1	0	1	0	0	1	0	1	3
08:30 AM	0	1	0	0	0	1	0	0	3	0	3	0	0	1	0	1	5
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	2	0	0	0	2	1	0	7	0	8	0	0	5	0	5	15
Grand Total	0	4	0	0	0	4	4	0	9	0	13	0	0	17	0	17	34
Apprch %		100	0	0	0		30.8	0	69.2	0		0	0	100	0		
Total %	0	11.8	0	0	0	11.8	11.8	0	26.5	0	38.2	0	0	50	0	50	

	Southbound	Kamehameha Highway Westbound				OCCC Visitor Parking Driveway Northbound				Kamehameha Highway Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:45 AM														
07:45 AM	0	**1**	0	0	**1**	0	0	0	0	0	0	**3**	**3**	4
08:00 AM	0	0	0	0	0	**1**	0	**3**	**4**	0	0	2	2	**6**
08:15 AM	0	1	0	0	1	0	0	1	1	0	0	1	1	3
08:30 AM	0	1	0	0	1	0	0	3	3	0	0	1	1	5
Total Volume	0	3	0	0	3	1	0	7	8	0	0	7	7	18
% App. Total		100	0	0		12.5	0	87.5		0	0	100		
PHF	.000	.750	.000	.000	.750	.250	.000	.583	.500	.000	.000	.583	.583	.750

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: PA
Counter: D4-5677
Weather: Clear

File Name : KamOCCC PM
Site Code : 00000005
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Kamehameha Highway Westbound					OCCC Visitor Parking Driveway Northbound					Kamehameha Highway Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
03:30 PM	0	0	0	0	0	0	1	0	3	0	4	0	0	2	0	2	6
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	3	0	4	0	0	3	0	3	7
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	2
Total	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Grand Total	0	0	0	0	0	0	1	0	4	0	5	0	0	4	1	5	10
Apprch %		0	0	0	0		20	0	80	0		0	0	80	20		
Total %	0	0	0	0	0	0	10	0	40	0	50	0	0	40	10	50	

	Southbound	Kamehameha Highway Westbound				OCCC Visitor Parking Driveway Northbound				Kamehameha Highway Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:00 PM														
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	1
03:30 PM	0	0	0	0	0	**1**	0	**3**	**4**	0	0	**2**	**2**	**6**
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	1	0	3	4	0	0	3	3	7
% App. Total		0	0	0		25	0	75		0	0	100		
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.250	.000	.000	.375	.375	.292

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: CK, HM
Counter: TU-2049, TU-1957
Weather: Clear

File Name : NimPuu AM
Site Code : 00000003
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Puuhale Road Southbound					Nimitz Highway Westbound					Puuhale Road Northbound					Nimitz Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	9	28	16	0	53	0	234	11	15	260	9	11	10	13	43	6	520	48	0	574	930
06:15 AM	4	21	19	1	45	0	247	8	18	273	11	11	31	13	66	3	634	71	0	708	1092
06:30 AM	15	34	12	1	62	0	249	19	12	280	10	19	21	3	53	5	727	45	0	777	1172
06:45 AM	16	30	7	1	54	0	344	19	11	374	8	16	18	2	44	9	804	46	0	859	1331
Total	44	113	54	3	214	0	1074	57	56	1187	38	57	80	31	206	23	2685	210	0	2918	4525
07:00 AM	20	35	10	0	65	0	320	14	1	335	5	11	24	0	40	9	936	45	0	990	1430
07:15 AM	22	28	14	0	64	0	321	20	6	347	8	22	18	1	49	7	943	19	0	969	1429
07:30 AM	33	36	8	0	77	0	341	17	15	373	10	18	13	4	45	6	802	26	0	834	1329
07:45 AM	15	55	10	0	80	0	321	22	5	348	12	24	14	3	53	7	676	19	0	702	1183
Total	90	154	42	0	286	0	1303	73	27	1403	35	75	69	8	187	29	3357	109	0	3495	5371
08:00 AM	21	37	12	0	70	0	355	22	7	384	8	7	18	1	34	8	613	18	0	639	1127
08:15 AM	17	23	8	1	49	0	301	24	4	329	13	18	15	0	46	11	778	34	0	823	1247
08:30 AM	20	41	14	0	75	0	329	16	8	353	8	11	20	1	40	13	677	40	0	730	1198
08:45 AM	16	32	17	0	65	0	250	16	2	268	9	11	9	1	30	8	499	30	0	537	900
Total	74	133	51	1	259	0	1235	78	21	1334	38	47	62	3	150	40	2567	122	0	2729	4472
Grand Total	208	400	147	4	759	0	3612	208	104	3924	111	179	211	42	543	92	8609	441	0	9142	14368
Apprch %	27.4	52.7	19.4	0.5		0	92	5.3	2.7		20.4	33	38.9	7.7		1	94.2	4.8	0		
Total %	1.4	2.8	1	0	5.3	0	25.1	1.4	0.7	27.3	0.8	1.2	1.5	0.3	3.8	0.6	59.9	3.1	0	63.6	

	Puuhale Road Southbound				Nimitz Highway Westbound				Puuhale Road Northbound				Nimitz Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:45 AM																	
06:45 AM	16	30	7	53	0	**344**	19	**363**	8	16	18	42	**9**	804	**46**	859	1317
07:00 AM	20	35	10	65	0	320	14	334	5	11	**24**	40	9	936	45	**990**	**1429**
07:15 AM	22	28	**14**	64	0	321	**20**	341	8	**22**	18	**48**	7	**943**	19	969	1422
07:30 AM	**33**	**36**	8	**77**	0	341	17	358	**10**	18	13	41	6	802	26	834	1310
Total Volume	91	129	39	259	0	1326	70	1396	31	67	73	171	31	3485	136	3652	5478
% App. Total	35.1	49.8	15.1		0	95	5		18.1	39.2	42.7		0.8	95.4	3.7		
PHF	.689	.896	.696	.841	.000	.964	.875	.961	.775	.761	.760	.891	.861	.924	.739	.922	.958

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: CK, JT
Counter: TU-2049, TU-1957
Weather: Clear

File Name : NimPuu PM
Site Code : 00000003
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Puuhale Road Southbound					Nimitz Highway Westbound					Puuhale Road Northbound					Nimitz Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	13	21	0	0	34	18	488	17	2	525	24	34	11	4	73	12	489	19	0	520	1152
03:15 PM	22	21	1	0	44	29	510	7	11	557	24	29	21	0	74	10	502	20	0	532	1207
03:30 PM	18	29	20	0	67	23	627	16	10	676	18	41	21	2	82	3	460	12	0	475	1300
03:45 PM	5	37	10	0	52	8	647	17	9	681	16	31	21	0	68	8	501	22	0	531	1332
Total	58	108	31	0	197	78	2272	57	32	2439	82	135	74	6	297	33	1952	73	0	2058	4991
04:00 PM	17	20	15	0	52	19	665	15	7	706	31	38	20	2	91	2	475	13	0	490	1339
04:15 PM	15	30	9	0	54	7	638	18	0	663	29	41	19	0	89	13	505	22	0	540	1346
04:30 PM	11	29	8	0	48	12	628	13	6	659	31	44	15	0	90	11	571	4	0	586	1383
04:45 PM	18	29	9	0	56	10	618	30	16	674	25	32	12	0	69	14	563	18	0	595	1394
Total	61	108	41	0	210	48	2549	76	29	2702	116	155	66	2	339	40	2114	57	0	2211	5462
05:00 PM	17	16	9	0	42	10	682	15	5	712	21	37	23	6	87	7	542	25	0	574	1415
05:15 PM	13	23	9	0	45	12	626	21	8	667	25	22	12	3	62	12	562	15	0	589	1363
05:30 PM	10	9	6	0	25	10	686	18	5	719	15	17	9	0	41	4	507	17	0	528	1313
05:45 PM	16	9	7	0	32	10	616	12	2	640	21	17	4	0	42	9	410	17	0	436	1150
Total	56	57	31	0	144	42	2610	66	20	2738	82	93	48	9	232	32	2021	74	0	2127	5241
Grand Total	175	273	103	0	551	168	7431	199	81	7879	280	383	188	17	868	105	6087	204	0	6396	15694
Apprch %	31.8	49.5	18.7	0		2.1	94.3	2.5	1		32.3	44.1	21.7	2		1.6	95.2	3.2	0		
Total %	1.1	1.7	0.7	0	3.5	1.1	47.3	1.3	0.5	50.2	1.8	2.4	1.2	0.1	5.5	0.7	38.8	1.3	0	40.8	

	Puuhale Road Southbound				Nimitz Highway Westbound				Puuhale Road Northbound				Nimitz Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	11	**29**	8	48	**12**	628	13	653	**31**	**44**	15	**90**	11	**571**	4	586	1377
04:45 PM	**18**	29	**9**	**56**	10	618	**30**	658	25	32	12	69	**14**	563	18	**595**	1378
05:00 PM	17	16	9	42	10	**682**	15	**707**	21	37	**23**	81	7	542	**25**	574	**1404**
05:15 PM	13	23	9	45	12	626	21	659	25	22	12	59	12	562	15	589	1352
Total Volume	59	97	35	191	44	2554	79	2677	102	135	62	299	44	2238	62	2344	5511
% App. Total	30.9	50.8	18.3		1.6	95.4	3		34.1	45.2	20.7		1.9	95.5	2.6		
PHF	.819	.836	.972	.853	.917	.936	.658	.947	.823	.767	.674	.831	.786	.980	.620	.985	.981

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: BE, GH
Counter: TU-0649, TU-2050
Weather: Clear

File Name : NimSand AM
Site Code : 00000004
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Nimitz Highway Westbound					Sand Island Access Road Northbound					Nimitz Highway Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	73	167	0	6	246	67	0	27	6	100	0	615	369	0	984	1330
06:15 AM	0	65	220	0	3	288	92	0	37	3	132	0	766	332	0	1098	1518
06:30 AM	0	86	226	0	5	317	95	0	28	9	132	0	828	302	0	1130	1579
06:45 AM	0	89	268	0	7	364	124	0	38	6	168	0	880	264	0	1144	1676
Total	0	313	881	0	21	1215	378	0	130	24	532	0	3089	1267	0	4356	6103
07:00 AM	0	72	267	0	1	340	120	0	41	2	163	0	1057	270	0	1327	1830
07:15 AM	0	64	278	0	4	346	131	0	37	8	176	0	992	182	0	1174	1696
07:30 AM	0	93	290	0	7	390	95	0	38	12	145	0	797	201	0	998	1533
07:45 AM	0	87	294	0	4	385	115	0	36	1	152	0	776	202	0	978	1515
Total	0	316	1129	0	16	1461	461	0	152	23	636	0	3622	855	0	4477	6574
08:00 AM	0	88	255	0	2	345	83	0	44	2	129	0	788	200	0	988	1462
08:15 AM	0	62	278	0	4	344	93	0	40	5	138	0	812	246	0	1058	1540
08:30 AM	0	88	309	0	3	400	98	0	36	3	137	0	690	213	0	903	1440
08:45 AM	0	63	225	0	0	288	118	0	42	1	161	0	554	181	0	735	1184
Total	0	301	1067	0	9	1377	392	0	162	11	565	0	2844	840	0	3684	5626
Grand Total	0	930	3077	0	46	4053	1231	0	444	58	1733	0	9555	2962	0	12517	18303
Apprch %		22.9	75.9	0	1.1		71	0	25.6	3.3		0	76.3	23.7	0		
Total %	0	5.1	16.8	0	0.3	22.1	6.7	0	2.4	0.3	9.5	0	52.2	16.2	0	68.4	

	Southbound	Nimitz Highway Westbound				Sand Island Access Road Northbound				Nimitz Highway Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 06:30 AM														
06:30 AM	0	86	226	0	312	95	0	28	123	0	828	**302**	1130	1565
06:45 AM	0	**89**	268	0	**357**	124	0	38	162	0	880	264	1144	1663
07:00 AM	0	72	267	0	339	120	0	**41**	161	0	**1057**	270	**1327**	**1827**
07:15 AM	0	64	**278**	0	342	**131**	0	37	**168**	0	992	182	1174	1684
Total Volume	0	311	1039	0	1350	470	0	144	614	0	3757	1018	4775	6739
% App. Total		23	77	0		76.5	0	23.5		0	78.7	21.3		
PHF	.000	.874	.934	.000	.945	.897	.000	.878	.914	.000	.889	.843	.900	.922

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: BE, GH
Counter: TU-0649, TU-2050
Weather: Clear

File Name : NimSand PM
Site Code : 00000004
Start Date : 4/11/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Nimtiz Highway Westbound					Sand Island Access Road Northbound					Nimtiz Highway Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	0	43	519	0	10	572	219	0	50	16	285	0	481	138	0	619	1476
03:15 PM	0	39	561	0	5	605	191	0	56	3	250	0	548	170	0	718	1573
03:30 PM	0	70	586	0	5	661	185	0	58	4	247	0	518	139	0	657	1565
03:45 PM	0	45	648	0	8	701	185	0	52	8	245	0	553	135	0	688	1634
Total	0	197	2314	0	28	2539	780	0	216	31	1027	0	2100	582	0	2682	6248
04:00 PM	0	39	689	0	5	733	178	0	49	5	232	0	534	135	0	669	1634
04:15 PM	0	34	651	0	5	690	151	2	71	8	232	0	507	131	0	638	1560
04:30 PM	0	36	616	0	12	664	163	0	62	16	241	0	552	118	0	670	1575
04:45 PM	0	31	645	0	4	680	127	0	59	2	188	0	555	143	0	698	1566
Total	0	140	2601	0	26	2767	619	2	241	31	893	0	2148	527	0	2675	6335
05:00 PM	0	45	667	0	2	714	141	0	55	3	199	0	524	80	0	604	1517
05:15 PM	0	28	636	0	0	664	132	0	56	0	188	0	562	77	0	639	1491
05:30 PM	0	43	626	0	6	675	89	0	45	6	140	0	489	78	0	567	1382
05:45 PM	0	38	605	0	4	647	85	0	32	6	123	0	441	61	0	502	1272
Total	0	154	2534	0	12	2700	447	0	188	15	650	0	2016	296	0	2312	5662
Grand Total	0	491	7449	0	66	8006	1846	2	645	77	2570	0	6264	1405	0	7669	18245
Apprch %		6.1	93	0	0.8		71.8	0.1	25.1	3		0	81.7	18.3	0		
Total %	0	2.7	40.8	0	0.4	43.9	10.1	0	3.5	0.4	14.1	0	34.3	7.7	0	42	

	Southbound	Nimtiz Highway Westbound				Sand Island Access Road Northbound				Nimtiz Highway Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:15 PM														
03:15 PM	0	39	561	0	600	**191**	0	56	**247**	0	548	**170**	**718**	1565
03:30 PM	0	**70**	586	0	656	185	0	**58**	243	0	518	139	657	1556
03:45 PM	0	45	648	0	693	185	0	52	237	0	**553**	135	688	1618
04:00 PM	0	39	**689**	0	**728**	178	0	49	227	0	534	135	669	**1624**
Total Volume	0	193	2484	0	2677	739	0	215	954	0	2153	579	2732	6363
% App. Total		7.2	92.8	0		77.5	0	22.5		0	78.8	21.2		
PHF	.000	.689	.901	.000	.919	.967	.000	.927	.966	.000	.973	.851	.951	.980

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: AH, GH
Counter: D4-3888, TU-0652
Weather: Clear

File Name : KamLei AM
Site Code : 00000001
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Kamehameha Highway Southbound					Leilehua Road Westbound					Kamehameha Highway Northbound					Eastbound	
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
06:00 AM	59	54	0	0	113	4	0	105	0	109	0	127	48	0	175	0	397
06:15 AM	39	59	0	0	98	9	0	77	0	86	0	105	26	0	131	0	315
06:30 AM	48	69	0	1	118	10	0	84	2	96	0	130	43	0	173	0	387
06:45 AM	79	86	0	2	167	8	0	110	1	119	0	136	35	0	171	0	457
Total	225	268	0	3	496	31	0	376	3	410	0	498	152	0	650	0	1556
07:00 AM	44	88	0	0	132	12	0	105	0	117	0	164	38	0	202	0	451
07:15 AM	81	111	0	0	192	18	0	114	0	132	0	133	47	0	180	0	504
07:30 AM	79	127	0	1	207	27	0	114	1	142	0	154	54	0	208	0	557
07:45 AM	120	118	0	0	238	17	0	81	0	98	0	153	66	0	219	0	555
Total	324	444	0	1	769	74	0	414	1	489	0	604	205	0	809	0	2067
08:00 AM	68	96	0	0	164	23	0	86	0	109	0	126	54	0	180	0	453
08:15 AM	69	107	0	0	176	22	0	74	0	96	0	112	26	0	138	0	410
08:30 AM	61	73	0	0	134	14	0	95	0	109	0	118	29	0	147	0	390
08:45 AM	73	85	0	0	158	15	0	74	0	89	0	102	24	0	126	0	373
Total	271	361	0	0	632	74	0	329	0	403	0	458	133	0	591	0	1626
Grand Total	820	1073	0	4	1897	179	0	1119	4	1302	0	1560	490	0	2050	0	5249
Apprch %	43.2	56.6	0	0.2		13.7	0	85.9	0.3		0	76.1	23.9	0			
Total %	15.6	20.4	0	0.1	36.1	3.4	0	21.3	0.1	24.8	0	29.7	9.3	0	39.1	0	

	Kamehameha Highway Southbound				Leilehua Road Westbound				Kamehameha Highway Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:15 AM														
07:15 AM	81	111	0	192	18	0	**114**	132	0	133	47	180	0	504
07:30 AM	79	**127**	0	206	**27**	0	114	**141**	0	**154**	54	208	0	**555**
07:45 AM	**120**	118	0	**238**	17	0	81	98	0	153	**66**	**219**	0	555
08:00 AM	68	96	0	164	23	0	86	109	0	126	54	180	0	453
Total Volume	348	452	0	800	85	0	395	480	0	566	221	787	0	2067
% App. Total	43.5	56.5	0		17.7	0	82.3		0	71.9	28.1			
PHF	.725	.890	.000	.840	.787	.000	.866	.851	.000	.919	.837	.898	.000	.931

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: FS, GH
Counter: D4-3888, TU-0652
Weather: Clear

File Name : KamLei PM
Site Code : 00000001
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Kamehameha Highway Southbound					Leilehua Road Westbound					Kamehameha Highway Northbound					Eastbound	
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
03:00 PM	114	115	0	0	229	22	0	20	0	42	0	121	33	0	154	0	425
03:15 PM	85	156	0	0	241	32	0	21	1	54	0	129	37	0	166	0	461
03:30 PM	136	157	0	0	293	25	0	32	0	57	0	81	29	0	110	0	460
03:45 PM	93	156	0	0	249	29	0	30	0	59	0	129	36	0	165	0	473
Total	428	584	0	0	1012	108	0	103	1	212	0	460	135	0	595	0	1819
04:00 PM	135	162	0	0	297	36	0	26	0	62	0	104	19	0	123	0	482
04:15 PM	86	171	0	0	257	32	0	38	1	71	0	122	40	0	162	0	490
04:30 PM	108	156	0	0	264	35	0	41	0	76	0	110	28	0	138	0	478
04:45 PM	98	170	0	0	268	41	0	39	0	80	0	100	31	0	131	0	479
Total	427	659	0	0	1086	144	0	144	1	289	0	436	118	0	554	0	1929
05:00 PM	111	144	0	0	255	31	0	53	0	84	0	91	25	0	116	0	455
05:15 PM	104	161	0	0	265	22	0	41	0	63	0	96	29	0	125	0	453
05:30 PM	89	163	0	0	252	27	0	30	0	57	0	125	28	0	153	0	462
05:45 PM	62	126	0	0	188	23	0	40	0	63	0	104	30	0	134	0	385
Total	366	594	0	0	960	103	0	164	0	267	0	416	112	0	528	0	1755
Grand Total	1221	1837	0	0	3058	355	0	411	2	768	0	1312	365	0	1677	0	5503
Apprch %	39.9	60.1	0	0		46.2	0	53.5	0.3		0	78.2	21.8	0			
Total %	22.2	33.4	0	0	55.6	6.5	0	7.5	0	14	0	23.8	6.6	0	30.5	0	

	Kamehameha Highway Southbound				Leilehua Road Westbound				Kamehameha Highway Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 04:00 PM														
04:00 PM	**135**	162	0	**297**	36	0	26	62	0	104	19	123	0	482
04:15 PM	86	**171**	0	257	32	0	38	70	0	**122**	**40**	**162**	0	**489**
04:30 PM	108	156	0	264	35	0	**41**	76	0	110	28	138	0	478
04:45 PM	98	170	0	268	**41**	0	39	**80**	0	100	31	131	0	479
Total Volume	427	659	0	1086	144	0	144	288	0	436	118	554	0	1928
% App. Total	39.3	60.7	0		50	0	50		0	78.7	21.3			
PHF	.791	.963	.000	.914	.878	.000	.878	.900	.000	.893	.738	.855	.000	.986

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: BE
Counter: D4-5676
Weather: Clear

File Name : H-2 On-Ramp AM
Site Code : 00000002
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Leilehua Road Westbound					Northbound	Leilehua Road Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	55	99	0	0	154	0	0	28	69	0	97	251
06:15 AM	0	47	83	0	0	130	0	0	35	32	0	67	197
06:30 AM	0	48	95	0	0	143	0	0	34	57	0	91	234
06:45 AM	0	50	106	0	0	156	0	0	47	44	0	91	247
Total	0	200	383	0	0	583	0	0	144	202	0	346	929
07:00 AM	0	70	107	0	0	177	0	0	31	45	0	76	253
07:15 AM	0	54	129	0	0	183	0	0	76	53	0	129	312
07:30 AM	0	50	130	0	0	180	0	0	92	38	0	130	310
07:45 AM	0	52	106	0	0	158	0	0	124	44	0	168	326
Total	0	226	472	0	0	698	0	0	323	180	0	503	1201
08:00 AM	0	66	104	0	0	170	0	0	71	38	0	109	279
08:15 AM	0	48	91	0	0	139	0	0	42	52	0	94	233
08:30 AM	0	48	114	0	0	162	0	0	48	40	0	88	250
08:45 AM	0	43	89	0	0	132	0	0	48	39	0	87	219
Total	0	205	398	0	0	603	0	0	209	169	0	378	981
Grand Total	0	631	1253	0	0	1884	0	0	676	551	0	1227	3111
Apprch %		33.5	66.5	0	0			0	55.1	44.9	0		
Total %	0	20.3	40.3	0	0	60.6	0	0	21.7	17.7	0	39.4	

	Southbound	Leilehua Road Westbound				Northbound	Leilehua Road Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 07:15 AM											
07:15 AM	0	54	129	0	**183**	0	0	76	**53**	129	312
07:30 AM	0	50	**130**	0	180	0	0	92	38	130	310
07:45 AM	0	52	106	0	158	0	0	**124**	44	**168**	**326**
08:00 AM	0	**66**	104	0	170	0	0	71	38	109	279
Total Volume	0	222	469	0	691	0	0	363	173	536	1227
% App. Total		32.1	67.9	0			0	67.7	32.3		
PHF	.000	.841	.902	.000	.944	.000	.000	.732	.816	.798	.941

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: BE
Counter: D4-5676
Weather: Clear

File Name : H-2 On-Ramp PM
Site Code : 00000002
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Leilehua Road Westbound					Northbound	Leilehua Road Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	0	66	79	0	0	145	0	0	59	69	0	128	273
03:15 PM	0	65	66	0	0	131	0	0	49	81	0	130	261
03:30 PM	0	76	78	0	0	154	0	0	45	117	0	162	316
03:45 PM	0	67	74	0	0	141	0	0	63	89	0	152	293
Total	0	274	297	0	0	571	0	0	216	356	0	572	1143
04:00 PM	0	90	85	0	0	175	0	0	53	89	0	142	317
04:15 PM	0	53	72	0	0	125	0	0	59	63	0	122	247
04:30 PM	0	92	83	0	0	175	0	0	58	75	0	133	308
04:45 PM	0	88	81	0	0	169	0	0	78	55	0	133	302
Total	0	323	321	0	0	644	0	0	248	282	0	530	1174
05:00 PM	0	113	89	0	0	202	0	0	59	79	0	138	340
05:15 PM	0	66	62	0	0	128	0	0	60	73	0	133	261
05:30 PM	0	87	63	0	0	150	0	0	56	63	0	119	269
05:45 PM	0	58	57	0	0	115	0	0	61	40	0	101	216
Total	0	324	271	0	0	595	0	0	236	255	0	491	1086
Grand Total	0	921	889	0	0	1810	0	0	700	893	0	1593	3403
Apprch %		50.9	49.1	0	0			0	43.9	56.1	0		
Total %	0	27.1	26.1	0	0	53.2	0	0	20.6	26.2	0	46.8	

	Southbound	Leilehua Road Westbound				Northbound	Leilehua Road Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 04:30 PM											
04:30 PM	0	92	83	0	175	0	0	58	75	133	308
04:45 PM	0	88	81	0	169	0	0	**78**	55	133	302
05:00 PM	0	**113**	**89**	0	**202**	0	0	59	**79**	**138**	**340**
05:15 PM	0	66	62	0	128	0	0	60	73	133	261
Total Volume	0	359	315	0	674	0	0	255	282	537	1211
% App. Total		53.3	46.7	0			0	47.5	52.5		
PHF	.000	.794	.885	.000	.834	.000	.000	.817	.892	.973	.890

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: BE
Counter: D4-5676
Weather: Clear

File Name : H-2 Off-Ramp AM
Site Code : 00000002
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Westbound	H-2 Off-Ramp Northbound					Eastbound	
Start Time	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
06:00 AM	0	0	48	0	14	0	62	0	62
06:15 AM	0	0	38	0	34	0	72	0	72
06:30 AM	0	0	52	0	37	0	89	0	89
06:45 AM	0	0	45	0	31	0	76	0	76
Total	0	0	183	0	116	0	299	0	299
07:00 AM	0	0	49	0	63	0	112	0	112
07:15 AM	0	0	55	0	65	0	120	0	120
07:30 AM	0	0	56	0	82	0	138	0	138
07:45 AM	0	0	43	0	94	0	137	0	137
Total	0	0	203	0	304	0	507	0	507
08:00 AM	0	0	42	0	47	0	89	0	89
08:15 AM	0	0	39	0	72	0	111	0	111
08:30 AM	0	0	46	0	53	0	99	0	99
08:45 AM	0	0	27	0	54	0	81	0	81
Total	0	0	154	0	226	0	380	0	380
Grand Total	0	0	540	0	646	0	1186	0	1186
Apprch %			45.5	0	54.5	0			
Total %	0	0	45.5	0	54.5	0	100	0	

	Southbound	Westbound	H-2 Off-Ramp Northbound				Eastbound	
Start Time	App. Total	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1								
Peak Hour for Entire Intersection Begins at 07:00 AM								
07:00 AM	0	0	49	0	63	112	0	112
07:15 AM	0	0	55	0	65	120	0	120
07:30 AM	0	0	**56**	0	82	**138**	0	**138**
07:45 AM	0	0	43	0	**94**	137	0	137
Total Volume	0	0	203	0	304	507	0	507
% App. Total			40	0	60			
PHF	.000	.000	.906	.000	.809	.918	.000	.918

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: AH
Counter: TU-0654
Weather: Clear

