Traffic Impact Report

Kapolei Northwest Corner

Prepared for:
Hawaii Housing Finance and
Development Corporation

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December 2022

TRAFFIC IMPACT REPORT

FOR THE

KAPOLEI NORTHWEST CORNER

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I. INTRODUCTION

A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the development of the Northwest Corner parcel at the Villages of Kapolei in Kapolei on the island of Oahu. The proposed project entails the development of residential and commercial uses.

B. 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. Superimposition of 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.

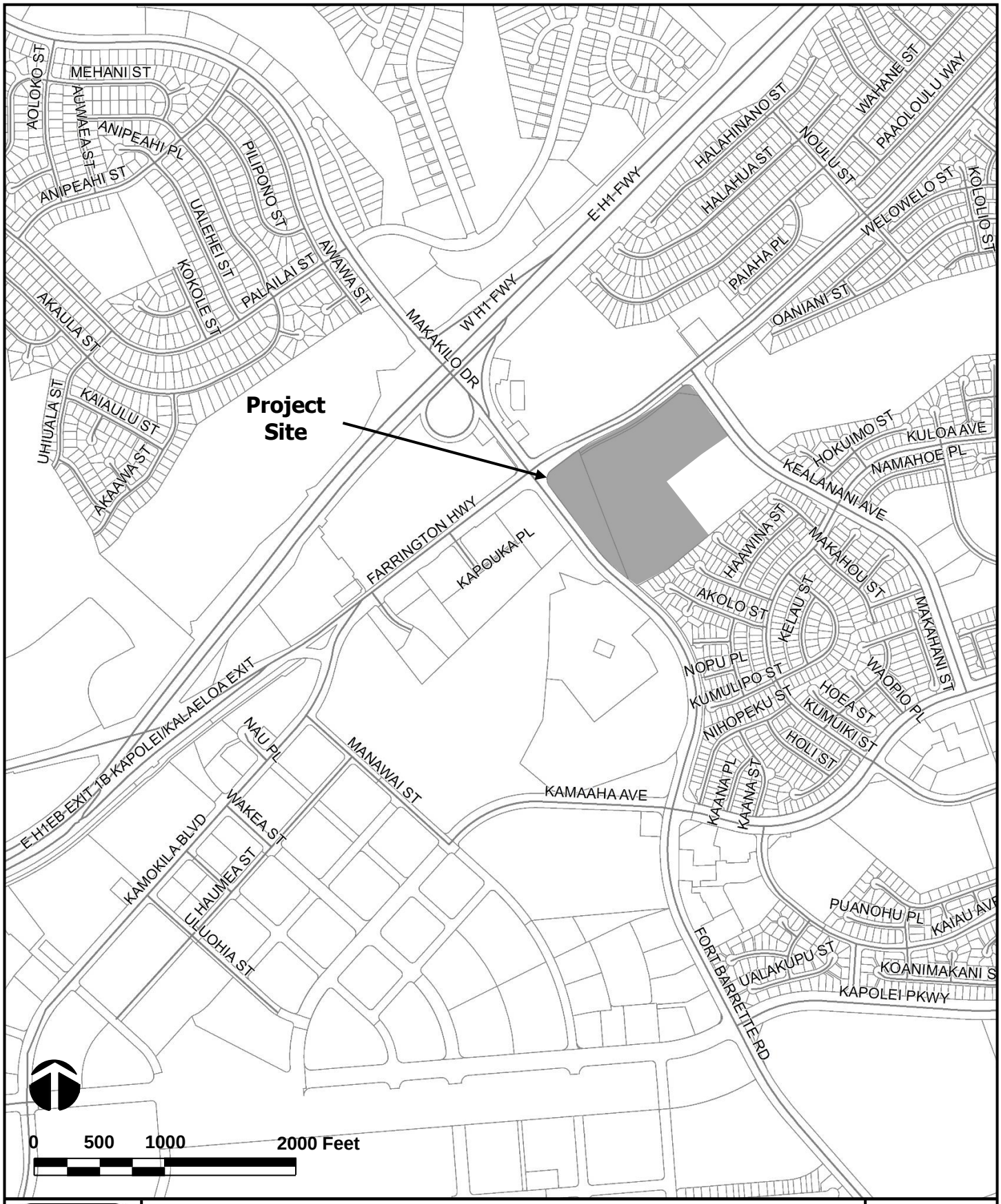
II. PROJECT DESCRIPTION

A. Location

The Northwest Corner parcel of the Villages of Kapolei is located adjacent to Farrington Highway in Kapolei on the island of Oahu (see Figure 1). The site is bounded by Farrington Highway to the north, residential uses to the south, Fort Barrette Road to the west, and Kealanani Avenue to the east and is further identified as Tax Map Key (TMK) (1) 9-1-016:035. Access to the proposed project is expected to be provided via driveways off Kealanani Avenue, Farrington Highway, and Fort Barrette Road.

B. Project Characteristics

The project site for the proposed project encompasses a portion of the parcel located at the southeast corner of the intersection of Farrington Highway, Fort



WILSON OKAMOTO CORPORATION	**KAPOLEI NORTHWEST CORNER**	FIGURE 1
	LOCATION AND VICINITY MAP	

Barrette Road, and Makakilo Drive referred to as the "Northwest Corner of the Villages of Kapolei." A separate development is also currently being constructed on the southeast portion of the same parcel and is discussed later in this report. The proposed project (hereafter referred to as the "Kapolei Northwest Corner" development) entails the construction of a mixed-use development that includes approximately 800 multi-family residential units and 50,000 square feet (sf) of commercial uses. Access to the proposed project is expected to be provided via driveways off Farrington Highway, Kealanani Avenue, and Fort Barrette Road. The access off Fort Barrette Road is expected to be restricted to right-turn in movements only based on previous consultation with the State of Hawaii Department of Transportation (HDOT). The proposed project is anticipated to be completed and occupied by Year 2028. Figure 2 shows the project site plan. It should be noted that the site plan does not currently reflect these turning restrictions.

III. EXISTING TRAFFIC CONDITIONS

A. Area Roadway System

In the vicinity of the proposed project, Farrington Highway is a predominantly four-lane, two-way, City and County of Honolulu roadway generally oriented in the east-west direction. At the northwest corner of the project site, Farrington Highway intersects Fort Barrette Road and Makakilo Drive. At this signalized intersection, the westbound approach on Farrington Highway is comprised of two exclusive left-turn lanes, two through lanes, and two exclusive right-turn lanes. The eastbound approach on Farrington Highway includes two exclusive left-turn lanes, two through lanes, and an exclusive right-turn lane. Fort Barrette Road is a predominantly two-lane, two-way State of Hawaii roadway generally oriented in the north-south direction that starts at Farrington Highway and continues south until its terminus at Roosevelt Avenue. The northbound approach on Fort Barrette Road includes two exclusive left-turn lanes, two through lanes, and an exclusive right-turn lane. The north leg of the intersection is comprised of Makakilo Drive, a predominantly four lane, two-way, divided roadway that starts as a State of Hawaii roadway between Farrington Highway and the Makakilo Interchange but transitions to a City and County of Honolulu roadway north of the interchange. The southbound approach on Makakilo

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PROJECT SITE PLAN

FIGURE 2

Drive include two exclusive left-turn lanes, a through lane, a shared through and right-turn lane, and an exclusive right-turn lane.

East of the intersection with Fort Barrette Road and Makakilo Drive, Farrington Highway intersects a driveway for the adjacent Walmart. At this unsignalized T-intersection, the eastbound approach on Farrington Highway includes two through lanes while the westbound approach includes two through lanes and an exclusive right-turn lane. The southbound approach of the intersection is comprised of a driveway that serves the adjacent Walmart and includes an exclusive right-turn lane. It should be noted that a raised channelization island is provided on the southbound approach, as well as a raised median island along Farrington Highway to enforce that only right-turn in and right-turn out movements are allowed at this access point.

At the northeast corner of the project site, Farrington Highway intersects Kealanani Avenue. At this signalized intersection, the westbound approach on Farrington Highway includes an exclusive left-turn lane, two through lanes, and an exclusive right-turn lane, while the eastbound approach includes two exclusive left-turn lanes, a through lane, and a shared through and right-turn lane. Kealanani Avenue is a predominantly four lane, two-way, divided State of Hawaii roadway (under the Hawaii Housing Finance and Development Corporation) between Farrington Highway and Kamaaha Avenue. At the intersection with Farrington Highway, the northbound approach on Kealanani Avenue includes a through lane and exclusive turning lanes. The southbound approach is comprised of another driveway that serves the adjacent Walmart and the commercial uses within the Kealanani Plaza. That approach also includes a through lane and exclusive turning lanes.

B. Traffic Volumes and Conditions

1. General

a. Field Investigations

Field investigations were conducted on November 1 and 3, 2022, consisting of manual turning movement count surveys during the morning peak hours between 6:00 AM and 9:00 AM, and the

afternoon peak hours between 3:00 PM and 6:00 PM at the following intersections:

- Farrington Highway, Fort Barrette Road, and Makakilo Drive
- Farrington Highway and Walmart Driveway
- Farrington Highway and Kealanani Avenue

Appendix A includes the traffic count data.

b. Capacity Analysis Methodology

The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2016, 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 B.

2. Existing Peak Hour Traffic

a. General

Figures 3 and 4 show the existing lane configurations and peak hour traffic volumes. The AM peak hour of traffic generally occurs between 7:30 AM and 8:30 AM while the PM peak hour of traffic generally occurs between 3:00 PM and 4:00 PM. The analysis is based on these peak hour time periods for each intersection to identify

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EXISTING LANE CONFIGURATIONS

FIGURE 3

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EXISTING YEAR 2022 PEAK HOURS OF TRAFFIC

FIGURE 4

the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

b. Farrington Highway, Fort Barrette Road, and Makakilo Drive

At the intersection with Fort Barrette Road and Makakilo Drive, Farrington Highway carries 722 vehicles eastbound and 616 vehicles westbound during the AM peak period. During the PM peak period, the traffic volumes are higher with 1,255 vehicles traveling eastbound and 828 vehicles traveling westbound. The eastbound approach operates at LOS "C" during both peak periods, while the westbound approach operates at LOS "C" and LOS "D" during the AM and PM peak periods, respectively. It should be noted that a comparison of historical traffic data collected at this intersection indicates that current traffic volumes are slightly less than previous years. This may be attributed to on-going roadway improvements within Kapolei providing alternative routes and thereby resulting in slightly better levels of service. Traffic queues periodically formed on both approaches of the intersection. Average queue lengths of 16-18 vehicles were observed on the eastbound approach while average queue lengths of 15-17 vehicles were observed on the westbound approach during both peak periods. It should be noted that queues on the westbound approach occasionally extended to the upstream intersection with the Walmart driveway during both peak periods.

At the intersection with Farrington Highway, Fort Barrette Road carries 708 vehicles northbound while Makakilo Drive carries 1,217 vehicles southbound. During the PM peak period, the overall traffic volume is higher with 829 vehicles traveling northbound on Fort Barrette Road and 1,100 vehicles traveling southbound on Makakilo Drive. The northbound approach on Fort Barrette Road operates at LOS "C" during both peak periods while the southbound approach on Makakilo Drive also operates at LOS "C" during both

peak periods. Traffic queues periodically formed on both approaches of the intersection with the most significant queueing observed during the PM peak period. Average queue lengths in excess of 20 vehicles were observed on the northbound approach while average queue lengths of 18-20 vehicles were observed on the southbound approach. These queues generally cleared the intersection after each traffic signal cycle due to the long traffic signal cycle length at the intersection.

Crosswalks are provided across all approaches of the intersection. During the AM peak period, 5 and 3 pedestrians were observed crossing Farrington Highway on the east and west sides of the intersection, respectively while 19 pedestrians were observed crossing Makakilo Drive on the north side of the intersection and 1 pedestrian crossed Fort Barrette Road on the south side of the intersection. During the PM peak period, 1 and 6 pedestrians were observed crossing Farrington Highway on the east and west sides of the intersection, respectively while 25 pedestrians were observed crossing Makakilo Drive on the north side of the intersection and 1 pedestrian crossed Fort Barrette Road on the south side of the intersection.

c. Farrington Highway and Walmart Driveway

At the intersection with the Walmart driveway midway between Fort Barrette Road and Kealanani Avenue, Farrington Highway carries 511 vehicles eastbound and 543 vehicles westbound during the AM peak period. During the PM peak period, traffic volumes are higher with 765 vehicles traveling eastbound and 654 vehicles traveling westbound. As previously discussed, a raised median island is provided along Farrington Highway at this intersection to reinforce turning restrictions at the Walmart Driveway. During field investigations, a number of eastbound vehicles along Farrington Highway were observed executing U-turn maneuvers east of the median island to access the right-turn lane into the Walmart

driveway at this intersection. In addition, as previously discussed, westbound queues from the adjacent intersection with Fort Barrette Road and Makakilo Drive were also observed extending to this intersection.

