Table 8: Commuting Patterns by Place of Residence, 2000

	City and County of Honolulu	Ewa CDPs: Ewa Villages	Ewa Gentry	Ewa Beach	Iroquois Point	Barbers Point	Makakilo	Central Oahu CDPs (selected): Waipahu	Village Park	Waipio
Commuting to Work										
Drove alone	61.4%	61.2%	67.5%	62.8%	52.8%	79.2%	69.3%	57.7%	65.1%	70.8%
Carpooled	19.4%	19.6%	21.3%	20.8%	14.1%	20.8%	22.3%	21.1%	24.5%	21.0%
Public transportation	8.3%	16.3%	7.9%	11.2%	19.3%	0.0%	4.3%	16.0%	6.9%	5.1%
Mean travel time to work (minutes)	27.3	35.6	37	39.6	38.0	25.4	35.3	33.2	33.3	31.7

SOURCE: US Census (www.census.gov).

Table 9: Commuting Patterns, by Place of Work and Mode of Transport, 2000

	City and County of Honolulu	Ewa NB	Makakilo/Kapolei/ Honokai Hale NB	Waipahu NB
Total Workers, 2000	393,245	3,010	11,560	11,165
Drove Alone	61.4%	62.0%	75.4%	71.3%
Carpool	19.3%	17.0%	15.3%	16.4%
Mass Transit	8.1%	3.9%	3.1%	4.7%
Other	11.2%	17.2%	6.1%	7.6%

SOURCE: US Census, compiled by the City and County of Honolulu Department of Planning and Permitting. Available at http://honoluludpp.org/planning/demographics2/2000/NA/economic.pdf

Table 10: Inter-regional Commuting Patterns, 2005

Residential Areas (1)	Residents	Share of residents working in: Pearl City + Central	Downtown + Kaka'ako	E Honolulu + Waikiki	Windward Oahu	Rest of Oahu
Ewa / Wai'anae DP Areas	39,286	55.1%	13.0%	1.9%	0.8%	29.2%
Central Oahu / N. Shore / Pearl City	107,024	40.4%	16.1%	4.2%	2.0%	37.3%
Windward Oahu	52,219	19.1%	13.4%	0.6%	36.9%	30.0%
East Honolulu and Waikiki	59,464	18.9%	31.4%	30.8%	1.7%	17.4%
Rest of Primary Urban Center	108,630	33.2%	25.0%	7.6%	1.9%	32.3%

NOTE: Based on survey data, weighted to estimate population size. Residential and worksite areas are close to, but may not be precisely aligned with, the regions used to label them.
SOURCE: SMS Market Study, as reported in SMS 2005b.

2.4.4 Community Amenities and Facilities

To develop a new urban center, the City and State have relocated agencies to Kapolei. Residents are served by local police and fire stations, a satellite city hall office, and a public library.

Commercial development has proceeded quickly in Kapolei and along Fort Weaver Road. Kapolei has shopping centers, medical offices, and a movie theater. The Fort Weaver Road area has a medical center, a social service complex, and neighborhood malls. Neither has a regional mall, although Kapolei has "power centers" at K-Mart and Home Depot. The Waikele shopping center and outlet center, in Waipahu, is the nearest regional mall serving the area.

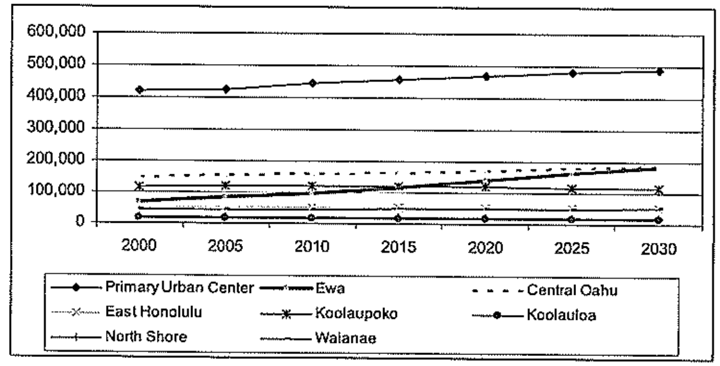
Kapolei has O'ahu's largest private recreation area, Hawaiian Waters Adventure Park. Community parks and golf courses are scattered throughout the 'Ewa region. Kalaeloa has extensive areas which have been designated for park development. However, funds for further development have not been programmed. The sand beaches are now accessible to the general public. Beaches at Ko 'Olina and 'Ewa Beach are also used by 'Ewa residents.

2.5 EMERGING TRENDS

Population and job growth are expected to continue. The 'Ewa Development Plan area is expected to see a growth rate far higher than in any other area of O'ahu over the next twenty years. To accomplish that growth, more than 34,600 housing units would be needed in 'Ewa between 2000 and 2025.

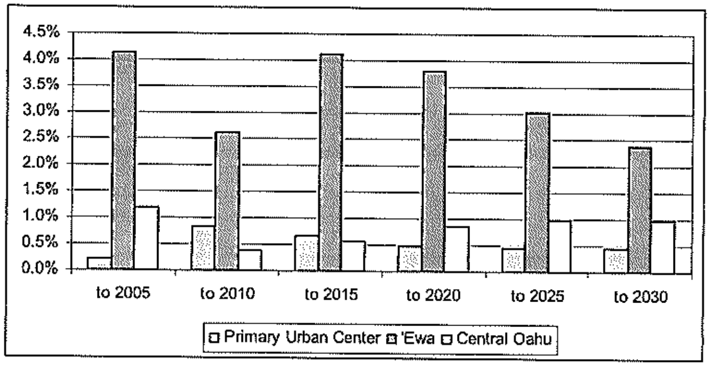
For a detailed analysis of housing demand in relation to the proposed Ho'opili project, see the market study for Ho'opili (Mikiko Corporation, 2007).

Figure 12: Forecast Population Increase



SOURCE: Honolulu Department of Planning and Permitting. Available at http://honoluludpp.org/planning/demographics2/Projections/2030byDP.pdf

Figure 13: Annual Forecast Rate of Increase in Housing, 2000 to 2030, for Major Development Plan Areas



While Kapolei was planned as an urban center second to Honolulu, large facilities serving the larger region have tended to be located on its outskirts. Home Depot, for example, is located west of the urban center. More importantly, two projects being planned for the center of 'Ewa, the UHWO campus and a Ray and Joan Kroc Community Center, will be located east of the Villages of Kapolei on the new North-South Road. Commercial areas have also been proposed next to the campus and on DHHL land near the community center.

CHAPTER THREE
COMMUNITY ISSUES AND CONCERNS

3.1 SOURCES

Major sources for understanding community viewpoints in Leeward O'ahu include Neighborhood Board discussions and public reactions to planning reported in City planning documents, EISs, and the newspapers. For the island as a whole, survey information is also available.

D.R. Horton – Schuler Division has convened a series of discussions with community stakeholders to help the developer shape the project to meet regional needs and avoid unwanted impacts. For this report, Belt Collins has reviewed minutes, attended meetings, and followed up with selected community stakeholders on issues raised in the meetings. Table 11 lists the members of the Ho'opili Community Task Force advisory group.

Table 11: Ho'opili Community Task Force

HOOPILI COMMUNITY TASK FORCE	
Maureen Andrade	Village Park Community Association
Gary Bautista	'Ewa Neighborhood Board
Dick Beamer	"Honorary Mayor" of Ewa Beach
Scott Belford	HOSEFF Non-profit
John Condello	Hawaii Theological Institute
Kurt Fevella	'Ewa Neighborhood Board
Pearlyn Fukuba	Hawaii Community Development Authority, Kalaeloa
Frank Genadio	Makakilo resident
Kevin Gilbert	Hawaii Theological Institute
Michael Golojuch	Palehua Community Association
Carolyn Golojuch	Makakilo resident
Sharon Har	Kapolei resident
Teri Ikehara	West Loch Estates Board President
Coby Lynn	Ewa Beach Lions Club
Eileen Lynn	Ewa Beach resident
Tesha Malama	Ewa Beach resident
Richard Oshiro	Waipahu Neighborhood Board
Rodolpho Ramos	'Ewa Task Force
Frances Rivero	Ewa Beach Boys and Girls Club
Ross Rolirad	Rotary Club
Georgette Stevens	West Oahu Economic Development Association
Summer Thompson	Ewa Beach Boys and Girls Club
Keith Timson	Makakilo resident
Maeda Timson	Kapolei Neighborhood Board
Karen Wenke	'Ewa resident; small business owner
Chuck Wheatley	Guardian Angels, Waipahu
Lance Widner	Royal Kunia Community Association
Stephanie Widner	Royal Kunia resident
George Yakowenko	Waipahu Neighborhood Board
Annette Yamaguchi	Waipahu Business Association
Linda Young	Kapolei Neighborhood Board; Malanai Iki Assoc.

NOTE: List taken from Ho'opili Community Task Force Vision Statement. Members may have attended some, but not all, meetings. Several others, not listed, attended only one meeting.

Belt Collins also interviewed local stakeholders, complementing the process organized by the developer. Informants were asked to share ideas -- both their own and those of others in the community. Affiliations are listed as an indicator of their experience and knowledge of the community. Neither informants nor community groups should be viewed as taking a position for or against the project because they are listed in the table.

Table 12: Informants Contacted for this Report

Patti Bates	Child & Family Service
Bob Campbell	West Loch Fairways Board of Directors
Donna Campbell	West Loch homeowner
Lincoln Chan	West Loch Fairways Board of Directors
Robert Creps	Grace Pacific Corporation
Yvonne Dembinski	West Loch Fairways Board of Directors
David Ellis	Kahi Mohala
Stanton Enomoto	Hawaii Community Development Authority, Kalaeloa; now with Office of Hawaiian Affairs
Larry Jefts	Sugarland Farms
Leonard Licino	Kahi Mohala
Laurie Murphy	West Loch Fairways Board of Directors
Mark Mitchell, MD	Kahi Mohala
Richard Oshiro	Waipahu Neighborhood Board
Diane L. Reece	Child & Family Service
Alec Sou	Aloun Farms
Chris Steele	Grace Pacific Corporation
Maeda Timson	Kapolei Neighborhood Board

NOTE: The persons listed were asked to provide information about concerns and views of the community, not to speak on behalf of their agencies or groups. Affiliations are listed to indicate the range of persons interviewed, not to claim that the organizations in question have taken any particular stance in relation to the Ho'opili project.

3.2 Issues and Concerns Voiced in Community Planning

The Department of Planning and Permitting reviewed Neighborhood Board minutes for 2000 through 2003 from the two 'Ewa Development Plan area boards and analyzed the frequency of concerns voiced in the meetings. The leading topics were:

- Transportation infrastructure: 43% of concerns;
- Public facilities (primarily schools, parks and parking): 29%;
- Development projects: 13%; and
- Environmental infrastructure (solid waste, water supply, sewerage): 10%.

Residents expressed concerns with both regional circulation and inter-regional movement, i.e., mass transit. (The analysis was prepared for discussion with community stakeholders. It was accessed in December 2005 at http://honoluludpp.org/Planning/ewa/ewa5yr/StatusReportApril12.pdf.)

The Neighborhood Board minutes for 2004 and 2005 show continuing interest and concern about these themes. However, a shift of concern is apparent. Less time has been spent recently on plans for new roadways, and more on traffic flow on major streets, such as Makakilo Drive and Fort Weaver Road. Interest in ease of movement and connectivity is balanced by concern for pedestrian safety.

Major local development topics discussed included new roads, schools, the UHWO and DHHL projects in mid-'Ewa, a new electrical generating plant in Campbell Industrial Park, and plans to close Waimanalo Gulch landfill. Residents sought information about community benefits offered by Hawaiian Electric and by the city in connection with the electrical plant and landfill.

In a 2005 survey, residents of 'Ewa and Central O'ahu stood out as having longer average commuting times – 44 minutes – than residents of other O'ahu regions, and as seeing weekday traffic as "a lot worse" in the last year (57% of respondents).[1] Traffic emerged as the second "most important issues facing the State" in this poll, after education, for the first time in 2005. (The question was first asked for this poll in 1999.) This viewpoint was expressed even more strongly in a poll for the O'ahu Regional Transportation Plan (Ward Research, 2006). Some 94% of 'Ewa and Wai'anae respondents felt that traffic was a serious problem for their region.

All stakeholders expressing viewpoints at the community advisory group meetings for Ho'opili, and in interviews for this report, emphasized problems of traffic congestion and slow infrastructure development. Most mentioned their support for rail transit to help address the region's traffic problems, but added that it will not be sufficient to ease the region's traffic problems. Additional actions – movement of many jobs to Leeward O'ahu, a ferry system, and new bridges and roads between 'Ewa Beach and Honolulu – were cited as needed or worth further consideration to improve residents' quality of life.

In the O'ahu Regional Transportation Plan survey, 55% of 'Ewa/Wai'anae respondents said that they would use rail rapid transit regularly when it becomes available.

[1] The "People's Pulse" poll of January 2005 had a sample of 400 from O'ahu, 700 statewide. The "Ewa/Leeward" category reported here is distinguished from four other O'ahu areas (Honolulu, Windward, North Shore, Wai'anae) and presumably is equivalent to 'Ewa and Central O'ahu combined (accessed at http://www.prp-hawaii.com/prp/marketing/news.jsp, January 4, 2006).

'Ewa residents see the State and City as lagging far behind developers in providing for new residential areas. As a result, they would like to see developers insuring that needed infrastructure – roads, schools, parks – is in place early, not after a development is nearly built out. Some wanted the developers to pay for infrastructure, and then recoup others' share of the cost as other new developments are built.

3.3 Issues and Concerns with Regard to the Ho'opili Project

At the Ho'opili Community Task Force meetings, some local stakeholders said explicitly that the Ho'opili project had their support. They cited the project's ability to help to mitigate regional traffic problems and its contribution to regional land use planning as crucial (in the course of several meetings, they found that the project's commitment to transit, its bike trails, and its overall plan were a contribution to the region). Others recognized that the development was already within the planned urban area, but still wanted to hear how the project would help to alleviate traffic problems.

During group discussions of amenities in the project, considerable interest was expressed in features that could attract residents of the surrounding area. The park area located along Fort Weaver Road interested some as an amenity serving the Fort Weaver Road communities. The proposed town center was seen as attractive, especially if designed to allow farmers' markets or street fairs.

Interviewees included (a) a few of the stakeholders who had participated in the task force meetings and (b) persons knowledgeable about nearby institutions. Interviewees were asked about their general impressions and expectations of the project. They were then shown a preliminary map of land uses in the Ho'opili project area (Figure 2).

All stakeholders spoke about traffic and infrastructure issues. They stressed the impact of the project on the area's traffic congestion as a major issue. Some noted that, while state agencies were responsible for supplying highways and schools needed by residents, members of the regional community would be opposed to development if it worsens congestion. Respondents tended to discuss traffic as affecting the larger community, and schools as affecting future residents of Ho'opili.

Several stakeholders had heard that the developer was reserving space for a private school. They supported an increase in the number of private schools in the region. Participants in the community task force meetings favored this idea on several occasions.

A few stakeholders discussed the withdrawal of agricultural land due to urbanization of the property. They recognized that the process has long been anticipated. Community members expressed interest in seeing developers solve regional drainage problems, which have led to flooding in 'Ewa Villages in the past.

The idea of a walkable community was welcomed by some stakeholders, both as reducing dependence on automobiles and as encouraging a valued lifestyle. A few cautioned that it will be important to provide attractive streetscapes, with shade trees, to encourage walking.

Several stakeholders viewed Ho'opili as an extremely large development. In the community task force meetings, participants came to agree that the size of the project was understandable in relation to expected population growth on O'ahu. They also saw the project as being large enough to make up for the limitations of current development in the area. Still, when respondents were interviewed individually or in small groups, they were more likely to remark on the size of the project, the number of residents, and the potential traffic generated.

Some stakeholders with properties nearby expressed concern that young people from Ho'opili would add to traffic through their areas, not just along the main roads. They were concerned about both automobile and bicycle traffic.

Some stakeholders anticipated that the Ho'opili project would bring at least one more traffic light on Fort Weaver Road, and at least one on Farrington Highway. They saw this, along with population growth in the project, as adding to the major traffic problems experienced in the region.

Some informants were concerned that the project's residents would begin to experience parking and traffic problems on side streets as Ho'opili families mature, and have several cars in each household. They pointed to side streets in Makakilo as examples of roads that once seemed adequate but now are crowded.

One local resident pointed out that the proposed rail system would only be completed after the first generation of homebuyers in Ho'opili have lived there for at least a decade. As a result, children in those families would grow up in auto-dependent households, and would tend not to rely on bus and rail transportation. Later, perhaps, Ho'opili residents would come to prefer mass transit.

CHAPTER FOUR
IMPACTS AND MITIGATIONS

4.1 INTRODUCTION

This chapter deals with impacts of the Ho'opili project on social life. "Impacts" are distinguished from "issues," discussed in the last chapter. Impacts are, in the professional judgment of the analyst, likely consequences of project development, attributable at least in part to the development. "Issues" are identified as of concern to members of the community; they may point to impacts, but do not necessarily do so.

An impact makes a difference: if an issue is already felt to be a problem, and it will continue after development of a project, it is not an impact unless the project makes it happen more often or more severely. In this report, attention is paid to both beneficial and adverse impacts – in part because impacts viewed as beneficial to some may be seen as adverse to others. Where impacts appear to be adverse, ways to mitigate the impact are considered in Section 4.5.

As a major urban development, Ho'opili will affect its immediate neighbors, other communities on or near its major access roads, and the island as a whole.

Impacts may arise during planning, construction, or the operational lifetime of a project. Some impacts are likely to be transitory: construction impacts on traffic and nearby homes are limited by government regulations and usually only occur for a period of weeks or months. Others may increase over time, as the developed area becomes larger and community residents come to use facilities in the new project.

4.2 AFFECTED PARTIES

Stakeholders who may be especially affected by the Ho'opili project fall into six groups:

- Future residents and businesses in the project: These are the most immediate beneficiaries of project development, and the persons most extensively affected.
- On-site agricultural operations and employees: Two firms hold the major leases on the property, and additional farmers are sub-lessees. The two firms are the largest suppliers of truck crops (locally grown fresh produce) on O'ahu, Sugarland Farms and Aloun Farms. As development proceeds, lands now leased short-term for agricultural

use will be withdrawn, and the tenants will need to consolidate their operations and relocate them. The impact is discussed in detail in a separate report (Decision Analysts Hawaii Inc., 2007). The social impacts involve disruption of activities and, with higher production costs as agricultural operations move from the 'Ewa Plain, eventual increases in the cost of production, and hence the price of produce for consumers.[1]

Withdrawals will involve acreage larger than the land to be immediately developed. The tenants will need to provide buffers between agricultural and residential areas. While agricultural activities have constitutional protection in Hawai'i, the major agricultural operators seek to avoid confrontations with neighbors over dust, insecticides and the like. Accordingly, withdrawal of agricultural operations from the Ho'opili project land will be completed well before the project buildout (also, withdrawal of sites crucial in water distribution could affect all areas dependent on these for irrigation).

The two major tenants emphasized that land on the 'Ewa Plain is used in conjunction with other agricultural land to assure delivery of produce to Honolulu markets throughout the year. The 'Ewa lands have lower rainfall in winter months than fields at higher altitudes in Central O'ahu and, hence, are preferred for production in that period. Also, crop and variety choices depend on the specific characteristics of fields used. Relocation of agricultural operations will demand a careful review of varieties planted and cultivation techniques.

- Residents and operations on adjoining parcels: Properties adjoining or across the road from the project include two social service agencies (Child and Family Service and Kahi Mohala), older homes and small businesses along Old Fort Weaver Road, a Hawaiian Electric transformer substation, and lands to be developed by the DHHL. Much of the land on the *mauka* side of Farrington Highway is largely in agricultural use. Parts of 'Ewa Villages are directly south of Ho'opili, separated from it by part of that community's golf course.
- Residents of communities along Fort Weaver Road: This area has seen continuing growth since the early 1990s. Traffic congestion is a grave problem and concern. The communities were developed as plantation towns ('Ewa Villages, 'Ewa Beach), military housing areas (Iroquois Point and Pu'uloa), or residential subdivisions ('Ewa by Gentry, newer parts of 'Ewa Villages, West Loch, Ocean Pointe). None provides a center for activity or organization of the region as a whole.

[1] While agricultural operations will be disrupted by being moved off-site, this change has been long anticipated. The lands at the Ho'opili site were opened for truck farming only on limited-term leases, in the expectation of urban development in the near future.

- Operations on Farrington Highway: Currently, two commercial activities are located on Farrington Highway between the project site and Fort Barrette Road: the Gentry Pacific quarry and the Kapolei Golf Course. Both loaded and unloaded trucks use the highway to travel to and from the quarry. The golf course depends on the highway for access by golfers.
- Residents and other stakeholders of the larger Leeward area. Drivers from Wai'anae and Kapolei will take the H-1 Freeway past Ho'opili, and will form part of the customer and workforce base for the project. For Waipahu residents, Ho'opili will be a new development close to home.

In addition, all participants in the O'ahu housing market will be affected by the development of a new community at Ho'opili. The island economy, and construction workers in particular, will benefit from the jobs and income created throughout construction.

4.3 SOCIAL IMPACTS

Table 13 provides a listing of specific social impacts. The table organizes impacts by phase, and then describes them as actions leading to effects felt by particular groups with implications for social life. The key social impacts are in most cases due to the implications of and reactions to activities at Ho'opili, not the immediate effect. Over time, the development of Ho'opili will help to bring about a complex process of community development and integration on the 'Ewa Plain. That process will be discussed after attention is paid to more specific impacts.

Table 13: Major Socio-Economic Impacts of Ho'opili Project *(continued)*

Phase	Action	Effect	Affected	Implications
Operations – approximately 2012 to 2062 (continued)				
			Region as a whole	Secondary urban center, both FWR and NSR corridors meet local needs
		Contributions to 'Ewa Traffic Impact Fund	SDOT, DTS, area residents	Help to improve roadways for 'Ewa
		Urbanization along Farrington Highway	Regional residents, businesses	Connectivity, UHWO to FWR, alternatives to Farrington Hwy; alternative access from FWR to the H-1 Freeway
	Roadways planned to allow connectivity	Increase routes available across 'Ewa	Regional residents	More choices for in-region trips; lessen impact of regional urbanization on traffic congestion
	Planning for transit, bus, bike use	Encourage alternatives to automobiles, ridership for public transit	Residents, workers in project, O'ahu	Lower impact of population growth on traffic congestion Set an example of a planned community that encourages alternative transportation
	Schools in project	Serve residents and nearby communities	Resident of project and nearby areas	New high school may link Ho'opili, Kunia, West Loch areas. Private school would expand educational choices, opportunity for regional residents.
	Proposed District Park site off FWR	Offer new park amenity	Residents along FWR	Serve as a shared resource for FWR communities.

Notes: Abbreviations:
FWR: Fort Weaver Road
NSR: North-South Road

Table 13: Major Socio-Economic Impacts of Ho'opili Project

Phase	Action	Effect	Affected	Implications
Planning – approximately 2006 to 2009				
	Notification, meetings, and permit process	Collaborative planning	Agricultural tenants on-site	Given ample warning of eventual phased withdrawal, can plan for relocation of affected operations
			Other developers	Collaborate on plans, infrastructure
			Community	Raise concerns about impacts, explore way to mitigate impacts and create community amenities
Construction – approximately 2010 to 2030				
	Phased clearing of lands	Withdrawal of leased agricultural lands	Agricultural tenants	Consolidate operations and/or move
		Dust, noise	Adjacent properties	Irritants, controlled by State and County regulations
	Phased on-site construction	Truck and worker traffic	Adjacent properties; FWR communities	Dust, nose, truck traffic
	Road construction	Reduced road area	Other road users	Congestion; can be limited to off-peak hours
	Construction	Employment	Construction workers throughout O'ahu	Income, jobs in Leeward area.
Operations – approximately 2012 onwards				
	Housing development	Increase supply of new products	Island housing market	Housing provided in response to local demand; Increases to inventory tend to control price increases
	Mixed-use, mixed density planning	Distinctive community identity	Residents	Encourage loyalty to community; moving up over time; Facilitate bike, bus commutes; reduce car trips
	Planning for transit, bus, bicycles, pedestrian use	Less reliance on automobiles	Residents	Lead to improved health
	Urbanization of site	Further withdrawals	Agricultural tenants	Relocate, consolidate operations. Less dust and soil erosion.
		Loss of open space	Wai'anae, Kapolei	Change in view during part of commute on the H-1 Freeway; change on *makai* side of road - *mauka* still open.
		More population, traffic in 'Ewa	Area residents	Congestion on FWR, Farrington Highway, North-South Road
		New commercial, industrial space	Area residents	Jobs, shopping nearby, reduced need for commuting towards the Primary Urban Center.
		Medical park space	Area residents	Increased access to health providers
			Local industry	Complaints about noise, dirt, spills from residents

4.3.1 Planning Phase

During planning and permitting, the developer has consulted with lessees currently on-site, with other developers, with members of the surrounding community, and with government agencies. For the agricultural tenants, the discussions deal with operations, long-term coordination, and planning. These meetings will eventually give notice of when fields will no longer be available for cultivation, and allow lessees to schedule future planting and harvests. Discussions with other developers and public agencies help in coordinating plans, notably in encouraging connectivity between future DHHL, UHWO, and D.R. Horton projects. These discussions have helped developers and local community leaders give input together on regional roadways and planning for O'ahu's future mass transit system.

The Ho'opili Community Task Force has offered ideas concerning development choices and ways in which the Ho'opili project can be integrated with the surrounding area. It provides a channel for the developer to share facts and viewpoints with the community. Topics have included regional transportation, public and private schooling for the region, employment, and public spaces in Ho'opili for gatherings and recreation. Participants have identified community concerns and criticism of development, and discussed ways in which Ho'opili can be designed to correct or mitigate problems and contribute to the larger regional community.

4.3.2 Construction Phase

Construction will bring physical irritants such as noise, dust, slow traffic on roadways around the project, which can be controlled through adherence to regulations established by the State Department of Health and the City and County of Honolulu, and directing construction traffic to off-peak hours. Impacts are most likely to affect Ho'opili residents, residents of the new UHWO and DHHL East Kapolei area, and perhaps golfers on the 'Ewa Villages course located directly *makai* of Ho'opili. For the agricultural tenants, construction will continue the phased withdrawal of lands from agricultural use.

For construction firms and workers, development at Ho'opili will bring income. With steady work at Ho'opili over many years, construction workers will be increasingly likely to live in Leeward O'ahu.

4.3.3 Operations Phase

The Ho'opili project will include approximately 11,750 homes. That number amounts to approximately 4.5 years' supply of new housing for O'ahu.[2] The project is located in an area in which new housing is expected to serve the needs of O'ahu's middle-income residents, rather than the mix of upper income residents and part-time residents found in established upscale neighborhoods.

New housing production increased through 2003; housing price increases continued through 2005. Figure 9 shows that the number and share of new units produced for middle-income families – 80% to 120% of the County median income – declined after 2003. Production for lower-income households disappeared.

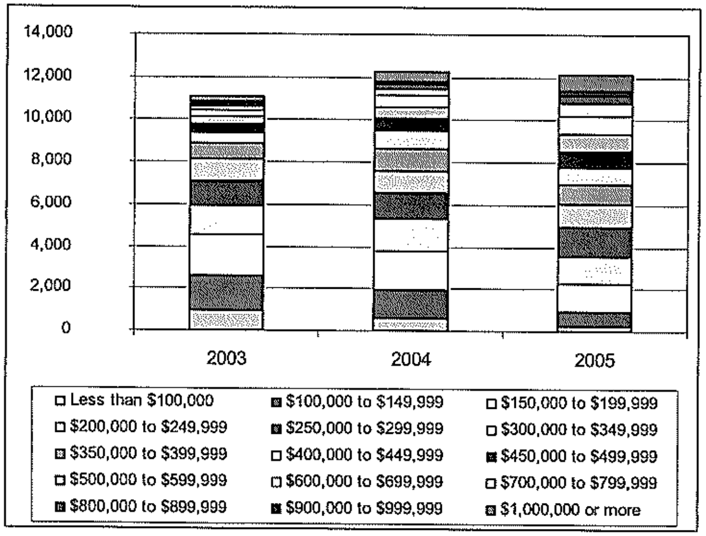
When sales data from the Multiple Listings Service – i.e., resales of existing homes – are compared, it is clear that the distribution of units sold by price range has changed in two ways. Fewer units are sold at the lower price ranges, and the number of units sold in each price range tends to be about the same. Buyers who can pay higher prices are finding homes; families with limited resources have less choice or no opportunity to enter the 'for sale' housing market.

O'ahu needs housing for middle-income families. By developing new housing for the middle-income group, Ho'opili is responding to that need. Moreover, new housing construction will help to limit price increases for both new and resale housing.

The proposed housing will be in neighborhoods that integrate low- and medium-density or medium- and high-density residential areas. As a result, Ho'opili will include a range of income levels, and will likely include mixed-income neighborhoods. In this respect, it will resemble Hawai'i Kai and Mililani: planned communities that have become home to thousands of O'ahu residents who choose to move up within their community as they grow older, rather than move to other communities. However, Ho'opili will differ in several ways from existing subdivisions. It is being planned as part of a regional community. It is designed to encourage walking, bicycling, and use of public transport. Live/work units will be integrated into the development.

[2] The average number of new units built on O'ahu was 2,588 for the years 2000 through 2005 (DBEDT 2006). There is clearly demand for a larger number of units; the most recent Housing Policy Study estimates new demand for about 3,050 new units annually as of 2007, growing to about 4,280 units by 2024 (SMS 2003).

Figure 14: O'ahu Sales on Multiple Listings Service, by Price Range, 2003-2005



The presence of industrial and commercial areas will work to make Ho'opili a community, and not just a bedroom subdivision, for many residents. Some will be able to live and work within the community. Moreover, bus routes and bike paths connecting to every school in the project will encourage residents to live and work within the project with less dependence on their automobiles than in other developments. The project's design for alternative means of transportation will increase the number of young people who can reach their schools by bicycle – again, lowering automobile traffic.

Planning for Ho'opili will encourage community identity and encourage trips within, rather than outside, the development. The commercial core of the development will be a focus for socializing, shopping, and for special events.

Urbanization of the site will have mixed consequences. The first is continuing withdrawal of land from agriculture.[3] Agricultural tenants note that they will have to withdraw land to buffer new development from cultivation, as well as the land actually developed in early phases. Consequently, more land will be

[3] For discussion of the impacts of Ho'opili on agriculture, see Decision Analysts Hawaii, Inc. (2007).

withdrawn from agriculture during the early years of project development than will be urbanized. As noted earlier, the withdrawal will force agricultural tenants to move, and may increase operating costs. However, the land was slated for urban development even before truck crops and seed corn were planted on-site. Tenants had reason to know that cultivation was an interim use of the site.

From the H-1 Freeway, the major route used by residents of the Wai'anae Coast and the Kapolei area, the *mauka* view will remain open. *Makai*, drivers now see a berm, with occasional views of fields, succeeded by residential areas and the ocean in the distance. Development at Ho'opili (and the proposed elevated rail transit) will hence affect only part of the view plane from the highway. Project plans call for a landscape buffer along the H-1 Freeway right-of-way.

The visual impact of the project will be greater along Farrington Highway. Currently, there is little development along that roadway between Kapolei Golf Course and Fort Weaver Road. This will change with the development of the UHWO campus. Development of Ho'opili, along with the City-planned widening of Farrington Highway (and the proposed elevated rail transit), will extend the transformation of open space to urban areas. Also, Ho'opili will include destinations – notably commercial areas at the intersections of the highway with the North-South Road and Fort Weaver Road – encouraging travel along this roadway.

Urbanization will add to traffic on Fort Weaver Road and Farrington Highway through the project area.[4] On the other hand, development of the North-South Road and the H-1 Freeway access associated with the new roadway will help to limit congestion throughout the regional road system. New roads within the project will provide additional connectivity between Fort Weaver Road and the North-South Road and between the DHHL lands to the south of Ho'opili and Ho'opili itself.

Before Ho'opili is built, the new H-1 Freeway interchange will serve the North-South Road and Farrington Highway. This will be important for trucks to and from the Grace Pacific quarry and plant: they will travel to the new interchange, rather than along Farrington Highway past a major portion of the Ho'opili site. Accordingly, urbanization along Farrington Highway east of the new interchange will have little or no impact on this truck traffic.

Agricultural tenants and industrial managers expect that growth of residential areas will bring complaints about dust, litter, noise, and other irritants. As the

[4] For a detailed quantitative analysis of the project's impact on transportation and traffic congestion, see the Traffic Impact Analysis Report (Wilbur Smith Associates 2007). Traffic congestion is a social issue insofar as it affects the quality of life. As such, it is discussed in this report.

area urbanizes, they will need to be increasingly sure that they do not intrude on residents' enjoyment of the area.

Eventually, rail transit could be built along North-South Road and Farrington Highway. Plans for Ho'opili have been drawn up with transit in mind, even though the exact route and placement of stations is still undecided. With transit, the project can further minimize dependence on automobiles by its residents.

The Ho'opili site fronts Old Fort Weaver Road. Properties on that road include older homes and a mental health facility. These have already been affected by development in the region, inasmuch as the daily afternoon rush hour commute fills this roadway as well as the major roads. With development of Ho'opili, the existing properties will be more visible to new neighbors. Development of commercial areas – both fronting Old Fort Weaver Road and along Farrington Highway just east of the northern end of Old Fort Weaver Road – will make commercial facilities more accessible to this neighborhood. However, project plans call for open space along much of Old Fort Weaver Road, limiting visual impacts.

A new road (referred to as the "proposed East-West Connector") will link Old Fort Weaver Road to the new North-South Road, through the Ho'opili project. While the project will add to traffic along the existing road, it will also provide an additional route that residents of Old Fort Weaver Road and the Fort Weaver Road corridor can use to travel from their homes to the west towards the city of Kapolei.

Ho'opili has been planned with the reduction of traffic impacts in mind. First, it includes transit-oriented development. Bus lines have been identified to encourage residents throughout the project to use rapid transit or to use buses or bicycles within the project area. Street sizes and connectivity will encourage pedestrian and bicycle movement. To the extent that automobile use declines (or Ho'opili attracts new residents who are less committed to automobile use than others), residents can expect to have more exercise, and be healthier than people in other subdivisions of Leeward O'ahu.

Schools in the project will serve residents of Ho'opili and nearby subdivisions. A high school will certainly attract residents from nearby areas – West Loch, UHWO, and the future DHHL areas, and possibly Royal Kunia. As a result, students from those areas may come to see Ho'opili as a focus for community life. If, as planned, a private school is built within the project, this will increase local families' educational choices, and possibly reduce one of the destinations for commuting outside of the region.

A proposed medical office park will complement the nearby hospital, making it easier for residents of the region to get access to health providers.

The project includes a canyon area below the elevation of most of Ho'opili. This can be developed as a passive park space easily accessible to residents of the Fort Weaver Road communities and available to anyone in the region.

Additional park spaces within Ho'opili will serve residents by providing play space and open areas near the homes. The regional demand for play areas will be met in part at the new Kroc Center on North-South Road and a proposed County District Park site along Fort Weaver Road. Eventually, additional fields may be developed (as initially proposed by the City and County of Honolulu) within Kalaeloa to the south.

4.4 COMMUNITY DEVELOPMENT ON THE 'EWA PLAIN

Development of a "second city" on O'ahu has long been a policy of the State and City and County. The process began with planning for Kapolei and the growth of the James Campbell Industrial Park as the island's major industrial area. It continued with commercial and office development in Kapolei and several residential subdivisions in the Kapolei area and along Fort Weaver Road. With the rapid growth of those subdivisions, policy makers became concerned that 'Ewa would serve many of its residents as a bedroom suburb of Honolulu.

The second city is increasing understood as covering much of the 'Ewa Plain, with discrete land uses serving a regional community and with a system of roadways connecting different community areas and land uses. The new Kroc Center and UHWO campus, for example, will serve the region. They will be reached by routes now being built – the North-South Road and Kapolei Parkway – and new or widened roadways through Ho'opili, as well as bus and rail transit.

Mixed uses are increasingly being planned and built as well. Mehana in the City of Kapolei includes a mix of residential densities. Its first phase emphasizes live-work townhomes. Plans for the Kalaeloa Redevelopment District emphasize density, a new spine road, and mixed use development.

Ho'opili will contribute to the growth of urban community life in 'Ewa by providing new job locations, recreational areas, and schools as well as housing. Its transportation planning will work to address the region's serious traffic congestion problems. It will help to link existing and new communities, serving its neighbors as well as its residents.

Finally, further urbanization on the 'Ewa Plain could well have implications for community and political life on O'ahu. The region's political stance has been characterized in recent years by a sense of isolation. Local representatives have argued that their area receives O'ahu's unwanted land uses such as landfills and electrical plants, but little infrastructure that would improve quality of life for residents of the region. Support for this view can be found in studies that show county spending to be concentrated in older urban areas (Decision Analysts Hawaii, Inc. 1994). The obvious inference is that, with increasing population, areas of the island can expect to receive a larger share of government funding. As the 'Ewa Plain becomes urbanized, it will come to gain its fair share of funding for infrastructure and other services.

4.5 MITIGATION OF ADVERSE IMPACTS

The Ho'opili planning process has been characterized by extensive involvement with lessees and the surrounding community. That process has allowed for early identification of community concerns, leading to steps to mitigate or avoid anticipated impacts. As noted above, consultation with agricultural tenants is intended to lead to orderly consolidation of cultivated fields and to minimize the chance of conflict between agricultural operations and residents.

The developer plans to continue communications with local stakeholders such as the Neighborhood Boards, helping to alert the wider community to future opportunities for public input. After the current planning phase, it will be helpful to share information about upcoming construction activity and to invite regional participation in onsite events.

During construction, state and county regulations will limit noise and dust from construction activities. The project's builders will conform to those regulations and work with government agencies to co-ordinate work on or next to major roads, limiting the time in which drivers will be slowed down by construction zones.

Traffic impacts will be mitigated through several measures. First, the project's mixed use design is aimed to minimize traffic on the local roadways. The project is planned to be bicycle- and pedestrian-friendly, and transit-oriented. Next, Ho'opili will contribute to the 'Ewa Transportation Impact Fee program, supporting development of local roadways and easing impacts on the already-crowded arterials. Furthermore, the developer will implement the improvements identified in the Traffic Impact Analysis Report as needed to mitigate the impacts of the project on local roadways. Finally, the developer is investigating ways in which Transportation Demand Management activities can help to lower congestion during peak hours.

CHAPTER FIVE
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Appendix J
Market Assessment

MIKIKO CORPORATION

MARKET ASSESSMENT FOR HO`OPILI

ISLAND OF OAHU

Prepared for:
D.R. Horton – Schuler Homes, LLC
dba D.R. Horton - Schuler Division

FINAL REPORT

March 2007

Market Assessment for Ho`opili

Table of Contents

MARKET ASSESSMENT FOR HO'OPILI

Report Text

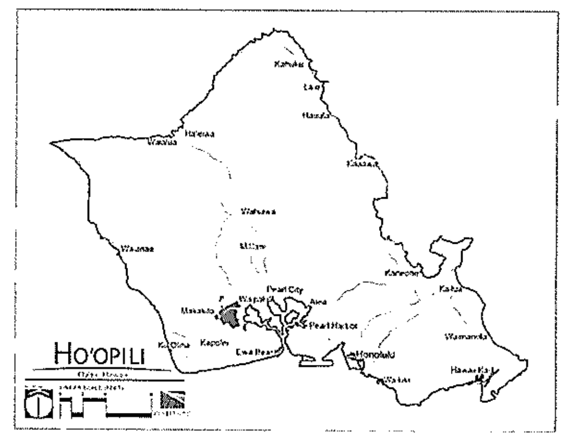
1 – Introduction and Executive Summary

Project Background (Exhibits 1-1 and 1-2)

D.R. Horton – Schuler Homes, LLC dba D.R. Horton – Schuler Division (DRH) owns approximately 1,555 acres in the Ewa District of Oahu. DRH proposes to develop these lands as an integrated, live-work community to be known as Ho`opili.

Ho`opili (the Project) occupies a prime development site due to its location within the Ewa Development Plan Area (DPA), which has long planned by the City and County of Honolulu (County) and the State of Hawaii (State) to accommodate the majority of future population growth for the island of Oahu. Within this district, Ho`opili is one of the most strategic urban expansion areas on the island:

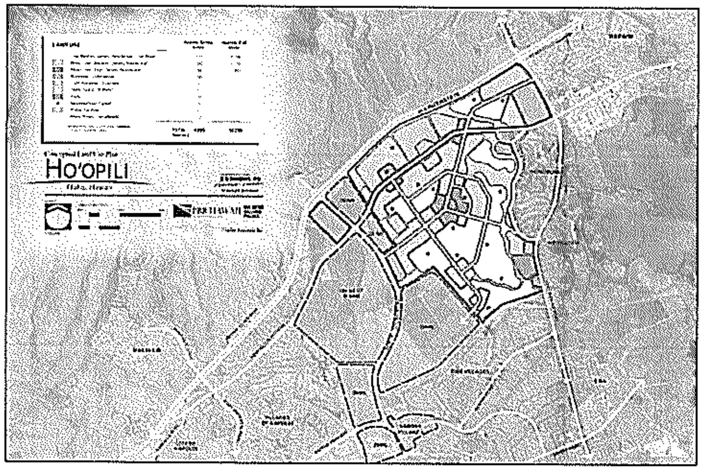
- It stands at the "gateway" between the Ewa and the Central Oahu districts, fronting both H-1 and Fort Weaver Road.
- It is at approximately the center of population for the island.
- It is next to the planned University of Hawaii at West O'ahu (UHWO) campus and community, several residential and commercial areas planned by the State Department of Hawaiian Home Lands (DHHL), and the existing communities of Ewa Villages and West Loch.
- It encompasses current alignments for the County's proposed mass transit system.



Source: PBR Hawaii & Associates, Inc.

As envisioned, Ho`opili would encompass:

- **11,750 residential units**. Many of these would be developed in mixed-use structures combining retail and/or office uses. Up to 30% are expected to be developed as "affordable" units, in accordance with County guidelines.
- **2.96 million square feet of commercial retail or office spaces**, some within six Business/Commercial designated areas,[1] and some dispersed in residential mixed-use areas.
- **50 gross acres of business park or light industrial** uses, located between H-1 and Farrington Highway.
- Regional and neighborhood **parks, open spaces and a trail system.**
- Up to six sites for **schools or other public uses.**



Sources: PBR Hawaii, DRH, Van Meter Williams Pollack, Charlier Associates, Inc., 2006. See Exhibit 1-1 for copy at larger scale.

[1] One Business-Commercial site is located across the developing North-South Road from the rest of the community, separated by lands held by DLNR.

DRH estimates that the first real estate products at Ho`opili could be marketed as early as 2012. Further information on the resident, commercial and business park uses, which are the subject of this market study, are presented in Exhibit 1-2.

Study Background

DRH has initiated a planning and entitlement process for Ho`opili, including an Environmental Impact Statement (EIS) that will be used in the State Land Use and County zoning processes. PBR Hawaii & Associates, Inc. (PBR Hawaii) is assisting DRH in this process and asked Mikiko Corporation (MC) to prepare market, economic and fiscal impact assessments for the Project, addressing the residential, commercial retail/office and industrial land uses noted above.

This report covers the market assessment. The economic and fiscal impacts of the Project are described in a separate report.

Mikiko Corporation Study Objective

MC's objective in this study was to describe the market support for development of the residential and commercial uses proposed at Ho`opili, in terms of:

a) Evidence of the demand for and competitive supply for the residential, commercial and light industrial/business park development elements, and

b) Assessment of likely market segments, supportable market shares and market absorption at Ho`opili; also, for residential units, assessment of supportable unit pricing.

These evaluations are based in part on information and planning parameters provided by PBR Hawaii and/or DRH.

The remaining sections of this chapter summarize the market conclusions. The rationale behind these conclusions, as well as documentation of the study methodology and supportive data, may be found in the subsequent chapters.

General Community Outlook

Structural Changes

The projections developed herein largely judge that during Ho`opili's marketing timeframe (about 2012 to 2030), the Ewa DPA in general and Kapolei and East Kapolei in particular will approach their desired roles in a "Second City" for the State of Hawaii. An analogous though more advanced example of the roles played by the various areas of this urbanizing area may be drawn from Hawaii's "First City":

- **The City of Kapolei** would be the Ewa DPA's Central Business District (CBD),

- **East Kapolei** would be a nearby, and one day possibly adjacent, supplementary business district with lower densities and more residential uses, analogous to the Kapiolani or Kaka`ako districts, and

- **Ewa DPA** would be the entire area that is directly driven by the economic and civic leadership of the CBD and its supplementary business areas, analogous to the broader "City of Honolulu."

Approaching this desired outcome will require structural changes in the economy and culture of the area and will have far-reaching effects on the markets for housing, retail, office, business park and other land uses. This general outlook for Ewa assumes that some significant regional milestones are met during Ho`opili's marketing. These include establishment of:

- New centers of "primary jobs," those with sufficient income to sustain a household;
- Public policy support for new economies relevant to the area;
- More, high-quality elementary, middle and/or high schools;
- More options for entertainment, cultural, civic and spiritual endeavors;
- More high quality housing targeting a wide range of income and age groups;
- Neighborhoods of move-up housing; and
- More efficient transportation linkages within the area and to the rest of Oahu.

All of these precursors to change are in progress, and all are also reinforced by Ho`opili itself. Those already underway include:

- Plans for the new UHWO campus, with expanded programs and a surrounding town;
- The new State judiciary complex in Kapolei, with 650 direct and indirect jobs;
- Plans for other office buildings in Kapolei;
- Significant inventory of new business park areas under development in Kapolei;

- Growth of the private Island Pacific Academy college preparatory PK-12 school;
- Second home and golf-front developments recently entitled at Kapolei West;
- Development planning for the first regional shopping centers in Ewa;
- The promotion of knowledge- and innovation-based economies Statewide;
- Discussion of high technology or defense-related developments at Kalaeloa;
- Planned transit service linking Kapolei to Honolulu, and going through Ho`opili;
- Development of the North-South Road and Kapolei Parkway; and
- Improvements to Fort Barrette and Fort Weaver Roads.

New Urbanism

Considering the magnitude of demand for new housing and commercial facilities, yet with respect for Hawaii's precious island land, it is fortunate that Hawaii residents, like other people worldwide, are showing interest in more dense "urban village" living styles. Given the environmental burdens of population growth, this "New Urbanism" or "Smart Growth" movement not only reflects taste changes but a more sound approach to the use of natural resources. Chapter 3 offers a more complete discussion of these trends.

Ho`opili is in the path of urbanization, along a proposed transit route, and adjacent to existing and new centers of employment such as UHWO. These characteristics enhance "New Urbanist" planning, and support the mixed-use, higher-density developments proposed at Ho`opili.

Summary of Market Conclusions

The table below summarizes the projected market support for the land uses evaluated. These conclusions are explained in the sections and chapters that follow.

Projected Market Absorption at Ho`opili

	2012-2015	2016-2030	Total
Residential units	2,600	9,150	11,750
Commercial (square feet)	600,000	2,360,000	2,960,000
Business Park (net acres)	40	0	40

Source: Mikiko Corporation, 2007.

Residential Market Assessment

Market Environment

Oahu has an acute shortage of housing suitable for primary residents, with an estimated pent-up demand for some 17,000 units as of the end of 2006. Additionally, based on growth projections in a study prepared for the State and county housing agencies, Oahu will need to house some 81,000 more households by 2030.[2]

About 55,100 potential future housing units are currently entitled at the State Land Use Commission (LUC) level.[3] Even assuming substantially accelerated housing development in the short-term, without further Urbanization of lands for residential use, Oahu's housing shortfall could gradually be pared down to some 10,000 units by about 2015, but it could then spiral to about 46,000 units by 2030.[4]

This conclusion is summarized as follows:

Supply and Demand for New Resident Housing Units on Oahu 2007 to 2030

Future Demand	Pent-up demand, end 2006	17,000
	Future need, 2007-2030	81,000
	Total need	98,000
Future Supply	Planned and entitled (55,000 less 5% vacancy)	52,000
Shortage	**As of 2030**	**46,000**

Source: Mikiko Corporation, 2007. Future supply estimate assumes full buildout of all lands currently designated Urban by the LUC, and proposed for residential development. See Exhibit 3-8 for further information.

[2] SMS, Inc., "Housing Policy Study, 2006: Hawaii Housing Model 2006," February 2007.

[3] In this report, "State-entitled" or "LUC-entitled" means lands carrying LUC "Urban" designation or those that are proposed for development but may be exempt from State regulatory control. Some of these would still require County zoning or other entitlement in order to proceed.

[4] Besides Ho`opili, other major developments for which State entitlement are sought include Koa Ridge and Waiawa by Castle & Cooke (up to 5,000 units) and Gentry Waiawa Phase 2 (up to 7,000 units.) Even if all three of these projects were entitled and developed to their full potential by 2030, Oahu could still be 22,250 housing units "short" (46,000 – 11,750 – 5,000 – 7,000).

Ho`opili Residential Market Assessment

Ho`opili's housing units are an important component of the Ewa regional plan as well as a solution for up to 25% of the island's currently unentitled housing needs through 2030.

- **Product mix** – The majority of Ho`opili's 11,750 residential units would be for-sale multifamily homes. The Project would also include single-family units for-sale and multifamily rental units. The exact mix of units by type will be determined during build-out, as market conditions and preferences materialize.

- **Development densities** – Ho`opili's single-family units would be developed at about 5 to 8 units per net acre while its multifamily units could range from low-rise townhouse units at 10 to 14 units per net acre, to mid-rise development at 30 to 50 units per net acre.

- **Target markets** – Up to 30% or 3,525 units is expected to be developed as affordable housing, in accordance with the County's affordable housing guidelines.

  Among the market for-sale units, the majority is expected to be purchased for use by owner-occupants. Some may be purchased as investments and rented out, again resulting in units for primary resident use.

- **Pricing (2006 dollars):**

  - **Market units:** Multifamily units are expected to find market support in the $350,000 to $650,000 range, while single-family units might be priced from about $500,000 to $750,000.

  - **Affordable units:** Pricing will be based on then-prevailing County rules and market conditions. For illustrative purposes, the County's 2006 price guidelines included:

    - For-sale units: $232,000 to $392,000 for families of four earning 80% to 120% of the County median income.

    - Rental units: $998 to $2,481 per month, for studio to 4-bedroom units and households earning 80% to 100% of the median County income.

- **Market share** – By the time of Ho`opili's marketing, there could be few other large residential developments with inventory. Hypothetically, if there were no further LUC entitlement of Oahu residential lands other than Ho`opili, the Project's fair market share in the 2016 to 2030 timetable would represent about 39% of developable inventory. However, three large residential projects in Central Oahu are preparing to petition the LUC at this time. Even if these projects were also entitled and marketed in a competitive time frame, Ho`opili's fair market share could still represent about 28% of Oahu's future market, as shown below.

Hypothetical Ho`opili Fair Market Share Under Two Entitlement Scenarios, 2016 to 2030

	Scenario 1: Add Ho`opili	Scenario 2: Add Ho`opili, Gentry-Waiawa, Waiawa-C&C & Koa Ridge	Notes
Entitled additional units, 2015 – 2030*	18,700	18,700	See Exhibit 3-7.
Ho`opili*	11,750	11,750	Maximum proposed.
Castle & Cooke-Waiawa and Koa Ridge plus Gentry Waiawa Ph 2*	0	12,000	Expected maximum residential entitlements to be sought.
Total potential inventory	**30,450**	**42,450**	Net of currently entitled but unplanned future developments.
Hypothetical Ho`opili Fair Market Share	**39%**	**28%**	**Percent of future Oahu market**

* Remaining developable inventory could vary, depending on amount of sales realized by 2015.
Source: Mikiko Corporation, 2007.

The above benchmarks are considered hypothetical since other development plans will inevitably emerge over the next decades. However, they are worthwhile benchmarks since Oahu is running out of large, developable tracts of land for new development.

In recent years, Oahu has absorbed around 2,000 developer units per year, with supply constraints. To begin to address pent-up and future demand, the island would have to produce around 3,900 units per year[5]. This assessment concludes that Ho`opili could achieve a 15% to 20% market share of the future island market, assuming there is sufficient other Oahu supply to approach the 3,900 units per year goal.

[5] 81,000 future + 17,000 pent-up demand satisfied over 25 years would require an average production of 3,920 units per year (98,000/25).

If future development represents only 2,000 units per year, closer to Oahu's historical levels and likely resulting in an increasing housing crisis, the Project's achieved market share could be expected to represent 30% to 35% of Oahu sales.

Projected Annual Residential Unit Sales Absorption at Ho`opili

	Scenario 1: At recent historical levels of Oahu production	Scenario 2: At demand-satisfying levels of Oahu production	Conclusion for Ho`opili
Assumed total Oahu developer sales	2,000	3,900	
Ho`opili market share	30% - 35%	15% - 20%	
Ho`opili average annual sales	**600 - 700**	**585 - 780**	**650**

Source: Mikiko Corporation, 2007.

Absorption – The above capture rates support the study conclusion that Ho`opili could sell about 650 units per year on a long-term average basis. Year-to-year sales would vary depending on production, unit mix, market and other factors.

The average sales could represent about 450 market units and 200 affordable units in any given year. The for-sale affordable housing is assumed to be absorbed more gradually because it would generally need to be developed as infrastructure and community facilities are supported by market unit sales.

This sales pace would lead to complete absorption of Ho`opili's residential inventory within 19 years, or by 2030.

This analysis assumes all units are built as for-sale housing. However, some may be developed as rentals, which would be expected to accelerate absorption.

Illustrative Mix of Potential Residential Sales Absorption at Ho'opili

	Market units	Affordable for-sale units	Total for-sale housing
Potential total inventory	8,250	3,500	11,750
Average annual sales	**450**	**200**	**650**
Years on market	19	18	19
Start date	2012	2012	2012
End date	**By 2030**	**By 2029**	**By 2030**

Source: Mikiko Corporation, 2007.

Commercial Market Assessment

The commercial market assessment encompasses retail- and office-based developments, in recognition of the mixed-uses planned at Ho'opili as well as the typical crossover of office spaces within shopping centers and retail uses in office complexes. Specific types of commercial uses within each area of the Project will be determined in accordance with future market conditions and area-specific needs as each area is planned.

Retail Market Environment

Oahu's retail environment is considered undersupplied, with a year-end 2006 vacancy of 2.18%, the lowest in 15 years, according to Colliers Monroe Friedlander, Inc. (CMF.) Considering a Project Trade Area consisting of the Ewa, Central Oahu and Waianae DPAs, there were about 3.9 million retail square feet of gross leasable area (GLA) with an average vacancy of 2.5% in December 2006.

Another 3.9 million square feet of retail-based areas are planned and entitled within the Trade Area, mostly in Kapolei and East Kapolei. While these increases would be dramatic, given the large population increases anticipated in the region, its transition away from a bedroom community, and its under-retailed status today, the Trade Area could still be undersupplied throughout the projection period.

Office Market Environment

The Ewa DPA includes some 436,000 square feet of rentable building area (RBA) office space, mostly in Kapolei.[6] Central Oahu offers 194,000 square feet. The fact that Ewa's inventory is already twice Central Oahu's despite a population of about half of Central Oahu's demonstrates the widespread confidence in the area's potential as a future urban center.