File Name : H-2 Off-Ramp PM
Site Code : 00000002
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Westbound	H-2 Off-Ramp Northbound					Eastbound	
Start Time	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
03:00 PM	0	0	30	0	60	0	90	0	90
03:15 PM	0	0	36	0	63	0	99	0	99
03:30 PM	0	0	41	0	42	0	83	0	83
03:45 PM	0	0	35	0	62	0	97	0	97
Total	0	0	142	0	227	0	369	0	369
04:00 PM	0	0	39	0	52	0	91	0	91
04:15 PM	0	0	30	0	59	1	90	0	90
04:30 PM	0	0	33	0	65	0	98	0	98
04:45 PM	0	0	37	0	64	0	101	0	101
Total	0	0	139	0	240	1	380	0	380
05:00 PM	0	0	40	0	50	0	90	0	90
05:15 PM	0	0	29	0	57	0	86	0	86
05:30 PM	0	0	24	0	51	0	75	0	75
05:45 PM	0	0	28	0	54	0	82	0	82
Total	0	0	121	0	212	0	333	0	333
Grand Total	0	0	402	0	679	1	1082	0	1082
Apprch %			37.2	0	62.8	0.1			
Total %	0	0	37.2	0	62.8	0.1	100	0	

	Southbound	Westbound	H-2 Off-Ramp Northbound				Eastbound	
Start Time	App. Total	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1								
Peak Hour for Entire Intersection Begins at 04:00 PM								
04:00 PM	0	0	**39**	0	52	91	0	91
04:15 PM	0	0	30	0	59	89	0	89
04:30 PM	0	0	33	0	**65**	98	0	98
04:45 PM	0	0	37	0	64	**101**	0	**101**
Total Volume	0	0	139	0	240	379	0	379
% App. Total			36.7	0	63.3			
PHF	.000	.000	.891	.000	.923	.938	.000	.938

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: YS
Counter: TU-1958
Weather: Clear

File Name : KahAka AM
Site Code : 00000004
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Castle&Cooke Driveway Southbound					Kahelu Avenue Westbound					Akamaunui Street Northbound					Kahelu Avenue Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	0	0	0	1	10	0	1	12	5	0	4	0	9	1	22	4	2	29	50
06:15 AM	0	0	0	0	0	0	8	1	2	11	6	0	0	0	6	0	30	8	2	40	57
06:30 AM	0	0	0	0	0	0	7	0	3	10	16	0	0	0	16	6	36	21	3	66	92
06:45 AM	0	0	0	0	0	0	7	0	0	7	19	0	0	0	19	6	48	30	1	85	111
Total	0	0	0	0	0	1	32	1	6	40	46	0	4	0	50	13	136	63	8	220	310
07:00 AM	0	0	0	1	1	0	21	0	0	21	23	1	0	0	24	3	40	31	0	74	120
07:15 AM	0	0	1	0	1	1	15	1	1	18	40	0	0	0	40	2	59	34	2	97	156
07:30 AM	0	0	1	0	1	0	22	0	0	22	40	0	1	0	41	15	49	39	1	104	168
07:45 AM	0	0	0	0	0	0	20	2	0	22	26	0	0	0	26	21	66	57	0	144	192
Total	0	0	2	1	3	1	78	3	1	83	129	1	1	0	131	41	214	161	3	419	636
08:00 AM	0	0	0	0	0	0	22	0	2	24	20	0	1	1	22	13	49	26	0	88	134
08:15 AM	0	0	0	0	0	0	20	1	0	21	14	0	1	0	15	8	27	37	0	72	108
08:30 AM	0	0	1	0	1	2	16	0	0	18	8	0	0	0	8	11	33	23	0	67	94
08:45 AM	0	0	2	0	2	0	11	2	0	13	5	0	2	1	8	7	34	19	1	61	84
Total	0	0	3	0	3	2	69	3	2	76	47	0	4	2	53	39	143	105	1	288	420
Grand Total	0	0	5	1	6	4	179	7	9	199	222	1	9	2	234	93	493	329	12	927	1366
Apprch %	0	0	83.3	16.7		2	89.9	3.5	4.5		94.9	0.4	3.8	0.9		10	53.2	35.5	1.3		
Total %	0	0	0.4	0.1	0.4	0.3	13.1	0.5	0.7	14.6	16.3	0.1	0.7	0.1	17.1	6.8	36.1	24.1	0.9	67.9	

	Castle&Cooke Driveway Southbound				Kahelu Avenue Westbound				Akamaunui Street Northbound				Kahelu Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	**1**	**1**	**1**	15	1	17	**40**	0	0	40	2	59	34	95	153
07:30 AM	0	0	1	1	0	**22**	0	**22**	40	0	**1**	**41**	15	49	39	103	167
07:45 AM	0	0	0	0	0	20	**2**	22	26	0	0	26	**21**	**66**	**57**	**144**	**192**
08:00 AM	0	0	0	0	0	22	0	22	20	0	1	21	13	49	26	88	131
Total Volume	0	0	2	2	1	79	3	83	126	0	2	128	51	223	156	430	643
% App. Total	0	0	100		1.2	95.2	3.6		98.4	0	1.6		11.9	51.9	36.3		
PHF	.000	.000	.500	.500	.250	.898	.375	.943	.788	.000	.500	.780	.607	.845	.684	.747	.837

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: YS
Counter: TU-1958
Weather: Clear

File Name : KahAka PM
Site Code : 00000004
Start Date : 4/27/2017
Page No : 1

Groups Printed- Unshifted

	Castle&Cooke Driveway Southbound					Kahelu Avenue Westbound					Akamainui Street Northbound					Kahelu Avenue Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	1	0	1	0	2	1	25	4	0	30	12	0	0	0	12	6	5	6	0	17	61
03:15 PM	0	0	1	0	1	0	15	1	0	16	15	0	0	0	15	4	9	5	0	18	50
03:30 PM	0	0	0	0	0	0	26	0	0	26	12	0	2	0	14	7	5	5	0	17	57
03:45 PM	0	0	2	0	2	0	19	0	0	19	6	0	0	0	6	5	9	2	0	16	43
Total	1	0	4	0	5	1	85	5	0	91	45	0	2	0	47	22	28	18	0	68	211
04:00 PM	0	0	0	0	0	0	37	0	0	37	38	0	2	0	40	1	17	5	0	23	100
04:15 PM	0	0	0	0	0	0	20	1	1	22	22	1	2	2	27	6	12	5	5	28	77
04:30 PM	0	0	0	0	0	0	46	0	0	46	39	0	3	0	42	4	19	6	2	31	119
04:45 PM	0	0	0	0	0	2	47	0	0	49	31	2	0	0	33	19	17	5	2	43	125
Total	0	0	0	0	0	2	150	1	1	154	130	3	7	2	142	30	65	21	9	125	421
05:00 PM	0	0	1	0	1	0	40	3	1	44	64	1	0	0	65	3	17	4	0	24	134
05:15 PM	0	0	3	0	3	1	39	2	0	42	28	0	0	0	28	1	17	0	5	23	96
05:30 PM	0	0	1	0	1	1	37	0	0	38	44	0	2	0	46	3	12	2	2	19	104
05:45 PM	0	0	2	0	2	1	24	0	0	25	20	0	2	0	22	4	25	3	0	32	81
Total	0	0	7	0	7	3	140	5	1	149	156	1	4	0	161	11	71	9	7	98	415
Grand Total	1	0	11	0	12	6	375	11	2	394	331	4	13	2	350	63	164	48	16	291	1047
Apprch %	8.3	0	91.7	0		1.5	95.2	2.8	0.5		94.6	1.1	3.7	0.6		21.6	56.4	16.5	5.5		
Total %	0.1	0	1.1	0	1.1	0.6	35.8	1.1	0.2	37.6	31.6	0.4	1.2	0.2	33.4	6	15.7	4.6	1.5	27.8	

	Castle&Cooke Driveway Southbound				Kahelu Avenue Westbound				Akamainui Street Northbound				Kahelu Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	46	0	46	39	0	**3**	42	4	**19**	**6**	29	117
04:45 PM	0	0	0	0	**2**	**47**	0	**49**	31	**2**	0	33	**19**	17	5	**41**	123
05:00 PM	0	0	1	1	0	40	**3**	43	**64**	1	0	**65**	3	17	4	24	**133**
05:15 PM	0	0	**3**	**3**	1	39	2	42	28	0	0	28	1	17	0	18	91
Total Volume	0	0	4	4	3	172	5	180	162	3	3	168	27	70	15	112	464
% App. Total	0	0	100		1.7	95.6	2.8		96.4	1.8	1.8		24.1	62.5	13.4		
PHF	.000	.000	.333	.333	.375	.915	.417	.918	.633	.375	.250	.646	.355	.921	.625	.683	.872

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: AH
Counter: D4-5673
Weather: Clear

File Name : HalWai AM
Site Code : 00000003
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Halawa Valley Street Westbound					Waiua Place Northbound					Halawa Valley Street Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	42	0	0	42	6	0	0	0	6	0	73	12	0	85	133
06:15 AM	0	2	33	0	0	35	9	0	0	0	9	0	58	16	1	75	119
06:30 AM	0	0	47	0	0	47	6	0	0	0	6	0	74	13	1	88	141
06:45 AM	0	0	32	0	0	32	9	0	0	0	9	0	66	13	0	79	120
Total	0	2	154	0	0	156	30	0	0	0	30	0	271	54	2	327	513
07:00 AM	0	0	30	0	0	30	3	0	1	0	4	0	66	13	1	80	114
07:15 AM	0	0	31	0	0	31	6	0	2	0	8	0	61	17	0	78	117
07:30 AM	0	1	36	0	0	37	8	0	0	0	8	0	67	18	0	85	130
07:45 AM	0	0	39	0	0	39	6	0	1	0	7	0	96	15	0	111	157
Total	0	1	136	0	0	137	23	0	4	0	27	0	290	63	1	354	518
08:00 AM	0	0	21	0	0	21	6	0	0	0	6	0	61	17	1	79	106
08:15 AM	0	0	37	0	0	37	4	0	1	0	5	0	57	23	1	81	123
08:30 AM	0	1	15	0	0	16	6	0	1	0	7	0	18	9	1	28	51
Grand Total	0	4	363	0	0	367	69	0	6	0	75	0	697	166	6	869	1311
Apprch %		1.1	98.9	0	0		92	0	8	0		0	80.2	19.1	0.7		
Total %	0	0.3	27.7	0	0	28	5.3	0	0.5	0	5.7	0	53.2	12.7	0.5	66.3	

	Southbound	Halawa Valley Street Westbound				Waiua Place Northbound				Halawa Valley Street Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:30 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:00 AM														
07:00 AM	0	0	30	0	30	3	0	1	4	0	66	13	79	113
07:15 AM	0	0	31	0	31	6	0	**2**	**8**	0	61	17	78	117
07:30 AM	0	**1**	36	0	37	**8**	0	0	8	0	67	**18**	85	130
07:45 AM	0	0	**39**	0	**39**	6	0	1	7	0	**96**	15	**111**	**157**
Total Volume	0	1	136	0	137	23	0	4	27	0	290	63	353	517
% App. Total		0.7	99.3	0		85.2	0	14.8		0	82.2	17.8		
PHF	.000	.250	.872	.000	.878	.719	.000	.500	.844	.000	.755	.875	.795	.823

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: AH
Counter: D4-5673
Weather: Clear

File Name : HalWai PM
Site Code : 00000003
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Halawa Valley Street Westbound					Waiua Place Northbound					Halawa Valley Street Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	0	0	44	0	0	44	11	0	0	0	11	0	32	8	0	40	95
03:15 PM	0	2	69	0	0	71	15	0	0	0	15	0	39	10	0	49	135
03:30 PM	0	0	75	0	0	75	20	0	1	0	21	0	38	5	0	43	139
03:45 PM	0	0	66	0	0	66	22	0	0	0	22	0	23	2	0	25	113
Total	0	2	254	0	0	256	68	0	1	0	69	0	132	25	0	157	482
04:00 PM	0	1	68	0	0	69	17	0	0	0	17	0	22	9	0	31	117
04:15 PM	0	0	59	0	0	59	24	0	1	0	25	0	20	6	1	27	111
04:30 PM	0	0	76	0	0	76	23	0	0	0	23	0	16	11	0	27	126
04:45 PM	0	0	30	0	0	30	13	0	0	0	13	0	13	10	0	23	66
Total	0	1	233	0	0	234	77	0	1	0	78	0	71	36	1	108	420
05:00 PM	0	0	70	0	0	70	16	0	0	0	16	0	12	13	2	27	113
05:15 PM	0	0	42	0	0	42	19	0	0	0	19	0	15	4	0	19	80
05:30 PM	0	0	38	0	0	38	7	0	0	2	9	0	6	1	0	7	54
05:45 PM	0	1	33	0	0	34	5	0	0	2	7	0	11	3	0	14	55
Total	0	1	183	0	0	184	47	0	0	4	51	0	44	21	2	67	302
Grand Total	0	4	670	0	0	674	192	0	2	4	198	0	247	82	3	332	1204
Apprch %		0.6	99.4	0	0		97	0	1	2		0	74.4	24.7	0.9		
Total %	0	0.3	55.6	0	0	56	15.9	0	0.2	0.3	16.4	0	20.5	6.8	0.2	27.6	

	Southbound	Halawa Valley Street Westbound				Waiua Place Northbound				Halawa Valley Street Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:15 PM														
03:15 PM	0	**2**	69	0	71	15	0	0	15	0	**39**	**10**	**49**	135
03:30 PM	0	0	**75**	0	**75**	20	0	**1**	21	0	38	5	43	**139**
03:45 PM	0	0	66	0	66	**22**	0	0	**22**	0	23	2	25	113
04:00 PM	0	1	68	0	69	17	0	0	17	0	22	9	31	117
Total Volume	0	3	278	0	281	74	0	1	75	0	122	26	148	504
% App. Total		1.1	98.9	0		98.7	0	1.3		0	82.4	17.6		
PHF	.000	.375	.927	.000	.937	.841	.000	.250	.852	.000	.782	.650	.755	.906

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: FS, DY
Counter: D4-3889, D4-5676
Weather: Clear

File Name : HalUlu AM
Site Code : 00000001
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Halawa Valley Street Southbound					Ulune Street Westbound					Northbound	Ulune Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	30	56	0	86	0	212	81	0	293	0	98	0	100	0	198	577
06:15 AM	0	17	50	0	67	0	245	100	0	345	0	122	0	107	0	229	641
06:30 AM	0	24	69	0	93	0	210	122	0	332	0	112	0	120	0	232	657
06:45 AM	0	26	77	0	103	0	263	111	0	374	0	107	0	116	0	223	700
Total	0	97	252	0	349	0	930	414	0	1344	0	439	0	443	0	882	2575
07:00 AM	0	26	54	0	80	0	256	81	0	337	0	97	0	141	0	238	655
07:15 AM	0	23	76	0	99	0	268	82	0	350	0	96	0	163	0	259	708
07:30 AM	0	57	100	0	157	0	281	90	0	371	0	114	0	159	0	273	801
07:45 AM	0	23	85	0	108	0	214	104	0	318	0	180	0	147	0	327	753
Total	0	129	315	0	444	0	1019	357	0	1376	0	487	0	610	0	1097	2917
08:00 AM	0	23	89	0	112	0	237	97	1	335	0	95	0	109	0	204	651
08:15 AM	0	24	83	0	107	0	221	76	0	297	0	116	0	109	0	225	629
08:30 AM	0	29	69	1	99	0	214	74	0	288	0	79	0	107	0	186	573
08:45 AM	0	33	67	0	100	0	209	70	0	279	0	76	0	111	0	187	566
Total	0	109	308	1	418	0	881	317	1	1199	0	366	0	436	0	802	2419
Grand Total	0	335	875	1	1211	0	2830	1088	1	3919	0	1292	0	1489	0	2781	7911
Apprch %	0	27.7	72.3	0.1		0	72.2	27.8	0			46.5	0	53.5	0		
Total %	0	4.2	11.1	0	15.3	0	35.8	13.8	0	49.5	0	16.3	0	18.8	0	35.2	

	Halawa Valley Street Southbound				Ulune Street Westbound				Northbound	Ulune Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:00 AM														
07:00 AM	0	26	54	80	0	256	81	337	0	97	0	141	238	655
07:15 AM	0	23	76	99	0	268	82	350	0	96	0	**163**	259	708
07:30 AM	0	**57**	**100**	**157**	0	**281**	90	**371**	0	114	0	159	273	**801**
07:45 AM	0	23	85	108	0	214	**104**	318	0	**180**	0	147	**327**	753
Total Volume	0	129	315	444	0	1019	357	1376	0	487	0	610	1097	2917
% App. Total	0	29.1	70.9		0	74.1	25.9			44.4	0	55.6		
PHF	.000	.566	.788	.707	.000	.907	.858	.927	.000	.676	.000	.936	.839	.910

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: FS, DY
Counter: D4-3889, D4-5676
Weather: Clear

File Name : HalUlu PM
Site Code : 00000001
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Halawa Valley Street Southbound					Ulune Street Westbound					Northbound	Ulune Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	0	109	114	0	223	0	176	59	0	235	0	42	0	337	0	379	837
03:15 PM	0	105	111	0	216	0	218	75	0	293	0	54	0	335	0	389	898
03:30 PM	0	182	145	0	327	0	217	57	0	274	0	37	0	289	0	326	927
03:45 PM	0	125	141	3	269	0	231	55	0	286	0	35	0	427	0	462	1017
Total	0	521	511	3	1035	0	842	246	0	1088	0	168	0	1388	0	1556	3679
04:00 PM	0	153	135	0	288	0	207	68	0	275	0	64	0	273	0	337	900
04:15 PM	0	141	96	0	237	0	200	71	0	271	0	33	0	297	0	330	838
04:30 PM	0	163	164	1	328	0	202	74	0	276	0	30	0	282	0	312	916
04:45 PM	0	116	84	0	200	0	269	74	0	343	0	47	0	327	0	374	917
Total	0	573	479	1	1053	0	878	287	0	1165	0	174	0	1179	0	1353	3571
05:00 PM	0	148	137	0	285	0	262	65	0	327	0	37	0	311	0	348	960
05:15 PM	0	134	88	0	222	0	245	76	1	322	0	48	0	276	0	324	868
05:30 PM	0	94	91	0	185	0	218	51	0	269	0	39	0	294	0	333	787
05:45 PM	0	88	78	0	166	0	273	70	1	344	0	46	0	191	0	237	747
Total	0	464	394	0	858	0	998	262	2	1262	0	170	0	1072	0	1242	3362
Grand Total	0	1558	1384	4	2946	0	2718	795	2	3515	0	512	0	3639	0	4151	10612
Apprch %	0	52.9	47	0.1		0	77.3	22.6	0.1			12.3	0	87.7	0		
Total %	0	14.7	13	0	27.8	0	25.6	7.5	0	33.1	0	4.8	0	34.3	0	39.1	

	Halawa Valley Street Southbound				Ulune Street Westbound				Northbound	Ulune Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:15 PM														
03:15 PM	0	105	111	216	0	218	**75**	**293**	0	54	0	335	389	898
03:30 PM	0	**182**	**145**	**327**	0	217	57	274	0	37	0	289	326	927
03:45 PM	0	125	141	266	0	**231**	55	286	0	35	0	**427**	**462**	**1014**
04:00 PM	0	153	135	288	0	207	68	275	0	**64**	0	273	337	900
Total Volume	0	565	532	1097	0	873	255	1128	0	190	0	1324	1514	3739
% App. Total	0	51.5	48.5		0	77.4	22.6			12.5	0	87.5		
PHF	.000	.776	.917	.839	.000	.945	.850	.962	.000	.742	.000	.775	.819	.922

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: YS
Counter: D4-5677
Weather: Clear

File Name : HalKoa AM
Site Code : 00000000
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Halawa Valley Street Westbound					Koaha Place Northbound					Halawa Valley Street Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	20	0	0	20	16	0	1	0	17	0	17	25	0	42	79
06:15 AM	0	0	3	0	0	3	19	0	3	0	22	0	12	22	0	34	59
06:30 AM	0	0	7	0	0	7	39	0	0	0	39	0	12	39	0	51	97
06:45 AM	0	0	8	0	0	8	26	0	1	0	27	0	14	38	0	52	87
Total	0	0	38	0	0	38	100	0	5	0	105	0	55	124	0	179	322
07:00 AM	0	2	5	0	0	7	20	0	1	0	21	0	9	32	0	41	69
07:15 AM	0	0	5	0	0	5	26	0	1	0	27	0	7	41	0	48	80
07:30 AM	0	0	5	0	0	5	18	0	3	0	21	0	14	20	0	34	60
07:45 AM	0	0	14	0	0	14	24	0	1	0	25	0	20	37	0	57	96
Total	0	2	29	0	0	31	88	0	6	0	94	0	50	130	0	180	305
08:00 AM	0	1	3	0	0	4	19	0	1	0	20	0	6	28	0	34	58
08:15 AM	0	1	7	0	0	8	18	0	0	0	18	0	14	25	0	39	65
08:30 AM	0	0	3	0	0	3	11	0	1	0	12	0	9	13	0	22	37
08:45 AM	0	0	3	0	0	3	22	0	1	0	23	0	9	24	0	33	59
Total	0	2	16	0	0	18	70	0	3	0	73	0	38	90	0	128	219
Grand Total	0	4	83	0	0	87	258	0	14	0	272	0	143	344	0	487	846
Apprch %		4.6	95.4	0	0		94.9	0	5.1	0		0	29.4	70.6	0		
Total %	0	0.5	9.8	0	0	10.3	30.5	0	1.7	0	32.2	0	16.9	40.7	0	57.6	

	Southbound	Halawa Valley Street Westbound				Koaha Place Northbound				Halawa Valley Street Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 06:30 AM														
06:30 AM	0	0	7	0	7	**39**	0	0	**39**	0	12	39	51	**97**
06:45 AM	0	0	**8**	0	**8**	26	0	**1**	27	0	**14**	38	**52**	87
07:00 AM	0	**2**	5	0	7	20	0	1	21	0	9	32	41	69
07:15 AM	0	0	5	0	5	26	0	1	27	0	7	**41**	48	80
Total Volume	0	2	25	0	27	111	0	3	114	0	42	150	192	333
% App. Total		7.4	92.6	0		97.4	0	2.6		0	21.9	78.1		
PHF	.000	.250	.781	.000	.844	.712	.000	.750	.731	.000	.750	.915	.923	.858

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: YS
Counter: D4-5677
Weather: Clear

File Name : HalKoa PM
Site Code : 00000000
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Southbound	Halawa Valley Street Westbound					Koaha Place Northbound					Halawa Valley Street Eastbound					
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	0	0	10	0	0	10	18	0	0	0	18	0	2	10	0	12	40
03:15 PM	0	0	11	0	0	11	28	0	0	0	28	0	4	9	0	13	52
03:30 PM	0	0	11	0	0	11	20	0	0	0	20	0	1	11	0	12	43
03:45 PM	0	0	10	0	0	10	30	0	0	0	30	0	1	8	0	9	49
Total	0	0	42	0	0	42	96	0	0	0	96	0	8	38	0	46	184
04:00 PM	0	0	9	0	0	9	33	0	0	0	33	0	2	11	0	13	55
04:15 PM	0	0	2	0	0	2	23	0	0	0	23	0	0	6	0	6	31
04:30 PM	0	0	6	0	0	6	17	0	0	0	17	0	0	4	0	4	27
04:45 PM	0	0	7	0	0	7	18	0	0	0	18	0	0	7	0	7	32
Total	0	0	24	0	0	24	91	0	0	0	91	0	2	28	0	30	145
05:00 PM	0	1	14	0	0	15	41	0	0	0	41	0	2	5	0	7	63
05:15 PM	0	1	13	0	0	14	21	0	0	0	21	0	1	6	0	7	42
05:30 PM	0	0	3	0	0	3	14	0	0	0	14	0	2	0	0	2	19
05:45 PM	0	0	6	0	0	6	17	0	0	0	17	0	2	3	0	5	28
Total	0	2	36	0	0	38	93	0	0	0	93	0	7	14	0	21	152
Grand Total	0	2	102	0	0	104	280	0	0	0	280	0	17	80	0	97	481
Apprch %		1.9	98.1	0	0		100	0	0	0		0	17.5	82.5	0		
Total %	0	0.4	21.2	0	0	21.6	58.2	0	0	0	58.2	0	3.5	16.6	0	20.2	

	Southbound	Halawa Valley Street Westbound				Koaha Place Northbound				Halawa Valley Street Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:15 PM														
03:15 PM	0	0	**11**	0	**11**	28	0	0	28	0	**4**	9	**13**	52
03:30 PM	0	0	11	0	11	20	0	0	20	0	1	**11**	12	43
03:45 PM	0	0	10	0	10	30	0	0	30	0	1	8	9	49
04:00 PM	0	0	9	0	9	**33**	0	0	**33**	0	2	11	13	**55**
Total Volume	0	0	41	0	41	111	0	0	111	0	8	39	47	199
% App. Total		0	100	0		100	0	0		0	17	83		
PHF	.000	.000	.932	.000	.932	.841	.000	.000	.841	.000	.500	.886	.904	.905

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: GH, BE
Counter: TU-0650, D4-3890
Weather: Clear

File Name : Hallwa AM
Site Code : 00000002
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Iwaiwa Street Southbound					Halawa Valley Street Westbound					Northbound	Halawa Valley Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	4	0	38	1	43	0	45	4	1	50	0	81	98	0	0	179	272
06:15 AM	1	0	23	1	25	0	43	0	0	43	0	101	109	0	0	210	278
06:30 AM	2	0	34	0	36	0	56	0	0	56	0	94	123	0	0	217	309
06:45 AM	3	0	43	1	47	0	49	1	0	50	0	97	113	0	0	210	307
Total	10	0	138	3	151	0	193	5	1	199	0	373	443	0	0	816	1166
07:00 AM	5	0	40	1	46	0	44	2	0	46	0	76	99	0	0	175	267
07:15 AM	4	0	38	0	42	0	54	4	0	58	0	85	95	0	0	180	280
07:30 AM	5	0	55	0	60	0	67	2	0	69	0	75	110	0	0	185	314
07:45 AM	5	0	55	0	60	0	47	4	0	51	0	121	134	0	0	255	366
Total	19	0	188	1	208	0	212	12	0	224	0	357	438	0	0	795	1227
08:00 AM	6	0	50	0	56	0	45	3	0	48	0	102	98	0	0	200	304
08:15 AM	2	0	64	1	67	0	43	5	0	48	0	91	90	0	0	181	296
08:30 AM	4	0	57	0	61	0	35	5	0	40	0	76	75	0	0	151	252
08:45 AM	4	0	46	0	50	0	53	6	0	59	0	64	80	0	0	144	253
Total	16	0	217	1	234	0	176	19	0	195	0	333	343	0	0	676	1105
Grand Total	45	0	543	5	593	0	581	36	1	618	0	1063	1224	0	0	2287	3498
Apprch %	7.6	0	91.6	0.8		0	94	5.8	0.2			46.5	53.5	0	0		
Total %	1.3	0	15.5	0.1	17	0	16.6	1	0	17.7	0	30.4	35	0	0	65.4	

	Iwaiwa Street Southbound				Halawa Valley Street Westbound				Northbound	Halawa Valley Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:30 AM														
07:30 AM	5	0	55	60	0	**67**	2	**69**	0	75	110	0	185	314
07:45 AM	5	0	55	60	0	47	4	51	0	**121**	**134**	0	**255**	**366**
08:00 AM	**6**	0	50	56	0	45	3	48	0	102	98	0	200	304
08:15 AM	2	0	**64**	**66**	0	43	**5**	48	0	91	90	0	181	295
Total Volume	18	0	224	242	0	202	14	216	0	389	432	0	821	1279
% App. Total	7.4	0	92.6		0	93.5	6.5			47.4	52.6	0		
PHF	.750	.000	.875	.917	.000	.754	.700	.783	.000	.804	.806	.000	.805	.874

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counted By: GH, BE
Counter: TU-0650, D4-3890
Weather: Clear