At the intersection with Farrington Highway, the Walmart Driveway carries 67 vehicles southbound during the AM peak period and 193 vehicles during the PM peak period. The southbound approach operates at LOS "A" and LOS "B" during the AM and PM peak periods, respectively. Traffic queues occasionally formed on the southbound approach with average queues lengths of 2-3 vehicles observed on this approach. As previously discussed, westbound queues along Farrington Highway at the adjacent intersection with Fort Barrette Road/Makakilo Drive occasionally extended to the Walmart driveway impeding exiting vehicles from the driveway.

d. Farrington Highway and Kealanani Avenue

At the intersection with Kealanani Avenue, Farrington Highway carries 511 vehicles eastbound and 399 vehicles westbound during the AM peak period. During the PM peak period, traffic volumes are higher with 765 vehicles traveling eastbound and 489 vehicles traveling westbound. The eastbound approach operates at LOS "B" and LOS "C" during the AM and PM peak periods, respectively, while westbound approaches operate at LOS "C" during both peak periods. Traffic queues occasionally formed on the Farrington Highway approaches of the intersection with the most significant queues observed during the PM peak period. Average queue lengths of 4-6 vehicles were observed on both approaches during that peak period. These queues generally cleared the intersection after each traffic signal cycle.

At the intersection with Farrington Highway, Kealanani Avenue carries 415 vehicles northbound during the AM peak period. During the PM peak period, traffic volumes are slightly higher with

471 northbound vehicles. The northbound approach operates at LOS "C" during both peak periods. Traffic queues periodically formed on the northbound approach with the most significant queuing observed on the left-turn lane. Average queue lengths of 6-8 vehicles were observed along this lane during both peak periods with maximum queues extending beyond the provided storage bay. Although most of these queues generally cleared the intersection after each traffic signal cycle, vehicles on the left-turn lane occasionally had to wait for more than one traffic signal cycle.

The southbound approach of the intersection is comprised of a driveway that serves the adjacent Walmart and other commercial uses. The southbound approach carries 64 vehicles during the AM peak period and 256 vehicles during the PM peak period. The southbound approach operates at LOS "C" during both peak periods. Traffic queues occasionally formed on this approach with average queues of 2-4 vehicles observed on this approach. These queues generally cleared the intersection after each traffic signal cycle.

Crosswalks are provided across all approaches of the intersection. During the AM peak period, 3 and 7 pedestrians were observed crossing Farrington Highway on the east and west sides of the intersection, respectively, while 1 pedestrian was observed crossing the Walmart Driveway. During the PM peak period, 11 and 13 pedestrians were observed crossing Farrington Highway on the east and west sides of the intersection, respectively, while 3 pedestrians were observed crossing the Walmart Driveway. There were no pedestrians observed crossing Kealanani Avenue during both peak periods.

IV. PROJECTED TRAFFIC CONDITIONS

A. Site-Generated Traffic

1. Trip Generation Methodology

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 10th Edition," 2017. The ITE trip generation rates are developed empirically by correlating vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per dwelling unit or 1,000 sf of development. It should be noted that a more recent edition of the Trip Generation was recently published at the end of 2021. Although average trip generation rates for some residential land uses have remained generally similar, the retail land uses have been updated to provide additional land use types. However, trip generation data for some of these uses are still limited. As such, for the purpose of this assessment, the 2017 edition was used. Table 1 below summarizes the trip generation characteristics related to the AM and PM peak hours of traffic.

Table 1: Peak Hour Trip Generation

MULTIFAMILY HOUSING (LOW-RISE) INDEPENDENT VARIABLE: dwelling units = 80		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	9
	EXIT	28
	TOTAL	37
PM PEAK	ENTER	28
	EXIT	17
	TOTAL	45
MULTIFAMILY HOUSING (MID-RISE) INDEPENDENT VARIABLE: dwelling units = 720		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	67
	EXIT	192
	TOTAL	259
PM PEAK	ENTER	193
	EXIT	124
	TOTAL	317

Table 1: Peak Hour Trip Generation (Cont'd)

SHOPPING CENTER INDEPENDENT VARIABLE: 1,000 sf of development = 50		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	29
	EXIT	18
	TOTAL	47
PM PEAK	ENTER	91
	EXIT	100
	TOTAL	191
TOTALS		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	105
	EXIT	238
	TOTAL	343
PM PEAK	ENTER	312
	EXIT	241
	TOTAL	553

The trip generation methodology also includes provisions for multimodal trips and internal capture of trips. Multimodal trips are trips made using non-motorized modes of travel such as those made via transit, as well as walking and biking. The State of Hawaii Department of Business, Economic Development and Tourism, Research and Economic Analysis Division previously published the study "Commuting Patterns in Hawaii" (dated April 2015) which indicated that in the vicinity of the proposed project, approximately 9% of commuters utilize alternative modes of transportation to commute with 7% of trips made via transit and 2% via non-motorized modes. The internal capture of trips account for trips that visit more than destination within the same area without adding additional vehicular trips to the external roadways. Given the compatibility of the proposed residential and commercial uses, the trips associated with the proposed Kapolei Northwest Corner development were adjusted to account for the influence of internal capture of trips, as well as the influence of multimodal trips. Table 2 summarizes the adjusted trip generation characteristics related to the proposed project applied to the AM and PM peak hours of traffic.

Table 2: Adjusted Proposed Peak Hour Trip Generation

TOTALS		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	92
	EXIT	213
	TOTAL	305
PM PEAK	ENTER	254
	EXIT	187
	TOTAL	441

2. Trip Distribution

Figure 5 shows the distribution of site-generated traffic during the AM and PM peak periods. Access to the project site is expected to be provided via driveways off Fort Barrette Road, Farrington Highway, and Kealanani Avenue. As previously discussed, the access off Fort Barrette Road is assumed to be restricted to right-turn in movements only based on previous consultation with HDOT. In addition, given the location of the proposed project, nearby uses, and existing operations at the adjacent intersections, the remaining driveways proposed off Farrington Highway and Kealanani Avenue need to be assessed to determine if turning movements restrictions would also be appropriate at those access points.

The proposed driveway off Farrington Highway is expected to align with the existing driveway for the adjacent Walmart. Due to the number of lanes along the highway, length of the turning bays from the adjacent intersections, potential conflicting traffic accessing Walmart, and the existing queuing along the highway, full access at this location would not be advisable without the provision of a traffic signal system to facilitate entering and exiting movements. To determine if a traffic signal system would be warranted at this location to facilitate site-generated traffic, a cursory analysis based on Warrant 3 of the "Manual on Uniform Traffic Control Devices for Streets and Highways," 2009 Edition (MUTCD) was conducted which is discussed in conjunction with projected conditions later in this report. However, the conclusion of this cursory assessment was that a traffic signal system was not warranted at this location based on the anticipated traffic

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DISTRIBUTION OF SITE-GENERATED VEHICLES WITH PROJECT

FIGURE 5

volumes. In addition, the inclusion of a traffic signal system could further impede traffic flow along the highway and exacerbate existing queuing. Finally, it should be noted that the adjacent signalized intersections are in close proximity to this location (~500'-550') and both include long turning bays that would need to be shortened or adjusted to accommodate full turning movements at this location. As such, turning movements at the proposed driveway off Farrington Highway are assumed to be restricted to right-turn in, right-turn out movements only.

Similar turning restrictions are also anticipated for the proposed driveway off Kealanani Avenue due to the close proximity to the intersection with the highway (approximately 300') and length of the northbound turning bay from that intersection. As previously mentioned, existing northbound queues along Kealanani Avenue extend beyond the turning bay length during the peak periods and the proposed driveway location intersects Kealanani Avenue before the turning bay ends. As such, it is also assumed that the proposed driveway off Kealanani Avenue will be restricted to right-turn in, right-turn out movements only.

The directional distribution of site-generated trips was based on the relative distribution of traffic along the major roadways in the vicinity of the project. As such, 35% of trips were assumed to be traveling to/from the north, with 15% of trips traveling to/from the south during both peak periods. In addition, 35% of trips were assumed to be traveling to/from the west with 15% of trips assumed to be traveling to/from the east during both peak periods. The site-generated trips were distributed at the project driveways and study intersections based upon their assumed origin/destination, allowed turning movements, and relative convenience of the available routes.

B. Through Traffic Forecasting Methodology

The travel forecast is based upon the available historical traffic count data obtained from HDOT, Highways Division at survey stations in the vicinity of the project site which indicates fluctuating traffic volumes in the vicinity. This may be attributed to continuing development within Kapolei, as well as on-going

improvements to the roadway network system providing alternative routes. Although the area within the immediate vicinity of the proposed Kapolei Northwest Corner is mostly built out, development within the Kapolei region is expected to continue in other adjacent areas including Hoopili to the east, the Mehana Subdivision to the south, and the Kalaeloa Community Development District further west. As such, a 1.0% growth rate per year was conservatively assumed along Farrington Highway, Fort Barrette Road, and Makakilo Drive. Using Year 2022 as the Base Year, a growth rate factor of 1.05 was applied to the existing through traffic demands along the aforementioned roadways to achieve the projected Year 2028 traffic volumes.

C. Other Considerations

1. Hawaii State Veterans Home (HSVH)

There is another development currently under construction within the southeast portion of the Northwest Corner Kapolei parcel at the Villages of Kapolei. That project, referred to as the "Hawaii State Veterans Home," entails the development of an approximately 135,000 sf skilled nursing facility. Based on the Transportation Assessment Report (dated March 2019) prepared for that project, the HSVH is expected to generate a total of 74 trips during the AM peak period and 80 trips during the PM peak period with access provided via a right-turn in right-turn out driveway off Kealanani Avenue. As previously mentioned, the HSVH is currently under construction and is expected to be completed by Year 2023. As such, this development was incorporated into without project conditions.

2. Farrington Highway Roadway Widening

In the vicinity of the project, jurisdiction of Farrington Highway is currently divided between the HDOT and the City and County of Honolulu. At the intersection with Fort Barrett Road, Farrington Highway is under HDOT's jurisdiction. This transitions to the City and County of Honolulu approximately 500 feet east of the intersection. East of the project site, HDOT plans to widen the segment of Farrington Highway between the Kapolei Golf Course Road and Fort Weaver Road to install a new roadbed, curbs, gutters, sidewalks, and a bike lane along both directions of the highway

(Project Number 7101A-01-20). After completion of the project, HDOT is expected to assume jurisdiction and ownership of the entire segment of Farrington Highway between Makakilo Drive/Fort Barrette Road and Fort Weaver Road. Construction of this project is currently expected to commence in May 2024, contingent upon material procurement, with the entire project anticipated to span approximately 2 years with completion expected by Year 2026. As such, these improvements were assumed to be completed under without project conditions.

3. Traffic Signal Warrant

As previously discussed, a cursory analysis based on Warrant 3 of the "Manual on Uniform Traffic Control Devices for Streets and Highways", 2009 Edition, was conducted to assess if a traffic signal would be warranted at the proposed project driveway off Farrington Highway. Warrant 3, the "Peak Hour Warrant," consists of several conditions that may justify the installation of a traffic signal at an intersection where vehicles experience high traffic delay due to large volumes of intersection traffic during the peak hour periods. One of the conditions is based upon the relationship between the traffic volumes along the major and minor streets. If the traffic volumes along the minor street exceed the threshold shown in Figure 4C-3 of the MUTCD, a traffic signal system may be warranted. Based on projected traffic conditions, traffic volumes at the intersection with the proposed project driveway off Farrington Highway do not satisfy Warrant 3 during both peak periods.

D. Total Traffic Volumes Without Project

The projected Year 2028 AM and PM peak period traffic volumes and operating conditions without the Kapolei Northwest Corner development are shown in Figure 6 and summarized in Table 3. The analysis incorporates other developments in the vicinity including the completion of the HSVH skilled nursing facility, as well as ambient growth of traffic. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.

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YEAR 2028 PEAK HOURS OF TRAFFIC WITHOUT PROJECT

FIGURE 6

Table 3: Existing and Projected Year 2028 (Without Project) LOS Traffic Operating Conditions

Intersection	Approach/ Critical Movement	AM		PM	
		Exist	Year 2028 w/out Proj	Exist	Year 2028 w/out Proj
Farrington Hwy/ Fort Barrette Rd/ Makakilo Dr	Eastbound	C	C	C	C
	Westbound	C	C	D	D
	Northbound	C	C	C	C
	Southbound	C	C	C	C
Farrington Hwy/ Walmart Drwy	Southbound	A	B	B	B
Farrington Hwy/ Kealanani Ave/	Eastbound	B	C	C	C
	Westbound	C	C	C	C
	Northbound	C	C	C	C
	Southbound	C	C	C	C

Under Year 2028 without project conditions, traffic operations are generally expected to remain similar to existing conditions. Along Farrington Highway, traffic operations at the intersection with Fort Barrette Road and Makakilo Drive are expected to continue operating at LOS "C" during the AM peak period and LOS "D" or better during the PM peak period. At the intersection with Kealanani Avenue, the approaches at that intersection are also expected to continue operating at LOS "C" during both peak periods. The remaining study intersection along Farrington Highway at the Walmart driveway is also expected to continue operating similar to existing conditions. As previously discussed, existing westbound queues along Farrington Highway at the Fort Barrette/Makakilo Drive intersection are expected to continue influencing traffic operations at this location.

E. Total Traffic Volumes With Project

Figure 7 shows the Year 2028 cumulative AM and PM peak hour traffic conditions resulting from the Kapolei Northwest Corner development. The cumulative volumes consist of site-generated traffic superimposed over Year 2028 projected traffic demands. Access to the project site will be provided via proposed driveways off Fort Barrette Road, Farrington Highway, and Kealanani Avenue. The

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YEAR 2028 PEAK HOURS OF TRAFFIC WITH PROJECT

FIGURE 7

access off Fort Barrett Road is assumed to be restricted to right-turn in movements only based on previous consultations with HDOT. In addition, the proposed access off Farrington Highway and Kealanani Avenue are also expected to be restricted to right-turn in right-turn out movements only.