Year-end 2006 office vacancies in "Leeward Oahu," which includes Ewa, Central Oahu and Waianae, were estimated at 6.4%, compared to 7.0% for the island as a whole, according to CMF. The Oahu rate was the lowest it has been since 1991, due to strong recent absorption.

Based on current plans, Ewa and Central Oahu's office-based areas could increase to 1.6 million square feet by 2015, and to 2.4 million by 2030. However, about a third of this potential future inventory is in Kalaeloa, where development plans are in considerable flux.

Ho'opili Commercial Market Assessment

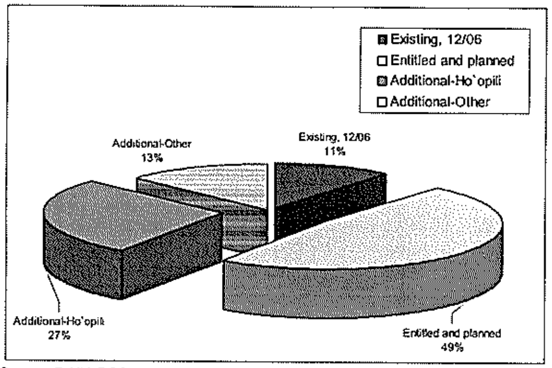
- **Product overview** - Ho'opili is proposed for up to 2.96 million square feet of commercial uses on six Business/Commercial-designated and other mixed-use sites. Commercial areas would be developed for retail or office purposes, or in flexible capacities such as "live-work" units where portions of a unit could be used for residential or office purposes.

- **Sources of demand** – Ho'opili's primary retail Trade Area is considered to include the Ewa, Central Oahu and Waianae DPAs, while its office areas could draw from a larger community, including businesses that attract employees from throughout Oahu.

- **Market share** - If developed to the full proposed capacity, Ho'opili's commercial spaces could represent about 27% of the Ewa DPA's total 2030 inventory. It could also represent a venue for about two-thirds of the currently unplanned but future supportable commercial space in the DPA.

[6] The office market survey excludes government office buildings and office spaces that are ancillary to shopping centers. The Kapolei inventory noted above excludes the 215,000 square foot State Office Building, 96,000 square foot Kapolei Hale and 50,689 square foot Police headquarters.

Ho'opili Commercial Development in Relation to Ewa DPA Marketplace, at Maximum Build-Out



Source: Exhibit 7-2 for sources and further information.

These market shares are considered achievable in light of the prime locations enjoyed by the site and the diverse commercial development types that are proposed for Ho'opili. Given that potential commercial developments on other entitled lands throughout Kapolei, East Kapolei, Ocean Pointe and Ewa Beach have already been accounted for, Ho'opili appears to be one of the only remaining areas within the DPA on which substantial commercial development could occur.

- **Absorption** - While some early commercial development will likely be a priority to anchor and serve the first increments of development at Ho'opili by 2015, the majority of the Project's commercial areas could be expected to be developed between 2016 and 2030.

Business Park/Industrial Market Assessment

Market Environment

Ewa offered some 1,560 acres of business park or industrial areas in 2006, all in Kapolei. Central Oahu included only about 320 acres. In terms of industrial building space, Ewa is considered undersupplied, with a 2.6% vacancy as of December 2006, according to CMF.

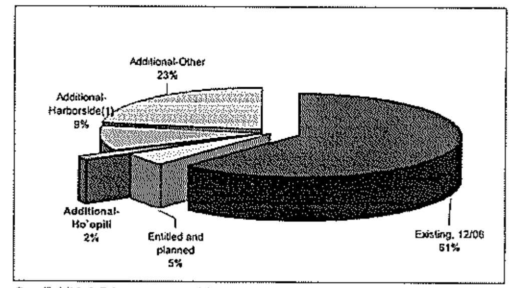
Kapolei's share of Oahu industrial building space inventory has ranged from 12% to 14%, but the area accounts for the vast majority of new space absorption on Oahu, some 70% to 90% since 2003. This reflects the strong market potential of the Kapolei region and the island's growing dependence on this area to serve its industrial and business park-related needs.

There are some 280 net acres entitled and planned for business park/industrial use in Ewa. However, the analysis concludes that about 280 more acres could be needed in the DPA by 2015, or 850 by 2030, over and above the planned inventory.[7] Not included in the planned count is the Kapolei Harborside Center, which is proposed for 345 acres (240 net saleable) and currently involved in hearings before the LUC. If Harborside is entitled, the region would still be expected to demand another 40 acres by 2015 (280 - 240) or 610 by 2030 (850 – 240).

Ho'opili Business Park Market Assessment

- **Product overview** - Ho'opili would offer one prime business park site of 50 acres (40 net acres). Due to its location within a mixed-use residential community, the park is expected to cater to "clean" industries such as office headquarters campuses, research & development facilities, or service-retail uses.
- **Sources of demand** – As for other industrial/business park users in Kapolei, the trade area for businesses at this site would be expected to be super-regional, island-wide, Statewide or even out-of State. The analysis was prepared on the basis of Oahu-wide demand generators, with consideration for inter-regional movements of tenants.
- **Market share** – The 40-net acre site would represent only 2% of the future supportable areas in the region. Even if the Kapolei Harborside project receives LUC and other approvals to permit its development, there could remain substantial unmet demand for business park or industrial lands in the area, particularly in the 2015 to 2030 period.

Potential Ewa DPA Business Park/Industrial Inventory, 2030 (Ho'opili site as currently planned)



See Exhibit 8-7 for sources and further information.

[7] About 144 acres of the 280-net acre planned inventory are located in Kalaeloa, where the ultimate use and development timing is very uncertain as of this writing.

- **Absorption** – Based on the Ewa net demand and the other developments proposed at Ho`opili, this site could be expected to find market support by 2015. However, its sale or lease could also be delayed in order to find the optimal user(s) for this key, high visibility position within Ho`opili.

- **Further development potential** - Given the strong regional market outlook, the outstanding location, access and visibility of Ho`opili, and the planned integration of a business park site into a mixed-use community with a range of housing opportunities, it is concluded that there could be market support for two or more times the current land allocation of 40 net acres at the Project. The additional areas would be expected to find market support between 2015 and 2030.

  Even at an expanded 80 net acres, business park development at Ho`opili would represent only 4% of future regional inventory in 2030, or 10% of net unplanned-for demand in the DPA.

- **Potential development concepts** – A business park at Ho`opili could be an iconographic source of high quality employment for the community. Example development types that might be considered include:

  - **Science and technology park** – This could be a complex catering to innovation- and knowledge-based enterprises. Its market could relate to the site's proximity to the proposed UHWO as well as its location on a future transit route and the modern infrastructure and planning of Ho`opili.

  - **Lifestyle/wellness campus** – Baby Boomers and younger generations have demonstrated significant expenditures at enterprises that cater to enhancing quality of life and appearance, and in prolonging one's healthy and productive years.

  - **General business park** – The site could also be developed as a more generic business park, offering land sales or space sales/leases to a variety of enterprises, including those related to the above concepts.

Report Conditions

This assessment is based on information provided by government agencies, developers, brokers, landowners, and other third party sources. While every attempt has been made to verify information via multiple sources, it is not always possible to do so. MC has noted any data that appears inconsistent, but cannot guarantee the accuracy of all information upon which its assessments are based.

MC has no responsibility to update this report or any of the underlying data for events and circumstances occurring after February 1, 2007, the date of substantial completion of primary data collection.

This report is for the planning purposes of DRH, PBR Hawaii and their consultants, as well as for public disclosure of the nature of the Project pursuant to seeking State and County land entitlements. It is not to be used for solicitation of investment or other third party purposes without prior written consent of the author.

This report does not offer an appraisal of the Subject, nor should it be construed as an opinion of value for the Project.

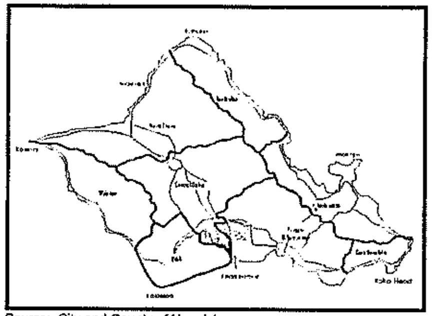
2. Economic and Demographic Trends

Geographic Areas of Analysis

City and County DPAs

Much of the economic and demographic data presented herein is organized by the City's DPAs. Ho`opili falls within the Ewa DPA, which extends from Iroquois Point on the western side of Pearl Harbor, up Fort Weaver Road and circles back to the Waianae coastline between Waimanalo Gulch and Nanakuli.

Oahu Development Plan Areas



Source: City and County of Honolulu.

Special attention is also given herein to the adjacent Central Oahu and Waianae DPAs because they represent supplementary markets for Ho`opili's commercial and community amenities.

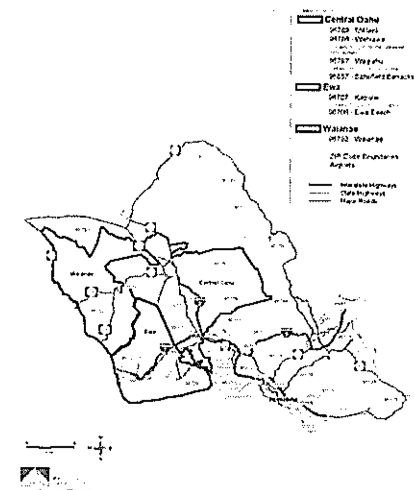
- **The Ewa DPA** encompasses the Subject as well as Makakilo, Kapolei (including the Villages of Kapolei, Kapolei City and East Kapolei), Ko Olina Resort, Ewa Villages, Ewa by Gentry, Ewa Beach, Iroquois Point, and several proposed or developing communities including Mehana, Maka'iwa Hills, and UH West Oahu.
- **The Central Oahu DPA** includes the communities of Waipahu, Village Park, Waipio, Wheeler Air Force Base, Schofield Barracks, Wahiawa, Kunia, Mililani and Mililani Mauka, Waikele, Waipio Acres and Waiawa. It stops short of Pearl City and Waimalu.
- **The Waianae DPA** includes the towns of Nanakuli, Ma`ili, Wai`anae and Makaha, as well as the Lualualei Military Reservation. It extends out to Ka`ena Point.

DPAs Approximated by Zip Code (Exhibit 2-1)

The City's DPAs often follow natural features that are not recognized as census divisions, so it is difficult to collect economic and demographic information within the DPAs per se. Thus, this report uses zip code areas as a proxy for the City's DPAs, and data presented as representative of a DPA may be drawn from the corresponding area approximated by zip code. By zip code, these areas differ from the "real" DPAs as follows:

- Ewa includes more land at its northern tip, but this area includes few homes.
- Central Oahu includes an extension to its northwest, between Routes 803 and 99. This area includes the military housing areas of Whitmore Village and Helemano.
- Waianae includes additional lands that wrap around and behind Schofield Barracks and mauka of Mokule`ia, but these appear to include little or no housing.

DPAs as Approximated by Zip Code



Source: Claritas 2006, see Exhibit 2-1 for copy at larger scale.

Overview of Demographic Trends

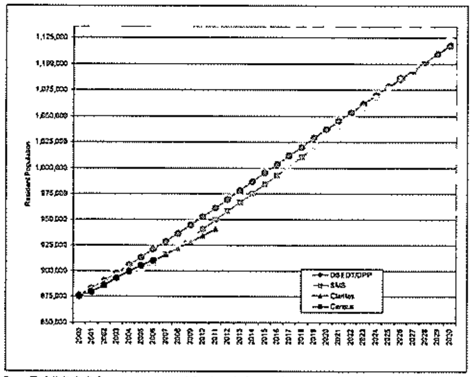
Projected Oahu Population (Exhibit 2-2)

Oahu recorded 876,156 residents at the U.S. Census in 2000. Four sources are considered in estimating how population has grown since then, and how it is likely to grow over the next two decades.

- In March 2007, the U.S. Census estimated Oahu's 2006 resident population at 909,863, or 0.5% higher than the 905,266 estimated for 2005.

- Claritas[1] provided this study with 2006 population estimates and a 5-year projection to 940,689 by 2011. Claritas' figures were prepared on the basis of the Census' 2005 estimate.

Resident Population – Island of Oahu



See Exhibit 2-2 for sources and further information.

- SMS[2] recently prepared a long-term outlook, with 1,125,688 residents projected for 2030 based on the "official parameter" growth rate of 0.9%. While SMS's shorter-term projections (for 2005 through 2011) are higher than those made by the Census and Claritas with the benefit of updated information, in the medium-term, they are lower than those prepared by DBEDT and DPP (see next bullet).

- The State of Hawaii, Department of Business, Economic Development and Tourism (DBEDT) also offers a long-term projection; the latest was prepared in August 2004. The City's Department of Planning and Permitting (DPP) has adopted DBEDT's projections. This series is higher than SMS's until 2025, after which the latter surpasses it. DBEDT/DPP's series anticipates 1,117,300 residents on Oahu by 2030.

[1] Claritas is a leading provider of geodemographic market research information to government and industry throughout the U.S. Claritas derives its information from the U.S. Bureau of the Census, State and local governmental planning and forecasting entities, its proprietary Business-Facts ® database and other sources.

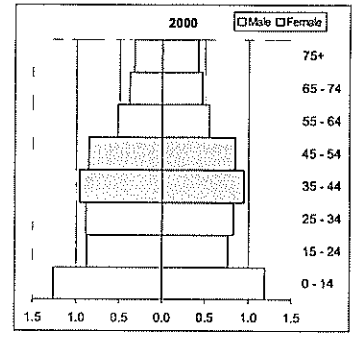
[2] SMS, Inc., "Housing Policy Study, 2006: Hawaii Housing Model 2006," February 2007. The study was prepared for a consortium including the Housing Officers and other Administrators of the City and County of Honolulu (as well as the other three Hawaii counties), and the State of Hawaii, Hawaii Housing Finance and Development Corporation, the Office of Hawaiian Affairs, and the Department of Hawaiian Home Lands.

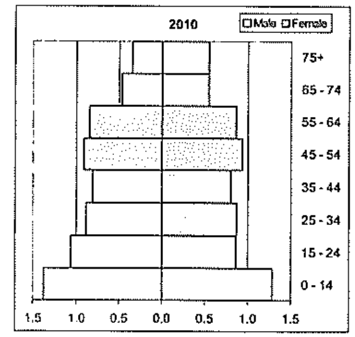
Aging of the Population (Exhibit 2-3)

The changing age-composition of the population will have an enormous impact on home-buying and other consumer spending patterns in Hawaii as elsewhere in the nation. While long-term projected age-cohort data is not available by county or sub-areas, the U.S. Census does prepare decennial projections by state.

Viewed in an age pyramid, a most notable feature is the aging of the Baby Boomers, whose members were between the ages of 41 and 60 in 2006, will range from about 45 to 64 years old by 2010, 55 to 74 by 2020, and 65 to 84 by 2030.

Age Pyramids – State of Hawaii: 2000 and 2010





See Exhibit 2-3 for sources and further information.

- **2000 to 2010** - As the dominant consumers in the overall marketplace today and for years to come, Baby Boomers are fueling a move-up home-buying market consistent with their middle-aged, peak earnings-power status.

  Age groups showing the most population gains in the 2000 to 2010 period in Hawaii are all over 45:

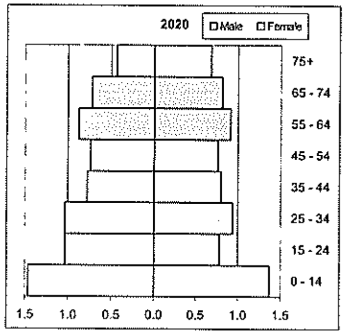
  - ☐ 45 to 54: +14,000 persons
  - ☐ 55 to 64: +64,000 persons
  - ☐ 65 to 74: +16,000 persons
  - ☐ 75+: +15,000 persons

2010 to 2020 – In the subsequent decade, Baby Boomers will continue to exert strong influence in the housing market. This is expected to be reflected in rapidly growing demand for downsized, retirement and/or other specialized housing types reflecting their empty nester and retiree stages of life. Also notable in this decade will be strong growth in the entry and early-housing market, represented by persons aged 25 to 34.

Thus, age groups projected to show the most gains in this later period include both early and older homebuyers:

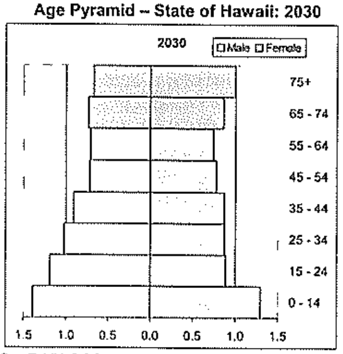
- 25 to 34: +22,000 persons
- 55 to 64: +8,000 persons
- 65 to 74: +52,000 persons
- 75+: +21,000 persons

Age Pyramid – State of Hawaii: 2020



See Exhibit 2-3 for sources and further information.

Age Pyramid – State of Hawaii: 2030



See Exhibit 2-3 for sources and further information.

2020 to 2030 – The last decade evaluated will be characterized by rapid growth of the elderly population, necessitating specialized and age-catering housing solutions.

The second most rapidly growing potential housing market during this period will consist of those aged 15 to 24, an age that usually encompasses household formation, often in rental housing.

The third rapidly growing group would be those aged 35 to 44, typically a home-buying or early trade-up housing market.

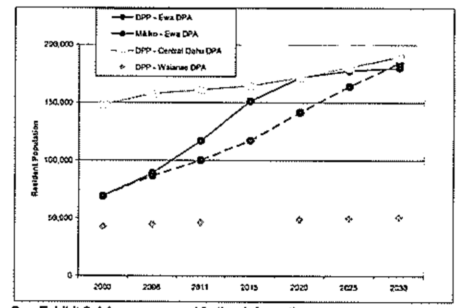
Cohorts expected to gain population statewide in this decade include:

- 15 to 24: + 27,000 persons
- 35 to 44: + 19,000 persons
- 65 to 74: + 6,000 persons
- 75+: +56,000 persons

Demographic Trends by Development Plan Area

Population by Area
(Exhibit 2-4)

Resident Population - Ewa, Central Oahu & Waianae



See Exhibit 2-4 for sources and further information.

DPP uses the State's projections to forecast population within its DPAs. DPP's most recent such forecast was prepared in 2006 and extends to 2030. These allocations of island population to DPAs are based in part on the City's development policies and plans. DPP anticipates relatively high rates of growth in Ewa over the projection period, as it becomes a "Second City." Ewa is eventually seen to house 17% of the island's population, more than doubling from some 86,000 persons in 2006 to 184,600 by 2030. The Ewa DPA is projected to approach Central Oahu in population by the end of the period.

MC reviewed DPP's Ewa projection in light of the existing inventory of unbuilt but State-entitled housing and found that even with dramatically smaller household sizes for new as compared to existing households and phased development of new projects, Ewa area population could grow more rapidly than projected by DPP initially, but could be constrained after 2025 by a lack of further developable housing inventory. In MC's analysis, population in the Ewa DPA is projected to grow 3.0% per annum over the next 24 years, finishing 2030 at about 180,200 persons. At 2025, this figure is closer than

DBEDT/DPP's to those estimated by Campbell Estate and Decision Analysts[3] for the area. MC's projections may be conservative because:

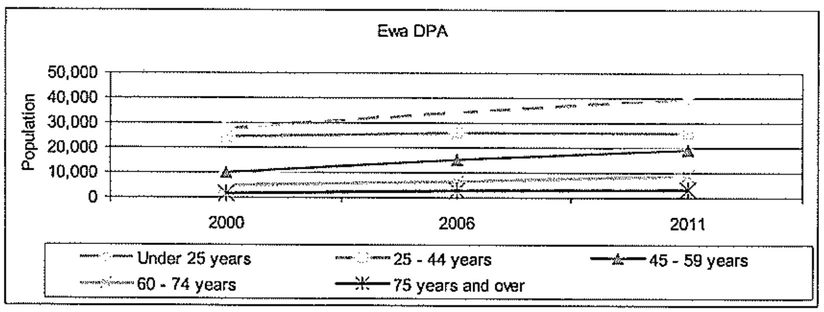
- We assume the new homes to be added will house fewer persons each than do existing homes, and
- We do not consider any impact from proposed developments that are not yet LUC-entitled, such as Ho'opili itself.

The conclusion of the entitled housing-based methodology is close to DPP's overall projection for the County in the long-run.

Population by Age Group (Exhibit 2-5)

The largest age groups in all three DPAs were those under 25, followed by the 25 to 44 and 45 to 59 age groups. Over the next five years, the greatest increases are anticipated within the under 25 and the 45 to 59 age groups, followed by the 60 to 74 age group. This reflects the Baby Boom generation moving into its 50s and 60s. In contrast, in this short-term view, Claritas projects that the 25 to 44 age group may decline in Central Oahu, and be static in Ewa and Waianae.

Population by Age Group – Ewa DPA



See Exhibit 2-5 for sources and further information.

[3] Decision Analysts Hawaii, Inc., projected Ewa regional population at 175,360 for 2025. "Ewa Development, 2006 to 2025: Economic, Population and Fiscal Impacts," September 2005.

Ewa was estimated to have a median resident age of 32 in 2006, younger than the island-wide 37.7. This is attributed to Ewa's more numerous entry-level housing options. Central Oahu was also relatively young, at an estimated 2006 median age of 33.1, while Waianae was estimated at 29.3.

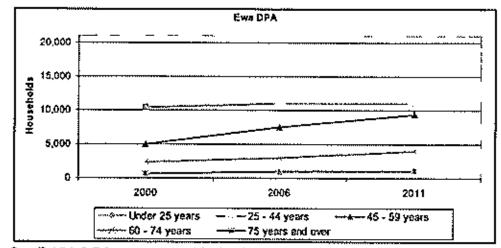
Number and Age of Households (Exhibits 2-6 and 2-7)

In 2006, Claritas estimated Oahu had about 300,900 households. Within this total, some 8% or 25,300 lived in Ewa[4], 16% or 48,000 lived in Central Oahu and 4% or 11,000 in Waianae. With the majority of entitled vacant lands on the island, Ewa's households are expected to gain against the County's over the next 5 years, to about 11% by 2011. This would represent 34,300 households at an average size of 3.4. This would represent new households at an average of 3.1 persons and already existing households at the 3.6 persons estimated by Claritas. Claritas sees household size declining in Central Oahu, to 3.3 by 2011, while remaining static in Waianae at 4.0.

Household heads are older than the population as a whole. The biggest group island-wide is currently householders ranging from 25 to 44.

However, the number of households headed by those aged 45 to 59 is increasing most rapidly. This group's size is anticipated to approach the 25 to 44 age group by 2011 in all three DPAs. The combination of population growth, aging and a trend towards smaller households could lead to 1,900 more households headed by persons aged 45 to 59, and 1,000 more by those aged 60 to 74 in Ewa over the next five years. Also over this period, the number of households headed by those aged 25 to 44 is expected to be static.

Households by Age of Head – Ewa DPA



See Exhibit 2-7 for sources and further information.

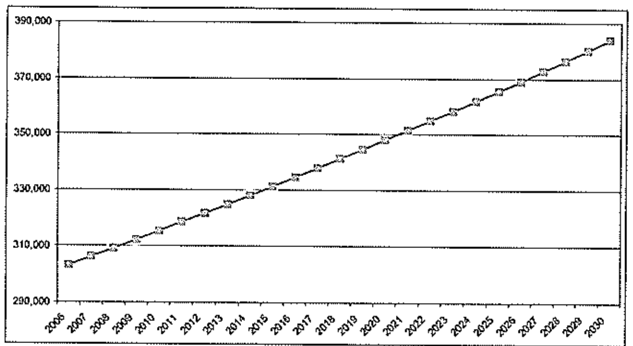
The 45 to 59 age group is considered a prime move-up housing market, while the 25 to 44 age group includes many first-time buyers.

[4] 2006 and 2011 Claritas figures for Ewa adjusted to be consistent with the area population projection presented previously.

Long-term Projection of Households

SMS projected Oahu households to 2030, utilizing the projected population figures shown previously and assuming a gradual continuation of the trend towards smaller households. The series shows 303,149 households on Oahu in 2006, (at 2.99 persons per household) and 384,005 in 2030 (at 2.93 per household).

Projected Oahu Households



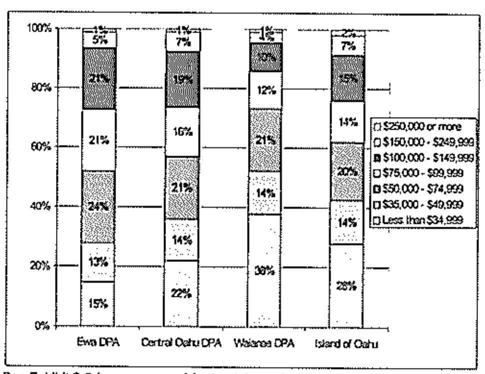
Source: SMS, Inc., February 2007.

Households by Income
(Exhibit 2-8)

Ewa and Central Oahu show a higher household income profile than the island as a whole, while Waianae shows a lower one. Claritas estimates the median 2006 household income is approximately $73,000 in Ewa, $66,700 in Central Oahu and $47,900 in Waianae, compared to $59,600 for the island of Oahu.

The Ewa DPA also shows relatively fewer households with incomes below $74,999

Households by Household Income, 2006



See Exhibit 2-8 for sources and further information.

(52%), and a greater share with incomes between $75,000 and $149,999 (42%) than the other regions evaluated. In comparison, an estimated 62% of Oahu's households earned less than $75,000 and only 29% $75,000 to $149,999 in 2006. Other areas of Oahu may have relatively more households in the highest income brackets; however, these represent a small number of households in absolute terms.

Further evidence of relatively high incomes in the Trade Area is found in an analysis of median household income by the state's top 30 zip codes in 2006[5], which found that:

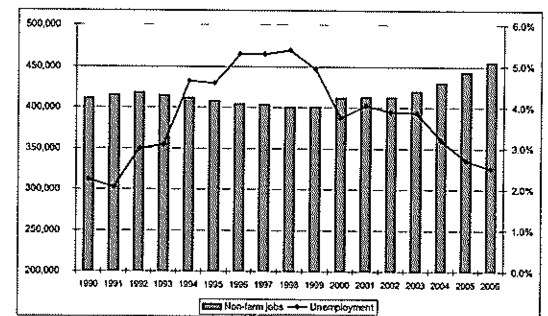
- **Mililani** (96789) showed the state's third highest median income, at $81,340;
- **Kapolei, Makakilo and Kalaeloa** (96707) had the sixth highest, at $77,902;
- **Ewa Beach** (96706) was seventh, at $74,396;
- **Waipahu** (96797) was ranked tenth, at $72,053.

For comparison, 96816 (Kahala, Waialae and Kaimuki) showed an estimated median household income of only $66,806. This made it only the thirteenth highest earning zip code area in the state in 2006, up from the fourteenth in 2005.

Employment Trends
(Exhibit 2-9)

The State of Hawaii, Department of Labor and Industrial Relations (DLIR) reports Oahu unemployment averaging 2.5% in 2006, down from 2.7% in 2005[6]. This is also down from the island averages of 3.2% in 2004 and 3.8% to 4.1% between 2000 and 2003, and significantly down from the 4.3% to 4.9% range exhibited from 1995 to

Oahu Labor Force Trends



See Exhibit 2-9 for sources and further information.

[5] Pacific Business News, December 22, 2006, 2007 Book of Lists: "Wealthiest Zip Codes, Ranked by 2006 Median Household Income." Data provided to Pacific Business News by ESRI.

[6] Not seasonally adjusted, for civilian labor force. Figures dated 12/4/2006.

1999. Oahu's unemployment rates have been among the lowest in the nation in recent years.

Oahu has supported annual increases in the number of employed persons since 2002. In 2006, some 446,200 persons were employed out of a total civilian labor force of 457,700, according to the DLIR.

3. Residential Market Environment

Historical Supply Conditions

2005 Inventory

- **Oahu** had some 329,300 housing units in 2005, of which 300,557 or 91% were estimated to be occupied, according to the U.S. Census, American Community Survey (ACS)[1]. This estimate is within 1% of the Claritas estimate for Honolulu for 2005, which was at 333,000 total housing units.

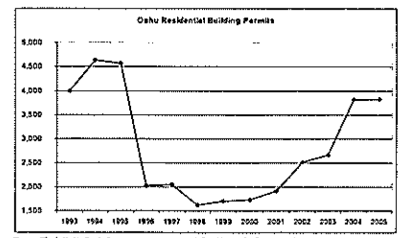
  Among occupied units, 57% were owner-occupied and 43% renter-occupied, according to the ACS. Among the 9% of units estimated to be vacant, the majority reflect non-resident housing uses, since the homeowner vacancy rate was estimated at less than 1% and the rental vacancy rate at 4%.

- **Ewa and Central Oahu** - While the ACS does not break out housing supply by area, according to Claritas, about 15% and 7% of the island's 2005 housing units were located in the Central Oahu and Ewa DPAs, respectively, representing about 50,900 in Central Oahu and 24,600 in Ewa.

  Both of these DPAs have substantially higher ownership rates than the County as a whole. In Central Oahu, some 61% of occupied units were estimated to be owner-occupied, while in Ewa some 72% were.

Residential Building Permits (Exhibit 3- 1)

Oahu residential permitting plunged from 1995 to 1996, as the effects of the collapsing real estate "bubble" of the late 1980s and early 1990s were finally realized. Permitting did not rise again materially until 2002.



See Exhibit 3-1 for sources and further information.

[1] Average figure for year, also referred to by State DBEDT as July 1 estimate. U.S. Census, "2005 American Community Survey," released October 2006. The ACS does not survey population living in institutions, college dormitories or other group quarters.

In 2005, 3,821 new residential building permits were obtained on Oahu, according to the City and County. This compares to more than 4,500 per year in 1994 and 1995.

Data from the first three quarters of 2006 show a 30% decline in permitting activity from the same period in 2005. This represents the first decline in permitting activity since 1998, and reflects a lack of entitled land inventory held by developers, production difficulties related to labor and regulatory controls and a slowing business cycle.

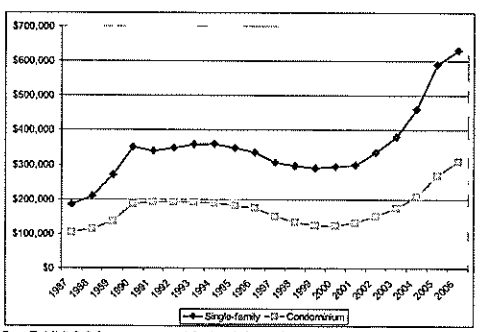
Market Trends

Oahu Home Resales (Exhibit 3-2)

Rapidly rising home prices in recent years reflect the relatively limited production of new housing, combined with strong labor market conditions and favorable financing conditions in recent years.

Sales recordations of existing homes during 2006 showed a median single-family price of $630,000 and a median condominium price of $310,000, according to the Honolulu Board of Realtors (HBOR).[2] These medians are 7% and 15% higher, respectively, than those recorded in 2005.

Oahu Resales – Median Prices



See Exhibit 3-2 for sources and further information.

In the first two months of 2007, prices are flattening or rising more slowly, while residential sales velocity has slowed since 2005. During 2005, 4,617 existing single-family homes were resold on Oahu, as were 7,990 condominium homes. These represent 1.8% fewer single-family and 1.3% more condominium sales than recorded in 2004. At 4,041 and 6,380 sales, respectively, 2006 showed a 14% decline in single-family and 20% decline in condominium sales compared to 2005. Previously, the number of homes resold on Oahu had shown nearly consistent annual increases since 1995.

[2] Honolulu Board of Realtors, "December 2006 Monthly Statistical Report," January 2007. The HBOR defines condominiums as duplexes, townhomes and other multifamily units having common areas.

Months inventory remaining, while still far below historical levels in the early- to mid-1990s, has been on an upswing since mid-2005, further defining a "landing" to the boom that endured over the prior six years. As of February 2007, the HBOR estimated there were 6.5 months worth of single-family inventory remaining on the island market, and 5.5 months of condominium inventory.

The short-term outlook is for slowing sales and stabilized or somewhat declining prices as the market makes adjustments to reflect the overly rapid rises of past years. However, longer-term, ongoing population growth, household formation and the still significant overhang of unhoused persons will continue to fuel demand for new housing.

Subject Area Resales (Exhibit 3-3)

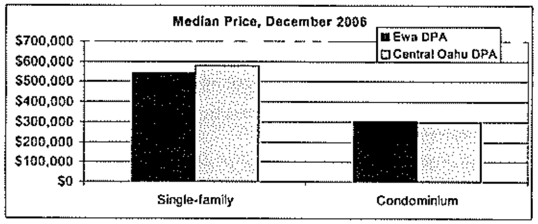
Like the island as a whole, Central Oahu and Ewa neighborhood markets are recording fewer sales, while prices have continued to appreciate. During 2006 (with comparisons to 2005):

- Within the Ewa DPA:
  - Sales slowed 10% on the Ewa Plain[3], but increased 7% in Makakilo. Overall, the Ewa DPA declined 7%.
  - Prices have continued to rise. The Ewa Plain showed price increases averaging 8% for single-family and 18% for condominium products, for median prices of $528,000 single-family and $302,000 condominium.
  - In Makakilo, median prices increased 9% and 16% for single-family and condominium sales, respectively, reaching $600,000 for single-family homes and $320,000 for condominiums.
- Within Central Oahu:
  - Wahiawa, Mililani and Waipahu all generally showed fewer sales, averaging 9% fewer than in 2005. The only exception is Wahiawa condominiums, which show 5% more sales than the prior year.

[3] As defined by the HBOR, the Ewa Plain includes Kapolei, Ewa Beach and Ewa by Gentry.

- Median prices rose across the board in these Central Oahu communities, ranging from 8% to 10% increases for single-family products and 14% to 39% increases for condominium products.

- Median single-family prices were highest in Mililani at $610,000, and lowest in Wahiawa at $462,000. Among condominium sales, the median price ranged from $188,000 in Wahiawa to $315,000 in Mililani. Wahiawa tends to have older housing stock than either Mililani or Waipahu.

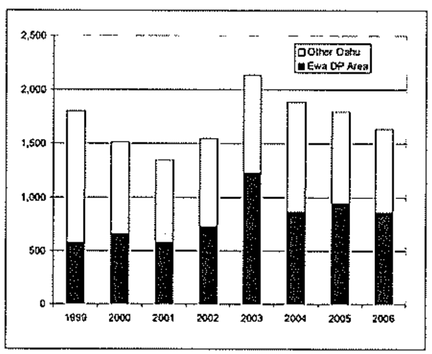


See Exhibit 3-2 for sources and further information.

Developer Unit Sales by Area (Exhibit 3-4)

Developer-built homes have also shown rising prices but absorption has been limited by production factors such as labor, permitting and the availability of entitled sites.

Oahu recorded an estimated 1,800 new home sales in 2005, but only 1,640 in 2006, according to The Harris Company. This is down from the peak production and absorption of 2,136 in 2003.[4] Of the total closings, 46% to 58% of units have been located in the Ewa DP area[5] over the past 5 years.



See Exhibit 3-4 for sources and further information.

[4] Note that developer unit sales are fewer than residential permits granted in any given year (Exhibit 3-1). The difference is due to permitted units not getting built, or being built as rental or other unit types not covered by the residential developer unit surveys.

Notably, there has been no long-term increase in new home production over the past eight years, despite population increases and very strong market activity. Production has generally stayed in the 1,500 to 2,000-unit level, subject to business cycles and other factors.

Also in recent years, single-family units have been losing market share to townhouse and high-rise home sales.

Ewa Developer Unit Sales by Type (Exhibit 3-4)

Considering only the Ewa area, developer sales have hovered between about 850 and 950 units per year in recent years, down from their peak of 1,230 units closed in 2003.

Historically, Ewa has provided an opportunity for smaller-unit, single-family living at relatively modest cost, given the trade-off of a longer commute to town. However, as Hawaii home prices have risen across the board, townhomes are assuming an increasing share of even Ewa area sales. In 2006 townhomes represented some 21% of area new sales, compared to an average 18% over the entire period. Additionally, the density of many single-family homes has increased to within the historical range of townhomes and a growing segment includes condominiumized elements such as driveways, courtyards, structural walls and the like. Thus the "single-family" homes being developed are increasingly likely to have characteristics previously associated with multifamily or townhome developments.

Housing Supply Outlook

Planned Communities in Ewa and Central Oahu (Exhibits 3-5 and 3-6)

MC reviewed planned residential development projects within the Ewa and Central Oahu DP areas. This survey targeted projects of 100 units or more for which LUC Urban designation was in place, and/or for which the landowner was be exempt from LUC governance.

- **Ewa** - Some 31,000 units of State-entitled future development were identified at 20 sites in Ewa. Of this total, about 65% could be fully absorbed by 2015.

  These figures do not include Ho`opili.

[5] Includes the Ewa, Kapolei and West Oahu (Ko Olina) areas, as defined by the Harris Company.

- **Central Oahu** has only about 8,200 potential future units entitled currently, all of which could be developed and absorbed by 2020, and 90% by 2015.

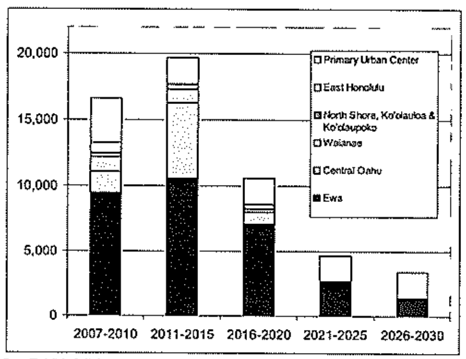
  Three planned Central Oahu developments, Castle & Cooke's Koa Ridge and Waiawa, and Gentry's Waiawa Phase 2 could conceivably add up to another 12,000 units. However, all three of these projects require LUC approval.

These potential inventories are considered generous since they consider current zoning or plan maximums and projected development schedules. Often projects get developed at less than their permitted or planned densities, and/or experience delays that push inventory further into the future.

Projected Oahu Housing Development (Exhibit 3-7)

Combining the data on Ewa and Central Oahu resident housing projects with information gathered on planned developments elsewhere on the island shows some 55,100 resident housing units with LUC approval at this time. This number is based on an estimated 31,000 units in Ewa, 8,200 in Central Oahu, 2,470 in Waianae, 1,230 in the North Shore, Ko'olauloa and Ko'olaupoko areas, 740 in East Honolulu and 9,370 in the Primary Urban Center (PUC.) The PUC figure includes an allowance of 2,000 units per 5-year period after 2010 for unforeseen redevelopment projects.

LUC-Entitled and Planned New Housing Unit Development on Oahu



See Exhibit 3-7 for sources and further information.

Considering information provided by developers and landowners and on historical absorption rates of similar products in the area, buildout of these entitled units could occur as shown above.

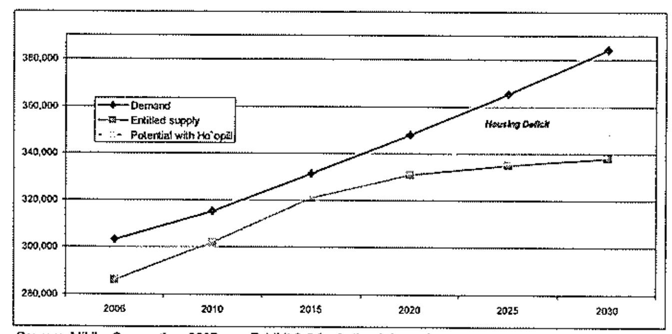
Summary of Island Demand and Supply Factors (Exhibit 3-8)

- **Current and Future Demand** - The SMS study previously cited projected that Oahu households will increase from about 303,149 in 2006, to 384,005 in 2030. These considerations suggest a need to provide housing for 81,000 new households over the next 24 years, or by 2030. In addition, existing pent-up demand as of the end of 2006 is estimated at 17,000 units.

- **Current Supply** – The current supply of housing is estimated using the ACS survey finding of 300,557 occupied housing units in 2005, less a 6% allowance for units held for nonresident use such as visitor or part-time resident use. This results in an estimated 283,000 occupied resident housing units (RHU) in mid-year 2005. Added to this figure are recorded new unit closings from July 2005 through December 2006. This results in an estimated 286,000 net available RHU by the end of 2006.

- **Future Supply** – Future supply estimates are based on the schedule of LUC-entitled potential future developments islandwide, representing some 55,100 units by 2030, as shown previously in Exhibit 3-7. From this figure a 5% vacancy allowance is deducted, resulting in some 52,000 units available for resident housing use. Note that these estimates are considered generous, as explained previously.

Oahu Resident Housing Unit Supply and Demand After Development of Currently LUC-Urban Lands

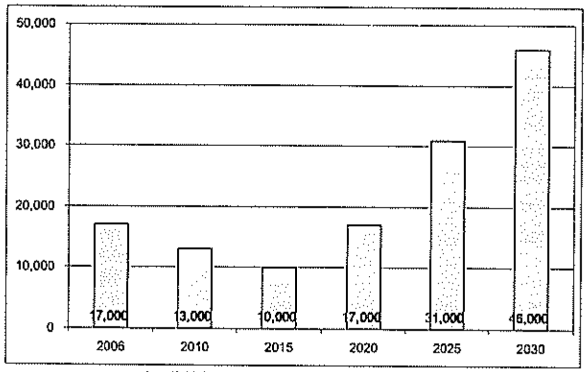


Source: Mikiko Corporation, 2007; see Exhibit 3-8 for further information.

Taken together, the outlooks for demand and entitled supply projections indicate a substantial shortfall in currently permitted housing opportunities. In addition to the need to house up to 81,000 new households by 2030, there is a pre-existing estimated pent-up demand for about 17,000 housing units, yet only 52,000 net units LUC-enabled.[6]

Thus, it appears that aggressive housing production efforts in the near term could pare Oahu's shortage of primary resident housing units down to about 10,000 units by about 2015. However, without further State entitlement of major housing developments, the unmet need for housing could thereafter be expected to spiral up to some 46,000 homes by the year 2030.

Oahu Resident Housing Unit Deficit
After Development of Currently LUC Urban Lands



See Exhibit 3-7 for sources and further information.

[6] Based on 55,000 LUC-entitled units total, less a 5% vacancy allowance on those units.

4 – Ho`opili Residential Market Assessment

Future Housing Market Setting

Housing Demand (reference Exhibits 2-2 and 3-8)

DRH anticipates Ho`opili's first housing units could be available for occupancy in 2012. At that time, the housing market is expected to still be in deficit mode, with about 10,000 to 13,000 fewer units available for resident use than desired.

From 2012 to 2030, potential new household formation could be expected to generate demand for another 65,800 or so units.[1] This new demand is expected to be distributed between:

- **Downsizers** – Hawaii's 55 to 74 year-olds are expected to increase by about 60,000 between 2010 and 2020. This is the Baby Boom generation, and a larger share will be entering their mid-60s than their mid-50s by 2020, as shown previously in Exhibit 2-2.

  Many members of this generation can be expected to downsize their housing and to seek to live closer to community amenities as their children move out, they enter retirement and/or as they no longer care to maintain large properties. The leading end of this trend is already seen nationwide; in Hawaii, those trading single-family homes for multifamily living in a more urban setting are evidenced in Kaka'ako's new high rises.

  After 2020, the 55 to 64 age cohort could decline as more move into their 70s (see "senior markets," below.)

- **Entry level markets** – Hawaii's next most rapidly growing cohort between 2010 and 2020 is likely to be persons aged 25 to 34, the "Echo Boom" generation. This phase often includes household formation, and one's first rental or home purchase. Since affordability is key to this market and many do not yet have spouses or children, this market also tends to seek smaller units. This cohort is anticipated to increase by 22,000 persons statewide between 2010 and 2020.

[1] See Exhibit 3-8; represents 12,800 demanded 2012-2015 (3,200/year) plus 17,000 from 2016 to 2020, 18,000 from 2021 to 2025, and 18,000 from 2026 to 2030.

- **First move-ups** – A strong move-up market could emerge after 2020, as the Echo Boom cohort ages into its mid 30s and early 40s. This age group is projected to increase by about 19,000 persons statewide between 2020 and 2030.

- **Retirement/senior markets** – The retiree/senior market will also show significant gains, with an additional 21,000 persons aged 75 or more anticipated statewide in 2020 compared to 2010, and another 56,000 between 2020 and 2030. Typically one or two persons per household, this market is also amenable to smaller units.

Altogether, satisfying the potential demand from Oahu's growing population after 2006, plus existing pent-up demand is projected to require that some 98,000 (81,000 + 17,000) more housing units be supplied over the next 24 years.

Within the island, the Ewa Plain has long been the preferred location for such future large-scale development, and a number of factors support this:

- **Land and infrastructure** – The Ewa DPA contains the majority of the island's remaining extensive, flat and less developed lands. State, County and private entities have already invested heavily in primary infrastructure for the area, including highways, major roads, harbor improvements and water and sewer systems.

- **Transit** – The County's proposed mass transit project, targeted to be operational by 2012, would link Kapolei to downtown Honolulu and eventually Waikiki and the University of Hawaii (UH) Manoa campus. The currently preferred route runs through Ho'opili, along Farrington Highway.

- **Jobs** – In addition to transportation solutions that enhance commuting out of the district, Kapolei is rapidly developing its own jobs base, which will reduce the need to out-commute. While historically the area has generated mostly secondary jobs, significant new primary job[2] creation is occurring, such as at:

  - **Judiciary** – The new State Court complex is projected to relocate 650 direct and indirect jobs to Kapolei.

  - **Island Pacific Academy** – This private school, opened in Kapolei in 2004 as a lower school, expanded enrollment and added middle and high school levels in 2006.

  - **UH West Oahu** – This major expansion is projected to generate 1,200 jobs at the new campus and support facilities.

[2] Meaning those jobs capable of providing the major financial support for a household.

  - **Business and industrial parks within the region** – Build-out of Kapolei Business Park and development of new parks such as the 54-acre Phase 2 of Kapolei Business Park, a 22-acre movie studio, and the 66-acre former Hawaii Raceway Park, as well as Kapolei Harborside Center (345 gross acres, now petitioning the LUC for a land use boundary amendment).

In summary, developments underway in Kapolei are projected to add 40,000 more jobs in the region by 2025, according to an earlier study[3].

Housing Supply (reference Exhibits 3-7 and 3-8)

Currently entitled projects are estimated to yield up to 52,000[4] of the required 98,000 housing units by 2030, if they are developed within the time frame and at currently planned or entitled use levels.

Despite these substantial developments and a greater than historical rate of new home production initially, the island could still anticipate a 46,000-unit shortage by 2030, the end of the projection period:

Supply and Demand for New Resident Housing Units on Oahu 2007 to 2030

Future Demand	Pent-up demand, end 2006 Future need, 2007-2030 Total need	17,000 81,000 98,000
Future Supply	Planned and entitled (55,000 less 5% vacancy)	52,000
Shortage	**As of 2030**	**46,000**

Source: Mikiko Corporation, 2007. Future supply estimate assumes full buildout of all lands currently designated Urban by the LUC, and proposed for residential development. See Exhibit 3-8 for further information.

Moreover, more than 65% of the entitled new development could be built out over the next 8 years, or by 2015. By 2020, within 8 years of Ho'opili's projected first marketing, all but 15% of the island's entitled inventory could have already been developed and absorbed.

[3] Decision Analysts Hawaii, Inc., "Ewa Development, 2006 to 2025: Economic, Population and Fiscal Impacts," 2005.

[4] This would represent up to 55,100 units delivered, less a 5% vacancy allowance.

In conclusion, a stepped-up rate of housing production that appears possible over the next several years could help to pare down the current housing deficit through about 2015. However, thereafter, currently entitled projects would be unable to keep up with demand. Without further entitlement of significant lands for residential development, another, an even more drastic housing crisis than today's is anticipated to emerge between 2016 and 2030.

Supply Solutions/Currently Entitled Projects

During the majority of Ho'opili's marketing, most of the currently entitled projects are expected to be sold out. By 2016, only a few projects are anticipated to have significant remaining inventory. Even so, most of these could be fully absorbed by 2020:

- **In Ewa** -
  - Makaiwa Hills – Higher end, likely to substantially sell-out by 2020.
  - East Kapolei II and III – DHHL projects, to be restricted to persons of Native Hawaiian ancestry; expected to be completed by 2020.
  - UH West Oahu – Core is oriented to campus needs; surrounding potential developments projected to sell out before 2020.
  - Kalaeloa – Development types and schedules to be determined; much depends on U.S. Navy decisions yet to be made and emerging State policy.
- **In Central Oahu** - Waiawa Gentry Phase 1 could be nearing sell-out in the 2016 to 2020 period.

Outside of Ewa and Central Oahu, there is likely to be redevelopment within existing neighborhoods but there are limited lands available for new development and no major primary residential communities known to be in the planning phase.

This contrasts with today's market, where more than 12 developments of 500 or more remaining units are underway or in planning. By the time of Ho'opili's marketing, without further land use entitlement, there could be only the five projects noted above, and by 2020, only one or two. This is the source of the drastic housing shortage that could materialize after 2015, in the event that significant further inventory is not entitled.[5]

[5] In addition to Ho'opili, other large proposed developments that may seek LUC Urban reclassification include Castle & Cooke's Koa Ridge and Waiawa, and Gentry's Waiawa Phase 2. Together, these Central Oahu projects could offer up to 12,000 residential units, as currently configured.

New Urbanism

The development concept for Ho'opili is one that has been widely tested and refined as the principles of "New Urbanism" or "Smart Growth" are adopted in communities worldwide.[6] In contrast to the former suburban/commuter model of development, typical guidelines for New Urbanism include:

- Mixed land uses (residential, commercial, community);
- Compact building designs and higher densities;
- Walkable neighborhoods;
- A variety of transportation choices;
- Housing opportunities and choices for a range of household types and incomes; and
- A greater balance of jobs and housing within each community.

According to The Congress for New Urbanism (CNU), a leading promoter of such development, even if overall demand for new housing were to slow, cultural changes are resulting in a preference for living in dense, walkable neighborhoods, and thus the demand for homes in New Urbanist communities is expected to increase rapidly. This is being driven by several trends:

- Rapid increase in the number of households that are middle-aged or older, even though these same persons likely grew up in and raised their children in suburban, car-centered communities;
- Receptivity of the young adult "Echo Boomers" to urban lifestyles and New Urbanist values, as well as their general inability to afford living in the suburbs;
- Deteriorating driving experience on most US highways and roadways; and
- Workforce changes related to technology and outsourcing that encourage more people to work from home.

In Hawaii, recent high-rise development in the Kaka'ako area illustrates the acceptability of these concepts in our island setting. Over the past five years, Oahu residents have demonstrated strong interest in high density housing in Kaka'ako that is proximate to

[6] Although often dated to the late 1990s, the New Urbanism or Smart Growth movement is rooted in the ideas of Jane Jacobs, whose The Death and Life of Great American Cities was published in 1961.

jobs (Waikiki, downtown and the corridor in between), entertainment, shopping, culture, multi-modal transportation and myriad recreational and natural resources.

Mehana, another DRH project, will be the first to directly implement these principles on the Ewa Plain. Mehana is expected to commence sales in mid-2007, and will offer 1,150 homes, most of which will be in mixed-use settings. Approximately 80% is planned as multifamily or attached housing. All of Mehana is within walking distance of the City of Kapolei and the site is traversed by the County's proposed transit route. To date, community reaction to Mehana has been very positive.

Also on the Ewa Plain, UHWO's college town area is planned to offer higher density developments dominated by multifamily housing, much of it in mixed-use settings.

Ho`opili's Proposal

Development Concept

Ho`opili is planned to respond to the trends and future community needs discussed above. It will serve a "graying" Kapolei and will make available opportunities for urban village living at more modest cost than now possible in Kaka'ako.

- It offers significant primary resident housing in an area that has long been planned for such expansion. Ho`opili's 11,750 units could represent a solution for up to about 25% of the island's currently unentitled housing needs through 2030.
- It offers a wide variety of housing types, not dominated by the high-end.
- It offers a highly accessible lifestyle that is not car-driven. This is enabled by its access to future transit service, its planned higher densities and mixed uses, and its planned trails and "walkable" streets. These transportation options further enhance the affordability of the community, as studies have shown that automobile costs represent up to 15% or more of the typical US household budget (and much more for lower income households.)
- It offers housing in conjunction with significant jobs, schools, parks and other community amenities. This in turn enhances Ho`opili's affordability as it reduces the need for a second or third automobile per household and also may represent significant timesavings.

Ho`opili Product Mix

The majority of Ho`opili's units are expected to be for-sale multifamily units. The development would also include single-family units for-sale and it may include multifamily rental units. The exact mix of units by type will be determined during the years of build-out, as market conditions and preferences materialize.

In terms of market orientation, up to 30% of Ho`opili's units are expected to be developed as affordable housing, in accordance with the County's affordable housing guidelines.

General densities, tied to the areas shown in the Land Use Map, are envisioned as follows:

- **Low- to medium-density** – 5,100 units total, including single-family homes at 5 to 8 units per acre and multifamily at 10 to 14 units per acre. Some multifamily development may be in residential-only buildings. Others would be located above lower or ground floor commercial uses and/or designed as "live-work" units that offer both a residence and a potential commercial area.
- **Medium-density** – 5,200 units total, all multifamily at 15 to 29 units per acre. These areas are planned as mixed-use, "live-work" units within low- to mid-rise buildings with neighborhood-serving commercial. They may include a senior housing or lifestyle component as well.
- **High-density** – 1,450 units total, developed in buildings at 30 to 50 units per acre, typically with neighborhood-serving commercial on the ground floor.

Affordable housing opportunities are planned within the medium and high-density areas.

Market Evaluation and Conclusions for Ho`opili

Anticipated Buyer Markets (Exhibit 4-1)

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

- **Entry-level markets** – Up to 30% units, those designated as affordable units, as well as many of the other higher density for-sale multifamily units are conceived to appeal to entry-level markets, typified by the rapidly increasing 25- to 34-year-old Echo Boom cohort in the 2010 to 2020 period.
- **Move-up markets** – Ho`opili's "traditional" or lower-density single-family housing, as well as some of its more amenitized multifamily offerings could appeal to move-up

markets and growing families. The first level move-up market, typified by persons aged 35 to 44, is projected to grow particularly rapidly in the 2020 to 2030 period as the Echo Boomers mature.

- **Downsizers** – Ho`opili's higher density single-family units and all of its mixed-use multifamily units are seen to appeal to the Baby Boomer cohort that is looking to simplify its lifestyle, lessen homeowner commitments and enhance access to urban amenities.

- **Retirement/senior markets** – The medium density areas are seen to possibly include one or more senior housing developments, catering to the 75+ population, a rapidly increasing age classification. Some of the senior housing may also be part of the affordable housing inventory.

The great majority of Ho`opili homebuyers are anticipated to be purchasing for use as an owner-occupant. Based on surveys of 365 persons who signed sales contracts at eight DRH projects in 2004 and 2005, 95% expected to be an owner-occupant, while only 5% were purchasing primarily for an investment or for second home use.

Ho`opili's live-work units might encourage a higher share of investor buyers than seen in the marketplace recently. However, most of these buyers would be expected to put the units back into long-term rental, meaning it would still be in the primary residential market.