File Name : Hallwa PM
Site Code : 00000002
Start Date : 4/12/2017
Page No : 1

Groups Printed- Unshifted

	Iwaiwa Street Southbound					Halawa Valley Street Westbound					Northbound	Halawa Valley Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	4	0	126	1	131	0	79	3	0	82	0	45	53	0	0	98	311
03:15 PM	3	0	85	1	89	0	111	4	0	115	0	60	65	0	0	125	329
03:30 PM	4	0	145	0	149	0	132	3	0	135	0	39	51	0	1	91	375
03:45 PM	11	0	78	5	94	0	138	1	0	139	0	51	41	0	0	92	325
Total	22	0	434	7	463	0	460	11	0	471	0	195	210	0	1	406	1340
04:00 PM	5	0	100	0	105	0	127	4	0	131	0	50	63	0	0	113	349
04:15 PM	5	0	77	0	82	0	123	6	0	129	0	51	52	0	0	103	314
04:30 PM	6	0	118	1	125	0	149	5	0	154	0	50	42	0	0	92	371
04:45 PM	4	0	66	3	73	0	102	8	0	110	0	66	42	0	0	108	291
Total	20	0	361	4	385	0	501	23	0	524	0	217	199	0	0	416	1325
05:00 PM	3	0	156	0	159	0	117	5	0	122	0	53	34	0	0	87	368
05:15 PM	3	0	60	1	64	0	96	5	0	101	0	47	53	0	0	100	265
05:30 PM	1	0	78	0	79	0	84	5	0	89	0	50	29	0	0	79	247
05:45 PM	1	0	73	0	74	0	72	1	0	73	0	53	41	0	0	94	241
Total	8	0	367	1	376	0	369	16	0	385	0	203	157	0	0	360	1121
Grand Total	50	0	1162	12	1224	0	1330	50	0	1380	0	615	566	0	1	1182	3786
Apprch %	4.1	0	94.9	1		0	96.4	3.6	0			52	47.9	0	0.1		
Total %	1.3	0	30.7	0.3	32.3	0	35.1	1.3	0	36.5	0	16.2	14.9	0	0	31.2	

	Iwaiwa Street Southbound				Halawa Valley Street Westbound				Northbound	Halawa Valley Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:15 PM														
03:15 PM	3	0	85	88	0	111	**4**	115	0	**60**	**65**	0	**125**	328
03:30 PM	4	0	**145**	**149**	0	132	3	135	0	39	51	0	90	**374**
03:45 PM	**11**	0	78	89	0	**138**	1	**139**	0	51	41	0	92	320
04:00 PM	5	0	100	105	0	127	4	131	0	50	63	0	113	349
Total Volume	23	0	408	431	0	508	12	520	0	200	220	0	420	1371
% App. Total	5.3	0	94.7		0	97.7	2.3			47.6	52.4	0		
PHF	.523	.000	.703	.723	.000	.920	.750	.935	.000	.833	.846	.000	.840	.916

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1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

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Counter: D4-5673,TU-2049
Weather: Clear

File Name : KalWCCC AM
Site Code : 00000001
Start Date : 4/25/2017
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Groups Printed- Unshifted

	Women's Correctional Driveway Southbound					Kalanianaole Highway Westbound					Olomana School Driveway Northbound					Kalanianaole Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	3	0	3	1	424	0	0	425	0	0	0	0	0	4	69	1	0	74	502
06:15 AM	0	0	4	0	4	2	370	1	0	373	0	0	0	0	0	4	91	1	0	96	473
06:30 AM	0	0	4	0	4	2	329	0	0	331	0	0	1	0	1	4	117	3	0	124	460
06:45 AM	0	0	0	0	0	2	288	0	0	290	0	0	0	0	0	2	114	2	0	118	408
Total	0	0	11	0	11	7	1411	1	0	1419	0	0	1	0	1	14	391	7	0	412	1843
07:00 AM	1	0	0	0	1	0	312	2	0	314	0	0	0	0	0	0	151	7	0	158	473
07:15 AM	2	0	1	0	3	1	357	2	0	360	0	0	0	0	0	2	187	7	0	196	559
07:30 AM	0	0	4	0	4	6	322	1	1	330	4	0	0	0	4	1	176	10	0	187	525
07:45 AM	0	0	1	0	1	7	307	0	1	315	5	0	2	0	7	6	207	16	0	229	552
Total	3	0	6	0	9	14	1298	5	2	1319	9	0	2	0	11	9	721	40	0	770	2109
08:00 AM	0	0	3	0	3	4	275	2	3	284	4	0	2	0	6	4	191	8	0	203	496
08:15 AM	1	0	2	0	3	0	308	0	0	308	3	0	1	0	4	4	157	5	0	166	481
08:30 AM	0	0	1	0	1	3	273	0	0	276	1	0	1	0	2	5	192	2	0	199	478
08:45 AM	1	0	0	0	1	0	204	2	0	206	4	0	1	0	5	3	150	3	0	156	368
Total	2	0	6	0	8	7	1060	4	3	1074	12	0	5	0	17	16	690	18	0	724	1823
Grand Total	5	0	23	0	28	28	3769	10	5	3812	21	0	8	0	29	39	1802	65	0	1906	5775
Apprch %	17.9	0	82.1	0		0.7	98.9	0.3	0.1		72.4	0	27.6	0		2	94.5	3.4	0		
Total %	0.1	0	0.4	0	0.5	0.5	65.3	0.2	0.1	66	0.4	0	0.1	0	0.5	0.7	31.2	1.1	0	33	

	Women's Correctional Driveway Southbound				Kalanianaole Highway Westbound				Olomana School Driveway Northbound				Kalanianaole Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	**2**	0	1	3	1	**357**	**2**	**360**	0	0	0	0	2	187	7	196	**559**
07:30 AM	0	0	**4**	**4**	6	322	1	329	4	0	0	4	1	176	10	187	524
07:45 AM	0	0	1	1	**7**	307	0	314	**5**	0	**2**	**7**	**6**	**207**	**16**	**229**	551
08:00 AM	0	0	3	3	4	275	2	281	4	0	2	6	4	191	8	203	493
Total Volume	2	0	9	11	18	1261	5	1284	13	0	4	17	13	761	41	815	2127
% App. Total	18.2	0	81.8		1.4	98.2	0.4		76.5	0	23.5		1.6	93.4	5		
PHF	.250	.000	.563	.688	.643	.883	.625	.892	.650	.000	.500	.607	.542	.919	.641	.890	.951

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
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Groups Printed- Unshifted

	Women's Correctional Driveway Southbound					Kalanianaole Highway Westbound					Olomana School Driveway Northbound					Kalanianaole Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	0	0	7	0	7	0	220	1	14	235	12	0	5	0	17	5	292	0	0	297	556
03:15 PM	0	0	2	0	2	1	173	0	0	174	5	0	3	0	8	1	353	1	0	355	539
03:30 PM	1	0	3	0	4	0	206	0	0	206	2	0	2	0	4	1	336	1	0	338	552
03:45 PM	1	0	2	0	3	0	233	1	0	234	8	0	0	0	8	2	338	0	0	340	585
Total	2	0	14	0	16	1	832	2	14	849	27	0	10	0	37	9	1319	2	0	1330	2232
04:00 PM	0	0	8	0	8	0	236	0	0	236	6	0	1	0	7	3	316	2	0	321	572
04:15 PM	0	0	1	0	1	0	202	1	0	203	6	0	0	0	6	1	333	0	0	334	544
04:30 PM	1	0	7	0	8	0	182	0	0	182	3	0	1	0	4	1	362	0	0	363	557
04:45 PM	0	0	0	0	0	0	216	0	0	216	0	0	0	0	0	0	339	0	0	339	555
Total	1	0	16	0	17	0	836	1	0	837	15	0	2	0	17	5	1350	2	0	1357	2228
05:00 PM	0	0	1	0	1	0	199	0	0	199	0	0	0	0	0	1	369	0	0	370	570
05:15 PM	0	0	0	0	0	0	221	0	0	221	0	0	1	0	1	0	364	0	0	364	586
05:30 PM	0	0	1	0	1	0	205	0	0	205	1	0	0	0	1	2	352	0	0	354	561
05:45 PM	0	0	0	0	0	0	200	0	0	200	1	0	0	0	1	2	337	0	0	339	540
Total	0	0	2	0	2	0	825	0	0	825	2	0	1	0	3	5	1422	0	0	1427	2257
Grand Total	3	0	32	0	35	1	2493	3	14	2511	44	0	13	0	57	19	4091	4	0	4114	6717
Apprch %	8.6	0	91.4	0		0	99.3	0.1	0.6		77.2	0	22.8	0		0.5	99.4	0.1	0		
Total %	0	0	0.5	0	0.5	0	37.1	0	0.2	37.4	0.7	0	0.2	0	0.8	0.3	60.9	0.1	0	61.2	

	Women's Correctional Driveway Southbound				Kalanianaole Highway Westbound				Olomana School Driveway Northbound				Kalanianaole Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	0	0	0	216	0	216	0	0	0	0	0	339	0	339	555
05:00 PM	0	0	**1**	**1**	0	199	0	199	0	0	0	0	1	**369**	0	**370**	570
05:15 PM	0	0	0	0	0	**221**	0	**221**	0	0	**1**	**1**	0	364	0	364	**586**
05:30 PM	0	0	1	1	0	205	0	205	**1**	0	0	1	**2**	352	0	354	561
Total Volume	0	0	2	2	0	841	0	841	1	0	1	2	3	1424	0	1427	2272
% App. Total	0	0	100		0	100	0		50	0	50		0.2	99.8	0		
PHF	.000	.000	.500	.500	.000	.951	.000	.951	.250	.000	.250	.500	.375	.965	.000	.964	.969

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1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

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Counter: TU-0649, TU-2050
Weather: Clear

File Name : KalUlu AM
Site Code : 00000002
Start Date : 4/25/2017
Page No : 1

Groups Printed- Unshifted

	Ulupii Street Southbound					Kalanianaole Highway Westbound					Ulupii Street Northbound					Kalanianaole Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	4	1	4	0	9	2	384	2	0	388	0	2	0	0	2	4	71	3	0	78	477
06:15 AM	3	2	3	0	8	5	357	8	0	370	0	0	2	0	2	2	94	1	0	97	477
06:30 AM	2	1	3	0	6	25	381	5	0	411	1	0	1	0	2	1	117	6	0	124	543
06:45 AM	2	0	1	0	3	14	326	12	0	352	0	3	6	0	9	2	101	9	0	112	476
Total	11	4	11	0	26	46	1448	27	0	1521	1	5	9	0	15	9	383	19	0	411	1973
07:00 AM	4	3	3	0	10	14	278	3	0	295	2	6	11	0	19	3	148	10	0	161	485
07:15 AM	5	5	1	0	11	30	307	6	0	343	3	7	12	0	22	3	179	9	0	191	567
07:30 AM	5	6	1	21	33	35	306	30	0	371	9	9	16	3	37	3	167	19	0	189	630
07:45 AM	6	6	7	16	35	25	292	34	1	352	3	10	10	9	32	2	199	8	0	209	628
Total	20	20	12	37	89	104	1183	73	1	1361	17	32	49	12	110	11	693	46	0	750	2310
08:00 AM	7	2	16	0	25	9	267	23	0	299	4	4	7	0	15	1	177	3	0	181	520
08:15 AM	15	8	16	0	39	6	301	31	0	338	0	2	6	0	8	5	146	2	0	153	538
08:30 AM	4	4	3	1	12	3	277	13	0	293	1	1	2	0	4	2	172	4	0	178	487
08:45 AM	2	1	1	0	4	0	205	2	0	207	3	1	4	0	8	2	154	3	0	159	378
Total	28	15	36	1	80	18	1050	69	0	1137	8	8	19	0	35	10	649	12	0	671	1923
Grand Total	59	39	59	38	195	168	3681	169	1	4019	26	45	77	12	160	30	1725	77	0	1832	6206
Apprch %	30.3	20	30.3	19.5		4.2	91.6	4.2	0		16.2	28.1	48.1	7.5		1.6	94.2	4.2	0		
Total %	1	0.6	1	0.6	3.1	2.7	59.3	2.7	0	64.8	0.4	0.7	1.2	0.2	2.6	0.5	27.8	1.2	0	29.5	

	Ulupii Street Southbound				Kalanianaole Highway Westbound				Ulupii Street Northbound				Kalanianaole Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	5	5	1	11	30	**307**	6	343	3	7	12	22	**3**	179	9	191	567
07:30 AM	5	**6**	1	12	**35**	306	30	**371**	**9**	9	**16**	**34**	3	167	**19**	189	**606**
07:45 AM	6	6	7	19	25	292	**34**	351	3	**10**	10	23	2	**199**	8	**209**	602
08:00 AM	**7**	2	**16**	**25**	9	267	23	299	4	4	7	15	1	177	3	181	520
Total Volume	23	19	25	67	99	1172	93	1364	19	30	45	94	9	722	39	770	2295
% App. Total	34.3	28.4	37.3		7.3	85.9	6.8		20.2	31.9	47.9		1.2	93.8	5.1		
PHF	.821	.792	.391	.670	.707	.954	.684	.919	.528	.750	.703	.691	.750	.907	.513	.921	.947

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File Name : KalUlu PM
Site Code : 00000002
Start Date : 4/25/2017
Page No : 1

Groups Printed- Unshifted

	Ulupii Street Southbound					Kalanianaole Highway Westbound					Ulupii Street Northbound					Kalanianaole Highway Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	12	4	4	2	22	1	194	4	0	199	8	2	6	0	16	10	292	3	1	306	543
03:15 PM	12	1	4	0	17	5	159	4	0	168	8	4	11	0	23	6	332	2	0	340	548
03:30 PM	20	0	16	1	37	5	171	13	0	189	7	4	7	0	18	5	311	9	0	325	569
03:45 PM	10	1	5	0	16	4	251	3	0	258	5	2	9	0	16	7	330	6	0	343	633
Total	54	6	29	3	92	15	775	24	0	814	28	12	33	0	73	28	1265	20	1	1314	2293
04:00 PM	21	1	2	0	24	7	207	4	0	218	6	5	7	0	18	2	306	4	0	312	572
04:15 PM	7	1	2	0	10	6	218	6	0	230	8	5	4	0	17	4	323	7	0	334	591
04:30 PM	10	0	4	0	14	8	154	8	0	170	11	3	8	0	22	4	346	11	0	361	567
04:45 PM	4	0	5	0	9	4	298	7	0	309	3	2	4	0	9	4	340	4	0	348	675
Total	42	2	13	0	57	25	877	25	0	927	28	15	23	0	66	14	1315	26	0	1355	2405
05:00 PM	14	0	6	1	21	3	194	10	0	207	4	6	6	0	16	4	357	8	0	369	613
05:15 PM	13	2	5	0	20	3	214	7	0	224	5	4	6	0	15	4	345	5	0	354	613
05:30 PM	17	0	2	1	20	12	180	5	0	197	3	2	8	0	13	7	334	4	0	345	575
05:45 PM	8	0	5	0	13	6	179	7	0	192	5	4	6	1	16	5	330	5	0	340	561
Total	52	2	18	2	74	24	767	29	0	820	17	16	26	1	60	20	1366	22	0	1408	2362
Grand Total	148	10	60	5	223	64	2419	78	0	2561	73	43	82	1	199	62	3946	68	1	4077	7060
Apprch %	66.4	4.5	26.9	2.2		2.5	94.5	3	0		36.7	21.6	41.2	0.5		1.5	96.8	1.7	0		
Total %	2.1	0.1	0.8	0.1	3.2	0.9	34.3	1.1	0	36.3	1	0.6	1.2	0	2.8	0.9	55.9	1	0	57.7	

	Ulupii Street Southbound				Kalanianaole Highway Westbound				Ulupii Street Northbound				Kalanianaole Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	4	0	5	9	4	**298**	7	**309**	3	2	4	9	4	340	4	348	**675**
05:00 PM	14	0	**6**	**20**	3	194	**10**	207	4	**6**	6	**16**	4	**357**	**8**	**369**	612
05:15 PM	13	**2**	5	20	3	214	7	224	**5**	4	6	15	4	345	5	354	613
05:30 PM	**17**	0	2	19	**12**	180	5	197	3	2	**8**	13	**7**	334	4	345	574
Total Volume	48	2	18	68	22	886	29	937	15	14	24	53	19	1376	21	1416	2474
% App. Total	70.6	2.9	26.5		2.3	94.6	3.1		28.3	26.4	45.3		1.3	97.2	1.5		
PHF	.706	.250	.750	.850	.458	.743	.725	.758	.750	.583	.750	.828	.679	.964	.656	.959	.916

APPENDIX B

LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

Level of Service (LOS) for signalized intersections is defined in terms of delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. Specifically, level-of-service (LOS) criteria are stated in terms of the average control delay per vehicle, typically a 15-min analysis period. The criteria are given in the following table.

Table 1: Level-of-Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec/veh)
A	≤10.0
B	>10.0 and ≤20.0
C	>20.0 and ≤35.0
D	>35.0 and ≤55.0
E	>55.0 and ≤80.0
F	>80.0

Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group.

Level of Service A describes operations with low control delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.

Level of Service B describes operations with control delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

Level of Service C describes operations with control delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from only fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

Level of Service D describes operations with control delay greater than 35 and up to 55 sec per vehicle. At level of service D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

"Highway Capacity Manual," Transportation Research Board, 2000.

Level of Service E describes operation with control delay greater than 55 and up to 80 sec per vehicle. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.

Level of Service F describes operations with control delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delay levels.

"Highway Capacity Manual," Transportation Research Board, 2000.

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

Table 1: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (Sec/Veh)
A	≤10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

"Highway Capacity Manual," Transportation Research Board, 2000.

APPENDIX C

CAPACITY ANALYSIS CALCULATIONS
EXISTING PEAK HOUR TRAFFIC ANALYSIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	2011	20	10	610	65	0	1	4	38	4	11
Future Volume (vph)	65	2011	20	10	610	65	0	1	4	38	4	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.97			1.00	1.00
Flpb, ped/bikes	0.99	1.00		1.00	1.00			1.00			0.98	1.00
Frt	1.00	1.00		1.00	0.99			0.89			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.96	1.00
Satd. Flow (prot)	1756	5078		1770	3475			1616			1745	1583
Flt Permitted	0.39	1.00		0.08	1.00			1.00			0.74	1.00
Satd. Flow (perm)	720	5078		140	3475			1616			1355	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	66	2052	20	10	622	66	0	1	4	39	4	11
RTOR Reduction (vph)	0	0	0	0	5	0	0	4	0	0	0	10
Lane Group Flow (vph)	66	2072	0	10	683	0	0	1	0	0	43	1
Confl. Peds. (#/hr)	13					13			25	25		
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	68.3	68.3		68.3	68.3			10.1			10.1	10.1
Effective Green, g (s)	68.3	68.3		68.3	68.3			10.1			10.1	10.1
Actuated g/C Ratio	0.77	0.77		0.77	0.77			0.11			0.11	0.11
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	556	3923		108	2684			184			154	180
v/s Ratio Prot		c0.41			0.20			0.00				
v/s Ratio Perm	0.09			0.07							c0.03	0.00
v/c Ratio	0.12	0.53		0.09	0.25			0.01			0.28	0.01
Uniform Delay, d1	2.5	3.9		2.5	2.8			34.7			35.8	34.7
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	0.1	0.1		0.4	0.1			0.0			1.0	0.0
Delay (s)	2.6	4.0		2.8	2.9			34.7			36.8	34.7
Level of Service	A	A		A	A			C			D	C
Approach Delay (s)		3.9			2.9			34.7			36.4	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	4.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	88.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	2006	2	3	1124	54	14	7	4	57	2	33
Future Volume (vph)	82	2006	2	3	1124	54	14	7	4	57	2	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.99	1.00
Frt	1.00	1.00		1.00	0.99			0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.95	1.00
Satd. Flow (prot)	1766	5084		1769	3510			1766			1755	1583
Flt Permitted	0.21	1.00		0.07	1.00			0.84			0.71	1.00
Satd. Flow (perm)	389	5084		140	3510			1531			1315	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	84	2047	2	3	1147	55	14	7	4	58	2	34
RTOR Reduction (vph)	0	0	0	0	2	0	0	3	0	0	0	29
Lane Group Flow (vph)	84	2049	0	3	1200	0	0	22	0	0	60	5
Confl. Peds. (#/hr)	9		1	1		9			14	14		
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	67.6	67.6		67.6	67.6			12.6			12.6	12.6
Effective Green, g (s)	67.6	67.6		67.6	67.6			12.6			12.6	12.6
Actuated g/C Ratio	0.75	0.75		0.75	0.75			0.14			0.14	0.14
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	291	3810		104	2630			213			183	221
v/s Ratio Prot		c0.40			0.34							
v/s Ratio Perm	0.22			0.02				0.01			c0.05	0.00
v/c Ratio	0.29	0.54		0.03	0.46			0.10			0.33	0.02
Uniform Delay, d1	3.6	4.7		2.9	4.3			33.9			35.0	33.5
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	0.6	0.1		0.1	0.1			0.2			1.1	0.0
Delay (s)	4.2	4.9		3.0	4.4			34.1			36.0	33.5
Level of Service	A	A		A	A			C			D	C
Approach Delay (s)		4.9			4.4			34.1			35.1	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱	↰	↑↑		↰		↱	↰	↱	
Traffic Volume (vph)	0	1527	460	35	380	0	141	0	73	32	71	60
Future Volume (vph)	0	1527	460	35	380	0	141	0	73	32	71	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.93	1.00	1.00		1.00		0.97	1.00	0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		0.99		1.00	0.99	1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	0.93	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (prot)		3539	1472	1764	3539		1749		1542	1744	1714	
Flt Permitted		1.00	1.00	0.10	1.00		0.63		1.00	0.95	1.00	
Satd. Flow (perm)		3539	1472	191	3539		1152		1542	1744	1714	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1624	489	37	404	0	150	0	78	34	76	64
RTOR Reduction (vph)	0	0	152	0	0	0	0	0	24	0	27	0
Lane Group Flow (vph)	0	1624	337	37	404	0	150	0	54	34	113	0
Confl. Peds. (#/hr)	50		50	50		50	15		15	15		15
Turn Type		NA	Perm	Perm	NA		Perm		Perm	Perm	NA	
Protected Phases		2			6						4	
Permitted Phases			2	6			8		8	4		
Actuated Green, G (s)		63.1	63.1	63.1	63.1		18.4		18.4	18.4	18.4	
Effective Green, g (s)		63.1	63.1	63.1	63.1		18.4		18.4	18.4	18.4	
Actuated g/C Ratio		0.69	0.69	0.69	0.69		0.20		0.20	0.20	0.20	
Clearance Time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2440	1015	131	2440		231		310	350	344	
v/s Ratio Prot		c0.46			0.11						0.07	
v/s Ratio Perm			0.23	0.19			c0.13		0.04	0.02		
v/c Ratio		0.67	0.33	0.28	0.17		0.65		0.17	0.10	0.33	
Uniform Delay, d1		8.1	5.7	5.5	5.0		33.6		30.3	29.8	31.3	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2		0.7	0.2	1.2	0.0		6.2		0.3	0.1	0.6	
Delay (s)		8.8	5.9	6.7	5.0		39.8		30.5	29.9	31.8	
Level of Service		A	A	A	A		D		C	C	C	
Approach Delay (s)		8.2			5.1			36.6			31.4	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	91.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Puuhale Rd & Kamehameha Hwy/Dillingham Blvd

7/12/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1774	361	22	973	0	311	0	199	41	27	87
Future Volume (vph)	0	1774	361	22	973	0	311	0	199	41	27	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.93	1.00	1.00		1.00		0.97	1.00	0.98	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		0.99		1.00	0.98	1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	0.89	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (prot)		3539	1473	1770	3539		1747		1541	1743	1616	
Flt Permitted		1.00	1.00	0.06	1.00		0.66		1.00	0.95	1.00	
Satd. Flow (perm)		3539	1473	109	3539		1222		1541	1743	1616	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1887	384	23	1035	0	331	0	212	44	29	93
RTOR Reduction (vph)	0	0	123	0	0	0	0	0	13	0	62	0
Lane Group Flow (vph)	0	1887	261	23	1035	0	331	0	199	44	60	0
Confl. Peds. (#/hr)	40		40	40		40	13		13	13		13
Turn Type		NA	Perm	Perm	NA		Perm		Perm	Perm	NA	
Protected Phases		2			6						4	
Permitted Phases			2	6			8		8	4		
Actuated Green, G (s)		68.5	68.5	68.5	68.5		34.4		34.4	34.4	34.4	
Effective Green, g (s)		68.5	68.5	68.5	68.5		34.4		34.4	34.4	34.4	
Actuated g/C Ratio		0.61	0.61	0.61	0.61		0.30		0.30	0.30	0.30	
Clearance Time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2147	893	66	2147		372		469	531	492	
v/s Ratio Prot		c0.53			0.29						0.04	
v/s Ratio Perm			0.18	0.21			c0.27		0.13	0.03		
v/c Ratio		0.88	0.29	0.35	0.48		0.89		0.43	0.08	0.12	
Uniform Delay, d1		18.7	10.6	11.1	12.3		37.4		31.4	28.0	28.3	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2		4.5	0.2	3.2	0.2		21.9		0.6	0.1	0.1	
Delay (s)		23.2	10.8	14.2	12.5		59.3		32.0	28.1	28.5	
Level of Service		C	B	B	B		E		C	C	C	
Approach Delay (s)		21.1			12.5			48.7			28.4	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	22.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	112.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	3485	136	0	1326	70	31	67	73	91	129	39
Future Volume (vph)	31	3485	136	0	1326	70	31	67	73	91	129	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.86			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		0.97	1.00	
Frt	1.00	0.99			0.99		1.00	0.92		1.00	0.96	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	5751			3167		1597	1503		1542	1622	
Flt Permitted	0.95	1.00			1.00		0.39	1.00		0.48	1.00	
Satd. Flow (perm)	1597	5751			3167		654	1503		773	1622	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	32	3630	142	0	1381	73	32	70	76	95	134	41
RTOR Reduction (vph)	0	3	0	0	2	0	0	1	0	0	8	0
Lane Group Flow (vph)	32	3769	0	0	1452	0	32	145	0	95	167	0
Confl. Peds. (#/hr)	1					1			33	33		
Heavy Vehicles (%)	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Turn Type	Prot	NA			NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.1	112.3			103.2		20.5	20.5		20.5	20.5	
Effective Green, g (s)	4.1	112.3			103.2		20.5	20.5		20.5	20.5	
Actuated g/C Ratio	0.03	0.79			0.72		0.14	0.14		0.14	0.14	
Clearance Time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	45	4522			2288		93	215		110	232	
v/s Ratio Prot	0.02	c0.66			0.46			0.10			0.10	
v/s Ratio Perm							0.05			c0.12		
v/c Ratio	0.71	0.83			0.63		0.34	0.68		0.86	0.72	
Uniform Delay, d1	68.8	9.5			10.1		55.1	58.0		59.8	58.4	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	41.4	1.4			0.6		2.2	8.1		46.0	10.5	
Delay (s)	110.1	10.9			10.7		57.3	66.1		105.8	68.9	
Level of Service	F	B			B		E	E		F	E	
Approach Delay (s)		11.7			10.7			64.5			81.9	
Approach LOS		B			B			E			F	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	142.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Puuhale Rd & Nimitz Hwy