V. TRAFFIC IMPACT ANALYSIS

The Year 2028 cumulative AM and PM peak hour traffic conditions with the development of the Kapolei Northwest Corner are summarized in Table 4. The existing and projected Year 2028 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

Table 4: Existing and Projected Year 2028 (Without and With Project) LOS Traffic Operating Conditions

Intersection	Approach/ Critical Movement	AM			PM		
		Exist	Year 2028		Exist	Year 2028	
			w/out Proj	w/ Proj		w/out Proj	w/ Proj
Farrington Hwy/ Fort Barrette Rd/ Makakilo Dr	Eastbound	C	C	C	C	C	C
	Westbound	C	C	C	D	D	D
	Northbound	C	C	C	C	C	D
	Southbound	C	C	C	C	C	C
Farrington Hwy/ Walmart Drwy/ Project Drwy	Northbound	-	-	B	-	-	B
	Southbound	A	B	B	B	B	B
Farrington Hwy/ Kealanani Ave	Eastbound	B	C	C	C	C	C
	Westbound	C	C	C	C	C	C
	Northbound	C	C	C	C	C	C
	Southbound	C	C	C	C	C	C

Under Year 2028 with project conditions, traffic operations in the vicinity are generally expected to remain similar to without project conditions despite the addition of site-generated traffic to the adjacent roadways. The proposed project is located in close proximity to regional roadways with multiple travel lanes and capacity to accommodate the addition of site-generated trips. In addition, due to the turning restrictions at the project driveways, site-generated are funneled away from the major intersections like the intersection of Farrington Highway with Makakilo Drive/ Fort Barrette Road where there is already existing high demands. Along Farrington Highway, the approaches at the intersection with

Makakilo Drive and Fort Barrette Road are expected to continue operating at LOS "C" during the AM peak period and LOS "D" or better during the PM peak period. At Kealanani Avenue, traffic operations are expected to remain operating at LOS "C" during both peak periods, whereas those at the Walmart and Project driveway are expected to operate at LOS "B" during both peak periods.

VI. MULTIMODAL FACILITIES

A. Pedestrian Facilities

1. Existing Conditions

Pedestrian facilities in the vicinity of the project are generally comprised of sidewalks, marked crosswalks, and curb ramps facilitating access to nearby transit stops and other nearby destinations. Along Kealanani Avenue, the overall pedestrian environment is enhanced by the presence of trees that provide intermittent shade along both sides of the roadway, as well as along the median of this divided roadway. In addition, a landscaping strip along the sidewalks provide buffer between the vehicular travel way and the pedestrian walkway. Along Farrington Highway, improved sidewalks are provided along both directions of the roadway with some landscaping treatments and trees also provided, but the overall pedestrian environment is influenced by the multilane configuration of this roadway. Along Fort Barrette Road on the east side of the roadway, a continuous pathway that runs parallel to the roadway between Farrington Highway and Kamaaha Avenue was recently constructed, but the lack of landscaping and other pedestrian amenities affect the overall attractiveness of this provided pedestrian facility.

Pedestrian crossings in the vicinity of the project are facilitated via designated pedestrian phases at the signalized intersections along Farrington Highway at Fort Barrette Road and Kealanani Avenue. It should be noted that the distance between these crossings is greater than 1,000 feet.

2. With Project Conditions

The proposed project is expected to maintain the existing pedestrian facilities along the adjacent roadways. A network of on-site pedestrian facilities are planned in conjunction with the proposed project with trees and

other landscaping treatments to be provided to increase the overall attractiveness of the provided facilities. However, consideration should also be given to providing enhanced pedestrian facilities on-site including raised crossings and bulb outs to further enhance the overall pedestrian environment and increase pedestrian safety as they traverse the site. In addition, since the proposed commercial uses are generally located on the north side of the project site and the residential uses to the south, adequate connections should be provided to facilitate access between these compatible uses.

B. Bicycle Facilities

1. Methodology

Bicycle Level of Traffic Stress (LTS) is a metric developed by the Mineta Transportation Institute used to classify a roadway segment or intersection. The LTS ranking system is based on the amount of traffic stress imposed on cyclists based on variables such as street width, prevailing vehicle speed, and average daily traffic volumes. The Level of Traffic Stress ranges from 1 to 4 and can be assessed for a given segment or intersection via six tables provided by the Mineta Transportation Institute. The general descriptions of the LTS levels are as follows:

- LTS 1: Characterized by strong separation from all except low speed, low volume traffic. Simple crossings. Suitable for children.
- LTS 2: Except in low speed/low volume traffic situations, cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings. There is a physical separation from higher speed and multilane traffic. Crossings are easy for an adult to navigate. This refers to a level of traffic stress that most adults can tolerate, particularly those sometimes classified as interested but concerned.
- LTS 3: Involves interaction with moderate speed or multilane traffic, or close proximity to higher speed traffic. Refers to a level of traffic stress acceptable to those classified as enthused and confident.
- LTS 4: Involves interaction with higher speed traffic or close proximity to high-speed traffic. Refers to a level of stress acceptable only to those classified as strong and fearless.

It should be noted that current LTS methodology assumes no traffic stress is imposed on cyclists at signalized intersections. Guidance provided by

the Mineta Transportation Institute includes categorizing signalized intersections as a LTS 2.

2. Existing Conditions and Bicycle Level of Traffic Stress

Currently, there are existing bicycle facilities along Farrington Highway and Kealanani Avenue (see Figure 8). Although bike facilities are provided in the vicinity of the project site, a minimal number of bicyclists were observed during field investigations. As such, the roadways in the vicinity of the proposed project were assessed to determine the level of stress (LTS) imposed upon bicyclists based upon the prevailing speed and geometric characteristics of the roadway. Due to the provision of bike lanes along Kealanani Avenue and Farrington Highway, these roadways are rated at LTS 2. To the west of the project site, Fort Barrette Road/Makakilo Drive is rated at LTS 4 since bicyclists along this multi-lane roadway must share the travel way with vehicular traffic. The conditions along Fort Barrette Road/Makakilo Drive are generally better suited for more experienced bicyclists. Figure 9 depicts the existing LTS along the roadways in the vicinity of the project.

3. With Project Conditions

The proposed project is expected to incorporate bike facilities within the project site to encourage the use of this alternative mode of transportation. In addition, the State of Hawaii and City and County of Honolulu also has future plans to provide additional bicycle facilities in the project vicinity (see Figure 8). According to the 2019 Update of the "Oahu Bike Plan" published by the City and County of Honolulu Department of Transportation Services (DTS), these improvements include the following:

- Bike lane along Fort Barrette Road from Farrington Highway to Leeward Bike Path
- Shared-use path along Fort Barrette Road from Farrington Highway to Renton Road (recently completed)
- Shared-use path along Makakilo Drive from Farrington Highway to Palailai Street
- Extension of the existing bike lanes along Farrington Highway from the Kapolei Golf Course Road to Fort Weaver Road

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BICYCLE FACILITIES

FIGURE 8

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EXISTING BICYCLE LEVEL OF TRAFFIC STRESS

FIGURE 9

These improvements are expected to increase the availability of dedicated bicycle facilities in the vicinity of the project. However, the timelines for these improvements are not known at this time, with the exception of the extension of the existing bike lanes along Farrington Highway. As previously mentioned, that project is planned to be implemented in conjunction with the widening of that roadway, which is anticipated to start construction by Year 2024.

C. Transit Facilities

1. Methodology

Transit Capacity and Quality of Service is a metric used to measure transit availability, comfort, and convenience from both the passenger and transit service provider's points of view. The framework for this metric is outlined in the Transit Cooperative Research Program (TCRP) Report 165: Transit Capacity and Quality of Service Manual (TCQSM), 3rd Edition published in 2013 which provides research-based guidance on public transit capacity and quality of service. The quality of service concepts and methods contained in the TCQSM address real-world transit operations, comprehensive planning, and design needs. The research for and development of the TCQSM has also directly supported the development of the Multimodal Level of Service (LOS) analysis methodologies introduced in the Highway Capacity Manual (HCM) 2010 and subsequently refined in HCM 6. Multimodal LOS analyzes a roadway corridor comprised of street segments which are defined as a length of street between intersections where traffic may have to stop due to traffic control. Transit LOS can be directly compared to other transportation modes with LOS "A" representing the best quality of service and the letter "F" used to represent the worst quality of service. The assessment evaluates the quality of transit operations incorporating factors that bear all aspect of a transit trip including the pedestrian environment along the street, service frequency and reliability, and the availability of transit amenities at those stop locations.

2. Existing Conditions and Transit LOS

Transit service in the project vicinity is provided by "TheBus" which is operated by the Oahu Transit Services (OTS) for the City and County of Honolulu Department of Transportation Services. There are approximately 7 transit stops that are served by 8 unique bus routes within the project area (see Figure 10). Based on the Transit Capacity and Quality of Service Manual (TCQSM), a quarter mile represents the maximum distance that people will walk to a transit stop which is equivalent to approximately 5 minutes of walking time. To verify the existing quality of service for the transit facilities in the project vicinity, an assessment of the facilities located within a quarter-mile radius of the project site was conducted based on the methodology outlined by the TCQSM. The assessment indicates that transit service in the vicinity of the project operate at LOS "C" or better due to the availability of a number of routes and frequency of service. Majority of the transit stops in the vicinity of the project also include amenities such as benches and shelters which are accessed via existing pedestrian facilities. Transit service in the vicinity of the project under with project conditions are generally expected to remain similar to existing conditions. Transit LOS calculations are included in Appendix F.

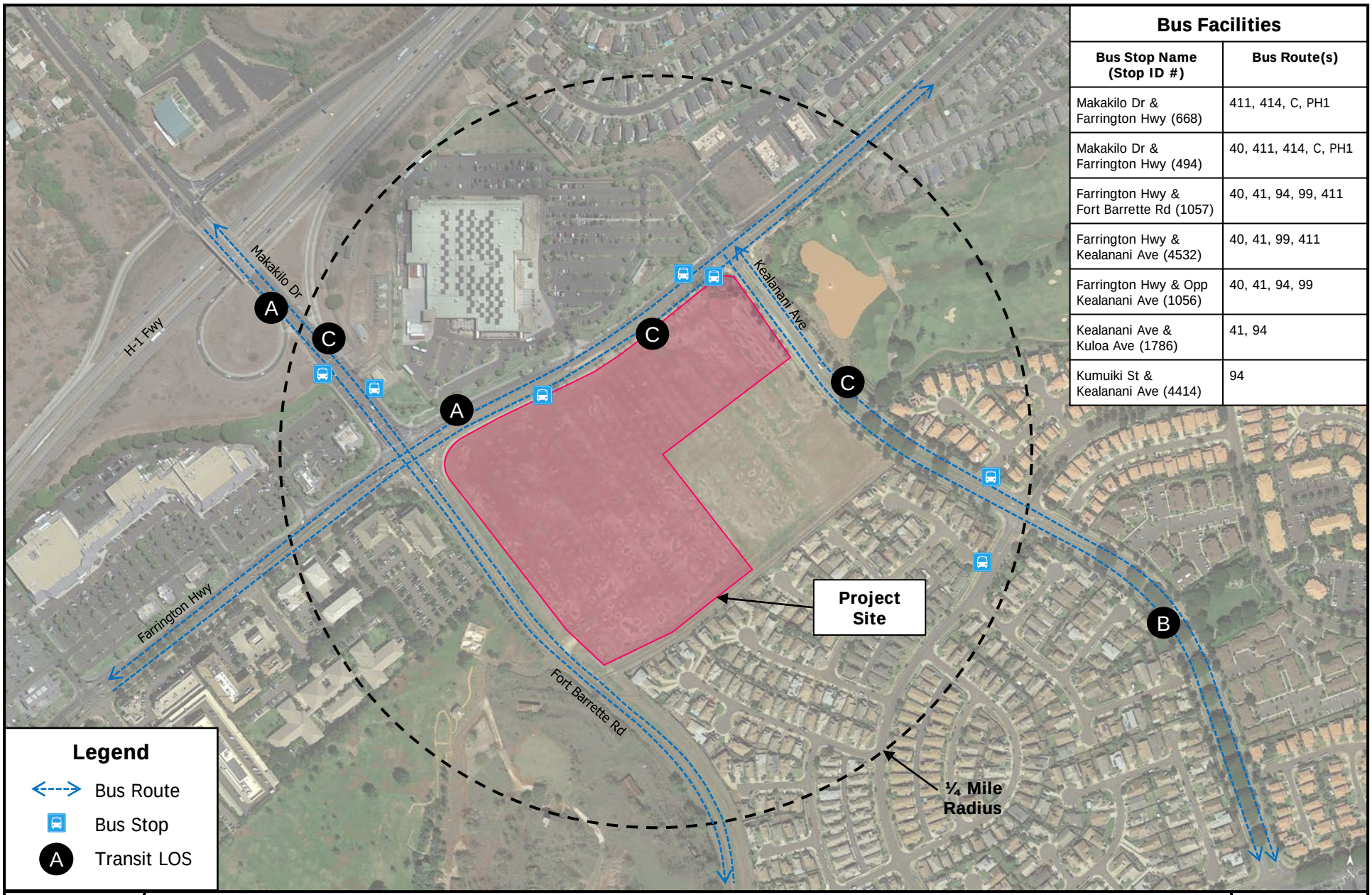
VII. RECOMMENDATIONS

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

1. Provide sufficient sight distance for motorists to safely enter and exit the project driveways, as well as at the internal intersections within the project site, to ensure pedestrians, bicyclists, and motorists are aware of the presence of each other at these conflict points.