Ho`opili Residential Prices (Exhibits 4-2 and 4-3)

Pricing at other DRH projects frames the market orientation and production capabilities that the company could bring to Ho`opili. DRH's current projects in the region include build-out at various sites in Makakilo and of its masterplanned Sea Country community in Ma'ili. In addition, the company has been selling the last of its townhouse inventory in Hawaii Kai and single-family condominiums in Kahala. 2006 price indicators at these locations are presented in Exhibit 4-2 and summarized on the following page.

Market Unit Price Indicators and Conclusion
2006, except Mehana

	Multifamily units	Single-family units	Comparison to Ho`opili
Makakilo	$316,000 - $583,000 (12-14 u/ac)	$543,000 - $913,000 (5-6 u/ac)	Some have superior location and views
Sea Country, Ma'ili	None offered	$327,000 - $550,000 (5-8 u/ac)	Less desirable location
Hawaii Kai & Kahala	$557,000 - $725,000 (15 u/ac)	$650,000 - $1,400,000	Locations command premiums
Mehana (estimated, mid-2007)	$350,000 - $550,000 (17 u/ac)	No product priced yet	Most comparable plans and location
Ho`opili assessment (market units)	**$350,000 - $650,000 (10+ u/ac)**	**$500,000 - $750,000 (5-8 u/ac)**	**May be additional premiums**

Sources: DRH and Mikiko Corporation. See Exhibits 4-2 and 4-3 for further information.

In conclusion, Ho`opili's market units are expected to support prices ranging from (in 2006 dollars):

- $350,000 to $650,000 for its various multifamily products, to
- $500,000 to $750,000 for its single-family products.

Additional premiums may be realized in the future due to New Urbanist features of Ho`opili and it's many community amenities.

Affordable for-sale multifamily units would be priced in accordance with then-applicable County rules and guidelines. In 2006, such units would have been priced from $232,000 to $392,000 for a family of four earning 80% to 120% of the Honolulu median income.

Rental rates, assuming some affordable housing units are developed as rentals, would also be based on County rules then in effect. Currently, these would be expected to be targeted at persons earning below 80% and up to 100% of Honolulu's median income, or in some circumstances, to lower income groups. In 2006, conforming rents for this target market ranged from $998 to $2,481 for studio to 4-bedroom units, according to the County.

Residential Production Capacity

Over the past two years, DRH closed approximately 400 new units on Oahu each year, the majority in Makakilo. These deliveries have been constrained within each community by labor and supply factors, while the island-wide sales have been capped by the company's lack of other large sites ready for development. DRH's capacity has also been hampered because, without a large single project, it has had to disperse its Oahu production activities among three or more disparate locations (including Makakilo, Ma'ili, Kahala and Hawaii Kai.)

DRH's 2005 and 2006 sales were produced under a relatively high competition setting, and represent 21% to 22% of the island-wide market for new home sales in each of the years. Schuler's past market records demonstrate the company's ability to sustain much higher levels of production and sales, even before its capacity-increasing association with DRH in 2002. From 1992 to 1995, Schuler closed some 600 to 1,100 units annually on Oahu, with sales peaking in 1994 at 1,143 homes.

Ho'opili Absorption Conclusions

Given the highly limited supply of community development opportunities on Oahu in the 2012+ time frame, and even assuming entitlement of the large properties currently considering petitioning for development entitlements in Central Oahu, DRH's market share could be substantially higher than during the last two years. Since Ho'opili is the only large community in planning by DRH on Oahu (other than Mehana, which likely will be substantially sold out), this enlarged market share would largely accrue to Ho'opili. Ho'opili's anticipated market share also considers:

- It is a highly desirable location, far more proximate to future job and school centers than Makakilo or Ma'ili.
- As shown in the analyses in Chapter 1, without further entitlement of other residential developments, Ho'opili's hypothetical fair share in the 2016 to 2030 period could be about 39% of the island market. If Koa Ridge, and both of the Waiawa projects were also entitled and developed in the time frame, their additional 10,500 units could reduce the Project's fair market share to about 29% after 2015.
- The Project will offer a wide range of products, targeting many household types of a broad range of income levels. In comparison, the ridge developments at Makakilo

(historically) and at Koa Ridge and Waiawa Phase 2 (if they are entitled in the future) will likely need to offer lower density and higher priced product.

As demonstrated previously in Exhibit 3-8, Oahu needs an annual average production of about 3,400 units through 2030 in order to meet future demand from household formation. In order to also pare down pent-up-demand, Oahu needs more than this.

The table on the next page shows two potential future housing scenarios with Ho'opili on the market. In both cases, the Project's assumed market share is substantially less than what its hypothetical fair share could be.

- **In the first case,** Oahu housing production would be near to recent historical levels, at an assumed 2,000 units per year. (In this scenario, the marketplace would likely continue to slide towards a greater housing crisis than is now being experienced.) This scenario could result from an inadequate supply of entitled and serviced lands, or other nonmarket barriers to production. Given the limited competitive product, Ho'opili's market share is expected to be substantially higher than has DRH's in recent years (21% to 22%), when there was a great deal of competition and the DRH's product was in less prime locations. This scenario suggests Ho'opili sales achieving a 30% to 35% market share, and averaging 600 to 700 closings per year.
- **The second scenario** assumes a more adequate supply of new housing on Oahu, though still not enough to also eliminate the backlog of pent-up demand. In this case, a hypothetical Oahu absorption of 3,900 units per year is assumed.

  This environment would be more competitive for DRH than Scenario 1, but still less than under current conditions. In this case the Project's market share is conservatively assumed to be 15% to 20% of the Oahu new home market, below the range of DRH's recent historical achievements, and less than its hypothetical fair share of about 30% in a similar situation. This would result in average annual Project sales of some 585 to 780 units as shown on the following page.

Oahu and Ho`opili Annual Residential Unit Sales Absorption, 2012+

	Scenario 1: At recent historical levels of island production	Scenario 2: At demand-satisfying levels of island production	Conclusion for Ho`opili
Assumed total Oahu developer sales	2,000	3,900	
Ho`opili market share[7]	30% - 35%	15% - 20%	
Ho`opili average annual sales	**600 - 700**	**585 - 780**	**650**

Source: Mikiko Corporation, 2007.

Projected Ho`opili Residential Absorption

Considering the two scenarios, it is concluded that Ho`opili should be able to sell 650 units per year on a long-term average basis. Actual sales from year to year could span the range of outcomes projected (585 to 780 units per year), or show even greater fluctuation depending on market conditions and the types of units under development at any given time.

The 650 unit sales could represent 450 market units and 200 affordable units in an average year. The affordable housing sales absorption is assumed to occur more gradually because it would generally need to be developed as infrastructure and community facilities are supported by market housing unit sales.

[7] Compared to the Project's potential fair market share of 40% and 30%, respectively, under two similar scenarios (see Chapter 1.)

These rates would lead to complete absorption of the Project within 19 years, or by 2030.

Illustrative Mix of Potential Residential Sales Absorption at Ho`opili

	Market units	Affordable for-sale units	Total for-sale housing
Potential total inventory	8,250	3,500	11,750
Average annual sales	**450**	**200**	**650**
Years on market	19	18	19
Start date	2012	2012	2012
End date	**By 2030**	**By 2029**	**By 2030**

Source: Mikiko Corporation, 2007.

Alternatively, if some of the units were developed as rental products, the community could be expected to become fully occupied even earlier, given the historically high demand for and limited supply of quality rental products on Oahu.

5 Retail Market Environment

Methodology

This chapter presents the estimated market support for additional commercial space in Ewa as derived from retail-based market indicators. While many retail shopping centers include substantial office space, and office buildings often include retail, office market conditions are considered more specifically in the next chapter[1].

The market assessment for retail areas compares retail supply to consumer demand, which consists of resident and daytime populations. Nationally, there was an average of 20.3 square feet of shopping center space per person in the U.S. in 2004, and 63% of all retail space was within shopping centers.[2] This is equivalent to 32 square feet total retail area per person.

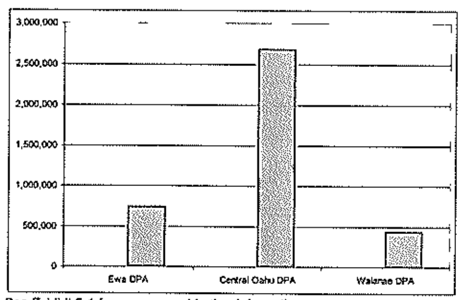
This is a useful benchmark, but Hawaii's retail market is unique in many respects. Thus, retail supply and population are also evaluated for the Ewa, Central Oahu and Waianae DPAs, which are considered the primary Trade Area, as well as for Hawaii Kai, which is considered a benchmark market.

Retail-Based Supply

Trade Area, 2006 (Exhibit 5-1)

The Trade Area had some 3.86 million square feet of retail space in December 2006. About 70% or 2.68 million square feet of this was located in Central Oahu. The Ewa DPA accounted for 19% of the region or some 737,000 square feet in place, while Waianae held the remaining 11%, with 439,000.

Existing Retail Gross Leasable Area
(square feet)



See Exhibit 5-1 for sources and further information.

[1] For purposes of this analysis, these relatively limited office areas within retail shopping centers are considered part of the "retail" market.

[2] National Research Bureau, Inc., "2004 NRB Shopping Center Census," 2005; Niemira, Michael P., "The U.S. Retail Space Market," Research Review, V.12, No. 2, 2005. Mr. Niemira is Vice President, Chief Economist and Director of Research for the International Council of Shopping Centers.

As of now, Ewa has no regional centers, but a 600,000 square foot center, the Kapolei Commons, is being planned.

Overall, Oahu's retail market is considered undersupplied, with a December 2006 vacancy rate of 2.2%, the lowest in 15 years, according to CMF. This is despite three strong years of net absorption, totaling about 650,000 square feet.[3] These trends are mirrored in West Oahu, which had an average 2.5% vacancy in December 2006. Central Oahu and Hawaii Kai's vacancies were even lower, at 0.6% each. Waianae showed the island's highest vacancy rate, at 14.5%.

Benchmark Area, 2006 (Exhibit 5-1)

As a planned community nearing buildout, with retail centers operating at or near capacity and a growing jobs base, Hawaii Kai is considered an indicator for the relationship of balanced retail supply to population levels in a suburban community.[4] Hawaii Kai has about 857,000 square feet of gross leasable areas (GLA), of which 247,000 are in the regional Hawaii Kai Towne Center, about 322,000 in Koko Marina Shopping Center, and 133,600 in Hawaii Kai Shopping Center.

Planned Development in the Trade Area (Exhibit 5-2)

Within Ewa, Kapolei is the focus of current commercial development interest. There are an estimated 3.3 million square feet of potential retail spaces underway or proposed on lands that are entitled[5] and planned for commercial development throughout the DPA. Of this, 75% or 2.5 million square feet are in Kapolei, including the East Kapolei area. Nearly 1.7 million square feet, more than twice Ewa's existing stock, could be added by 2011.

In contrast, the Central Oahu DPA has only about 540,00 square feet of identifiable and State-entitled retail projects in planning. The majority of this is at Gentry/A&B's Waiawa Phase 1, which has been designated Urban, but much of which still requires zoning. However, Waiawa could produce more retail development than the 400,000 square feet estimated here for planning purposes. Over 100 acres of lands within this project were previously designated for commercial or industrial use and presumably will be developed in accordance with market demands.[6]

[3] Colliers Monroe Friedlander, Inc., "Retail Market Report: Oahu Year-End 2006," January 2007.

[4] Because Hawaii Kai is a suburban community, whereas Ewa is planned to be mostly urban, Hawaii Kai's ratios are considered possibly low indicators for Ewa.

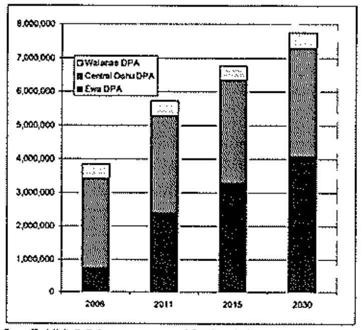
[5] As for residential developments, this analysis considers only those proposals on lands designated Urban by the LUC.

[6] The other potential major retail project in Central Oahu would be at Castle & Cooke's proposed Koa Ridge development. These plans are still under review, but the project could designate significant lands to retail use if market conditions warrant. Koa Ridge is not included in the "entitled/planned" inventory because it still requires LUC redesignation, as well as County zoning, in order to proceed.

Specific projects and land areas from which these estimates were derived are presented in Appendix 4.

Future Trade Area Inventory (Exhibit 5-3)

Potential Future Retail Gross Leasable Area in Trade Area (square feet)



See Exhibit 5-3 for sources and further information.

Considering the planned and entitled projects identified, retail areas in the Trade Area could nearly double by 2030, to approximately 7.7 million square feet. Most of this new inventory would be added in Ewa, in alignment with the area's projected residential and population growth.

Retail-Based Demand

Area Resident Profiles (Exhibit 5-4)

With about 88,800 residents, the Ewa DPA has a little more than half the population of the Central Oahu DPA, and Waianae has about half of Ewa's. In total, the Trade Area is home to about 290,950 persons or 32% of the island's population in 2006. Relationships within the Trade Area will change significantly over the next five years, as Ewa population is projected to grow an average of 5.6% per year to 2011, compared to 0.4% in Central Oahu and 0.7% in Waianae.

The benchmark market Hawaii Kai housed about 29,000 persons in 2006 and could grow 0.9% per annum in coming years.

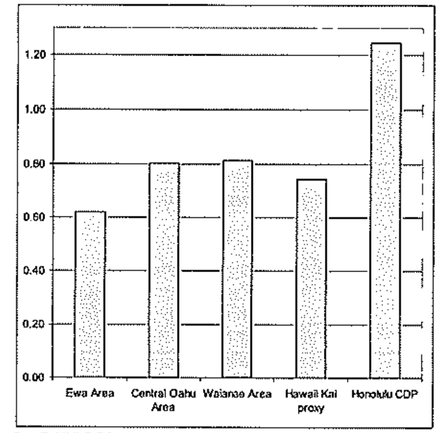
Incomes in the Ewa DPA compare favorably to Central Oahu and the island of Oahu as a whole, with a median $73,025 per household in 2006, or some $22,900 per person. This compares to medians of $66,667 in Central Oahu, $47,923 in Waianae, and $75,432 for the island as a whole.

Hawaii Kai shows a higher median household income than the Trade Area, at an estimated $97,091.

Daytime Population Ratios (Exhibit 5-5)

Daytime populations within the Trade Area and benchmark market are estimated based on 2000 ratios prepared by the US Census within Census Designated Places (CDPs)[7]. The Ewa DPA includes three CDPs, while Central Oahu has seven and Waianae has three. The ratios derived from this source are considered baseline figures for the current analysis, as explained below.

Ratio of Daytime Population to Residents



See Exhibit 5-5 for sources and further information.

Hawaii Kai is not a "Place" designated by the Census. Therefore, Kailua Town's population ratio was used as a proxy for Hawaii Kai's, since both are long-established bedroom communities to Honolulu, located about 30 minutes away, and both have shown recent increases in retail- and service-related employment.

On average, the Ewa CDPs show a daytime population of 62% of their resident population, suggesting significant out-commuting during the day.

Central Oahu reflects less out-commuting, as evidenced by a daytime ratio averaging 80% among its CDPs.

Waianae's CDPs also show a relatively high daytime population ratio, at 81%. However, this may be influenced by the relatively high unemployment rates in the district as much as by out-commuting.

Out-commuting for the Trade Area as a whole would be substantially lower than these figures reflect, because (1) there are persons who live and work in different Census Places but still within the Trade Area, and (2) the data are based on 2000 employment and residence patterns and, particularly in Ewa, significant job creation has occurred since then.

As a proxy for Hawaii Kai, Kailua CDP showed a 74% daytime to resident population ratio. Figures for the Honolulu CDP are also presented as an example of an urban area with net daytime in-commuting, and the ratio achievable within a much larger area.[8] The Honolulu

[7] US Census Bureau, Census 2000, PHC-T-40, "Estimated Daytime Population and Employment-Residence Ratios: 2000" Journey to Work and Migration Statistics Branch, 2005.

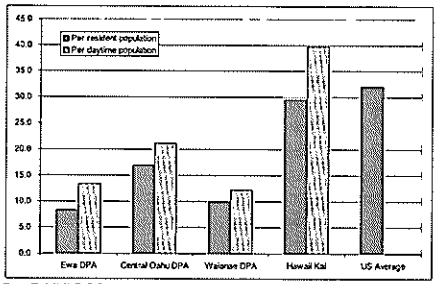
[8] The Census Bureau defines the Honolulu CDP to include Waikiki, the Primary Urban Center and East Honolulu. These data are not skewed by visitors, as they are not inventoried in the Census methodology.

CDP is estimated to provide 54% more jobs than could be filled by its resident workers, and shows a daytime population ratio of 1.25.

Retail Supply in Relation to Population
(Exhibit 5-6)

Comparing retail GLA to resident population, the Ewa and Waianae DPAs appear significantly under-retailed currently, at only 8 to 10 square feet per resident. Central Oahu's resident ratio is more than twice Ewa's, at 17 square feet, while Hawaii Kai is considered a relatively balanced suburban market, at 30 square feet per resident. The latter is more consistent with the U.S. average of about 32 square feet per resident, as discussed previously.

Gross Leasable Square Feet Per Person



See Exhibit 5-6 for sources and further information.

In comparison to estimated daytime population, Ewa and Waianae again stand out as under-retailed, with a ratio just over one-third that shown as supportable in Hawaii Kai. Hawaii Kai is able to support these significantly higher space ratios despite virtually no vacancies.

Supportable Retail-Based Area in Ewa

Methodology (Exhibits 5-7 and 5-8)

Future support for additional retail-based areas in Ewa is expected to come primarily from the resident and daytime populations of the Trade Area. Within the Trade Area, the rapidly increasing resident populations of the Ewa DPA itself would anchor demand for new retail in the DPA. Additionally, the populations of the nearby Waianae and Central Oahu DPAs are expected to contribute an increasing share of their retail expenditures in Ewa, as Ewa becomes a regional hub for jobs, services, entertainment and shopping.

Therefore, the anticipated market support for additional retail space in Ewa is considered from these two perspectives:

- **Immediate market (Ewa DPA)** – Demand is projected by correlating the existing and planned/entitled retail areas in the Ewa DPA with its projected resident and daytime populations. These populations are estimated to support 30 square feet GLA per resident, and 36 square feet per daytime population. Both of these ratios apply to expenditures within the Ewa DPA and are benchmarked to within-community ratios derived from Hawaii Kai.

- **Nearby markets (Waianae and Central Oahu DPAs)** – Demand is projected by estimating expenditures these resident and daytime populations make within a regional market, and within this, Ewa capture rates are estimated. For these purposes, retail potential is estimated at 32 square feet GLA per resident population, and 40 square feet per daytime population. These ratios are marginally higher than those applied to Ewa, since they refer to potential expenditures throughout the Trade Area region, not just Ewa.

Key Assumptions (Exhibits 5-7 and 5-8)

Key assumptions to the projection methodology include the retail to population ratios, daytime to resident population ratios and Ewa's capture rate of retail expenditures made by those who live or work outside the DPA.

- **Retail to population ratios** (as presented above) -

  - **Central Oahu** today is a relatively large, diverse area with significant and diverse retail and service industries that provide a job base. However, it is not a major job center and still experiences significant out-commuting. Thus its resident and daytime retail to population ratios of 17 and 21 square feet, respectively, are very low indicators for the Trade Area, particularly in the future. Also, its vacancy rate of approximately 0.6% suggests it is under-retailed for its existing populations.

  - **Hawaii Kai** is smaller in terms of population, but is a nearly mature bedroom community, with a wide variety of retail, dining and service choices. It also offers facilities that serve a broader regional market. Thus, its ratios of 30 and 40 square feet per resident and daytime population are considered more representative of what the Trade Area could achieve in the future. However, given Hawaii Kai's bedroom community status and its low vacancy rates (0.6% in December 2006), it could also be a low benchmark for Ewa in the future. Additionally, since these figures are derived from space supported within Hawaii Kai only, they could under-represent the total market support if a larger area were considered.

  - The estimated **U.S. average** of 32 square feet per resident population helps to further establish the reasonableness of a resident ratio slightly higher than Hawaii Kai's 30.

- **Regional capture rate** - Ewa's share of expenditures made by nearby residents is expected to increase over time, from a nominal amount currently, to up to 15% (daytime population) or 20% (resident population) by 2030, as Kapolei and East Kapolei grow as centers of employment, shopping, entertainment and dining. It is particularly logical that Ho`opili capture a significant share of Central Oahu resident and daytime population expenditures, due to its location on the Central Oahu border. Residents are expected to be more flexible as to where they make their expenditures than are employees, who are an additional component of daytime population.

- **Daytime population ratios** - This assessment assumes daytime to resident population ratios approaching 0.95 throughout the Trade Area, compared to the average 0.75 within CDP ratios observed in 2000. This approximately 25% increase in the daytime population ratio over the 30 year period (from observations in 2000 to the end of the projection period in 2030) is considered possibly conservative due to:
  - The regional ratio is likely already substantially higher than the 0.75 figure assumed for 2006, since it reflects only those persons remaining within the Trade Area.
  - Some of this change is likely to have occurred already, since the ratios to which these increases are applied were based on 2000 data.
  - The Kapolei region is poised to move from a primarily bedroom community to one that is increasingly a "Second City," in accordance with public and community visions for the area.
  - The assessment would position the Trade Area of the future above the Hawaii Kai proxy of 0.74 and the 2000 Central Oahu figure of 0.80. Both of these areas are somewhat mature but are still bedroom communities.
  - At 0.88, the Trade Area would still be well below the Honolulu CDP figure of 1.25, which reflects a more representative land area, but one anchored by the State's major urban and jobs center.

Conclusions for Ewa

In comparing the two approaches, the daytime population methodology is considered more appropriate because it better reflects Ewa's expected emergence as a regional hub for employees, students, commuters and others who will represent primary support for its commercial markets. Compared to the resident population method, the daytime population method shows a more gradual build-up of additional supportable GLA, but a slightly higher level overall by the end of the projection period in 2030. The implications of the two methods as well as the conclusion for additional supportable retail-based areas in Ewa are summarized in the table on the following page.

Projected Supportable Additional Retail-Based Commercial Space in the Ewa DPA (square feet)

	2015	2030
Method 1: Resident population	1,900,000	2,800,000
Method 2: Daytime population	1,500,000	3,000,000
Conclusion (daytime method)	**1,500,000**	**3,000,000**

Note: Figures represent net additional development potential, beyond that for currently existing and proposed/State-entitled developments.

Source: Mikiko Corporation; see Exhibits 5-7 and 5-8 for further information.

6 - Office Market Environment

Methodology

This chapter presents the estimated market support for additional commercial space in Ewa, as derived from office-based market indicators. Although office spaces are often included in retail shopping centers, this chapter focuses on the market for other office-based facilities: those developed as stand-alone office complexes (that may include some retail) as well as those that may be part of mixed-use developments.

Government office buildings are not considered, since their development and placement is more often a matter of policy and budget processes than market trends. Long-term demand for civilian office facilities is related to civilian job creation.

Waianae residents are as likely as Ewa or Central Oahu residents to find employment within office buildings in the Ewa DPA. However, at this time Waianae has very limited office facilities, so the area is not used as a supply or demand comparison. Rather, the analysis focuses on the Ewa and Central Oahu DPAs, with urban Honolulu and the island as a whole used as benchmarks to portray the types of structural changes that could take place in Ewa over time.

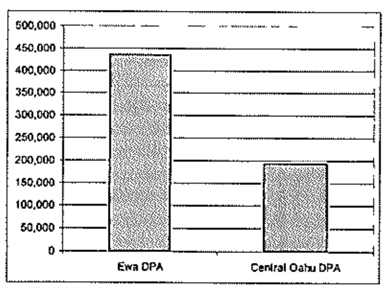
Office supply and demand is evaluated in terms of rentable building area (RBA), expressed in square feet.

Office-Based Supply

Area Inventory (Exhibit 6-1)

Ewa already has more RBA in office buildings than does the more populous Central Oahu DPA, reflecting the urban intent for Kapolei. As of December 2006, the Ewa DPA showed 436,00 square feet of private office space, compared to 194,000 in Central Oahu. The vast majority of Ewa's inventory is now in Kapolei.[1]

Existing Office RBA (square feet)



See Exhibit 6-1 for sources and further information.

[1] Not included in this Kapolei inventory because they are government facilities are 215,000 square feet at the State Office Building, 96,000 at the City's Kapolei Hale and 50,689 at its Police headquarters.

Although occupancy figures are not available for Ewa and Central Oahu separately, "Leeward Oahu," which includes both these areas as well as Waianae, showed a 6.4% office vacancy as of December 2006, according to CMF.

Benchmark Areas (Exhibit 6-1)

The island of Oahu had a total of 15.3 million RBA, of which 11.4 million or 74% was in urban Honolulu. For these purposes, urban Honolulu is defined as the Central Business District (CBD), Kapiolani and King Streets, and the Kaka'ako District, with the components as defined by CMF. Urban Honolulu would show considerably more office space if its government offices were included. Waikiki is not included in this definition of urban Honolulu.

The island's average vacancy rate was 7.0% in December 2006, while the CBD showed 6.7% and Kaka'ako, Kapiolani and King averaged 6.4%.

Planned and Entitled Development (Exhibit 6-2)

Ewa is poised for a nearly five-fold increase in office space, with about 2.2 million square feet of RBA planned and entitled as of December 2006. However, 725,000 square feet of this potential future inventory is located in Kalaeloa, where plans are in considerable flux as of this writing.

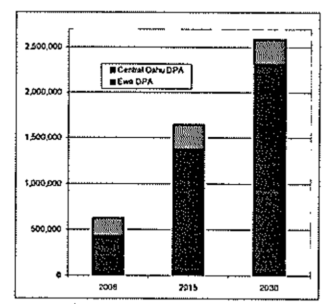
Central Oahu shows about 80,000 square feet in potential future office-based complexes, all within Gentry's Waiawa Phase 1, which is designated LUC Urban.

Specific projects and land areas from which these estimates were derived are presented in Appendix 5.

Future Area Inventory (Exhibit 6-3)

Considering the planned and entitled projects identified, plus those already operating, Ewa and Central Oahu could have some 2.6 million RBA by 2030, if all projects are developed as currently planned and on the timetables projected. As for the planned retail inventories discussed in the last chapter, most of this new inventory would be added in Ewa, in alignment with the area's projected residential and employment growth.

Potential Future Office RBA in Ewa and Central Oahu (square feet)



See Exhibit 6-3 for sources and further information.

Office-Based Demand

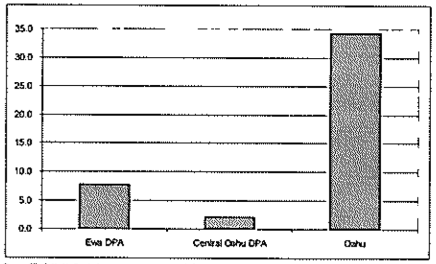
Employment Ratios (Exhibit 6-4)

The civilian labor force in the Ewa DPA currently represents 63% of its resident population. In Central Oahu, the ratio is 57% and in urban Honolulu as for the island as a whole, the ratio is 49%. Ewa's higher ratio reflects its relatively younger population, a higher share of whom are of labor force age. With the job and career opportunities envisioned in Ewa, it is likely to continue to attract a substantial workforce population, but its age profile will also "gray" as will the rest of Oahu's.

RBA Ratios (Exhibit 6-4)

Comparing existing office RBA to the number of civilian employees, the Ewa DPA shows more development than Central Oahu, but significantly less than Oahu as a whole and certainly than urban Honolulu. In 2006, Ewa's private office inventory was estimated at 8 square feet per person in the civilian labor force, compared to 2 in Central Oahu, 34 for the island, and 628 in urban Honolulu.

RBA Ratios Per Civilian Employed Persons



See Exhibit 6-4 for sources and further information.

The very high ratio in urban Honolulu (not depicted in the chart) is evidence of an office worker base that comes from throughout the island. It is anticipated that as it becomes a "Second City," Ewa will also be a magnet for office-based employment on the island, and that it will particularly provide opportunities for those who live in the West Oahu region, including Ewa.

Supportable Office-Based Area in Ewa

Key Assumptions (Exhibit 6-5)

Unlike for shopping, people are accustomed to commuting to their offices. Thus, while the population of the Ewa DPA itself will be a geographically immediate source of demand for future office development, the adjacent and more populous Central Oahu DPA is just as likely to be a source of office employees in Ewa. Central Oahu also appears to be under-supplied with respect to office space at the current time.

Considering just the Ewa and Central Oahu DPAs as demand generators, by 2030, Ewa could require up to 1.37 million square feet of office RBA beyond the potential future supplies that are already entitled and planned. This assessment is based on the following assumptions:

- **Sources of demand** - Only Ewa and Central Oahu employees are considered as a metric for future demand in Ewa. This is conservative since some future enterprises of the DPA could draw employees from throughout the island.

- **Share of population in civilian workforce** – While Ewa now shows 63% and Central Oahu 57%, the civilian employee ratios of both areas are expected to migrate towards the Honolulu and Oahu 2006 averages of 49% as their populations age. However, with the large amount of workforce housing planned in the region, Ewa is expected to continue to show a greater than island-average rate of civilian labor force participation.

- **Supportable RBA per civilian employee** – As the real estate and economic developments planned for the Ewa region take root, the area can expect to see structural changes in the nature of business and employment. Specifically, the Ewa DPA of the future is seen to have more professional and technical opportunities than today. These sectors tend to generate more office-based employment than others.

  Accordingly, the supportable RBA in the Ewa and Central Oahu DPAs is projected to increase to 10, 15 and then 25 square feet per civilian employed residents. This would be a significant change from the 2006 profiles of the areas, but is still a conservative assessment when compared to the 34-square foot average for the island as a whole or the 628 square feet per resident supported in urban Honolulu in 2006.

- **Ewa capture of regional market** – Ewa is projected to capture up to 55% of the combined DPA areas' office market opportunities. This reflects its fair market share (estimated at 50% based on 2030 residents) as well as Ewa's more urban nature relative to Central Oahu's.

Conclusions for Ewa (Exhibit 6-5)

Based on the analyses shown, the Ewa DPA is expected to support some 480,000 square feet of additional office-related building area by 2015, or up to 1.37 million additional RBA (including the 480,000) by 2030. These anticipated supportable areas are in addition to existing office buildings in the DPA, as well as office-based uses that are entitled and proposed for development in the interim.

7 – Ho`opili Commercial Market Assessment

Overview

Ho`opili Proposal

DRH proposes to offer up to 2.96 million square feet of commercial area at Hoòpili, including both retail- and office-based uses. The majority would be located on six BusinessCommercial-designated sites. The balance would be distributed in mixed-use settings andor live-work units near to the village core. As for residential development, the first finished commercial building products are assumed to be available for use in about 2012.

Methodology

The commercial market assessment encompasses both retail- and office-based uses, in recognition of the mixed uses planned at Hoòpili as well as the typical crossover of office spaces within shopping centers and retail uses in office complexes. Thus, the types of commercial uses at the Project will likely be determined as each area is developed.

This chapter summaries the projected supportable additional commercial space for the Ewa DPA as derived from the retail-based and the office-based analyses of the two prior chapters. It also provides the market assessment for commercial uses at Hoòpili.

Ewa DPA Commercial Market

Projected Supportable Area (Exhibit 7-1)

Considering the analyses of retail- and office-based markets presented previously, the Ewa DPA could be expected to support 1.98 million square feet of commercial space in addition to that already in place and entitled and planned for development, by 2015. Over the ensuing 15 years, the DPA is expected to support another 2.39 million square feet of new development, for a cumulative total of about 4.37 million square feet over and above those areas already existing or proposed and entitled for development.

Projected Supportable Additional Commercial Areas in Ewa DPA (square feet)

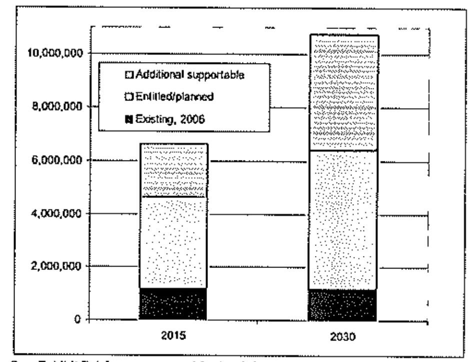
	2015	2030
Retail-based demand	1,500,000	3,000,000
Office-based demand	480,000	1,370,000
Total	**1,980,000**	**4,370,000**

Note: Represents net additional supportable development potential, beyond that for currently existing and proposed/State-entitled developments.

See Exhibits 5-8 and 6-5 for further information.

If added to the existing and proposedéntitled the retail and office areas, the net additional markets represent a potential total Ewa DPA commercial marketplace of up to 10.8 million square feet by 2030. This could include neighborhood, community and regional shopping centers, office buildings, "flex units" that could accommodate a proprietor's office as well as home, and retail spaces mixed into residential andór office structures.

Projected Supportable Commercial Areas in Ewa (square feet)



See Exhibit 7-1 for sources and further information.

Supportive Conditions are in Place

The strong commercial outlook for Ewa is based on an assumption that significant economic, workforce, and spending pattern changes take place within the DPA and its neighboring districts prior to or during Hoòpili's mark eting. Of great significance to commercial markets, these changes are expected to be accompanied by a decrease in out-commuting from Ewa, and its surrounding DPAs. These necessary precursors are consistent with the "Second City" vision for the area and include:

- **New centers of "primary jobs,"** meaning jobs with sufficient income to be the primary support for households living in the area;
- **Public policy support for new economic enterprises** relevant to the area, including knowledge- and innovation-based initiatives;
- **More, high quality elementary, middle and high schools,** offering a wide variety of options, including quality public, charter or magnet, private/religious affiliated, and private/non-affiliated schools;
- **More options for entertainment, cultural and civic and spiritual endeavors,** such as performing arts centers, theaters, museums, shopping, social/business clubs, places of worship and libraries;
- **Renewed development** of high quality housing targeting a wide range of income and age groups;
- **Neighborhoods of move-up housing,** to which area households with rising income and home equity would be proud to relocate;and
- **More efficient transportation systems,** both within and to the region.

All of these precursors are in progress in Kapolei and/or East Kapolei, and all are being pursued within Hoòpili itself. Regional developments already underway that are advancing the Ewa DPA towards these desired outcomes include:

- The significant planned expansion of the UHWO campus and programs, and plans to develop a surrounding college town;
- The new State judiciary complex in Kapolei, with 650 direct and indirect jobs;
- Plans for other office buildings in Kapolei;
- Significant inventory of new business park areas under development in Kapolei;
- The State Administration's various "Innovation Initiatives," directed at transforming Hawaii's economy and preparing its citizens for jobs in the new sectors;
- Discussion of high technology or defense-related developments at Kalaeloa;
- The private Island Pacific Academy college preparatory PK-12 school in Kapolei, which opened in 2004 and is now expanding its middle- and high-school programs;
- Second home and golf-front developments recently entitled at Kapolei West;

- Development planning for the first regional shopping centers in Ewa, the Kapolei Commons and DHHL's project;
- Planned transit service linking Kapolei to Honolulu, and going through Hoòpili;
- Development of the North-South Road and Kapolei Parkway;and
- Improvements to Fort Barrette and Fort Weaver Roads.

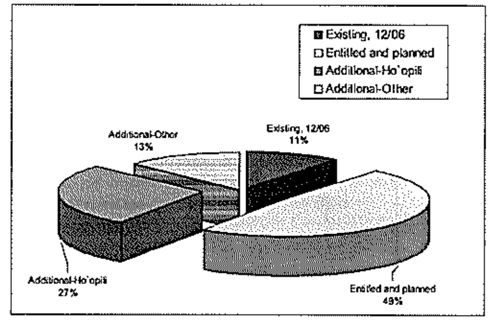
Assessment for Ho`opili

(Exhibit 7-2)

Hoòpili is proposed for up to 2.96 million square feet of commercial uses, including retail and office spaces.

If developed to the full proposed capacity, Hoòpili's commercial spaces could represent about 27% of the Ewa DPA's total future inventory. It could also represent a venue for about two-thirds of the currently unplanned but future supportable commercial space in the DPA.

Potential Ewa DPA Commercial Space Inventory: 2030



See Exhibit 7-2 for sources and further information.

These market shares are considered achievable in light of the prime locations enjoyed by the site and the diversity of commercial development types that are proposed for Hoòpili. Given that potential commercial developments on other entitled lands throughout Kapolei, East Kapolei, Ocean Pointe and Ewa Beach have already been accounted for, Hoòpili appears to be one of the only remaining areas within the DPA on which such development could occur.

8 – Business Park Market Environment and Ho`opili Assessment

Overview

Ho`opili Proposal

As currently laid out, Ho`opili would offer 50 acres for a light industrial research or business park development. After allowing for circulation and infrastructure, a net of 40 acres of the site could be saleable. As discussed at the end of the chapter, however, this analysis concludes that up to two or more times this area could be supported at Ho`opili by future market demand.

Due to its location within a mixed use residential community, Ho`opili's business park is expected to cater to "clean" industries such as office headquarter campuses, research & development facilities, or service-retail uses. As such, the park is expected to have a relatively high floor area ratio (FAR). Ho`opili's site is preliminarily envisioned to show an FAR of 0.50 compared to a typical 0.40 at other built-up light industrial lands on Oahu and about 0.13 as observed for built properties in industrial parks in the Ewa region as a whole.

Methodology

Industrial areas can support business parks, manufacturing, research & development, wholesale, office and retail uses as well as light or heavy industry. They typically serve a super-regional or island-wide market. This analysis profiles current market trends within Ewa and Central Oahu, but the assessment for future demand is based on island-wide trends. This is appropriate because, as eastern Oahu and the island's urban core are redeveloped with higher density and higher value uses, more land-extensive industrial and business park facilities are increasingly being pushed to the western areas of the island.

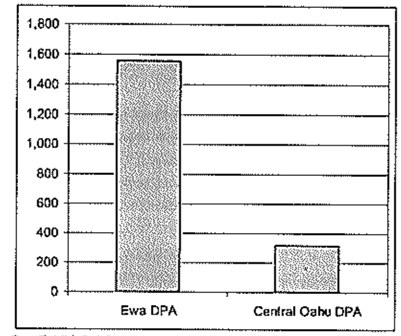
Like office demand, long-term market demand for business park/industrial land is related to trends in civilian job creation. This analysis does not consider public facilities with industrial-related uses or industrial-designated lands such as at military bases, harbors, universities and airports.

This analysis is prepared in terms of acres of land, although much of the available market data is for square feet within buildings developed on such lands.

Industrial and Business Park Supply

Area Inventory (Exhibit 8-1)

Existing Industrial Lands (in acres)

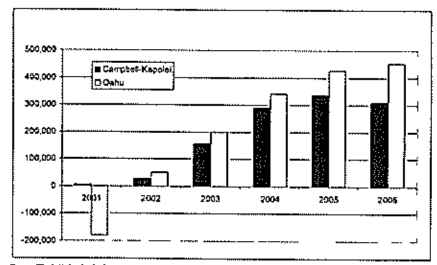


See Exhibit 8-1 for sources and further information.

Ewa's entire business park/industrial inventory is currently in the Kapolei area, where some 1,560 acres were sold or in use as of December 2006. In comparison, Central Oahu includes about 320 acres, which are dispersed in a number of locations.

Ewa showed a 2.6% vacancy as of December 2006, according to CMF, only slightly higher than Oahu's rate. This is a below-optimum level, one that inhibits the growth of businesses and increases their occupancy costs. As further evidence of the current inadequate supply of available properties, CMF reports that net asking rents for developed space have increased about 140% since 2002/03 in Kapolei,[1] and 23% for the island. Likewise, CMF estimates land appreciation since 2004 at 150% in Kapolei and 83% for Oahu as a whole.

Industrial Space Absorption (square feet)



See Exhibit 8-2 for sources and further information.

Market Trends for Industrial Space (Exhibit 8-2)

Oahu's current under-supplied market is in spite of four years of very strong industrial space absorption, particularly in Kapolei. Based on CMF's surveys of leaseable space in industrial buildings, Kapolei has been absorbing around 300,000 square feet in each of the past three years, peaking in 2005 at 335,500 square feet absorbed. Since at least 2001,

[1] CMF describes this area as "Campbell-Kapolei."

Oahu has shown consistent increases in absorption.

The Kapolei area now includes about 5.4 million square feet of leasable industrial building space, representing 14% of the island's built inventory of some 39 million square feet. While Kapolei's share of Oahu inventory has ranged from 12% to 14%, the area accounts for the vast majority of new space absorption, some 70% to 90% since 2003. This reflects the strong future market potential of the Kapolei region and Oahu's growing dependence on this area to serve its industrial- and business-related needs.

Although land area data is not available for the rest of Oahu, with its generally lower-costs and hence lower-density uses, the Kapolei region would represent an even greater share of both current inventory and abosrption if evaluated in terms of land acres rather than built square feet.

Planned Development and Future Inventory (Exhibit 8-3)

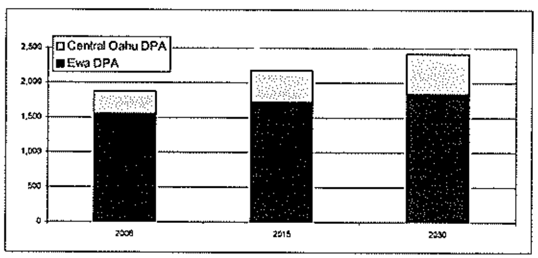
There are some 280 net acres of land entitled and planned for business park/industrial use in the Ewa DPA as of December 2006. However, some 144 acres of this potential future inventory are located in Kalaeloa (Navy plus HCDA-administered lands), and the ultimate use and development timing for these lands are very uncertain. Not included the 280-acre count is the Kapolei Harborside Center, which is proposed for 345 gross acres (240 net). Landowner Kapolei Property Development is now petitioning the LUC to entitle this project.

Another 260 net acres could be provided by 2030 in the Central Oahu DPA. These are largely within future phases of Mililani Tech Park and in Gentry's Waiawa Phase 1.

Specific projects from which these estimates were derived are presented in Appendix 6.

Considering these planned developments, plus areas already in use, Ewa and Central Oahu could have some 2,400 acres of private business or industrial park lands available by 2030, if all projects are developed as currently planned and on the timetables projected. The majority of this inventory would remain in the Ewa DPA.

Potential Future Industrial Land Inventory in Ewa and Central Oahu (acres)



See Exhibit 8-3 for sources and further information.

Industrial and Business Park Demand

Demand for future business park/industrial lands in Ewa can be expected to come from two sources:

1. **Employment-driven demand** - This is estimated based on projections of civilian employment and is driven by the future needs of businesses island-wide.
2. **Transition-driven demand** - Within Oahu, some existing industrial tenants and landowners can be expected to move to Ewa, as they are displaced from areas nearer to the urban core of Honolulu. Transition demand will also be driven by an increasing "pull" from Ewa with its critical mass of services, facilities and consumers, as well as its potentially lower costs and more modern infrastructure.

Employment-Driven Demand (Exhibit 8-4)

Oahu offered 88 square feet of industrial building area per civilian employed person in 2006. Considering the supply-constrained current marketplace, however, a more desirable ratio would be 90 square feet per employee, which would support an average 5% building vacancy compared to the current 2.3%. The ratio of building area to employees has been increasing, reflecting the strong State economy in recent years. Its rise also reflects as an evolving mix of industries on Oahu, particularly growth outside of tourism in areas such as research, high technology, film and media production and the like. As public policy and private efforts continue to encourage such economic transitions, one can expect to see the ratio of industrial space demand to employment continue to increase.

Compared to eight U.S. market areas reported on by Robert Charles Lesser & Co., LLC (RCL),[2] Honolulu's industrial space to employment ratio was the lowest. Comparison locales surveyed in 2004 include:

- Metro Las Vegas – 95 (with 7.6% vacancy);
- Metro Seattle – 111 (with 9.5% vacancy);
- San Diego County – 125 (with 7.6% vacancy);
- San Francisco Bay Area – 131 (with 0.0% vacancy);
- Metro Phoenix, Metro Denver and Los Angeles County – 143 to 236.

Based on just a 0.3% per annum increase in Oahu's ratio, to 97 square feet per employee by 2030, the island could be expected to demand up to 53.3 million square feet of industrial building area by 2030. This compares to the 39.1 million square feet existing as of December 2006, and implies need for another 14.2 million square feet over the next 24 years. The future inventory would represent only about a 1.2% per annum increase over the period, compared to a 0.9% projected annual increase in employed civilians.

[2] Robert Charles Lesser & Co., LLC, "Industrial Market Feasibility: 345-Acre Kapolei Harborside Center," Exhibit II-7, January 31, 2006, (prepared for Aina Nui Corporation). RCL cites Grubb and Ellis and Colliers as its sources.

Assuming a FAR of 0.20 for the new areas[3], the projected demand for new building space implies need for another 1,627 net acres of land by 2030. This includes some 113 acres of estimated pent-up demand in 2006. The ratio used in this projection would position the Oahu of 2030 between Metro Las Vegas and Metro Seattle of 2004.

Given the 540 net acres identified as planned in Ewa and Central Oahu, plus another 115 documented at three other sites on Oahu, the island could require another 972 net acres of business park/industrial lands by 2030, beyond those already entitled and planned (1,627-540-115). This is the need component that can be associated with increases in the island's employment base.

Transition-Driven Demand (Exhibit 8-5)

In addition to demand related to a growing employment base, the Ewa district in particular will need to support business park/industrial land users moving from other areas of Oahu. Sources of this transition-based demand are two-fold:

- **Displacement** – Two large areas of current business park/industrial use near to Honolulu's urban core are already displacing tenants and can be expected to continue to do so. These include the Kaka'ako District, estimated by CMF to house some 2.88 million square feet of business park/industrial tenants (2.78 million estimated to be occupied), and the former Kapalama Military Reservation on Sand Island, with an estimated 1.25 million square feet. KMR's transition is expected to take about 5 years, while Kaka'ako's could persist over the next 15 years.

  Together, these two areas represent about 4.0 million square feet of space that will need to relocate within the island. By 2012, the projected start date for Ho'opili, some 100 acres worth of tenant space might have already relocated, including all of KMR and a portion of Kaka'ako. Tenants requiring up to another 73 acres (23 + 50) might still need to be relocated by 2021.[4]

- **Lease turnover** – Based on a common five-year space lease, in any given year approximately 20% of existing leases would come up for renewal and some 5% of those could be expected to relocate. Considering Oahu's current business park/industrial space inventory (outside of Kaka'ako and KMR), this would represent about 342,000 square feet of business park/industrial space seeking to relocate in any given year. While this source of demand will grow as the island inventory of space increases, for these purposes, only the 342,000 square foot figure is used.

[3] This compares to the 0.13 currently observed in business park/industrial areas in West Oahu, according to survey data provided by CMF.

[4] Expiring ground leases, area redevelopment and other factors will also displace tenants at other locations, including the Airport and Mapunapuna areas. These situations are not added to the demand calculations here because of the lack of complete information. The assessment of demand in Ewa would be higher if more such situations could be documented.

Within the study horizon, lease turnover could generate about 8.2 million square feet of relocations (3.1 million + 5.1 million), which could represent about 340 acres of land.

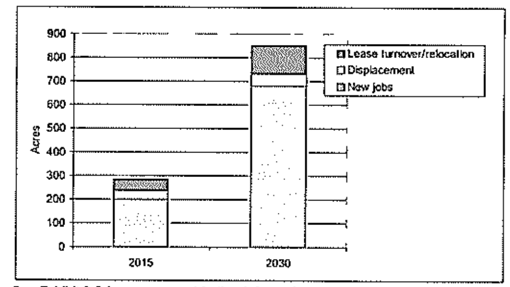
Business Park/Industrial Land Assessment

Ewa DPA (Exhibit 8-6)

The market potential for the Ewa DPA will be determined by its capture rates of the employment-driven and the transition-driven sectors of demand.

- **Employment-driven demand** – This demand originates primarily from new or expanding businesses that require new or more space. Because much of this demand could be attributable to new enterprises, it is considered more likely to be able to locate away from Oahu's existing centers of business and tourism near Honolulu and more likely to be attracted to the more modern infrastructure of the Kapolei region.

Potential Future Business Park/Industrial Land Requirements in the Ewa DPA by Demand Source



See Exhibit 8-6 for sources and further information.

A 70% capture rate is employed for this source, roughly equivalent to the Ewa DPA's fair share of anticipated new business park/industrial development on the island. Seventy percent is also within the Campbell-Kapolei area's share of new island industrial space absorption over the past four years, as presented in Exhibit 8-2.

This would result in about 199 more acres supportable in the DPA by 2015, or 680 cumulatively by 2030.

- **Transition-driven demand** – Transition-driven demand is the relocation of existing tenancies rather than a net increase in island-wide demand. The Ewa DPA is likely to be an attractive area for many transitioning tenants, with its lower occupancy costs that permit more land-extensive operations, and its greater supply availability.

  On the other hand, the majority of the existing lease turnover tenancies and all of those examined for displacement (Kaka'ako and KMR) are already established near to the urban core, and likely have business and client relations there. Thus only 30% to 35% of the identified transitioning sources of demand are assumed to relocate to the Ewa DPA.

  Transition-driven demand could be expected to support some 82 new acres of business park/industrial or business park tenancy in Ewa by 2015, or 171 cumulatively by 2030.

- **Total demand** – In total, supportable new industrial/business park land in the Ewa DPA, beyond that already entitled and planned, could amount to some 280 acres by 2015, or 850 cumulatively by 2030.

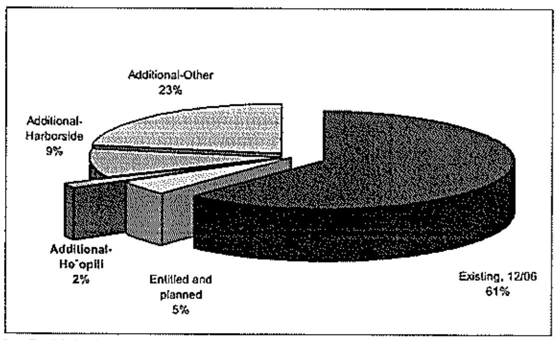
  Kapolei Harborside Center, a 240 net acre (345 gross acre) proposed development, is currently petitioning the LUC for Urbanization. Even if Harborside Center is approved, the region could still be expected to support at least 40 more net acres by 2015, or 610 cumulative by 2030 (850-240).

Assessment for Ho`opili (Exhibit 8-7)

The land use plan for Ho`opili includes a 50-acre (40 net acre) site for business park development.

This site would represent a solution for only 2% of the net unprovided-for demand in the region. Even if the Kapolei Harborside project receives LUC and other approvals to permit its development, there could remain substantial unmet demand for business park or industrial lands in the area, particularly in the 2015 to 2030 period.

Potential Supportable Ewa DPA Business Park/Industrial Inventory in 2030
(Hoopili land allocation as currently planned)



See Exhibit 8-7 for sources and further information.

Given the strong regional market conditions as well as Ho`opili's outstanding location, access and visibility, and the integration of its business park site into a mixed-use community with a range of housing opportunities, it is expected that the net 40-acre site proposed could be fully absorbed by 2015. In addition, it appears there could be market support for two or more times the current land allocation, with the additional area supportable between 2015 and 2030. At 80 net acres, the greater land allocation would still represent only 4% of 2030 regional supply or 10% of future demand currently not provided for by State entitlements and private development plans.

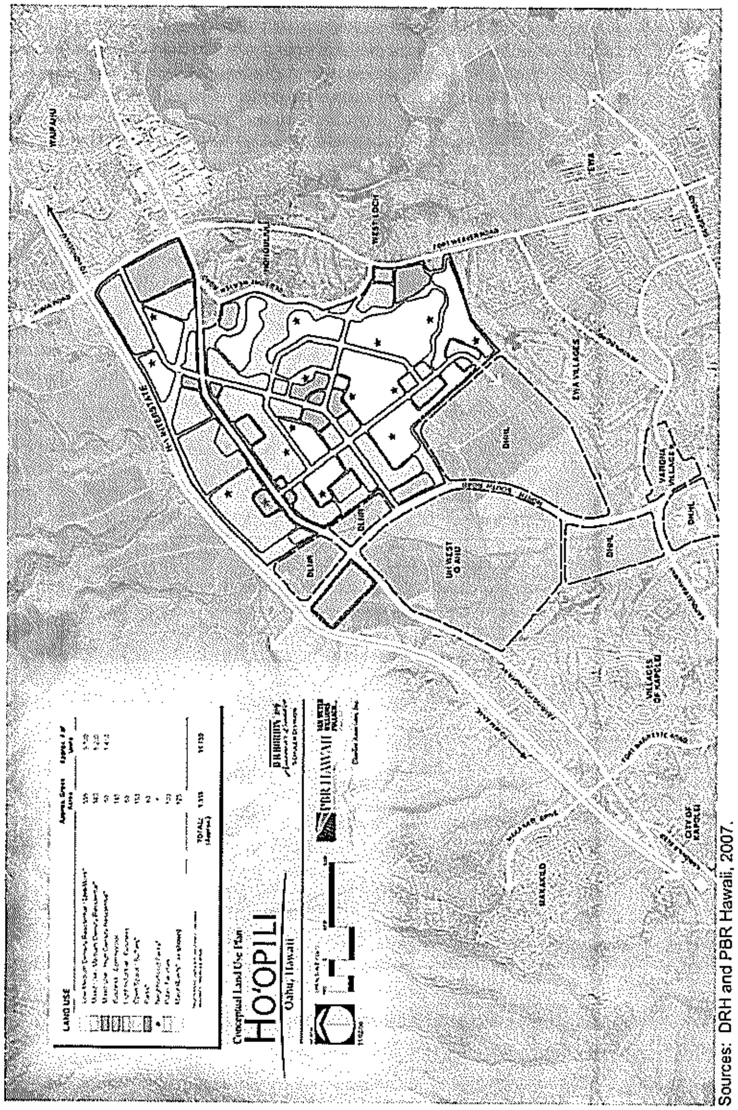
While even a 80 net acre site at Ho`opili would represent a small addition to the region's future inventory in 2030, it could enable an iconographic source of high quality employment for the community. Example development types that a Ho`opili business park could support include:

- **Science and Technology Park** – This opportunity could relate to the site's proximity to the proposed UH West Oahu as well as its location on a transit route and the modern infrastructure and planning of Ho`opili. Example enterprises or activities in such parks could include:
  - ☐ Wet lab-based research & development or production;
  - ☐ Social science or public health research;
  - ☐ Software or distance learning production;
  - ☐ Media/film/music school or production facility; and
  - ☐ Natural resource research and/or management.

- **Lifestyle/Wellness Center** – As Baby Boomers move into their 50s, 60s and beyond, there is amble evidence of interest in enterprises that cater to enhancing their quality of life or appearance, and in prolonging their healthy and productive years. Baby Boomers as well as younger generations have also demonstrated a willingness to expend significant funds on such endeavors. Example facilities within a lifestyle/wellness center include:
  - ☐ Health and wellness campus;
  - ☐ Fitness and rehabilitation institute;
  - ☐ Medical park;
  - ☐ Senior lifestyle and care facilities; and
  - ☐ Post-surgical retreat and recovery center.

- **General Business Park** – The site could also be developed as a more generic business park, offering land sales or space sales/leases to a variety of enterprises.

Exhibit 1-1
Ho`opili Conceptual Land Use Plan



Sources: DRH and PBR Hawaii, 2007.