7/12/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	2238	62	44	2554	79	102	135	62	59	97	35
Future Volume (vph)	44	2238	62	44	2554	79	102	135	62	59	97	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.96	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	4563		1597	4570		1597	1561		1535	1614	
Flt Permitted	0.95	1.00		0.95	1.00		0.48	1.00		0.31	1.00	
Satd. Flow (perm)	1597	4563		1597	4570		814	1561		496	1614	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	45	2284	63	45	2606	81	104	138	63	60	99	36
RTOR Reduction (vph)	0	1	0	0	1	0	0	7	0	0	6	0
Lane Group Flow (vph)	45	2346	0	45	2686	0	104	194	0	60	129	0
Confl. Peds. (#/hr)			9						35	35		
Heavy Vehicles (%)	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	9.1	151.9		9.1	151.9		33.3	33.3		33.3	33.3	
Effective Green, g (s)	9.1	151.9		9.1	151.9		33.3	33.3		33.3	33.3	
Actuated g/C Ratio	0.04	0.73		0.04	0.73		0.16	0.16		0.16	0.16	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	69	3311		69	3316		129	248		78	256	
v/s Ratio Prot	c0.03	0.51		0.03	c0.59			0.12			0.08	
v/s Ratio Perm							c0.13			0.12		
v/c Ratio	0.65	0.71		0.65	0.81		0.81	0.78		0.77	0.50	
Uniform Delay, d1	98.5	16.2		98.5	19.1		84.9	84.5		84.3	80.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	20.0	0.7		20.0	1.5		29.5	14.8		35.7	1.6	
Delay (s)	118.5	16.9		118.5	20.6		114.4	99.4		120.0	82.0	
Level of Service	F	B		F	C		F	F		F	F	
Approach Delay (s)		18.8			22.3			104.5			93.7	
Approach LOS		B			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	209.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	85	395	566	221	348	452
Future Volume (vph)	85	395	566	221	348	452
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1549	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1549	1770	3539
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	91	425	609	238	374	486
RTOR Reduction (vph)	0	352	0	168	0	0
Lane Group Flow (vph)	91	73	609	70	374	486
Confl. Peds. (#/hr)				1		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	10.7	10.7	18.3	18.3	18.6	41.9
Effective Green, g (s)	10.7	10.7	18.3	18.3	18.6	41.9
Actuated g/C Ratio	0.17	0.17	0.29	0.29	0.30	0.67
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	302	270	1034	452	525	2368
v/s Ratio Prot	c0.05		c0.17		c0.21	0.14
v/s Ratio Perm		0.05		0.04		
v/c Ratio	0.30	0.27	0.59	0.15	0.71	0.21
Uniform Delay, d1	22.7	22.6	18.9	16.4	19.6	4.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.5	0.9	0.2	4.5	0.0
Delay (s)	23.2	23.1	19.8	16.6	24.2	4.0
Level of Service	C	C	B	B	C	A
Approach Delay (s)	23.1		18.9			12.8
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	62.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	144	144	436	118	427	659
Future Volume (vph)	144	144	436	118	427	659
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1549	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1549	1770	3539
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	145	145	440	119	431	666
RTOR Reduction (vph)	0	117	0	90	0	0
Lane Group Flow (vph)	145	28	440	29	431	666
Confl. Peds. (#/hr)				1		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	12.8	12.8	16.3	16.3	23.3	44.6
Effective Green, g (s)	12.8	12.8	16.3	16.3	23.3	44.6
Actuated g/C Ratio	0.19	0.19	0.24	0.24	0.35	0.66
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	336	300	855	374	611	2341
v/s Ratio Prot	c0.08		c0.12		c0.24	0.19
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.43	0.09	0.51	0.08	0.71	0.28
Uniform Delay, d1	24.1	22.5	22.1	19.7	19.1	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1	0.5	0.1	3.7	0.1
Delay (s)	25.0	22.6	22.7	19.8	22.8	4.8
Level of Service	C	C	C	B	C	A
Approach Delay (s)	23.8		22.0			11.9
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	363	173	222	469	0	0
Future Volume (Veh/h)	363	173	222	469	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	386	184	236	499	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	537					
pX, platoon unblocked						
vC, conflicting volume			570		1449	478
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			570		1449	478
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			76		100	100
cM capacity (veh/h)			1002		110	587

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	570	236	499
Volume Left	0	236	0
Volume Right	184	0	0
cSH	1700	1002	1700
Volume to Capacity	0.34	0.24	0.29
Queue Length 95th (ft)	0	23	0
Control Delay (s)	0.0	9.7	0.0
Lane LOS		A	
Approach Delay (s)	0.0	3.1	
Approach LOS			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	255	282	359	315	0	0
Future Volume (Veh/h)	255	282	359	315	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	287	317	403	354	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	537					
pX, platoon unblocked						
vC, conflicting volume			604		1606	446
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			604		1606	446
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			59		100	100
cM capacity (veh/h)			974		68	613

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	604	403	354
Volume Left	0	403	0
Volume Right	317	0	0
cSH	1700	974	1700
Volume to Capacity	0.36	0.41	0.21
Queue Length 95th (ft)	0	51	0
Control Delay (s)	0.0	11.3	0.0
Lane LOS		B	
Approach Delay (s)	0.0	6.0	
Approach LOS			

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	363	0	0	488	203	304
Future Volume (Veh/h)	363	0	0	488	203	304
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	386	0	0	519	216	323
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1031					
pX, platoon unblocked						
vC, conflicting volume			386		646	386
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			386		646	386
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		47	47
cM capacity (veh/h)			1169		405	612

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	386	260	260	216	323
Volume Left	0	0	0	216	0
Volume Right	0	0	0	0	323
cSH	1700	1700	1700	405	612
Volume to Capacity	0.23	0.15	0.15	0.53	0.53
Queue Length 95th (ft)	0	0	0	76	77
Control Delay (s)	0.0	0.0	0.0	23.6	17.3
Lane LOS				C	C
Approach Delay (s)	0.0	0.0		19.8	
Approach LOS				C	

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	255	0	0	535	139	240
Future Volume (Veh/h)	255	0	0	535	139	240
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	271	0	0	569	148	255
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1031					
pX, platoon unblocked						
vC, conflicting volume			271		556	271
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			271		556	271
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		68	65
cM capacity (veh/h)			1289		461	727

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	271	284	284	148	255
Volume Left	0	0	0	148	0
Volume Right	0	0	0	0	255
cSH	1700	1700	1700	461	727
Volume to Capacity	0.16	0.17	0.17	0.32	0.35
Queue Length 95th (ft)	0	0	0	34	39
Control Delay (s)	0.0	0.0	0.0	16.4	12.6
Lane LOS				C	B
Approach Delay (s)	0.0	0.0		14.0	
Approach LOS				B	

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	223	156	1	79	3	126	0	2	0	0	2
Future Volume (Veh/h)	51	223	156	1	79	3	126	0	2	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	61	265	186	1	94	4	150	0	2	0	0	2
Pedestrians					3			1				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	98			452			532	581	230	358	672	49
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	98			452			532	581	230	358	672	49
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			64	100	100	100	100	100
cM capacity (veh/h)	1493			1104			415	406	770	551	360	1009

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	194	318	1	63	35	150	2	2
Volume Left	61	0	1	0	0	150	0	0
Volume Right	0	186	0	0	4	0	2	2
cSH	1493	1700	1104	1700	1700	415	770	1009
Volume to Capacity	0.04	0.19	0.00	0.04	0.02	0.36	0.00	0.00
Queue Length 95th (ft)	3	0	0	0	0	40	0	0
Control Delay (s)	2.6	0.0	8.3	0.0	0.0	18.5	9.7	8.6
Lane LOS	A		A			C	A	A
Approach Delay (s)	1.0		0.1			18.4		8.6
Approach LOS						C		A

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	36.3%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	70	15	3	172	5	162	0	3	0	0	4
Future Volume (Veh/h)	27	70	15	3	172	5	162	0	3	0	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	31	80	17	3	198	6	186	0	3	0	0	5
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	204			97			260	360	50	313	366	102
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	204			97			260	360	50	313	366	102
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			72	100	100	100	100	99
cM capacity (veh/h)	1365			1494			655	551	1007	602	547	933

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	71	57	3	132	72	186	3	5
Volume Left	31	0	3	0	0	186	0	0
Volume Right	0	17	0	0	6	0	3	5
cSH	1365	1700	1494	1700	1700	655	1007	933
Volume to Capacity	0.02	0.03	0.00	0.08	0.04	0.28	0.00	0.01
Queue Length 95th (ft)	2	0	0	0	0	29	0	0
Control Delay (s)	3.5	0.0	7.4	0.0	0.0	12.7	8.6	8.9
Lane LOS	A		A			B	A	A
Approach Delay (s)	1.9		0.1			12.6		8.9
Approach LOS						B		A

Intersection Summary				
Average Delay	5.1			
Intersection Capacity Utilization	33.9%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
1: Ulune Street Extension & Halawa Valley St

7/12/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	487	0	610	0	1049	357	0	0	0	0	129	315
Future Volume (vph)	487	0	610	0	1049	357	0	0	0	0	129	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frt	1.00		0.85		0.96						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1583		1583		4750						1667	1417
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1583		1583		4750						1667	1417
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	535	0	670	0	1153	392	0	0	0	0	142	346
RTOR Reduction (vph)	0	0	0	0	40	0	0	0	0	0	0	300
Lane Group Flow (vph)	535	0	670	0	1505	0	0	0	0	0	142	46
Heavy Vehicles (%)	14%	2%	2%	2%	2%	14%	2%	2%	2%	14%	14%	14%
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	49.5		132.8		50.8						17.5	17.5
Effective Green, g (s)	49.5		132.8		50.8						17.5	17.5
Actuated g/C Ratio	0.37		1.00		0.38						0.13	0.13
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	590		1583		1817						219	186
v/s Ratio Prot	c0.34				c0.32						c0.09	
v/s Ratio Perm			0.42									0.03
v/c Ratio	0.91		0.42		0.83						0.65	0.25
Uniform Delay, d1	39.5		0.0		37.1						54.7	51.7
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	17.6		0.8		3.3						6.5	0.7
Delay (s)	57.0		0.8		40.3						61.2	52.4
Level of Service	E		A		D						E	D
Approach Delay (s)		25.8			40.3			0.0			55.0	
Approach LOS		C			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	132.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	0	1324	0	873	255	0	0	0	0	565	532
Future Volume (vph)	190	0	1324	0	873	255	0	0	0	0	565	532
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frpb, ped/bikes	1.00		1.00		0.99						1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00						1.00	1.00
Frt	1.00		0.85		0.97						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1583		1583		4756						1667	1417
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1583		1583		4756						1667	1417
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	0	1439	0	949	277	0	0	0	0	614	578
RTOR Reduction (vph)	0	0	0	0	29	0	0	0	0	0	0	213
Lane Group Flow (vph)	207	0	1439	0	1197	0	0	0	0	0	614	365
Confl. Peds. (#/hr)						3						
Heavy Vehicles (%)	14%	2%	2%	2%	2%	14%	2%	2%	2%	14%	14%	14%
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	25.4		153.1		47.2						65.5	65.5
Effective Green, g (s)	25.4		153.1		47.2						65.5	65.5
Actuated g/C Ratio	0.17		1.00		0.31						0.43	0.43
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	262		1583		1466						713	606
v/s Ratio Prot	0.13				0.25						0.37	
v/s Ratio Perm			c0.91									0.26
v/c Ratio	0.79		0.91		0.82						0.86	0.60
Uniform Delay, d1	61.3		0.0		48.9						39.7	33.7
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	14.9		9.3		3.6						10.4	1.7
Delay (s)	76.2		9.3		52.6						50.1	35.4
Level of Service	E		A		D						D	D
Approach Delay (s)		17.7			52.6			0.0			43.0	
Approach LOS		B			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	153.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	389	432	202	14	18	224
Future Volume (vph)	389	432	202	14	18	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1650		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1650		1583	1417
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	447	497	232	16	21	257
RTOR Reduction (vph)	0	0	3	0	0	223
Lane Group Flow (vph)	447	497	245	0	21	34
Confl. Peds. (#/hr)				1		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	22.7	42.7	15.0		7.9	7.9
Effective Green, g (s)	22.7	42.7	15.0		7.9	7.9
Actuated g/C Ratio	0.37	0.70	0.25		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	592	1174	408		206	184
v/s Ratio Prot	c0.28	0.30	c0.15		0.01	
v/s Ratio Perm						c0.02
v/c Ratio	0.76	0.42	0.60		0.10	0.18
Uniform Delay, d1	16.5	3.8	20.2		23.2	23.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.4	0.2	2.5		0.2	0.5
Delay (s)	22.0	4.0	22.6		23.4	24.0
Level of Service	C	A	C		C	C
Approach Delay (s)		12.5	22.6		23.9	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	200	220	508	12	23	408
Future Volume (vph)	200	220	508	12	23	408
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1660		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1660		1583	1417
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	220	242	558	13	25	448
RTOR Reduction (vph)	0	0	1	0	0	389
Lane Group Flow (vph)	220	242	570	0	25	59
Confl. Peds. (#/hr)				6		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	16.9	55.0	33.1		9.8	9.8
Effective Green, g (s)	16.9	55.0	33.1		9.8	9.8
Actuated g/C Ratio	0.23	0.74	0.44		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	357	1225	734		207	185
v/s Ratio Prot	c0.14	0.15	c0.34		0.02	
v/s Ratio Perm						c0.04
v/c Ratio	0.62	0.20	0.78		0.12	0.32
Uniform Delay, d1	26.0	3.1	17.7		28.7	29.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.1	0.1	5.2		0.3	1.0
Delay (s)	29.2	3.1	22.9		29.0	30.5
Level of Service	C	A	C		C	C
Approach Delay (s)		15.5	22.9		30.4	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	74.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	290	63	1	136	23	4
Future Volume (Veh/h)	290	63	1	136	23	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	354	77	1	166	28	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			431		560	392
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			431		560	392
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		94	99
cM capacity (veh/h)			1067		469	631

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	431	167	33
Volume Left	0	1	28
Volume Right	77	0	5
cSH	1700	1067	488
Volume to Capacity	0.25	0.00	0.07
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.1	12.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	12.9
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	29.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	122	26	3	278	74	1
Future Volume (Veh/h)	122	26	3	278	74	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	134	29	3	305	81	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			163		460	148
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			163		460	148
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		85	100
cM capacity (veh/h)			1346		537	867

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	163	308	82
Volume Left	0	3	81
Volume Right	29	0	1
cSH	1700	1346	540
Volume to Capacity	0.10	0.00	0.15
Queue Length 95th (ft)	0	0	13
Control Delay (s)	0.0	0.1	12.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	12.9
Approach LOS			B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	42	150	2	25	111	3
Future Volume (Veh/h)	42	150	2	25	111	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	49	174	2	29	129	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			223		169	136
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			223		169	136
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		84	100
cM capacity (veh/h)			1278		793	882

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	223	31	132
Volume Left	0	2	129
Volume Right	174	0	3
cSH	1700	1278	795
Volume to Capacity	0.13	0.00	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.0	0.5	10.4
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	10.4
Approach LOS			B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	24.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	8	39	0	41	111	0
Future Volume (Veh/h)	8	39	0	41	111	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	9	43	0	45	122	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			52		76	30
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			52		76	30
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		86	100
cM capacity (veh/h)			1480		899	1010

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	52	45	122
Volume Left	0	0	122
Volume Right	43	0	0
cSH	1700	1480	899
Volume to Capacity	0.03	0.00	0.14
Queue Length 95th (ft)	0	0	12
Control Delay (s)	0.0	0.0	9.6
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.6
Approach LOS			A

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	16.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Ulune Street Extension & Halawa Valley St

7/12/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	487	0	610	0	1049	357	0	0	0	0	129	315
Future Volume (vph)	487	0	610	0	1049	357	0	0	0	0	129	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frt	1.00		0.85		0.96						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1583		1583		4750						1667	1417
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1583		1583		4750						1667	1417
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	535	0	670	0	1153	392	0	0	0	0	142	346
RTOR Reduction (vph)	0	0	0	0	40	0	0	0	0	0	0	300
Lane Group Flow (vph)	535	0	670	0	1505	0	0	0	0	0	142	46
Heavy Vehicles (%)	14%	2%	2%	2%	2%	14%	2%	2%	2%	14%	14%	14%
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	49.5		132.8		50.8						17.5	17.5
Effective Green, g (s)	49.5		132.8		50.8						17.5	17.5
Actuated g/C Ratio	0.37		1.00		0.38						0.13	0.13
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	590		1583		1817						219	186
v/s Ratio Prot	c0.34				c0.32						c0.09	
v/s Ratio Perm			0.42									0.03
v/c Ratio	0.91		0.42		0.83						0.65	0.25
Uniform Delay, d1	39.5		0.0		37.1						54.7	51.7
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	17.6		0.8		3.3						6.5	0.7
Delay (s)	57.0		0.8		40.3						61.2	52.4
Level of Service	E		A		D						E	D
Approach Delay (s)		25.8			40.3			0.0			55.0	
Approach LOS		C			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	132.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	0	1324	0	873	255	0	0	0	0	565	532
Future Volume (vph)	190	0	1324	0	873	255	0	0	0	0	565	532
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frpb, ped/bikes	1.00		1.00		0.99						1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00						1.00	1.00
Frt	1.00		0.85		0.97						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1583		1583		4756						1667	1417
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1583		1583		4756						1667	1417
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	0	1439	0	949	277	0	0	0	0	614	578
RTOR Reduction (vph)	0	0	0	0	29	0	0	0	0	0	0	213
Lane Group Flow (vph)	207	0	1439	0	1197	0	0	0	0	0	614	365
Confl. Peds. (#/hr)						3						
Heavy Vehicles (%)	14%	2%	2%	2%	2%	14%	2%	2%	2%	14%	14%	14%
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	25.4		153.1		47.2						65.5	65.5
Effective Green, g (s)	25.4		153.1		47.2						65.5	65.5
Actuated g/C Ratio	0.17		1.00		0.31						0.43	0.43
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	262		1583		1466						713	606
v/s Ratio Prot	0.13				0.25						0.37	
v/s Ratio Perm			c0.91									0.26
v/c Ratio	0.79		0.91		0.82						0.86	0.60
Uniform Delay, d1	61.3		0.0		48.9						39.7	33.7
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	14.9		9.3		3.6						10.4	1.7
Delay (s)	76.2		9.3		52.6						50.1	35.4
Level of Service	E		A		D						D	D
Approach Delay (s)		17.7			52.6			0.0			43.0	
Approach LOS		B			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	153.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	389	432	202	14	18	224
Future Volume (vph)	389	432	202	14	18	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1650		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1650		1583	1417
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	447	497	232	16	21	257
RTOR Reduction (vph)	0	0	3	0	0	223
Lane Group Flow (vph)	447	497	245	0	21	34
Confl. Peds. (#/hr)				1		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	22.7	42.7	15.0		7.9	7.9
Effective Green, g (s)	22.7	42.7	15.0		7.9	7.9
Actuated g/C Ratio	0.37	0.70	0.25		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	592	1174	408		206	184
v/s Ratio Prot	c0.28	0.30	c0.15		0.01	
v/s Ratio Perm						c0.02
v/c Ratio	0.76	0.42	0.60		0.10	0.18
Uniform Delay, d1	16.5	3.8	20.2		23.2	23.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.4	0.2	2.5		0.2	0.5
Delay (s)	22.0	4.0	22.6		23.4	24.0
Level of Service	C	A	C		C	C
Approach Delay (s)		12.5	22.6		23.9	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	200	220	508	12	23	408
Future Volume (vph)	200	220	508	12	23	408
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1660		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1660		1583	1417
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	220	242	558	13	25	448
RTOR Reduction (vph)	0	0	1	0	0	389
Lane Group Flow (vph)	220	242	570	0	25	59
Confl. Peds. (#/hr)				6		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	16.9	55.0	33.1		9.8	9.8
Effective Green, g (s)	16.9	55.0	33.1		9.8	9.8
Actuated g/C Ratio	0.23	0.74	0.44		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	357	1225	734		207	185
v/s Ratio Prot	c0.14	0.15	c0.34		0.02	
v/s Ratio Perm						c0.04
v/c Ratio	0.62	0.20	0.78		0.12	0.32
Uniform Delay, d1	26.0	3.1	17.7		28.7	29.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.1	0.1	5.2		0.3	1.0
Delay (s)	29.2	3.1	22.9		29.0	30.5
Level of Service	C	A	C		C	C
Approach Delay (s)		15.5	22.9		30.4	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	74.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
1: Ulupii St & Kalanianaole Hwy

7/12/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	722	39	99	1172	93	19	30	45	23	19	25
Future Volume (Veh/h)	9	722	39	99	1172	93	19	30	45	23	19	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	9	760	41	104	1234	98	20	32	47	24	20	26
Pedestrians					1			12				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			1				
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1332			813			1672	2350	414	1953	2322	666
vC1, stage 1 conf vol							810	810		1491	1491	
vC2, stage 2 conf vol							861	1540		462	831	
vCu, unblocked vol	1332			813			1672	2350	414	1953	2322	666
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			87			92	84	93	85	90	95
cM capacity (veh/h)	514			800			247	206	654	160	208	487

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	9	507	294	104	823	509	99	70
Volume Left	9	0	0	104	0	0	20	24
Volume Right	0	0	41	0	0	98	47	26
cSH	514	1700	1700	800	1700	1700	322	234
Volume to Capacity	0.02	0.30	0.17	0.13	0.48	0.30	0.31	0.30
Queue Length 95th (ft)	1	0	0	11	0	0	32	30
Control Delay (s)	12.1	0.0	0.0	10.2	0.0	0.0	21.1	26.8
Lane LOS	B			B			C	D
Approach Delay (s)	0.1			0.7			21.1	26.8
Approach LOS							C	D

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	55.1%	ICU Level of Service		B
Analysis Period (min)	15			

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
1: Ulupii St & Kalanianaole Hwy

7/12/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	1376	21	22	886	29	15	14	24	48	2	18
Future Volume (Veh/h)	19	1376	21	22	886	29	15	14	24	48	2	18
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	1496	23	24	963	32	16	15	26	52	2	20
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											3.5	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	996			1519			2100	2594	760	1852	2589	498
vC1, stage 1 conf vol							1550	1550		1028	1028	
vC2, stage 2 conf vol							550	1044		824	1561	
vCu, unblocked vol	996			1519			2100	2594	760	1852	2589	498
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			94			90	93	94	78	99	97
cM capacity (veh/h)	690			435			168	212	434	235	201	597

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	21	997	522	24	642	353	57	74
Volume Left	21	0	0	24	0	0	16	52
Volume Right	0	0	23	0	0	32	26	20
cSH	690	1700	1700	435	1700	1700	252	279
Volume to Capacity	0.03	0.59	0.31	0.06	0.38	0.21	0.23	0.26
Queue Length 95th (ft)	2	0	0	4	0	0	21	26
Control Delay (s)	10.4	0.0	0.0	13.7	0.0	0.0	23.4	22.5
Lane LOS	B			B			C	C
Approach Delay (s)	0.1			0.3			23.4	22.5
Approach LOS							C	C

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	53.9%	ICU Level of Service	A	
Analysis Period (min)	15			

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
2: Olomana School Dwy/WCCC Dwy & Kalanianaole Hwy

7/12/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	761	41	18	1261	5	13	0	4	2	0	9
Future Volume (Veh/h)	13	761	41	18	1261	5	13	0	4	2	0	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	14	801	43	19	1327	5	14	0	4	2	0	9
Pedestrians					5							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1332			801			1540	2199	406	1805	2196	666
vC1, stage 1 conf vol							829	829		1368	1368	
vC2, stage 2 conf vol							710	1370		438	829	
vCu, unblocked vol	1332			801			1540	2199	406	1805	2196	666
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	*6.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		5.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			96	100	99	99	100	98
cM capacity (veh/h)	514			818			315	170	666	211	178	487

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	14	400	400	43	19	885	447	18	11
Volume Left	14	0	0	0	19	0	0	14	2
Volume Right	0	0	0	43	0	0	5	4	9
cSH	514	1700	1700	1700	818	1700	1700	357	393
Volume to Capacity	0.03	0.24	0.24	0.03	0.02	0.52	0.26	0.05	0.03
Queue Length 95th (ft)	2	0	0	0	2	0	0	4	2
Control Delay (s)	12.2	0.0	0.0	0.0	9.5	0.0	0.0	15.6	14.4
Lane LOS	B				A			C	B
Approach Delay (s)	0.2				0.1			15.6	14.4
Approach LOS								C	B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	1424	0	0	841	0	1	0	1	0	0	2
Future Volume (Veh/h)	3	1424	0	0	841	0	1	0	1	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	3	1468	0	0	867	0	1	0	1	0	0	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	867			1468			1910	2341	734	1608	2341	434
vC1, stage 1 conf vol							1474	1474		867	867	
vC2, stage 2 conf vol							436	867		741	1474	
vCu, unblocked vol	867			1468			1910	2341	734	1608	2341	434
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	7.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
cM capacity (veh/h)	772			456			192	165	448	243	165	646

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	3	734	734	0	0	578	289	2	2
Volume Left	3	0	0	0	0	0	0	1	0
Volume Right	0	0	0	0	0	0	0	1	2
cSH	772	1700	1700	1700	1700	1700	1700	269	646
Volume to Capacity	0.00	0.43	0.43	0.00	0.00	0.34	0.17	0.01	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0	1	0
Control Delay (s)	9.7	0.0	0.0	0.0	0.0	0.0	0.0	18.5	10.6
Lane LOS	A							C	B
Approach Delay (s)	0.0				0.0			18.5	10.6
Approach LOS								C	B