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.



Bus Facilities

Bus Stop Name (Stop ID #)	Bus Route(s)
Makakilo Dr & Farrington Hwy (668)	411, 414, C, PH1
Makakilo Dr & Farrington Hwy (494)	40, 411, 414, C, PH1
Farrington Hwy & Fort Barrette Rd (1057)	40, 41, 94, 99, 411
Farrington Hwy & Kealanani Ave (4532)	40, 41, 99, 411
Farrington Hwy & Opp Kealanani Ave (1056)	40, 41, 94, 99
Kealanani Ave & Kuloa Ave (1786)	41, 94
Kumuiki St & Kealanani Ave (4414)	94

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KAPOLEI NORTHWEST CORNER

TRANSIT FACILITIES AND TRANSIT LOS

FIGURE 10

4. Provide sufficient turning radii at all project driveways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

5. Restrict turning movements at the proposed project driveway off Farrington Highway to right-turn in right-turn out movements only and provide adequate channelization to reinforce the turning restrictions. The specific configuration should be determined during the design phase.

6. Restrict turning movements at the proposed project driveway off Kealanani Avenue to right-turn in right-turn out movements only. Provide adequate channelization to reinforce the turning restrictions. The specific configuration should be determined during the design phase.

7. Restrict turning movements at the proposed driveway off Fort Barrette Road to right-turn in movements only based on previous consultation with the State of Hawaii Department of Transportation. Provide adequate channelization to reinforce the turning restrictions. The specific configuration should be determined during the design phase.

8. If access at the entrance to the parking areas are 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 roadway.

9. Consider working with the State of Hawaii Department of Transportation in conjunction with their roadway widening project along Farrington Highway to determine the feasibility of extending the raised median island along Farrington Highway to further reinforce the turning restrictions on both side approaches of the intersection and minimize conflicts with site-generated traffic. As previously discussed, a number of U-turn maneuvers were observed along the highway trying to access the Walmart driveway during field observations. Similar driver behaviors may also occur with the addition of the proposed project driveway.

10. Provide adequate pedestrian connections between the on-site uses and off-site facilities. All pedestrian connections should be made accessible in conformance with the American with Disabilities Act (ADA).

11. Improved pedestrian facilities such as sidewalks should be considered (wherever practical and feasible) to increase connectivity and facilitate circulation within the project site. In addition, consideration should be given to the inclusion of improved pedestrian facilities such as marked or protected crosswalks at intersections, raised intersections, raised crosswalks, and bulb-outs to reduce pedestrian crossing distances and increase pedestrian safety within the project boundaries. Pedestrian facilities should be made accessible in conformance with the Americans with Disabilities Act (ADA).

12. Incorporate bicycle facilities within the project boundaries including designated and secured bicycle parking to encourage the use of alternate modes of transportation. In addition, provide adequate connections to and from the bike parking areas to ensure convenient and safe pedestrian and bicyclist access, as well as connections to the bicycle facilities along the roadways adjacent to the project site.

13. Coordinate with the City and County of Honolulu Department of Transportation Services and Oahu Transit Services to ensure the smooth continuation of public transportation services within the project vicinity including the nearest bus stop located along Farrington Highway near the intersection with Fort Barrette Road. Consideration should be given to the provision of enhanced amenities at that bus stop location such as a bus shelter and other sidewalk furniture to encourage the use of this alternative mode of transportation.

14. Prepare a Construction Traffic Management Plan (CTMP) that includes the anticipated construction schedule and phasing, as well as traffic circulation, traffic control and parking during the construction period.

15. Consider preparing a Transportation Management Plan (TMP) which includes traffic circulation, parking, loading, and traffic demand management (TDM) strategies to further minimize the impact of the proposed project on the surrounding roadway network.

VIII. CONCLUSION

The proposed project entails the development of a portion of the parcel referred to as the Northwest Corner of the Kapolei Village to include a mix of residential and commercial uses. Access to the proposed project is expected to be provided via driveways off Farrington Highway, Kealanani Avenue, and Fort Barrette Road. Given the location of the proposed project, nearby uses, and existing operations at the adjacent intersections, it is recommended that the proposed driveways proposed off Farrington Highway and Kealanani Avenue be restricted to right-turn in right-turn out movements only. With the implementation of the aforementioned recommendations, traffic operations in the vicinity of the project are generally expected to remain similar to without project conditions. Although traffic operations are generally expected to remain similar to without project conditions, multimodal facilities should be incorporated in conjunction with the proposed project to encourage the use of alternative modes. In addition, the preparation of a Transportation Management Plan that includes traffic circulation, parking, loading, and traffic demand management strategies should also be considered to further minimize the impact of the proposed project on the surrounding roadway network.

APPENDIX A

EXISTING TRAFFIC COUNT DATA

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu HI, 96826

Counted By: GC, CO
Counters:TU-2606, TU-2605
Weather: Clear/Sunny

File Name : FarMak_AM
Site Code : 00000001
Start Date : 11/3/2022
Page No : 1

Groups Printed- Unshifted

	Makakilo Drive Southbound					Farrington Highway Westbound					Fort Barrette Road Northbound					Farrington 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	35	77	55	1	168	4	37	56	0	97	15	100	18	4	137	35	31	29	0	95	497
06:15 AM	57	92	65	5	219	3	27	36	5	71	21	80	16	2	119	38	43	14	0	95	504
06:30 AM	41	123	85	2	251	6	33	63	1	103	15	87	5	0	107	50	40	19	2	111	572
06:45 AM	40	124	74	9	247	8	44	64	3	119	26	76	9	1	112	50	31	14	1	96	574
Total	173	416	279	17	885	21	141	219	9	390	77	343	48	7	475	173	145	76	3	397	2147
07:00 AM	56	120	87	4	267	17	53	58	1	129	17	96	9	0	122	58	45	12	1	116	634
07:15 AM	44	139	103	3	289	29	63	63	0	155	24	99	11	1	135	78	39	12	0	129	708
07:30 AM	63	136	123	2	324	19	72	84	1	176	47	96	17	0	160	59	39	18	0	116	776
07:45 AM	61	154	139	4	358	9	112	56	3	180	73	136	14	1	224	89	69	42	0	200	962
Total	224	549	452	13	1238	74	300	261	5	640	161	427	51	2	641	284	192	84	1	561	3080
08:00 AM	43	132	99	7	281	12	64	73	1	150	37	120	12	0	169	91	69	30	2	192	792
08:15 AM	33	125	109	6	273	12	61	42	0	115	36	109	8	0	153	115	58	31	1	205	746
08:30 AM	50	150	112	5	317	16	55	53	1	125	47	100	1	0	148	96	60	26	0	182	772
08:45 AM	36	156	115	6	313	13	56	67	2	138	50	116	13	3	182	88	50	29	3	170	803
Total	162	563	435	24	1184	53	236	235	4	528	170	445	34	3	652	390	237	116	6	749	3113
Grand Total	559	1528	1166	54	3307	148	677	715	18	1558	408	1215	133	12	1768	847	574	276	10	1707	8340
Apprch %	16.9	46.2	35.3	1.6		9.5	43.5	45.9	1.2		23.1	68.7	7.5	0.7		49.6	33.6	16.2	0.6		
Total %	6.7	18.3	14	0.6	39.7	1.8	8.1	8.6	0.2	18.7	4.9	14.6	1.6	0.1	21.2	10.2	6.9	3.3	0.1	20.5	

	Makakilo Drive Southbound				Farrington Highway Westbound				Fort Barrette Road Northbound				Farrington 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 07:30 AM																	
07:30 AM	63	136	123	322	19	72	84	175	47	96	17	160	59	39	18	116	773
07:45 AM	61	154	139	354	9	112	56	177	73	136	14	223	89	69	42	200	954
08:00 AM	43	132	99	274	12	64	73	149	37	120	12	169	91	69	30	190	782
08:15 AM	33	125	109	267	12	61	42	115	36	109	8	153	115	58	31	204	739
Total Volume	200	547	470	1217	52	309	255	616	193	461	51	705	354	235	121	710	3248
% App. Total	16.4	44.9	38.6		8.4	50.2	41.4		27.4	65.4	7.2		49.9	33.1	17		
PHF	.794	.888	.845	.859	.684	.690	.759	.870	.661	.847	.750	.790	.770	.851	.720	.870	.851

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu HI, 96826

Counted By: GC, CO
Counters: TU-2606, TU-2605
Weather: Clear/Sunny

File Name : FarMak_PM
Site Code : 00000001
Start Date : 11/3/2022
Page No : 1

Groups Printed- Class 1

	Makakilo Drive Southbound					Farrington Highway Westbound					Fort Barrette Road Northbound					Farrington 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	53	133	90	9	285	16	95	86	1	198	40	176	13	0	229	141	85	65	0	291	1003
03:15 PM	62	88	113	8	271	16	105	90	0	211	35	140	21	1	197	179	120	48	3	350	1029
03:30 PM	69	109	90	6	274	19	69	116	0	204	34	153	20	0	207	166	111	55	1	333	1018
03:45 PM	77	117	99	2	295	16	98	102	0	216	42	127	14	0	183	143	73	53	2	271	965
Total	261	447	392	25	1125	67	367	394	1	829	151	596	68	1	816	629	389	221	6	1245	4015
04:00 PM	74	115	117	9	315	14	100	106	2	222	36	122	7	0	165	145	108	35	4	292	994
04:15 PM	74	86	80	6	246	18	91	88	0	197	31	112	25	0	168	159	90	43	0	292	903
04:30 PM	55	106	107	8	276	21	75	87	0	183	36	157	11	0	204	179	94	37	2	312	975
04:45 PM	88	115	105	4	312	19	97	99	0	215	30	148	16	0	194	161	107	27	2	297	1018
Total	291	422	409	27	1149	72	363	380	2	817	133	539	59	0	731	644	399	142	8	1193	3890
05:00 PM	81	97	115	4	297	17	80	81	0	178	46	136	22	0	204	161	98	39	2	300	979
05:15 PM	66	90	80	2	238	23	101	83	0	207	26	119	12	0	157	140	73	36	1	250	852
05:30 PM	73	89	69	4	235	30	85	78	2	195	43	138	12	5	198	109	49	38	3	199	827
05:45 PM	43	90	79	4	216	17	81	67	0	165	32	145	25	0	202	138	77	34	1	250	833
Total	263	366	343	14	986	87	347	309	2	745	147	538	71	5	761	548	297	147	7	999	3491
Grand Total	815	1235	1144	66	3260	226	1077	1083	5	2391	431	1673	198	6	2308	1821	1085	510	21	3437	11396
Apprch %	25	37.9	35.1	2		9.5	45	45.3	0.2		18.7	72.5	8.6	0.3		53	31.6	14.8	0.6		
Total %	7.2	10.8	10	0.6	28.6	2	9.5	9.5	0	21	3.8	14.7	1.7	0.1	20.3	16	9.5	4.5	0.2	30.2	

	Makakilo Drive Southbound				Farrington Highway Westbound				Fort Barrette Road Northbound				Farrington 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 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	53	133	90	276	16	95	86	197	40	176	13	229	141	85	65	291	993
03:15 PM	62	88	113	263	16	105	90	211	35	140	21	196	179	120	48	347	1017
03:30 PM	69	109	90	268	19	69	116	204	34	153	20	207	166	111	55	332	1011
03:45 PM	77	117	99	293	16	98	102	216	42	127	14	183	143	73	53	269	961
Total Volume	261	447	392	1100	67	367	394	828	151	596	68	815	629	389	221	1239	3982
% App. Total	23.7	40.6	35.6		8.1	44.3	47.6		18.5	73.1	8.3		50.8	31.4	17.8		
PHF	.847	.840	.867	.939	.882	.874	.849	.958	.899	.847	.810	.890	.878	.810	.850	.893	.979