Exhibit 1-2
Overview of Ho`opili Development Plan

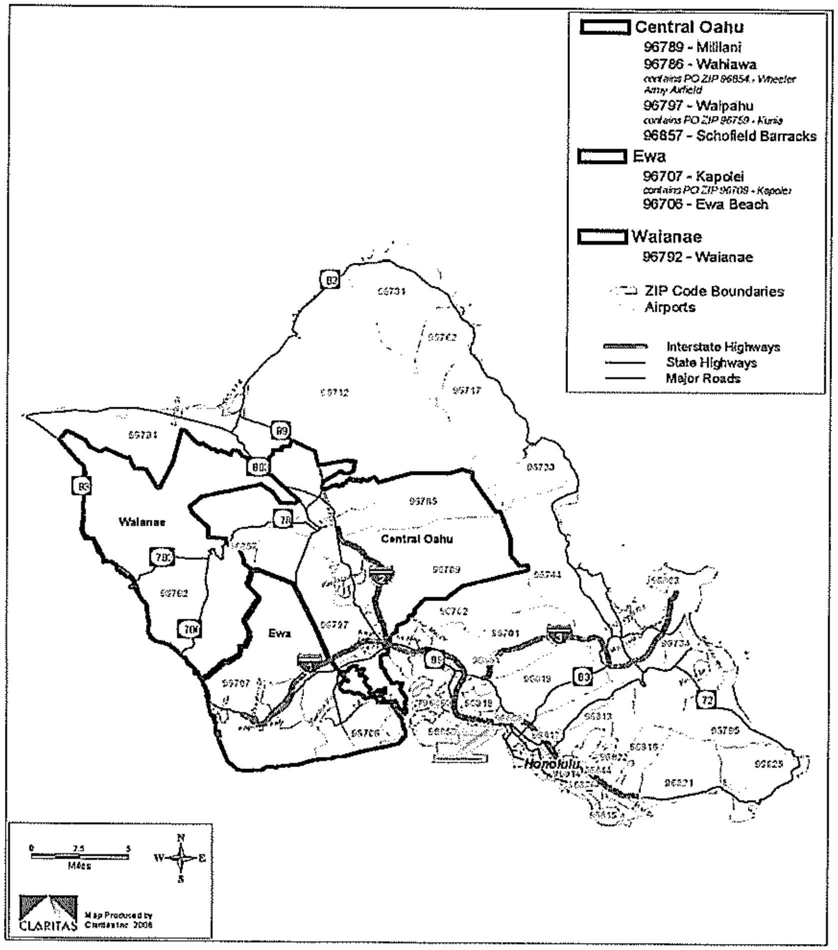
	Gross acres	Net acres[1]	Density range	Total	Comment
Residential:			*Units/net acre*	*Units*	
Low-Medium Density	535	400 - 475	5 -14	5,100	Single-family and mixed use (multifamily); includes office spaces within mixed-use areas.
Mixed Use/Medium Density	340	250 - 300	15 - 29	5,200	Mixed-use, including retail and office spaces (neighborhood-serving).
Mixed Use/High Density	50	40	30 - 50	1,450	Mixed-use, typically residential-over-retail, including retail and office spaces (neighborhood-serving).
Total	925	690 - 815		11,750	
			Floor area ratio	*Square feet*	
Commercial retail/office	145	130	.23 - .50	2,960,000	Figures include spaces within mixed-use residential areas; majority of retail space within two stand-alone sites serving regional markets.
Research and business park	50	40	0.50	800,000	Mauka of HECO sub-station, along Farrington.

Mixed use - combines residential with office and/or retail

[1] Excludes interior roadways and other non-saleable areas.

Sources: DRH and PBR Hawaii.

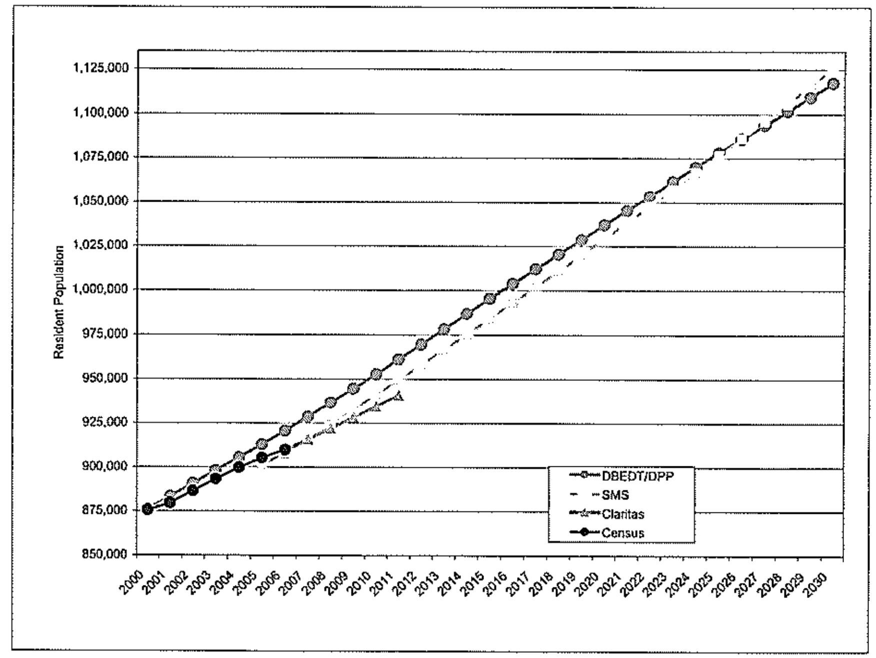
Exhibit 2-1
Trade Area Development Plan Areas as Approximated by Zip Code



Source: Claritas, Inc., 2006.

Exhibit 2-2
Resident Population - Island of Oahu
Comparison of Estimates and Projections
2000 to 2030

	Date prepared	2005	2006	2011	2015	2020	2025	2030
DBEDT/DPP[1]	2004	912,900	920,700	961,100	995,550	1,037,250	1,078,050	1,117,300
SMS[2]	2007	901,155	907,883	949,480	984,125	1,029,215	1,076,371	1,125,688
Claritas[3]	2006	--	909,408	940,689				
U.S. Census[4]	2006	905,266	909,863					



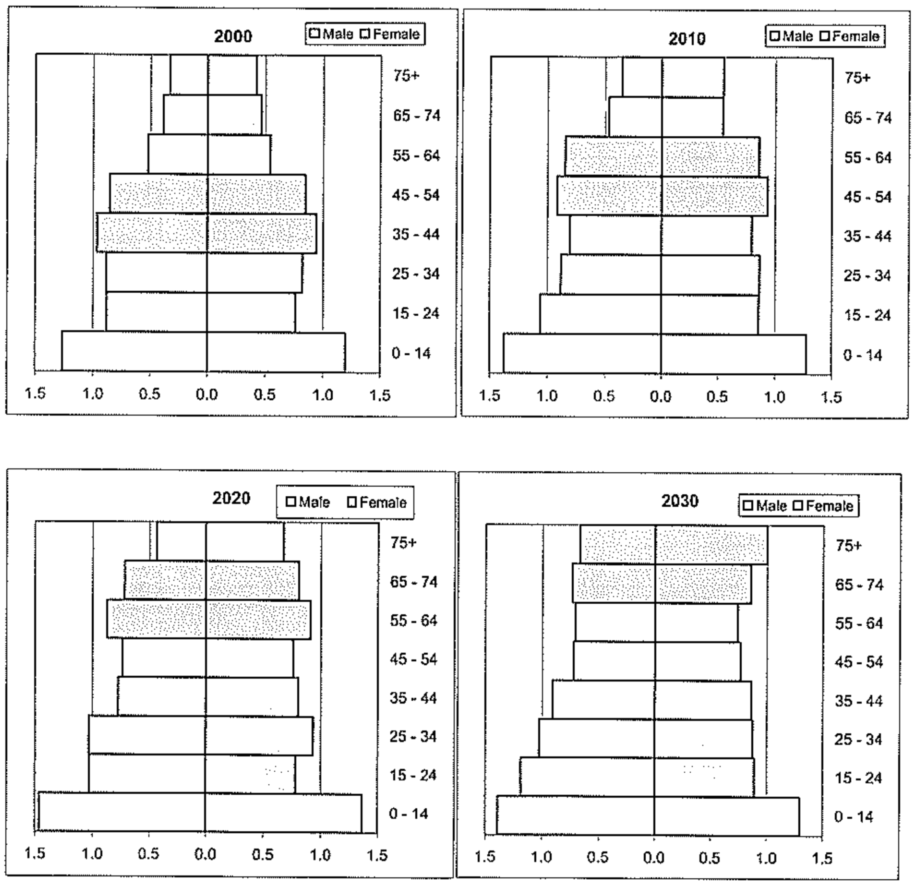
1 State of Hawaii, Department of Business, Economic Development and Tourism, Research and Economic Analysis Division, "Population and Economic Projections for the State of Hawaii to 2030," (DBEDT 2030 Series), August 2004. Projections for 2005 and 5-year increments thereafter to 2030; figures interpolated in-between. City and County of Honolulu, Department of Planning and Permitting uses DBEDT's projections.

2 SMS, Inc., "Housing Policy Study, 2006: Hawaii Housing Model 2006," February 2007. Population growth set to "official parameters" for Honolulu County of 0.9%.

3 Claritas, Inc., October 23, 2006. Estimate for 2006; projection for 2011; figures interpolated in-between.

4 U.S. Census Bureau, Population Division, Table 1; Annual Estimates of the Population for Counties of Hawaii (3/16/06). As of July 1.

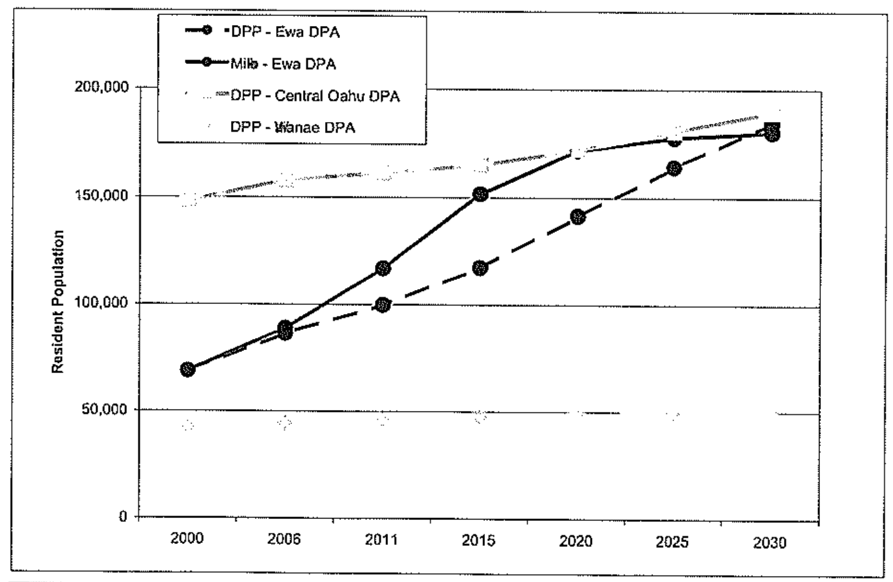
Exhibit 2-3
Projected Population by Age Group - State of Hawaii
2000 to 2030



Nes: Each unit on Xis represents 100,000 persons. Highlighted bars include Baby Boom cohort.
Source: U.S. Census Bureau, Population Division, Interim State Population Projections (released 4/21/05), http://www.census.gov/population/www/projections/statepyramid.html.

Exhibit 2-4
Resident Population - Ewa, Central Oahu and Waianae
2000 to 2030

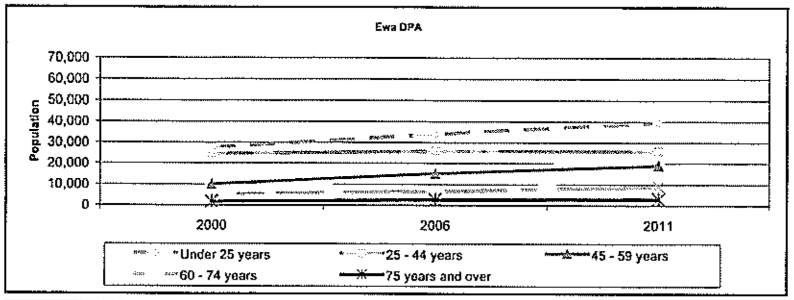
	2011	2015	2020	2025	2030	Average annual % increase, 2006-2030
DPP projections:						
Population:						
Ewa DPA	99,720	117,250	141,420	164,140	184,610	3.2%
Central Oahu DPA	161,250	164,950	172,100	180,690	189,600	0.8%
Wanae DPA	45,830	47,300	48,620	49,680	50,620	0.6%
Island of Oahu	961,080	995,550	1,037,250	1,078,050	1,117,300	0.8%
As a percentage of Oahu:						
Ewa DPA	10%	12%	14%	15%	17%	--
Central Oahu DPA	17%	17%	17%	17%	17%	--
Wanae DPA	5%	5%	5%	5%	5%	
Mikiko projection for Ewa DPA[1]:						
Population	116,800	151,600	171,900	177,800	180,200	3.0%
Percent of Oahu	12%	15%	17%	16%	16%	--

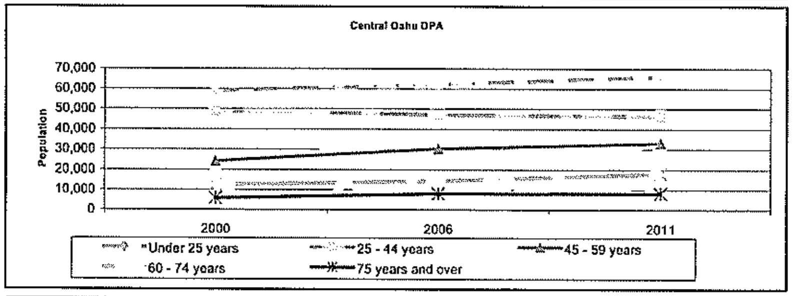


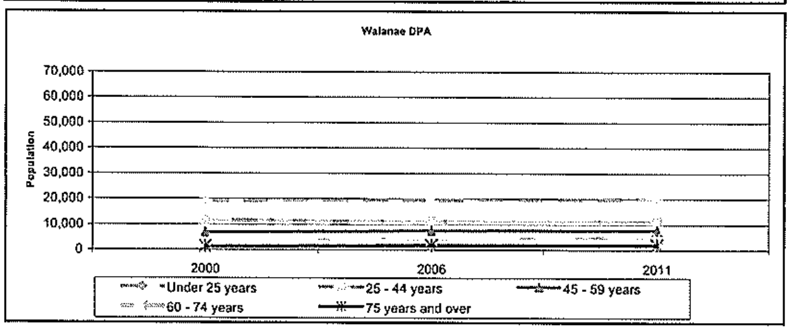
1 Mil Corporation projections are based on DPP's estimates for 2000 and 2005, with population thereafter based on anticipated development of UC-entitled housing in Ewa as shown in Ehibit 3-7 (adjusted 5% for vacancy) and an average household sie of 3.1 (vs. histori cal area estimate of 3.5) in new housing units. Figures do not reflect impact of Hoopili or other unentitled, proposed developments. Other DPA projections not reviewed by Mil.

Source: City and County of Honolulu, Department of Planning and Permitting, February 16, 2006; Mil Corporation, 2007.

Exhibit 2-5
Population by Age Group - Ewa, Central Oahu and Waianae
2000 to 2011







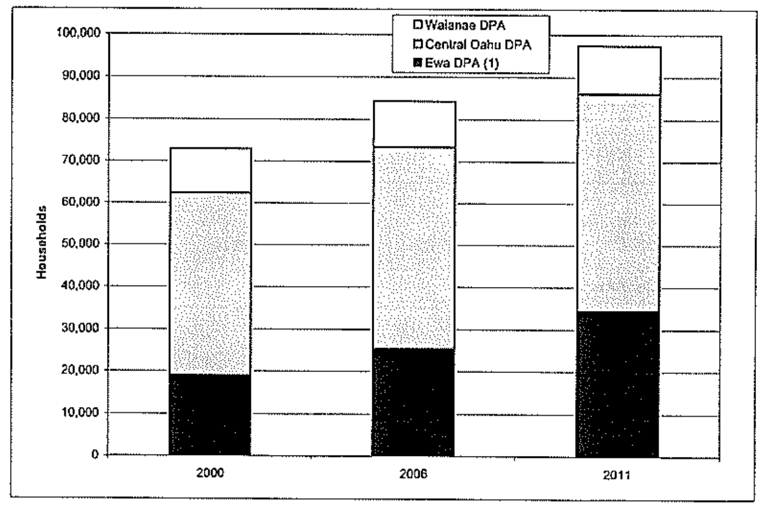
Median ages 2006: Ewa DPA - 32.0 Central Oahu - 33.1 Waianae DPA - 29.3 Oahu - 37.7

Note: DPAs (Development Plan Areas) are those defined by the City and County of Honolulu, but approximated for data generation purposes by zip code area. See Chapter 2 for further information.

Source: Claritas, Inc., October 23, 2006, October 24, 2006 and December 8, 2006.

Exhibit 2-6
Households - Ewa, Central Oahu and Waianae
2000 to 2011

	2000	2006	2011	Average annual % increase 2000 - 2006	Average annual % increase 2006 - 2011
Number of households:					
Ewa DPA[1]	18,942	25,371	34,344	5.0%	6.2%
Central Oahu DPA	43,384	47,981	51,811	1.7%	1.5%
Waianae DPA	10,535	10,960	11,365	0.7%	0.7%
Island of Oahu	286,450	300,924	313,409	1.0%	0.8%
Average household size:					
Ewa DPA[1]	3.6	3.5	3.4	-0.5%	-0.6%
Central Oahu DPA	3.5	3.4	3.3	-0.5%	-0.6%
Waianae DPA	4.0	4.0	4.0	0.0%	0.0%

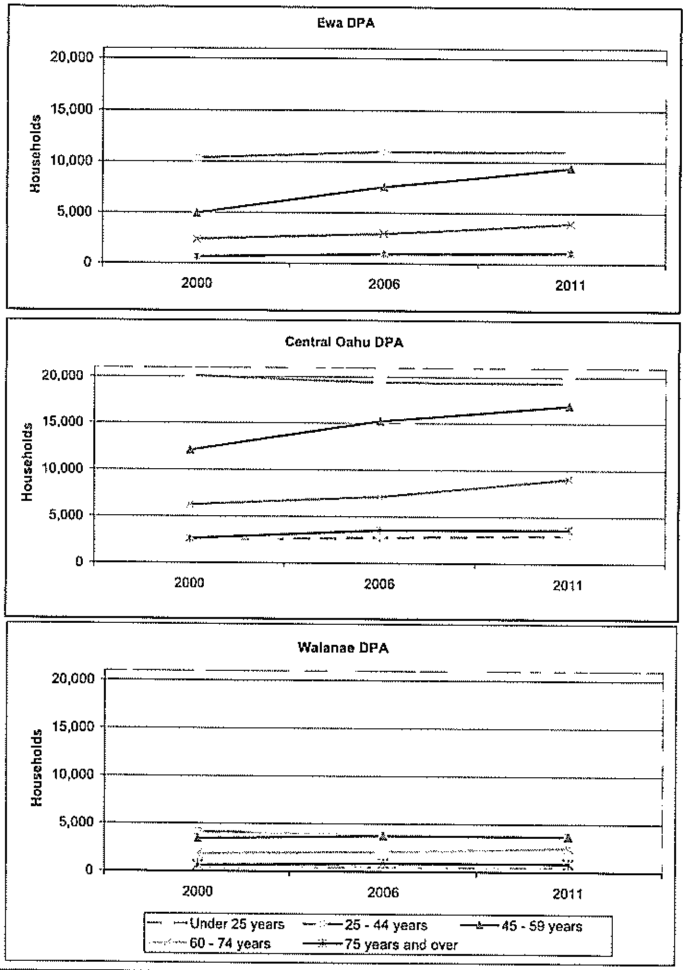


[1] Claritas figures for 2006 and 2011 adjusted by Mikiko Corporation to reflect anticipated population levels based on State LUC-entitled expected housing development, as shown in Exhibit 2-4. New households assumed to average 3.1 persons, while previously existing households assumed to average 3.5 in 2006.

Note: DPAs (Development Plan Areas) are those defined by the City and County of Honolulu, but approximated for data generation purposes by zip code area. See Chapter 2 for further information.

Source: Claritas, Inc., October 23, 2006, October 24, 2006 and December 8, 2006; Mikiko Corporation.

Exhibit 2-7
Households by Age of Head - Ewa, Central Oahu and Waianae
2000 to 2011

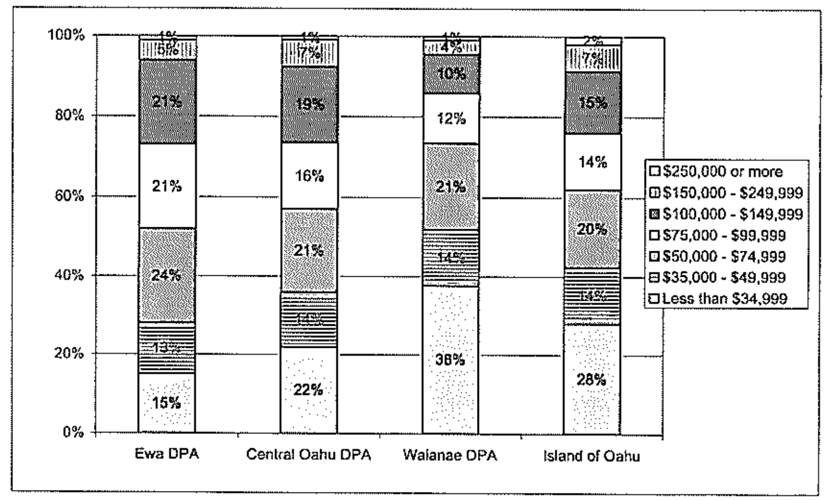


Note: DPAs (Development Plan Areas) are those defined by the City and County of Honolulu, but approximated for data generation purposes by zip code area. See Chapter 2 for further information.

Source: Claritas, Inc., October 23, 2006, October 24, 2006 and December 8, 2006.

Exhibit 2-8
Households by Household Income - Ewa, Central Oahu and Waianae
2006 Estimate

	Ewa DPA[1]	Central Oahu DPA	Waianae DPA	Island of Oahu
Median household income	$73,025	$66,667	$47,923	$59,606
Per capita income	$22,876	$23,493	$14,971	$25,565
Number of households, by income -				
Less than $34,999	3,806	10,563	4,127	84,338
$35,000 - $49,999	3,298	6,665	1,570	43,552
$50,000 - $74,999	6,089	10,143	2,353	58,744
$75,000 - $99,999	5,328	7,898	1,354	41,949
$100,000 - $149,999	5,328	9,060	1,068	46,369
$150,000 - $249,999	1,269	3,235	384	20,084
$250,000 or more	254	417	104	5,888
Total	25,371	47,981	10,960	300,924



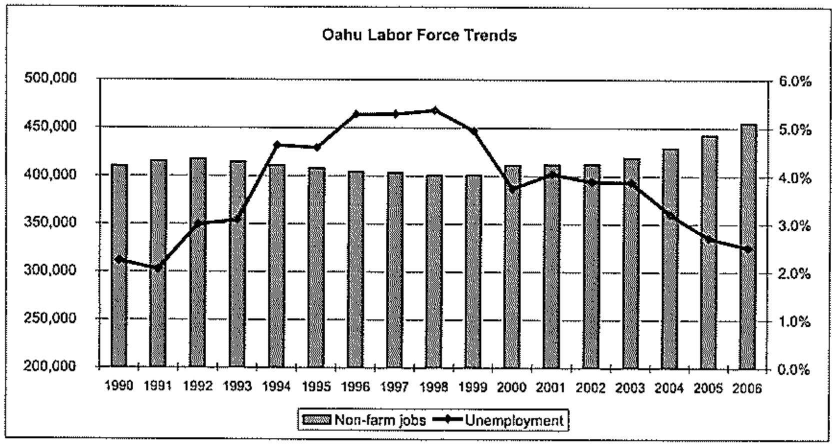
Note: DPAs (Development Plan Areas) are those defined by the City and County of Honolulu, but approximated for data generation purposes by zip code area. See Chapter 2 for further information.

[1] Number of households in Ewa reflect Mikiko Corporation projections as shown in Exhibit 2-6, with distribution according to Claritas' projections.

Sources: Claritas, Inc., October 23, 2006, October 24, 2006 and December 8, 2006; Mikiko Corporation.

Exhibit 2-9
Labor Force Trends - Honolulu County
1990 to 2006

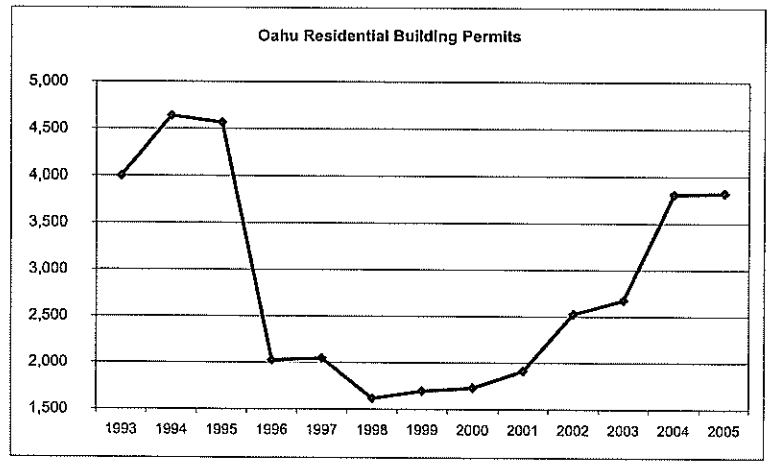
	Civilian labor force	Employed persons	Non-farm wage & salary jobs	Percent unemployment
1990	409,250	401,250	410,700	2.0%
1991	412,000	403,600	415,600	2.0%
1992	418,000	406,400	418,000	2.8%
1993	423,200	409,900	414,800	3.1%
1994	425,450	408,750	411,600	3.9%
1995	428,000	409,550	408,300	4.3%
1996	432,000	411,000	404,700	4.9%
1997	433,600	412,800	403,600	4.8%
1998	434,700	413,600	400,900	4.9%
1999	433,350	414,300	401,500	4.4%
2000	433,100	416,450	412,000	3.9%
2001	435,300	417,500	412,450	4.1%
2002	430,900	413,850	412,800	4.0%
2003	432,650	416,300	419,700	3.8%
2004	433,850	420,000	429,700	3.2%
2005	445,150	432,950	443,250	2.7%
2006	457,700	446,200	455,300	2.5%



Source: Hawaii State Department of Labor & Industrial Relations, 2007. Labor force estimates revised by DLIR with new methodology employed by U.S. Bureau of Labor Statistics, as of 2007. As referenced in: www.hiwi.org/admin/uploadedPublications/466_FHN.PD F. Non-farm wage and salary job estimates provided by DLIR as referenced in: http://www.hiwi.org/article.asp?ARTICLEID=615&PAGEID=94&SUBID=

Exhibit 3-1
Private Residential Building Permits - Island of Oahu
1993 to 2006

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual
1993	554	992	1,545	908	3,999
1994	613	1,385	1,261	1,380	4,639
1995	1,581	923	1,580	482	4,566
1996	532	260	885	347	2,024
1997	195	980	532	337	2,044
1998	423	334	497	361	1,615
1999	468	479	334	415	1,696
2000	352	469	382	527	1,730
2001	466	595	497	353	1,911
2002	296	553	807	867	2,523
2003	682	785	576	630	2,673
2004	1,509	940	620	742	3,811
2005	520	954	965	1,382	3,821
2006[1]	453	473	782	INA	INA

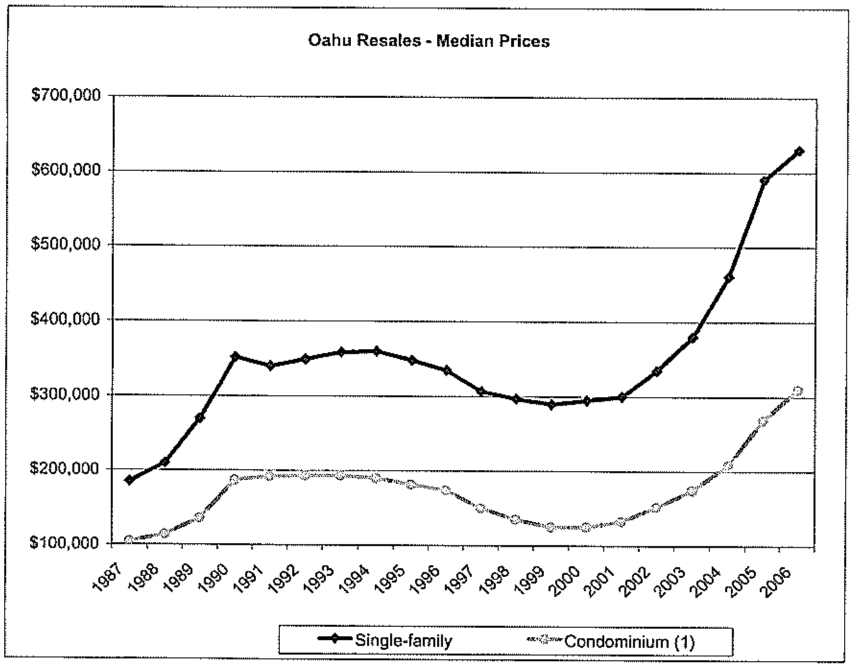


INA =Information not available.
[1] As of third qarter 2006.

Source: City &County of Honolulu Bilding Department, as referenced in http://www.hawaii.gov/dbedt/info/economic/data_reports/select-county-tables.xls.

Exhibit 3-2
Median Home Sales Prices - Honolulu County
1987 to 2006

	Single-family	Condominium[1]
2000	$295,000	$125,000
2001	$299,900	$133,000
2002	$335,000	$152,000
2003	$380,000	$175,000
2004	$460,000	$208,500
2005	$590,000	$269,000
2006	$630,000	$310,000

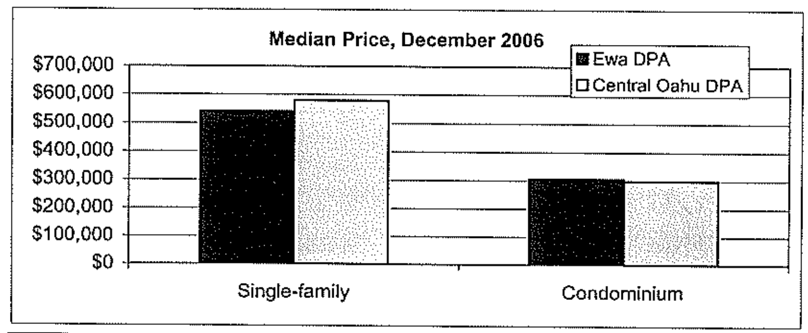


Note: Resales only; shows residential units that are entered in the Multiple Listing Service.
[1] Includes duplexes, townhomes and other multifamily units with common areas.

Source: Honolulu Board of Realtors, Residential Resale Activity on Oahu," monthly.

Exhibit 3-3
Residential Resales Indicators - Ewa and Central Oahu
As of December 2006

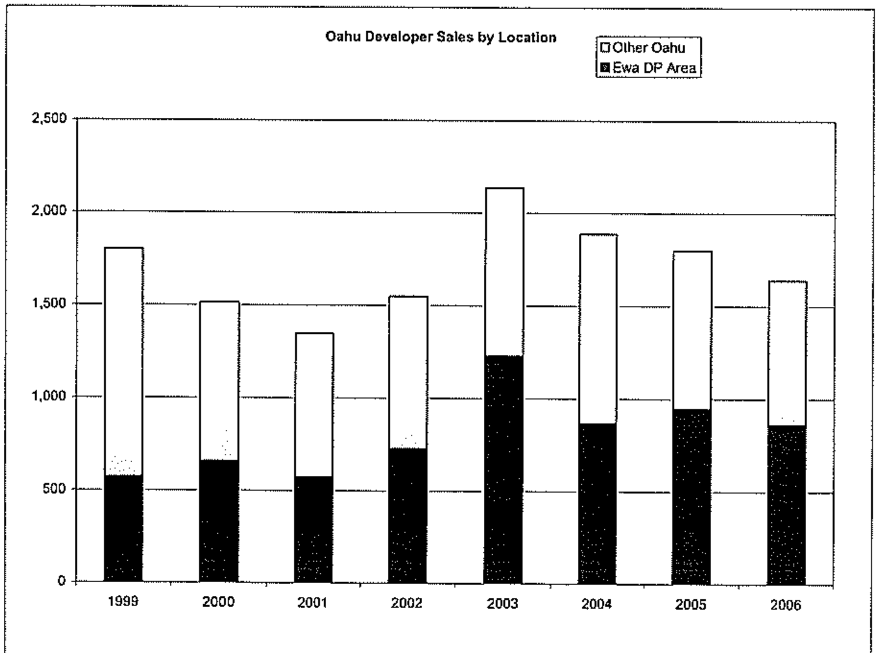
	Number of sales, Jan. - Dec. 2006			Median price, Dec. 2006	
	Single-family	Condominium	Total	Single-family	Condominium
Ewa DPA:					
Ewa Plain	692	500	1,192	$528,000	$302,000
Makakilo	179	191	370	$600,000	$320,000
Total	871	691	1,562	$543,000	$307,000
	Percent change since Jan. - Dec. 2005:			*Percent change since 12/05:*	
Ewa Plain	-9%	-12%	-10%	8%	18%
Makakilo	20%	-3%	7%	9%	16%
Total	-5%	-9%	-7%	9%	18%
Central Oahu DPA:					
Wahiawa	76	69	145	$462,000	$188,000
Mililani	348	524	872	$610,000	$315,000
Waipahu	355	410	765	$575,000	$298,000
Total	779	1,003	1,782	$580,000	$299,000
	Percent change since Jan. - Dec. 2005:			*Percent change since 12/05:*	
Wahiawa	-21%	5%	-10%	10%	39%
Mililani	0%	-19%	-12%	8%	17%
Waipahu	-3%	-7%	-5%	10%	14%
Total	-4%	-13%	-9%	9%	16%



Source: Honolulu Board of Realtors, December 2006 Monthly Statistical Report, Residential Resale Activity on Oahu," January 2007.

Exhibit 3-4
Developer Unit Sales - Island of Oahu and Ewa DPA
1999 to 2006

	1999	2000	2001	2002	2003	2004	2005	2006	Average annual
Island of Oahu:									
Single-family units	912	1,115	1,025	1,155	1,744	1,315	1,086	955	1,163
Townhouse units	290	195	268	381	371	547	531	358	368
High-rise condominium units	601	204	55	13	21	26	183	327	179
	1,803	1,514	1,348	1,549	2,136	1,888	1,800	1,640	1,710
Ewa DP area[1]:									
Single-family units	466	599	508	526	1,031	731	752	691	663
Townhouse units	108	62	66	204	199	136	195	170	143
High-rise condominium units	0	0	0	0	0	0	0	0	0
Total	574	661	574	730	1,230	867	947	861	805
As % of Island	32%	44%	43%	47%	58%	46%	53%	53%	47%



[1] Approximated by the Ewa, Kapolei and West Oahu (& Olina) areas, as defined by The Harris Company.

Source: The HARRIS Company, figures represent units reported by developers to have closed escrow and recorded.

Exhibit 3-5
Projected New Housing Supply - Ewa DPA
Planned Developments with State Land Use Entitlement or Exemption

as of December 2006

Project	Total planned units	2007 - 2010	2011 - 2015	2016 - 2020	2021 - 2025	2026 - 2030	Total, 2007-2030
Kapolei West	1,450	275	875	300	0	0	1,450
Makaiwa Hills I and II	4,100	650	1,625	1,625	200	0	4,100
City of Kapolei (Campbell)	1,000	650	350	0	0	0	1,000
Palailai Mauka (also "Kapolei Mauka")	750	225	525	0	0	0	750
Villages of Kapolei (remnants)	472	472	0	0	0	0	472
Wai Kalo'i ("Palehua East B")	300	300	0	0	0	0	300
Ewa Villages	57	0	57	0	0	0	57
Kahiwelo (por., Palehua East C & D)	475	285	190	0	0	0	475
Mehana (also "Kapolei Makai")	1,150	750	400	0	0	0	1,150
Ewa by Gentry and Gentry Ewa Makai	2,000	1,500	500	0	0	0	2,000
Ocean Pointe (prev. "Ewa Marina")	2,100	1,500	600	0	0	0	2,100
E A H	242	242	0	0	0	0	242
Ko Olina Resort & Marina	268	90	178	0	0	0	268
Franciscan Vistas Ewa	328	328	0	0	0	0	328
East Kapolei I	403	403	0	0	0	0	403
East Kapolei II & III	5,200	600	1,875	1,875	850	0	5,200
Kaupe'a (Villages of Kapolei, Village 8)	326	326	0	0	0	0	326
UH West Oahu project	4,041	400	1,875	1,766	0	0	4,041
Kalaeloa	6,290	400	1,500	1,500	1,500	1,390	6,290
Mokuola Vista	70	70	0	0	0	0	70
Total (rounded)	31,000	9,500	10,600	7,100	2,600	1,400	31,000
Percent of period		31%	34%	23%	8%	5%	100%

Source: Based on information presented in Appendix 2. Ko Olina units valued at 20% and Kapolei West units at 60% of respective total entitlements, to exclude nonresidential buyers.

Exhibit 3-6
Projected New Housing Supply - Central Oahu DPA
Planned Developments with State Land Use Entitlement or Exemption
as of December 2006

Project	Total planned units	2007-2010	2011 - 2015	2016 - 2020	2021 - 2025	2026 - 2030	Total, 2007-2030
Mililani Mauka	440	440	0	0	0	0	440
Waipio Point	66	66	0	0	0	0	66
Waiawa Gentry Phase 1	5,000	600	3,500	900	0	0	5,000
Kau'olu Properties	370	0	370	0	0	0	370
Royal Kunia II	2,000	200	1,800	0	0	0	2,000
Plantation Town Apartments	330	330	0	0	0	0	330
California Ave. Apartments	42	42	0	0	0	0	42
Total (rounded)	8,200	1,600	5,700	900	0	0	8,200
Percent of period		20%	70%	11%	0%	0%	100%

Source: Based on information presented in Appendix 2.

Exhibit 3-7
Projected New Housing Supply - Island of Oahu
Planned Developments with State Land Use Entitlement or Exemption
as of December 2006

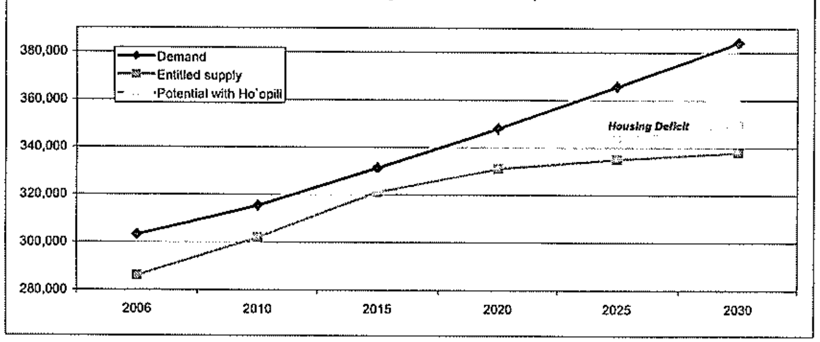
Development Plan Area	2007 - 2010	2011 - 2015	2016 - 2020	2021 - 2025	2026 - 2030	Total, 2007-2030	Comment
Ewa	9,500	10,600	7,100	2,600	1,400	31,000	Excludes Subject Hoopili. Includes off-ocean sites at Ko Olina, with resident use valued at 20% of development potential.
Central Oahu	1,600	5,700	900	0	0	8,200	Excludes Koa Ridge and Waiawa (Castle & Cooke, c. 5,000 units) and Gentry Waiawa Phase 2 (c. 7,000 units), all of which reqire LUC approvals.
Waianae	1,110	990	370	0	0	2,470	Includes units by DHHL;Village Pokai Bay;Sea Country;selfhelp;maximum affordable condition at Makaha Valley; others.
North Shore, Ko'olauloa & Ko'olaupoko	310	430	370	120	0	1,230	Includes DHHL units in Waimanalo. Excludes resort units but includes maximum affordable condition at Turtle Bay Resort under existing Unilateral Agreement.
East Honolulu	740	0	0	0	0	740	Excludes buildout of custom lots and potential for some 200 units at Kamilonui (now designated Urban but under lease.)
Primary Urban Center	3,370	2,000	2,000	2,000	2,000	9,370	Majority high rise;inventories discounted for estimated share nonresident units (ranging from 0% on elderly/affordables, 20% in Kakaako and up to 60% at some Waikiki projects);also includes 400 military homes on Ford Island and on-going allowance of 2,000 units per 5-year period after 2011 for unforeseen future redevelopment projects.
Total (rounded)	16,600	19,700	10,700	4,700	3,400	55,100	
Percent of period	30%	36%	19%	9%	6%	100%	

Note: Targeting projects of 100 units or more. Excludes emergency shelters, dormitory beds and other group living qarters.

Sources: Interviews with developers, landowners and project principals;City and County of Honolulu, Department of Planning an d Permitting, "Annual Report on the Status of Land Use on Oahu: Fiscal Year 2004," July 2005; interviews with developers and landowners;Hawaii Kai Neighborhood Board Meeting Minutes, January 2006;Honolulu Advertiser, "60,000 new homes planned for O'ahu," September 19, 2006;Ibid, "Special Report on Homeless on the W aianae Coast," October 20, 2006;Exhibits 35 and 36.

Exhibit 3-8
Projected Supply and Demand for Housing - Island of Oahu
2006 to 2030

	Reference	2006	2010	2015	2020	2025	2030	Total/ average, 2006-2030[1]
Demand (households):								
Number	SMS[1]	303,149	315,333	331,254	347,979	365,549	384,005	
Change since prior date -								
Total (rounded)		--	12,000	16,000	17,000	18,000	18,000	81,000
Average annual		--	3,000	3,200	3,400	3,600	3,600	3,380
Supply (resident housing units):								
Estimated occupied RHUs in 2005[2]	U.S. Census[2]	283,000						
New homes delivered, 2005-06	Harris[3]	2,800						
Entitled new developments, 2006-2025:								
Development since prior date	Exhibit 3-7	--	16,600	19,700	10,700	4,700	3,400	55,100
Less vacancy allowance (applied to new units)	5%	--	-830	-985	-535	-235	-170	-2,755
Net available RHUs (rounded)		286,000	302,000	321,000	331,000	335,000	338,000	52,000
Change since prior date -								
Total		--	16,000	19,000	10,000	4,000	3,000	52,000
Average annual		--	4,000	3,800	2,000	800	600	2,170
Resident housing unit surplus (deficit):								
At prior date shown		INA	(17,000)	(13,000)	(10,000)	(17,000)	(31,000)	
Net surplus (deficit) in RHU production since prior date		INA	4,000	3,000	(7,000)	(14,000)	(15,000)	
By end of year, column date		(17,000)	(13,000)	(10,000)	(17,000)	(31,000)	(46,000)	



INA = Information not available.

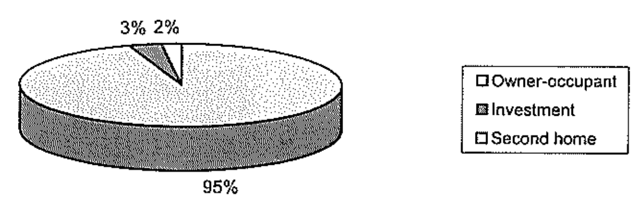
[1] SMS, Inc., "Housing Policy Study, 2006: Hawaii Housing Model 2006," February 2007. Population growth rate on interactive model set to "official parameters" for Honolulu County of 0.9% per annum.

[2] RHU = resident housing unit. Occupied housing units estimated by U.S. Census Bureau, 2005 American Community Survey (ACS, released October 2006) at 300,557. From this total, 6% are conservatively estimated to be used as second homes, vacation homes or for other nonresident uses. Note that a 2003 SMS study prepared for the State and Counties projected nonresident housing units on Oahu at 7.5% for 2006, while the ACS reflects the majority of the 9% of units found to be vacant were not RHUs..

[3] Developer ("new") unit sales since mid-2005 from The Harris Company, quarterly surveys of developer sales closings. Data is for 3Q05 through 4Q06 (six quarters), since the Census survey of supply refers to an "average" figure for 2005.

Exhibit 4-1
Comparison Project Buyer Motivations
Recent DRH Projects on Oahu
Sampled project sales through 2005

	Locations	Owner-occupant	Investment	Second home	Total
Townhomes	Hawaii Kai & Makakilo				
Distribution		92%	6%	2%	100%
Sample size		115	7	3	125
Single-family condos:	Makakilo & Ma'ili				
Distribution		98%	1%	1%	100%
Sample size		189	1	2	192
Traditional single-family:	Makakilo & Kapolei				
Distribution		85%	10%	4%	100%
Sample size		41	5	2	48
Total					
Distribution		95%	3%	2%	100%
Sample size		345	13	7	365



Notes: Based on samples of persons who executed purchase contracts at eight DRH residential projects on Oahu in 2004 and 2005. Purchasers did not necessarily close the sale.

Source: DRH, December 2006.

Exhibit 4-2
Comparison Project Pricing
Recent DRH Projects on Oahu

	Location	Unit Description	Units per acre	Market unit pricing (2006)	Comment
Townhomes:					
Moana Kai	Hawaii Kai	1,327 - 1,729 SF	15	$57,000 to $25,000	3-story buildings; behind Nanea
Kai Nani	Makakilo	1,010 - 1,766 SF	12 to 14	$30,000 to $83,000	
Ocean Ridge	Makakilo	1,424 - 1,529 SF	12	$16,000 to $79,000	Western end of Makakilo
Nanala	*Mehana, Kapolei*	*1,038 - 2,013 SF*	*17*	*$350,000 to $550,000*	*Preliminary pricing and plans; to be marketed 2007*
Pulewa		*1,182 - 1,562 (market units)*	*17*		
Single-family condos:					
Anuhea	Makakilo	1,291 - 1,808 SF	6	$43,000 to $20,000	Hillside
Holomoana	Maili (Sea Country)	1,119 - 1,270 SF	7	$27,000 to $26,000	3 to 4 units per courtyard
Kaimalino	Maili (Sea Country)	SFD and "duets"	8	$13,000 to $96,000	Duets share common walls at unit backs
Traditional single-family:					
Highpointe	Makakilo	1,359 - 2,757 SF	5	$99,000 to $13,000 (median $30,000)	Top of Makakilo; purchase lot & select home package
Wailana	Maili (Sea Country)	1,187 - 1,809 SF	5	$90,000 to $50,000	Ocean and valley views

Notes: SF - square feet; SFD - single-family detached
Source: DRH, anuary 2007.

Exhibit 4-3
Illustrative Potential Pricing of Residential Products at Ho`opili
In 2006 dollars

	Multifamily	Single-family	Comment
For-sale units (sales price):			
Market units	$50,000 - $50,000	$00,000 - $50,000	All single-family in Low-Medium Density areas; multifamily distributed throughout residential areas
"Affordable for-sale units"[1]	$32,000 - $92,000	Not offered	To be located in Medium- and High-Density mixed-use areas
"Affordable rental units" (monthly rent)[2]	$98 - $,481	Not offered	For studio to 4-BR units targeted at 80% to 100% of median income households.

[1] Pricing and other terms to be determined in agreements to be made with the County. Figures shown provided by County DPP in February 2007, represent guidelines that were in effect as of March 2006, assuming a family of 4 earning 80% to 120% of median family income, putting 5% to 10% down. According to the U.S. Department of Housing &Urban Development, as of 2006, median family income in Honolulu was $1,300, meaning that the 80% to 120% of median income was approximately $7,000 to $6,000.

[2] As provided by the County DPP, guidelines in effect from February 2006 through February 2007.

Sources: City &County of Honolulu, Department of Housing and Community Development, "Adoption of Rules for the Terms of Unilateral Agreements Requiring Affordable Housing," 1994;Ibid, Department of Planning &Permitting, February 2007.

Exhibit 5-1
Existing Retail Gross Leasable Area in Trade Area and Benchmark Market

In square feet, as of December 2006

	Trade Area				
	Ewa DPA	Central Oahu DPA	Waianae DPA	Total	Benchmark - Hawaii Kai
Existing inventory:					
Kapolei	524,807			524,807	
Ewa Beach	212,457			212,457	
Waipahu		1,986,007		1,986,007	
Mililani		694,764		694,764	
Waianae			439,112	439,112	
Hawaii Kai				0	857,392
Total, rounded	737,000	2,681,000	439,000	3,857,000	857,000
Vacancy indicators (12/06)[1]	2.1% "West Oahu"	0.6% "Central Oahu"	14.5% "Waianae"	2.5% Weighted average	0.6%
Largest properties (gross leasable area)	Kapolei Shopping Center (134,400)	Waikele Center (786,302)	Waianae Mall (208,000)	Waikele Center (786,302)	Koko Marina Shopping Center (322,261)
	Big Kmart (122,848)	Pearl Highlands Center (410,325)	Makaha Marketplace (98,768)	Pearl Highlands Center (410,325)	Hawaii Kai Towne Center (247,000)

[1] Based on CMF reported vacancy for areas as defined by CMF. These vary somewhat from the DPAs but are the same for Hawaii Kai.

Sources: Colliers Monroe Friedlander, Inc. 2006 and 2007, custom reports;Ibid, "Oahu Retail Guide," in Hawaii Business January 2007;Ibid, "Retail Market Report: Oahu Year End 2006," released January 24, 2007;Pacific Business News, 2006, "Book of Lists: 2007";www.Kapolei.com;other internet searches.

Exhibit 5-2
Planned and Entitled Retail Areas in Trade Area

Square feet of gross leasable area

Location	Estimated total[1]	Potential timing of deliveries 2007-2010	2011-2015	2016-2030
Ewa DPA:				
Kapolei, East Kapolei	2,494,155	1,391,155	720,000	383,000
Makaiwa	360,000	0	100,000	260,000
Ko Olina	20,000	0	20,000	0
Ewa Beach	255,000	255,000	0	0
Ocean Pointe	100,000	0	20,000	80,000
Kalaeloa	116,000	0	31,000	85,000
Subtotal, rounded	3,350,000	1,650,000	890,000	810,000
Central Oahu DPA:				
Mililani Mauka	85,000	85,000	0	0
Waiawa Phase 1	400,000	70,000	170,000	160,000
Waipio Gentry	25,189	25,189	0	0
Waipahu	34,000	34,000	0	0
Subtotal, rounded	540,000	210,000	170,000	160,000
Waianae DPA	10,000	6,000	4,000	-
Total, rounded	3,900,000	1,866,000	1,064,000	970,000

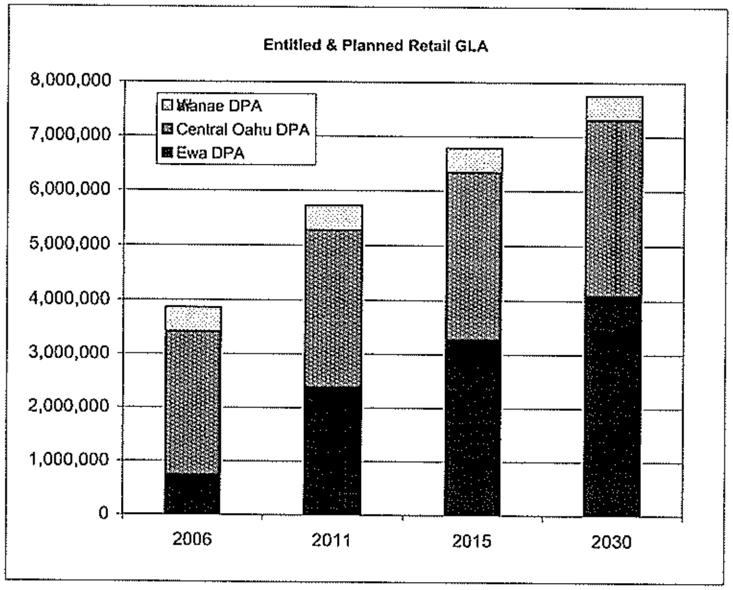
[1] See Appendix 4 for detailed listings. Based on State-entitled lands with development proposals in place; plans announced as of February 2007.

Note: Areas are net of those expected to primarily serve visitors, and of planned exclusive office or business purposes (may include some office uses mixed with retail in shopping-center type settings.)

Sources: Interviews with developers, landowners and brokers;area site visits;Pacific Business News, Book of Lists 2007;Pacific Business News (weekly);Colliers Monroe Friedlander;developer websites; Honolulu Advertiser;Hawaii Community Development Authority;Internet searches.

Exhibit 5-3
Potential Future Retail Areas in Trade Area
Existing and PlannedEntitled Developments as of February 2007

	Existing, 2006	Potential future 2011	2015	2030
Ewa DPA	737,000	2,387,000	3,277,000	4,087,000
Central Oahu DPA	2,681,000	2,891,000	3,061,000	3,221,000
Waianae DPA	439,000	445,000	449,000	449,000
Total	3,857,000	5,723,000	6,787,000	7,757,000



Source: Mik Corporation, based on Exhibits 5-1 and 5-2.

Exhibit 5-4
Area Resident Profiles
2006 estimates and 2011 projections

	Trade Area: Ewa DPA	Central Oahu DPA	Waianae DPA	Total	Benchmark - Hawaii Kai
Resident population[1]:					
2006 estimated	88,800	157,860	44,290	290,950	29,023
2011 projected	116,800	161,250	45,830	323,880	30,373
Compound annual % increase	5.6%	0.4%	0.7%	2.2%	0.9%
Income (2006):					
Median per household	$3,025	$6,667	$7,923	INA	$7,091
Est. per capita	$2,876	$3,493	$4,971	INA	$6,366

Note: DPAs (Development Plan Areas) are those defined by the City and County of Honolulu, but approximated for data generation purposes by ip code area. See Chapter 2 for further information. INA = Information not available.

[1] As shown in Exhibit 2-4;Ewa DPA population as adjusted by Mik Corporation.

Sources: Exhibits 2-4 and 2-8;Claritas Inc.: October 20, 2005 for benchmarkmarket, with population updated based on projected 2005-2010 growth rates. Hawaii Ki 2006 median income supplied by ESRI.

Exhibit 5-5
Daytime Population and Employment Residence Ratios by Census Designated Places
2000

	Residents, 2000	Employment residence ratio[1]	Daytime population[2]	Daytime pop/ residents
Trade Area:				
Ewa area CDPs -				
Ewa Beach CDP	14,650	0.35	10,627	0.73
Ewa Gentry CDP	4,939	0.06	2,477	0.50
Makakilo City CDP	13,156	0.09	7,243	0.55
Total/weighted av.	32,745	0.20	20,347	0.62
Central Oahu area CDPs -				
Mililani Town CDP	28,608	0.27	17,394	0.61
Schofield Barracks CDP	14,228	1.68	19,703	1.38
Wahiawa CDP	16,151	0.80	14,872	0.92
Village Park CDP	9,625	0.16	5,484	0.57
Waipahu CDP	33,108	0.55	27,397	0.83
Waipio CDP	11,672	0.37	7,547	0.65
Waipio Acres CDP	5,298	0.08	2,981	0.56
Total/weighted av.	118,690	0.58	95,378	0.80
Waianae area CDPs -				
Waianae CDP	10,506	0.68	9,264	0.88
Nanakuli CDP	10,814	0.28	8,355	0.77
Makaha CDP	7,753	0.34	6,031	0.78
Total/weighted av.	29,073	0.44	23,650	0.81
Benchmark markets:				
Hawaii Kai proxy[3]	INA	0.49	INA	0.74
Honolulu CDP[4]	371,657	1.54	462,962	1.25

INA -Information not available.