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT ALTERNATIVE 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	2072	21	10	629	67	0	1	4	39	4	11
Future Volume (vph)	67	2072	21	10	629	67	0	1	4	39	4	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.97			1.00	1.00
Flpb, ped/bikes	0.99	1.00		1.00	1.00			1.00			0.98	1.00
Frt	1.00	1.00		1.00	0.99			0.89			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.96	1.00
Satd. Flow (prot)	1756	5078		1770	3475			1615			1744	1583
Flt Permitted	0.38	1.00		0.07	1.00			1.00			0.74	1.00
Satd. Flow (perm)	702	5078		129	3475			1615			1353	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	68	2114	21	10	642	68	0	1	4	40	4	11
RTOR Reduction (vph)	0	0	0	0	4	0	0	4	0	0	0	10
Lane Group Flow (vph)	68	2135	0	10	706	0	0	1	0	0	44	1
Confl. Peds. (#/hr)	13					13			25	25		
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	70.5	70.5		70.5	70.5			10.3			10.3	10.3
Effective Green, g (s)	70.5	70.5		70.5	70.5			10.3			10.3	10.3
Actuated g/C Ratio	0.78	0.78		0.78	0.78			0.11			0.11	0.11
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	545	3942		100	2698			183			153	179
v/s Ratio Prot		c0.42			0.20			0.00				
v/s Ratio Perm	0.10			0.08							c0.03	0.00
v/c Ratio	0.12	0.54		0.10	0.26			0.01			0.29	0.01
Uniform Delay, d1	2.5	3.9		2.5	2.8			35.7			36.9	35.7
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	0.1	0.2		0.4	0.1			0.0			1.0	0.0
Delay (s)	2.6	4.1		2.9	2.9			35.7			37.9	35.7
Level of Service	A	A		A	A			D			D	D
Approach Delay (s)		4.0			2.9			35.7			37.5	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	4.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	2067	2	3	1158	56	14	7	4	59	2	34
Future Volume (vph)	84	2067	2	3	1158	56	14	7	4	59	2	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.99	1.00
Frt	1.00	1.00		1.00	0.99			0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.95	1.00
Satd. Flow (prot)	1766	5084		1769	3509			1766			1755	1583
Flt Permitted	0.20	1.00		0.07	1.00			0.84			0.71	1.00
Satd. Flow (perm)	371	5084		129	3509			1530			1315	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	86	2109	2	3	1182	57	14	7	4	60	2	35
RTOR Reduction (vph)	0	0	0	0	2	0	0	3	0	0	0	30
Lane Group Flow (vph)	86	2111	0	3	1237	0	0	22	0	0	62	5
Confl. Peds. (#/hr)	9		1	1		9			14	14		
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	69.3	69.3		69.3	69.3			12.8			12.8	12.8
Effective Green, g (s)	69.3	69.3		69.3	69.3			12.8			12.8	12.8
Actuated g/C Ratio	0.75	0.75		0.75	0.75			0.14			0.14	0.14
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	279	3825		97	2640			212			182	220
v/s Ratio Prot		c0.42			0.35							
v/s Ratio Perm	0.23			0.02				0.01			c0.05	0.00
v/c Ratio	0.31	0.55		0.03	0.47			0.10			0.34	0.02
Uniform Delay, d1	3.7	4.8		2.9	4.4			34.6			35.8	34.2
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	0.6	0.2		0.1	0.1			0.2			1.1	0.0
Delay (s)	4.3	5.0		3.0	4.5			34.8			37.0	34.3
Level of Service	A	A		A	A			C			D	C
Approach Delay (s)		5.0			4.5			34.8			36.0	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	5.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1573	474	36	392	0	145	0	75	33	73	62
Future Volume (vph)	0	1573	474	36	392	0	145	0	75	33	73	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.93	1.00	1.00		1.00		0.97	1.00	0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		0.99		1.00	0.99	1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	0.93	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (prot)		3539	1468	1770	3539		1749		1541	1743	1714	
Flt Permitted		1.00	1.00	0.09	1.00		0.61		1.00	0.95	1.00	
Satd. Flow (perm)		3539	1468	176	3539		1124		1541	1743	1714	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1673	504	38	417	0	154	0	80	35	78	66
RTOR Reduction (vph)	0	0	155	0	0	0	0	0	22	0	27	0
Lane Group Flow (vph)	0	1673	349	38	417	0	154	0	58	35	117	0
Confl. Peds. (#/hr)	50		50	50		50	15		15	15		15
Turn Type		NA	Perm	Perm	NA		Perm		Perm	Perm	NA	
Protected Phases		2			6						4	
Permitted Phases			2	6			8		8	4		
Actuated Green, G (s)		65.8	65.8	65.8	65.8		19.3		19.3	19.3	19.3	
Effective Green, g (s)		65.8	65.8	65.8	65.8		19.3		19.3	19.3	19.3	
Actuated g/C Ratio		0.69	0.69	0.69	0.69		0.20		0.20	0.20	0.20	
Clearance Time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2448	1015	121	2448		228		312	353	347	
v/s Ratio Prot		c0.47			0.12						0.07	
v/s Ratio Perm			0.24	0.22			c0.14		0.04	0.02		
v/c Ratio		0.68	0.34	0.31	0.17		0.68		0.18	0.10	0.34	
Uniform Delay, d1		8.6	5.9	5.8	5.1		35.0		31.4	30.8	32.4	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2		0.8	0.2	1.5	0.0		7.7		0.3	0.1	0.6	
Delay (s)		9.4	6.1	7.3	5.1		42.7		31.7	31.0	33.0	
Level of Service		A	A	A	A		D		C	C	C	
Approach Delay (s)		8.6			5.3			38.9			32.6	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	95.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1828	372	23	1003	0	320	0	205	42	28	90
Future Volume (vph)	0	1828	372	23	1003	0	320	0	205	42	28	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.93	1.00	1.00		1.00		0.97	1.00	0.98	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		0.99		1.00	0.98	1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	0.89	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (prot)		3539	1470	1770	3539		1747		1540	1742	1616	
Flt Permitted		1.00	1.00	0.06	1.00		0.66		1.00	0.95	1.00	
Satd. Flow (perm)		3539	1470	105	3539		1206		1540	1742	1616	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1945	396	24	1067	0	340	0	218	45	30	96
RTOR Reduction (vph)	0	0	125	0	0	0	0	0	13	0	60	0
Lane Group Flow (vph)	0	1945	271	24	1067	0	340	0	205	45	66	0
Confl. Peds. (#/hr)	40		40	40		40	13		13	13		13
Turn Type		NA	Perm	Perm	NA		Perm		Perm	Perm	NA	
Protected Phases		2			6						4	
Permitted Phases			2	6			8		8	4		
Actuated Green, G (s)		70.7	70.7	70.7	70.7		35.4		35.4	35.4	35.4	
Effective Green, g (s)		70.7	70.7	70.7	70.7		35.4		35.4	35.4	35.4	
Actuated g/C Ratio		0.61	0.61	0.61	0.61		0.30		0.30	0.30	0.30	
Clearance Time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2155	895	63	2155		367		469	531	492	
v/s Ratio Prot		c0.55			0.30						0.04	
v/s Ratio Perm			0.18	0.23			c0.28		0.13	0.03		
v/c Ratio		0.90	0.30	0.38	0.50		0.93		0.44	0.08	0.13	
Uniform Delay, d1		19.7	10.9	11.6	12.7		39.1		32.4	28.8	29.2	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2		5.7	0.2	3.8	0.2		28.8		0.7	0.1	0.1	
Delay (s)		25.5	11.1	15.4	12.9		67.9		33.0	28.9	29.4	
Level of Service		C	B	B	B		E		C	C	C	
Approach Delay (s)		23.0			12.9			54.3			29.2	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	116.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	3591	140	0	1366	72	32	69	75	94	133	40
Future Volume (vph)	32	3591	140	0	1366	72	32	69	75	94	133	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.86			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		0.97	1.00	
Frt	1.00	0.99			0.99		1.00	0.92		1.00	0.97	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	5751			3167		1597	1503		1542	1623	
Flt Permitted	0.95	1.00			1.00		0.38	1.00		0.47	1.00	
Satd. Flow (perm)	1597	5751			3167		635	1503		761	1623	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	33	3741	146	0	1423	75	33	72	78	98	139	42
RTOR Reduction (vph)	0	3	0	0	2	0	0	1	0	0	8	0
Lane Group Flow (vph)	33	3884	0	0	1496	0	33	149	0	98	173	0
Confl. Peds. (#/hr)	1					1			33	33		
Heavy Vehicles (%)	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Turn Type	Prot	NA			NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.1	112.3			103.2		21.0	21.0		21.0	21.0	
Effective Green, g (s)	4.1	112.3			103.2		21.0	21.0		21.0	21.0	
Actuated g/C Ratio	0.03	0.78			0.72		0.15	0.15		0.15	0.15	
Clearance Time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	45	4506			2280		93	220		111	237	
v/s Ratio Prot	0.02	c0.68			0.47			0.10			0.11	
v/s Ratio Perm							0.05			c0.13		
v/c Ratio	0.73	0.86			0.66		0.35	0.68		0.88	0.73	
Uniform Delay, d1	69.1	10.3			10.6		55.1	57.9		59.9	58.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	46.2	1.9			0.7		2.3	8.0		50.5	11.0	
Delay (s)	115.3	12.2			11.3		57.4	66.0		110.4	69.5	
Level of Service	F	B			B		E	E		F	E	
Approach Delay (s)		13.1			11.3			64.4			83.9	
Approach LOS		B			B			E			F	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	143.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	2306	64	45	2632	81	105	139	64	61	100	36
Future Volume (vph)	45	2306	64	45	2632	81	105	139	64	61	100	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.96	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	4563		1597	4570		1597	1560		1536	1614	
Flt Permitted	0.95	1.00		0.95	1.00		0.47	1.00		0.29	1.00	
Satd. Flow (perm)	1597	4563		1597	4570		791	1560		466	1614	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	46	2353	65	46	2686	83	107	142	65	62	102	37
RTOR Reduction (vph)	0	1	0	0	1	0	0	8	0	0	6	0
Lane Group Flow (vph)	46	2417	0	46	2768	0	107	199	0	62	133	0
Confl. Peds. (#/hr)			9						35	35		
Heavy Vehicles (%)	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	9.2	155.8		9.2	155.8		34.0	34.0		34.0	34.0	
Effective Green, g (s)	9.2	155.8		9.2	155.8		34.0	34.0		34.0	34.0	
Actuated g/C Ratio	0.04	0.73		0.04	0.73		0.16	0.16		0.16	0.16	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	68	3322		68	3327		125	247		74	256	
v/s Ratio Prot	c0.03	0.53		0.03	c0.61			0.13			0.08	
v/s Ratio Perm							c0.14			0.13		
v/c Ratio	0.68	0.73		0.68	0.83		0.86	0.81		0.84	0.52	
Uniform Delay, d1	100.9	16.8		100.9	20.1		87.6	86.8		87.3	82.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	23.5	0.8		23.5	1.9		40.2	17.3		53.0	1.8	
Delay (s)	124.4	17.6		124.4	22.0		127.8	104.2		140.3	84.3	
Level of Service	F	B		F	C		F	F		F	F	
Approach Delay (s)		19.6			23.6			112.2			101.6	
Approach LOS		B			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	29.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	214.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITH ALTERNATIVE 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	2072	30	14	629	67	1	1	8	39	4	11
Future Volume (vph)	67	2072	30	14	629	67	1	1	8	39	4	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.97			1.00	1.00
Flpb, ped/bikes	0.99	1.00		1.00	1.00			1.00			0.98	1.00
Frt	1.00	1.00		1.00	0.99			0.89			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.96	1.00
Satd. Flow (prot)	1756	5074		1770	3475			1607			1744	1583
Flt Permitted	0.38	1.00		0.07	1.00			0.98			0.74	1.00
Satd. Flow (perm)	702	5074		128	3475			1576			1346	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	68	2114	31	14	642	68	1	1	8	40	4	11
RTOR Reduction (vph)	0	1	0	0	4	0	0	7	0	0	0	10
Lane Group Flow (vph)	68	2144	0	14	706	0	0	3	0	0	44	1
Confl. Peds. (#/hr)	13					13			25	25		
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	70.6	70.6		70.6	70.6			10.3			10.3	10.3
Effective Green, g (s)	70.6	70.6		70.6	70.6			10.3			10.3	10.3
Actuated g/C Ratio	0.78	0.78		0.78	0.78			0.11			0.11	0.11
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	545	3940		99	2698			178			152	179
v/s Ratio Prot		c0.42			0.20							
v/s Ratio Perm	0.10			0.11				0.00			c0.03	0.00
v/c Ratio	0.12	0.54		0.14	0.26			0.02			0.29	0.01
Uniform Delay, d1	2.5	3.9		2.5	2.8			35.8			36.9	35.8
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	0.1	0.2		0.7	0.1			0.0			1.1	0.0
Delay (s)	2.6	4.1		3.2	2.9			35.8			38.0	35.8
Level of Service	A	A		A	A			D			D	D
Approach Delay (s)		4.0			2.9			35.8			37.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	4.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	2067	3	3	1158	56	27	7	13	59	2	34
Future Volume (vph)	84	2067	3	3	1158	56	27	7	13	59	2	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.99	1.00
Frt	1.00	1.00		1.00	0.99			0.96			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.95	1.00
Satd. Flow (prot)	1766	5084		1769	3509			1732			1755	1583
Flt Permitted	0.20	1.00		0.07	1.00			0.81			0.70	1.00
Satd. Flow (perm)	371	5084		129	3509			1441			1284	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	86	2109	3	3	1182	57	28	7	13	60	2	35
RTOR Reduction (vph)	0	0	0	0	2	0	0	11	0	0	0	30
Lane Group Flow (vph)	86	2112	0	3	1237	0	0	37	0	0	62	5
Confl. Peds. (#/hr)	9		1	1		9			14	14		
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	68.7	68.7		68.7	68.7			12.8			12.8	12.8
Effective Green, g (s)	68.7	68.7		68.7	68.7			12.8			12.8	12.8
Actuated g/C Ratio	0.75	0.75		0.75	0.75			0.14			0.14	0.14
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	278	3817		96	2634			201			179	221
v/s Ratio Prot		c0.42			0.35							
v/s Ratio Perm	0.23			0.02				0.03			c0.05	0.00
v/c Ratio	0.31	0.55		0.03	0.47			0.18			0.35	0.02
Uniform Delay, d1	3.7	4.9		2.9	4.4			34.7			35.6	34.0
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	0.6	0.2		0.1	0.1			0.4			1.2	0.0
Delay (s)	4.3	5.0		3.0	4.5			35.2			36.7	34.0
Level of Service	A	A		A	A			D			D	C
Approach Delay (s)		5.0			4.5			35.2			35.7	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	91.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1576	475	36	395	0	146	0	75	33	73	62
Future Volume (vph)	0	1576	475	36	395	0	146	0	75	33	73	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.93	1.00	1.00		1.00		0.97	1.00	0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		0.99		1.00	0.99	1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	0.93	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (prot)		3539	1468	1770	3539		1749		1541	1743	1714	
Flt Permitted		1.00	1.00	0.09	1.00		0.61		1.00	0.95	1.00	
Satd. Flow (perm)		3539	1468	175	3539		1122		1541	1743	1714	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1677	505	38	420	0	155	0	80	35	78	66
RTOR Reduction (vph)	0	0	155	0	0	0	0	0	22	0	27	0
Lane Group Flow (vph)	0	1677	350	38	420	0	155	0	58	35	117	0
Confl. Peds. (#/hr)	50		50	50		50	15		15	15		15
Turn Type		NA	Perm	Perm	NA		Perm		Perm	Perm	NA	
Protected Phases		2			6						4	
Permitted Phases			2	6			8		8	4		
Actuated Green, G (s)		66.1	66.1	66.1	66.1		19.4		19.4	19.4	19.4	
Effective Green, g (s)		66.1	66.1	66.1	66.1		19.4		19.4	19.4	19.4	
Actuated g/C Ratio		0.69	0.69	0.69	0.69		0.20		0.20	0.20	0.20	
Clearance Time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2449	1016	121	2449		227		313	354	348	
v/s Ratio Prot		c0.47			0.12						0.07	
v/s Ratio Perm			0.24	0.22			c0.14		0.04	0.02		
v/c Ratio		0.68	0.34	0.31	0.17		0.68		0.18	0.10	0.34	
Uniform Delay, d1		8.6	5.9	5.8	5.1		35.2		31.5	30.9	32.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2		0.8	0.2	1.5	0.0		8.2		0.3	0.1	0.6	
Delay (s)		9.4	6.1	7.3	5.2		43.4		31.8	31.1	33.1	
Level of Service		A	A	A	A		D		C	C	C	
Approach Delay (s)		8.7			5.3			39.4			32.7	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	95.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1837	372	23	1003	0	320	0	205	42	28	90
Future Volume (vph)	0	1837	372	23	1003	0	320	0	205	42	28	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.93	1.00	1.00		1.00		0.97	1.00	0.98	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		0.99		1.00	0.98	1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	0.89	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (prot)		3539	1470	1770	3539		1747		1540	1742	1616	
Flt Permitted		1.00	1.00	0.06	1.00		0.66		1.00	0.95	1.00	
Satd. Flow (perm)		3539	1470	105	3539		1205		1540	1742	1616	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1954	396	24	1067	0	340	0	218	45	30	96
RTOR Reduction (vph)	0	0	124	0	0	0	0	0	13	0	60	0
Lane Group Flow (vph)	0	1954	272	24	1067	0	340	0	205	45	66	0
Confl. Peds. (#/hr)	40		40	40		40	13		13	13		13
Turn Type		NA	Perm	Perm	NA		Perm		Perm	Perm	NA	
Protected Phases		2			6						4	
Permitted Phases			2	6			8		8	4		
Actuated Green, G (s)		70.8	70.8	70.8	70.8		35.4		35.4	35.4	35.4	
Effective Green, g (s)		70.8	70.8	70.8	70.8		35.4		35.4	35.4	35.4	
Actuated g/C Ratio		0.61	0.61	0.61	0.61		0.30		0.30	0.30	0.30	
Clearance Time (s)		5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2156	895	63	2156		367		469	530	492	
v/s Ratio Prot		c0.55			0.30						0.04	
v/s Ratio Perm			0.18	0.23			c0.28		0.13	0.03		
v/c Ratio		0.91	0.30	0.38	0.49		0.93		0.44	0.08	0.13	
Uniform Delay, d1		19.8	10.9	11.5	12.7		39.1		32.4	28.8	29.3	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2		5.9	0.2	3.8	0.2		28.8		0.7	0.1	0.1	
Delay (s)		25.8	11.1	15.4	12.9		67.9		33.1	28.9	29.4	
Level of Service		C	B	B	B		E		C	C	C	
Approach Delay (s)		23.3			12.9			54.3			29.3	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	25.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	116.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	3591	140	0	1366	73	32	69	75	95	133	40
Future Volume (vph)	32	3591	140	0	1366	73	32	69	75	95	133	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.86			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		0.97	1.00	
Frt	1.00	0.99			0.99		1.00	0.92		1.00	0.97	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	6372			3508		1770	1667		1711	1798	
Flt Permitted	0.95	1.00			1.00		0.37	1.00		0.46	1.00	
Satd. Flow (perm)	1770	6372			3508		682	1667		830	1798	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	33	3741	146	0	1423	76	33	72	78	99	139	42
RTOR Reduction (vph)	0	3	0	0	2	0	0	1	0	0	8	0
Lane Group Flow (vph)	33	3884	0	0	1497	0	33	149	0	99	173	0
Confl. Peds. (#/hr)	1					1			33	33		
Turn Type	Prot	NA			NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.1	111.4			102.3		19.9	19.9		19.9	19.9	
Effective Green, g (s)	4.1	111.4			102.3		19.9	19.9		19.9	19.9	
Actuated g/C Ratio	0.03	0.79			0.72		0.14	0.14		0.14	0.14	
Clearance Time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	51	5023			2539		96	234		116	253	
v/s Ratio Prot	0.02	c0.61			0.43			0.09			0.10	
v/s Ratio Perm							0.05			c0.12		
v/c Ratio	0.65	0.77			0.59		0.34	0.64		0.85	0.68	
Uniform Delay, d1	67.9	8.1			9.4		54.8	57.3		59.3	57.7	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.8	0.8			0.4		2.1	5.6		42.0	7.5	
Delay (s)	92.7	8.9			9.7		56.9	62.9		101.2	65.2	
Level of Service	F	A			A		E	E		F	E	
Approach Delay (s)		9.6			9.7			61.8			77.9	
Approach LOS		A			A			E			E	

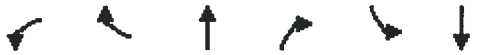
Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	141.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	2306	64	45	2632	81	105	139	64	61	100	36
Future Volume (vph)	45	2306	64	45	2632	81	105	139	64	61	100	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.96	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	5055		1770	5062		1770	1730		1704	1788	
Flt Permitted	0.95	1.00		0.95	1.00		0.46	1.00		0.27	1.00	
Satd. Flow (perm)	1770	5055		1770	5062		858	1730		482	1788	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	46	2353	65	46	2686	83	107	142	65	62	102	37
RTOR Reduction (vph)	0	1	0	0	1	0	0	8	0	0	6	0
Lane Group Flow (vph)	46	2417	0	46	2768	0	107	199	0	62	133	0
Confl. Peds. (#/hr)			9						35	35		
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	8.6	150.5		8.6	150.5		30.8	30.8		30.8	30.8	
Effective Green, g (s)	8.6	150.5		8.6	150.5		30.8	30.8		30.8	30.8	
Actuated g/C Ratio	0.04	0.73		0.04	0.73		0.15	0.15		0.15	0.15	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	74	3712		74	3718		128	260		72	268	
v/s Ratio Prot	c0.03	0.48		0.03	c0.55			0.12			0.07	
v/s Ratio Perm							0.12			c0.13		
v/c Ratio	0.62	0.65		0.62	0.74		0.84	0.77		0.86	0.50	
Uniform Delay, d1	96.5	13.8		96.5	15.9		84.6	83.6		85.0	79.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.1	0.4		15.1	0.8		35.3	12.7		60.9	1.4	
Delay (s)	111.7	14.3		111.7	16.8		119.9	96.3		145.9	81.4	
Level of Service	F	B		F	B		F	F		F	F	
Approach Delay (s)		16.1			18.3			104.3			101.3	
Approach LOS		B			B			F			F	

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	204.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX F

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT ALTERNATIVE 2



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	88	407	583	228	359	466
Future Volume (vph)	88	407	583	228	359	466
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1549	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1549	1770	3539
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	95	438	627	245	386	501
RTOR Reduction (vph)	0	363	0	173	0	0
Lane Group Flow (vph)	95	75	627	72	386	501
Confl. Peds. (#/hr)				1		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	10.9	10.9	18.6	18.6	19.0	42.6
Effective Green, g (s)	10.9	10.9	18.6	18.6	19.0	42.6
Actuated g/C Ratio	0.17	0.17	0.29	0.29	0.30	0.67
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	303	271	1036	453	529	2374
v/s Ratio Prot	c0.05		c0.18		c0.22	0.14
v/s Ratio Perm		0.05		0.05		
v/c Ratio	0.31	0.28	0.61	0.16	0.73	0.21
Uniform Delay, d1	23.0	22.9	19.3	16.6	19.9	4.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.6	1.0	0.2	5.0	0.0
Delay (s)	23.6	23.4	20.3	16.8	25.0	4.1
Level of Service	C	C	C	B	C	A
Approach Delay (s)	23.5		19.3			13.1
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	63.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	148	148	449	122	440	679
Future Volume (vph)	148	148	449	122	440	679
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1549	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1549	1770	3539
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	149	149	454	123	444	686
RTOR Reduction (vph)	0	121	0	93	0	0
Lane Group Flow (vph)	149	28	454	30	444	686
Confl. Peds. (#/hr)				1		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	13.1	13.1	16.9	16.9	24.3	46.2
Effective Green, g (s)	13.1	13.1	16.9	16.9	24.3	46.2
Actuated g/C Ratio	0.19	0.19	0.24	0.24	0.35	0.67
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	334	299	863	377	620	2359
v/s Ratio Prot	c0.08		c0.13		c0.25	0.19
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.45	0.09	0.53	0.08	0.72	0.29
Uniform Delay, d1	24.9	23.2	22.7	20.2	19.5	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.1	0.6	0.1	3.9	0.1
Delay (s)	25.8	23.3	23.3	20.3	23.4	4.8
Level of Service	C	C	C	C	C	A
Approach Delay (s)	24.6		22.7			12.2
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	69.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	374	178	229	483	0	0
Future Volume (Veh/h)	374	178	229	483	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	398	189	244	514	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	537					
pX, platoon unblocked						
vC, conflicting volume			587		1494	492
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			587		1494	492
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			75		100	100
cM capacity (veh/h)			988		102	576

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	587	244	514
Volume Left	0	244	0
Volume Right	189	0	0
cSH	1700	988	1700
Volume to Capacity	0.35	0.25	0.30
Queue Length 95th (ft)	0	24	0
Control Delay (s)	0.0	9.8	0.0
Lane LOS		A	
Approach Delay (s)	0.0	3.2	
Approach LOS			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	263	291	370	325	0	0
Future Volume (Veh/h)	263	291	370	325	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	296	327	416	365	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	537					
pX, platoon unblocked						
vC, conflicting volume			623		1656	460
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			623		1656	460
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			57		100	100
cM capacity (veh/h)			958		61	602

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	623	416	365
Volume Left	0	416	0
Volume Right	327	0	0
cSH	1700	958	1700
Volume to Capacity	0.37	0.43	0.21
Queue Length 95th (ft)	0	56	0
Control Delay (s)	0.0	11.6	0.0
Lane LOS		B	
Approach Delay (s)	0.0	6.2	
Approach LOS			

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	374	0	0	503	209	313
Future Volume (Veh/h)	374	0	0	503	209	313
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	398	0	0	535	222	333
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1031					
pX, platoon unblocked						
vC, conflicting volume			398		666	398
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			398		666	398
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		43	45
cM capacity (veh/h)			1157		393	601

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	398	268	268	222	333
Volume Left	0	0	0	222	0
Volume Right	0	0	0	0	333
cSH	1700	1700	1700	393	601
Volume to Capacity	0.23	0.16	0.16	0.57	0.55
Queue Length 95th (ft)	0	0	0	84	85
Control Delay (s)	0.0	0.0	0.0	25.4	18.2
Lane LOS				D	C
Approach Delay (s)	0.0	0.0		21.1	
Approach LOS				C	

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	263	0	0	551	143	247
Future Volume (Veh/h)	263	0	0	551	143	247
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	280	0	0	586	152	263
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1031					
pX, platoon unblocked						
vC, conflicting volume			280		573	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			280		573	280
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		66	63
cM capacity (veh/h)			1280		450	717

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	280	293	293	152	263
Volume Left	0	0	0	152	0
Volume Right	0	0	0	0	263
cSH	1700	1700	1700	450	717
Volume to Capacity	0.16	0.17	0.17	0.34	0.37
Queue Length 95th (ft)	0	0	0	37	42
Control Delay (s)	0.0	0.0	0.0	17.0	12.9
Lane LOS				C	B
Approach Delay (s)	0.0	0.0		14.4	
Approach LOS				B	

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	230	161	1	81	3	130	0	2	0	0	2
Future Volume (Veh/h)	53	230	161	1	81	3	130	0	2	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	63	274	192	1	96	4	155	0	2	0	0	2
Pedestrians					3			1				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	100			467			549	599	237	368	693	50
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	100			467			549	599	237	368	693	50
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			62	100	100	100	100	100
cM capacity (veh/h)	1490			1090			403	395	762	541	349	1008

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	200	329	1	64	36	155	2	2
Volume Left	63	0	1	0	0	155	0	0
Volume Right	0	192	0	0	4	0	2	2
cSH	1490	1700	1090	1700	1700	403	762	1008
Volume to Capacity	0.04	0.19	0.00	0.04	0.02	0.38	0.00	0.00
Queue Length 95th (ft)	3	0	0	0	0	44	0	0
Control Delay (s)	2.6	0.0	8.3	0.0	0.0	19.4	9.7	8.6
Lane LOS	A		A			C	A	A
Approach Delay (s)	1.0		0.1			19.3		8.6
Approach LOS						C		A

Intersection Summary				
Average Delay	4.5			
Intersection Capacity Utilization	37.0%	ICU Level of Service		A
Analysis Period (min)	15			

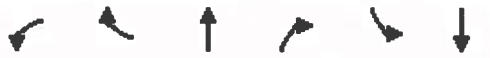
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	72	15	3	177	5	167	0	3	0	0	4
Future Volume (Veh/h)	28	72	15	3	177	5	167	0	3	0	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	32	83	17	3	203	6	192	0	3	0	0	5
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	209			100			268	370	51	322	376	104
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	209			100			268	370	51	322	376	104
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			70	100	100	100	100	99
cM capacity (veh/h)	1359			1490			647	544	1005	594	540	930

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	74	58	3	135	74	192	3	5
Volume Left	32	0	3	0	0	192	0	0
Volume Right	0	17	0	0	6	0	3	5
cSH	1359	1700	1490	1700	1700	647	1005	930
Volume to Capacity	0.02	0.03	0.00	0.08	0.04	0.30	0.00	0.01
Queue Length 95th (ft)	2	0	0	0	0	31	0	0
Control Delay (s)	3.5	0.0	7.4	0.0	0.0	12.9	8.6	8.9
Lane LOS	A		A			B	A	A
Approach Delay (s)	1.9		0.1			12.8		8.9
Approach LOS						B		A

Intersection Summary				
Average Delay	5.2			
Intersection Capacity Utilization	34.3%	ICU Level of Service		A
Analysis Period (min)	15			