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu HI, 96826

Counted By: MA
Counters: TU-1958, TU-2841
Weather: Clear/Sunny

File Name : FarKea_AM
Site Code : 00000002
Start Date : 11/3/2022
Page No : 1

Groups Printed- Class 1

	Kealanani Avenue Southbound					Farrington Highway Westbound					Kealanani Avenue Northbound					Farrington 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	3	4	0	8	6	27	6	0	39	58	2	55	2	117	12	51	22	1	86	250
06:15 AM	4	7	4	0	15	14	23	5	0	42	37	10	43	1	91	17	47	35	0	99	247
06:30 AM	2	5	6	1	14	7	38	5	0	50	52	3	36	4	95	23	38	47	0	108	267
06:45 AM	2	8	5	0	15	22	42	9	0	73	52	6	41	2	101	18	55	16	0	89	278
Total	9	23	19	1	52	49	130	25	0	204	199	21	175	9	404	70	191	120	1	382	1042
07:00 AM	5	6	7	0	18	18	47	11	0	76	47	8	30	0	85	22	55	32	0	109	288
07:15 AM	3	9	6	1	19	32	58	2	0	92	69	9	31	0	109	23	54	30	2	109	329
07:30 AM	0	5	8	0	13	29	77	6	0	112	66	9	24	0	99	29	61	37	0	127	351
07:45 AM	3	7	5	1	16	26	83	10	3	122	70	15	37	0	122	40	82	46	3	171	431
Total	11	27	26	2	66	105	265	29	3	402	252	41	122	0	415	114	252	145	5	516	1399
08:00 AM	10	22	10	0	42	33	49	8	0	90	58	17	25	1	101	47	61	32	2	142	375
08:15 AM	6	12	8	0	26	19	44	12	0	75	40	15	23	0	78	45	58	27	2	132	311
08:30 AM	11	11	9	2	33	34	30	13	0	77	57	11	24	0	92	48	34	41	1	124	326
08:45 AM	3	8	19	2	32	14	33	11	0	58	56	15	25	0	96	53	43	32	0	128	314
Total	30	53	46	4	133	100	156	44	0	300	211	58	97	1	367	193	196	132	5	526	1326
Grand Total	50	103	91	7	251	254	551	98	3	906	662	120	394	10	1186	377	639	397	11	1424	3767
Apprch %	19.9	41	36.3	2.8		28	60.8	10.8	0.3		55.8	10.1	33.2	0.8		26.5	44.9	27.9	0.8		
Total %	1.3	2.7	2.4	0.2	6.7	6.7	14.6	2.6	0.1	24.1	17.6	3.2	10.5	0.3	31.5	10	17	10.5	0.3	37.8	

	Kealanani Avenue Southbound				Farrington Highway Westbound				Kealanani Avenue Northbound				Farrington 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 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	5	6	7	18	18	47	11	76	47	8	30	85	22	55	32	109	288
07:15 AM	3	9	6	18	32	58	2	92	69	9	31	109	23	54	30	107	326
07:30 AM	0	5	8	13	29	77	6	112	66	9	24	99	29	61	37	127	351
07:45 AM	3	7	5	15	26	83	10	119	70	15	37	122	40	82	46	168	424
Total Volume	11	27	26	64	105	265	29	399	252	41	122	415	114	252	145	511	1389
% App. Total	17.2	42.2	40.6		26.3	66.4	7.3		60.7	9.9	29.4		22.3	49.3	28.4		
PHF	.550	.750	.813	.889	.820	.798	.659	.838	.900	.683	.824	.850	.713	.768	.788	.760	.819

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu HI, 96826

Counted By: MA, LP
Counters: TU-1958, TU-2841
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File Name : FarKea_PM
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Groups Printed- Class 1

	Kealanani Avenue Southbound					Farrington Highway Westbound					Kealanani Avenue Northbound					Farrington 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	14	21	22	2	59	45	62	14	1	122	63	14	26	0	103	58	59	50	2	169	453
03:15 PM	9	14	32	0	55	43	63	24	3	133	62	21	29	0	112	72	75	75	5	227	527
03:30 PM	8	33	43	1	85	28	46	19	5	98	83	39	36	0	158	76	61	49	5	191	532
03:45 PM	10	25	25	0	60	39	80	26	2	147	56	26	16	0	98	48	62	86	1	197	502
Total	41	93	122	3	259	155	251	83	11	500	264	100	107	0	471	254	257	260	13	784	2014
04:00 PM	10	25	38	0	73	43	64	9	11	127	66	30	22	2	120	53	74	57	13	197	517
04:15 PM	16	21	23	0	60	56	75	20	0	151	51	19	26	0	96	65	76	67	2	210	517
04:30 PM	8	23	24	0	55	43	75	20	4	142	61	26	20	0	107	80	42	54	5	181	485
04:45 PM	16	27	29	0	72	33	72	13	4	122	55	27	29	0	111	79	89	80	4	252	557
Total	50	96	114	0	260	175	286	62	19	542	233	102	97	2	434	277	281	258	24	840	2076
05:00 PM	15	29	27	0	71	54	59	14	0	127	47	19	20	1	87	78	59	68	1	206	491
05:15 PM	17	33	37	2	89	49	65	10	2	126	38	26	25	1	90	71	65	59	2	197	502
05:30 PM	11	33	34	0	78	46	63	15	3	127	54	17	12	0	83	64	48	59	4	175	463
05:45 PM	12	31	27	0	70	34	49	21	3	107	40	14	14	0	68	71	49	51	5	176	421
Total	55	126	125	2	308	183	236	60	8	487	179	76	71	2	328	284	221	237	12	754	1877
Grand Total	146	315	361	5	827	513	773	205	38	1529	676	278	275	4	1233	815	759	755	49	2378	5967
Apprch %	17.7	38.1	43.7	0.6		33.6	50.6	13.4	2.5		54.8	22.5	22.3	0.3		34.3	31.9	31.7	2.1		
Total %	2.4	5.3	6	0.1	13.9	8.6	13	3.4	0.6	25.6	11.3	4.7	4.6	0.1	20.7	13.7	12.7	12.7	0.8	39.9	

	Kealanani Avenue Southbound				Farrington Highway Westbound				Kealanani Avenue Northbound				Farrington 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 04:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	10	25	38	73	43	64	9	116	66	30	22	118	53	74	57	184	491
04:15 PM	16	21	23	60	56	75	20	151	51	19	26	96	65	76	67	208	515
04:30 PM	8	23	24	55	43	75	20	138	61	26	20	107	80	42	54	176	476
04:45 PM	16	27	29	72	33	72	13	118	55	27	29	111	79	89	80	248	549
Total Volume	50	96	114	260	175	286	62	523	233	102	97	432	277	281	258	816	2031
% App. Total	19.2	36.9	43.8		33.5	54.7	11.9		53.9	23.6	22.5		33.9	34.4	31.6		
PHF	.781	.889	.750	.890	.781	.953	.775	.866	.883	.850	.836	.915	.866	.789	.806	.823	.925

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu HI, 96826

Counted By: JT
Counters: TU-0649
Weather: Clear/Sunny

File Name : FarDwy_AM
Site Code : 00000001
Start Date : 11/1/2022
Page No : 1

Groups Printed- Unshifted

	Walmart Driveway Southbound			Farrington Highway Westbound			Farrington Highway Eastbound		
Start Time	Right	Peds	App. Total	Thru	Right	App. Total	Thru	App. Total	Int. Total
06:00 AM	6	1	7	88	2	90	80	80	177
06:15 AM	19	1	20	80	1	81	86	86	187
06:30 AM	9	0	9	85	0	85	90	90	184
06:45 AM	7	2	9	100	1	101	78	78	188
Total	41	4	45	353	4	357	334	334	736
07:00 AM	16	1	17	107	1	108	94	94	219
07:15 AM	18	0	18	115	1	116	98	98	232
07:30 AM	8	0	8	125	2	127	120	120	255
07:45 AM	14	0	14	136	1	137	139	139	290
Total	56	1	57	483	5	488	451	451	996
08:00 AM	25	0	25	137	2	139	123	123	287
08:15 AM	20	0	20	111	3	114	122	122	256
08:30 AM	26	1	27	106	3	109	115	115	251
08:45 AM	23	2	25	108	3	111	130	130	266
Total	94	3	97	462	11	473	490	490	1060
Grand Total	191	8	199	1298	20	1318	1275	1275	2792
Apprch %	96	4		98.5	1.5		100		
Total %	6.8	0.3	7.1	46.5	0.7	47.2	45.7	45.7	

	Walmart Driveway Southbound		Farrington Highway Westbound			Farrington Highway Eastbound		
Start Time	Right	App. Total	Thru	Right	App. Total	Thru	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	8	8	125	2	127	120	120	255
07:45 AM	14	14	136	1	137	139	139	290
08:00 AM	25	25	137	2	139	123	123	287
08:15 AM	20	20	111	3	114	122	122	256
Total Volume	67	67	509	8	517	504	504	1088
% App. Total	100		98.5	1.5		100		
PHF	.670	.670	.929	.667	.930	.906	.906	.938

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu HI, 96826

Counted By: JT
Counters: TU-0649
Weather: Clear/Sunny

File Name : FarDwy_PM
Site Code : 00000001
Start Date : 11/1/2022
Page No : 1

Groups Printed- Unshifted

	Walmart Driveway Southbound			Farrington Highway Westbound			Farrington Highway Eastbound		
Start Time	Right	Peds	App. Total	Thru	Right	App. Total	Thru	App. Total	Int. Total
03:00 PM	54	1	55	126	9	135	173	173	363
03:15 PM	36	2	38	130	8	138	203	203	379
03:30 PM	45	2	47	199	5	204	204	204	455
03:45 PM	44	0	44	163	4	167	191	191	402
Total	179	5	184	618	26	644	771	771	1599
04:00 PM	49	2	51	142	3	145	184	184	380
04:15 PM	55	3	58	133	5	138	218	218	414
04:30 PM	51	2	53	148	4	152	202	202	407
04:45 PM	43	0	43	170	6	176	201	201	420
Total	198	7	205	593	18	611	805	805	1621
05:00 PM	50	3	53	133	3	136	186	186	375
05:15 PM	43	0	43	126	2	128	196	196	367
05:30 PM	42	1	43	131	0	131	171	171	345
05:45 PM	33	1	34	118	7	125	163	163	322
Total	168	5	173	508	12	520	716	716	1409
Grand Total	545	17	562	1719	56	1775	2292	2292	4629
Apprch %	97	3		96.8	3.2		100		
Total %	11.8	0.4	12.1	37.1	1.2	38.3	49.5	49.5	

	Walmart Driveway Southbound		Farrington Highway Westbound			Farrington Highway Eastbound		
Start Time	Right	App. Total	Thru	Right	App. Total	Thru	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 03:30 PM								
03:30 PM	45	45	199	5	204	204	204	453
03:45 PM	44	44	163	4	167	191	191	402
04:00 PM	49	49	142	3	145	184	184	378
04:15 PM	55	55	133	5	138	218	218	411
Total Volume	193	193	637	17	654	797	797	1644
% App. Total	100		97.4	2.6		100		
PHF	.877	.877	.800	.850	.801	.914	.914	.907

APPENDIX B

LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR AUTOMOBILES AT SIGNALIZED INTERSECTIONS

LOS A describes operations with a control delay of 10s/veh or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.

LOS B describes operations with control delay between 10 and 20s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

LOS C describes operations with control delay between 20 and 35s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.

LOS D describes operations with control delay between 35 and 55s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

LOS E describes operations with control delay between 55 and 80s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

LOS F describes operations with control delay exceeding 80s/veh or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most Cycles fail to clear the queue.

A lane group can incur a delay less than 80s/veh when the volume-to-capacity ratio exceeds 1.0. This condition typically occurs when the cycle length is short, the signal progression is favorable, or both. As a result, both the delay and volume-to-capacity ratio are considered when lane group LOS is established. A ratio of 1.0 or more indicated that cycle capacity is fully utilized and represents failure from a capacity perspective (just as delay in excess of 80s/veh represents failure from a delay perspective).

"Highway Capacity Manual," Transportation Research Board, 2016.

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE (LOS) CRITERIA FOR AUTOMOBILES AT A TWO-WAY STOP CONTROLLED (TWSC) INTERSECTIONS

LOS for a TWSC intersection is determined by the computed or measured control delay. For motor vehicles, LOS is determined for each minor-street movement (or shared movement) as well as major-street left turns by using criteria shown below. Major-street through vehicles are assumed to experience zero delay. LOS F is assigned to the movement if the volume-to-capacity ratio for the movement exceeds 1.0, regardless of the control delay.

The following lists the LOS criteria for a TWSC intersection:

LOS A describes operations with a control delay of 10s/veh or less and a volume-to-capacity ratio no greater than 1.0.

LOS B describes operations with a control delay between 10s/veh and 15s/veh and a volume-to-capacity ratio no greater than 1.0.

LOS C describes operations with a control delay between 15s/veh and 25s/veh and a volume-to-capacity ratio no greater than 1.0.

LOS D describes operations with a control delay between 25s/veh and 35s/veh and a volume-to-capacity ratio no greater than 1.0.

LOS E describes operations with a control delay between 35s/veh and 50s/veh and a volume-to-capacity ratio no greater than 1.0.

LOS F describes operations with a control exceeding 50s/veh and a volume-to-capacity ratio no greater than 1.0 or when the volume-to-capacity ratio exceeds 1.0, regardless of the measurement of the control delay.

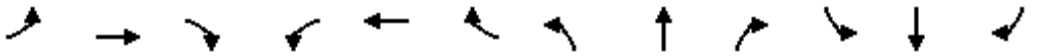
"Highway Capacity Manual," Transportation Research Board, 2016.