Note: All ratios shown are within the respective CDP. Ratios would be higher if reported on a regional basis.

[1] Workers working in the CDP divided by workers living the CDP.

[2] Residents plus in-commuters less out-commuters.

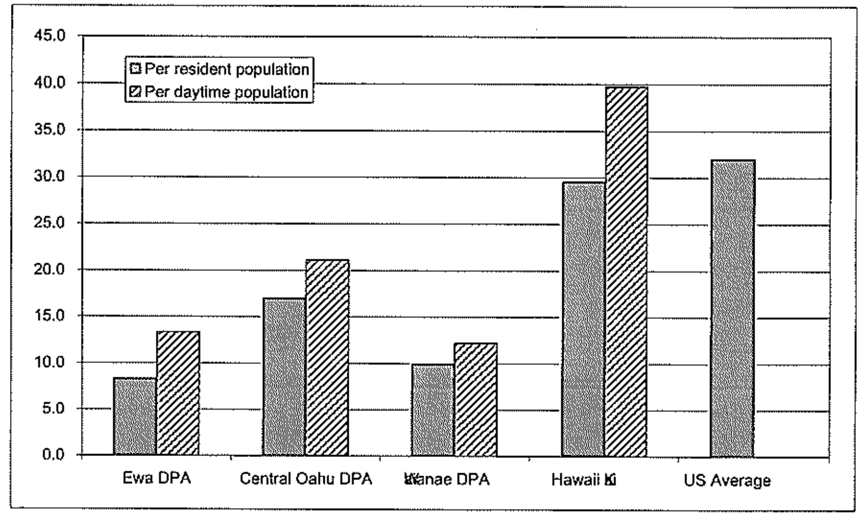
[3] The 2000 Census included Hawaii Kai within the Honolulu CDP, so Kailua CDP used as a proxy for Hawaii Kai ratios; actual population figures not relevant.

[4] Includes PUC and East Honolulu, encompassing Waikiki, Aina Haina, Hawaii Kai. The Census' daytime population calculations in this case do not consider visitors.

Source: US Census Bureau, Census 2000, PHC-T-40, "Estimated Daytime Population and Employment-Residence Ratios: 2000" durney to Work and Migration Statistics Branch, 2005.

Exhibit 5-6
Existing Retail Areas in Relation to Consumer Population
As of 2006, except where noted

	Trade Area: Ewa DPA	Central Oahu DPA	Waianae DPA	Total	Benchmark markets: Hawaii Kai	2004 US average[1]
Estimated consumers:						
Resident population[2]	88,800	157,860	44,290	290,950	29,023	INA
Daytime ratio[3]	*0.62*	*0.80*	*0.81*	*0.75*	*0.74*	INA
Daytime population	55,200	126,900	36,000	218,100	21,568	INA
Existing retail GLA[4]	737,000	2,681,000	439,000	3,857,000	857,000	INA
Existing GLA ratios:						
Per resident population	8	17	10	13	30	32
Per daytime population	13	21	12	18	40	INA



Note: DPAs (Development Plan Areas) are those defined by the City and County of Honolulu, but approximated for data generation purposes by ip code area. See Chapter 2 for further information.

INA - Information not available.

[1] Based on shopping center per resident ratio of 20.3, as reported by National Research Bureau;figure adjusted by the estimated 37% U.S. retail space not located in shopping centers, as reported by the same source.

[2] Trade Area populations as shown in Exhibit 2-4;Ewa DPA according to Mil projections shown there.

[3] 2000 ratios, as shown in Exhibit 5-4

[4] Hawaii information as shown in Exhibit 5-1.

Sources: Claritas Inc., October 20, 2005;Colliers International, "Retail Markt Report: Oahu Year End 2006", 2007;State of Hawaii, Department of Business Economic Development and Tourism;National Research Bureau, Inc., "2004 NRB Shopping Center Census," 2005;Niemira, Michael P., "The U.S. Retail Space Market," Research Review, V12, No. 2, 2005.

Exhibit 5-7

Projected Supportable Additional Retail-Based Commercial Areas in the Ewa DPA Based on Resident Population Ratios

Gss leasable square feet, 2011 to 2030

	Basis/reference	2011	2015	2030	Av. annual change, 2011-2030
Immediate market (Ewa DPA)					
Resident population	Exhibit 2-4[1]	116,800	151,600	180,200	2.3%
Supportable GA in Ewa	30 sf/person [2]	3,500,000	4,500,000	5,400,000	2.3%
Less existing & planned	Exhibit 5-3	2,400,000	3,300,000	4,100,000	2.9%
Subtotal, supportable additional GA in Ewa		1,100,000	1,200,000	1,300,000	0.9%
Nearby markets (Central Oahu and Wanae DPAs)					
Resident population	Exhibit 2-4[1]	207,080	212,250	240,160	0.8%
Supportable GA in Trade Area	32 sf/person [2]	6,600,000	6,800,000	7,700,000	0.8%
New shares of region captured in Ewa DPA	Share of other Trade Area	5%	10%	20%	7.6%
Subtotal, supportable additional GA in Ewa		300,000	700,000	1,500,000	8.8%
Total additional market potential in Ewa DPA		1,400,000	1,900,000	2,800,000	

Note: DPAs (Development Plan Areas) as defined by the City and County of Honolulu. Differ slightly from those approximated by zip code area, as shown elsewhere in this report. See Chapter 2 for further information.

[1] Ewa DPA as assessed by Mikiko Corporation; others as projected by City & County of Honolulu, Department of Planning & Permitting, 2006.

[2] Derived from within Hawaii and average U.S. ratios shown in Exhibit 5-6.

Exhibit 5-8

Projected Supportable Additional Retail-Based Commercial Areas in the Ewa DPA Based on Daytime Population Ratios

Gss leasable square feet, 2011 to 2030

	Basis/reference	2011	2015	2030	Av. annual change, 2011-2030
Immediate market (Ewa DPA)					
Resident population	Exhibit 2-4[1]	116,800	151,600	180,200	2.3%
Daytime population -					
Ratio to resident pop	0.62 in 2000[2]	0.70	0.75	0.90	1.3%
Projected persons		81,760	113,700	162,180	3.7%
Supportable GA in Ewa	36 sf/person [3]	2,900,000	4,100,000	5,800,000	3.7%
Less existing & planned	Exhibit 5-3	2,400,000	3,300,000	4,100,000	2.9%
Subtotal, supportable additional GA in Ewa		500,000	800,000	1,700,000	6.7%
Nearby markets (Central Oahu and Wanae DPAs)					
Resident population	Exhibit 2-4[1]	207,080	212,250	240,160	0.8%
Daytime population -		161,250	164,950	180,690	0.6%
Ratio to resident pop	0.80 in 2000[2]	0.85	0.85	0.90	0.3%
Projected persons		176,018	180,413	216,144	1.1%
Supportable GA throughout Trade Area	40 sf/person [3]	7,000,000	7,200,000	8,600,000	1.1%
New shares of region captured in Ewa DPA	Share of other Trade Area	5%	10%	15%	6.0%
Subtotal, supportable additional GA in Ewa		400,000	700,000	1,300,000	6.4%
Total additional market potential in Ewa DPA		900,000	1,500,000	3,000,000	

Note: DPAs (Development Plan Areas) as defined by the City and County of Honolulu. Differ slightly from those approximated by zip code area, as shown elsewhere in this report. See Chapter 2 for further information.

[1] Ewa DPA as assessed by Mikiko Corporation; others as projected by City & County of Honolulu, Department of Planning & Permitting, 2006.

[2] Based on figures for Census Defined Places, not regions, in 2000, as shown in Exhibit 5-6. Hence these benchmarks are considered below daytime ratios that would be effective for the larger regions considered here.

[3] Reference Hawaii ratio shown in Exhibit 5-6.

Exhibit 6-1
Existing Office Space in Ewa, Central Oahu and Benchmarks
Rentable building area, in square feet, as of December 2006

	Ewa DPA	Central Oahu DPA	Total	Benchmark markets: Island of Oahu	Benchmark markets: Urban Honolulu[1]
Existing inventory:					
Kapolei	422,118		422,118		
Ewa Beach	14,126		14,126		
Waipahu		84,999	84,999		
Mililani		108,804	108,804		
Waianae			0		
Central Business District					7,931,698
Kaka'ako/Kapiolani/ King					3,433,414
Total Oahu			0	15,336,904	
Total, rounded	436,000	194,000	630,000	15,337,000	11,365,000
Vacancy indicators (12/06)	INA	INA	6.4% "Leeward Oahu"	7.0% Island of Oahu average	6.7% and 6.4% CBD and Kaka'ako/ Kapiolani/King
Largest properties/areas (rentable building area)	Bank of Hawaii Building (208,406)	Lee Towne Center (52,557)	Bank of Hawaii Building (208,406)	Central Business District (7.9 million)	58 buildings, including Chinatown & Capitol district
	Campbell Square (136,868)	Castle & Cooke Building (34,241)	Campbell Square (136,868)	Kaka'ako/ Kapiolani/King (3.4 million)	

Notes: Excludes government-owned buildings and exclusively owner-occupied buildings. INA - information not available.

[1] Includes the Central Business District, Kapiolani and King Streets and Kaka'ako District, as defined by CMF. Excludes Waikiki.

Sources: Colliers Monroe Friedlander, Inc. 2006, custom reports; Ibid, "Honolulu Year-End 2006 Office Report Brief," released ânuary 24, 2007; Internet searches.

Exhibit 6-2
Planned and Entitled Office Developments in Ewa and Central Oahu
Square feet of rentable building area

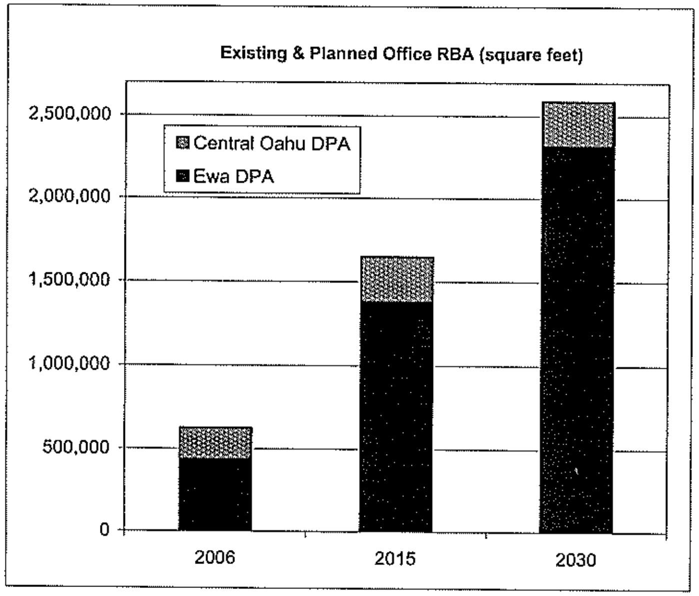
Location	Potential new development[1]: Total	2007-2015	2016-2030	Comments
Ewa DPA:				
Kpolei	1,285,000	785,000	500,000	Stand-alone and MUD buildings. Excludes Subject.
Makaiwa	90,000	0	90,000	Much in mixed-use development.
Kalaeloa	725,000	150,000	350,000	Long-term development, assumed to extend beyond 2030.
Subtotal, rounded	2,100,000	940,000	940,000	
Central Oahu DPA:				
Wawa	80,000	80,000	0	Zning allows office, industrial or retail on many of these sites.
Subtotal, rounded	80,000	80,000	-	
Total, rounded	2,180,000	1,020,000	940,000	

[1] Excludes buildings proposed by government agencies. See Appendix 5 for detailed listings. Based on State LUC-entitled lands and plans known as of February 2007. Some proposed projects assumed to occur beyond the projection period, if at all.

Sources: Interviews with developers, landowners and brokers;area site visits;Pacific Business News, Book of Lists 2007; Pacific Business News (weekly);Colliers Monroe Friedlander Inc., 2006;developer websites;Honolulu Advertiser; Internet searches.

Exhibit 6-3
Potential Future Office Areas in Ewa and Central Oahu
Existing and PlannedEntitled Developments as of December 2006

	Existing, 2006	Potential future 2015	Potential future 2030
Ewa DPA	436,000	1,376,000	2,316,000
Central Oahu DPA	194,000	274,000	274,000
Total	630,000	1,650,000	2,590,000

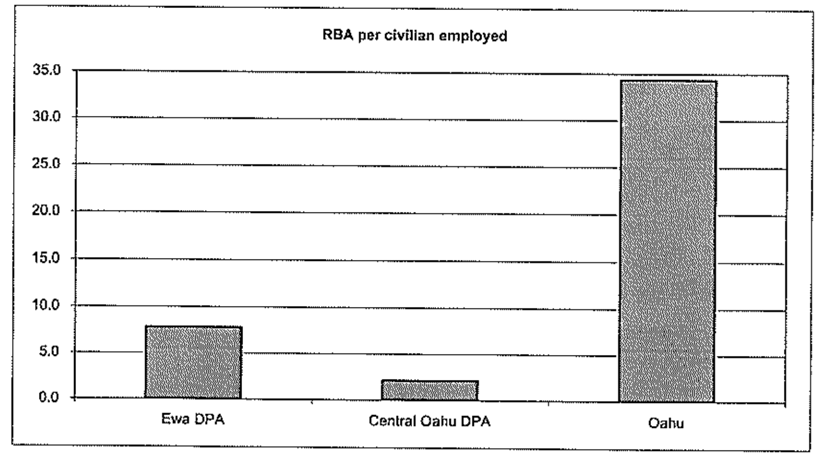


Note: Excludes government-owned buildings. RBA - rentable building area, in square feet.

Source: Mikiko Corporation, based on Exhibits 6-1 and 6-2.

Exhibit 6-4
Existing Office RBA in Relation to Employment
As of 2006, except where noted

	Ewa DPA	Central Oahu DPA	Total	Benchmark markets: Island of Oahu	Benchmark markets: Urban Honolulu[1]
Estimated consumers:					
Resident population[2]	88,800	157,860	246,660	909,408	37,100
% civilian employed[3]	63%	57%	59%	49%	49%
Civilian employed persons[4]	55,900	90,000	145,900	446,200	18,100
Existing office RBA[5]	436,000	194,000	630,000	15,337,000	11,365,000
Existing RBA ratio:					
Per civilian resident employee	8	2	4	34	628



Note: INA - Information not available; RBA - Rentable building area, in square feet.

[1] Includes the Central Business District, Kapiolani and King Streets and Kakaako District, as defined by CMF. Associated population based on 2000 U.S. data for zip codes 96813 and 96814. Population updated to 2006 based on island growth rate in interim. Civilian employed persons estimated based on number in labor force in 2000, adjusted for 2006 island unemployment and 2000 to 2006 island growth rates.

[2] Ewa and Central Oahu populations as shown in Exhibit 2-4;Oahu total population as estimated by Claritas, 2006. See footnote 1 re Honolulu.

[3] 2005 estimates for Ewa and Central Oahu provided by Claritas, Inc., 2006;Island figure derived from DLIR estimate of civilian employed persons, as shown in Exhibit 2-9. See footnote 1 re Honolulu.

[4] Indicates civilians resident in area who are employed, but not necessarily in the area. See footnote 1 re Honolulu.

[5] As shown in Exhibit 6-1.

Sources: Claritas Inc., 2005 and 2006;American Factfinder, 2007;prior exhibits as cited.

Exhibit 6-5
Projected Supportable Additional Office-Based Commercial Areas in the Ewa DPA
Private sector rentable building area, in square feet, 2011 to 2030

	Basis/reference	2011	2015	2030	Av. annual change, 2011-2030
Ewa and Central Oahu region:					
Resident population (Ewa and Central Oahu DPAs)	Exhibit 2-4[1]	278,050	316,550	369,800	1.5%
Number of civilian employees	55% of population	152,900	174,100	203,400	1.5%
Supportable RBA/employee[3]	In Ewa and Central Oahu	10	15	25	4.9%
Supportable RBA	In Ewa and Central Oahu	1,529,000	2,611,500	5,085,000	6.5%
Less existing & planned in Ewa and Central Oahu	Exhibit 6-3	1,220,000	1,650,000	2,590,000	4.0%
Supportable additional RBA in region[4]		309,000	961,500	2,495,000	11.6%
Ewa DPA conclusion:					
Share captured in Ewa DPA	Share of region	45%	50%	55%	1.1%
Total additional market potential in Ewa DPA		**140,000**	**480,000**	**1,370,000**	**12.8%**

Notes: Does not consider needs of government agencies, nor demand that could originate from employment provided to residents beyond the two DPAs evaluated.

[1] Ewa DPA as assessed by Mikiko Corporation; others as projected by City & County of Honolulu, Department of Planning & Permitting, 2006.

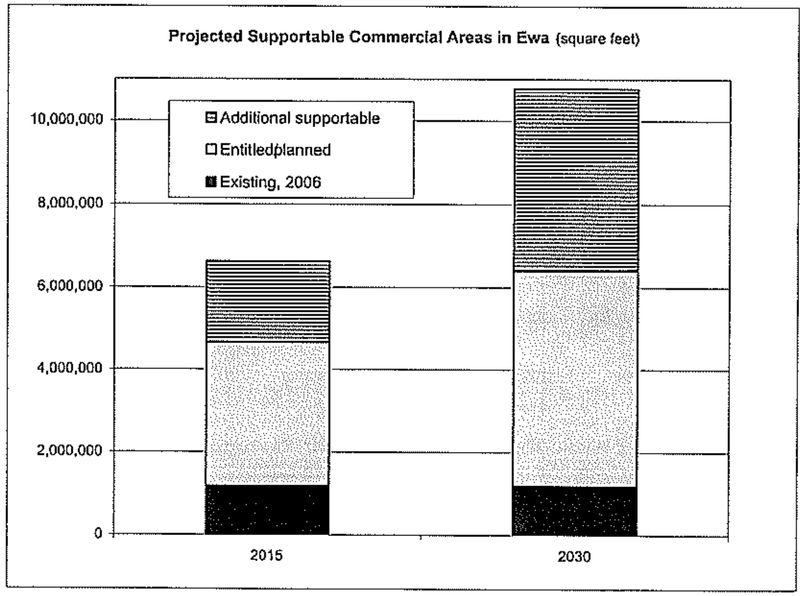
[2] As shown in Exhibit 6-1.

[3] Expected to approach Oahu ratio shown in Exhibit 6-4.

[4] As supported by Ewa and Central Oahu populations; other areas could also contribute to demand.

Exhibit 7-1
Ewa DPA Commercial Market Summary
Retail and office uses, in square feet, 2015 and 2030

	Basis/reference	2015	2030
Completed as of December 2006:			
Retail	*Exhibit 5-1*	737,000	737,000
Office	*Exhibit 6-1*	436,000	436,000
Subtotal		1,173,000	1,173,000
Entitled and planned:			
Retail	*Exhibit 5-2*	2,540,000	3,350,000
Office	*Exhibit 6-2*	940,000	1,880,000
Subtotal		3,480,000	5,230,000
Net additional supportable	*Exhibits 5-8 & 6-5*	**1,980,000**	**4,370,000**
Total		**6,600,000**	**10,800,000**

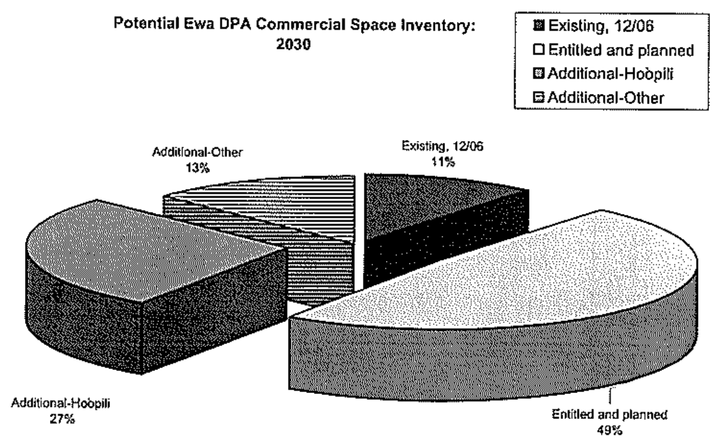


Source: Mikiko Corporation, 2007

Exhibit 7-2
Commercial Market Assessment for Ho`opili
Retail and office uses, in square feet, 2015 and 2030

	Basis/reference	2015	2030
Ho`opili commercial market:			
Potential development phasing	*2,960,000 total proposed*	**600,000**	**2,960,000**
Share of total future Ewa DPA		**9%**	**27%**
Share of net additional Ewa DPA		**30%**	**68%**
Projected supportable in Ewa DPA:	*Exhibit 7-1*		
Existing, 12/06		1,173,000	1,173,000
Entitled and planned for 2007-2030		3,480,000	5,230,000
Net additional supportable		1,980,000	4,370,000
Total		6,600,000	10,800,000

Potential Ewa DPA Commercial Space Inventory: 2030



Source: Mikiko Corporation, 2007

Exhibit 8-1
Developed Business Park/Industrial Lands in Ewa, Central Oahu and Benchmarks
Acres, as of December 2006

	Ewa DPA	Central Oahu DPA	Island of Oahu
Existing inventory:			
Kpolei	1,563		
Wpahu		121	
Mililani		71	
Wpio		122	
Whiawa		4	
Total, rounded	1,560	320	INA[1]
Vacancy indicators (1206)[2]	2.6% Kpolei Busines s ParkCampbell Industrial ParkKna i Industrial Park	3.6% Wpahu, Mill Tow n Business Center	2.3% Island of Oahu average
		0.2% Gntry Busines s Park	Below 3% for last 5 years
Weighted average net asking rent psf (developed space, per month)[2]	$.03 - Campbell IndustrialKpole i Business Park	$.19-Wpahu/ Milltown $.67 - Gntry	$.12
% increase since 20022003	140%	INA	23%
Land appreciation (since 2004)	150% - Kpolei	INA	83%

Notes: INA - Information not available. Net of government-owned and operated facilities such as military bases, harbors, airports and universities.

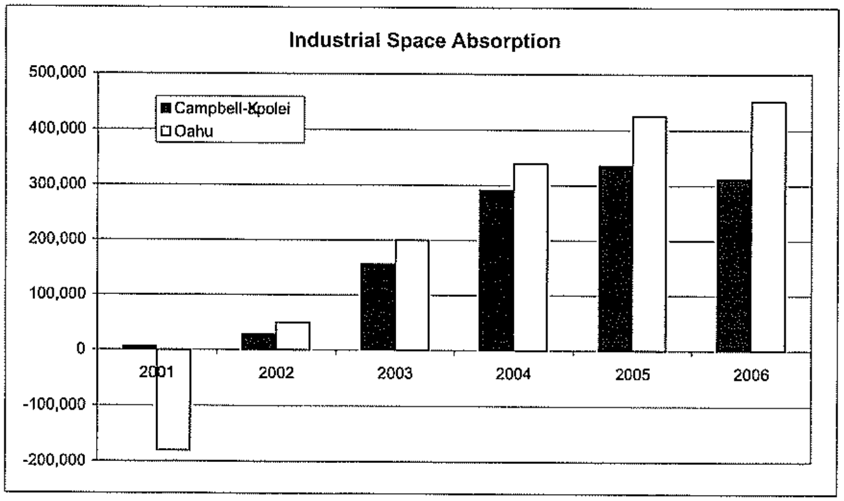
[1] Data not available in land acres.

[2] Based on spaces in I-1 and I-2 zoned lands. Excludes IMXzoned lands, which can also permit retail development, as well as Ka`ab, where vacancies are estimated to be higher than this average..

Sources: Colliers Monroe Friedlander, Inc. 2006, custom reports;Ibid, "Industrial Markt Report: Honolulu Yar-End 2006," anuary 24, 2007;Ibid, "Kpolei's Expanding Industrial Marketplace," December 2006 presentation.

Exhibit 8-2
Business Park/Industrial Space Market Trends: Campbell-Kapolei and Oahu
Square feet in leasable buildings

	2001	2002	2003	2004	2005	2006
Campbell-Kapolei						
Vacancy	5.2%	5.2%	1.3%	0.3%	1.6%	4.6%
Absorption	6,400	28,900	156,300	290,900	335,500	312,200
Inventory	4,321,000	4,321,000	4,321,000	4,598,000	4,973,000	5,453,000
Island of Oahu						
Vacancy	4.4%	4.0%	2.7%	1.7%	1.8%	2.3%
Absorption	-180,800	50,300	199,400	339,700	425,300	452,000
Inventory	33,345,000	35,939,000	36,512,000	37,070,000	37,787,000	39,125,000
Campbell/Kapolei market share						
Absorption	NA	57%	78%	86%	79%	69%
Inventory	13%	12%	12%	12%	13%	14%

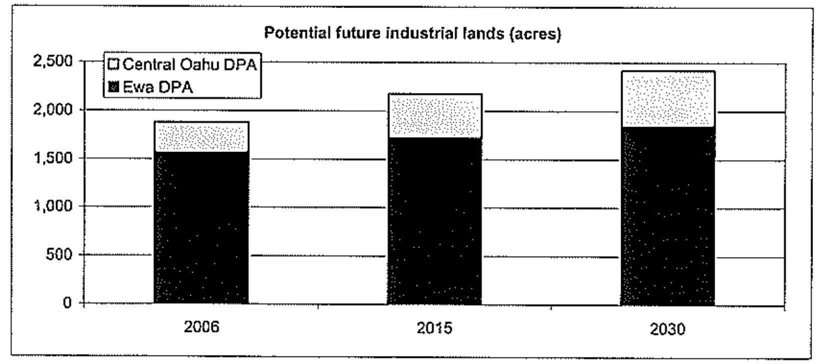


Notes: Net of owner-occupied or government-owned and operated facilities such as military bases, harbors and airports.

Sources: Colliers Monroe Friedlander, Inc. 2006, custom reports;ibid, "Industrial Market Report: Honolulu Year-End 2006," January 24, 2007. Published CMF data adjusted to include CMF estimate of an additional 2.88 million square feet of inventory in Kal'ab. Vacancy rates shown do not reflect relatively higher rates reported in Kal'ab.

Exhibit 8-3
Planned and Entitled Business Park/Industrial Lands in Ewa and Central Oahu DPAs
Net acres; plans known as of December 2006

Location	Existing, 2006	Potential new development[1] 2015	2030	Total	Areas
Entitled potential supply (net acres since prior date):					
Ewa DPA		160	120	280	Kapolei, Kalaeloa, Kunia, Ewa Beach
Central Oahu DPA		140	120	260	Mililani, Waiawa
Total, rounded		300	240	540	
Potential future supply (existing and planned, cumulative):					
Ewa DPA	1,560	1,720	1,840		
Central Oahu DPA	320	460	580		
Total, rounded	1,880	2,180	2,420		



Note: Net acres represent salable or leasable areas, after allowance for major roads and other infrastructure. Planned inventory excludes government-owned and operated facilities such as military bases, harbors, airports and universities.

[1] See Appendix 6 for detailed listings. Based on plans known as of December 2006. Some proposed projects assumed to occur beyond the projection period, if at all. Future use of the Kalaeloa lands, representing some 200 acres of the proposed Ewa DPA inventory, is considered very preliminary but are included within the projection period to be conservative.

Sources: Interviews with project landowners, their consultants, planners, land managers, and brokers; Pacific Business News; company web sites; Enterprise Honolulu; Hawaii Community Development Authority, "Draft Kalaeloa Master Plan," 2005; Colliers Monroe Friedlander Inc., 2006.

Exhibit 8-4
Projected Business Park/Industrial Land Requirements - Employment-Based Demand
Cumulative, Island of Oahu: 2015 and 2030

	Basis/notes	Benchmark - 2006	Projected 2015	Projected 2030	Average annual change, 2006-20230
Sources of demand:					
Resident population[1]	Exhibit 2-4	909,408	995,500	1,117,300	0.9%
Civilian employed persons[2]	49% of residents	446,200	488,400	548,200	0.9%
2006 market characteristics:[3]					
Building area (sq. ft.), 2006	Year-end, 2006	39,124,741			
Occupied building area, 2006	2.4% vacancy	38,196,000			
Net additional demand:					
Required building area for balanced market	5.0% vacancy	40,110,000	45,220,000	53,300,000	1.2%
Ratio for balanced market [4]	Bldg. sq. ft. per employee	90	93	97	0.3%
Additional sq. ft. required to achieve balance	Cumulative, vs. 2006	985,259	6,095,259	14,175,259	11.8%
Associated land area (cumulative net acres)	0.20 Floor Area Ratio (FAR)[5]	113 [6]	700	1,627	
Planned and entitled supply (cumulative net acres):					Percent mix, 2030
Ewa & Central Oahu	Exhibit 8-3		300	540	82%
Other - Hawaiian Cement	CMF, RCL		29	29	4%
Other - Manana Lands	CMF, RCL		15	15	2%
Other - Tesoro	CMF, RCL		71	71	11%
Total, cumulative			415	655	100%
Net additional requirements (cumulative acres)			285	972	

Notes: Net of government-owned and operated facilities such as military bases, harbors, airports and universities. FAR - Floor area ratio.

[1] 2006 figure from Claritas' estimate based on U.S. Census updates;2015 and 2025 figures based on State and County long-term pro jections as cited in Exhibit 2-2.

[2] 2006 ratio is based on DLIR's civilian labor force estimate, as shown in Exhibit 2-9. Projections assume ratio remains stable.

[3] CMF estimates Oahu space inventory at 36,244,741 square feet at 2.3% vacancy as of year-end 2006. However, per CMF, February 2007, these figures exclude approximately 2.88 million square feet in Ka'ak. Kakak areas estimated at 3.5% vacancy based on CMF in R CL.

[4] RCL reports 2004 ratios (not adjusted for vacancy) at 80 in Honolulu, 95 Metro Las Vegas, 111 Seattle, and 125 San Diego County . Oahu's industrial building area required ratio is expected to increase as the economy transitions.

[5] According to data provided by CMF, 2006 industrial inventory in West Oahu, including Pearl City, Ewa, and Central Oahu, average s 0.13 FAR over 1,980 acres (11.4 million sf). Industrial uses in more urban areas would show higher FARs.

[6] Estimate of pent-up demand in 2006.

Sources: Colliers Monroe Friedlander, Inc. 2006, custom reports;Ibid, "Industrial Market Report: Honolulu Year-End 2006," January 24, 2007;Robert Charles Lesser & Co., LLC, "Industrial Market Feasibility: 345-Acre Kapolei Harborside Center," January 31, 2006;Claritas, 2007;State of Hawaii, Department of Labor & Industrial Relations, 2007.

Exhibit 8-5
Projected Business Park/Industrial Land Requirements - Transitioning Demand
Within Oahu: 2015 and 2030

	Occupied sq. ft.	Impacted area (sq. ft.)[1]	Loss over # years	Average annual replacement need (sq. ft.)	Duration Start	Duration End
Areas of displacement:						
Kapalama Military Reservation	1,250,000	1,250,000	5	250,000	2007	2011
Kaka'ako	2,780,000	2,780,000	15	185,000	2007	2021
Subtotal, in square feet	4,030,000	4,030,000		435,000		
Lease turnover:						
Oahu inventory (net of above), in square feet	34,160,000	342,000	On-going	342,000	On-going	

Total, replacement requirements (rounded):	Estimated total area impacted: Square feet	Acres[2]	Annual: Square feet	Acres[2]
Due to displacement -				
2007-2011	2,360,000	100	435,000	18
2012-2015	555,000	23	185,000	8
2016-2021	1,110,000	50	185,000	8
Due to turnover -				
2007-2015	3,078,000	130	342,000	14
2016-2030	5,130,000	210	342,000	14

Notes: Net of government-owned and operated facilities such as at military bases, harbors, airports and universities.

[1] Kapalama and Kaka'ako impacted areas based on occupied square feet. Oahu lease turnover assumes 5-year terms and 5% of those expiring seeking to move. Turnover estimate is conservative in that it does not account for an increasing Oahu inventory.

[2] Based on an average FAR of 0.55 which considers the higher than average existing densities of the areas to be relocated.

Sources: Colliers Monroe Friedlander, Inc. 2006, custom reports and subsequent discussions; Ibid, "Industrial Market Report: Honolulu Year-End 2006," January 24, 2007; Robert Charles Lesser & Co., LLC, "Industrial Market Feasibility: 345-Acre Kapolei Harborside Center," January 31, 2006; internet research.

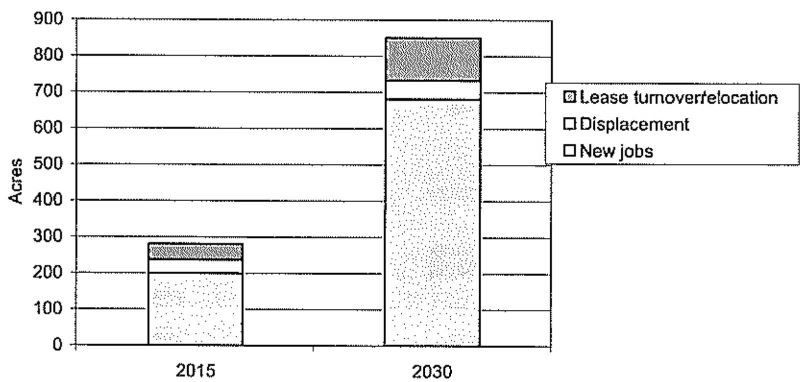
Exhibit 8-6

Business Park/Industrial Market Assessment for the Ewa DPA

Required additional land, cumulative acres, 2015 and 2030

	Basis/ reference	Potential Island-wide 2015	Potential Island-wide 2030	Ewa DPA Capture rate	Ewa DPA 2015	Ewa DPA 2030
Employment-driven demand	Exhibit 8-4	285	972	70%	199	680
Transition-driven demand:	Exhibit 8-5					
Due to displacement[1]	2007-2021	123	173	30%	37	52
Due to lease turnover[2]	2007-2030	130	340	35%	46	119
Subtotal		253	513		82	171
Total demand, rounded[3]		540	1,490		280	850

Potential Future Business Park/Industrial Land Requirements in the Ewa DPA by Demand Source



[1] Cumulative demand by 2015 based on 2007 to 2011 and 2012 and 2021 impacted areas;demand by 2030, based on 2015 total plus 2016 to 2021 impacted areas, as shown in Exhibit 8-5.

[2] Cumulative demand by 2015 based on 2007 to 2015 impacted areas;demand by 2030, based on 2015 total plus 2016 to 2030 impacted areas, as shown in Exhibit 8-5. Turnover estimate considered conservative in that it does not account for an increasing Oahu inventory.

[3] Beyond those already entitled. If entitled and zoned, Kapolei Harborside Center could satisfy about 240 acres (net) of this demand after 2009.

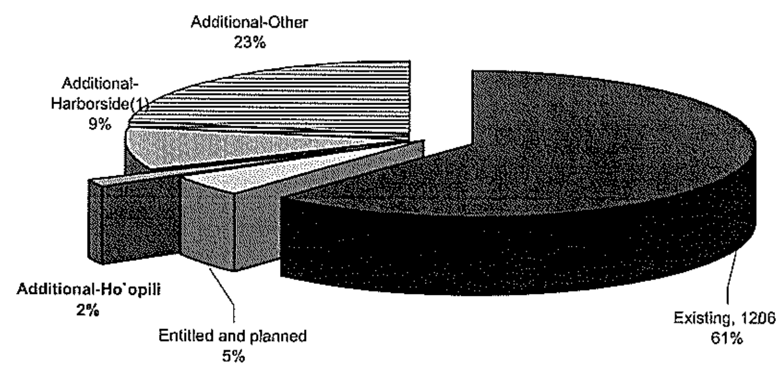
Exhibit 8-7

Business Park/Industrial Market Assessment for Ho`opili (Ho`opili Land Allocation as Currently Planned)

Cumulative net acres, by 2015 or 2025

	Basis/reference	2015	2030
Projected supportable in Ewa DPA:			
Existing, December 2006	Exhibit 8-1	1,560	1,560
Entitled and planned for 2007-2030	Exhibit 8-3	160	120
Net additional supportable in Ewa	Exhibit 8-6	280	850
Total, rounded		2,000	2,530
Ho`opili market:			
Proposed net acres		40	40
Share of total future Ewa DPA		2%	2%
Share of net additional Ewa RBA		14%	5%

Potential Ewa DPA Business Park/Industrial Land Inventory, 2030



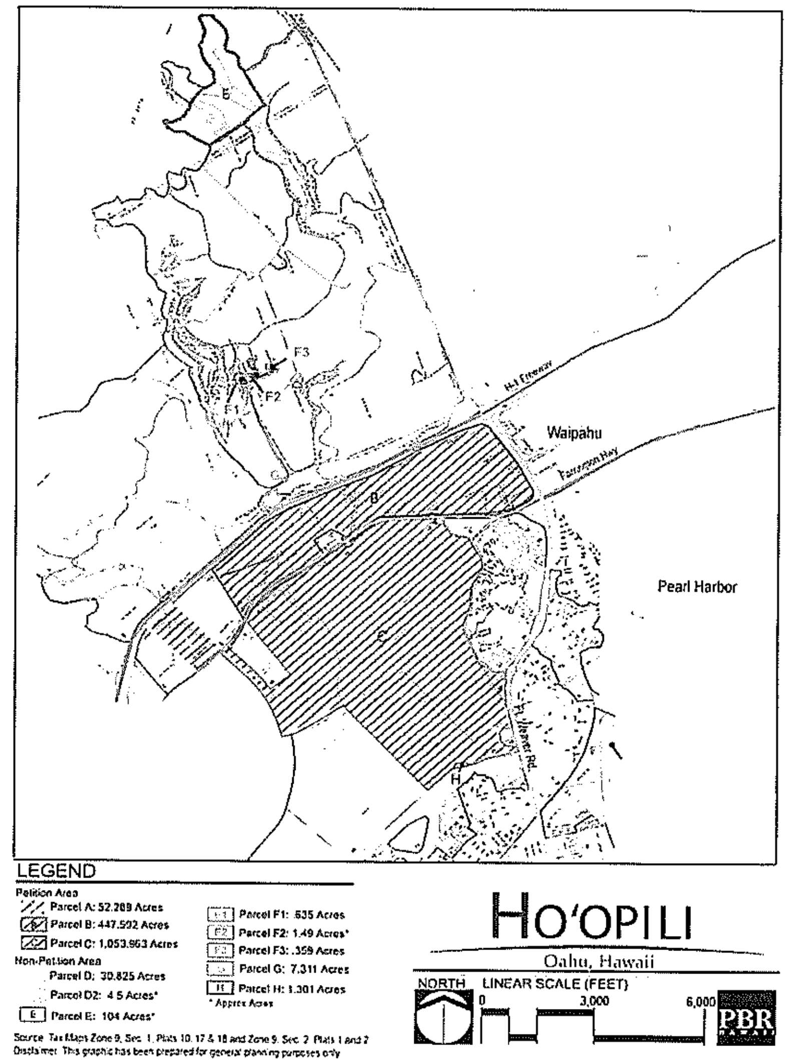
[1] Kapolei Harborside Center, petitioning the State LUC for Urban designation as of March 2007. This market share would revert to "Additional-Other" if HC were not to receive necessary entitlements.

Source: Mikiko Corporation, 2007.

MARKET ASSESSMENT FOR
HO`OPILI

Report Appendices

Appendix 1: Ho`opili Petition Area



Source: PBR Hawaii, 2007.

Appendix 2: Planned Residential Development Projects in the Ewa Development Plan Area, Con't.

Projects with State Land Use Entitlement or Exemption, as of February 2007

Project	Developer or Owner	Number of units: Total	Built as of 1/07	Potential remaining	Estimated project timing/buildout	Residential product mix	Entitlement status	Comment
E A H	Hui Kauhale, Inc. (E A H)	242	0	242	2007 - 2010	192 apartment rentals 50 SF for-sale	Entitled	Ewa Villages Area "H", 123 acres. Rentals are tax credits targeted at <70% of MFY.
Ko Olina Resort & Marina	Ko Olina Development LLC (various entities) and Sekiguchi	2,500	1,164	1,340	2008 +	Condo: tower & low-rise	Entitled	A-1 and A-2 zoned sites only; excluding sites 44 and 47, being considered for nonresidential uses. Likely 70-80% out-of-state markets.
Franciscan Vistas Ewa	St. Francis Development Corp.	328	0	328	Available for sale/rent 2008	207 senior rentals 121 for-sale SF & TH	Entitled	Behind Ewa Villages Manager's home; 23 acres. Rentals are tax credits.
East Kapolei I	State of Hawaii (DHHL)	403	0	403	Grading start 2006; occupancy 2009+	All SF	SLUC Urban; not zoned but DHHL exempt	Average 5,000 s.f. lots, 97 acres. Contingent on DOT completion of N-S Road. Adjacent UHWO.
East Kapolei II & III	State of Hawaii (DHHL, HHFDC, DLNR)	5,200	0	5,200	Ground break 2008+; home completions 2009+	1,000 SF 1,200 MF	INA but DHHL exempt	Financing an issue to completion, as DHHL State funding expires in 2012. Includes 600 rental units to be developed by HHFDC.
Kaupe'a (Villages of Kapolei, Village 8)	State of Hawaii (DHHL)	326	0	326	Under construction 2006; occupancy 2007 - 2010	All SF homes	Entitled	Last of Villages of Kapolei, 53.3 acre site; minimum 5,000 s.f. lots.
UH West Oahu project	UH/West Oahu Campus Development LLP (Hunt ELP Ltd.)	4,041	0	4,041	2009 to 2020+	761 - student & faculty homes 355 - workforce /affordable units 2,560 - MF 365 - SF	500-acre site was Urbanized by HCDCH	MF includes 925 high density, 1,050 medium density and 585 in mixed use. About 300 of 500 acres are for college town, 100 for campus. Campus requires further State funding.
Kalaeloa	Various (State HCDA is master planner)	6,350	60	6,290	60-unit Onelau'ena reopened 2006; most rest 2015-2030	Med-high density TH and apartments	SLUC Urban; HCDA must zone & establish rules	3700 acre masterplanned area. More than half on Navy-brokered lands.
Mokuola Vista	INA	70	0	70	2007			Waipahu
	Total, rounded	41,500	9,400	32,100				

Note - Excludes Subject and c. 150 potential units at Palehua D-2, not yet Urban. Shows remaining units to be developed at each masterplanned project, targeting those of 100+ units each. Figures shown based on stated owner or developer plans within entitlement restrictions, wherever information is available.

INA - Information not available; DP - on City Development Plan Map; SF - Single-family; MF - Multifamily; TH - Townhouse (multifamily); SLUC - State Land Use Commission; DHHL - Department of Hawaiian Home Lands; DLNR - Department of Land & Natural Resources; HHFDC - Hawaii Housing Finance & Development Corporation; HCDA - Hawaii Community Development Authority; MFY - median family income for City and County of Honolulu; DEIS - Draft Environmental Impact Statement.

Sources: Interviews with project principals, developers, planners and brokers, and City and State officials; Honolulu Advertiser; Honolulu Star Bulletin; Pacific Business News; project websites.

Appendix 2: Planned Residential Development Projects in the Ewa Development Plan Area

Projects with State Land Use Entitlement or Exemption, as of February 2007

Project	Developer or Owner	Number of units: Total	Built as of 1/07	Potential remaining	Estimated project timing/buildout	Residential product mix	Entitlement status	Comment
Kapolei West	Aina Nui Corporation (Campbell Estate)	1,450	0	1,450	2009 - 2020	SF & TH	SLUC Urban as of 2006; not zoned	Entitled for 2,370 units but 38% estimated to be targeted at non-resident/second home buyers.
Makaiwa Hills I and II	Makaiwa Hills LLC (Campbell & Monarch Group)	4,100	0	4,100	2009 - 2025	Emphasis on SF; Affordable to luxury	SLUC Urban; not zoned	Includes limited neighborhood commercial. EIS in 2006. Across highway from Kapolei West.
City of Kapolei (Campbell)	Aina Nui Corporation (Campbell Estate)	1,000	0	1,000	2008 - 2015	Some age restricted	SLUC Urban; not zoned	Mauka of Mehana site by D.R. Horton/Schuler; count includes Leihano for-sale housing (Brookfield/Kisco).
Palailai Mauka (also "Kapolei Mauka")	Aina Nui Corporation (Campbell Estate)	750	0	750	2009-2015	THs for affordable to middle markets	SLUC Urban; not zoned	May address some of affordable requirements for Kapolei West.
Villages of Kapolei (remnants)	Castle & Cooke Homes Hawaii, Inc.	472	0	472	Estimated completions 2008 - 2010	228 for sale MF, 244 rental	Entitled	Tax credit (<60% MFY) & gap rentals (120-140% MFY); for-sale. Por. Villages 2, 5, 6 & 8.
Wai Kalo'i ("Palehua East B")	Castle & Cooke Homes Hawaii, Inc.	300	0	300	Estimated buildout 2008	SF detached, min. 5,000 s.f. lots	Entitled	At end of Makakilo Drive. Also "Makakilo Extension."
Ewa Villages	City and County of Honolulu	57	0	57	Indefinite	Vacant lots	Entitled	Held at Managing Director's Office; disposition uncertain.
Kahiwelo (por., Palehua East C & D)	D.R. Horton/Schuler Homes	475	0	475	2008 - 2012	SF homes	Entitled	Includes C-1, C-2, D-1 and portion of C-3 (the latter not part of Palehua East).
Mehana (also "Kapolei Makai")	D.R. Horton/Schuler Homes	1,150	0	1,150	2008 - 2015	SF, duplex, TH, condo	Entitled	30% affordable to households at 80% to 120% of median. Also "City of Kapolei - Schuler," and "Kapolei Parkway Residential"
Ewa by Gentry and Gentry Ewa Makai	Gentry Homes	8,350	6,350	2,000	Makai started 2005; buildout estimated by 2011-2014	SF condo, SF detached, MF	Entitled	Zoning on Makai obtained 4/2004.
Ocean Pointe (prev. "Ewa Marina")	HASEKO (Ewa), Inc.	3,900	1,800	2,100	On-going, started 1998	SF detached & TH	Entitled	Includes potential vacation units but excludes 950-unit hotel. 4,850 maximum units per Unilateral.

Appendix 4: Entitled and Planned Retail Developments in the Ewa and Central Oahu Development Plan Areas

Projects with State LUC entitlement and plans, as of February 2007

Project Identification	Location	Developer	Site area (ac)	Estimated retail GLA (SF)	Potential new project delivery (square feet) 2007-2010	2011-2015	2016-2030	Comment
Ewa:								
Boat Parcel	Kapolei	Low Archibald (Newport Beach, CA)	14	88,000	88,000	0	0	To market 2-14 acre lots; not planned as shopping center; across Hawaiian Waters.
Kapolei Commons	Kapolei	MacNaughton /Kobayashi Groups	41	550,000	250,000	300,000	0	Initial 21 acres leased; 23-acre site at Kapolei West for 2nd phase under negotiation.
Costco	Kapolei	INA	13	160,000	160,000	0	0	Across from Home Depot.
Wal-Mart	Kapolei	Wal-Mart	25	148,000	148,000	0	0	Off of H-1 Makakilo Drive exit.
Leihano Senior Village	Kapolei	KISCO Senior Living/Brookfield Homes	INA	40,000	40,000	0	0	MUD in senior village.
Kapolei BMX Site	Kapolei	Brookfield Homes Hawaii	4	40,000	20,000	20,000	0	Currently being marketed for sale; part of Brookfield Transit Village MUD development.
Kapolei Center	Kapolei	MW Group	10	147,000	147,000	0	0	Former 12-acre site between K Mart & Home Depot; MW retaining 2 acres for self-storage.
Kapolei Promenade	Kapolei	INA	14	88,155	88,155	0	0	Balance of 335,155 GLA proposed as auto dealership.
City of Kapolei - other	Kapolei	Campbell	INA	333,000	50,000	100,000	183,000	Est. balance of zoned lands; includes Village Walk
Kapolei West	Kapolei	Aina Nui	21	125,000	0	70,000	55,000	15-acre transit site planned for MUD; 2 acre neighborhood retail site further west.
UH West Oahu Campus Village	East Kapolei	To be selected	46	175,000	50,000	80,000	45,000	Neighborhood; MUD
DHHL[1]	East Kapolei	De Bartolo Development	67	600,000	350,000	150,000	100,000	Regional/other

Appendix 3: Planned Residential Development Projects in the Central Oahu Development Plan Area

Projects with State Land Use Entitlement or Exemption, as of February 2007

Project	Developer or Owner	Number of units: Total	Built as of 1/07	Potential remaining	Estimated project timing/buildout	Residential product mix	Entitlement status	Comment
Mililani Mauka	Castle & Cooke Homes Hawaii, Inc.	6,480	6,040	440	Projected sell-out by 2008	70% SF historically; c. 55% future	Entitled	All product levels, including affordables.
Waipio Point	Castle & Cooke Homes Hawaii, Inc.	66	0	66	Projected sell-out by 2007	All SF	Entitled	Near Waipahu High School; all released units reserved as of 2/24/06.
Waiawa Gentry Phase 1	Gentry Investments	5,000	0	5,000	Ground break 2006/07; unit sales estimated 2010-2020	Est. 40% attached; 60% detached	Entitled	4,500 to 6,000 units possible depending on density. Planned for multiple homebuilders. Phase 2 (c. 5,000 units) has DP recognition but is not Urban.
Kau'olu Properties	GSF (from State - HCDCH)	370	0	370	>2010	For-sale condos	SLUC Urban, seeking up-zoning	Waipahu. Targeted at households earning 140% or less of County median income. Now zoned R-5; preparing EA.
Royal Kunia II	Horita (161 acres); Robinson Trusts (50 acres)	2,000	0	2,000	Indefinite	SF and MF 600 affordable	SLUC - all; Zoning - Horita lands only	2,000 max based on off-site infra-structure, not entitlements. Horita repurchased at bankruptcy auction, 8/06.
Plantation Town Apartments	Plantation Town Apartments LLC	330	0	330	2008	2, 12-story towers, units, $139-298K	Needs height variance	Within HHFDC's Kau'olu community, Waipahu. Affordable housing.
California Ave. Apartments	INA	42	0	42	2007	Elderly rentals		Wahiawa
	Total, rounded	**14,300**	**6,000**	**8,200**				

Note - Excludes Koa Ridge and Waiawa by Castle & Cooke (up to 5,500 units) and Gentry Waiawa Phase 2 (up to 5,000 units), both planned developments requiring SLUC approval. Exhibit shows net remaining units to be developed at each masterplanned project, targeting those of 100+ units each. Figures shown based on stated owner or developer plans within entitlement restrictions, wherever information is available.

INA - Information not available; DP - on City Development Plan Map; SF - Single-family; MF - Multifamily; TH - Townhouse (multifamily); SLUC - State Land Use Commission; HCDCH - Housing & Community Development Corporation of Hawaii; DHHL - Department of Hawaiian Home Lands; DLNR - Department of Land & Natural Resources; HHFDC - Hawaii Housing Finance & Development Corporation; HCDA - Hawaii Community Development Authority; MFY - median family income for City and County of Honolulu; DEIS - Draft Environmental Impact Statement.

Sources: Interviews with project principals, developers, planners and brokers, and City and State officials; Honolulu Advertiser; Honolulu Star Bulletin; Pacific Business News; project websites.

Appendix 5: Planned and Entitled Office Developments in the Ewa and Central Oahu Development Plan Areas

As of February 2007

Project identification	Location	Developer/ Owner	RBA or building size (SF)	Potential new delivery (SF) 2007-2015	2016-2030	Project timing	Comments
Ewa:							
Kapolei Pacific Center	Kapolei	Avalon Development	335,000	335,000	0	2009	11-stories; includes up to 50,000 sq. ft. ground floor retail; across from library and regional park.
Kapolei City Center Office Complex	Kapolei	Kahl & Goveia	200,000	200,000	0	2009	Includes both medical and general office space
Goodwill Site	Kapolei	INA	200,000	200,000	0	2009	Planned for office development. Goodwill seeking proposals for ground lease.
City of Kapolei - other	Kapolei	Campbell	550,000	50,000	500,000	2008-2025	Estimated balance of City of Kapolei commercial-zoned lands, net of those committed to State or County.
Makaiwa Hills	Makaiwa	Aina Nui Corporation	90,000	0	90,000	2011+	Possibly additional office areas as future conditions warrant.
Kalaeloa	Kalaeloa	State/private partner(s)	725,000	150,000	350,000	2010 to 2030+	Includes about 56,000 RBA on Navy-brokered lands.
Central Oahu:							
Gentry Waiawa Phase 1	Waiawa	Gentry	80,000	80000	0	2010+	Not committed yet - could be interchanged with commercial, industrial uses.
Totals of available information, rounded:							
	Ewa		2,100,000	940,000	940,000		
	Central Oahu		80,000	80,000	-		
	Total Trade Area		2,180,000	1,020,000	940,000		

SF - square feet

Sources: Interviews with project developers, landowners, planners and brokers; area site visits; Pacific Business News, 2006, "Book of Lists 2007"; Pacific Business News (weekly); Colliers Monroe Friedlander; www.kapolei.com and other internet sites; Honolulu Advertiser; Hawaii Community Development Authority; Hawaii State Department of Business Economic Development & Tourism, Research and Economic Analysis Division, "Economic Impacts of the Proposed Kalaeloa Project," January 2007.

Appendix 4: Entitled and Planned Retail Developments in the Ewa and Central Oahu Development Plan Areas

Projects with State LUC entitlement and plans, as of February 2007

Project identification	Location	Developer	Site area (ac)	Estimated retail GLA (SF)	Potential new project delivery (square feet) 2007-2010	2011-2015	2016-2030	Comment
Makaiwa Hills	Makaiwa	Campbell	INA	360,000	0	100,000	260,000	Community center or MUD; balance of 450,000 assumed to be office
Ko Olina Junction	Ko Olina	Honu Group	INA	20,000	0	20,000	0	Balance of c. 60,000 expected to be primarily resort-oriented
Laulani Shopping Center	Ewa Beach	Bristol Group/Hamico (Art Howard)	20	255,000	255,000	0	0	Potential Target or other big box; on Ft. Weaver Rd.
Ocean Pointe	Ocean Pointe	Haseko	INA	100,000	0	20,000	80,000	Balance of 500,000 may include spa, other hotel-support
Kalaeloa	Kalaeloa	State/private partner(s)	INA	116,000	0	31,000	85,000	All commercial retail development on Navy brokered lands within Kalaeloa.
Central Oahu:								
Mililani Mauka Commercial B	Mililani Mauka	Castle & Cooke		85,000	85,000	0	0	INA
Gentry Waiawa	Waiawa	Gentry	18	100,000	30,000	70,000	0	Neighborhood, community, non-shopping center
Gentry Waiawa	Waiawa	Gentry	85	300,000	40,000	100,000	160,000	Commercial or industrial; unzoned
Laniakea Plaza	Waipio Gentry	INA	INA	25,189	25,189	0	0	
Plaza at Mill Town	Waipahu	Avalon	INA	34,000	34,000	0	0	2 acres of 15.3 acre site; balance zoned for industrial
Totals/average of available information, rounded:								
	Ewa			3,350,000	1,650,000	890,000	810,000	
	Central Oahu			540,000	210,000	170,000	160,000	
	Total			3,890,000	1,860,000	1,060,000	970,000	

INA = Information not available U/C = Under construction MUD = Mixed-use development, including residential and retail SC = Shopping center

[1] Assumes phasing of regional mall.