APPENDIX G

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITH ALTERNATIVE 2



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	100	460	583	261	411	466
Future Volume (vph)	100	460	583	261	411	466
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1549	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1549	1770	3539
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	108	495	627	281	442	501
RTOR Reduction (vph)	0	410	0	202	0	0
Lane Group Flow (vph)	108	85	627	79	442	501
Confl. Peds. (#/hr)				1		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	11.6	11.6	19.1	19.1	22.0	46.1
Effective Green, g (s)	11.6	11.6	19.1	19.1	22.0	46.1
Actuated g/C Ratio	0.17	0.17	0.28	0.28	0.32	0.68
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	303	271	998	437	575	2409
v/s Ratio Prot	c0.06		c0.18		c0.25	0.14
v/s Ratio Perm		0.05		0.05		
v/c Ratio	0.36	0.31	0.63	0.18	0.77	0.21
Uniform Delay, d1	24.8	24.6	21.2	18.4	20.6	4.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.7	1.2	0.2	6.1	0.0
Delay (s)	25.5	25.2	22.4	18.6	26.7	4.1
Level of Service	C	C	C	B	C	A
Approach Delay (s)	25.3		21.3			14.7
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	67.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	165	449	122	441	679
Future Volume (vph)	165	165	449	122	441	679
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1549	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1549	1770	3539
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	167	167	454	123	445	686
RTOR Reduction (vph)	0	135	0	93	0	0
Lane Group Flow (vph)	167	32	454	30	445	686
Confl. Peds. (#/hr)				1		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	13.7	13.7	17.1	17.1	24.6	46.7
Effective Green, g (s)	13.7	13.7	17.1	17.1	24.6	46.7
Actuated g/C Ratio	0.19	0.19	0.24	0.24	0.35	0.66
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	344	308	859	376	618	2347
v/s Ratio Prot	c0.09		c0.13		c0.25	0.19
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.49	0.11	0.53	0.08	0.72	0.29
Uniform Delay, d1	25.2	23.3	23.1	20.6	19.9	4.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.2	0.6	0.1	4.1	0.1
Delay (s)	26.3	23.5	23.7	20.7	24.0	5.0
Level of Service	C	C	C	C	C	A
Approach Delay (s)	24.9		23.1			12.5
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	459	178	282	547	0	0
Future Volume (Veh/h)	459	178	282	547	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	488	189	300	582	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	537					
pX, platoon unblocked						
vC, conflicting volume			677		1764	582
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			677		1764	582
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			67		100	100
cM capacity (veh/h)			915		62	513

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	677	300	582
Volume Left	0	300	0
Volume Right	189	0	0
cSH	1700	915	1700
Volume to Capacity	0.40	0.33	0.34
Queue Length 95th (ft)	0	36	0
Control Delay (s)	0.0	10.8	0.0
Lane LOS		B	
Approach Delay (s)	0.0	3.7	
Approach LOS			

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	264	291	435	358	0	0
Future Volume (Veh/h)	264	291	435	358	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	297	327	489	402	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	537					
pX, platoon unblocked						
vC, conflicting volume			624		1840	460
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			624		1840	460
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			49		100	100
cM capacity (veh/h)			957		41	601

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	624	489	402
Volume Left	0	489	0
Volume Right	327	0	0
cSH	1700	957	1700
Volume to Capacity	0.37	0.51	0.24
Queue Length 95th (ft)	0	75	0
Control Delay (s)	0.0	12.6	0.0
Lane LOS		B	
Approach Delay (s)	0.0	6.9	
Approach LOS			

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	459	0	0	620	209	391
Future Volume (Veh/h)	459	0	0	620	209	391
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	499	0	0	674	227	425
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1031					
pX, platoon unblocked						
vC, conflicting volume			499		836	499
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			499		836	499
tC, single (s)			4.1		*5.9	*5.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		40	29
cM capacity (veh/h)			1061		380	597

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	499	337	337	227	425
Volume Left	0	0	0	227	0
Volume Right	0	0	0	0	425
cSH	1700	1700	1700	380	597
Volume to Capacity	0.29	0.20	0.20	0.60	0.71
Queue Length 95th (ft)	0	0	0	93	146
Control Delay (s)	0.0	0.0	0.0	27.5	24.5
Lane LOS				D	C
Approach Delay (s)	0.0	0.0		25.6	
Approach LOS				D	

Intersection Summary				
Average Delay	9.1			
Intersection Capacity Utilization	57.3%	ICU Level of Service		B
Analysis Period (min)	15			

* User Entered Value

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	264	0	0	649	143	248
Future Volume (Veh/h)	264	0	0	649	143	248
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	281	0	0	690	152	264
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1031					
pX, platoon unblocked						
vC, conflicting volume			281		626	281
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			281		626	281
tC, single (s)			4.1		*5.9	*5.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		69	66
cM capacity (veh/h)			1278		490	777

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	281	345	345	152	264
Volume Left	0	0	0	152	0
Volume Right	0	0	0	0	264
cSH	1700	1700	1700	490	777
Volume to Capacity	0.17	0.20	0.20	0.31	0.34
Queue Length 95th (ft)	0	0	0	33	38
Control Delay (s)	0.0	0.0	0.0	15.6	12.0
Lane LOS				C	B
Approach Delay (s)	0.0	0.0		13.3	
Approach LOS				B	

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	393	161	1	198	3	130	0	2	0	0	2
Future Volume (Veh/h)	53	393	161	1	198	3	130	0	2	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	63	468	192	1	236	4	155	0	2	0	0	2
Pedestrians					3			1				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	240			661			813	933	334	605	1027	120
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	240			661			813	933	334	605	1027	120
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	7.5	6.5	*5.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			53	100	100	100	100	100
cM capacity (veh/h)	1324			922			328	252	726	365	221	941

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	297	426	1	157	83	155	2	2
Volume Left	63	0	1	0	0	155	0	0
Volume Right	0	192	0	0	4	0	2	2
cSH	1324	1700	922	1700	1700	328	726	941
Volume to Capacity	0.05	0.25	0.00	0.09	0.05	0.47	0.00	0.00
Queue Length 95th (ft)	4	0	0	0	0	61	0	0
Control Delay (s)	2.0	0.0	8.9	0.0	0.0	25.5	10.0	8.8
Lane LOS	A		A			D	A	A
Approach Delay (s)	0.8		0.0			25.3		8.8
Approach LOS						D		A

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	47.0%	ICU Level of Service		A
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	74	15	3	275	5	167	3	3	0	0	4
Future Volume (Veh/h)	28	74	15	3	275	5	167	3	3	0	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	32	85	17	3	316	6	192	3	3	0	0	5
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	322			102			326	486	52	437	491	161
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	322			102			326	486	52	437	491	161
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	7.5	6.5	*5.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			70	99	100	100	100	99
cM capacity (veh/h)	1235			1488			645	467	1019	488	463	896

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	74	60	3	211	111	192	6	5
Volume Left	32	0	3	0	0	192	0	0
Volume Right	0	17	0	0	6	0	3	5
cSH	1235	1700	1488	1700	1700	645	640	896
Volume to Capacity	0.03	0.04	0.00	0.12	0.07	0.30	0.01	0.01
Queue Length 95th (ft)	2	0	0	0	0	31	1	0
Control Delay (s)	3.6	0.0	7.4	0.0	0.0	12.9	10.7	9.0
Lane LOS	A		A			B	B	A
Approach Delay (s)	2.0		0.1			12.9		9.0
Approach LOS						B		A

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	Err%	ICU Level of Service		H
Analysis Period (min)	15			

* User Entered Value

APPENDIX H

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT ALTERNATIVE 3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	401	445	208	14	19	231
Future Volume (vph)	401	445	208	14	19	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1650		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1650		1583	1417
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	461	511	239	16	22	266
RTOR Reduction (vph)	0	0	2	0	0	232
Lane Group Flow (vph)	461	511	253	0	22	34
Confl. Peds. (#/hr)				1		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	23.7	44.0	15.3		8.0	8.0
Effective Green, g (s)	23.7	44.0	15.3		8.0	8.0
Actuated g/C Ratio	0.38	0.71	0.25		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	605	1183	407		204	182
v/s Ratio Prot	c0.29	0.31	c0.15		0.01	
v/s Ratio Perm						c0.02
v/c Ratio	0.76	0.43	0.62		0.11	0.19
Uniform Delay, d1	16.7	3.8	20.8		23.8	24.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.6	0.3	2.9		0.2	0.5
Delay (s)	22.3	4.0	23.7		24.1	24.6
Level of Service	C	A	C		C	C
Approach Delay (s)		12.7	23.7		24.6	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	62.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	206	227	523	12	24	420
Future Volume (vph)	206	227	523	12	24	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1661		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1661		1583	1417
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	226	249	575	13	26	462
RTOR Reduction (vph)	0	0	1	0	0	403
Lane Group Flow (vph)	226	249	587	0	26	59
Confl. Peds. (#/hr)				6		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	17.6	57.2	34.6		9.9	9.9
Effective Green, g (s)	17.6	57.2	34.6		9.9	9.9
Actuated g/C Ratio	0.23	0.74	0.45		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	361	1236	745		203	181
v/s Ratio Prot	c0.14	0.15	c0.35		0.02	
v/s Ratio Perm						c0.04
v/c Ratio	0.63	0.20	0.79		0.13	0.33
Uniform Delay, d1	26.8	3.0	18.1		29.8	30.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.4	0.1	5.6		0.3	1.1
Delay (s)	30.2	3.1	23.7		30.1	31.6
Level of Service	C	A	C		C	C
Approach Delay (s)		16.0	23.7		31.6	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	77.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	299	65	1	140	24	4
Future Volume (Veh/h)	299	65	1	140	24	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	365	79	1	171	29	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			444		578	404
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			444		578	404
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		94	99
cM capacity (veh/h)			1055		458	621

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	444	172	34
Volume Left	0	1	29
Volume Right	79	0	5
cSH	1700	1055	477
Volume to Capacity	0.26	0.00	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.1	13.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	13.1
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	126	27	3	286	76	1
Future Volume (Veh/h)	126	27	3	286	76	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	138	30	3	314	84	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			168		473	153
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			168		473	153
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		84	100
cM capacity (veh/h)			1340		527	862

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	168	317	85
Volume Left	0	3	84
Volume Right	30	0	1
cSH	1700	1340	530
Volume to Capacity	0.10	0.00	0.16
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.0	0.1	13.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	13.1
Approach LOS			B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	28.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	43	155	2	26	114	3
Future Volume (Veh/h)	43	155	2	26	114	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	50	180	2	30	133	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			230		174	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			230		174	140
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		83	100
cM capacity (veh/h)			1270		788	877

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	230	32	136
Volume Left	0	2	133
Volume Right	180	0	3
cSH	1700	1270	790
Volume to Capacity	0.14	0.00	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.0	0.5	10.5
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	10.5
Approach LOS			B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	8	40	0	42	114	0
Future Volume (Veh/h)	8	40	0	42	114	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	9	44	0	46	125	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			53		77	31
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			53		77	31
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		86	100
cM capacity (veh/h)			1479		897	1010

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	53	46	125
Volume Left	0	0	125
Volume Right	44	0	0
cSH	1700	1479	897
Volume to Capacity	0.03	0.00	0.14
Queue Length 95th (ft)	0	0	12
Control Delay (s)	0.0	0.0	9.7
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	744	40	102	1208	96	20	31	46	24	20	26
Future Volume (Veh/h)	9	744	40	102	1208	96	20	31	46	24	20	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	9	783	42	107	1272	101	21	33	48	25	21	27
Pedestrians					1			12				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			1				
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1373			837			1722	2421	426	2012	2392	686
vC1, stage 1 conf vol							834	834		1536	1536	
vC2, stage 2 conf vol							888	1587		475	855	
vCu, unblocked vol	1373			837			1722	2421	426	2012	2392	686
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			86			91	83	93	83	89	94
cM capacity (veh/h)	496			784			236	197	645	151	199	475

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	9	522	303	107	848	525	102	73
Volume Left	9	0	0	107	0	0	21	25
Volume Right	0	0	42	0	0	101	48	27
cSH	496	1700	1700	784	1700	1700	308	222
Volume to Capacity	0.02	0.31	0.18	0.14	0.50	0.31	0.33	0.33
Queue Length 95th (ft)	1	0	0	12	0	0	35	34
Control Delay (s)	12.4	0.0	0.0	10.3	0.0	0.0	22.4	28.9
Lane LOS	B			B			C	D
Approach Delay (s)	0.1			0.7			22.4	28.9
Approach LOS							C	D

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	56.4%	ICU Level of Service		B
Analysis Period (min)	15			

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
1: Ulupii St & Kalanianaole Hwy

7/11/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1418	22	23	913	30	15	14	25	49	2	19
Future Volume (Veh/h)	20	1418	22	23	913	30	15	14	25	49	2	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	1541	24	25	992	33	16	15	27	53	2	21
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											3.5	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1026			1565			2165	2673	782	1908	2668	514
vC1, stage 1 conf vol							1597	1597		1060	1060	
vC2, stage 2 conf vol							568	1076		849	1609	
vCu, unblocked vol	1026			1565			2165	2673	782	1908	2668	514
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			94			90	93	94	76	99	96
cM capacity (veh/h)	672			418			159	203	422	224	191	586

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	22	1027	538	25	661	364	58	76
Volume Left	22	0	0	25	0	0	16	53
Volume Right	0	0	24	0	0	33	27	21
cSH	672	1700	1700	418	1700	1700	243	269
Volume to Capacity	0.03	0.60	0.32	0.06	0.39	0.21	0.24	0.28
Queue Length 95th (ft)	3	0	0	5	0	0	23	28
Control Delay (s)	10.5	0.0	0.0	14.2	0.0	0.0	24.4	23.6
Lane LOS	B			B			C	C
Approach Delay (s)	0.1			0.3			24.4	23.6
Approach LOS							C	C

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	55.4%	ICU Level of Service	B	
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	784	42	19	1299	5	13	0	4	2	0	9
Future Volume (Veh/h)	13	784	42	19	1299	5	13	0	4	2	0	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	14	825	44	20	1367	5	14	0	4	2	0	9
Pedestrians					5							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1372			825			1586	2265	418	1859	2262	686
vC1, stage 1 conf vol							853	853		1410	1410	
vC2, stage 2 conf vol							732	1412		450	853	
vCu, unblocked vol	1372			825			1586	2265	418	1859	2262	686
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	*6.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		5.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			95	100	99	99	100	98
cM capacity (veh/h)	496			801			305	162	656	201	170	475

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	14	412	412	44	20	911	461	18	11
Volume Left	14	0	0	0	20	0	0	14	2
Volume Right	0	0	0	44	0	0	5	4	9
cSH	496	1700	1700	1700	801	1700	1700	346	381
Volume to Capacity	0.03	0.24	0.24	0.03	0.02	0.54	0.27	0.05	0.03
Queue Length 95th (ft)	2	0	0	0	2	0	0	4	2
Control Delay (s)	12.5	0.0	0.0	0.0	9.6	0.0	0.0	16.0	14.7
Lane LOS	B				A			C	B
Approach Delay (s)	0.2				0.1			16.0	14.7
Approach LOS								C	B

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	47.6%	ICU Level of Service		A
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	1467	0	0	867	0	1	0	1	0	0	2
Future Volume (Veh/h)	3	1467	0	0	867	0	1	0	1	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	3	1512	0	0	894	0	1	0	1	0	0	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	894			1512			1967	2412	756	1657	2412	447
vC1, stage 1 conf vol							1518	1518		894	894	
vC2, stage 2 conf vol							449	894		763	1518	
vCu, unblocked vol	894			1512			1967	2412	756	1657	2412	447
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	7.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
cM capacity (veh/h)	755			438			183	157	436	234	157	636

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	3	756	756	0	0	596	298	2	2
Volume Left	3	0	0	0	0	0	0	1	0
Volume Right	0	0	0	0	0	0	0	1	2
cSH	755	1700	1700	1700	1700	1700	1700	258	636
Volume to Capacity	0.00	0.44	0.44	0.00	0.00	0.35	0.18	0.01	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0	1	0
Control Delay (s)	9.8	0.0	0.0	0.0	0.0	0.0	0.0	19.1	10.7
Lane LOS	A							C	B
Approach Delay (s)	0.0				0.0			19.1	10.7
Approach LOS								C	B

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	50.6%	ICU Level of Service		A
Analysis Period (min)	15			

* User Entered Value

APPENDIX I

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITH ALTERNATIVE 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	597	0	629	0	1050	436	0	0	0	0	167	408
Future Volume (vph)	597	0	629	0	1050	436	0	0	0	0	167	408
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frt	1.00		0.85		0.96						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1770		1583		4862						1863	1583
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1770		1583		4862						1863	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	656	0	691	0	1154	479	0	0	0	0	184	448
RTOR Reduction (vph)	0	0	0	0	56	0	0	0	0	0	0	390
Lane Group Flow (vph)	656	0	691	0	1577	0	0	0	0	0	184	58
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	48.6		123.6		43.9						16.1	16.1
Effective Green, g (s)	48.6		123.6		43.9						16.1	16.1
Actuated g/C Ratio	0.39		1.00		0.36						0.13	0.13
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	695		1583		1726						242	206
v/s Ratio Prot	c0.37				c0.32						c0.10	
v/s Ratio Perm			0.44									0.04
v/c Ratio	0.94		0.44		0.91						0.76	0.28
Uniform Delay, d1	36.2		0.0		38.0						51.9	48.5
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	21.3		0.9		7.9						13.1	0.8
Delay (s)	57.5		0.9		45.9						65.0	49.3
Level of Service	E		A		D						E	D
Approach Delay (s)		28.5			45.9			0.0			53.9	
Approach LOS		C			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	40.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	123.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	0	1364	0	900	264	0	0	0	0	633	595
Future Volume (vph)	197	0	1364	0	900	264	0	0	0	0	633	595
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frpb, ped/bikes	1.00		1.00		0.99						1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00						1.00	1.00
Frt	1.00		0.85		0.97						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1770		1583		4881						1863	1583
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1770		1583		4881						1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	0	1483	0	978	287	0	0	0	0	688	647
RTOR Reduction (vph)	0	0	0	0	29	0	0	0	0	0	0	213
Lane Group Flow (vph)	214	0	1483	0	1236	0	0	0	0	0	688	434
Confl. Peds. (#/hr)						3						
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	23.8		153.5		48.0						66.7	66.7
Effective Green, g (s)	23.8		153.5		48.0						66.7	66.7
Actuated g/C Ratio	0.16		1.00		0.31						0.43	0.43
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	274		1583		1526						809	687
v/s Ratio Prot	0.12				0.25						0.37	
v/s Ratio Perm			c0.94									0.27
v/c Ratio	0.78		0.94		0.81						0.85	0.63
Uniform Delay, d1	62.3		0.0		48.6						38.9	33.8
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	13.4		11.9		3.4						8.5	1.9
Delay (s)	75.8		11.9		51.9						47.5	35.7
Level of Service	E		B		D						D	D
Approach Delay (s)		19.9			51.9			0.0			41.8	
Approach LOS		B			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	36.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	153.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	401	608	325	14	19	231
Future Volume (vph)	401	608	325	14	19	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1851		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1863	1851		1770	1583
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	461	699	374	16	22	266
RTOR Reduction (vph)	0	0	2	0	0	233
Lane Group Flow (vph)	461	699	388	0	22	33
Confl. Peds. (#/hr)				1		
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	21.2	43.8	17.6		7.5	7.5
Effective Green, g (s)	21.2	43.8	17.6		7.5	7.5
Actuated g/C Ratio	0.35	0.71	0.29		0.12	0.12
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	612	1331	531		216	193
v/s Ratio Prot	c0.26	0.38	c0.21		0.01	
v/s Ratio Perm						c0.02
v/c Ratio	0.75	0.53	0.73		0.10	0.17
Uniform Delay, d1	17.7	4.0	19.7		23.9	24.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.2	0.4	5.1		0.2	0.4
Delay (s)	23.0	4.4	24.8		24.1	24.5
Level of Service	C	A	C		C	C
Approach Delay (s)		11.8	24.8		24.5	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	61.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	206	229	621	12	24	420
Future Volume (vph)	206	229	621	12	24	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1857		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1863	1857		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	224	249	675	13	26	457
RTOR Reduction (vph)	0	0	1	0	0	364
Lane Group Flow (vph)	224	249	687	0	26	93
Confl. Peds. (#/hr)				6		
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	16.2	57.5	36.3		10.6	10.6
Effective Green, g (s)	16.2	57.5	36.3		10.6	10.6
Actuated g/C Ratio	0.21	0.74	0.46		0.14	0.14
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	367	1371	863		240	214
v/s Ratio Prot	c0.13	0.13	c0.37		0.01	
v/s Ratio Perm						c0.06
v/c Ratio	0.61	0.18	0.80		0.11	0.44
Uniform Delay, d1	28.1	3.1	17.8		29.6	31.0
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.0	0.1	5.2		0.2	1.4
Delay (s)	31.1	3.2	22.9		29.8	32.4
Level of Service	C	A	C		C	C
Approach Delay (s)		16.4	22.9		32.3	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	78.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	462	65	1	257	24	4
Future Volume (Veh/h)	462	65	1	257	24	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	563	79	1	313	29	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			642		918	602
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			642		918	602
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		90	99
cM capacity (veh/h)			943		301	499

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	642	314	34
Volume Left	0	1	29
Volume Right	79	0	5
cSH	1700	943	320
Volume to Capacity	0.38	0.00	0.11
Queue Length 95th (ft)	0	0	9
Control Delay (s)	0.0	0.0	17.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.0	17.6
Approach LOS			C

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		38.3%	ICU Level of Service A
Analysis Period (min)		15	

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	128	27	3	384	76	1
Future Volume (Veh/h)	128	27	3	384	76	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	141	30	3	422	84	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			171		584	156
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			171		584	156
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		82	100
cM capacity (veh/h)			1406		473	890

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	171	425	85
Volume Left	0	3	84
Volume Right	30	0	1
cSH	1700	1406	476
Volume to Capacity	0.10	0.00	0.18
Queue Length 95th (ft)	0	0	16
Control Delay (s)	0.0	0.1	14.2
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	14.2
Approach LOS			B

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	206	155	2	143	114	3
Future Volume (Veh/h)	206	155	2	143	114	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	240	180	2	166	133	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			420		500	330
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			420		500	330
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		75	100
cM capacity (veh/h)			1139		529	712

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	420	168	136
Volume Left	0	2	133
Volume Right	180	0	3
cSH	1700	1139	532
Volume to Capacity	0.25	0.00	0.26
Queue Length 95th (ft)	0	0	25
Control Delay (s)	0.0	0.1	14.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	14.1
Approach LOS			B

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	10	40	0	140	114	0
Future Volume (Veh/h)	10	40	0	140	114	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	11	44	0	154	125	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			55		187	33
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			55		187	33
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		84	100
cM capacity (veh/h)			1550		802	1041

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	55	154	125
Volume Left	0	0	125
Volume Right	44	0	0
cSH	1700	1550	802
Volume to Capacity	0.03	0.00	0.16
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.0	0.0	10.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX J

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT ALTERNATIVE 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	502	0	629	0	1050	368	0	0	0	0	133	325
Future Volume (vph)	502	0	629	0	1050	368	0	0	0	0	133	325
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frt	1.00		0.85		0.96						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1583		1583		4743						1667	1417
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1583		1583		4743						1667	1417
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	552	0	691	0	1154	404	0	0	0	0	146	357
RTOR Reduction (vph)	0	0	0	0	40	0	0	0	0	0	0	309
Lane Group Flow (vph)	552	0	691	0	1518	0	0	0	0	0	146	48
Heavy Vehicles (%)	14%	2%	2%	2%	2%	14%	2%	2%	2%	14%	14%	14%
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	50.9		132.6		49.0						17.7	17.7
Effective Green, g (s)	50.9		132.6		49.0						17.7	17.7
Actuated g/C Ratio	0.38		1.00		0.37						0.13	0.13
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	607		1583		1752						222	189
v/s Ratio Prot	c0.35				c0.32						c0.09	
v/s Ratio Perm			0.44									0.03
v/c Ratio	0.91		0.44		0.87						0.66	0.25
Uniform Delay, d1	38.7		0.0		38.8						54.6	51.5
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	17.5		0.9		4.8						6.9	0.7
Delay (s)	56.2		0.9		43.6						61.4	52.2
Level of Service	E		A		D						E	D
Approach Delay (s)		25.4			43.6			0.0			54.9	
Approach LOS		C			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	38.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	132.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	196	0	1364	0	900	263	0	0	0	0	582	548
Future Volume (vph)	196	0	1364	0	900	263	0	0	0	0	582	548
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frpb, ped/bikes	1.00		1.00		0.99						1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00						1.00	1.00
Frt	1.00		0.85		0.97						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1583		1583		4755						1667	1417
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1583		1583		4755						1667	1417
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	213	0	1483	0	978	286	0	0	0	0	633	596
RTOR Reduction (vph)	0	0	0	0	29	0	0	0	0	0	0	210
Lane Group Flow (vph)	213	0	1483	0	1235	0	0	0	0	0	633	386
Confl. Peds. (#/hr)						3						
Heavy Vehicles (%)	14%	2%	2%	2%	2%	14%	2%	2%	2%	14%	14%	14%
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	26.3		160.2		50.4						68.5	68.5
Effective Green, g (s)	26.3		160.2		50.4						68.5	68.5
Actuated g/C Ratio	0.16		1.00		0.31						0.43	0.43
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	259		1583		1495						712	605
v/s Ratio Prot	0.13				0.26						0.38	
v/s Ratio Perm			c0.94									0.27
v/c Ratio	0.82		0.94		0.83						0.89	0.64
Uniform Delay, d1	64.7		0.0		50.8						42.3	36.1
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	18.6		11.9		3.9						13.0	2.2
Delay (s)	83.3		11.9		54.7						55.3	38.3
Level of Service	F		B		D						E	D
Approach Delay (s)		20.9			54.7			0.0			47.1	
Approach LOS		C			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	38.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	160.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	401	445	208	14	19	231
Future Volume (vph)	401	445	208	14	19	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1650		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1650		1583	1417
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	461	511	239	16	22	266
RTOR Reduction (vph)	0	0	2	0	0	232
Lane Group Flow (vph)	461	511	253	0	22	34
Confl. Peds. (#/hr)				1		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	23.7	44.0	15.3		8.0	8.0
Effective Green, g (s)	23.7	44.0	15.3		8.0	8.0
Actuated g/C Ratio	0.38	0.71	0.25		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	605	1183	407		204	182
v/s Ratio Prot	c0.29	0.31	c0.15		0.01	
v/s Ratio Perm						c0.02
v/c Ratio	0.76	0.43	0.62		0.11	0.19
Uniform Delay, d1	16.7	3.8	20.8		23.8	24.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.6	0.3	2.9		0.2	0.5
Delay (s)	22.3	4.0	23.7		24.1	24.6
Level of Service	C	A	C		C	C
Approach Delay (s)		12.7	23.7		24.6	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	62.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	206	227	523	12	24	420
Future Volume (vph)	206	227	523	12	24	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1583	1667	1661		1583	1417
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1583	1667	1661		1583	1417
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	226	249	575	13	26	462
RTOR Reduction (vph)	0	0	1	0	0	403
Lane Group Flow (vph)	226	249	587	0	26	59
Confl. Peds. (#/hr)				6		
Heavy Vehicles (%)	14%	14%	14%	14%	14%	14%
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	17.6	57.2	34.6		9.9	9.9
Effective Green, g (s)	17.6	57.2	34.6		9.9	9.9
Actuated g/C Ratio	0.23	0.74	0.45		0.13	0.13
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	361	1236	745		203	181
v/s Ratio Prot	c0.14	0.15	c0.35		0.02	
v/s Ratio Perm						c0.04
v/c Ratio	0.63	0.20	0.79		0.13	0.33
Uniform Delay, d1	26.8	3.0	18.1		29.8	30.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.4	0.1	5.6		0.3	1.1
Delay (s)	30.2	3.1	23.7		30.1	31.6
Level of Service	C	A	C		C	C
Approach Delay (s)		16.0	23.7		31.6	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	77.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	744	40	102	1208	96	20	31	46	24	20	26
Future Volume (Veh/h)	9	744	40	102	1208	96	20	31	46	24	20	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	9	783	42	107	1272	101	21	33	48	25	21	27
Pedestrians					1			12				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			1				
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1373			837			1722	2421	426	2012	2392	686
vC1, stage 1 conf vol							834	834		1536	1536	
vC2, stage 2 conf vol							888	1587		475	855	
vCu, unblocked vol	1373			837			1722	2421	426	2012	2392	686
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			86			91	83	93	83	89	94
cM capacity (veh/h)	496			784			236	197	645	151	199	475