APPENDIX C

CAPACITY ANALYSIS CALCULATIONS
EXISTING PEAK PERIOD TRAFFIC ANALYSIS

HCM 6th Signalized Intersection Summary
1: Fort Barrett Rd/Makakilo Dr & Farrington Hwy

11/30/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	354	247	121	52	309	255	193	461	54	200	547	470
Future Volume (veh/h)	354	247	121	52	309	255	193	461	54	200	547	470
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	354	247	0	52	309	0	193	461	0	200	685	319
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	486	1069		78	725		297	1101		309	1162	491
Arrive On Green	0.14	0.30	0.00	0.04	0.20	0.00	0.09	0.31	0.00	0.09	0.31	0.31
Sat Flow, veh/h	3456	3554	1585	1781	3554	2790	3456	3554	1585	3563	3741	1580
Grp Volume(v), veh/h	354	247	0	52	309	0	193	461	0	200	685	319
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1781	1777	1395	1728	1777	1585	1781	1870	1580
Q Serve(g_s), s	7.6	4.0	0.0	2.2	5.9	0.0	4.2	7.9	0.0	4.2	11.9	13.5
Cycle Q Clear(g_c), s	7.6	4.0	0.0	2.2	5.9	0.0	4.2	7.9	0.0	4.2	11.9	13.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	486	1069		78	725		297	1101		309	1162	491
V/C Ratio(X)	0.73	0.23		0.67	0.43		0.65	0.42		0.65	0.59	0.65
Avail Cap(c_a), veh/h	1789	3357		369	2254		1118	3495		1153	3679	1555
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.8	20.3	0.0	36.4	26.8	0.0	34.2	21.1	0.0	34.1	22.5	23.0
Incr Delay (d2), s/veh	2.1	0.1	0.0	10.1	0.4	0.0	2.4	0.3	0.0	2.3	0.5	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	1.6	0.0	1.2	2.4	0.0	1.8	3.2	0.0	1.9	5.1	5.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.9	20.4	0.0	46.5	27.2	0.0	36.6	21.4	0.0	36.4	23.0	24.5
LnGrp LOS	C	C		D	C		D	C		D	C	C
Approach Vol, veh/h		601	A		361	A		654	A		1204	
Approach Delay, s/veh		28.4			30.0			25.9			25.6	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	28.3	11.6	29.0	15.9	20.8	11.7	28.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	16.0	73.0	25.0	76.0	40.0	49.0	25.0	76.0
Max Q Clear Time (g_c+I1), s	4.2	6.0	6.2	15.5	9.6	7.9	6.2	9.9
Green Ext Time (p_c), s	0.1	1.8	0.6	7.2	1.3	2.2	0.6	3.5

Intersection Summary	
HCM 6th Ctrl Delay	26.8
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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

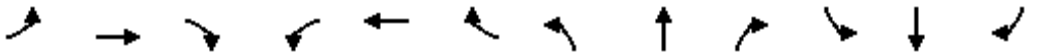
Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↱		↱
Traffic Vol, veh/h	0	511	535	8	0	67
Future Vol, veh/h	0	511	535	8	0	67
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	70	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	511	535	8	0	67

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	315
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	5.9
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3
Pot Cap-1 Maneuver	0	-	-	0	0	814
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	814
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	814
HCM Lane V/C Ratio	-	-	0.097
HCM Control Delay (s)	-	-	9.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.3



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	114	252	145	105	265	29	252	41	122	11	27	26
Future Volume (veh/h)	114	252	145	105	265	29	252	41	122	11	27	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	114	252	103	105	265	0	252	41	86	11	27	18
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	360	474	188	140	592		314	557	470	25	253	211
Arrive On Green	0.10	0.19	0.19	0.08	0.17	0.00	0.18	0.30	0.30	0.01	0.14	0.14
Sat Flow, veh/h	3456	2465	975	1781	3554	1585	1781	1870	1580	1781	1870	1560
Grp Volume(v), veh/h	114	179	176	105	265	0	252	41	86	11	27	18
Grp Sat Flow(s),veh/h/ln	1728	1777	1664	1781	1777	1585	1781	1870	1580	1781	1870	1560
Q Serve(g_s), s	1.5	4.3	4.6	2.8	3.2	0.0	6.5	0.8	1.9	0.3	0.6	0.5
Cycle Q Clear(g_c), s	1.5	4.3	4.6	2.8	3.2	0.0	6.5	0.8	1.9	0.3	0.6	0.5
Prop In Lane	1.00		0.59	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	360	342	320	140	592		314	557	470	25	253	211
V/C Ratio(X)	0.32	0.52	0.55	0.75	0.45		0.80	0.07	0.18	0.43	0.11	0.09
Avail Cap(c_a), veh/h	1298	1446	1354	557	2669		446	1600	1352	186	1327	1107
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.9	17.4	17.5	21.6	18.0	0.0	18.9	12.1	12.5	23.4	18.2	18.1
Incr Delay (d2), s/veh	0.5	1.3	1.5	8.2	0.5	0.0	7.3	0.1	0.2	11.7	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	1.7	1.7	1.4	1.2	0.0	3.0	0.3	0.6	0.2	0.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.4	18.6	19.0	29.8	18.5	0.0	26.2	12.1	12.7	35.1	18.4	18.3
LnGrp LOS	C	B	B	C	B		C	B	B	D	B	B
Approach Vol, veh/h		469			370	A		379			56	
Approach Delay, s/veh		19.2			21.7			21.6			21.6	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.8	14.2	13.4	11.5	10.0	13.0	5.7	19.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	39.0	12.0	34.0	18.0	36.0	5.0	41.0
Max Q Clear Time (g_c+I1), s	4.8	6.6	8.5	2.6	3.5	5.2	2.3	3.9
Green Ext Time (p_c), s	0.2	2.3	0.2	0.2	0.3	1.8	0.0	0.5

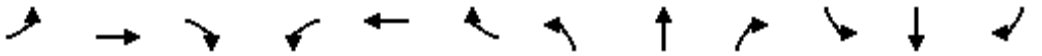
Intersection Summary	
HCM 6th Ctrl Delay	20.8
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
1: Fort Barrett Rd/Makakilo Dr & Farrington Hwy

11/30/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	629	405	221	67	367	394	151	593	82	261	447	392
Future Volume (veh/h)	629	405	221	67	367	394	151	593	82	261	447	392
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	629	405	0	67	367	0	151	593	0	261	564	262
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	782	1266		87	637		237	885		373	1068	449
Arrive On Green	0.23	0.36	0.00	0.05	0.18	0.00	0.07	0.25	0.00	0.10	0.29	0.29
Sat Flow, veh/h	3456	3554	1585	1781	3554	2790	3456	3554	1585	3563	3741	1575
Grp Volume(v), veh/h	629	405	0	67	367	0	151	593	0	261	564	262
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1781	1777	1395	1728	1777	1585	1781	1870	1575
Q Serve(g_s), s	14.3	6.9	0.0	3.1	7.9	0.0	3.5	12.5	0.0	5.9	10.5	11.8
Cycle Q Clear(g_c), s	14.3	6.9	0.0	3.1	7.9	0.0	3.5	12.5	0.0	5.9	10.5	11.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	782	1266		87	637		237	885		373	1068	449
V/C Ratio(X)	0.80	0.32		0.77	0.58		0.64	0.67		0.70	0.53	0.58
Avail Cap(c_a), veh/h	2454	3849		364	2053		707	2352		1201	2972	1251
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.4	19.4	0.0	39.0	31.2	0.0	37.7	28.1	0.0	35.9	25.0	25.4
Incr Delay (d2), s/veh	2.0	0.1	0.0	14.2	0.8	0.0	2.9	0.9	0.0	2.4	0.4	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	2.8	0.0	1.7	3.4	0.0	1.6	5.2	0.0	2.6	4.6	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.4	19.6	0.0	53.2	32.0	0.0	40.6	29.0	0.0	38.3	25.4	26.7
LnGrp LOS	C	B		D	C		D	C		D	C	C
Approach Vol, veh/h		1034	A		434	A		744	A		1087	
Approach Delay, s/veh		27.4			35.3			31.4			28.8	
Approach LOS		C			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	34.6	10.7	28.7	23.8	19.9	13.7	25.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	90.0	17.0	66.0	59.0	48.0	28.0	55.0
Max Q Clear Time (g_c+I1), s	5.1	8.9	5.5	13.8	16.3	9.9	7.9	14.5
Green Ext Time (p_c), s	0.1	3.0	0.3	5.5	2.5	2.7	0.8	4.6

Intersection Summary	
HCM 6th Ctrl Delay	29.8
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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

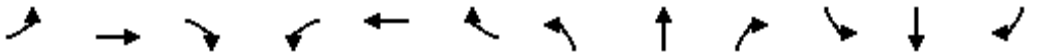
Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↱		↱
Traffic Vol, veh/h	0	765	637	17	0	193
Future Vol, veh/h	0	765	637	17	0	193
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	70	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	765	637	17	0	193

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	329
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	5.9
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3
Pot Cap-1 Maneuver	0	-	-	0	0	800
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	800
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	800
HCM Lane V/C Ratio	-	-	0.249
HCM Control Delay (s)	-	-	11
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	252	255	258	155	251	83	264	100	107	41	93	122
Future Volume (veh/h)	252	255	258	155	251	83	264	100	107	41	93	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	252	255	190	155	251	0	264	100	79	41	93	89
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	390	418	300	198	747		324	581	487	73	317	263
Arrive On Green	0.11	0.21	0.21	0.11	0.21	0.00	0.18	0.31	0.31	0.04	0.17	0.17
Sat Flow, veh/h	3456	1974	1418	1781	3554	1585	1781	1870	1568	1781	1870	1549
Grp Volume(v), veh/h	252	229	216	155	251	0	264	100	79	41	93	89
Grp Sat Flow(s),veh/h/ln	1728	1777	1615	1781	1777	1585	1781	1870	1568	1781	1870	1549
Q Serve(g_s), s	4.3	7.2	7.5	5.2	3.7	0.0	8.7	2.4	2.2	1.4	2.7	3.1
Cycle Q Clear(g_c), s	4.3	7.2	7.5	5.2	3.7	0.0	8.7	2.4	2.2	1.4	2.7	3.1
Prop In Lane	1.00		0.88	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	390	376	342	198	747		324	581	487	73	317	263
V/C Ratio(X)	0.65	0.61	0.63	0.78	0.34		0.81	0.17	0.16	0.56	0.29	0.34
Avail Cap(c_a), veh/h	1012	1070	973	348	1793		609	1339	1123	203	913	756
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.1	21.9	22.0	26.6	20.6	0.0	24.1	15.4	15.4	28.9	22.3	22.5
Incr Delay (d2), s/veh	1.8	1.6	2.0	6.9	0.3	0.0	5.2	0.1	0.2	6.8	0.5	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	2.9	2.8	2.5	1.5	0.0	3.9	1.0	0.8	0.7	1.2	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.9	23.5	24.0	33.5	20.9	0.0	29.3	15.6	15.5	35.7	22.8	23.2
LnGrp LOS	C	C	C	C	C		C	B	B	D	C	C
Approach Vol, veh/h		697			406	A		443			223	
Approach Delay, s/veh		25.2			25.7			23.8			25.4	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.8	18.0	16.2	15.4	11.9	17.9	7.5	24.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	37.0	21.0	30.0	18.0	31.0	7.0	44.0
Max Q Clear Time (g_c+I1), s	7.2	9.5	10.7	5.1	6.3	5.7	3.4	4.4
Green Ext Time (p_c), s	0.2	2.9	0.6	0.8	0.7	1.6	0.0	0.8

Intersection Summary	
HCM 6th Ctrl Delay	25.0
HCM 6th LOS	C

Notes

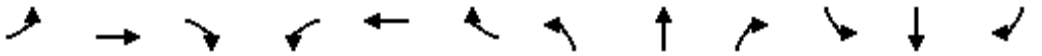
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2028 PEAK PERIOD TRAFFIC
ANALYSIS WITHOUT PROJECT

HCM 6th Signalized Intersection Summary
1: Fort Barrett Rd/Makakilo Dr & Farrington Hwy

11/30/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	372	269	127	56	327	271	203	484	61	225	574	494
Future Volume (veh/h)	372	269	127	56	327	271	203	484	61	225	574	494
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	372	269	0	56	327	0	203	484	0	225	722	336
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	499	1084		78	727		303	1110		334	1191	503
Arrive On Green	0.14	0.30	0.00	0.04	0.20	0.00	0.09	0.31	0.00	0.09	0.32	0.32
Sat Flow, veh/h	3456	3554	1585	1781	3554	2790	3456	3554	1585	3563	3741	1581
Grp Volume(v), veh/h	372	269	0	56	327	0	203	484	0	225	722	336
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1781	1777	1395	1728	1777	1585	1781	1870	1581
Q Serve(g_s), s	8.4	4.6	0.0	2.5	6.6	0.0	4.7	8.9	0.0	5.0	13.3	15.0
Cycle Q Clear(g_c), s	8.4	4.6	0.0	2.5	6.6	0.0	4.7	8.9	0.0	5.0	13.3	15.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	499	1084		78	727		303	1110		334	1191	503
V/C Ratio(X)	0.75	0.25		0.71	0.45		0.67	0.44		0.67	0.61	0.67
Avail Cap(c_a), veh/h	1777	3132		371	2045		1015	3219		1177	3526	1490
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	21.3	0.0	38.5	28.5	0.0	36.1	22.4	0.0	35.8	23.5	24.1
Incr Delay (d2), s/veh	2.3	0.1	0.0	12.1	0.4	0.0	2.6	0.3	0.0	2.4	0.5	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	1.9	0.0	1.3	2.8	0.0	2.0	3.6	0.0	2.2	5.7	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.8	21.5	0.0	50.6	28.9	0.0	38.7	22.6	0.0	38.2	24.0	25.7
LnGrp LOS	D	C		D	C		D	C		D	C	C
Approach Vol, veh/h		641	A		383	A		687	A		1283	
Approach Delay, s/veh		29.8			32.1			27.4			26.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.6	29.9	12.2	31.0	16.8	21.7	12.7	30.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	72.0	24.0	77.0	42.0	47.0	27.0	74.0
Max Q Clear Time (g_c+I1), s	4.5	6.6	6.7	17.0	10.4	8.6	7.0	10.9
Green Ext Time (p_c), s	0.1	1.9	0.6	7.7	1.4	2.3	0.7	3.7