Sources: Interviews with project developers, landowners, planners and brokers; area site visits; Pacific Business News, 2006, "Book of Lists: 2007"; Pacific Business News (weekly); Colliers Monroe Friedlander, Inc.; developer websites; Honolulu Advertiser; Hawaii Community Development Authority; Hawaii State Department of Business Economic Development & Tourism, Research and Economic Analysis Division, "Economic Impacts of the Proposed Kalaeloa Project," January 2007.

Appendix 6: Existing and Planned Business and Industrial Parks in Ewa and Central Oahu DPAs

As of February 2007

Project	Location	Year opened/ projected	Land area (gross acres) Total	In use or sold	Future supply[1]	Future net acres[2]	Potential new delivery (net acres) 2007-2015	2016-2030	Zoning	Comment
Central Oahu:										
Mililani Technology Park	Mililani	1989	101	71	30	23	20	3	Ph I - IMX-1	Ph I - 101 acres; Ph II - 135 acres but excluded because still Ag. Ph 1D infrastructure not complete.
Mill Town Business Center	Waipahu	1998	48	35	13	10	10	0	I-1	Includes Avalon's Sugar Mill Center (15-acres = 2 acres ground floor retail and 2 acres industrial, to market 2007).
Waipahu	Waipahu	INA	86	86	0	0	0	0	Most I-2; some B-2	Throughout town; c. 2.2 mil s.f. buildings.
Gentry Business Park	Waipio	1980	122	122	0	0	0	0	IMX-1, I-2	c. 1,523,000 s.f.
Wahiawa Industrial Center	Wahiawa	1990	4	4	0	0	0	0	I-2	Intensive industrial.
Gentry Waiawa Phase 1	Waiawa	2009+	175	0	175	131	90	41	B-2, IMX-1 & unzoned	Lands designated Commercial/Industrial on master plan - most could be developed as either.
Royal Kunia	Kunia	2012+	123	0	123	92	20	72	A-1	Requires zoning.
Subtotal, rounded			660	320	340	260	140	120		
Total, rounded			2,590	1,880	710	540	300	240		

[1] Estimated lands with State entitlement or exemption, and planned but not yet committed. Aina Nui's Kapolei Harborside Center (345 acres gross, 240 saleable) not included as it is currently before the LUC. Aina Nui projects 2009 to 2017 marketing period if entitled.

[2] Net acres estimated at 75% of gross acres, to allow for roads, infrastructure, etc.

INA - Information not available s.f. - square feet. FAR - Floor Area Ratio

Sources: Interviews with project landowners, their consultants, planners, land managers, and brokers; Pacific Business News; company web sites; Enterprise Honolulu; Hawaii Community Development Authority, "Draft Kalaeloa Master Plan," 2005; Colliers Monroe Friedlander Inc., 2006.

Appendix 6: Existing and Planned Business and Industrial Parks in Ewa and Central Oahu DPAs

As of February 2007

Project	Location	Year opened/ projected	Land area (gross acres) Total	In use or sold	Future supply[1]	Future net acres[2]	Potential new delivery (net acres) 2007-2015	2016-2030	Zoning	Comment
Ewa:										
Hawaii Raceway Park	Kapolei	2010	54	0	54	41	41	0	INA	To sell developed lots. Owner Irongate also developing Trump Towers in Waikiki.
James Campbell Industrial Park	Kapolei	1959	1,367	1,367	0	0	0	0	I-2	Heavy industry; vertical developments sold to HRPT.
Kapolei Business Park	Kapolei	1993	189	136	53	40	40	0	I-2, restricted	Phase 1 and 2 sold to Jupiter; 53 acres (19 lots) in phase 2, includes Kapolei Spectrum (condos) and Kapolei Industrial Court (also built.)
Kenai Industrial Park	Kapolei	1990	60	60	0	0	0	0	I-3	Sold out.
West Kalaeloa	Kapolei	2008+	100	0	100	75	75	0	I-2	Makai of Honolulu Advertiser site, adjacent to studio site. SHM Partners expect 2 mil s.f.
Kapolei Studios	Kapolei	2008+	23	0	23	17	17	6	I-2	Movie/production studios. SHM Partners; planning on State tax credits (Act 88).
Kalaeloa - Navy brokered & State administered properties	Kalaeloa	2010+	192	0	192	144	30	114	INA	Industrial, Light Industrial and Eco-Industrial lands, 10% in Navy-brokered lands; acreage estimated by CMF based on assumed FAR.
Subtotal, rounded			1,930	1,560	370	280	160	120		

Appendix K

Economic & Fiscal Impact

MIKIKO CORPORATION

ECONOMIC AND FISCAL IMPACT ASSESSMENT FOR HO`OPILI

ISLAND OF OAHU

Prepared for:
D.R. Horton – Schuler Homes, LLC
dba D.R. Horton – Schuler Division

FINAL REPORT

August 2007

Economic and Fiscal Impact Assessment for Ho`opili

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ECONOMIC AND FISCAL IMPACT ASSESSMENT FOR HO'OPILI

Report Text

1 – Introduction and Executive Summary

This chapter relates the study background, objectives, approach and principal conclusions of an economic and fiscal impact assessment prepared for the proposed Ho`opili development on Oahu. The following chapters offer a more detailed explanation of the findings and analyses on which these conclusions are based.

Project and Study Background

D.R. Horton – Schuler Homes, LLC dba D.R. Horton – Schuler Division (DRH), has initiated a planning and entitlement process to develop Ho`opili (also "the Project"). The mixed-use, master-planned community encompasses approximately 1,555 acres in the City and County of Honolulu's Ewa Development Plan Area (DPA). As proposed, Ho`opili would include up to 11,750 homes, a 50-acre (40 net acres) business park, and several areas of retail and/or office commercial development, totaling up to 2.96 million square feet of gross leasable area at buildout. It would also include one or more County-operated transit stations, up to six sites for schools or other public uses, regional and neighborhood parks, and other open spaces.

The Project is described further below, and in Mikiko Corporation (MC)'s prior report, "Market Assessment for Ho`opili," which is dated March 2007.

The planning firm PBR Hawaii & Associates, Inc. (PBR Hawaii) is preparing materials to support DRH's entitlement efforts for these lands.

Mikiko Corporation Study Objectives

PBR Hawaii engaged MC to prepare two reports:

1) **Market assessment** – An assessment of the market support for the residential, commercial and business park uses proposed at Ho`opili, including:

   - ☐ Evidence of demand and competitive supply
   - ☐ Assessment of appropriate markets, pricing, and supportable absorption

2) **Economic and fiscal impact assessment** – An assessment of the economic and fiscal impacts of the Project in terms of population, employment, personal income and State and County government operating expenditures.

The market report is the separate document cited above. This report uses the findings of the market report as input assumptions.

Economic and Fiscal Impact Approach

This economic and fiscal impact assessment is intended to assess the Project's effects within the State of Hawaii (State) and the City and County of Honolulu (County). Impacts that were evaluated include:

- ☒ Economic impacts:
  - ☐ Part-time resident expenditures in Hawaii
  - ☐ Development-related employment
  - ☐ Operations-related employment
  - ☐ Personal income deriving from development and operations
- ☒ Population impacts:
  - ☐ Residential utilization patterns
  - ☐ In-migrant population
- ☒ Fiscal impacts:
  - ☐ Property tax and other County government revenues
  - ☐ General excise tax, income and other State government revenues
  - ☐ County and State government operating expenditures
  - ☐ County and State net fiscal operating impacts

State and County revenues and expenses estimated herein are generally based on the structure of tax collections and services reported as of the fiscal year ending June 30, 2006[1]. The impacts estimated would differ if governmental taxing and spending policies were to be materially altered.

All dollar amounts in this report are stated in 2007 dollars, and year references are to calendar years, unless otherwise stated.

[1] Real property tax rates, however, have been updated to FY 2008 rates, since the County enacted significant changes to its tax structure in summer 2007.

Executive Summary

Development Proposal

Over three decades ago, city planners set out to create a "second" city in West Oahu that would provide island residents an alternative to living and working in downtown Honolulu's existing urban core. This is documented in the County's Ewa Development Plan, which was adopted by the City Council in August 1997 and is periodically updated. The plan presents a vision for Ewa's future development and provides conceptual land use plans that serve as a policy guide for more detailed planning and for public and private sector investment decisions.

In the near future, Ewa should also become a major economic engine for the state. For the 2006 to 2025 period, planned development in the DPA is projected to generate some $620 million in annual payroll, and 40,000 new jobs in the area. Projections also forsee over 38,000 new workers employed in the area by 2025.[2]

This is the context in which Ho`opili was conceived. The new community is designed as one of the last pieces of the larger master plan for the area, delivering needed homes and jobs in this fast-growing region. Ho`opili is proposed as mixed-use project developed in a New Urbanist[3] style, a community where residences, employment opportunities and amenities are closely integrated and may be reached by foot, bike or transit, as well as by car. Like other New Urbanist developments, Ho`opili is intended as a community where one can "live, work and play."

Ho`opili will offer traditional single- and multifamily homes, as well as multifamily residences developed in mixed-use settings. These may be units developed on second or third floors above ground floor retail, as well as "live-work" units, which include spaces designed and permitted for commercial business operations. In general, housing at Ho`opili will be developed at higher average densities than Hawaii's planned communities have been historically. This should serve to enhance the affordability of its housing, to encourage non-automobile-based modes of travel, and to support the Project's commercial facilities.

In accordance with County policies, about 30% of Ho`opili's residential units would be priced to County standards for affordable housing. The table on the next page summarizes the key Project components that drive the economic and fiscal impact assessment presented herein.

[2] Decision Analysts Hawaii, Inc., September 2005, "Ewa Development, 2006 to 2025: Economic, Population and Fiscal Impacts."

[3] See market study, Chapter 4 for discussion on New Urbanism.

Ho`opili would also offer up to 2.96 million square feet of commercial areas, including retail and office uses. Some of this space would be located within six business/ commercial designated areas, and some dispersed in residential mixed-use areas. With its advantageous location at the "gateway" to Ewa, including the intersection of H-1 freeway and Fort Weaver Road, Ho`opili's commercial areas could serve broad regional markets as well as its own community needs.

Finally, the Project's 50-acre (40 net acres) business park is envisioned to seek establishments that serve national and international markets. This could include a science and technology center, a health-and-wellness-related facility or other professional or technical-focused enterprises.

This report does not consider the impacts of developing and operating the County's proposed transit station(s) at Ho`opili.

Overview of Proposed Developments at Ho`opili
2007 dollars

	Comment	By 2015	By 2030	Total
Homes:	*Overall mix:*			
Market units	*70%*	1,800	6,450	8,250
Affordable units[1]	*30%*	300	3,200	3,500
Total		**2,100**	**9,650**	**11,750**
Average home sales price:				
Market units		$480,000	$480,000	$480,000
Affordable units		$295,000	$295,000	$295,000
Weighted average		**$425,000**	**$425,000**	**$425,000**
Other developments:				
Business park	*Net acres*	20	20	40
Business park	*Same areas, but in building sq. ft.*	120,000	680,000	800,000
Commercial centers	*Gross leasable sq. ft.*	600,000	2,360,000	2,960,000
Total development costs	*Hard and soft costs (mils)*	**$1,076.6**	**$3,531.7**	**$4,608.3**

Note: Project also includes school and park sites, public facility sites, a bike path and open spaces.

1 Assumes 1:1 credit per County guidelines currently in effect. Actual credit could vary, changing the affordable unit count. See City & County of Honolulu, "Adoption of Rules for the Terms and Unilateral Agreements Requiring Affordable Housing," October 20, 1994.

Sources: Exhibits 1 and 5; DRH, 2007; Mikiko Corporation, "Market Assessment for Ho`opili," March 2007.

As shown in the preceding table, development costs are estimated to total some $4.6 billion, including on- and off-site infrastructure, vertical construction, landscaping and soft costs such as professional services, administration of operating subsidiaries, marketing and the like.

Projected Impacts[4]

The Project would generate significant, on-going economic and fiscal benefits for residents of the islands, as well as for the County and State governments. Development of facilities would generate employment and consequent income and taxes. In addition, by attracting new part-time residents or retirees to Oahu and generating additional real estate sales activity, the Project is expected to support long-term impacts, including additional consumer expenditures, employment opportunities, personal income and government revenue enhancement.

Highlights of the Project impacts are summarized in the table on the next page.

- **Development employment** - Throughout its development, Ho`opili could support some 2,300 to 3,300 full-time equivalent (FTE) development-related jobs through its direct, indirect and induced impacts. These jobs are expected to be associated with annual personal earnings[5] of some $131 to $178 million per year, or $53,000 to $56,000 per job.

- **Operational employment** - By its completion in about 2030, the Project could also be expected to have generated about 7,000 permanent, ongoing FTE jobs, through its direct, indirect and induced impacts. About 1,550 of these jobs could be new to the County and State. They could be expected to include professional, technical and managerial positions at the proposed business park, sales and marketing positions supported by resales and releasing of property at the Project after its initial occupancy, and myriad other positions generated throughout the economy, as supported by the activity generated by such new expenditures. Altogether, these net new operations-related positions could be expected to generate personal earnings for Hawaii residents of about $109 million per year.

[4] See following chapter for study methodology and definitions of key terminology, such as "direct," "indirect" and "induced" impacts.

[5] Earnings are defined as wage, salary and proprietary income, plus director's fees and employer contributions to health insurance, less employee contributions to social insurance. "Earnings" are typically less than salaries.

Summary of Projected Economic and Fiscal Impacts

2007 dollars, in millions

	Comment	By 2015	By 2030
FTE employment[1]:	*Direct, indirect and induced*		
Development-related	*Average annual in preceding period*	2,340	3,340
Operations-related	*Annual, on-going*		
Total generated by Project	*On-site and directly supported*	1,836	7,043
Net new jobs	*New to County or State*	740	1,550
Total personal earnings[2]:	*Direct, indirect and induced*		
Development-related	*Average annual in preceding period*	$130.7	$178.3
Operations-related	*Annual, on-going, on net new jobs only*	$65.2	$109.2
Average earnings per FTE job[2]	*Direct, indirect and induced*		
Development-related	*Average annual in preceding period*	$56,000	$53,000
Operations-related	*On net new jobs only*	$88,000	$70,000
In-migrant resident population:	*Average daily employees, dependents, and part-time residents*		
To the County		550	2,170
To the State	*Subset of County in-migrants*	260	1,020
Net additional government operating revenues[3]:	*Operating revenues less operating expenditures*		
For the County		$7.8	$27.5
For the State		$14.4	$19.9
Revenue/expenditure ratio[3]:	*For government operations*		
For the County		9.8	8.5
For the State		9.4	3.8

1. FTE = Full-time equivalent, defined as 40 hours per week or 2,080 hours per year.
2. Earnings defined to include wage, salary and proprietary incomes, plus directors' fees and employer contributions to health insurance, less employee contributions to social insurance.
3. Does not consider impact and permit fees paid to County and State governments. These are projected to amount to approximately $194 million and $25 million, respectively, over the life of the Project, in 2007 dollars. They include sewer, water, transportation, schools, and other fees and permits. Figures also exclude impacts of transit facilities.

Sources: DRH, 2007; Mikiko Corporation, "Market Assessment for Ho'opili," March 2007.

- **Population movements** - It can be assumed that the jobs created by Ho`opili, particularly its professional, technical and managerial career opportunities, will create incentives for some neighbor islanders or former Hawaii residents to move to Oahu. These and other indirect factors can be expected to result in up to 2,170 persons living on Oahu who might not otherwise have lived on the island (in-migration to the County.) Within this total, some 1,020 persons could be those who had previously lived out-of-State.

- **Net County fiscal impacts** - The Project could be expected to contribute some $27.5 million in net additional County revenues at its completion. By 2030 and beyond, new County government revenues are estimated to represent 8.5 times the new County government operating expenditures required to support the additional population expected to be attracted to Oahu by the Project.

- **Net State fiscal impacts** - For the State, net additional operating revenues derived from the Project are estimated at $19.9 million per year by 2030 and beyond. This represents a revenue/expenditure ratio of 3.8.

These public sector contributions do not consider the value of the school sites, public parks or various off-site infrastructural improvements to be contributed by DRH, nor do they consider the estimated $219 million in various impact and permit fees expected to be paid to the County and State governments during the development of the Project. These additional contributions would greatly increase the net public benefits of Ho`opili.

Report Organization

The rest of the report is organized in three parts, as follows:

1) **Remainder of Report Text** - Explanation of the study analyses and conclusions, including:

    - Study Approach
    - Economic Impacts
    - In-Migrant Population
    - Fiscal Impacts

2) **Exhibits**- Detailed bases and findings on which the conclusions are based.

3) **Appendices** – Report conditions and further documentation of input assumptions.

2. Study Approach

Special Considerations

Special considerations for some of Ho`opili's facilities guide the analyses presented herein. These and other aspects of this study's analytical framework are set forth below:

- **Time frame** – This analysis extends from 2009 to 2030, a 22-year period that would encompass from preconstruction planning through Project build-out. Ground-breaking may be anticipated in 2010. All residential units, as well as commercial and industrial space are projected to be sold and/or occupied during this period, in accordance with findings of the market study.

- **Use and classification of residential units** – Although not considered a major market segment, Ho`opili's unique development style and mixed-uses could attract some buyers that would be seeking a part-time residence in the community. This group is distinguished from primary resident buyers or renters because their economic and fiscal impacts are distinct.

    - Homes occupied by full-time residents are referred to herein as "primary resident homes" and are assumed to be occupied by persons who would be living elsewhere on Oahu even if the Project were not developed.

    - Homes occupied by part-time residents may be referred to herein as "non-resident homes" and/or "non-resident/second homes," and are assumed to be occupied by persons who will stay at the unit for significant portions of the year, but whose primary place of residence is or was formerly somewhere other than Oahu. This latter group also includes persons who retire to Ho`opili from somewhere off-island, even if their Ho`opili home becomes their principal place of residence.

- **Commercial facilities** - The proposed commercial facilities are expected to attract spending from:

    - Unit buyers at Ho`opili who reside on-site full- or part-time,
    - Oahu residents not living at Ho`opili, and
    - Oahu visitors not staying at Ho`opili.

    It is likely that Oahu residents and visitors not staying at Ho`opili would have spent an equivalent amount on dining out and/or personal services whether or not the Project's commercial facilities were developed. Thus, given the competitive retail market on Oahu, the planned complexes could lead to a geographic reallocation of spending within the region, but would not in themselves be expected to increase expenditures made in the County or State.

On the other hand, commercial facilities would contribute to the Project's ability to attract residential buyers to Ho`opili.

In other words, Ho`opili's commercial facilities will employ workers, pay taxes and generate other economic and fiscal benefits. These are considered directly generated impacts and most of these jobs would be located on-site. However, the net benefits of the Project's commercial facilities are best measured in terms of the part-time residents Ho`opili attracts, and the spending, taxes and other benefits these persons will generate throughout the County and State.

- **Other uses/considerations not modeled** – Other than development costs for the parks and infrastructure affiliated with the school site, this assessment does not consider the economic and fiscal impacts of development that would be of a public or civic nature. Thus, building or other facilities on the school sites or parks, the proposed transit station(s) and other public facilities are not considered. Neither is the value of the lands to be contributed to governmental agencies considered.

  With respect to the proposed transit station(s), it is assumed that they might be developed elsewhere in the Ewa district, if at all, whether or not Ho`opili proceeds. Thus the development costs and many other impacts of introducing mass transit in the region, although likely profound, are not considered to be a function of the development of Ho`opili per se.

- **Entitlement spending not considered** – DRH's currently on-going entitlement process for Ho`opili is already generating economic and fiscal benefits by employing professionals and supporting various vendors around the State. However, since such benefits are not dependent on the outcome of the entitlement process, they are not enumerated in this analysis.

- **Other** –This study does not compare the proposed developments to prior master plan(s) for the property nor to other developments that could be hypothesized given the lands' existing entitlements.

Definition of Terminology

Within this report, the following definitions apply:

- **Direct impacts** - Those economic, population or other impacts attributable to persons or activities that are a direct result of the proposed development. For instance, direct employment impacts might include those involved in building the proposed facilities, such as construction workers, and those who would later work at them in their operations.

  Many, but not all of direct impacts can be expected to occur on-site. For instance, a portion of the construction budget is for architects and engineers. While such persons' employment might be temporarily dependent on the contracts generated by Ho`opili, they may do the majority of their work from offices in Honolulu or elsewhere. Likewise, administrative and managerial staff located off-site would support construction professionals working on-site.

- **Indirect impacts** - Indirect impacts occur when the businesses or persons who are directly affected make expenditures for additional supplies or services. For instance, some of the additional retail spending by those newly attracted to Hawaii by Ho`opili could be spent on eating out. These elevated dining out expenditures could indirectly increase demand for produce, seafood and meats from Hawaii farms, fishermen and/or ranching enterprises. Ho`opili would thus have indirectly supported new business opportunities for area providers of such goods and services.

- **Induced impacts** - Induced impacts occur throughout the community when those persons or companies that have benefited from the direct or indirect impacts of the Project spend their associated earnings on consumer goods and services. For instance, a construction worker may spend her earned wages to buy a new pair of shoes, or to pay for her child's day care. The farmer who sells produce to a restaurant at Ho`opili may use some of his profit to take his family out to the movies. The businesses and individuals impacted by such re-spending are said to enjoy induced economic impacts from the Project.

- **Total impacts** - Total impacts are defined as the sum of direct, indirect and induced impacts for any given variable.

- **Resident population** - Resident population refers to all those persons who habitually reside in a given area, whether or not they may have temporarily traveled away.

- **Full-time equivalent** - Although some direct, indirect and induced employment opportunities generated by Ho`opili can be expected to be part-time, this study measures employment opportunities in full-time equivalent (FTE) units. For purposes of this study, one full-time equivalent position is defined as 2,080 hours of employment (including paid vacation and sick leave) per year. This is equivalent to 40 hours per week, and may also be referred to as a "person-year" of employment. Two half-time jobs would be considered to together represent one FTE job.

  Residents may also be referred to as FTE. In this case, one FTE resident would represent 365 days of presence in the community. As an illustration, this could also represent four part-time residents each staying three months.

Project Parameters

Assumptions regarding the scale, nature and timing of the Project are made in order to assess its impacts. This assessment is based on findings of the market study, and on timelines and development programs provided by DRH, PBR and others as noted.

Development Program (Exhibit 2-1)

Ho'opili is proposed to be developed with up to 11,750 residential units, 2.96 million square feet of commercial (retail and office) space, and 40 net acres (50 gross acres) of business park. The business park lands could be expected to accommodate up to 800,000 square feet of rentable building areas at completion.

Among the residential units, about 30% or some 3,500 would be developed as affordable housing, in accordance with County guidelines. If these units were developed for sale (as opposed to rentals), they could expect to be marketed for about $295,000 on average, based on County guidelines in effect in February 2007. Affordable units might be produced at a rate of about 200 per year, on average.

The average market-priced unit could be expected to be sold at $480,000, with an average of 450 units selling each year. These assumptions are explained in the market study.

Including the above land uses plus school and park sites, roads, pathways and other open spaces planned, the Project encompasses some 1,555 acres. The school and/or "public facilities" sites and several of the park sites are intended for contribution to State and County governments.

Assuming entitlements are obtained on a timely basis, the landowner believes construction of infrastructure could begin in 2010, and the first units could be available for occupancy in 2012. The Project as a whole is anticipated to be fully sold out and/or leased by 2030. As noted previously, however, this analysis begins in 2009, in order to capture the impacts of pre-construction but post-discretionary permit planning, design and related professional services.

Utilization Patterns (Exhibit 3-2)

County guidelines are expected to restrict the use of affordable housing units to primary residents. Market units are also likely to be mostly used as primary residences. Many would be purchased by households intending to live in them themselves, while some others may be purchased by investors who would subsequently rent them out. This would again result in a unit available for primary resident use.

Based on historical estimates for Oahu, about 7% of homes could be expected to be purchased by persons who customarily live or previously lived off-island, on a neighbor

island or out-of-State. These would include those who intend to live in their new unit on a part-time basis, as well as those who intend to move to Oahu to reside in the unit full-time, such as a retiree who relocates from off-island.

Primary resident market units at Ho'opili are assumed to be occupied 95% of the time, at 3.2 persons per household for market units, and 3.4 per household for the affordable units. These are based on the estimated 3.5 persons per household now resident in the Ewa DPA, and the projected 3.4 per household by 2011[6]. The current estimate and near-term projection are discounted further during the projection period to reflect ongoing anticipated declines in average household size.

The nonresident/second home units are assumed to be occupied an average of 50% of the year, by an average of 2.3 persons per unit, based on surveys of brokers and residents in other second home communities on Oahu. These assumptions support an average daily Project population of some 35,290 persons, assuming its full build-out and sales absorption by 2030.

[6] Claritas, Inc., 2006.

3. Economic Impacts

Ho`opili may be expected to impact the State and County economies by (a) attracting part-time residents who would make new expenditures,[7] (b) generating development activity, which supports expenditures for goods and services, and (c) creating and supporting jobs and business enterprises in its ongoing operations. The new jobs would in turn generate additional personal earnings in the County and throughout the State.

Part-Time Resident Expenditures (Exhibit 3-1)

Expenditures by part-time residents attracted to Oahu by the Project will contribute to Ho`opili's economic benefits. Direct expenditures made in Hawaii by the part-time residents themselves are projected to amount to about $2.4 million by 2015, or $11.1 million per year by the Project's stabilization in 2030. Including the indirect and induced impacts of these direct expenditures, the total contribution to the State economy by Ho`opili's part-time residents is expected to amount to about $4.1 million per year by 2015 and $19.0 million per year by 2030 and thereafter.

Project Costs

Coefficients and Multipliers (Exhibit 3-2)

The State of Hawaii, Department of Business Economic Development and Tourism (DBEDT) periodically evaluates the economic interdependencies of the various industries within the State, and their rates of job and personal earnings creation. The latest such study is dated June 2006 and entitled, "The 2002 State Input-Output Study for Hawaii." Exhibit 4 shows the information extracted from this report for use in the analysis of Ho`opili's development activity.

- **Final demand industry coefficients** show the relationship between input, or spending within any given industry category, and its resulting creation of jobs and earnings in other sectors of the State economy[8]. Such coefficients are used to

[7] Although not planned as a second home community, nearly all areas of Hawaii attract some part-time resident ownership. Ho`opili's relatively smaller, mixed-use units could additionally appeal to neighbor islanders who frequently do business in or travel to Oahu.

[8] Personal earnings are defined in the DBEDT study as wage and salary income plus proprietors' income, plus director's fees, plus employer contributions to health insurance, less personal contributions to social insurance (i.e., social security taxes). See pp. 23 to 24.

estimate the direct effects of the construction and development activities planned for Ho`opili.

- **Industry multipliers** show the relationship between direct jobs or earnings and the indirect and induced jobs or earnings that they can be expected to subsequently support.

Development Costs (Exhibits 3-3 and 3-4)

Based on estimates provided by DRH and other sources as cited in the exhibits, Ho`opili's development costs will amount to some $4.6 billion in total, spent over the 22 years between 2009 and 2030. This budget is in 2007 dollars and includes:

- **Professional services** – planning, architectural, engineering, landscape design, development management, legal, and similar services. Note that those services related to the effort to entitle Ho`opili's lands are not included in this estimate, since they are not contingent on the entitlement.
- **Construction** – including on- and off-site infrastructure, land subdivision and site preparation, all facility development (except for public facilities), and retail, office and business park tenant improvements.
- **Other** – including administrative overhead, subsidiary operations, marketing, public relations, off-site community contributions and other "soft" costs incurred during the Project's development.

Because the latest DBEDT coefficients are calibrated to 2002 dollars, the development budgets are also re-estimated in 2002 dollars, as also shown in Exhibit 3-3.

Exhibit 3-4 restates the 2007 figures but on an average annual basis within each period considered, rather than as a total for each period. Over the projection period, the Project could be expected to average $209.5 million per year in development expenditures in Hawaii. The rate of expenditures could be higher than this average between 2016 and 2030.

Employment and Earnings

Development Employment (Exhibit 3-5)

Over the life of its buildout, Ho`opili could directly generate some 27,400 person-years of development-related work. The majority of this work would occur on-site. However, some, such as the professional services and administrative positions, are likely to be located off-site, likely elsewhere on Oahu. This estimate includes wage, salaried and proprietary employment opportunities supported by Ho`opili's development.

Considering also the indirect and induced employment opportunities that these direct impacts are likely to support, the total impacts of the Project's development could represent 66,600 FTE jobs by 2030.

The impacts are also considered on an average annual basis, in order to suggest the numbers of persons that could be employed in Ho'opili's development in an average year. Over the entire development period from 2006 to 2030, the Project is anticipated to support an average 1,240 direct FTE development-related jobs within the State. Total employment impacts, including direct, indirect and induced FTE jobs, could represent about 3,020 FTE positions in an average year. Average annual demand for development-related employees could be higher between 2016 and 2030.

Personal Earnings from Development (Exhibits 3-6 and 3-7)

Direct personal earnings associated with Hawaii-based positions could amount to some $1.84 billion over the Project's initial development. Considering the indirect and induced earnings, Hawaii workers could expect to enjoy some $3.59 billion in additional earnings over the Project's development.

On an annual basis, these total earnings represent an average of $163.1 million per year from 2009 to 2030, or up to $178.3 million per year between 2016 and 2030. The indirect and induced benefits could be expected to be supported throughout the State, with concentration on Oahu.

Comparing projected earnings to the employment figures shown previously, the FTE-wages, salaries, proprietary income and other earnings generated by the Project's overall development are estimated to average about $67,000 per direct FTE position, or $54,000 considering its total, more dispersed impacts.

Since most families include more than one jobholder, and many employees themselves hold more than one job, these position-specific salaries can be expected to be associated with higher average family incomes.[9] Thus, on average, those employed in positions directly supported by Ho'opili's development could be expected to have family incomes averaging $121,000, while those associated with all jobs created through the Project's direct, indirect or induced effects could be expected to have family incomes averaging $97,000. These would represent 165% and 132% of the median family income for Honolulu County, which was estimated at $73,500 in 2007.[10]

[9] Ratio derived from average annual wage in Honolulu County, as reported by the State Department of Labor & Industrial Relations and the median family income as reported for Honolulu MSA by the U.S. Department of Housing & Urban Development. See Exhibit 3-7 for further information.

[10] U.S. Department of Housing & Urban Development, HUD USER, July 2007.

Operational Employment (Exhibits 3-8 and 3-9)

In addition to its development-related positions, Ho'opili would create numerous long-term permanent jobs in its operations. Operational employment may be considered in two ways:

- **Employment directly generated** (Exhibit 3-8) – Ho'opili is expected to be directly associated with over 7,000 permanent positions in its operations. Most of these jobs would be on-site, such as employees of Ho'opili's business park, and its retail and office facilities, including those working at their own live-work units. Additionally, second home residents of Ho'opili will likely require assistance with property management, landscaping, cleaning and the like. Also, the development and marketing of Ho'opili will generate opportunities in real estate brokerage, management, sales and marketing. Some of these latter opportunities may be based at offices off-site. These estimates do not include employees of public facilities that may be developed on-site, such as at schools, parks or the like.

- **Net additional employment** (Exhibit 3-9) - It is likely that existing and future Oahu residents would spend an equivalent amount on dining out and/or personal services whether or not the Project's commercial facilities were developed. One impact of the Project's development may be a geographic reallocation of spending and hence jobs within the region. However, from a broader standpoint, many of the jobs to located at Ho'opili would not be net new jobs for Hawaii.

  On the other hand, to the extent that Ho'opili attracts new residents to the islands, those persons' spending can be considered new monies in the State economy, and that new spending will generate new employment opportunities that may be dispersed State-wide.

  In conclusion, Ho'opili's impacts on employment opportunities State-wide are estimated:

  - Via employment multipliers applied to estimated spending by new residents attracted by the Project;
  - Via employment multipliers applied to the projected volume of sales and leasing costs and commissions; and
  - As an estimated percent of the jobs at the business park that would be supported at businesses serving markets outside of Hawaii.

  Altogether, some 680 of the direct operational jobs to be generated by Ho'opili are considered likely to be net new jobs to the State. Indirect and induced effects could add another 870 permanent positions in Hawaii, for a total of some 1,550 net new permanent positions by the Project's stabilization in 2030.

Personal Earnings from Operations (Exhibits 3-10 and 3-11)

Personal earnings are estimated for the net new operational jobs supported by Ho`opili. Direct wages and salaries paid to those employed in the Project's operations, plus proprietary earnings, director's fees and the like earned as a direct result of the Project's resident spending are expected to reach $40.9 million per year by Project stabilization in 2030. Including personal earnings associated with the indirect and induced positions, the Project could generate some $109.2 million per year in ongoing payroll within the State.

These figures do not include gratuities, bonuses or some of the employee benefits that would also be realized by many of the employees and proprietors benefiting from this economic growth.

Based on the multipliers derived from DBEDT's Input-Output Study, the direct employment and proprietary opportunities generated by Ho`opili could be expected to support average FTE earnings of about $70,000 at stabilization. This relatively high average reflects the caliber of earnings expected to be associated with the business park and with real estate brokerage.

As for development employment, these operational earnings per job would be associated with higher average family incomes. Using the same methodology explained previously, the families that include a person employed through direct, indirect or induced employment impacts of Ho`opili can be expected to have average incomes of about $126,000. This would put these Ho`opili-associated families in the 171st percentile with respect to the 2007 Oahu median family income

4. In-Migrant Population

Ho`opili is expected to lead to in-migration to the State and County as discussed below.

Ho`opili Residents (Exhibit 4-1)

Part-time/second home or retirement home buyers coming from off-island would have a direct impact on population. The majority of such in-migrants are anticipated to come from out-of State, but some could be newcomers to Oahu only, having moved from a neighbor island. Those moving could be attracted by a variety of factors, including the community lifestyle offered at Ho`opili, its job opportunities or those at the nearby UHWO.

By 2030, part-time/second home buyers or off-island retirees living at Ho`opili are estimated at 660 FTE persons. Some 430 of these persons are estimated to be in-migrants to the State, having moved from the US mainland or internationally. These persons, together with perhaps 230 FTE others that could have moved to Oahu from another island comprise the estimated total of 660 in-migrants to the County.

Employees and Dependents (Exhibit 4-1)

Some of those taking advantage of the construction and operational employment generated by the Project might move from other counties or states because of a job opportunity at Ho`opili. These might include young householders who grew up in Hawaii but had been working on the U.S. mainland due to the lack of attractive career and living environments in Hawaii, or neighbor islanders who seek employment and lifestyle opportunities such as envisioned at Ho`opili. Other household members might also accompany such in-migrating workers.

- **Development employees** - Hawaii's labor market is considered to have sufficient supply and the required skills to satisfy most of the Project's development labor needs. A nominal 3% of FTE specialty staffing needs is assumed to come from or be employed on the U.S. mainland. This could represent 30 or so of the development employees required in any given year. Such persons might be temporarily resident in the islands during periods of the Project's development.

  Those moving or commuting between islands during the Project's development could fill another 2%. Together with those from out-of-State, this would represent 5% of development employees being temporary in-migrants to the County, for a total of 50 of the FTE development positions per year.

- **Operational employees** – Some 93% of the Project's operational employee needs are anticipated to be satisfied from within the State's and 85% from within Oahu's labor pool. Conversely, this could mean that nearly 500 operational employees are ultimately attracted to Hawaii because of Ho`opili's operational employment opportunities, and another 500 or so are attracted from the neighbor islands. Together this would mean that total migration to Oahu from off-island (from out-of-State and within the State) would represent about 1,000 FTE persons.

- **Dependents** - In-migrant dependents are estimated at an average of 0.2 per FTE in-migrant construction worker, since the position on which the "move" is based would be temporary, and 1.0 per FTE in-migrant operational employee. Dependents are estimated at about 500 moving to the State plus another 500 moving to Oahu from within the State.

Total In-Migrant Impacts (Exhibit 4-1)

In total, by 2030, Ho`opili's employment creation is projected to have been associated with about 2,170 in-migrants to the County, of whom about 1,020 were also new to the State.

5. Fiscal Impacts

Ho`opili's fiscal impacts are estimated by comparing its anticipated impacts on government revenues to the government service costs associated with the additional population the Project could attract to the State and County.

Operating Revenues

Real Property Taxes (Exhibit 5-1)

For the County, the Project's most significant fiscal impact would be the higher real property taxes it would generate compared to those currently paid. Net new real property taxes are based on the County's Fiscal Year 2007-2008 (FY08) rates for land and building uses of the relevant land use classifications, as approved by the City Council in summer 2007.

Future assessed values will be based on the County assessors' estimates at a future time, and County standards of practice for establishing such values. For projection purposes, the following proxies are used:

- **Assessed values of the residential areas as improved** are based on the estimated average home sales price of $425,000, together with the total number of units projected to have been sold as of the two benchmark years of 2015 and 2030.

- **Assessed values of the unimproved residential areas** are based on comparison to FY07 tax assessed values per acre at other Urban-designated and Unimproved Residential use lands held by DRH at Mehana and Kahiwelo, and a pro-rata share of the Project's residential lands assumed to remain undeveloped at any given time.

- **Assessed values of the business park and commercial improvements** are estimated based on the estimated "hard" construction costs for the buildings, plus their tenant improvement costs, as presented previously.

- **Assessed values of the business park and commercial lands** are based on currently assessed values for an undeveloped industrial property held by DRH in East Kapolei and an unimproved commercial site held by DRH in Mehana, both in the Ewa DPA.

Based on these proxies, the Project is estimated to have a tax assessed value of $1.39 billion in 2015, and $6.29 billion by 2030, when it is assumed to be fully built-out.

County Real Property Tax Revenues (Exhibit 5-1)

Considering the estimated assessments and the current County real property taxation structure, Ho'opili could support potential new real property taxes of up to $8.3 million by 2015 or $32.4 million per year by 2030 and thereafter.

Deductions from these figures include real property taxes currently paid for the subject lands, and an allowance for homeowners' exemptions.

On balance, Ho'opili is projected to supply the County with about $7.7 million in net additional real property tax revenues in 2015, or $29.1 million on an on-going annual basis after its completion in 2030.

Total County Government Operating Revenues (Exhibit 5-2)

In addition to real property taxes, the County obtains liquid fuel, utility franchise, motor vehicle weight, and other license and permit fees from residents and businesses. Based on Honolulu County revenues reported by City and County of Honolulu for FY06, these minor County taxes and fees amount to about $204 per resident, in 2007 dollars. Applying this revenue rate to the number of persons expected to move to the County because of Ho'opili yields an estimated $0.6 million in new County revenues by 2030.

Honolulu County also receives a 0.5% "surcharge" on all Gross Excise Tax (GET) collected by the State. Considering the development and operational activities of the Project that would be subject to GET, at completion Ho'opili could generate another approximately $1.5 million per year in new tax revenues for the County from this revenue source.

Added to the real property taxes discussed above, net new taxes earned by the County as a result of the Project's development and operations are estimated at $8.7 million in 2015 or $31.1 million per year by 2030 and thereafter.

These figures do not include some $194 million in impact and permit fees anticipated to be paid to the County during the development of the Project, nor the value of lands to be dedicated to County agencies such as for police, fire and transportation uses.

State Government Operating Revenues (Exhibits 5-3 and 5-4)

Additional operating revenues accruing to the State government are expected to derive principally from:

- GET applied to Ho'opili's development expenditures, brokers' commissions, the in-State spending by its part-time or retiree residents and employees who came from out of State, as well as
- Individual income taxes paid by the Project's employees, including both its development- and operations-related employees.

- Conveyance taxes on the initial developer sales of homes and developed commercial properties.
- Other sources evaluated include income taxes on new personal earnings generated by Ho'opili, and specific excise, licenses, fees, fines and other payments to the State made by those who move to Hawaii because of the Project.

Assumptions on which the above sources are estimated are shown in Exhibit 5-3.

Exhibit 5-4 applies these assumptions and shows net new operating revenues for the State at some $16.1 million in 2015, or $27.0 million per year by 2030 and thereafter.

These projected State tax revenues may be conservative in that they do not include:

- Potential income taxes from certain business operating incomes, including those that may be paid by the operating entity for Ho'opili,
- Personal income tax on gratuities, bonuses or other earnings by Project employees not accounted for herein,
- GET on any portion of Homeowners' Association fees that may be non-exempt,
- Conveyance taxes on commercial and business park space leasing,
- Conveyance taxes on the ongoing resales of residential and commercial or business park properties within the Project, and
- State surcharges on motor and tour vehicles that could be rented by the Project's residents.

The figures cited above also exclude some $25 million in school fees and a share of transportation fees that are expected to be paid to the State on behalf of Ho'opili over the years of its development. Neither do they include the value of lands to be dedicated to the State such as to the departments of Education and Transportation.

Operating Expenses

Per Capita Government Operating Expenditures (Exhibits 5-5 and 5-6)

Both State and County governments can be expected to incur additional operating expenses in supporting the in-migrants that are attracted by the Project. An analysis of the County's FY06 operating expenditures, net of Federal and State grants, suggests that the County spends some $1,291 per FTE resident per year, in 2007 dollars. These expenditures support functions ranging from public safety and highways to recreation, as well as County debt service and benefits for its employees.

A similar analysis of State government operating expenditures, also based on data provided for FY06, suggests that the State spends about $4,912 per year to support government operations on behalf of each FTE resident.

Additional County Government Operating Expenditures (Exhibit 5-7)

The per capita budgets derived above are applied to the counts of those anticipated to in-migrate to the County because of employment or housing opportunities at the Project. This results in an estimated $0.9 million in additional County government operating expenditures in 2015, and $3.7 million per year by the time of project stabilization in 2030 and thereafter.

Additional State Government Operating Expenditures (Exhibit 5-8)

Employing an analogous methodology, the State could be expected to require up to $7.1 million more per year to support the net additional residents the Project could eventually attract, by 2030.

Net Fiscal Benefits (Exhibit 5-9)

Comparing the net new government operating revenues and expenditures discussed above yields the projected net fiscal benefits for the County and State governments.

- **County government** operating revenues attributable to Ho'opili are anticipated to exceed the additional operating expenses in both of the benchmark years evaluated. By Project stabilization, net additional operating revenues could represent some $27.5 million per year, for a revenue/expenditure ratio of 8.5.
- **The State government's** operating revenues are also anticipated to exceed the additional operating expenses throughout the Project's development and operating periods. The State's net additional revenues are projected to amount to $19.9 million per year by Project stabilization in 2030. New revenues to the State government could then represent some 3.8 times new State government operating expenditures.

Economic and Fiscal Impact Assessment for Ho`opili

Exhibits

Exhibit 2-1
Project Concept and Potential Development Timing
2009 to 2030

	Unit	Notes		2009-15	2016-30	Total
Highlights of period:				■ 2009-2011 infra-structure planning and develop-ment ■ First deliveries 2012	■ Ho`opili buildout and sales completion	
Development in period:						
Residential unit completions/sales -		Av. price:	Av. sales/year			
Market units (single & multifamily)	Sold homes	$480,000	450	1,800	6,450	8,250
Affordable units (multifamily)[1]	Sold homes	$295,000	200	300	3,200	3,500
Subtotal, residential units/weighted average price		$425,000	650	2,100	9,650	11,750
Business Park-developed land	Net acres	Exhibit 8-7, Market study		20	20	40
Business Park-buildings	Built square feet	Assumes lag from land delivery		120,000	680,000	800,000
Commercial Centers	Gross leasable square feet	Exhibit 7-2, Market study		600,000	2,360,000	2,960,000
Cumulative development by end of period:						
Residential unit completions/sales -						
Market units (single & multifamily)	Sold homes			1,800	8,250	
Affordable units (multifamily)	Sold homes			300	3,500	
Subtotal				2,100	11,750	
Business Park	Net acres			20	40	
Commercial Centers	Gross leasable square feet			600,000	2,960,000	

1 Assumes 1:1 credit per County guidelines currently in effect. Actual credits could vary, changing the affordable unit count. See City & County of Honolulu, "Adoption of Rules for the Terms of Unilateral Agreements Requiring Affordable Housing," October 20, 1994, page 2-2.

Sources: DRH, 2007; Mikiko Corporation, "Market Assessment for Ho`opili," March 2007.

Exhibit 2-2
Residential Utilization Patterns
2015 and 2030

	Basis/reference	2015	2030
Usage assumptions:			
Market units-primary residences	*93% of sold market units*	1,674	7,673
Market units-2nd home/off-island buyer	*7% of sold market units*	126	578
Affordable units (all primary homes)[1]	*100% of sold affordable units*	300	3,500
Total		2,100	11,750
Unit occupancy assumptions:			
Market units-primary residences	*Allowance for vacancy/transitions*	95%	95%
Market units-2nd home/off-island buyer	*Share of time spent on-island*	50%	50%
Affordable units (all primary homes)	*Allowance for vacancy/transitions*	95%	95%
Utilization pattern:			
Average daily occupied units -	*Exhibit 2-1 + usage assumption*		
Market units-primary residences		1,590	7,289
Market units-2nd home/off-island buyer		63	289
Affordable units (all primary homes)		285	3,325
Subtotal		1,938	10,903
Average daily persons in residence[2] -			
Market units-primary residences	*3.2 persons per occupied unit*	5,089	23,324
Market units-2nd home/off-island	*2.3 persons per occupied unit*	145	664
Affordable units	*3.4 persons per occupied unit*	969	11,305
Subtotal, rounded		6,200	35,290

1 Assumes 1:1 credit per County guidelines currently in effect. Actual credits could vary, changing the affordable unit count. See City & County of Honolulu, "Adoption of Rules for the Terms of Unilateral Agreements Requiring Affordable Housing," October 20, 1994, page 2-2.

2 Primary resident occupancy based on Claritas, Inc., 2006 estimate of average 3.5 persons per household in Ewa District and projected 3.4 by 2011. Discounted further to reflect declining household sizes in future. Non-resident/second home estimate based on interviews with area realtors and property operators.

Exhibit 3-1
Part-Time Resident Expenditures in Hawaii, Average Annual
2015 and 2030 (2007 dollars, in millions, except as noted)

	Basis/reference (not in millions)		2015	2030
Bases for direct expenditures:				
Average household income	*Part-time residents, pre-tax*	*$175,000*		
Percent of income spent on island[1]	*US Bureau of Labor Statistics*	*22%*		
Persons per household	*(See Exhibit 2-2):*	*2.3*		
Projections:				
Direct expenditures	*Expenditure per FTE person:*	*$16,700*	$2.4	$11.1
Indirect & induced	*0.71 multiplier*[2]		$1.7	$7.9
Total			$4.1	$19.0

Note: Assumes new expenditures are attributable to part-time residents of residential units and their associated guests only, i.e., no additional retail spending on-island hypothesized for kama'ainas or other island visitors because they are assumed to spend elsewhere on the island even if the Project were not developed.

1 Based on spending patterns for consumer units averaging $115,629 income as shown in US Bureau of Labor Statistics, Table 2, "Income before taxes: Average annual expenditures and characteristics, Consumer Expenditure Survey, 2002." Excludes expenditures for mortgage interest and charges, rented dwellings, other lodging, natural gas, cash contributions, health & other insurance and pensions. Figures adjusted further to account for percent of time spent on island (see Exhibit 2-2, occupancy assumptions.)

2 Based on estimates by Dr. Xijun Tian, DBEDT (personal communication, 4/18/1999). Considers weighted average visitors to Hawaii and their expenditures as allocated to 118 industry categories as available in 1992 State Input-Output model by DBEDT.

Exhibit 3-2
Industry Coefficients and Multipliers for Development Activities

FINAL DEMAND INDUSTRY COEFFICIENTS[1]	DBEDT industrial categories applied	Final demand coefficient per $1 million (2002$) project cost: Jobs[2]	FTE factor[3]	$ Earnings[4]
Professional services	*#45-Architectural and engineering services*	10.31	0.85	0.63
Construction:				
Residential units	*#13-SF housing construction*	7.37	0.94	0.34
Business park	*#14-Construction of other buildings*	8.41	0.94	0.44
Commercial facilities	*#14-Construction of other buildings*	8.41	0.94	0.44
Tenant improvements	*#14-Construction of other buildings*	8.41	0.94	0.44
Infrastructure	*#15-Heavy & civil engineering construction*	11.61	0.94	0.86
Other costs	*#42-Real estate, #44-Legal services, #40-Other finance and insurance*	8.55	0.85	0.52

DIRECT-EFFECT INDUSTRY MULTIPLIERS[5]	DBEDT industrial categories applied	Indirect & induced multiplier per direct: FTE job	$ Earnings[4]
Professional services	*Same as above*	1.03	0.63
Construction:			
Residential units	*Same as above*	1.52	1.22
Business park	*Same as above*	1.42	1.05
Commercial facilities	*Same as above*	1.42	1.05
Tenant improvements	*Same as above*	1.42	1.05
Infrastructure	*Same as above*	1.40	0.67
Other	*Same as above*	0.97	1.17

1 For direct impacts of development expenditures. Type I total jobs and earnings direct impact coefficients, from Hawaii State Department of Business, Economic Development & Tourism, "The 2002 State Input-Output Study for Hawaii," June 2006 (revised from May 2006), Detailed Tables. Jobs coefficients are for 2012; earnings coefficients not provided for future years.

2 Input-Output Study estimates total wage, salaried and proprietary jobs, both full- and part-time (not full-time equivalent).

3 Adjustment factor applied in addition to the jobs coefficient to estimate full-time equivalent jobs at 40 hours per week. Factor derived from the 37.5 average weekly hours reported worked in the natural resources, mining and construction industries and 34.0 in financial activities industries for Honolulu MSA for 2006, as reported by Hawaii Department of Labor and Industrial Relations, at www.hawaii.gov/labor/rs, "Average Hourly Earnings," as accessed May 2007.

4 Earnings defined to include wage, salary and proprietary incomes, plus directors' fees and employer contributions to health insurance, less employee contributions to social insurance.

5 For indirect and induced impacts of respective direct impacts. Indirect and induced factors derived from Type II Direct-Effect total job/total job and earnings/earnings multipliers as shown in DBEDT, ibid, "Job multipliers for 2012-2012" and "2002 Detailed Output, Earnings and Tax Multipliers for Hawaii."

Exhibit 3-3
Estimated Current Development Costs: Total for Each Period
2009 to 2030 (2007 and 2002 dollars, in millions unless stated)

	Basis/reference (not in mils unless stated)	2009 2015	2016 2030	Total
In 2007 dollars[1]:				
Professional services	*$34 mil. total, of which 39% assumed expended by 2015*	$13.1	$20.4	$33.5
Construction -	*Net of contingencies; vertical and infrastructure*			
Residential units	*Average cost/unit: $161,000*	$338.1	$1,553.7	$1,891.8
Business park	*800,000 sq. ft at psf cost: $150*	$18.0	$102.0	$120.0
Commercial facilities	*2,960,000 sq. ft at psf cost: $200*	$120.0	$472.0	$592.0
Tenant Improvements[2]	*$200 psf leased*	$144.0	$608.0	$752.0
Infrastructure[3]	*$1,072 mil. total, of which 37% assumed expended by 2015*	$396.6	$675.4	$1,072.0
Subtotal		$1,016.7	$3,411.0	$4,427.8
Other	*$147 mil., distributed pro rata by number of years in period*	$46.8	$100.2	$147.0
Total, rounded		$1,076.6	$3,531.7	$4,608.3
In 2002 dollars:	*0.73 of 2007 values*[4]			
Professional services		$9.5	$14.8	$24.3
Construction -				
Residential units		$245.7	$1,128.8	$1,374.5
Business park		$13.1	$74.1	$87.2
Commercial facilities		$87.2	$342.9	$430.1
Tenant improvements		$104.6	$441.8	$546.4
Infrastructure		$288.2	$490.7	$778.9
Other		$34.0	$72.8	$106.8
Total, rounded		$782.2	$2,566.0	$3,348.2

Note. Figures exclude impacts of development of transit facilities.

1 Provided by DRH , May 2007.

2 Includes developer- and tenant-provided construction budgets. Recent Kapolei area examples for first generation buildouts include office space at $150-170 per square foot, retail at $150-$250 per square foot, industrial with 10% office $125, as provided by Colliers Monroe Friedlander, May 2007; high tech/laboratory spaces at $350-$1,000 per square foot; restaurants minimum $300 per square foot per SL Sofos & Co., Ltd.

3 Covers site preparation for residential and commercial pads, including sewer, water, electrical and drainage; also off-site utilities, roads, signalization, drainage; bicycle network; and preparation of school, public facility (fire/police stations) and parks site. Excludes vertical construction costs for schools, fire station and police station; park equipment to be donated; and contingencies representing 5-10% of each budget item.

4 First Hawaiian Bank, Research Department, records; Hawaii State Department of Business, Economic Development and Tourism (DBEDT), Research & Economic Analysis Division, Quarterly Statistical and Economic Reports, as reported by DBEDT for 2002 to 2006; UHERO, Honolulu construction cost index forecast for 2006 to 2007.

Exhibit 3-4
Estimated Current Development Costs: Average Annual
2009 to 2030 (2007 dollars, in millions)

	Basis/reference	2009 2015	2016 2030	Overall average
Costs by type:	*Exhibit 3-3, annualized*			
Professional services		$1.9	$1.4	$1.5
Construction -				
Residential units		$48.3	$103.6	$86.0
Business park		$2.6	$6.8	$5.5
Commercial facilities		$17.1	$31.5	$26.9
FF&E/Tenant Improvements[1]		$20.6	$40.5	$34.2
Infrastructure[2]		$56.7	$45.0	$48.7
Other		$6.7	$6.7	$6.7
Total, rounded		$153.8	$235.4	$209.5

Note: Figures exclude impacts of transit facilities.

1 Includes developer- and tenant-provided construction budgets.

2 Covers site preparation for residential and commercial pads, including sewer, water, electrical and drainage; also off-site utilities, roads, signalization, drainage; bicycle network; and preparation of school, public facility (fire/police stations) and parks site. Excludes vertical construction costs for schools, fire station and police station; park equipment to be donated; and contingencies representing 5-10% of each budget item.

Exhibit 3-5
Development Employment, FTE Jobs[1]
2009 to 2030 (Total in each period)

	Basis/reference	2009 2015	2016 2030	Total/ average
Total:				
Direct jobs -	*Exhibits 3-2 and 3-3*			
Professional services		83	130	213
Construction -				
Residential units		1,697	7,800	9,497
Business park		103	584	687
Commercial facilities		687	2,704	3,391
FF&E/Tenant improvements[2]		825	3,483	4,308
Infrastructure[3]		3,137	5,341	8,478
Other		247	529	776
Subtotal direct jobs (rounded)		6,800	20,600	27,400
Indirect and Induced jobs[4]	*Exhibit 3-2*	9,591	29,597	39,188
Subtotal jobs (rounded)		16,400	50,200	66,600
Average annual:				
Direct jobs -				
Professional services		12	9	10
Construction[2,3]		921	1,327	1,198
Other		35	35	35
Subtotal direct jobs (rounded)		970	1,370	1,240
Indirect and Induced jobs[4]		1,370	1,973	1,781
Subtotal jobs (rounded)		2,340	3,340	3,020

Note: Figures exclude impacts of transit facilities.