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	9	522	303	107	848	525	102	73
Volume Left	9	0	0	107	0	0	21	25
Volume Right	0	0	42	0	0	101	48	27
cSH	496	1700	1700	784	1700	1700	308	222
Volume to Capacity	0.02	0.31	0.18	0.14	0.50	0.31	0.33	0.33
Queue Length 95th (ft)	1	0	0	12	0	0	35	34
Control Delay (s)	12.4	0.0	0.0	10.3	0.0	0.0	22.4	28.9
Lane LOS	B			B			C	D
Approach Delay (s)	0.1			0.7			22.4	28.9
Approach LOS							C	D

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	56.4%	ICU Level of Service		B
Analysis Period (min)	15			

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
1: Ulupii St & Kalanianaole Hwy

7/11/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1418	22	23	913	30	15	14	25	49	2	19
Future Volume (Veh/h)	20	1418	22	23	913	30	15	14	25	49	2	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	1541	24	25	992	33	16	15	27	53	2	21
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											3.5	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1026			1565			2165	2673	782	1908	2668	514
vC1, stage 1 conf vol							1597	1597		1060	1060	
vC2, stage 2 conf vol							568	1076		849	1609	
vCu, unblocked vol	1026			1565			2165	2673	782	1908	2668	514
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			94			90	93	94	76	99	96
cM capacity (veh/h)	672			418			159	203	422	224	191	586

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	22	1027	538	25	661	364	58	76
Volume Left	22	0	0	25	0	0	16	53
Volume Right	0	0	24	0	0	33	27	21
cSH	672	1700	1700	418	1700	1700	243	269
Volume to Capacity	0.03	0.60	0.32	0.06	0.39	0.21	0.24	0.28
Queue Length 95th (ft)	3	0	0	5	0	0	23	28
Control Delay (s)	10.5	0.0	0.0	14.2	0.0	0.0	24.4	23.6
Lane LOS	B			B			C	C
Approach Delay (s)	0.1			0.3			24.4	23.6
Approach LOS							C	C

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	55.4%	ICU Level of Service	B	
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	784	42	19	1299	5	13	0	4	2	0	9
Future Volume (Veh/h)	13	784	42	19	1299	5	13	0	4	2	0	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	14	825	44	20	1367	5	14	0	4	2	0	9
Pedestrians					5							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1372			825			1586	2265	418	1859	2262	686
vC1, stage 1 conf vol							853	853		1410	1410	
vC2, stage 2 conf vol							732	1412		450	853	
vCu, unblocked vol	1372			825			1586	2265	418	1859	2262	686
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	*6.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		5.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			95	100	99	99	100	98
cM capacity (veh/h)	496			801			305	162	656	201	170	475

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	14	412	412	44	20	911	461	18	11
Volume Left	14	0	0	0	20	0	0	14	2
Volume Right	0	0	0	44	0	0	5	4	9
cSH	496	1700	1700	1700	801	1700	1700	346	381
Volume to Capacity	0.03	0.24	0.24	0.03	0.02	0.54	0.27	0.05	0.03
Queue Length 95th (ft)	2	0	0	0	2	0	0	4	2
Control Delay (s)	12.5	0.0	0.0	0.0	9.6	0.0	0.0	16.0	14.7
Lane LOS	B				A			C	B
Approach Delay (s)	0.2				0.1			16.0	14.7
Approach LOS								C	B

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	47.6%	ICU Level of Service		A
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	1467	0	0	867	0	1	0	1	0	0	2
Future Volume (Veh/h)	3	1467	0	0	867	0	1	0	1	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	3	1512	0	0	894	0	1	0	1	0	0	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	894			1512			1967	2412	756	1657	2412	447
vC1, stage 1 conf vol							1518	1518		894	894	
vC2, stage 2 conf vol							449	894		763	1518	
vCu, unblocked vol	894			1512			1967	2412	756	1657	2412	447
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	7.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
cM capacity (veh/h)	755			438			183	157	436	234	157	636

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	3	756	756	0	0	596	298	2	2
Volume Left	3	0	0	0	0	0	0	1	0
Volume Right	0	0	0	0	0	0	0	1	2
cSH	755	1700	1700	1700	1700	1700	1700	258	636
Volume to Capacity	0.00	0.44	0.44	0.00	0.00	0.35	0.18	0.01	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0	1	0
Control Delay (s)	9.8	0.0	0.0	0.0	0.0	0.0	0.0	19.1	10.7
Lane LOS	A							C	B
Approach Delay (s)	0.0				0.0			19.1	10.7
Approach LOS								C	B

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	50.6%	ICU Level of Service		A
Analysis Period (min)	15			

* User Entered Value

APPENDIX K

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITH ALTERNATIVE 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	597	0	629	0	1050	436	0	0	0	0	167	408
Future Volume (vph)	597	0	629	0	1050	436	0	0	0	0	167	408
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frt	1.00		0.85		0.96						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1770		1583		4862						1863	1583
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1770		1583		4862						1863	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	656	0	691	0	1154	479	0	0	0	0	184	448
RTOR Reduction (vph)	0	0	0	0	56	0	0	0	0	0	0	390
Lane Group Flow (vph)	656	0	691	0	1577	0	0	0	0	0	184	58
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	48.6		123.6		43.9						16.1	16.1
Effective Green, g (s)	48.6		123.6		43.9						16.1	16.1
Actuated g/C Ratio	0.39		1.00		0.36						0.13	0.13
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	695		1583		1726						242	206
v/s Ratio Prot	c0.37				c0.32						c0.10	
v/s Ratio Perm			0.44									0.04
v/c Ratio	0.94		0.44		0.91						0.76	0.28
Uniform Delay, d1	36.2		0.0		38.0						51.9	48.5
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	21.3		0.9		7.9						13.1	0.8
Delay (s)	57.5		0.9		45.9						65.0	49.3
Level of Service	E		A		D						E	D
Approach Delay (s)		28.5			45.9			0.0			53.9	
Approach LOS		C			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	40.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	123.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	0	1364	0	900	264	0	0	0	0	633	595
Future Volume (vph)	197	0	1364	0	900	264	0	0	0	0	633	595
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0		5.0						5.0	5.0
Lane Util. Factor	1.00		1.00		0.91						1.00	1.00
Frpb, ped/bikes	1.00		1.00		0.99						1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00						1.00	1.00
Frt	1.00		0.85		0.97						1.00	0.85
Flt Protected	0.95		1.00		1.00						1.00	1.00
Satd. Flow (prot)	1770		1583		4881						1863	1583
Flt Permitted	0.95		1.00		1.00						1.00	1.00
Satd. Flow (perm)	1770		1583		4881						1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	0	1483	0	978	287	0	0	0	0	688	647
RTOR Reduction (vph)	0	0	0	0	29	0	0	0	0	0	0	213
Lane Group Flow (vph)	214	0	1483	0	1236	0	0	0	0	0	688	434
Confl. Peds. (#/hr)						3						
Turn Type	Prot		Free		NA						NA	Perm
Protected Phases	5				6						4	
Permitted Phases			Free									4
Actuated Green, G (s)	23.8		153.5		48.0						66.7	66.7
Effective Green, g (s)	23.8		153.5		48.0						66.7	66.7
Actuated g/C Ratio	0.16		1.00		0.31						0.43	0.43
Clearance Time (s)	5.0				5.0						5.0	5.0
Vehicle Extension (s)	3.0				3.0						3.0	3.0
Lane Grp Cap (vph)	274		1583		1526						809	687
v/s Ratio Prot	0.12				0.25						0.37	
v/s Ratio Perm			c0.94									0.27
v/c Ratio	0.78		0.94		0.81						0.85	0.63
Uniform Delay, d1	62.3		0.0		48.6						38.9	33.8
Progression Factor	1.00		1.00		1.00						1.00	1.00
Incremental Delay, d2	13.4		11.9		3.4						8.5	1.9
Delay (s)	75.8		11.9		51.9						47.5	35.7
Level of Service	E		B		D						D	D
Approach Delay (s)		19.9			51.9			0.0			41.8	
Approach LOS		B			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	36.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	153.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	401	608	325	14	19	231
Future Volume (vph)	401	608	325	14	19	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1851		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1863	1851		1770	1583
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	461	699	374	16	22	266
RTOR Reduction (vph)	0	0	2	0	0	233
Lane Group Flow (vph)	461	699	388	0	22	33
Confl. Peds. (#/hr)				1		
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	21.2	43.8	17.6		7.5	7.5
Effective Green, g (s)	21.2	43.8	17.6		7.5	7.5
Actuated g/C Ratio	0.35	0.71	0.29		0.12	0.12
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	612	1331	531		216	193
v/s Ratio Prot	c0.26	0.38	c0.21		0.01	
v/s Ratio Perm						c0.02
v/c Ratio	0.75	0.53	0.73		0.10	0.17
Uniform Delay, d1	17.7	4.0	19.7		23.9	24.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.2	0.4	5.1		0.2	0.4
Delay (s)	23.0	4.4	24.8		24.1	24.5
Level of Service	C	A	C		C	C
Approach Delay (s)		11.8	24.8		24.5	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	61.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	206	229	621	12	24	420
Future Volume (vph)	206	229	621	12	24	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1857		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1863	1857		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	224	249	675	13	26	457
RTOR Reduction (vph)	0	0	1	0	0	364
Lane Group Flow (vph)	224	249	687	0	26	93
Confl. Peds. (#/hr)				6		
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	16.2	57.5	36.3		10.6	10.6
Effective Green, g (s)	16.2	57.5	36.3		10.6	10.6
Actuated g/C Ratio	0.21	0.74	0.46		0.14	0.14
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	367	1371	863		240	214
v/s Ratio Prot	c0.13	0.13	c0.37		0.01	
v/s Ratio Perm						c0.06
v/c Ratio	0.61	0.18	0.80		0.11	0.44
Uniform Delay, d1	28.1	3.1	17.8		29.6	31.0
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.0	0.1	5.2		0.2	1.4
Delay (s)	31.1	3.2	22.9		29.8	32.4
Level of Service	C	A	C		C	C
Approach Delay (s)		16.4	22.9		32.3	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	78.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX L

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT PROJECT

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	744	40	102	1208	96	20	31	46	24	20	26
Future Volume (Veh/h)	9	744	40	102	1208	96	20	31	46	24	20	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	9	783	42	107	1272	101	21	33	48	25	21	27
Pedestrians					1			12				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			1				
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1373			837			1722	2421	426	2012	2392	686
vC1, stage 1 conf vol							834	834		1536	1536	
vC2, stage 2 conf vol							888	1587		475	855	
vCu, unblocked vol	1373			837			1722	2421	426	2012	2392	686
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			86			91	83	93	83	89	94
cM capacity (veh/h)	496			784			236	197	645	151	199	475

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	9	522	303	107	848	525	102	73
Volume Left	9	0	0	107	0	0	21	25
Volume Right	0	0	42	0	0	101	48	27
cSH	496	1700	1700	784	1700	1700	308	222
Volume to Capacity	0.02	0.31	0.18	0.14	0.50	0.31	0.33	0.33
Queue Length 95th (ft)	1	0	0	12	0	0	35	34
Control Delay (s)	12.4	0.0	0.0	10.3	0.0	0.0	22.4	28.9
Lane LOS	B			B			C	D
Approach Delay (s)	0.1			0.7			22.4	28.9
Approach LOS							C	D

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	56.4%	ICU Level of Service		B
Analysis Period (min)	15			

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
1: Ulupii St & Kalanianaole Hwy

7/11/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1418	22	23	913	30	15	14	25	49	2	19
Future Volume (Veh/h)	20	1418	22	23	913	30	15	14	25	49	2	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	1541	24	25	992	33	16	15	27	53	2	21
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											3.5	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1026			1565			2165	2673	782	1908	2668	514
vC1, stage 1 conf vol							1597	1597		1060	1060	
vC2, stage 2 conf vol							568	1076		849	1609	
vCu, unblocked vol	1026			1565			2165	2673	782	1908	2668	514
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			94			90	93	94	76	99	96
cM capacity (veh/h)	672			418			159	203	422	224	191	586

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	22	1027	538	25	661	364	58	76
Volume Left	22	0	0	25	0	0	16	53
Volume Right	0	0	24	0	0	33	27	21
cSH	672	1700	1700	418	1700	1700	243	269
Volume to Capacity	0.03	0.60	0.32	0.06	0.39	0.21	0.24	0.28
Queue Length 95th (ft)	3	0	0	5	0	0	23	28
Control Delay (s)	10.5	0.0	0.0	14.2	0.0	0.0	24.4	23.6
Lane LOS	B			B			C	C
Approach Delay (s)	0.1			0.3			24.4	23.6
Approach LOS							C	C

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	55.4%	ICU Level of Service	B	
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	784	42	19	1299	5	13	0	4	2	0	9
Future Volume (Veh/h)	13	784	42	19	1299	5	13	0	4	2	0	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	14	825	44	20	1367	5	14	0	4	2	0	9
Pedestrians					5							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1372			825			1586	2265	418	1859	2262	686
vC1, stage 1 conf vol							853	853		1410	1410	
vC2, stage 2 conf vol							732	1412		450	853	
vCu, unblocked vol	1372			825			1586	2265	418	1859	2262	686
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	*6.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		5.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			95	100	99	99	100	98
cM capacity (veh/h)	496			801			305	162	656	201	170	475

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	14	412	412	44	20	911	461	18	11
Volume Left	14	0	0	0	20	0	0	14	2
Volume Right	0	0	0	44	0	0	5	4	9
cSH	496	1700	1700	1700	801	1700	1700	346	381
Volume to Capacity	0.03	0.24	0.24	0.03	0.02	0.54	0.27	0.05	0.03
Queue Length 95th (ft)	2	0	0	0	2	0	0	4	2
Control Delay (s)	12.5	0.0	0.0	0.0	9.6	0.0	0.0	16.0	14.7
Lane LOS	B				A			C	B
Approach Delay (s)	0.2				0.1			16.0	14.7
Approach LOS								C	B

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	47.6%	ICU Level of Service		A
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	1467	0	0	867	0	1	0	1	0	0	2
Future Volume (Veh/h)	3	1467	0	0	867	0	1	0	1	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	3	1512	0	0	894	0	1	0	1	0	0	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	894			1512			1967	2412	756	1657	2412	447
vC1, stage 1 conf vol							1518	1518		894	894	
vC2, stage 2 conf vol							449	894		763	1518	
vCu, unblocked vol	894			1512			1967	2412	756	1657	2412	447
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	7.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
cM capacity (veh/h)	755			438			183	157	436	234	157	636

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	3	756	756	0	0	596	298	2	2
Volume Left	3	0	0	0	0	0	0	1	0
Volume Right	0	0	0	0	0	0	0	1	2
cSH	755	1700	1700	1700	1700	1700	1700	258	636
Volume to Capacity	0.00	0.44	0.44	0.00	0.00	0.35	0.18	0.01	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0	1	0
Control Delay (s)	9.8	0.0	0.0	0.0	0.0	0.0	0.0	19.1	10.7
Lane LOS	A							C	B
Approach Delay (s)	0.0				0.0			19.1	10.7
Approach LOS								C	B

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	50.6%	ICU Level of Service		A
Analysis Period (min)	15			

* User Entered Value

APPENDIX M

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2023 PEAK HOUR TRAFFIC
ANALYSIS WITH PROJECT

HCM Unsignalized Intersection Capacity Analysis
1: Ulupii St & Kalanianaole Hwy

10/04/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	9	771	40	102	1227	20	20	31	46	24	20
Future Volume (Veh/h)	26	9	771	40	102	1227	20	20	31	46	24	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	27	9	812	42	107	1292	21	21	33	48	25	21
Pedestrians					1			12				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			1				
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1399			833			652	1964	424	940	1724	700
vC1, stage 1 conf vol							481	481		837	837	
vC2, stage 2 conf vol							171	1483		103	887	
vCu, unblocked vol	1399			833			652	1964	424	940	1724	700
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			95			96	91	95	87	92	96
cM capacity (veh/h)	484			787			516	230	646	374	315	468

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	27	6	815	42	71	1328	75	94
Volume Left	27	0	0	42	0	0	21	48
Volume Right	0	0	812	0	0	1292	33	21
cSH	484	1700	1700	787	1700	1700	409	372
Volume to Capacity	0.06	0.00	0.48	0.05	0.04	0.78	0.18	0.25
Queue Length 95th (ft)	4	0	0	4	0	0	17	25
Control Delay (s)	12.9	0.0	0.0	9.8	0.0	0.0	15.8	17.9
Lane LOS	B			A			C	C
Approach Delay (s)	0.4			0.3			15.8	17.9
Approach LOS							C	C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
1: Ulupii St & Kalanianaole Hwy

10/04/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	1419	22	23	929	30	15	14	25	49	2	19
Future Volume (Veh/h)	20	1419	22	23	929	30	15	14	25	49	2	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	1542	24	25	1010	33	16	15	27	53	2	21
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											3.5	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1044			1566			2175	2692	783	1927	2688	522
vC1, stage 1 conf vol							1598	1598		1078	1078	
vC2, stage 2 conf vol							577	1094		850	1610	
vCu, unblocked vol	1044			1566			2175	2692	783	1927	2688	522
tC, single (s)	4.1			4.1			*6.5	*5.5	*5.9	*6.5	*5.5	*5.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			94			90	93	94	76	99	96
cM capacity (veh/h)	661			418			158	201	422	221	190	580

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	22	1028	538	25	673	370	58	76
Volume Left	22	0	0	25	0	0	16	53
Volume Right	0	0	24	0	0	33	27	21
cSH	661	1700	1700	418	1700	1700	242	266
Volume to Capacity	0.03	0.60	0.32	0.06	0.40	0.22	0.24	0.29
Queue Length 95th (ft)	3	0	0	5	0	0	23	29
Control Delay (s)	10.6	0.0	0.0	14.2	0.0	0.0	24.5	23.9
Lane LOS	B			B			C	C
Approach Delay (s)	0.1			0.3			24.5	23.9
Approach LOS							C	C

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	55.4%	ICU Level of Service		B
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	40	784	42	19	1299	13	13	0	4	7	0
Future Volume (Veh/h)	28	40	784	42	19	1299	13	13	0	4	7	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	29	42	825	44	20	1367	14	14	0	4	7	0
Pedestrians					5							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1387			42			202	1575	26	882	892	694
vC1, stage 1 conf vol							100	100		792	792	
vC2, stage 2 conf vol							102	1475		91	100	
vCu, unblocked vol	1387			42			202	1575	26	882	892	694
tC, single (s)	4.1			4.1			*6.5	*5.5	6.9	*6.5	*5.5	6.9
tC, 2 stage (s)							5.5	4.5		5.5	4.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			97			98	94	100	99	98	100
cM capacity (veh/h)	490			1565			795	244	1039	407	461	386

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	29	21	21	825	44	13	1374	28	11
Volume Left	29	0	0	0	44	0	0	14	4
Volume Right	0	0	0	825	0	0	1367	0	0
cSH	490	1700	1700	1700	1565	1700	1700	373	440
Volume to Capacity	0.06	0.01	0.01	0.49	0.03	0.01	0.81	0.07	0.02
Queue Length 95th (ft)	5	0	0	0	2	0	0	6	2
Control Delay (s)	12.8	0.0	0.0	0.0	7.4	0.0	0.0	15.4	13.4
Lane LOS	B				A			C	B
Approach Delay (s)	0.4				0.2			15.4	13.4
Approach LOS								C	B

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	65.2%	ICU Level of Service		C
Analysis Period (min)	15			

* User Entered Value

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	1467	0	0	867	0	1	0	1	4	0	18
Future Volume (Veh/h)	4	1467	0	0	867	0	1	0	1	4	0	18
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	4	1512	0	0	894	0	1	0	1	4	0	19
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	894			1512			1986	2414	756	1659	2414	447
vC1, stage 1 conf vol							1520	1520		894	894	
vC2, stage 2 conf vol							466	894		765	1520	
vCu, unblocked vol	894			1512			1986	2414	756	1659	2414	447
tC, single (s)	4.1			4.1			*6.5	6.5	*5.9	*6.5	6.5	*5.9
tC, 2 stage (s)							5.5	5.5		5.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	100	99	100	97
cM capacity (veh/h)	755			438			181	156	436	304	157	636

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	4	756	756	0	0	596	298	2	23
Volume Left	4	0	0	0	0	0	0	1	4
Volume Right	0	0	0	0	0	0	0	1	19
cSH	755	1700	1700	1700	1700	1700	1700	256	535
Volume to Capacity	0.01	0.44	0.44	0.00	0.00	0.35	0.18	0.01	0.04
Queue Length 95th (ft)	0	0	0	0	0	0	0	1	3
Control Delay (s)	9.8	0.0	0.0	0.0	0.0	0.0	0.0	19.2	12.0
Lane LOS	A							C	B
Approach Delay (s)	0.0				0.0			19.2	12.0
Approach LOS								C	B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

Appendix T-1: Road Ownership Maps

Oahu Community Correctional Center

May 30, 2018

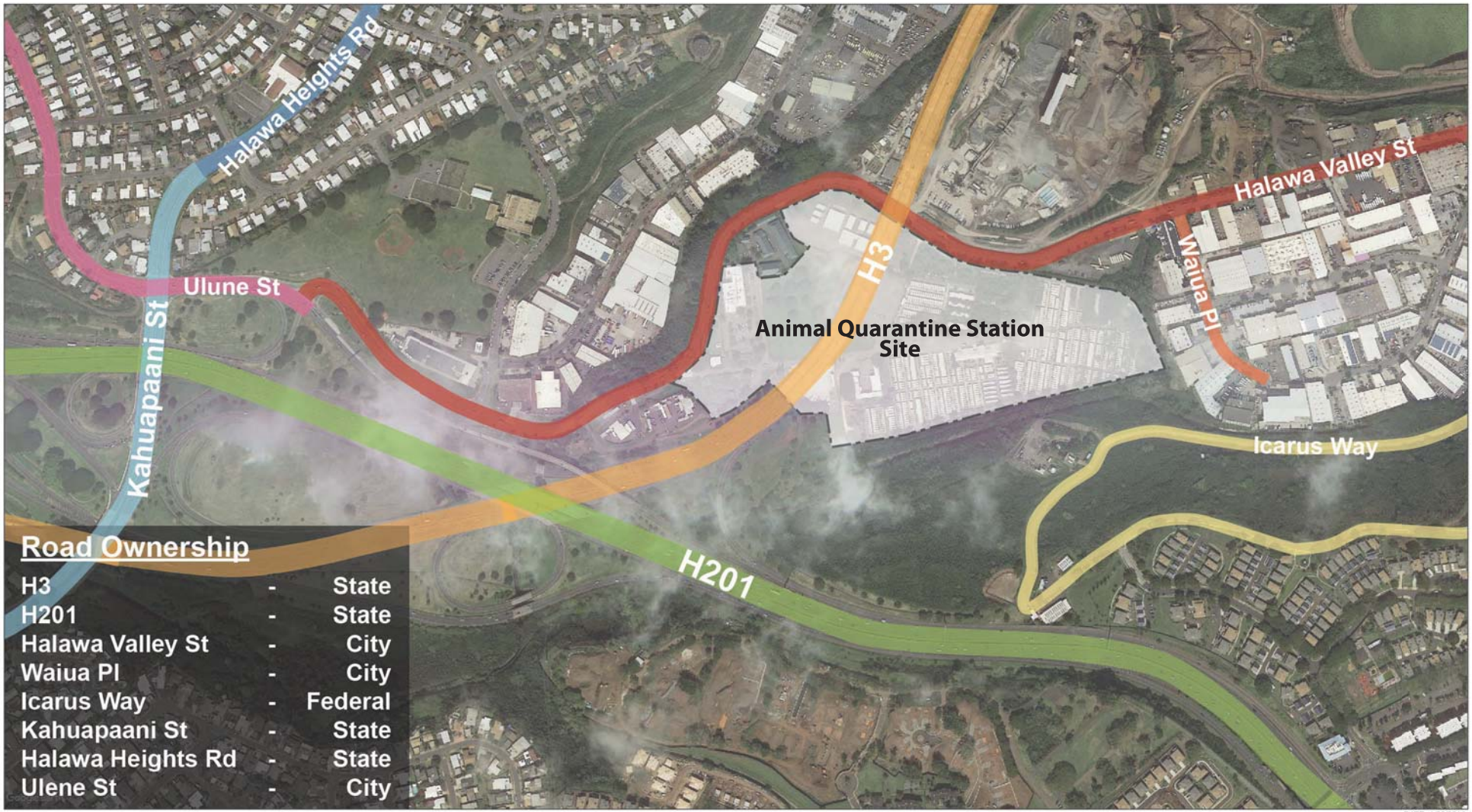
Prepared for:
State of Hawaii
Department of Accounting and General Services
Department of Public Safety

Prepared by:

ahl.

PBR HAWAII

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS



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Road Ownership Map

ANIMAL QUARANTINE STATION SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety — Island of O'ahu

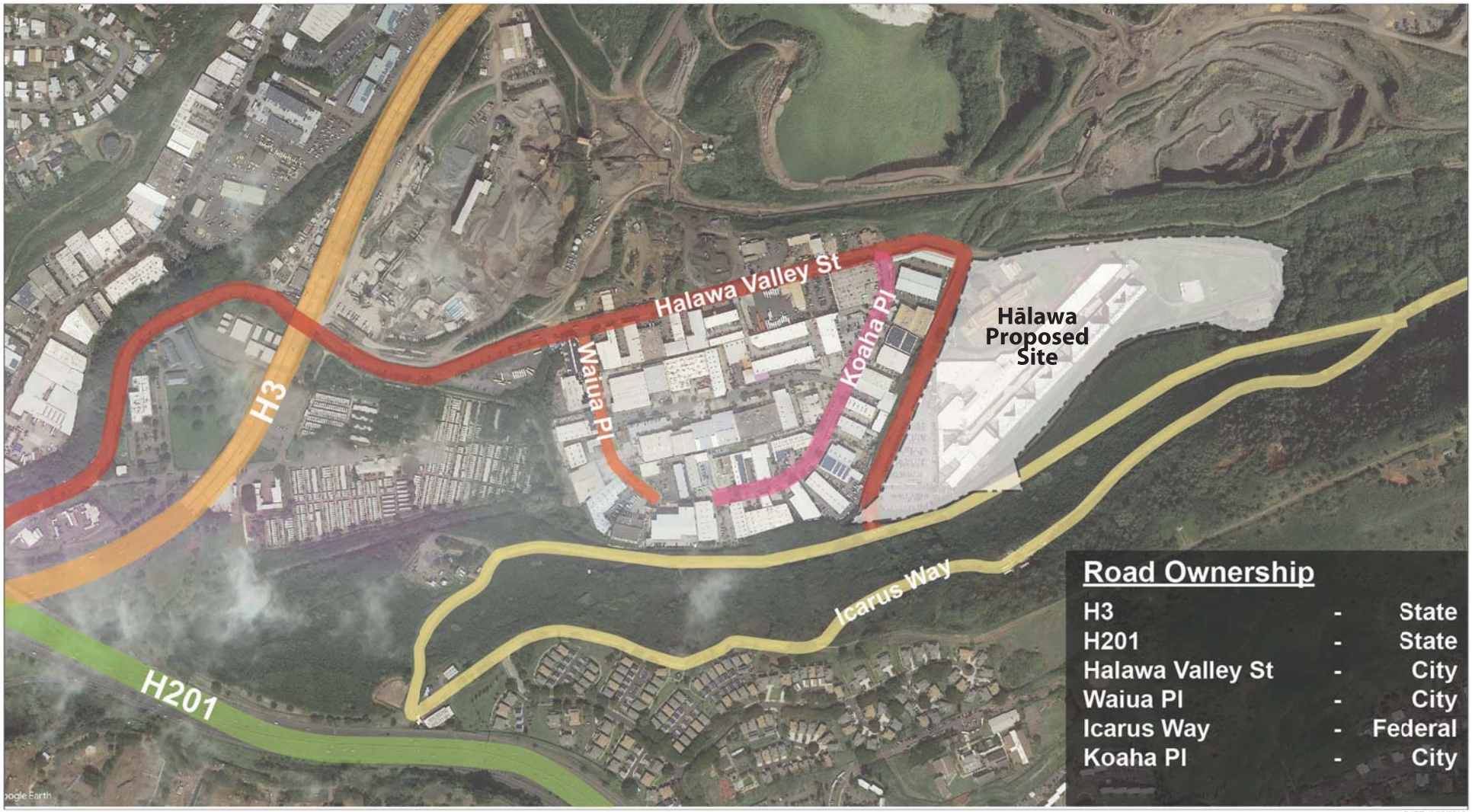
North

(Not to scale)

PBR HAWAII & ASSOCIATES, INC.