Intersection Summary	
HCM 6th Ctrl Delay	28.3
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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

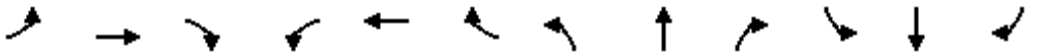
Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↱		↱
Traffic Vol, veh/h	0	537	562	8	0	67
Future Vol, veh/h	0	537	562	8	0	67
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	70	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	537	562	8	0	67

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	331
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	5.9
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3
Pot Cap-1 Maneuver	0	-	-	0	0	798
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	798
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	798
HCM Lane V/C Ratio	-	-	0.099
HCM Control Delay (s)	-	-	10
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.3



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	114	265	173	121	278	29	274	41	127	11	27	26
Future Volume (veh/h)	114	265	173	121	278	29	274	41	127	11	27	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	114	265	122	121	278	0	274	41	89	11	27	18
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	339	474	211	160	682		333	569	480	25	245	204
Arrive On Green	0.10	0.20	0.20	0.09	0.19	0.00	0.19	0.30	0.30	0.01	0.13	0.13
Sat Flow, veh/h	3456	2369	1055	1781	3554	1585	1781	1870	1580	1781	1870	1560
Grp Volume(v), veh/h	114	197	190	121	278	0	274	41	89	11	27	18
Grp Sat Flow(s),veh/h/ln	1728	1777	1647	1781	1777	1585	1781	1870	1580	1781	1870	1560
Q Serve(g_s), s	1.6	5.1	5.3	3.4	3.5	0.0	7.5	0.8	2.1	0.3	0.6	0.5
Cycle Q Clear(g_c), s	1.6	5.1	5.3	3.4	3.5	0.0	7.5	0.8	2.1	0.3	0.6	0.5
Prop In Lane	1.00		0.64	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	339	355	329	160	682		333	569	480	25	245	204
V/C Ratio(X)	0.34	0.55	0.58	0.76	0.41		0.82	0.07	0.19	0.44	0.11	0.09
Avail Cap(c_a), veh/h	1219	1288	1194	593	2507		419	1503	1270	175	1246	1039
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.5	18.4	18.5	22.7	18.1	0.0	19.9	12.6	13.1	25.0	19.5	19.5
Incr Delay (d2), s/veh	0.6	1.4	1.6	7.4	0.4	0.0	11.0	0.1	0.2	11.8	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	2.0	2.0	1.6	1.3	0.0	3.8	0.3	0.7	0.2	0.3	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.1	19.7	20.1	30.1	18.5	0.0	31.0	12.7	13.3	36.8	19.7	19.7
LnGrp LOS	C	B	C	C	B		C	B	B	D	B	B
Approach Vol, veh/h		501			399	A		404			56	
Approach Delay, s/veh		20.4			22.0			25.2			23.1	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.6	15.2	14.5	11.7	10.0	14.8	5.7	20.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	37.0	12.0	34.0	18.0	36.0	5.0	41.0
Max Q Clear Time (g_c+I1), s	5.4	7.3	9.5	2.6	3.6	5.5	2.3	4.1
Green Ext Time (p_c), s	0.2	2.5	0.2	0.2	0.3	1.9	0.0	0.5

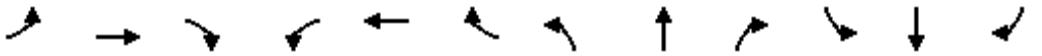
Intersection Summary	
HCM 6th Ctrl Delay	22.4
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
1: Fort Barrett Rd/Makakilo Dr & Farrington Hwy

11/30/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	660	433	232	73	397	426	159	626	88	279	469	412
Future Volume (veh/h)	660	433	232	73	397	426	159	626	88	279	469	412
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	660	433	0	73	397	0	159	626	0	279	595	276
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	804	1289		95	652		241	900		385	1091	459
Arrive On Green	0.23	0.36	0.00	0.05	0.18	0.00	0.07	0.25	0.00	0.11	0.29	0.29
Sat Flow, veh/h	3456	3554	1585	1781	3554	2790	3456	3554	1585	3563	3741	1575
Grp Volume(v), veh/h	660	433	0	73	397	0	159	626	0	279	595	276
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1781	1777	1395	1728	1777	1585	1781	1870	1575
Q Serve(g_s), s	16.3	8.0	0.0	3.6	9.2	0.0	4.0	14.4	0.0	6.8	12.1	13.5
Cycle Q Clear(g_c), s	16.3	8.0	0.0	3.6	9.2	0.0	4.0	14.4	0.0	6.8	12.1	13.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	804	1289		95	652		241	900		385	1091	459
V/C Ratio(X)	0.82	0.34		0.77	0.61		0.66	0.70		0.72	0.55	0.60
Avail Cap(c_a), veh/h	2305	3476		356	1817		691	2173		1148	2744	1156
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.7	20.8	0.0	42.0	33.8	0.0	40.8	30.4	0.0	38.8	26.8	27.4
Incr Delay (d2), s/veh	2.2	0.2	0.0	12.9	0.9	0.0	3.1	1.0	0.0	2.6	0.4	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.9	3.2	0.0	1.9	4.0	0.0	1.8	6.1	0.0	3.1	5.3	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.9	21.0	0.0	54.9	34.7	0.0	43.9	31.4	0.0	41.5	27.3	28.6
LnGrp LOS	C	C		D	C		D	C		D	C	C
Approach Vol, veh/h		1093	A		470	A		785	A		1150	
Approach Delay, s/veh		29.4			37.8			33.9			31.0	
Approach LOS		C			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.8	37.6	11.3	31.2	25.9	21.5	14.7	27.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	18.0	88.0	18.0	66.0	60.0	46.0	29.0	55.0
Max Q Clear Time (g_c+I1), s	5.6	10.0	6.0	15.5	18.3	11.2	8.8	16.4
Green Ext Time (p_c), s	0.1	3.3	0.4	5.9	2.6	2.9	0.9	4.9

Intersection Summary	
HCM 6th Ctrl Delay	32.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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

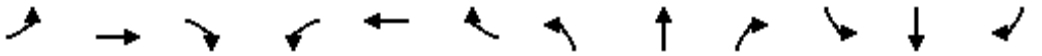
Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↱		↱
Traffic Vol, veh/h	0	803	669	17	0	193
Future Vol, veh/h	0	803	669	17	0	193
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	70	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	803	669	17	0	193

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	345
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	5.9
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3
Pot Cap-1 Maneuver	0	-	-	0	0	784
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	784
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	784
HCM Lane V/C Ratio	-	-	0.254
HCM Control Delay (s)	-	-	11.2
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	252	268	273	166	264	83	298	100	116	41	93	122
Future Volume (veh/h)	252	268	273	166	264	83	298	100	116	41	93	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	252	268	202	166	264	0	298	100	86	41	93	90
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	380	421	307	209	790		356	609	511	71	310	257
Arrive On Green	0.11	0.21	0.21	0.12	0.22	0.00	0.20	0.33	0.33	0.04	0.17	0.17
Sat Flow, veh/h	3456	1961	1429	1781	3554	1585	1781	1870	1569	1781	1870	1548
Grp Volume(v), veh/h	252	242	228	166	264	0	298	100	86	41	93	90
Grp Sat Flow(s),veh/h/ln	1728	1777	1613	1781	1777	1585	1781	1870	1569	1781	1870	1548
Q Serve(g_s), s	4.6	8.2	8.6	6.0	4.1	0.0	10.6	2.5	2.6	1.5	2.9	3.4
Cycle Q Clear(g_c), s	4.6	8.2	8.6	6.0	4.1	0.0	10.6	2.5	2.6	1.5	2.9	3.4
Prop In Lane	1.00		0.89	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	380	382	347	209	790		356	609	511	71	310	257
V/C Ratio(X)	0.66	0.63	0.66	0.79	0.33		0.84	0.16	0.17	0.58	0.30	0.35
Avail Cap(c_a), veh/h	940	967	878	323	1611		592	1272	1067	188	848	702
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.3	23.6	23.7	28.4	21.6	0.0	25.4	15.9	15.9	31.2	24.2	24.4
Incr Delay (d2), s/veh	2.0	1.8	2.1	7.7	0.2	0.0	5.7	0.1	0.2	7.3	0.5	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	3.4	3.3	2.9	1.7	0.0	4.8	1.0	0.9	0.8	1.3	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	25.4	25.9	36.1	21.9	0.0	31.1	16.0	16.1	38.5	24.8	25.3
LnGrp LOS	C	C	C	D	C		C	B	B	D	C	C
Approach Vol, veh/h		722			430	A		484			224	
Approach Delay, s/veh		27.2			27.4			25.3			27.5	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.8	19.2	18.2	16.0	12.3	19.7	7.6	26.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	36.0	22.0	30.0	18.0	30.0	7.0	45.0
Max Q Clear Time (g_c+I1), s	8.0	10.6	12.6	5.4	6.6	6.1	3.5	4.6
Green Ext Time (p_c), s	0.2	3.0	0.6	0.8	0.6	1.7	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	26.8
HCM 6th LOS	C

Notes

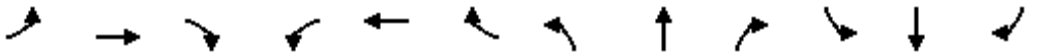
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2028 PEAK PERIOD TRAFFIC
ANALYSIS WITH PROJECT

HCM 6th Signalized Intersection Summary
1: Fort Barrett Rd/Makakilo Dr & Farrington Hwy

11/30/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	372	301	127	56	327	271	203	484	61	257	574	494
Future Volume (veh/h)	372	301	127	56	327	271	203	484	61	257	574	494
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	372	301	0	56	327	0	203	484	0	257	722	336
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	499	1084		78	727		303	1073		371	1191	503
Arrive On Green	0.14	0.30	0.00	0.04	0.20	0.00	0.09	0.30	0.00	0.10	0.32	0.32
Sat Flow, veh/h	3456	3554	1585	1781	3554	2790	3456	3554	1585	3563	3741	1581
Grp Volume(v), veh/h	372	301	0	56	327	0	203	484	0	257	722	336
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1781	1777	1395	1728	1777	1585	1781	1870	1581
Q Serve(g_s), s	8.4	5.3	0.0	2.5	6.6	0.0	4.7	9.0	0.0	5.7	13.3	15.0
Cycle Q Clear(g_c), s	8.4	5.3	0.0	2.5	6.6	0.0	4.7	9.0	0.0	5.7	13.3	15.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	499	1084		78	727		303	1073		371	1191	503
V/C Ratio(X)	0.75	0.28		0.71	0.45		0.67	0.45		0.69	0.61	0.67
Avail Cap(c_a), veh/h	1777	3089		371	2001		1015	3132		1308	3572	1509
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	21.6	0.0	38.5	28.5	0.0	36.1	23.0	0.0	35.3	23.5	24.1
Incr Delay (d2), s/veh	2.3	0.1	0.0	12.1	0.4	0.0	2.6	0.3	0.0	2.3	0.5	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	2.1	0.0	1.3	2.8	0.0	2.0	3.7	0.0	2.5	5.7	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.8	21.7	0.0	50.6	28.9	0.0	38.7	23.3	0.0	37.7	24.0	25.6
LnGrp LOS	D	C		D	C		D	C		D	C	C
Approach Vol, veh/h		673	A		383	A		687	A		1315	
Approach Delay, s/veh		29.5			32.1			27.9			27.1	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.6	29.9	12.2	31.0	16.8	21.7	13.5	29.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	71.0	24.0	78.0	42.0	46.0	30.0	72.0
Max Q Clear Time (g_c+I1), s	4.5	7.3	6.7	17.0	10.4	8.6	7.7	11.0
Green Ext Time (p_c), s	0.1	2.2	0.6	7.7	1.4	2.3	0.9	3.7

Intersection Summary	
HCM 6th Ctrl Delay	28.4
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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

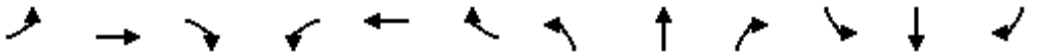
Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱			↱			↱
Traffic Vol, veh/h	0	537	64	0	562	8	0	0	107	0	0	67
Future Vol, veh/h	0	537	64	0	562	8	0	0	107	0	0	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	75	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	537	64	0	562	8	0	0	107	0	0	67

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	327	-	-	306
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	-	0	0	0	669	0	0	690
Stage 1	0	-	-	0	-	0	0	0	-	0	0	-
Stage 2	0	-	-	0	-	0	0	0	-	0	0	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	669	-	-	690
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	11.5	10.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	SBLn1
Capacity (veh/h)	669	-	-	-	690
HCM Lane V/C Ratio	0.174	-	-	-	0.106
HCM Control Delay (s)	11.5	-	-	-	10.8
HCM Lane LOS	B	-	-	-	B
HCM 95th %tile Q(veh)	0.6	-	-	-	0.4