1 FTE = Full time equivalent, defined as 40 hours per week or 2,080 hours per year.

2 Includes employees supported by developer- and tenant-provided construction activities.

3 Covers site preparation for residential and commercial pads, including sewer, water, electrical and drainage; also off-site utilities, roads, signalization, drainage; bicycle network; and preparation of school, public facility (fire/police stations) and parks site. Excludes employment associated with vertical construction activities for schools, fire station and police station; park equipment; and contingencies.

4 Based on weighted average of Direct-Effect jobs multipliers for each job category, as shown on Exhibit 3-2.

Exhibit 3-6
Personal Earnings from Development - Total in Period
2009 to 2030 (2007 dollars, in millions)

	Basis/reference	2009 2015	2016 2030	Total
Direct earnings[1]:	*Exhibits 3-2 & 3-3*			
Professional services		$6.0	$9.4	$15.4
Construction -				
Residential units		$92.3	$424.2	$516.5
Business park		$6.4	$36.0	$42.4
Commercial facilities		$42.4	$166.8	$209.2
FF&E/Tenant improvements[2]		$50.9	$214.8	$265.7
Infrastructure[3]		$273.9	$466.4	$740.3
Other		$17.7	$37.9	$55.6
Subtotal, direct		$489.5	$1,355.4	$1,844.9
Indirect and Induced earnings[4]		$425.3	$1,318.8	$1,744.1
Total earnings		$914.8	$2,674.2	$3,589.1

Note: Earnings defined to include wage, salary and proprietary incomes, plus directors' fees and employer contributions to health insurance, less employee contributions to social insurance. Figures exclude impacts of transit facilities.

1 Based on industry coefficients and FTE factors as shown in Exhibit 3-2 and estimated construction costs in 2002 dollars, as shown in Exhibit 3-3. Figures inflated forward to estimated 2007 dollars based on Honolulu CPI-U index from 2002 (first half) to second half 2006 dollars, at: 17.58% based on U.S. Department of Labor, Bureau of Labor Statistics, May 2007, at http://data.bls.gov.

2 Includes earnings supported by developer- and tenant-provided construction activities.

3 Covers site preparation for residential and commercial pads, including sewer, water, electrical and drainage; also off-site utilities, roads, signalization, drainage; bicycle network; and preparation of school, public facility (fire/police stations) and parks site. Excludes vertical construction costs for schools, fire station and police station; park equipment to be donated; and contingencies representing 5-10% of each budget item.

4 Weighted average of estimated direct earnings by industry as shown above, and Direct-Effect industry multipliers shown in Exhibit 3-2.

Exhibit 3-7
Personal Earnings from Development - Average Annual
2009 to 2030 (2007 dollars, in millions except average earnings)

	Basis/reference	2009 2015	2016 2030	Average
Average annual in period:	*Exhibit 3-6, refers to all jobs*			
Direct earnings		$69.9	$90.4	$83.9
Indirect & induced earnings		$60.8	$87.9	$79.3
Total earnings		$130.7	$178.3	$163.1
Average per new FTE job:	*Exhibits 3-5 and 3-6, rounded*			
Direct jobs		$72,000	$68,000	$67,000
Indirect and induced jobs		$44,000	$45,000	$45,000
Average per job		$56,000	$53,000	$54,000
Estimated average family income[1]:	*1.8 times average wage*			
For direct job-holders		$130,000	$119,000	$121,000
For indirect and induced job-holders		$79,000	$81,000	$81,000
All Ho`opili-related job-holders		$101,000	$95,000	$97,000
Percent of median income[2]:	*$73,500 median family income, 2007*			
For direct job-holders		177%	162%	165%
For indirect and induced job-holders		107%	110%	110%
All Ho`opili-related job-holders		137%	129%	132%

Note: Earnings defined to include wage, salary and proprietary incomes, plus directors' fees and employer contributions to health insurance, less employee contributions to social insurance. Figures exclude impacts of transit facilities.

1 Ratio estimated from 2005 average annual wage in Honolulu County ($37,656), as provided by State of Hawaii, Department of Labor & Industrial Relations, and FY 2005 median family income in Honolulu MSA ($67,750), as provided by U.S. Department of Housing & Urban Development, HUD USER. Reflects multiple job-holders within each family as well as multiple job-holding by individuals.

2 U.S. Department of Housing & Urban Development, HUD USER, July 2007.

Exhibit 3-8
Direct Operational Employment Generated by the Project
FTE Jobs
2015 and 2030

	Basis/reference	2015	2030
On-site:			
Residential units -			
Second home properties	*7% of sold market units see Exhibit 2-2*	126	578
Supported jobs	*5 jobs per 100*	6	29
Commercial facilities -			
Business park	*550 square feet RBA per FTE job*	218	1,236
Commercial retail/office	*425 square feet GLA per FTE job*	1,412	5,553
Subtotal, on-site jobs, rounded		1,640	6,820
Other associated jobs:			
Residential and commercial brokerage	See Exhibit 3-9	196	223
Subtotal, other jobs, rounded		196	223
Total direct jobs associated with Project		1,836	7,043

Note: Figures exclude impacts of transit facilities. FTE = Full time equivalent, defined as 40 hours per week or 2,080 hours per year.

Exhibit 3-9
Net Additional Operational Employment, FTE Jobs[1]
2015 and 2030 (2007 dollars, in millions)

	Basis/reference	2015	2030
Bases for projection:			
Av. annual spending by PT residents -	*Direct, indirect & induced, in state: Exhibit 3-1*	*$4.1*	*$19.0*
Av. annual residential selling costs -	*See Exhibit 3-1*		
Sell-out of developer inventory	*4.5% of gross sales, preceding years*	*$10.0*	*$12.3*
Resales after 2015	*2.3% Turnover per year[2]* *6.0% of gross sales, same av. price*	*$0.0*	*$0.5*
Av. annual commercial & industrial leasing expenses -			
Initial lease-up	*$25.9 mil total, listing & outside agents*	*$1.2*	*$1.4*
Releasing after 2015	*5.0% Turnover per year*	*$0.0*	*$0.1*
Av. annual commercial & industrial selling costs -	*3.5% of gross sales, preceding years*		
Sell-out of developer inventory	*9% Cap, sales of stabilized centers*	*$2.7*	*$1.4*
Resales after 2015	*10% Resold between 2016 and 2030*	*$0.0*	*$0.3*
Projected net additional jobs:			
Direct -			
Attributable to part-time residents[3]	*23.0 FTE/$mil, net margin: 35%*	33	152
Real estate leasing & sales	*14.0 FTE/$mil selling costs, new and resales*	196	223
Business park	*25% assumed new jobs to island; Exhibit 3-8*	55	309
Subtotal, direct jobs, rounded		280	680
Indirect and induced -	*Multiplier and industry category applied[4]:*		
Attributable to part-time residents	*1.07 Average of select industries*	36	163
Real estate leasing & sales	*1.91 Real estate & rentals industries*	374	426
Business park	*0.91 Average of select industries*	50	282
Subtotal, indirect & induced jobs, rounded		460	870
Total net additional jobs		740	1,550

Note: Figures exclude impacts of transit facilities.

1 FTE = Full time equivalent, defined as 40 hours per week or 2,080 hours per year.

2 From 2016 on, resales activity assumed at 2.3% of completed and sold residential inventory shown in Exhibit 2-1. Resales factor based on 2004 Oahu sales activity of approximately 7,000 units per year vs. estimated 300,000 housing units (2.3%) and 2006 ratio of 10,421 resales among approximately 340,000 total units (3.0%). : Honolulu Board of Realtors and American Community Survey. Commissions and other selling costs estimated at rate shown and average prices shown in Exhibit 2-1.

3 Category includes shopping center and office operational employment, since net additional employment is largely considered a function of induced new spending on-island, not leasable area to be developed at the Project. Also spending by existing island residents, such as at the commercial centers to be developed, is assumed to have occurred elsewhere on-island even if the Project were not developed.

Retail spending subject to reduction by 35% assumed retail trade margin prior to application of weighted average Type II jobs multiplier shown in Appendix 2. This results in conservative estimates since DBEDT multipliers for many applicable industry categories such as services, agriculture, food processing & etc. are calculated assuming they will be applied to total expenditures rather than trade margin expenditures.

4 Based on Type II Direct-Effect Multipliers (less 1.0 each) as shown by industry groups in Appendix 2. Part-time residents based on all industries shown; business park multiplier based on information, health services, professional services, and business services industries.

Exhibit 3-10
Personal Earnings from Net New Operational Activity - Total Annual
2015 and 2030 (2007 dollars, in millions except where noted)

	Basis/reference (not in millions)	2015	2030
Direct earnings -	*Estimated average FTE salary or other basis[1]:*		
Attributable to part-time residents	*$41,434 Average Honolulu wage*	$1.4	$6.3
Av. annual commercial leasing -	Residential, commercial and industrial properties, Exhibit 3-9		
Initial lease-up		$1.2	$1.4
Releasing after 2015		$0.0	$0.1
Real estate sales & marketing -	Residential, commercial and industrial properties, Exhibit 3-9		
Sell out of developed inventory		$12.7	$13.7
On-going resales		$0.0	$0.8
Business park	*$60,200 average of select industries*	$3.3	$18.6
Subtotal, direct earnings		$18.6	$40.9
Indirect and induced earnings -	*Multiplier and industry category[2]:*		
Attributable to part-time residents	*1.01 Average of select industries*	$1.4	$6.4
Real estate leasing and sales	*3.07 Real estate & rentals industries*	$42.9	$49.0
Business park	*0.70 Average of select industries*	$2.3	$13.0
Subtotal, indirect & induced		$46.6	$68.3
Total earnings		$65.2	$109.2

Note: Exhibit portrays on those earnings on positions that would be new to the community; not on all employment associated with Ho'opili. Figures exclude impacts of transit facilities.

1 Exclusive of tips, bonuses, etc. Average Honolulu salary based on $37,656 reported for 2005 by Department of Labor and Industrial Relations, "2005 Employment and Payrolls in Hawai'i," with inflation to 2007 dollars based on Honolulu CPI-U. Considered conservative because it incorporates no adjustment to FTE work. Business park typical wage estimated as average for the following industrial classifications: information, professional & technical services, management of companies & enterprises, health care & social assistance.

2 Based on Type II Direct-Effect Multipliers (less 1.0 each) as shown by industry groups in Appendix 2. Part-time residents based on all industries shown; business park multiplier based on information, health services, professional services, and business services industries.

Exhibit 3-11
Personal Earnings from Net New Operational Activity - Average Per Job and Family
2015 and 2030 (2007 dollars)

	Basis/reference (not in millions)	2015	2030
Average earnings per new FTE job:	*Not in millions*		
Direct jobs		$67,000	$60,000
Indirect and induced jobs		$101,000	$79,000
Average per job		$88,000	$70,000
Estimated average family income[1]**:**	1.8 *times average wage*		
For direct job-holders		$121,000	$108,000
For indirect and induced job-holders		$182,000	$142,000
All Ho`opili-related job-holders		$158,000	$126,000
Percent of median income[2]**:**	$73,500 *median family income, 2007*		
For direct job-holders		165%	147%
For indirect and induced job-holders		248%	193%
All Ho`opili-related job-holders		215%	171%

Note: Exhibit portrays on those earnings on positions that would be new to the community; not on all employment associated with Ho`opili. Figures exclude impacts of transit facilities. Earnings defined to include wage, salary and proprietary incomes, plus directors' fees and employer contributions to health insurance, less employee contributions to social

1 Ratio estimated from 2005 average annual wage in Honolulu County ($37,656), as provided by State of Hawaii, Department of Labor & Industrial Relations, and FY 2005 median family income in Honolulu MSA ($67,750), as provided by U.S. Department of Housing & Urban Development, HUD USER. Reflects multiple job-holders within each family as well as multiple job-holding by individuals.

2 U.S. Department of Housing & Urban Development, HUD USER.

Exhibit 4-1
Average Daily In-Migrant Population
2015 and 2030

	Basis/reference	2015	2030
Ho`opili part-time residents:			
Average FTE persons in residence	*At 2nd home/off-island buyer units: Exhibit 2-2*	145	664
In-migrants to State (rounded)	*65% of FTE persons in residence*	90	430
In-migrants to Co. (rounded)[1]	*100% of FTE persons in residence*	140	660
Employees:			
In-migrants to the State[1] - Development employees	*(Subset of in-migrants to County)* *3% of direct av. annual jobs (Ex. 3-5)*	0	29
Direct operational employees	*7% of jobs generated (Exhibit 3-8)*	129	493
Dependents[2]	*Ratio of in-migrant employees*	129	499
In-migrants to State (rounded)[3]		260	1,020
In-migrants to County[3] - Development employees	*(Includes in-migrants to State)* *5% of direct av. annual jobs (Ex. 3-5)*	0	49
Operational employees	*15% of jobs generated (Exhibit 3-8)*	275	1,056
Dependents[2]	*Ratio of in-migrant employees*	275	1,066
In-migrants to County (rounded)[3]		550	2,170

Note: Figures exclude impacts of transit facilities.

1 Subset of County in-migrants. See footnote 3, below.

2 In-migrant dependents estimated to average 0.2 per in-migrant development employee, and 1.0 per in-migrant operational employee.

3 In-migrants to the County include all those moving to the State plus any that may move between islands due to job opportunities at the Project.

Exhibit 5-1
Real Property Taxes Generated by Development
2015 and 2030 (2007 dollars, in millions except as noted)

	Basis/reference (not in millions)	2015	2030
Total assessed values[1]:			
Improved residential	*Based on number sold by average price (Ex. 2-1)*	$892.5	$4,993.8
Unimproved residential	*Estimated assessed value per acre: $135,000*	$102.6	$0.0
Business park - land	*50 acres, @ per acre: $165,000*	$8.3	$8.3
Business park - improvements	*Vert. cost (Ex. 3-3) + share of TI @ 50%*	$90.0	$406.0
Commercial - land	*145 acres, @ per acre: $630,000*	$91.4	$91.4
Commercial - improvements	*Vert. cost (Ex. 3-3) + share of TI @ 50%*	$192.0	$776.0
Park & open space land[2]	*210 acres, @ per acre: $50,000*	$10.5	$10.5
Total assessed values		$1,387.2	$6,285.9
Real property tax revenues:			
Potential new revenues -	*FY08 rates per $1,000 net taxable value*		
Improved residential	*$3.29 Improved Residential*	$2.9	$16.4
Unimproved residential	*$5.70 Unimproved Residential*	$0.6	$0.0
Business park - land	*$12.40 Industrial*	$0.1	$0.1
Business park - improvements	*$12.40 Industrial*	$1.1	$5.0
Commercial - land	*$12.40 Commercial*	$1.1	$1.1
Commercial - improvements	*$12.40 Commercial*	$2.4	$9.6
Parks & open spaces	*$5.70 Preservation*	$0.1	$0.1
Subtotal, potential tax revenues		$8.3	$32.4
Less deductions -			
RPT payments prior to Project	*FY07 real property taxes, per DRH*	$0.1	$0.1
Homeowners' exemption[4]	*$88,000 /unit, primary residences (Ex. 2-2)*	$0.6	$3.2
Subtotal deductions		$0.6	$3.3
Estimated net additional RPT		$7.7	$29.1

Note: Figures exclude impacts of transit facilities; public facility lands such as schools and roads presumed not taxed and dedicated.

1 Tax assessed values for unimproved lands based on other lands of same classification held by DRH at East Kapolei (other than Ho`opili), Mehana and Kahiwalo (Palehua). Undeveloped residential areas estimated pro rata based on number of units sold and total of: 925.0 acres, for a total land value of: $124.88 million. These lands include 390 acres that would be designated mixed-use and could be taxed at higher rates.

2 Based on estimated raw land values only; excludes value of grading, irrigating & grassing these lands.

3 Assumes 20% of households at $120,000 exemption, and 80% at $80,000 exemption. Note methodology may overstate exemptions/understate tax revenues: Claritas projects that by 2011, approximately 11% of Ewa DPA households will be headed by persons 65 or older (Claritas, Inc., 2006.)

Exhibit 5-2
Total Annual Revenues to County Government Attributable to Development & In-Migrant Population
2015 and 2030 (2007 dollars, in millions, except as noted)

	Basis/reference	2015	2030
Bases for projection:			
FTE in-migrants to County -	*Exhibit 4-1*		
Ho`opili part-time residents		*140*	*660*
Employees and their dependents		*550*	*2,170*
GET County surcharges	*Spending as shown in Exhibit 5-3*		
Estimated tax and other revenues:			
Net new property tax revenues	*Exhibit 5-1*	$7.7	$29.1
Taxes and other revenue sources from in-migrant residents[1]	*Other than real property taxes* *$204 per person*	$0.1	$0.6
General excise taxes, on -	*County GET surcharges only*		
Development	*0.5% of professional service and construction costs*	$0.8	$1.2
Real estate sales and marketing	*0.5% of costs*	$0.1	$0.1
Spending by Project PT residents	*0.5% of spending*	$0.0	$0.1
Spending by in-migrants to State	*0.5% of employee & dependent spending*	$0.0	$0.1
Total new County revenues		$8.7	$31.1

Note: Does not consider impact and permit fees paid to County. These projected to amount to approximately $194 million over the life of the Project, in 2007 dollars, including sewer, water system, water meter and other fees and permits, as well as a share of transportation impact fees. Figures also exclude impacts of transit facilities.

1 Includes fuel and motor vehicle weight taxes, licenses and permits and charges for services. Excludes forfeitures, fines and penalties, public utility franchise tax, transient accommodation taxes, public service company tax, sewer charges, bus transportation revenues, solid waste & other revenues. As stated in City and County of Honolulu, "The Executive Program and Budget: Fiscal Year 2008 - Volume 1 - Operating Program and Budget," 2007 (summary of resources by source.)

Exhibit 5-3
Bases for Projecting State Government Revenues
2015 and 2030 (2007 dollars, in millions, except as noted)

	Basis/reference (in millions only where noted)		2015	2030
For GET calculations:				
Project development costs -	*Exhibit 3-4, average annual for preceding period*			
Professional services			$1.9	$1.4
Construction and other			$151.9	$234.1
Subtotal development cost			$153.8	$235.4
Real est. sales & marketing costs -	*Based on average activity in prior 5 years*			
Residential	*New and resold units, Exhibit 3-9*		$10.0	$12.8
Commercial & business park	*Leasing and selling costs, Exhibit 3-9*		$3.9	$3.2
Subtotal			$14.0	$15.9
Spending by part-time residents	*In-State spending: Exhibit 3-9*		$4.1	$19.0
In-migrant employees & dependents to State -				
Number persons	*Exhibit 4-1*		260	1,020
Estimated number households	*2.5 persons per household*		104	408
In-State spending[1]	*58% of hhd income, av. $79,000*		$4.8	$18.7
For individual income taxes:				
Net new personal income earned -	*Average annual in preceding period*			
Development employment	*Exhibit 3-7 (total personal earnings)*		$130.7	$178.3
Operational employment	*Exhibit 3-10 (total personal earnings)*		$65.2	$109.2
Av. personal earnings/FTE job -				
Development employment	*Exhibit 3-7 (total personal earnings)*	*Not in millions >>*	$56,000	$53,000
Operational employment	*Exhibit 3-10 (total personal earnings)*	*Not in millions >>*	$88,000	$70,000
For conveyance taxes[2]:				
On residential sales	*$480,000 av price (Ex. 2-1)*	*App. unit sales (Ex. 2-2)>>*	126	578
On commercial & industrial sales	*$1,315 mil total sales*	*% transacted (Ex. 2-1)>>*	19%	81%
For other State taxes:				
FTE in-migrants to State	*FTE part-time residents & primary residents: Exhibit 4-1*		350	1,450

Note: Does not consider impact fees paid to State. These projected to amount to approximately $25 million over the life of the Project, in 2007 dollars, including school fees and a share of transportation fees. Figures also exclude impacts of transit facilities.

1 U.S. Department of labor, Bureau of Labor Statistics, "Consumer Spending Patterns in Honolulu: 2001-02", released April 30, 2004 at www.bls.gov/ro9/cexhono.htm. Estimate uses study findings showing 77.6% of pre-tax income of household units was spent, of which 75.1% were on items likely subject to Hawaii Gross Excise Tax. Excludes spending on shelter (owned dwellings), cash contributions, personal insurance and pensions. Applied to estimated in-migrant households and average of personal earnings for 2015 and 2030 for operational employees, as shown. Excludes potential household income from other household members.

2 Conservative estimate in that conveyance taxes on commercial leasing are not considered nor conveyance taxes on resales. Conveyance taxes on residential sales applicable only to those that will not claim a homeowner's exemption.

Exhibit 5-4
Projected State Government Revenues
2015 and 2030 (2007 dollars, in millions, except as noted)

	Basis/reference (not in millions)	2015	2030
General excise taxes, on:	*County GET surcharges accounted for on prior exhibit*		
Development[1]		$4.0	$6.1
Real estate sales and marketing	*4.0% of costs*	$0.6	$0.6
Spending by Project PT residents	*4.0% of spending*	$0.2	$0.8
Spending by in-migrants to State	*4.0% of employee & dependent spending*	$0.2	$0.7
Individual income taxes[2]:			
Development employees	*5.01% effective tax rate on est. av. $53-$56K income*	$6.5	$8.9
Operational employees	*5.63% effective tax rate on est. av. $89K income (2015)* *5.34% effective tax rate on est. av. $70K income (2030)*	$3.7	$5.8
Conveyance taxes[3]:			
On residential sales	*0.15% of full consideration paid*	$0.1	$0.4
On commercial & industrial sales	*0.30% of full consideration paid*	$0.6	$3.2
Other taxes and revenues from in-migrants[4]	*$224 per person*	$0.1	$0.3
Total, additional revenues		$16.1	$27.0

Note: Does not consider impact fees paid to State. These projected to amount to approximately $25 million over the life of the Project, in 2007 dollars, including school fees, and a share of transportation fees. Figures also exclude impacts of transit facilities.

1 Based on 4% on 100% of professional services and 60% of construction costs, plus a wholesale construction materials tax of 0.5% against 40% of construction costs.

2 Based on 2006 Tax Table, Schedule II for married taxpayers filing joint returns and range of average personal earnings per job shown above. Adjusted Gross Incomes (AGI) assumed to be 15% less than total average earnings shown. Estimated tax impact likely to be conservative due to frequency of dual incomes and multiple job-holding among Hawaii households, which could push household incomes to higher tax brackets.

3 Conservative estimate in that conveyance taxes on commercial leasing are not considered nor conveyance taxes on resales. Conveyance taxes on residential sales applicable only to those that will not claim a homeowner's exemption.

4 Based on total FY 2006 State tax revenue receipts as reported by State of Hawaii, "Comprehensive Annual Financial Report for the Fiscal Year Ended June 30, 2006," statement of activities-general revenue taxes. Includes tobacco and liquor taxes, liquid fuel tax, and motor vehicle weight & registration tax. Excludes fines & forfeitures, licenses and other fees.

Exhibit 5-5
City and County of Honolulu Operating Expenditures by Function, Net of Federal and State Sources
Per Capita in Fiscal Year July 1, 2005 to June 30, 2006

	Expenditures ($thousands)	Service population[1]	Expenditures (not in thousands) per: Resident	Visitor
Executive:				
General Government	$137,333	992,800	$138	$138
Public Safety	$288,511	992,800	$291	$291
Highways and Streets	$21,838	992,800	$22	$22
Sanitation[2]	$176,175	992,800	$177	$177
Human Services	$59,348	907,100	$65	
Culture-Recreation	$67,949	992,800	$68	$68
Utilities or Other Enterprises (Mass Transit)	$158,525	992,800	$160	$160
Debt Service	$202,336	992,800	$204	$204
Retirement System Contributions	$61,268	907,100	$68	$0
FICA and Pension Costs	$19,538	907,100	$22	$0
Health Benefits Contributions	$71,201	907,100	$78	$0
Miscellaneous	$19,225	992,800	$19	$19
Subtotal	$1,283,247		$1,313	$1,080
Legislative (Council operations)	$10,920	907,100	$12	$0
Less non-County operating resources:				
Federal Grants	-$75,094	992,800	-$76	-$76
State Grants	-$7,294	992,800	-$7	-$7
Subtotal, other sources	-$82,388		-$83	-$83
Total, in 2006 dollars	$1,211,779		$1,242	$997
Total, in 2007 dollars, based on increase of[3] 4.0%			$1,291	$1,037

1 Resident population of 907,100 as estimated by the U.S. Census Bureau, Population Division, March 20, 2007 (January 1 population estimated based on compound rate of growth between July 1, 2005 to July 1, 2006 estimates); plus average daily visitor population of 85,700 as published by Hawaii State Department of Business, Economic Development and Tourism, Research & Economic Analysis Division, for 2006.

2 Debt service on bonds for new sewer facilities included in Sanitation line item. Other City interest payments accounted for on the Debt Service line.

3 Based on 2007 vs. 2006 Honolulu CPI-U, 2007 as forecast by Hawaii State Department of Business, Economic Development and Tourism, February 21, 2007.

Source: City and County of Honolulu, "The Executive Program and Budget: Fiscal Year 2008, Volume 1 - Operating Program and Budget", 2007, pages A-5 and A-6.

Exhibit 5-6
State of Hawaii Primary Government Activity Expenses
Per Capita in Fiscal Year July 1, 2005 to June 30, 2006

	Operating expenditures ($thousands)	Service population[1]	Expenditures (not in thousands) per: Resident	Visitor
Governmental activities:				
General government	$455,008	1,464,300	$311	$311
Public safety	$336,362	1,464,300	$230	$230
Highways	$646,336	1,464,300	$441	$441
Conservation of natural resources	$76,490	1,464,300	$52	$52
Health	$690,265	1,464,300	$471	$471
Welfare	$1,709,526	1,279,400	$1,336	$0
Lower education	$2,151,891	1,279,400	$1,682	$0
Higher education	$678,338	1,279,400	$530	$0
Other education	$19,183	1,279,400	$15	$0
Culture and recreation	$98,121	1,464,300	$67	$67
Urban redevelopment and housing	$87,789	1,279,400	$69	$0
Economic development and assistance	$215,578	1,279,400	$168	$0
Interest expense	$172,673	1,464,300	$118	$118
Business-type activities:				
Airports	$292,086	1,464,300	$199	$199
Harbors	$61,408	1,464,300	$42	$42
Unemployment compensation	$105,786	1,279,400	$83	$0
Nonmajor proprietary fund	$2,587	1,464,300	$2	$2
Subtotal	$7,799,427		$5,817	$1,934
Less: Intergovernmental revenues	($1,601,005)	1,464,300	($1,093)	($1,093)
Total, in 2006 dollars	$6,198,422		$4,723	$840
Total, in 2007 dollars, based on increase of[2]		4.0%	$4,912	$874

Note: General government includes legislative expenses; line items may also have debt service and employee benefit expenses within each. Excludes expenses of "Component Units" including the University of Hawaii, Housing and Community Development Corporation of Hawaii, Hawaii Health Systems Corporation and Hawaii Hurricane Relief Fund. The first three charge for services, and receive capital and operating grants and contributions.

1 Resident population of 1,279,400 as estimated by the U.S. Census Bureau, Population Division, March 20, 2007 (January 1 population estimated based on compound rate of growth between July 1, 2005 to July 1, 2006 estimates); plus average daily visitor population of 184,900 as published by Hawaii State Department of Business, Economic Development and Tourism, Research & Economic Analysis Division, for 2006.

2 Based on 2007 vs. 2006 Honolulu CPI-U, 2007 as forecast by Hawaii State Department of Business, Economic Development and Tourism, February 21, 2007.

Source: State of Hawaii, Department of Accounting and General Services, "State of Hawaii: Comprehensive Annual Financial Report For the Fiscal Year Ended June 30, 2006," 2007.

Exhibit 5-7
Annual County Government Expenditures
Attributable to Population In-Migrating
2015 and 2030 (2007 dollars, in millions, except where noted)

	Basis/reference (not in millions)	2015	2030
Bases for County projection -			
FTE in-migrants to County	*Part-time residents, employees and dependents (Ex. 4-1)*	*690*	*2,830*
Annual expenditures -			
FTE in-migrants to County	*$1,291 per person, ref: Exhibit 5-5*	$0.9	$3.7
Subtotal new County expenditures		$0.9	$3.7

Note: Does not consider impact and permit fees paid to County. These projected to amount to approximately $194 million over the life of the Project, in 2007 dollars, including sewer, water system, water meter and other fees and permits, as well as a share of transportation impact fees. Figures also exclude impacts of transit facilities.

Exhibit 5-8
Annual State Government Expenditures
Attributable to Population In-migrating
2015 and 2030 (2007 dollars, in millions, except where noted)

	Basis/reference	2015	2030
Bases for State projection -			
FTE in-migrants to State	*Part-time residents, employees and dependents (Ex. 4-1)*	*350*	*1,450*
Annual expenditures -			
FTE in-migrants to State	*$4,912 per FTE person, ref. Exhibit 5-6*	$1.7	$7.1
Subtotal new State expenditures		$1.7	$7.1

Note: Does not consider impact fees paid to State. These projected to amount to approximately $25 million over the life of the Project, in 2007 dollars, including school fees and a share of transportation fees. Figures also exclude impacts of transit facilities.

Exhibit 5-9
County & State Government Revenue and Expenditure Comparison
2015 and 2030 (2007 dollars, in millions, except where noted)

	Basis/reference	2015	2030
City and County of Honolulu:			
New revenues	*Exhibit 5-2*	$8.7	$31.1
New expenditures	*Exhibit 5-7*	$0.9	$3.7
Net additional revenues		$7.8	$27.5
Revenue ÷ expenditure ratio[1]		9.8	8.5
State of Hawaii:			
New revenues[2]	*Exhibit 5-4*	$16.1	$27.0
New expenditures	*Exhibit 5-8*	$1.7	$7.1
Net additional revenues		$14.4	$19.9
Revenue ÷ expenditure ratio[1]		9.4	3.8

Note: Does not consider impact and permit fees paid to County and State governments. These are projected to amount to approximately $194 million and $25 million, respectively, over the life of the Project, in 2007 dollars. They include sewer, water, transportation and other fees and permits. Figures also exclude impacts of transit facilities.

1 New revenues divided by new expenditures. Calculated where denominator (additional expenses) exceeds zero.

2 Excludes potential income taxes from any operating entities and GET on ground lease rents.

ECONOMIC AND FISCAL IMPACT ASSESSMENT FOR HO'OPILI

Appendices

Appendix 1: Report Conditions

This assessment incorporates information provided by government agencies, developers, brokers, landowners, DRH, PBR Hawaii, and other sources as cited in the exhibits. While attempts have been made to verify information via multiple sources, it is not always possible to do so. MC cannot guarantee the accuracy of all information upon which its assessments may be based.

MC has no responsibility to update this report or any of the underlying data for events and circumstances occurring after May 15, 2007, the date of substantial completion of primary data collection.

This report is for the planning purposes of DRH, PBR Hawaii and their consultants, as well as for public disclosure of the nature of the Project pursuant to seeking State and County land entitlements. It is not intended to be used for solicitation of investment.

This report does not offer an appraisal of the Subject, nor should it be construed as an opinion of value for the Project.

Appendix 2: Derivation of Multipliers for Part-Time Resident Spending

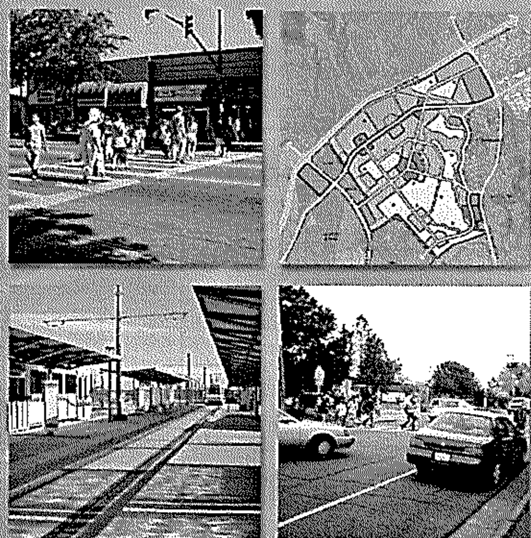
	Type II final demand multipliers		Type II direct effect multipliers (for Indirect & Induced Impacts)	
	Earnings	Job	Earnings	Job
Agriculture	0.66	36.6	1.77	1.44
Food processing	0.51	21.6	3.05	3.05
Other manufacturing	0.34	10.2	1.97	2.36
Transportation	0.57	17.7	2.26	2.55
Information	0.52	13.6	1.71	2.15
Utilities	0.33	8.2	2.38	4.17
Wholesale trade	0.55	17.1	1.76	1.96
Retail trade	0.57	24.4	1.69	1.51
Real estate & rentals	0.22	9.1	4.07	2.91
Professional services	0.81	23.3	1.69	1.97
Business services	0.83	30.9	1.69	1.62
Educational services	0.83	33.2	1.70	1.57
Health services	0.77	24.1	1.71	1.91
Arts & entertainment	0.77	37.4	1.59	1.38
Accommodations	0.63	20.0	1.90	2.06
Eating & drinking	0.60	30.5	1.99	1.54
Other services	0.69	30.7	1.80	1.54
Government	0.85	24.7	1.40	1.54
Average	0.61	23.0	2.01	2.07

Source: State of Hawaii, Department of Business, Economic Development and Tourism, "The 2002 State Input-Output Study for Hawaii," June 2006 (as revised from May 2006), Table 2.4.

Appendix L

Traffic Impact Analysis Report

Traffic Impact Analysis Report (TIAR)
Ho'opili
Oahu, Hawaii



prepared for
D.R. Horton Inc.
by **Wilbur Smith Associates**
February 2008

WilburSmith ASSOCIATES

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APPENDIX

EXECUTIVE SUMMARY

This document presents the results of the transportation impact analysis report (TIAR) prepared for the proposed Ho'opili Development (herein referred to as the "proposed Project"), a transit-oriented development in the 'Ewa District on the island of O'ahu, Hawaii. The purpose of this analysis is to identify the likely transportation impacts associated with the proposed development on the surrounding transportation system and to identify improvements to mitigate significant impacts. This TIAR solely reports on the impacts to intersections indentified herein, notably only those encompassed internally by the proposed project. As such, impacts found at intersections external to the project fall outside of the proposed project's jurisdiction and are not the responsibility of the project sponsor.

E.1 PROJECT DESCRIPTION

The proposed project involves development of a mixed-use community on approximately 1,555 acres in East Kapolei. The proposed plan for Ho'opili – which means "coming together" in Hawaiian – reflects the ideas, hopes and dreams of what the community wanted to see in this new development. The plan reflects the community's desire for vibrant and safe neighborhoods where people feel a sense of connection with one another, and with the rest of O'ahu.

The Conceptual Land Use Plan reflects the desire for a community that is "complete" with: affordable living options; employment centers; quality schools; shopping, gathering and recreational places; and parks and open space for residents. Implementation of the Plan will allow residents the ability to live, work, learn, play, and shop within Ho'opili without needing to use personal motor vehicles on regional roadways.

Ho'opili will be connected to the surrounding 'Ewa District (and neighboring Department of Hawaiian Home Lands (DHHL), the University of Hawaii at West Oahu (UHWO) and the Hawaii Community Development Authority (HCDA)) properties by a network of closely-spaced gridded streets and bicycle paths which allow a variety of circulation options for residents and visitors. Wider tree-lined boulevards will create a distinct axis running north-south and diagonally east-west across the site, but unlike a conventional subdivision of cul-de-sacs, there will many more streets, sized at a walking scale. Ho'opili is being designed to be transit-ready, and the land use plan, while subject to change, has been designed to accommodate a high-capacity transit corridor either along Farrington Highway or diagonally through the project site, with either one or two transit station locations. While the proposed residential unit count will not change, the land use plan will need to be adjusted depending on the final alignment of the high-capacity transit corridor, as the potential for noise impact from an elevated high-capacity transit alignment would likely require taller, higher density residential or industrial uses along the alignment. The final setting of the transit station location(s) will also provide transit-oriented development potentials, which will also cause the plan to be refined, as higher intensity development (and density) will be concentrated around the transit station(s).

EXECUTIVE SUMMARY

The general land use allocation is described below:

Low-Medium Density Residential/Live-Work
Ranging from traditional single family detached homes on varying lot sizes to multifamily dwellings with a variety of live-work opportunities, there are approximately 535 gross acres (which includes secondary roads and mini-"neighborhood" parks) planned to accommodate approximately 5,100 residential units at densities of 5 to 14 units per acre. These areas would include mini-parks located as focal points and activity centers of the community.

Mixed-Use/Medium Density Residential
Planned to be oriented along future high-capacity transit and major roadway alignments, these medium density mixed use districts would include live-work residential units or residential uses over ground floor commercial and office uses. Within these districts that comprise approximately 340 acres (all of which will not be developed for housing because the acreage includes secondary roads, off-street parking and mini-"neighborhood" parks), there are approximately 5,200 dwelling units planned at densities of 15 to 29 units per acre along with retail and office use.

Mixed-Use/High Density Residential
Planned to be located near major transportation junctions, these higher density mixed use districts would include commercial, office space, and higher density live-work residential units or residential uses above ground floor businesses. Within these districts that comprise approximately 50 gross acres (which includes secondary roads, off-street parking and mini-"neighborhood" parks) would be approximately 40 net developable acres that would accommodate approximately 1,450 dwelling units planned at densities of 30 to 50 units per acre along with retail and office use.

Business / Commercial
To serve the neighborhoods and surrounding communities and to provide a variety of employment opportunities within Ho'opili, the business/commercial uses are located to be conveniently accessed from the major transportation corridors of the region. The approximately 145 gross acres illustrated (which includes secondary roads and off-street parking) are estimated to yield a net development area of approximately 130 acres that are projected to accommodate retail and office use. These areas would be significant employment generators for Ho'opili and the region.

Light Industrial / Business Mixed-Use
To meet regional demands and to provide for an additional employment center for Ho'opili, approximately 50 gross acres (which includes secondary roads and off-street parking) are planned to provide an area for larger light industrial type users and businesses. It is estimated that there would be a net development area of approximately 40 acres industrial mixed-use.

Open Spaces / Buffers
Integral to the connectivity of Hoÿopili to the surrounding neighborhoods, a variety of open space buffers and drainage detention areas are planned. Some of the key open space buffers include along the H-1 Freeway, Honouliuli Gulch and along Old Fort Weaver Road.

Parks
Some of the key parks being planned include a district park along Fort Weaver Road and a "downtown" civic square to serve as the community gathering area.

Mini-Parks
Integral to the establishment and identity of neighborhoods, a variety of smaller parks of approximately one to two acres in size are planned. Properly planned and located, most residents will be within walking distance of one of these mini-parks.

Public Facilities
The proposed project could include as many as five or more public school sites. The Conceptual Land Use Plan shows the possible locations for five State Department of Education (DOE) school sites planned to be as accessible to the neighborhoods of Ho'opili as the community is developed; one high school, one middle school and three elementary schools. The plan can also accommodate a private school(s) as the need is determined. In addition, area is set aside along the western end of Farrington Highway fronting the Petition Area for either a fire station or a police substation. In total, approximately 100 acres are allocated to meet public facility needs.

There are several major transportation projects that have been long-planned for East Kapolei. The Ho'opili project has been planned assuming that the appropriate government agencies will secure the required rights-of-way from the landowner, these include the lands under: a portion of North-South Road between Farrington Highway and Kapolei Parkway; a portion of the North-South Road and a new H-1 Freeway interchange; a portion of the intersection of North-South Road and Farrington Highway; the long-planned widening of Farrington Highway fronting Ho'opili; the proposed East-West Connector Road through the Petition Area; and the segment of the proposed Honolulu High-Capacity Transit Corridor project through the Project Area.

The proposed project has been designed to reduce future residents' reliance on private motorized vehicles through the following measures:

- The project is the first new project designed to embrace high-capacity transit (elevated, fixed-guideway) corridor and station(s);
- The project is large enough to be designed and offer a full range of mixed land uses, including a wide range of places of live, work, shop, recreate and learn and will aspire to achieve a job-housing balance;
- The project is designed to maximize connectivity (transit, pedestrian, bicycle and vehicular) with surrounding streets and communities (including DHHL and UHWO),while minimizing cul-de-sacs and dead-end streets;
- The project will be designed to take advantage of the relatively flatness of the site and proximity to UHWO by designing streets and grade-separated multi-modal pathways for walking and bicycling; and
- The project will seek to implement other transportation management and transportation demand management strategies.

E.2 SCOPE OF ANALYSIS

The analysis for the Proposed Ho'opili Project focused on conditions with the City's proposed transit corridor project. However, an in depth analysis of conditions without the transit corridor was also conducted to identify additional traffic impact and improvement actions in the event that the proposed transit corridor does not extend to Ho'opili in 2030.

E.2.1 YEARS AND SCENARIOS

The transportation analysis was prepared according to the scope of work approved by the City and County of Honolulu, and the Hawaii Department of Transportation. For the analysis of the proposed Project, the following transportation scenarios were examined:

- Existing Conditions (2006)
- 2030 Baseline Conditions
- 2030 Baseline plus Project Conditions "With Transit Corridor"
- 2030 Baseline plus Project Conditions "Without Transit Corridor"

E.2.2 ANALYSIS LOCATIONS

The following intersections in the vicinity of the Proposed Project were analyzed for intersection Level of Service (LOS) during morning peak hour (one hour between 6:00 AM and 8:00 PM) and the evening peak hour (one hour between 3:00 PM and 5:00 PM):

- Kunia Rd / Kunia Loop
- Kunia Rd / H-1 WB On-Ramp
- Kunia Rd / H-I EB Ramps
- Farrington Hwy / Fort Weaver Rd. SB Ramps
- Farrington Hwy/ Fort Weaver Rd. NB Ramps
- Farrington Hwy / Leokū St
- Fort Weaver Rd / Laulauni St
- Fort Weaver Rd / Old Fort Weaver Rd
- Fort Weaver Rd / Renton Rd
- Farrington Hwy / East Old Fort Weaver Rd
- Farrington Hwy / West Old Fort Weaver Rd
- Farrington Hwy / Fort Barrette Rd

As part of the future network, the following key intersections were also analyzed for this project:

- North South Road/ H-1 Westbound Ramps
- North South Road/ H-1 Eastbound Ramps
- North South Road/ Farrington Highway
- North South Road/ North University of Hawai'i Connector
- North South Road/ South University of Hawai'i Connector
- North South Road/ Kapolei Parkway

- East-West Road/ Old Fort Weaver Road
- B Street/ 1st Avenue
- Farrington Highway/ B Street
- B Street/ 4th Avenue
- Parkway/ B Street
- B Street/5th Avenue
- East-West Road/ A Street
- 1st Avenue/ 2nd Avenue
- Farrington Highway/ Parkway/ 2nd Avenue
- Parkway/ 4th Avenue
- Parkway/ C Street
- C Street/ 5th Avenue
- 2nd Street/ D Street
- Kunia Road/ 2nd Avenue
- Kunia Road/ 3rd Avenue
- East-West Road/ B Street

Additionally, traffic impacts on freeways serving the vicinity of the development were also analyzed, these included:

- H-1 EB South of Makakilo Dr.
- H-1 EB West of Kunia Rd
- H-1 EB West of Paiwa St
- H-1 EB East of Kamehameha Hwy
- H-2 NB At Ka Uka Blvd.
- H-1 WB South of Makakilo Dr.
- H-1 WB West of Kunia Rd
- H-1 WB West of Paiwa St
- H-1 WB East of Kamehameha Hwy.
- H-2 SB At Ka Uka Blvd.

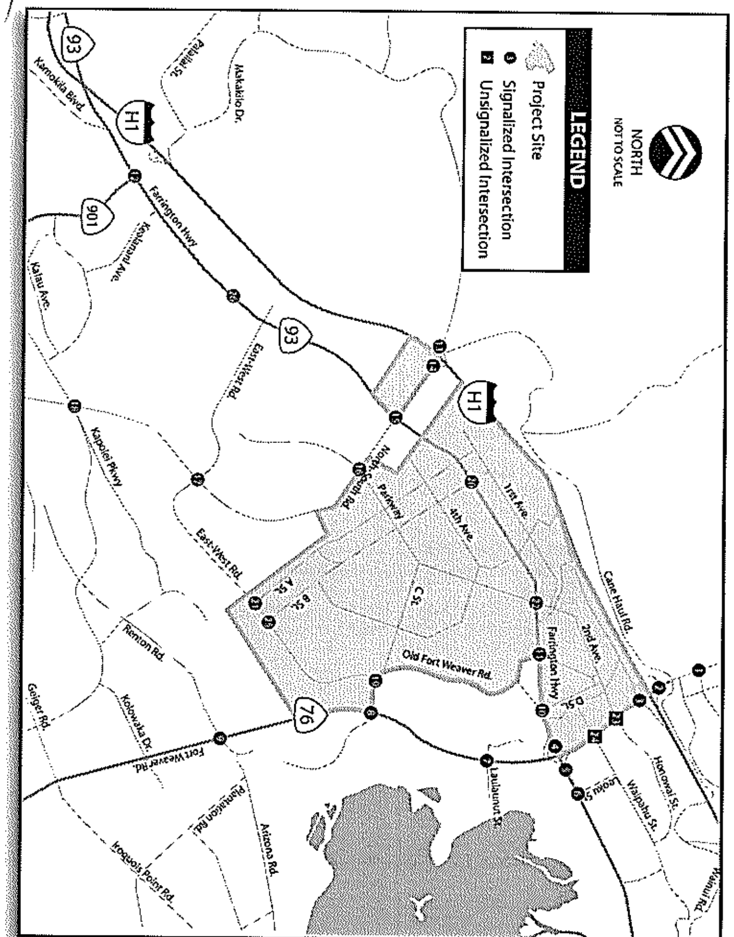


Figure E.2
STUDY INTERSECTIONS
100061/Draft October - 10/17/07

E.2.3 THRESHOLDS OF SIGNIFICANCE

Neither the City and County of Honolulu nor the State of Hawai'i have guidelines for identifying the transportation impacts caused by a project. As such, WSA followed the guidelines provided in *Sections 5.1.1, 5.1.2, and 5.1.3* to identify the transportation impacts at the intersections, freeway segments, and ramp-freeway junctions.

E.2.3.1 Intersections

The thresholds of significance for the study intersections are as follows:

1. A project would cause a transportation impact at an intersection if it degrades the LOS of the intersection to LOS E or worse.
2. A project would cause a transportation impact at an intersection operating at LOS E or F if it degrades the volume-to-capacity ratio of the intersection by more than 10 percent.

E.2.3.2 Freeway Segments

The thresholds of significance for the freeway segments are as follows:

1. A project would cause a transportation impact at a freeway segment if it degrades the LOS of the freeway segment to LOS E or worse.

E.2.2.3 Ramp-Freeway Junctions

The thresholds of significance for the ramp-freeway junctions are as follows:

1. A project would cause a transportation impact at a ramp-freeway junction if it degrades the LOS of the ramp-freeway to LOS E or worse.

E.3 TRAVEL DEMAND FORECASTS

The process used to identify the demand and forecast the total number of trips that would be generated by the proposed Project, included a three step process:

1. Trip generation
2. Trip distribution
3. Trip assignment

In the first step, the amount of traffic entering and exiting the Project land uses is estimated on a daily and peak hour basis. In the second step, the directions that vehicles use to approach and depart the project site are estimated. In the final step, the trips are assigned to specific street segments and intersection turning movements.

As mentioned above, the methodologies used in the estimation of the project traffic included a multiple step process involving the following:

4. Categorizing project land uses into appropriate Institute of Transportation Engineers (ITE) Trip Generation Categories
5. Identifying trip generation rates and/or trip generation equations
6. Applying trip generation reductions
7. Calculating the Final Trip Generation

Under "With Transit Corridor Conditions" the proposed Project is estimated to generate 140,920 daily trips of which 7,069 would be morning peak hour trips and 12,077 would be evening peak hour trips.

Under "Without Transit Corridor Conditions", the proposed Project is estimated to generate 158,669 daily trips of which 9,172 would be morning peak hour trips and 13,776 would be evening peak hour trips.

E.4 PROPOSED IMPACTS AND ACTIONS WITH TRANSIT CORRIDOR

In general, under "With Transit Corridor" conditions, impacts would occur on the following roadways: Farrington Highway, Fort Weaver, North-South Road, and East-West Road, as well as at the following external intersections:

- Farrington Highway/ Fort Weaver Rd. Northbound Ramps
- Farrington Highway /Leokū Street
- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ East-West Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/Fort Barrette Road
- North-South Road/ H-1 Eastbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ Kapolei Parkway

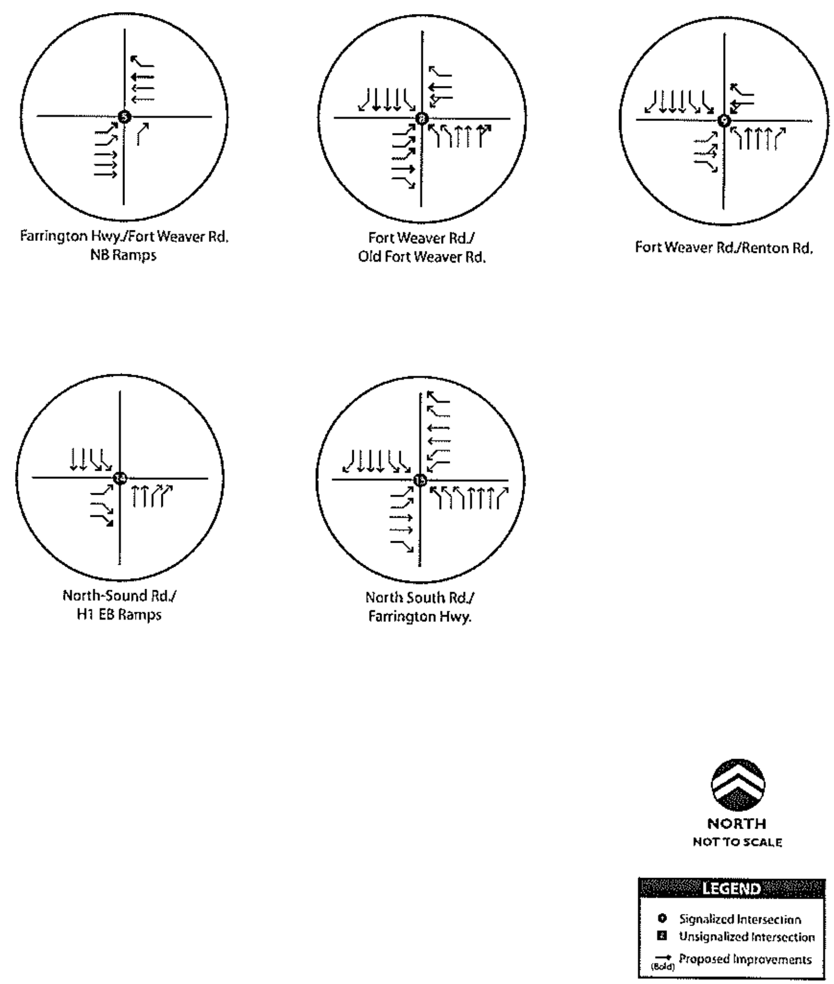
Note that impacts at these locations are identified under Year 2030 conditions, and represent increases in cumulative traffic within the entire study area. Therefore, the contribution of traffic from the proposed Project to cumulative traffic increases must be recognized, and the assignment of traffic impacts must be proportionally allocated. One such method would be the implementation of a recurrent monitoring program to periodically measure traffic at specific locations. This would include the measurement of traffic associated both with the proposed Project (e.g., at key project access points/driveways), as well as along key transportation facilities.

The following locations are proposed for improvement under Scenario A: With Transit Corridor Conditions:

- Farrington Highway/Fort Weaver Road Northbound Ramps

- Fort Weaver Road/Leokū Street
- Fort Weaver Road/Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/Fort Barrette Road
- North-South Road/H-1 Eastbound Ramps
- North-South Road/Farrington Highway
- North-South Road/Kapolei Parkway

Figure E.4 presents the proposed improvements at the above locations.



Wilbur Smith Associates

Figure E.4
PROPOSED MITIGATION MEASURES
SCENARIO A: WITH TRANSIT CORRIDOR SCENARIO
100061/DEC 2007-12/10/07

Proposed Intersection Improvements

Farrington Highway/Fort Weaver Road Northbound Ramps

1. Eastbound Approach: Construct one additional exclusive left-turn lane to provide dual left-turn lanes.
2. Westbound Approach: Convert existing shared through-right lane to through lane and construct a separate free right-turn lane.
3. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.

Fort Weaver Road/Leokū Street

The majority of the project-related traffic volumes would be added to the westbound through movements along Farrington Highway. Note that this section on Farrington Highway is planned to be widened to a six-lane roadway by Year 2030. To mitigate this impact, additional lanes would need to be constructed to accommodate through traffic, requiring acquisition of a new right-of-way. As such, it would not be feasible to add additional through lanes along Farrington Highway due to right-of-way constraints. However, implementation of the Transportation Demand Management (TDM) strategies discussed in *Section 6.3* could reduce the peak hour traffic volumes and Project impacts at this intersection.

Fort Weaver Road / Old Fort Weaver Road

1. Northbound Approach: Construct one additional exclusive left-turn lane to provide dual left turn lanes. Convert one of the existing through lanes to a shared through-right lane.
2. Eastbound Approach: Convert existing shared through-left turn lane to a through lane and construct 3 exclusive left turn lanes to allow a triple left-turn movement from Old Fort Weaver Road. Right-of-way acquisition may be required for the eastbound approach.
3. Signal Timing: For the eastbound and westbound directions, convert the signal timing from permitted to split phasing. In addition, provide free right-turns for eastbound and westbound movements.

Fort Weaver Road / Renton Road

1. Westbound Approach: Convert existing shared left-through-right lane to shared through-left lane and construct one exclusive right-turn lane.

Farrington Highway/Fort Barrette Road

1. Signal Timing: Change the cycle length from 210 seconds to 120 seconds. Also, convert the southeast and northwest right-turn phases from permitted to permitted plus overlap phases.
2. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.

North-South Road / H-1 Eastbound Ramps

1. Eastbound Approach: Construct one additional right-turn lane to provide dual right-turn lanes.

North-South Road / Farrington Highway

Two options were identified as part of the traffic analysis for this intersection. Option 1 is proposed as part of the Ho'opili TIAR while Option 2 is incorporated from the University of Hawai'i West O'ahu Traffic Study Report.

Option 1: Proposed as part of the Ho'opili TIAR

1. Southeast-bound Approach: Convert the shared through-right lane to an exclusive right-turn lane
2. Southwest-bound Approach: Construct one additional exclusive right-turn lane to provide dual right-turn lanes.
3. Northwest-bound Approach: Construct an additional left-turn lane to provide three exclusive left-turn lanes. This would also require widening Farrington Highway west of the intersection to provide three westbound departure lanes to receive the triple left-turn lane movement.

Option 2: Incorporated from the University of Hawai'i West O'ahu Traffic Study Report

As an alternative to the above mitigation measure, the mitigation measure proposed as part of the University of Hawai'i West O'ahu (UHWO) could also be implemented as a mitigation measure at this intersection. The UHWO Traffic Study Report suggests a potential configuration for grade separation to conduct the Farrington Highway through movement over the intersection. North-South Road would remain as an at-grade facility and all turning movements would occur at-grade at the intersection. By removing the Farrington Highway through movement from the intersection, more green time could be allocated to the other movements, to accommodate the projected traffic volumes.