Source: Google Earth, 2018.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



DATE: 4/30/2018

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Road Ownership Map

HĀLAWA PROPOSED SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety — Island of O'ahu

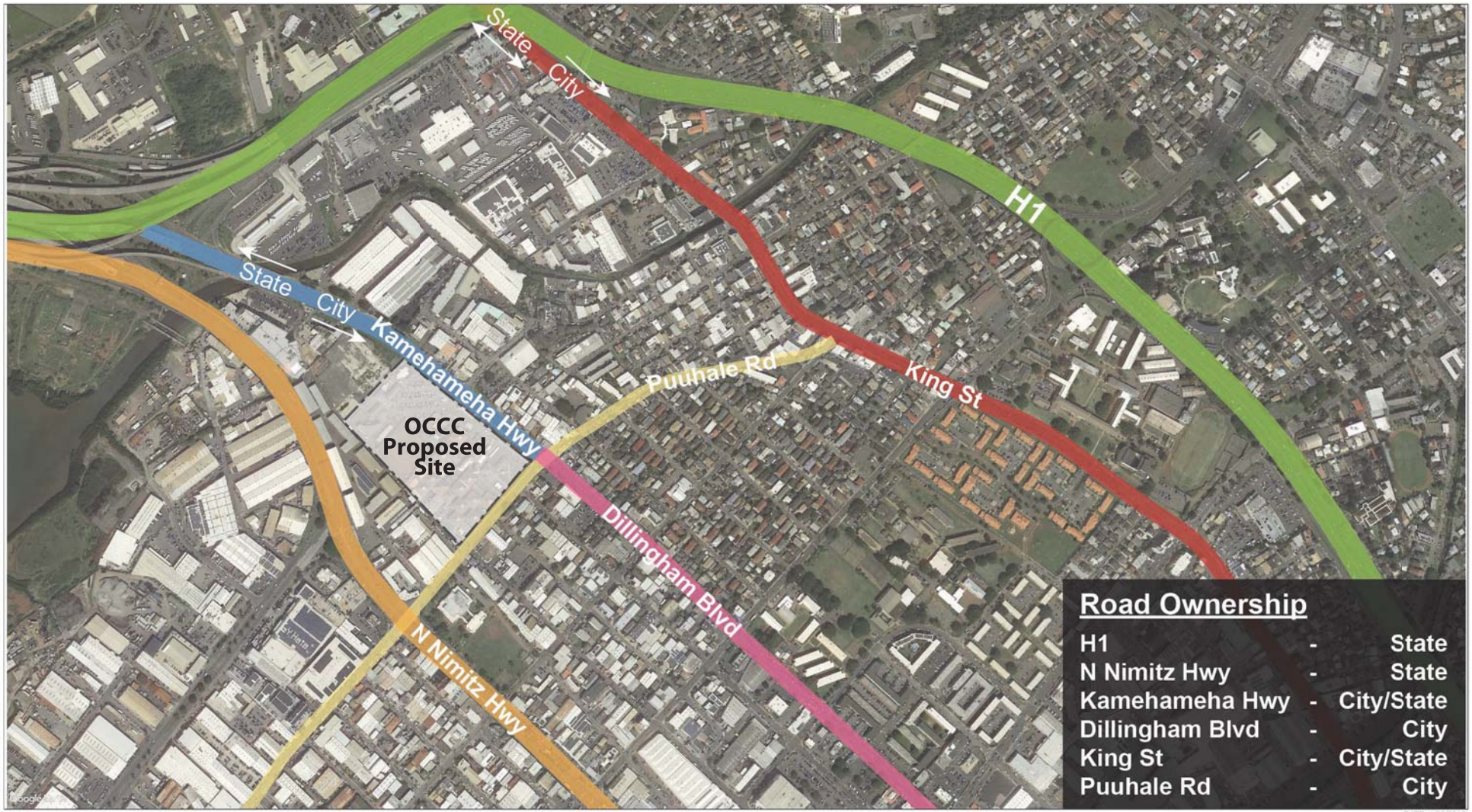
North

(Not to scale)

PBR HAWAII & ASSOCIATES, INC.

Source: Google Earth, 2018.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



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Road Ownership Map

OCCC PROPOSED SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety
Island of O'ahu

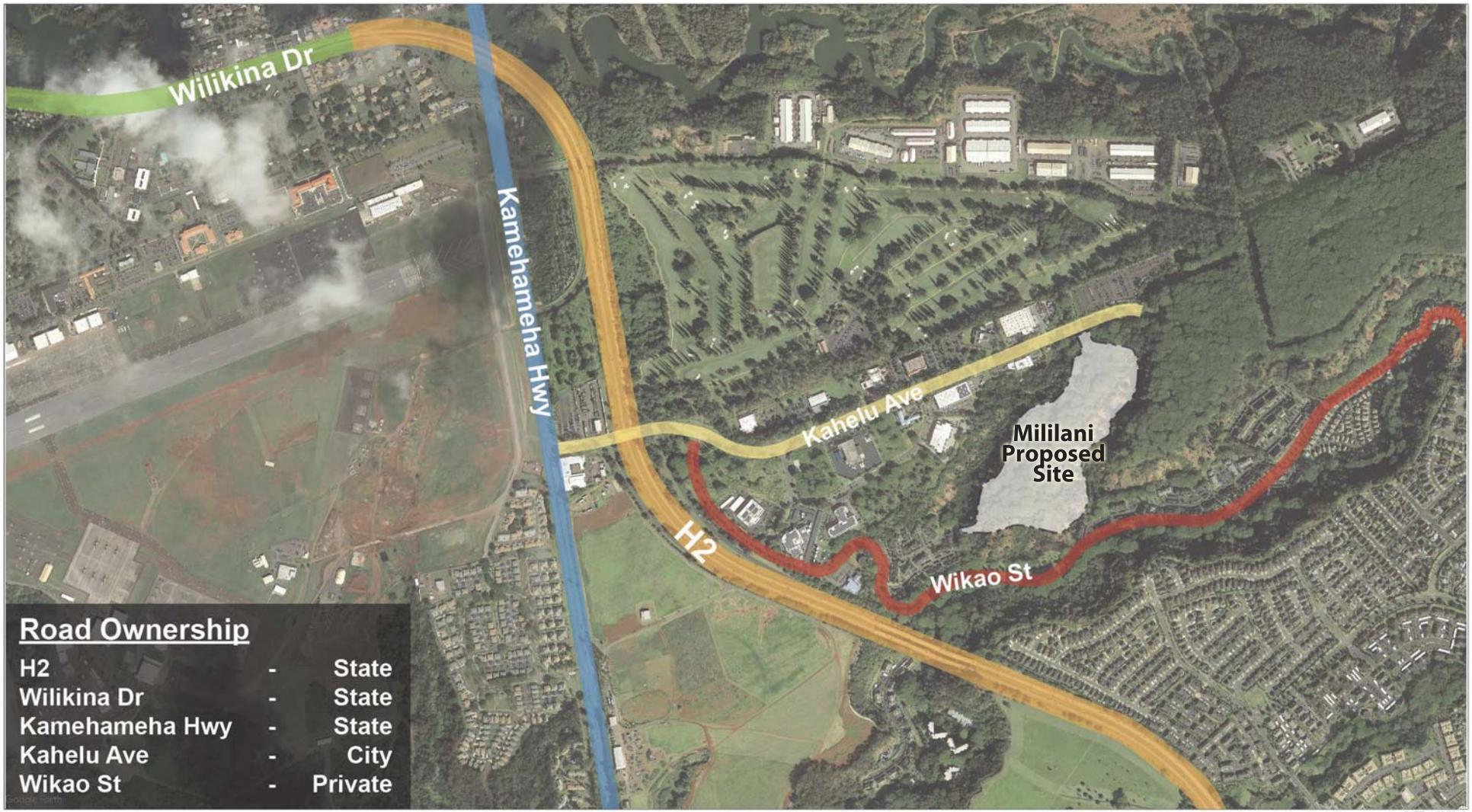
North

(Not to scale)

PBR HAWAII & ASSOCIATES, INC.

Source: Google Earth, 2018.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



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Road Ownership Map

MILILANI PROPOSED SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety — Island of O'ahu

North

(Not to scale)

PBR HAWAII & ASSOCIATES, INC.

Source: Google Earth, 2018.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

DATE: 4/30/2018

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Road Ownership Map

WCCC PROPOSED SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety
Island of O'ahu

North

(Not to scale)

PBR HAWAII & ASSOCIATES, INC.

Source: Google Earth, 2018.

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Appendix T-2: Current Transit Maps

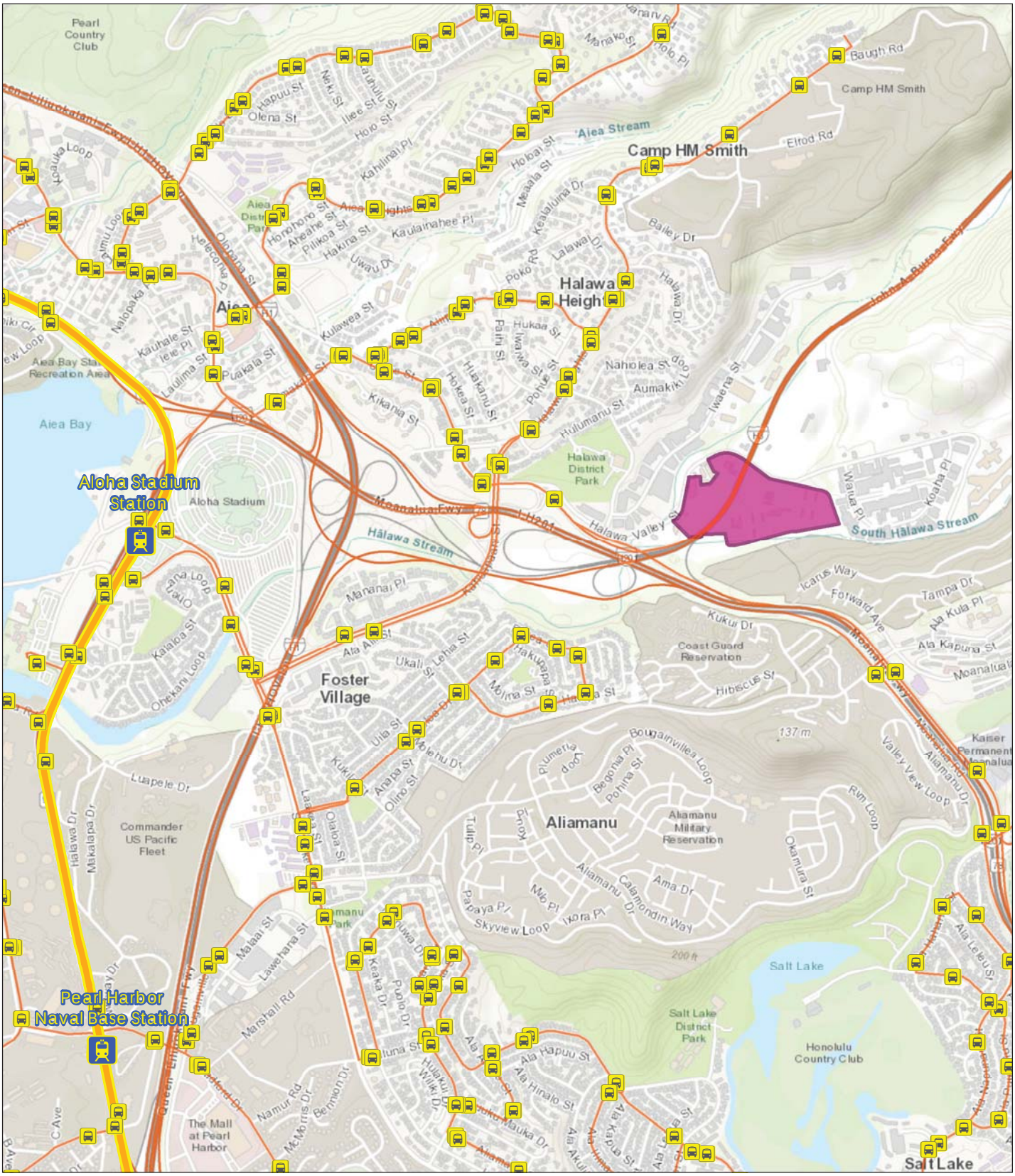
Oahu Community Correctional Center

May 30, 2018

Prepared for:
State of Hawaii
Department of Accounting and General Services
Department of Public Safety

Prepared by:

PBR HAWAII



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DATE: 4/13/2018

LEGEND

- Animal Quarantine Station Site
- Rail Station
- Rail Line
- Bus Stop
- Bus Route

Public Transportation

ANIMAL QUARANTINE STATION SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety — Island of Oahu

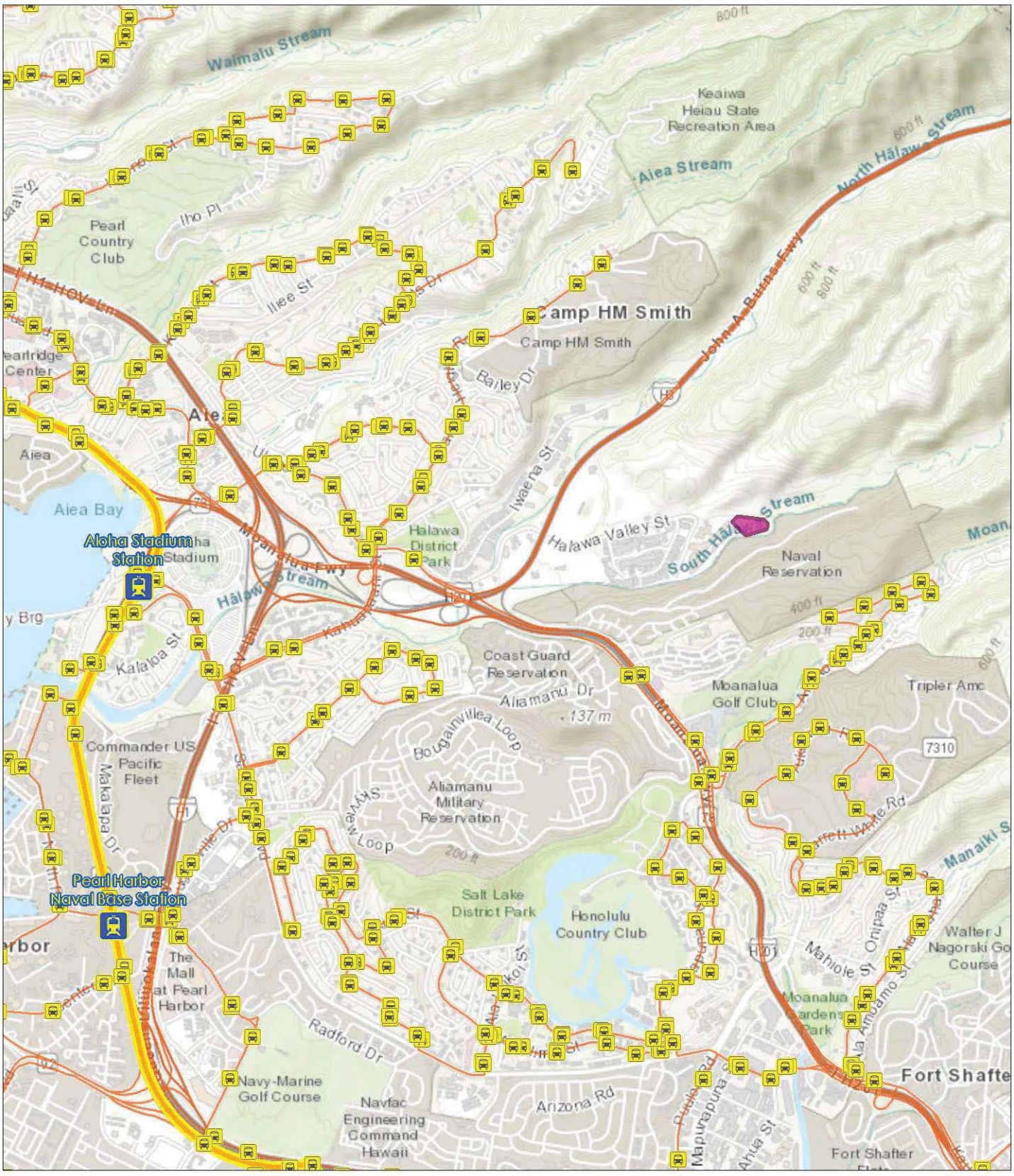
North

Linear Scale (feet)
0 500 1,000 2,000

PBR HAWAII & ASSOCIATES, INC.

Source: Department of Planning & Permitting, 2016.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



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DATE: 4/30/2018

LEGEND

- Halawa Site
- Rail Station
- Rail Line
- Bus Stop
- Bus Route

Public Transportation

HĀLAWA PROPOSED SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety — Island of Oahu

North

Linear Scale (feet)
0 750 1,500 3,000

PBR HAWAII & ASSOCIATES, INC.

Source: Department of Planning & Permitting, 2016.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

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DATE: 4/30/2018

LEGEND

- OCCC
- Laumaka Work Furlough Center
- Rail Station
- Rail Line
- Bus Stop
- Bus Route

Public Transportation

OCCC & LAUMAKA WORK FURLOUGH CENTER

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety — Island of O'ahu

North

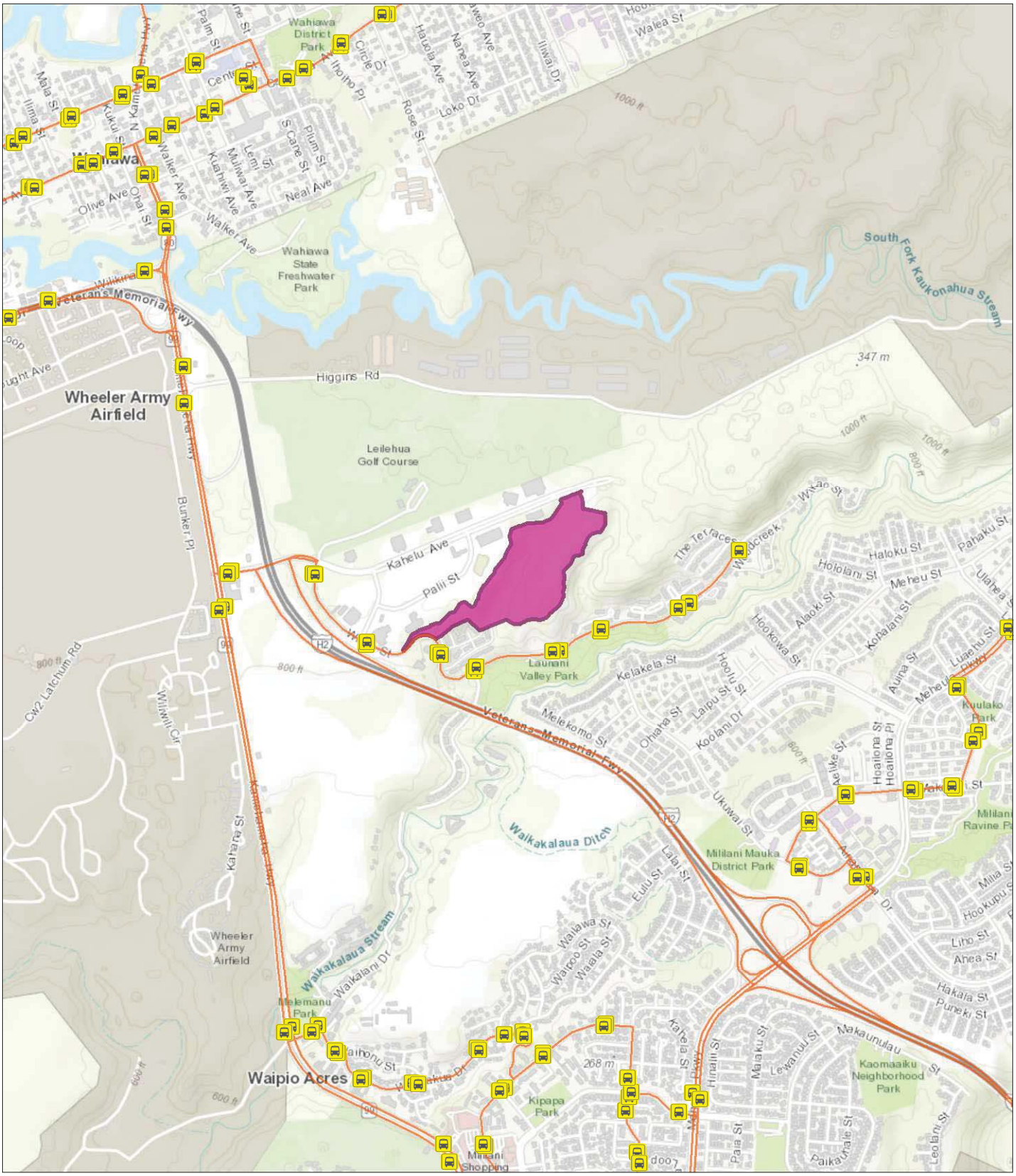
Linear Scale (feet)

0 500 1,500 3,000

PBR HAWAII & ASSOCIATES, INC.

Source: Department of Planning & Permitting, 2016.

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



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DATE: 4/30/2018

LEGEND

- Mililani Tech Park Site
- Rail Station
- Rail Line
- Bus Stop
- Bus Route

Public Transportation

MILILANI PROPOSED SITE

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

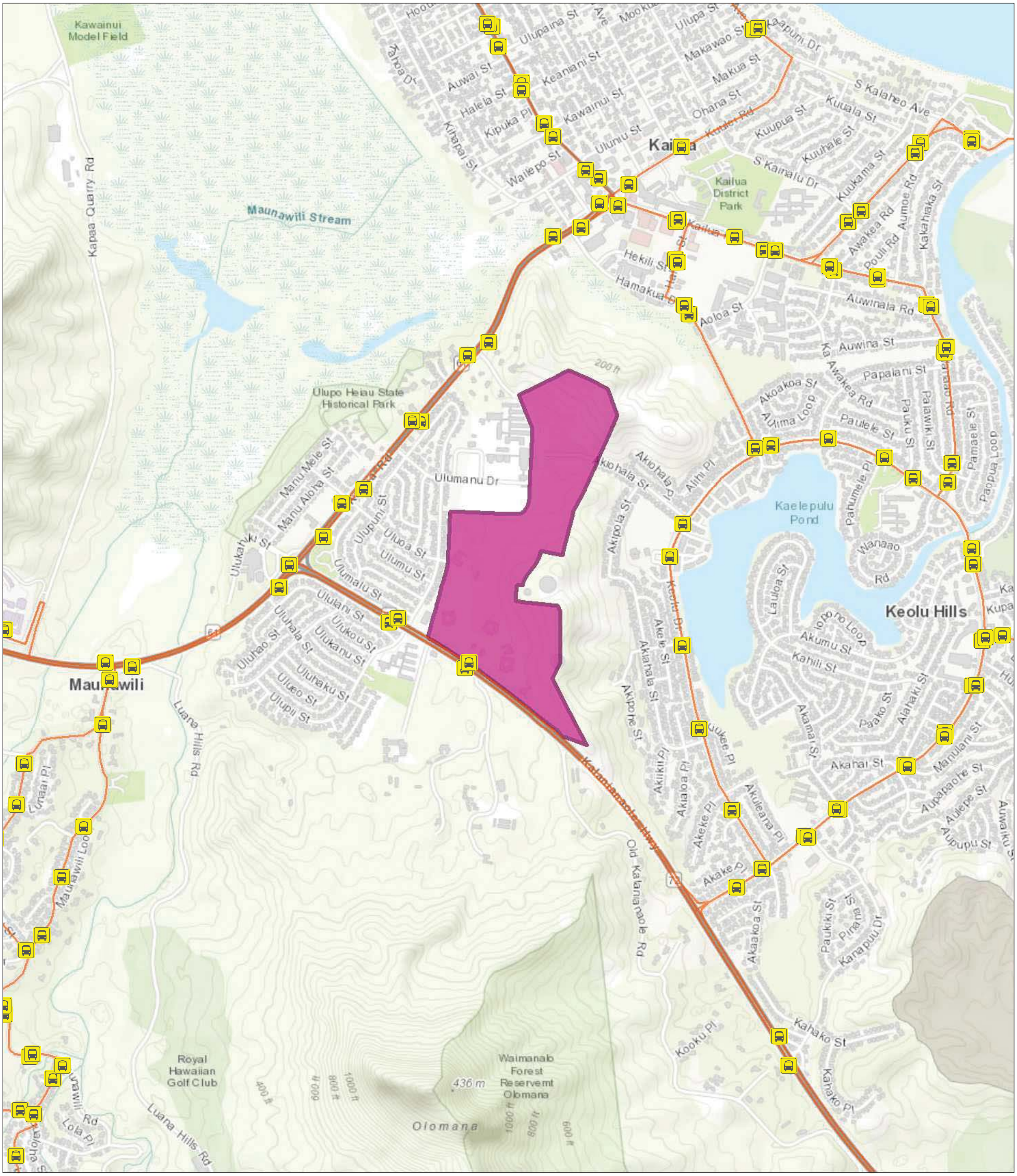
Department of Public Safety
Island of O'ahu

North

Linear Scale (feet)
0 500 1,000 2,000

PBR HAWAII & ASSOCIATES, INC.

Source: Department of Planning & Permitting, 2016.



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DATE: 4/30/2018

LEGEND

- WCCC
- Rail Station
- Rail Line
- Bus Stop
- Bus Route

Public Transportation

WCCC

REPLACEMENT OF THE O'AHU COMMUNITY CORRECTIONAL CENTER

Department of Public Safety | Island of O'ahu

North

Linear Scale (feet)
0 500 1,000 2,000

PBR HAWAII & ASSOCIATES, INC.

Source: Department of Planning & Permitting, 2016.

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