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	114	372	173	135	278	29	274	41	127	11	27	26
Future Volume (veh/h)	114	372	173	135	278	29	274	41	127	11	27	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	114	372	131	135	278	0	274	41	91	11	27	18
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	309	599	208	178	866		328	551	466	25	233	194
Arrive On Green	0.09	0.23	0.23	0.10	0.24	0.00	0.18	0.29	0.29	0.01	0.12	0.12
Sat Flow, veh/h	3456	2570	890	1781	3554	1585	1781	1870	1580	1781	1870	1558
Grp Volume(v), veh/h	114	255	248	135	278	0	274	41	91	11	27	18
Grp Sat Flow(s),veh/h/ln	1728	1777	1683	1781	1777	1585	1781	1870	1580	1781	1870	1558
Q Serve(g_s), s	1.7	7.2	7.4	4.1	3.6	0.0	8.3	0.9	2.4	0.3	0.7	0.6
Cycle Q Clear(g_c), s	1.7	7.2	7.4	4.1	3.6	0.0	8.3	0.9	2.4	0.3	0.7	0.6
Prop In Lane	1.00		0.53	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	309	414	393	178	866		328	551	466	25	233	194
V/C Ratio(X)	0.37	0.62	0.63	0.76	0.32		0.84	0.07	0.20	0.44	0.12	0.09
Avail Cap(c_a), veh/h	1114	1145	1085	574	2290		383	1373	1160	159	1139	949
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.9	19.2	19.3	24.5	17.3	0.0	22.0	14.2	14.7	27.3	21.7	21.7
Incr Delay (d2), s/veh	0.7	1.5	1.7	6.7	0.2	0.0	14.7	0.1	0.2	12.1	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	2.9	2.8	1.9	1.4	0.0	4.5	0.3	0.8	0.2	0.3	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.7	20.7	20.9	31.2	17.5	0.0	36.7	14.3	14.9	39.4	21.9	21.9
LnGrp LOS	C	C	C	C	B		D	B	B	D	C	C
Approach Vol, veh/h		617			413	A		406			56	
Approach Delay, s/veh		21.5			22.0			29.5			25.3	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.6	18.0	15.3	12.0	10.0	18.6	5.8	21.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	18.0	36.0	12.0	34.0	18.0	36.0	5.0	41.0
Max Q Clear Time (g_c+I1), s	6.1	9.4	10.3	2.7	3.7	5.6	2.3	4.4
Green Ext Time (p_c), s	0.2	3.3	0.2	0.2	0.3	1.9	0.0	0.5

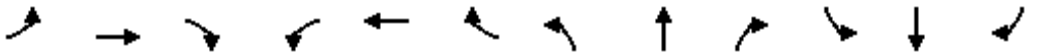
Intersection Summary	
HCM 6th Ctrl Delay	24.0
HCM 6th LOS	C

Notes

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

HCM 6th Signalized Intersection Summary
1: Fort Barrett Rd/Makakilo Dr & Farrington Hwy

11/30/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	660	522	232	73	397	426	159	626	88	368	469	412
Future Volume (veh/h)	660	522	232	73	397	426	159	626	88	368	469	412
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	660	522	0	73	397	0	159	626	0	368	595	276
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	795	1266		95	638		236	882		478	1174	495
Arrive On Green	0.23	0.36	0.00	0.05	0.18	0.00	0.07	0.25	0.00	0.13	0.31	0.31
Sat Flow, veh/h	3456	3554	1585	1781	3554	2790	3456	3554	1585	3563	3741	1576
Grp Volume(v), veh/h	660	522	0	73	397	0	159	626	0	368	595	276
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1781	1777	1395	1728	1777	1585	1781	1870	1576
Q Serve(g_s), s	17.5	10.6	0.0	3.9	9.9	0.0	4.3	15.4	0.0	9.6	12.5	14.0
Cycle Q Clear(g_c), s	17.5	10.6	0.0	3.9	9.9	0.0	4.3	15.4	0.0	9.6	12.5	14.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	795	1266		95	638		236	882		478	1174	495
V/C Ratio(X)	0.83	0.41		0.77	0.62		0.67	0.71		0.77	0.51	0.56
Avail Cap(c_a), veh/h	2087	3146		315	1629		612	1962		1299	2766	1165
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.2	23.3	0.0	44.9	36.4	0.0	43.7	32.9	0.0	40.1	26.9	27.4
Incr Delay (d2), s/veh	2.4	0.2	0.0	13.1	1.0	0.0	3.4	1.1	0.0	2.7	0.3	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.5	4.4	0.0	2.0	4.3	0.0	1.9	6.7	0.0	4.3	5.5	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.6	23.5	0.0	57.9	37.4	0.0	47.1	34.0	0.0	42.9	27.2	28.4
LnGrp LOS	D	C		E	D		D	C		D	C	C
Approach Vol, veh/h		1182	A		470	A		785	A		1239	
Approach Delay, s/veh		31.4			40.6			36.7			32.1	
Approach LOS		C			D			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.1	39.2	11.6	35.1	27.1	22.2	17.9	28.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	85.0	17.0	71.0	58.0	44.0	35.0	53.0
Max Q Clear Time (g_c+I1), s	5.9	12.6	6.3	16.0	19.5	11.9	11.6	17.4
Green Ext Time (p_c), s	0.1	4.1	0.3	5.9	2.6	2.8	1.3	4.9

Intersection Summary	
HCM 6th Ctrl Delay	33.9
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

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

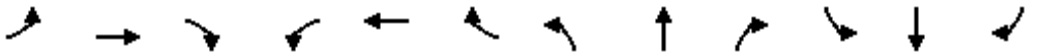
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱			↱			↱
Traffic Vol, veh/h	0	803	178	0	669	17	0	0	94	0	0	193
Future Vol, veh/h	0	803	178	0	669	17	0	0	94	0	0	193
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	Stop
Storage Length	-	-	-	-	-	75	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	803	178	0	669	17	0	0	94	0	0	193

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	533	-	-	364
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	-	0	0	0	491	0	0	633
Stage 1	0	-	-	0	-	0	0	0	-	0	0	-
Stage 2	0	-	-	0	-	0	0	0	-	0	0	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	491	-	-	633
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	14.3	13.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	SBLn1
Capacity (veh/h)	491	-	-	-	633
HCM Lane V/C Ratio	0.208	-	-	-	0.331
HCM Control Delay (s)	14.3	-	-	-	13.5
HCM Lane LOS	B	-	-	-	B
HCM 95th %tile Q(veh)	0.8	-	-	-	1.5



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	252	362	273	204	264	83	298	100	116	41	93	122
Future Volume (veh/h)	252	362	273	204	264	83	298	100	116	41	93	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	252	362	205	204	264	0	298	100	88	41	93	89
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	366	522	291	247	961		347	590	495	69	297	246
Arrive On Green	0.11	0.24	0.24	0.14	0.27	0.00	0.19	0.32	0.32	0.04	0.16	0.16
Sat Flow, veh/h	3456	2201	1226	1781	3554	1585	1781	1870	1568	1781	1870	1546
Grp Volume(v), veh/h	252	291	276	204	264	0	298	100	88	41	93	89
Grp Sat Flow(s),veh/h/ln	1728	1777	1650	1781	1777	1585	1781	1870	1568	1781	1870	1546
Q Serve(g_s), s	5.2	11.1	11.3	8.2	4.3	0.0	12.0	2.9	3.0	1.7	3.3	3.8
Cycle Q Clear(g_c), s	5.2	11.1	11.3	8.2	4.3	0.0	12.0	2.9	3.0	1.7	3.3	3.8
Prop In Lane	1.00		0.74	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	366	422	392	247	961		347	590	495	69	297	246
V/C Ratio(X)	0.69	0.69	0.70	0.82	0.27		0.86	0.17	0.18	0.60	0.31	0.36
Avail Cap(c_a), veh/h	840	864	802	337	1535		481	1086	911	168	758	626
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.9	25.8	25.9	31.0	21.3	0.0	28.8	18.3	18.4	35.0	27.6	27.8
Incr Delay (d2), s/veh	2.4	2.0	2.4	12.6	0.2	0.0	12.2	0.1	0.2	8.4	0.6	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	4.7	4.5	4.3	1.8	0.0	6.1	1.2	1.1	0.9	1.5	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.3	27.8	28.2	43.6	21.4	0.0	41.0	18.5	18.6	43.4	28.2	28.7
LnGrp LOS	C	C	C	D	C		D	B	B	D	C	C
Approach Vol, veh/h		819			468	A		486			223	
Approach Delay, s/veh		29.9			31.1			32.3			31.2	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.3	22.6	19.4	16.8	12.8	25.0	7.8	28.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	36.0	20.0	30.0	18.0	32.0	7.0	43.0
Max Q Clear Time (g_c+I1), s	10.2	13.3	14.0	5.8	7.2	6.3	3.7	5.0
Green Ext Time (p_c), s	0.2	3.6	0.5	0.8	0.6	1.7	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	30.9
HCM 6th LOS	C

Notes

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

APPENDIX F

TRANSIT LOS CALCULATIONS

Multimodal Transit LOS Calculation

		Makakilo NB	Makakilo SB	Kealanani NB	Kealanani SB	Farrington EB	Farrington WB
Inputs		**1**	**2**	**3**	**4**	**5**	**6**
	TRANSIT OPERATIONS INFORMATION						
	Number of local buses on street segment per hour (bus/h)	4	5	2	2	3	3
	Number of express buses stopping in segment per hour (bus/h)	2	1	0	2	2	1
t_{ex}	Average excess wait time (min)	4.6	2.1	1.3	3.7	6.4	3.7
L_f	Average passenger load factor (p/seat)	0.4	0.3	0.4	0.3	0.5	0.5
S	Average transit travel speed (mi/h)	10.1	36.3	18.5	17.2	7.5	29.6
l_{pt}	Average passenger trip length (mi)	6.8	2.8	5.0	5.4	5.0	7.6
	Is the segment in the CBD of a metro area of 5 million or more?	No	No	No	No	No	No
	TRANSIT AMENITY DATA						
p_{sh}	Percent stops in segment with a shelter	100%	0%	0%	50%	50%	100%
p_{be}	Percent stops in segment with a bench	100%	100%	100%	100%	100%	100%
	PEDESTRIAN ENVIRONMENT DATA						
W_A	Sidewalk width (ft) (Enter 0 if no sidewalk)	8.0	8.0	6.0	6.0	8.0	8.0
W_{buf}	Buffer width from sidewalk to street (ft)	0.0	0.0	4.0	4.0	0.0	0.0
	Does a continuous barrier exist between the street and sidewalk?	No	No	Yes	Yes	No	No
	Is the street divided?	No	No	Yes	Yes	No	No
	Are parking spaces striped?	No	No	No	No	No	No
p_{pk}	Proportion of on-street parking occupied	0%	0%	0%	0%	0%	0%
W_{bl}	Bicycle lane width (ft)	0.0	0.0	6.0	6.0	5.0	5.0
W_{os}	Shoulder/parking lane width (ft)	0.0	0.0	0.0	0.0	0.0	0.0
W_{ol}	Outside travel lane (closest to sidewalk) width (ft)	12.0	12.0	12.0	12.0	16.0	10.0
v_m	Outside lane demand flow rate at midsegment (veh/h)	800	800	300	300	800	800
S_R	Average vehicle running speed, including intersection delay (mi/h)	35.0	35.0	30.0	30.0	35.0	35.0
Calculations							
f	Transit frequency (bus/h)	6	6	2	4	5	4
f_h	Headway factor	3.15	3.15	1.95	2.80	3.00	2.80
f_{pl}	Passenger load weighting factor	1.00	1.00	1.00	1.00	1.00	1.00
T_{at}	Perceived amenity time rate (min/mi)	0.2	0.1	0.0	0.2	0.2	0.2
T_{ex}	Excess wait time rate due to late arrivals (min/mi)	0.7	0.8	0.3	0.7	1.3	0.5
T_{ptt}	Perceived travel time rate (min/mi)	7.1	3.1	3.7	4.7	10.4	2.8
T_{btt}	Base travel time rate (min/mi)	4.0	4.0	4.0	4.0	4.0	4.0
f_{tt}	Perceived travel time factor	0.80	1.11	1.03	0.94	0.70	1.15
$s_{w\text{-}r}$	Transit wait-ride score	2.52	3.49	2.01	2.62	2.10	3.22
f_s	Motorized vehicle speed adjustment factor	0.49	0.49	0.36	0.36	0.49	0.49
f_v	Motorized vehicle volume adjustment factor	1.82	1.82	0.68	0.68	1.82	1.82
W_{aA}	Adjusted available sidewalk width (ft)	8.0	8.0	6.0	6.0	8.0	8.0
f_{sw}	Sidewalk width coefficient	3.60	3.60	4.20	4.20	3.60	3.60
f_b	Buffer area coefficient	1.00	1.00	5.37	5.37	1.00	1.00
W_t	Total width of outside lane, bike lane, and parking lane/shoulder (ft)	12.0	12.0	18.0	18.0	21.0	15.0
W_v	Effective total width as a function of traffic volume (ft)	12.0	12.0	18.0	18.0	21.0	15.0
W_1	Effective width of combined bike lane and shoulder (ft)	0.0	0.0	6.0	6.0	5.0	5.0
f_w	Cross-section adjustment factor	-4.55	-4.55	-5.17	-5.17	-4.86	-4.71
I_p	Pedestrian environment score	3.80	3.80	1.92	1.92	3.50	3.65
	Pedestrian LOS	D	D	A	A	C	D
I_t	Transit LOS score	2.79	1.33	3.27	2.35	3.38	1.72
Output							
	Transit LOS	***C***	***A***	***C***	***B***	***C***	***A***