North-South Road / Kapolei Parkway

1. Southbound Approach: Convert shared through-right lane to exclusive right-turn lane to provide three through lanes and one right-turn lane.
2. Northbound Approach: Convert shared through-right lane to exclusive right-turn lane to provide three through lanes and one right-turn lane.

The proposed improvements identified for the above intersections could be implemented in a number of ways, including 1) by programming an alternate signal timing plans that would be in operation during specified peak commute periods, or 2) restricting pedestrian crossings on one or more intersection approach in order to allow for unconstrained vehicle movement.

Transportation Demand Management

Transportation Demand Management (TDM) strategies address traffic congestion by reducing the amount of vehicle miles traveled, thereby reducing overall travel demand. The aim of these strategies is focused on promoting travel alternatives such as increased transit usage, walking, and bicycling to help achieve this goal. The Leeward Oahu Transportation Management Association (LOTMA) currently provides TDM services in the vicinity of the proposed Project. It is anticipated that the proposed Project will continue to support the existing programs and services in place. It should be noted however that based on the proposed Project's trip generation during the AM and PM peak hours, the Project Sponsor may want to consider additional TDM strategies as a means of managing and improving travel demand. The following strategies are suggested for consideration:

- **Carsharing** – Project Sponsors could make carsharing available for residents of the Proposed development. Carsharing would provide residents access to a car on an "as needed" basis without incurring the fixed costs associated with owning and operating a personal automobile.
- **Carpool/Vanpool** – Developers and employers could promote carpool or vanpool programs for commuters who either live or work in the proposed Project and share the same schedule, through subsidizing the cost of vehicles and fuel costs.
- **Preferential HOV Parking** – Developers or employers could provide incentives for use of alternative modes of travel to the single occupancy vehicle by reserving close-in, secure, covered, or otherwise preferable parking spaces for high-occupancy vehicles.
- **Rent subsidies** – Developers of residential developments could offer tenants rent subsidies (reductions in rent) for the amount of money they would typically pay for a parking space included in the price of their rent.
- **Transit Subsidies** – Developers and employers could encourage the use of transit by offering a discounted monthly pass to its residents and employees.
- **Bicycle Parking and Shower Facilities** – Both businesses and developers can provide bicycle parking, storage, and shower facilities to promote and encourage the use of bicycles for work and home trips.
- **Staggered Class Schedules** – The University of Hawai'i and Department of Education (DOE) schools should consider following an alternative class schedules where courses begin at 9:00 AM so as to avoid the peak commute period (6:00AM to 8:00 AM).

E.5 PROPOSED IMPACTS AND ACTIONS WITHOUT TRANSIT CORRIDOR

The following presents a summary of the proposed impacts and actions that would occur as a result of the proposed Project in the event the City's transit corridor was not in place by Year 2030.

Under Scenario B: Without Transit Corridor, the following intersections would be impacted:

- Farrington Highway/ Fort Weaver Road Northbound Ramps
- Farrington Highway / Leokū Street
- Fort Weaver Road/ Laulaunui Street
- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/Fort Barrette Road
- North-South Road/ H-1 Eastbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ Kapolei Parkway

Of the 9 intersections identified above, 5 are found to be impacted under Scenario A: With Transit Corridor. While those impacts are discussed in detail under section E.4, the following three intersections are identified as having additional impacts under Scenario B and their corresponding improvement actions are also discussed:

- Farrington Highway/ North-South Road
- Fort Weaver Road/Laulaunui Street
- Farrington Highway/Fort Barrette Road

Note that impacts at these locations are identified under Year 2030 conditions, and represent increases in cumulative traffic within the entire study area. Therefore, the contribution of traffic from the proposed Project to cumulative traffic increases must be recognized, and the assignment of traffic impacts must be proportionally allocated. One such method would be the implementation of a recurrent monitoring program to periodically measure traffic at specific locations. This would include the measurement of traffic associated both with the proposed Project (e.g., at key project access points/driveways), as well as along key transportation facilities.

North-South Road/ Farrington Highway

Two options were identified as part of the traffic analysis for this intersection. Option 1 is proposed as part of the Ho'opili TIAR while Option 2 is incorporated from the University of Hawai'I West O'ahu Traffic Study Report.

Option 1: Proposed as part of the Ho'opili TIAR

1. Southwest-bound Approach: Construct one additional exclusive right-turn lane to provide dual right-turn lanes.
2. Southeast-bound Approach: Convert the existing permissive right-turn to a free right-turn.
3. Northeast-bound Approach: Convert the existing permissive right-turn to a dual free right-turn. Construct an additional right-turn lane.
4. Northwest-bound Approach: Construct an additional left-turn lane to provide triple left-turn lanes.

5. Signal Timing: Change the cycle length from 150 seconds to 140 seconds.

Even with the proposed mitigations, the impact at this intersection is identified as significant but avoidable during the PM peak hour. As such, additional improvement actions may be required.

Option 2: Incorporated from the University of Hawai'i West O'ahu Traffic Study Report

As an alternative to the above mitigation measure, the mitigation measure proposed as part of the University of Hawai'i West O'ahu (UHWO) could also be implemented as a mitigation measure at this intersection. The UHWO Traffic Study Report suggests a potential configuration for grade separation to conduct the Farrington Highway through movement over the intersection. North-South Road would remain as an at-grade facility and all turning movements would occur at-grade at the intersection. By removing the Farrington Highway through movement from the intersection, more green time could be allocated to the other movements, to accommodate the projected traffic volumes.

Fort Weaver Road/Laulaunui Street

1. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.
2. Eastbound Approach: Construct an exclusive left-turn lane in addition to the shared through-left lane.

Farrington Highway/Fort Barrette Road

1. Signal Timing: Change the cycle length from 210 seconds to 120 seconds. Also, convert the southeast and northwest right-turn phases from permitted to permitted plus overlap phases.
2. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.

The proposed improvements identified for the above intersections could be implemented in a number of ways, including 1) by programming an alternate signal timing plans that would be in operation during specified peak commute periods, 2) restricting pedestrian crossings on one or more intersection approach in order to allow for unconstrained vehicle movement, or 3) by reducing travel lane widths to accommodate the recommended lane additions within existing (or future) intersection right-of-way.

Chapter 1
INTRODUCTION

The following document is a Transportation Impact Analysis Report (TIAR) which presents the existing transportation conditions and assesses the transportation impacts associated with the proposed Ho'opili Development Project (herein referred to as the "proposed Project") in the 'Ewa District on the Island of Oahu, Hawaii. The following transportation impacts were analyzed in the study:

- Traffic conditions
- Transit operations
- Parking conditions
- Pedestrian circulation
- Bicycle circulation

1.1 PROJECT DESCRIPTION

The proposed project involves development of a mixed-use community on approximately 1,555 acres in East Kapolei. The proposed plan for Ho'opili – which means "coming together" in Hawaiian – reflects the ideas, hopes and dreams of what the community wanted to see in this new community. The plan reflects the community's desire for vibrant and safe neighborhoods where people feel a sense of connection with one another, and with the rest of O'ahu.

The Conceptual Land Use Plan reflects the desire for a community that is "complete" with: affordable living options; employment centers; quality schools; shopping, gathering and recreational places; and parks and open space for residents. Implementation of the Plan will allow residents the ability to live, work, learn, play, and shop within Ho'opili without needing to use personal motor vehicles on regional roadways.

Ho'opili will be connected to the surrounding 'Ewa District (and neighboring Department of Hawaiian Home Lands (DHHL), the University of Hawaii at West Oahu (UHWO) and the Hawaii Community Development Authority (HCDA) properties by a network of closely-spaced gridded streets and bicycle paths which allow a variety of circulation options for residents and visitors. Wider tree-lined boulevards will create a distinct axis running north-south and diagonally east-west across the site, but unlike a conventional subdivision of cul-de-sacs, there will many more streets, sized at a walking scale. Ho'opili is being designed to be transit-ready, and the land use plan, while subject to change, has been designed to accommodate a high-capacity transit corridor either along Farrington Highway or diagonally through the project site, with either one or two transit station locations. While the proposed residential unit count will not change, the land use plan will need to be adjusted depending on the final alignment of the high-capacity transit corridor, as the potential for noise impact from an elevated high-capacity transit alignment would likely require taller, higher density residential or industrial uses along the alignment. The final siting of the transit station location(s) will also provide transit-oriented development potentials, which will also cause the plan to be refined, as higher intensity development (and density) will be concentrated around the transit station(s).

The general land use allocation is described below:

Low-Medium Density Residential/Live-Work
Ranging from traditional single family detached homes on varying lot sizes to multifamily dwellings with a variety of live-work opportunities, there are approximately 535 gross acres (which includes secondary roads and mini-"neighborhood" parks) planned to accommodate approximately 5,100 residential units at densities of 5 to 14 units per acre. These areas would include mini-parks located as focal points and activity centers of the community.

Mixed-Use/Medium Density Residential
Planned to be oriented along future high-capacity transit and major roadway alignments, these medium density mixed use districts would include live-work residential units or residential uses over ground floor commercial and office uses. Within these districts that comprise approximately 340 acres (all of which will not be developed for housing because the acreage includes secondary roads, off-street parking and mini-"neighborhood" parks), there are approximately 5,200 dwelling units planned at densities of 15 to 29 units per acre along with retail and office use.

Mixed-Use/High Density Residential
Planned to be located near major transportation junctions, these higher density mixed use districts would include commercial, office space, and higher density live-work residential units or residential uses above ground floor businesses. Within these districts that comprise approximately 50 gross acres (which includes secondary roads, off-street parking and mini-"neighborhood" parks) would be approximately 40 net developable acres that would accommodate approximately 1,450 dwelling units planned at densities of 30 to 50 units per acre along with retail and office use.

Business / Commercial
To serve the neighborhoods and surrounding communities and to provide a variety of employment opportunities within Ho'opili, the business/commercial uses are located to be conveniently accessed from the major transportation corridors of the region. The approximately 145 gross acres illustrated (which includes secondary roads and off-street parking) are estimated to yield a net development area of approximately 130 acres that are projected to accommodate retail and office use. These areas would be significant employment generators for Ho'opili and the region.

Light Industrial / Business Mixed-Use
To meet regional demands and to provide for an additional employment center for Ho'opili, approximately 50 gross acres (which includes secondary roads and off-street parking) are planned to provide an area for larger light industrial type users and businesses. It is estimated that there would be a net development area of approximately 40 acres industrial mixed-use.

Open Spaces / Buffers
Integral to the connectivity of Ho'opili to the surrounding neighborhoods, a variety of open space buffers and drainage detention areas are planned. Some of the key open space buffers include along the H-1 Freeway, Honouliuli Gulch and along Old Fort Weaver Road.

Parks
Some of the key parks being planned include a district park along Fort Weaver Road and a "downtown" civic square to serve as the community gathering area.

Mini-Parks
Integral to the establishment and identity of neighborhoods, a variety of smaller parks of approximately one to two acres in size are planned. Properly planned and located, most residents will be within walking distance of one of these mini-parks.

Public Facilities
The proposed project could include as many as five or more public school sites. The Conceptual Land Use Plan shows the possible locations for five State Department of Education (DOE) school sites planned to be as accessible to the neighborhoods of Ho'opili as the community is developed; one high school, one middle school and three elementary schools. The plan can also accommodate a private school(s) as the need is determined. In addition, area is set aside along the western end of Farrington Highway fronting the Petition Area for either a fire station or a police substation. In total, approximately 100 acres are allocated to meet public facility needs.

Based on the above land use plan, the overall density is not anticipated to change. However, the distribution of density will change based upon the location of the proposed transit stations within Ho'opili. Additionally, internal traffic should be anticipated to change depending on the transit alignment and final station locations.

There are several major transportation projects that have been long-planned for East Kapolei. The Ho'opili project has been planned assuming that the appropriate government agencies will secure the required rights-of-way from the landowner, these include the lands under: a portion of North-South Road between Farrington Highway and Kapolei Parkway; a portion of the North-South Road and a new H-1 Freeway interchange; a portion of the intersection of North-South Road and Farrington Highway; the long-planned widening of Farrington Highway fronting Ho'opili; the proposed East-West Connector Road through the Petition Area; and the segment of the proposed Honolulu High-Capacity Transit Corridor project through the Project Area.

The proposed project has been designed to reduce future residents' reliance on private motorized vehicles through the following measures:

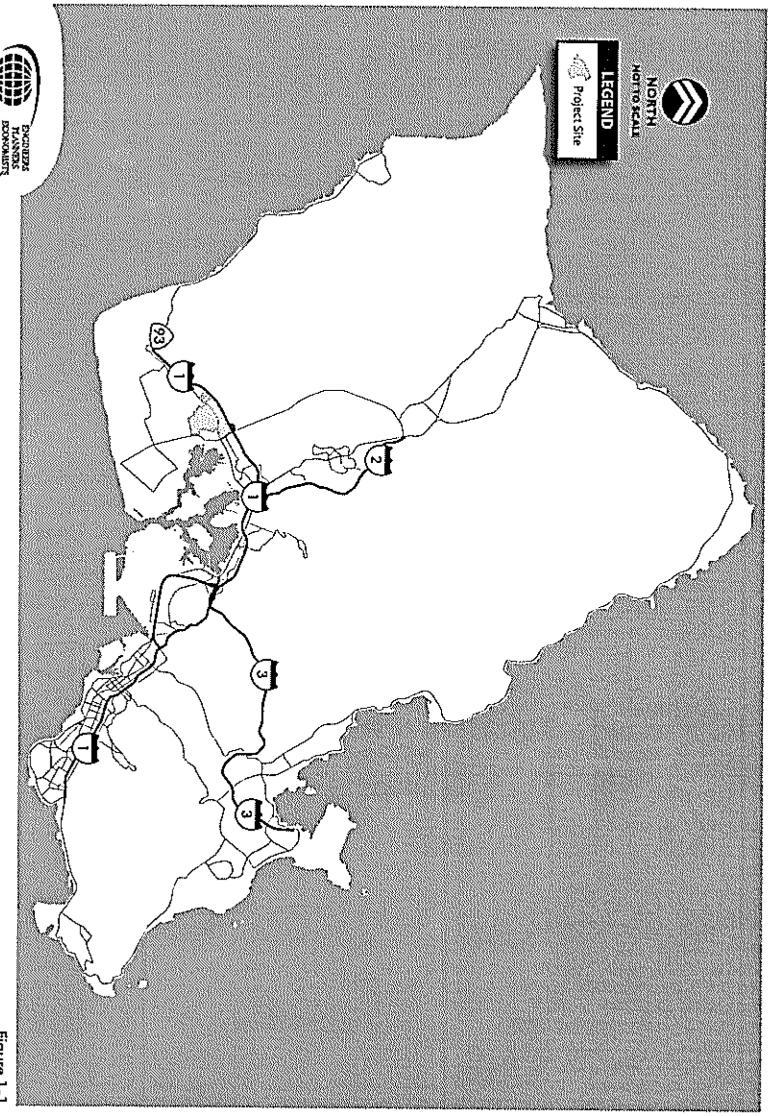
- the project is the first new project designed to embrace high-capacity transit (elevated, fixed-guideway) corridor and station(s);
- the project is large enough to be designed and offer a full range of mixed land uses, including a wide range of places of live, work, shop, recreate and learn and will aspire to achieve a job-housing balance;
- the project is designed to maximize connectivity (transit, pedestrian, bicycle and

vehicular) with surrounding streets and communities (including DHHL and UHWO), while minimizing cul-de-sacs and dead-end streets;
- the project will be designed to take advantage of the relatively flatness of the site and proximity to UHWO by designing streets and grade-separated multi-modal pathways for walking and bicycling; and
- the project will seek to implement other transportation management and transportation demand management strategies.

1.2 STUDY SCOPE AND APPROACH

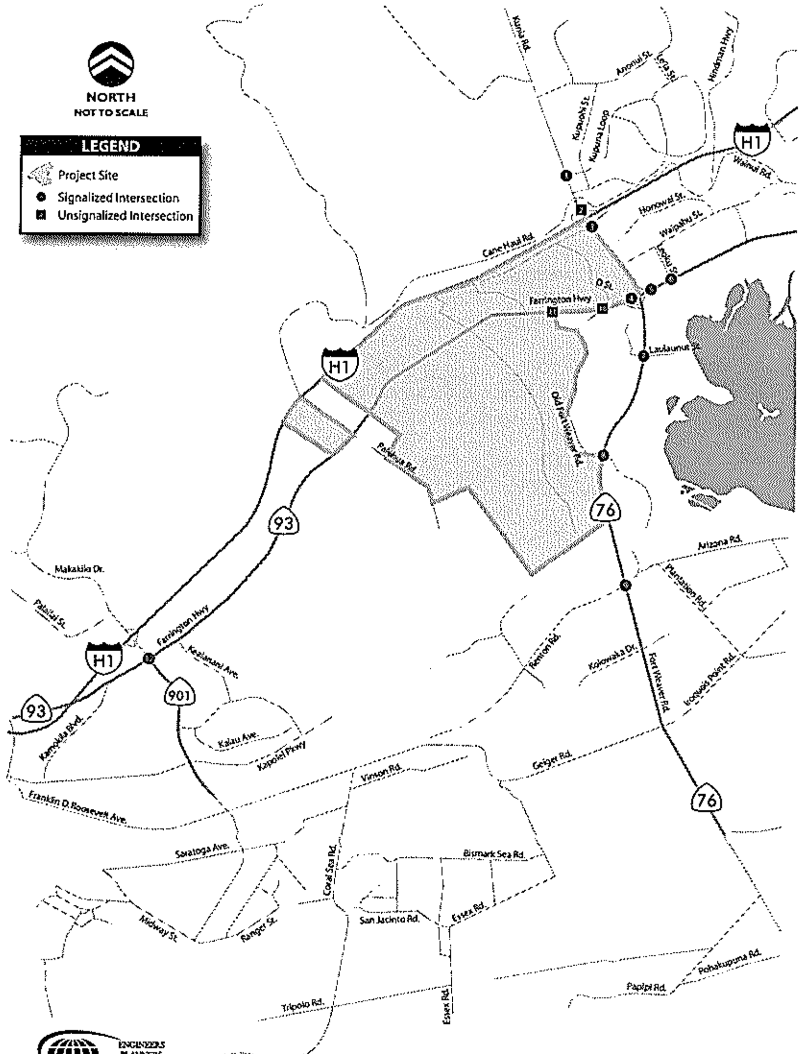
The transportation analysis was prepared according to the scope of work approved by the City and County of Honolulu, and the Hawaii Department of Transportation. For the analysis of the proposed Project, the following transportation scenarios were examined:

- Existing Conditions
- 2030 Baseline Conditions
- 2030 Baseline plus Project Conditions "With Transit Corridor"
- 2030 Baseline plus Project Conditions "Without Transit Corridor"



Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

Figure 1-1
PROJECT LOCATION
100061/BASE - 12/11/06



Wilbur Smith Associates — Engineers Planners Economists

Figure 1-2
PROJECT STUDY AREA
100061/BASE - 01/08/07

The purpose of this analysis is to identify the potential impacts of the proposed Project on the transportation system in the vicinity of the site that would be most directly impacted by the Project. As part of the existing traffic network, the following key intersections were analyzed for this project:

1. Kunia Road/ Kupuna Loop
2. H-1 Westbound Ramps/ Kunia Road
3. Fort Weaver Road/ H-1 Eastbound Ramps
4. Fort Weaver Road Southbound Ramps/ Farrington Freeway
5. Fort Weaver Northbound Ramps/ Farrington Freeway
6. Farrington Highway/ Leokū Street
7. Fort Weaver Road/ Laulaunui Street
8. Fort Weaver Road/ Old Fort Weaver Road
9. Fort Weaver Road/ Renton Road
10. Farrington Highway/ East Old Fort Weaver Road
11. Farrington Highway/ West Old Fort Weaver Road
12. Fort Barrette Road/ Farrington Highway

As part of the future traffic network, the following key intersections were also analyzed as part of this project:

13. North South Road/ H-1 Westbound Ramps
14. North South Road/ H-1 Eastbound Ramps
15. North South Road/ Farrington Highway
16. North South Road/ North University of Hawai'i Connector
17. North South Road/ South University of Hawai'i Connector
18. North South Road/ Kapolei Parkway
19. East-West Road/ Old Fort Weaver Road
20. B Street/ 1st Avenue
21. Farrington Highway/ B Street
22. B Street/ 4th Avenue
23. Parkway/ B Street
24. B Street/5th Avenue
25. East-West Road/ A Street
26. 1st Avenue/ 2nd Avenue
27. Farrington Highway/ Parkway/ 2nd Avenue
28. Parkway/ 4th Avenue
29. Parkway/ C Street
30. C Street/ 5th Avenue
31. 2nd Street/ D Street
32. Kunia Road/ 2nd Avenue
33. Kunia Road/ 3rd Avenue
34. East-West Road/ B Street

An evaluation of the traffic impacts on the freeways serving in the vicinity of the development area was also conducted. The following freeway mainline freeway segments were analyzed for this project:

- Section 1: H-1 Freeway (south of Makakilo Drive)
- Section 2: H-1 Freeway (west of Kunia Road)
- Section 3: H-1 Freeway (west of Pāiwa Street)
- Section 4: H-1 Freeway (east of Kamehameha Highway)
- Section 5: H-2 Freeway (at Ka Uka Boulevard)

Traffic impact evaluation was also conducted for the ramps connecting to the freeways serving in the vicinity of the proposed Project. This analysis was conducted for the existing ramp connections from Fort Weaver Road/Kunia Road to H-1 Freeway. Ramp analyses were also conducted for the future ramp configurations connecting from Fort Weaver Road/Kunia Road to H-1 Freeway as well as the ramps connecting from North South Road to H-1 Freeway.

Some of the mitigation measures in this TIAR proposed additional laneage at the intersections analyzed. Land acquisition for additional right of way where land is owned of controlled by the Project is readily accommodated. Land acquisition at project extremities and remote locations/intersections, if necessary, may require assistance from City and State as part of the overall master planned roadway network.

The operations of the key intersections and freeway segments were evaluated during the weekday morning (AM) and evening (PM) peak traffic periods for the following scenarios:

Scenario 1: Existing Conditions includes the analysis of existing traffic volumes obtained from traffic counts.

Scenario 2: 2030 Baseline Conditions includes future transportation improvements including freeway, intersection, transit, and bicycle/pedestrian improvements that will be in place without the project by the year 2030. The future traffic volumes have been obtained from the Year 2030 Oahu Metropolitan Planning Organization (OMPO) Transportation Model.

Scenario 3: 2030 Baseline plus Project Conditions "With Transit Corridor" (Scenario A: With High-Capacity Transit Corridor) includes project conditions volumes plus traffic associated with the proposed project under the assumption that the Honolulu High-Capacity Transit Corridor would pass through the project site. The transit corridor's alignment would be fixed and run diagonally through Ho'opili using the University of Hawai'i's Road B. It would further turn down North-South Road in the median and stop in front of the Kroc Center in the North-South median. Two stops are currently proposed within Ho'opili for which the exact stop locations are still being determined. The project sponsor will be responsible for integrating the transit stops into the surrounding environment. It should be noted that depending on their locations, the bus stops may experience higher densities and be able to capture increased ridership as a result. Additionally, it is likely that a transit maintenance facility be located within Ho'opili. The details of this arrangement are discussed in the EIS report.

Scenario 4: 2030 Baseline plus Project Conditions "Without Transit Corridor" (Scenario B: Without High Capacity Transit Corridor) includes project conditions volumes plus traffic

associated with the proposed project under the assumption that the Honolulu High-Capacity Transit Corridor would not pass through the project site.

The remainder of the report is divided into six chapters. Chapter 2 describes Existing Conditions with regards to roadway facilities, transit services, pedestrian and bicycle facilities, and analysis methodologies. Intersection and Freeway operations under Background Conditions with traffic from approved but not yet constructed developments are discussed in Chapter 3. Chapter 3 provides a baseline from which to identify Project impacts.

Chapter 4 describes the methodology used to estimate the project traffic and the project's impact on the transportation system. Chapter 5 describes the future (Year 2030) transportation conditions including freeway, and intersection operations that will be a result of the construction of the East Kapolei Project. The results of the Project condition analysis as compared to the results of the 2030 Baseline Conditions (Chapter 3) analysis are used to identify significant project impacts. In Chapter 6, these significant impacts are identified, recommended improvements are proposed, and a phasing plan for improvement implementation is described. Chapter 6 also includes an assessment of site access, on-site circulation, transit services & pedestrian facilities and a review of the proposed roadway cross-sections for internal roadways and roadways adjacent to the project site. The study conclusions are presented in Chapter 7.

Chapter 2
EXISTING CONDITIONS

This chapter provides a description of Existing Conditions in the vicinity of the proposed Project. Included in this chapter are descriptions of the existing roadway and transit networks, documentation of existing traffic, transit, pedestrian, and bicycle conditions.

2.1 EXISTING ROADWAY NETWORK

The project area includes several major roadways that serve regional trips within Central O'ahu, as well as provide access to the commercial and residential areas adjacent to the project area.

2.1.1 Regional Access

This section provides a discussion of the existing regional roadway network in the vicinity of the proposed Project site, including the location of the nearest access points.

H-1 Freeway (H-1) – H-1 extends east-west through Central Honolulu and the 'Ewa District to provide connections of the project area to areas outside of the 'Ewa District. East of the Waiawa interchange, it provides five travel lanes in each direction with one lane in each direction designated as a HOV lane for vehicles with two or more occupants, during the peak commute periods. Between the Waiawa and Kunia interchanges, the freeway provides four lanes in each direction. West of the Kunia interchange, the freeway has three travel lanes in each direction.

H-2 Freeway (H-2) – The H-2 Freeway extends north-south throughout Central O'ahu and connects at its interchange to the H-1 Freeway. The northern terminus is just south of Wahiawā at the junction with Kamehameha Highway and Wilikina Drive. It provides four lanes in each direction from the Waiawa interchange to Mililani, where it narrows to two lanes in each direction.

Farrington Highway – Farrington Highway extends east-west to accommodate traffic between its east terminus, at the interchange with Kamehameha Highway, and the Wai'anae coast of O'ahu. It is located generally parallel to and one-half to three quarters of a mile south of the H-1 Freeway within the study area. It provides four lanes in each direction from the Kamehameha interchange to Old Fort Weaver Road. It extends westward with one lane in each direction to the Villages of Kapolei where it widens to provide 2 lanes in each direction from Kapolei Golf Course Road into the City of Kapolei.

Kamehameha Highway (State Route 99) – Kamehameha Highway extends north-south to accommodate traffic between the north and south shores of O'ahu. It is located generally parallel to and one-half to one mile west of the H-2 Freeway within the study area. Kamehameha Highway has been widened to a four-lane highway, with separate left- and right-turn lanes at Waipahu Street, Lumiauau Street, Lumiaina Street, Waipio Uka Street, and Ka Uka Boulevard intersections, from the H-1 Freeway to Ka Uka Boulevard. Kamehameha Highway also has an

interchange with Farrington Highway where it continues to operate as a four lane freeway both east and west of the interchange.

2.1.2 Local Access

This section provides a discussion of the existing local roadway system in the vicinity of the proposed Project site, including the roadway designation, number of travel lanes, and traffic flow directions.

Fort Weaver Road – This north-south roadway connects the H-1 Freeway with the Farrington Highway and provides access to the Waipahu residential areas. North of Farrington Highway, Fort Weaver Road becomes Kunia Road. Fort Weaver Road functions as a six-lane expressway between the H-1 Freeway and Laulaunui Street which interchanges at H-1 and Farrington Highway. It is a four-lane principal arterial with a median divider and left turn lanes at cross streets from Farrington Highway to North Road. Makai of North Road, Farrington Highway functions as a two-lane minor arterial.

Fort Barrette Road – This north-south roadway connects the Kalaeloa Redevelopment Area to the Makakilo community and provides access to Farrington Highway and H-1 Freeway. It is a two-lane divided roadway from just makai of Farrington Highway to Franklin D. Roosevelt Avenue. It extends mauka of Farrington Highway as Makakilo Drive, a four-lane roadway with median divider.

Old Fort Weaver Road – Old Fort Weaver Road provides the Honouliuli community access to Farrington Highway and Fort Weaver Road. It is a two-lane roadway between Farrington Highway and Fort Weaver Road

Laulaunui Street is a four-lane east-west minor arterial roadway extending between Kaihuopala'ai Street and Laulaunui Lane. Laulauni Street also intersects with Fort Weaver Road.

Leokū Street is a two- to four-lane north-south minor roadway that extends from Waipahu Street to Leokāne Street and is parallel to Fort Weaver Road.

Kunia Road is an extension of Fort Weaver Road north from Farrington Highway and the H-1 Freeway interchange to provide access into Central O'ahu.

Kupuna Loop is a four lane looped arterial roadway with two lanes in each direction. It provides direct access to Kunia Road at both its origin and terminus.

Renton Road is a two- to four-lane east-west minor arterial roadway through the Renton Village area that connects Fort Weaver Road to the Kapolei Parkway and to Roosevelt Avenue.

2.2 TRANSIT NETWORK

The City and County of Honolulu provides TheBus fixed-route service to the communities adjacent to and in the general vicinity of the proposed Project site, these routes include both suburban trunk routes and express routes. Figure 2-1 presents nearby bus routes. Table 2.1 presents the service frequencies for TheBus routes that service the proposed Project site. TheBus operates seven bus lines that directly serve the proposed Project and its immediate vicinity, they include:

- **Route A City Express -** Route A operates express service that connects Waipahu and Pearlridge with Downtown and the University of Hawai'i. Service is provided at approximately 15 minute intervals between 4:45 am and 10:00 PM on weekdays and 30 minute intervals between 5:00 AM and 8:30 PM on weekends.

- **Route 41 Kapolei Transit Center-** This route serves the Villages of Kapolei areas, including a portion of the Makakilo Drive-Fort Barrette Road. Service is provided approximately at one hour intervals from about 5:00 AM to 9:00 PM, seven days a week.

- **Route 42 'Ewa Beach-** Route 42 provides service along Farrington Highway in the City of Kapolei at half-hour intervals from approximately 6:00 AM to 1:30 AM for westbound travel seven days a week. Eastbound service runs from approximately 4:00 AM to 1:00 am also seven days a week.

- **Route 43 Waipahu Transit Center –** This route provides service along the H-1 Freeway and through the City of Waipahu, connecting Waipahu to downtown Honolulu. Service is provided seven days a week at half-hour intervals from 7:00 AM to 5:00 PM

- **Route 81 Waipahu Express (PM)/ Downtown Express (AM)** - This route provides express service at approximately 15 minute intervals from Waipahu to Downtown during the morning hours between 4:30 AM and 7:30 AM. Evening service frequency to Waipahu varies from 15 to 30 minute intervals and operates between 3:00 PM and 6:20 PM.

- **Route 91 Express Downtown (AM) / 'Ewa Beach Express (PM)** - Service is provided along the H-1 Freeway connecting the Downtown to 'Ewa Beach. Eastbound service on this route runs at 20 minute intervals from 4:30 AM to 7:00 AM, connecting 'Ewa Beach to the Downtown. Westbound service to 'Ewa Beach is provided the PM hours at 20 minute intervals beginning at 3:25 and concluding at 6:15 PM.

- **Route 102 Villages of Kapolei Express-** This route provides 3 morning Honolulu-bound trips and 3 afternoon return trips to the Villages of Kapolei during the peak commute periods. The route provides service along Fort Barrette Road and Farrington Highway in the Villages of Kapolei area.

In addition to TheBus express routes, the Leeward Oahu Transportation Management Association (LOTMA) also sponsors an express bus service along Fort Weaver Road to Honolulu with one morning and one afternoon trip.

Table 2.1
Bus Service near the proposed Project

Route	From	To	Hours of Operation		Headway During Commute Periods			
					Weekday		Weekend	
			Weekday	Weekend/Holiday	AM	PM	AM	PM
A	Waipahu	University	4:22 AM – 10:02 PM	4:52 AM – 9:12 PM	15	15-20	15-30	30
A	University	Waipahu	5:18 AM – 8:48 PM	6:08 AM – 8:31 PM	10-15	10-15	15	30
41	Kapolei	'Ewa	5:00 AM – 9:15 PM	5:00 AM – 9:15 PM	30	30	60	60
41	'Ewa	Kapolei	5:03 AM – 9: 49 PM	5:33 AM – 9:49 PM	30	30	60	60
42	'Ewa	Waikīkī	4:20 AM – 12:54 AM	4:39 AM – 12:44 AM	30	30	20-30	20-30
42	Waikīkī	'Ewa	4:57 AM – 1:47 AM	5:59 AM – 1:29 AM	30	30	30	30
43	Honolulu	Waipahu	7:00 AM – 4:49 PM	7:03 AM – 5:03 PM	30	30	30	30
43	Waipahu	Honolulu	7:15 AM – 5:15 PM	7:15 AM – 5:15 PM	30	30	30	30
81	Waipahu	Honolulu	4:28 AM – 7:34 AM	4:40 AM – 7:00 AM	15-20	-	20	-
81	Honolulu	Waipahu	3:00 PM – 6:18 PM	-	-	20-30	-	-
91	'Ewa	Honolulu	4:30 AM – 7:10 AM	4:35 AM – 6:45 AM	20	-	20-45	-
91	Honolulu	'Ewa	3:25 PM – 6:15 PM	3:40 PM – 5:45 PM	-	20	-	20-30
102	Kapolei	Honolulu	5:30 AM – 6:10 AM	-	20	-	-	-
102	Honolulu	Kapolei	4:00 PM – 5:10 PM	-	-	20	-	-

Source: TheBus, January 2007

NOTES:
Headway is presented in minutes.

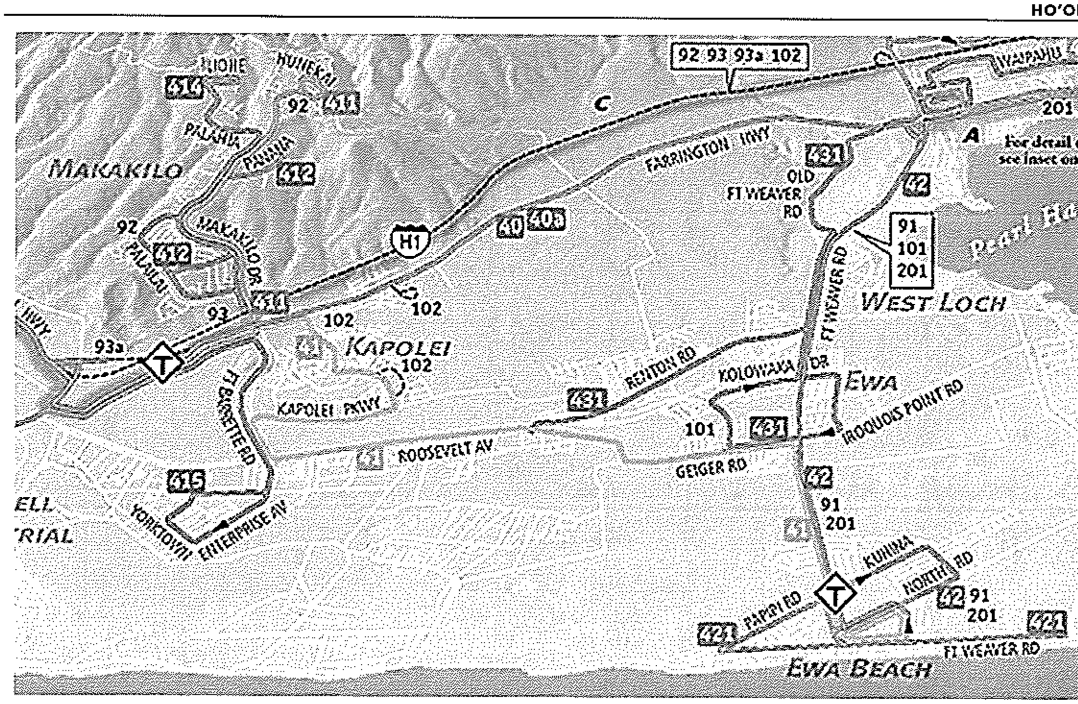


Figure 2-1
EXISTING TRANSIT NETWORK

2.3 PEDESTRIAN CONDITIONS

Within the vicinity of the proposed Project, sidewalk facilities are provided along both sides of Farrington Highway towards the east-west project limits beyond its intersection with Fort Weaver Road and along its intersection with Fort Barrette Road. Sidewalks are also provided along both sides of Renton Road, Laulaunui Road, Leokū Street, and along Makakilo Drive, as well as the westbound approach of Old Fort Weaver Road near the project area intersections. Crosswalks have also been provided along certain approaches to these intersections to support the sidewalks/bike trails.

2.4 BICYCLE CONDITIONS

A bicycle path is provided along both sides of Fort Weaver Road through the study area. Along the other major roadways, bicycles either use paved shoulder areas, wide outside lanes, or travel within the regular traffic lane.

2.5 TRANSPORTATION DEMAND MANAGEMENT

Since 1990, as Hawai'i's first transportation management organization, the Leeward Oahu Transportation Management Association (LOTMA) has worked to provide and promote alternative transportation options aimed at alleviating traffic congestion, air pollution, and fuel consumption. LOTMA presently sponsors a number of different programs to accommodate the increasing mobility needs of the West and Central Oahu region, including the following:

1. Carpooling and Vanpooling – In an effort to encourage new carpool and vanpool participation, LOTMA has partnered with Vanpool Hawai'i to provide financial start-up subsidies to new vanpool commuters who live in Leeward, Central and North Shore O'ahu.

2. Carpool Matchlist – LOTMA provides the opportunity for commuters living in Leeward, Central, and North Shore O'ahu to join a list of carpoolers which they can be paired with. As an incentive encouraging people to sign up and use this service, LOTMA enters each participant into a drawing for the opportunity to win a gas card valued at $25.00. In addition to the carpool list, LOTMA also provides information on larger carpooling databases offered by the O'ahu Department of Transportation as well as other international ridersharing websites.

3. LOTMA Commuter Express – Offers commuters morning and evening non-stop express service on the freeway express lanes between Central Oahu and Honolulu. Morning service begins at 6:05 AM from the Waipio Gentry Shopping Center and terminates at the Sheraton Waikīkī. Evening service from the Sheraton Waikīkī begins at 4:30 PM and terminates at 6:05 PM at the Miliani Mauka Park and Ride.

4. Emergency Ride Home Program (ERH) – The ERH program offers rides for unplanned personal emergencies including personal/family illness, family crisis, or in the event one's regularly scheduled carpool/vanpool is not available. Participation in the ERH is open to those living or working in Leeward, Central, or North Shore Oahu who carpool/vanpool, or ride the

LOTMA Commuter to work at least once a week. In addition, participants must commute to work by carpool/vanpool, or LOTMA Commuter Express on the day the ERH is needed.

5. LOTMA website – LOTMA regularly updates its website to provide users with the most current information about carpooling, vanpooling, the LOTMA Commuter Express, the Mililani Trolley, and TheBus. In addition, LOTMA also offers special program promotions via its website.

2.6 INTERSECTION OPERATING CONDITIONS

2.6.1 Methodology for Intersection Analysis

Operations of the study intersections were evaluated using Level of Service (LOS) calculations. LOS is a qualitative description of the performance of an intersection based on the average delay per vehicle. Intersection levels of service range from LOS A, which indicates free flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays.

Signalized Intersections
Levels of Service for signalized intersections were calculated using the *Highway Capacity Manual 2000* (HCM 2000) methodology. The LOS is based on the average delay (in seconds per vehicle) for the various movements within the intersection. A combined weighted average delay and LOS are presented for each of the signalized intersections. The average delay for signalized intersections was calculated using the Synchro analysis software and is correlated to the level of service designation as shown in Table 2.2.

Table 2.2
Level of Service Criteria – Signalized Intersections

Level of Service	Description of Operations	Average Delay
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 – 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 – 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 – 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.1 – 80.0
F	Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	≥ 80.1

Source: Highway Capacity Manual, Transportation Research Board, 2000

NOTES:
Delay presented in seconds per vehicle.

Unsignalized Intersections

Unsignalized intersections were evaluated using the *Highway Capacity Manual 2000* methodology. The LOS rating is based on the weighted average control delay expressed in seconds per vehicle as illustrated in Table 2.3. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration. At two-way controlled intersections, LOS is calculated for each controlled movement, as opposed to the intersection as a whole. For all-way stop controlled locations, LOS is computed for the intersection as a whole.

Table 2.3
Level of Service Criteria – Unsignalized Intersections

Level of Service	Description of Operations	Average Delay
A	No Delay for stop-controlled approaches.	≤ 10.0
B	Operations with minor delays.	10.1 – 15.0
C	Operations with moderate delays.	15.1 – 25.0
D	Operations with some delays.	25.1 – 35.0
E	Operations with high delays, and long queues.	35.1 – 50.0
F	Operations with extreme congestion, with very high delays and long queues unacceptable to most drivers.	≥ 50.1

Source: Highway Capacity Manual, Transportation Research Board, 2000

NOTES:
Delay presented in seconds per vehicle.

2.6.2 Methodology for Freeway Analysis

Freeway segment operating conditions were evaluated using the *HCM* 2000 methodology. HCM methodology computes LOS for basic freeway segments using density as the measure of effectiveness. Based on the values of the input parameters (geometric data, volume, and base free-flow speed) flow rate and speed are determined. Adjustments are typically made to the base free-flow speed to account for lane width, number of lanes, interchange density, and lateral clearance. Using the flow rate and speed, density of the freeway segment is computed. Table 2.4 presents the LOS criteria for freeway segments using density as the performance measure.

Table 2.4
Level of Service Criteria – Basic Freeway Segments

Level of Service	Density
A	0.0 – 11.0
B	11.1 – 18.0
C	18.1 – 26.0
D	26.1 – 35.0
E	35.1 – 45.0
F	> 45.0

Source: Highway Capacity Manual, Transportation Research Board, 2000

NOTES:
DEC – Demand Exceeds Capacity.
Density is presented in passenger cars per hour per lane.

2.6.3 Methodology for Ramp-Freeway Junction Analysis

As in the case of intersections and freeway segments, *HCM 2000* methodology was applied to identify the operating conditions of the Ramp-Freeway junctions. Similar to freeway segments, HCM methodology computes LOS for ramp-freeway junctions using density as the measure of effectiveness. HCM methodology for ramp-freeway junctions computes demand flow rate after making adjustments to account for peak-hour factor, heavy vehicle factor, and driver population factor. Flow rates are computed immediately upstream of ramp influence area for both merging and diverging ramps. Determination of the LOS is then based on the comparison between the computed demand flow rate and the capacity of the ramp influence area. If the capacity if less than the flow rate then the ramp influence area operates at LOS F. For ramp-freeway junctions, lower densities indicate lower service levels and fewer or no delays; whereas, higher densities indicate higher service levels and long queues. Table 2.5 presents the LOS criteria for ramp-freeway junctions.

Table 2.5
Level of Service Criteria – Ramp-Freeway Junctions

Level of Service	Density	Minimum Speed
A	≤ 10.0	58
B	10.1 – 20.0	56
C	20.1 – 28.0	52
D	28.1 – 35.0	46
E	> 35	42
F	DEC	DEC

Source: Highway Capacity Manual, Transportation Research Board, 2000

NOTES:
DEC – Demand Exceeds Capacity.
Density is presented in passenger cars per hour per lane.
Speed is presented in miles per hour.

In the absence of established local criteria to describe the operating conditions of intersections, freeway segments, and ramp-freeway junctions, LOS D or better is typically considered to be acceptable for peak hours, while LOS E or worse are considered undesirable conditions. As such, this criterion was used to identify the operating conditions of intersections, freeway segments, and ramp-freeway junctions for this transportation study.

2.7 EXISTING TRAFFIC CONDITIONS

2.7.1 Existing Intersection Operating Conditions

Existing intersection operating conditions were evaluated for the morning peak hour (6:00 AM to 8:00 AM) and evening peak hour (3:00 PM to 5:00 PM) using *Synchro* software. It should be noted that Existing commute peak hour traffic volumes at key intersections were developed from manual intersection turning movement counts conducted by Wilbur Smith Associates in April 2006. The traffic movements were counted and recorded by traffic surveyors in 15 minute intervals during the peak commute periods. These counts were then analyzed to determine the peak one-hour traffic volumes at each intersection. The off- and on-ramp volumes at the intersection Kunia Road/ H-1 Westbound Ramps were obtained from the State of Hawaii, Department of Transportation's 24-Hour Traffic Count summaries.

A total of 12 intersections were analyzed under existing conditions of which nine are signalized, and three are Two-Way Stop-Controlled (TWSC) intersections. A field visit was conducted to verify the existing intersection lane configurations, intersection control devices, and signal cycle lengths. Figure 2-2 shows the existing geometric configurations at the study intersections and Figure 2-3 exhibits the AM and PM peak hour turning movement volumes at the 12 study intersections under existing conditions.

The existing lane configurations and peak hour turning movement volumes were used to calculate the levels of service for the 12 study intersections under existing peak hour conditions.

The results of the existing LOS analysis are presented in Table 2.6, and the calculation worksheets are included in Appendix A-1.

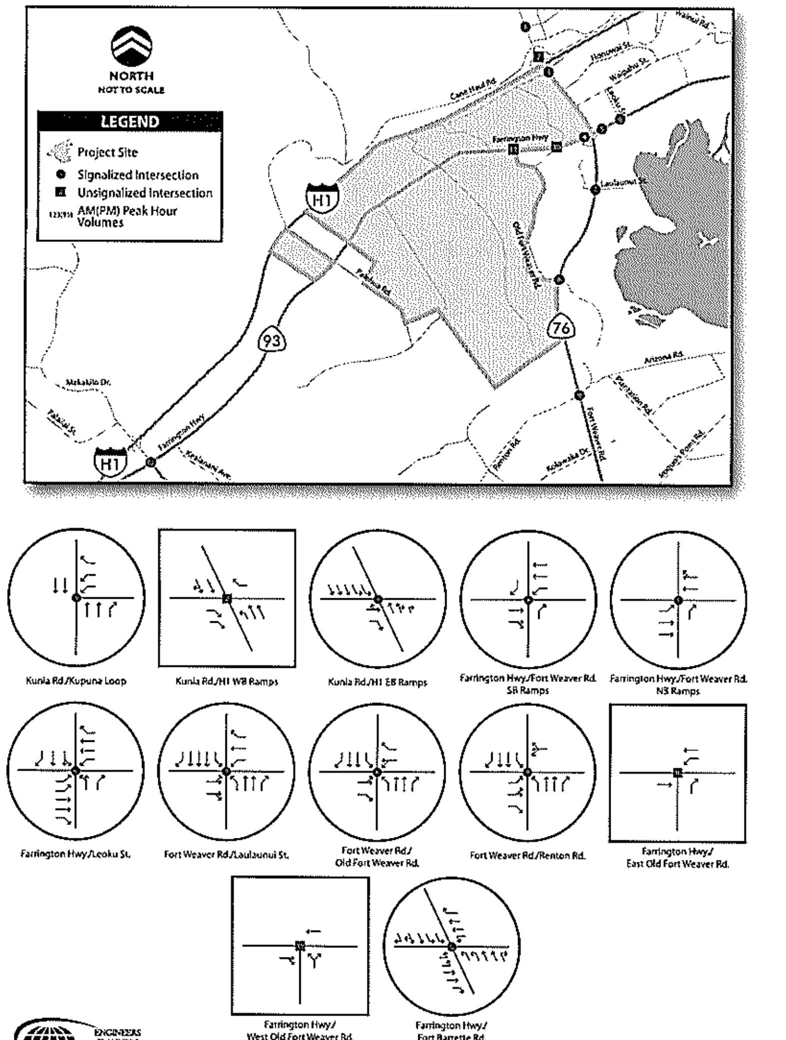
Under existing the AM peak hour conditions, seven of the 12 study intersections operate at LOS D or better (acceptable conditions), while the following five intersections operate at LOS E or F (unacceptable conditions):

- Kunia Road/ H-1 Westbound On-Ramp
- Fort Weaver Road/ Laulaunui Road
- Fort Weave Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/ Fort Barrette Road

Similar to AM peak hour conditions, under existing PM peak hour conditions, five study intersections operate at LOS E or F. The remaining seven intersections operate under acceptable conditions. The five intersections operating under unacceptable conditions are:

- Kunia Road/ H-1 Westbound On-Ramp
- Farrington Highway/ Leokū Street
- Fort Weaver Road/ Renton Road
- Farrington Highway/ East Old Fort Weaver Road
- Farrington Highway/ Fort Barrette Road

Figure 2-4 exhibits the LOS and delay values for all the turning movements of the study intersections under existing AM and PM peak hour conditions.



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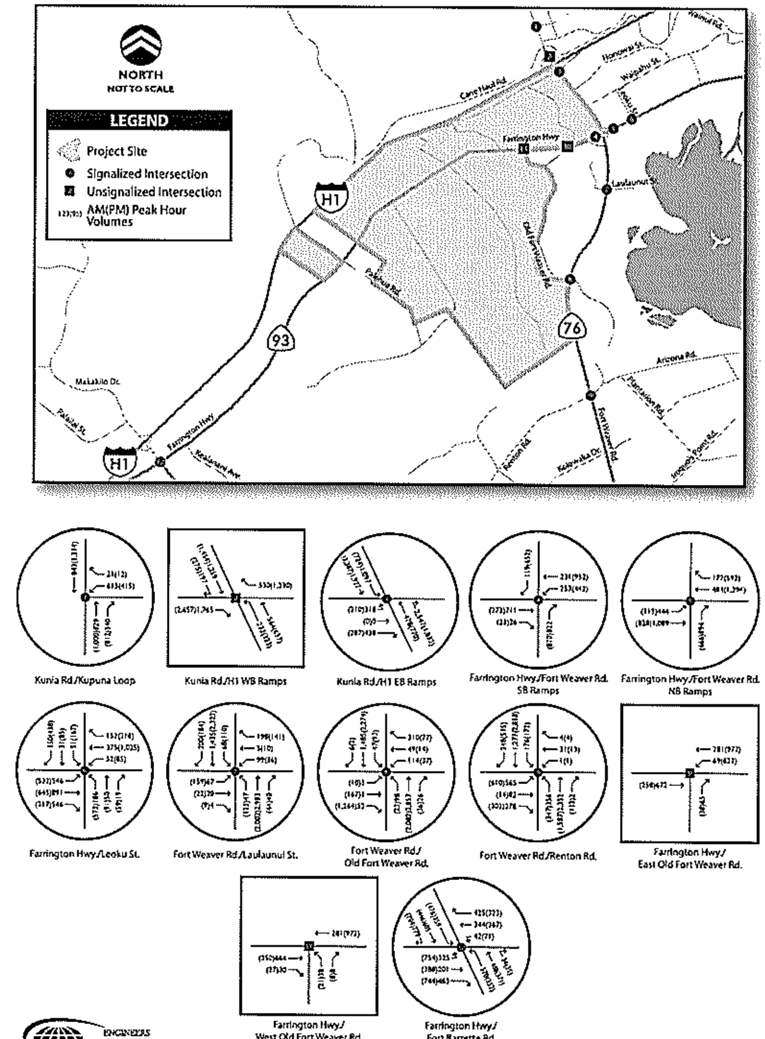
ENGINEERS PLANNERS ECONOMISTS

Figure 2-2
INTERSECTION GEOMETRIC CONFIGURATIONS - EXISTING CONDITIONS
100061/BASE - 12/19/06

HO'OPILI TIAR



Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

Figure 2-3
PEAK HOUR INTERSECTION VOLUMES - EXISTING CONDITIONS
100061/BASE - 12/19/06

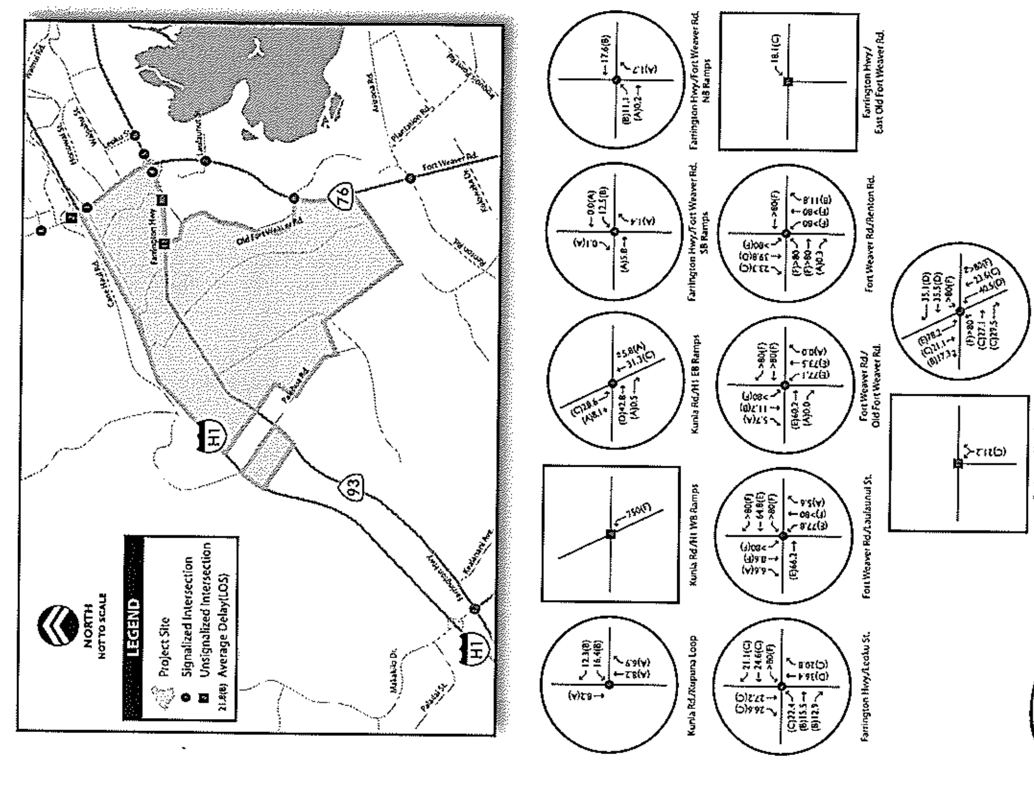


Figure 2-4A
AM PEAK HOUR INTERSECTION LOS AND DELAY VALUES
EXISTING CONDITIONS

Table 2.6
Peak Hour Intersection Operations – Existing Conditions

#	Intersection	Control	AM Delay	AM V/C Ratio	AM LOS	PM Delay	PM V/C Ratio	PM LOS
1	Kunia Rd / Kunia Loop	Signal	10.0	0.54	A	8.8	0.62	A
2	Kunia Rd / H-1 WB On-Ramp	TWSC	723.3 (WB)	**2.40 (WB)**	F	**>1000 (WB)**	**6.30 (WB)**	F
3	Kunia Rd / H-1 EB Ramps	Signal	17.8	0.78	B	19.2	0.95	B
4	Farrington Hwy / Fort Weaver Rd. SB Ramps	Signal	4.0	0.55	A	2.4	0.59	A
5	Farrington Hwy / Fort Weaver Rd. NB Ramps	Signal	5.9	0.60	A	14.6	0.95	B
6	Farrington Hwy / Leokū St	Signal	21.9	0.61	C	**108.1**	**1.18**	F
7	Fort Weaver Rd / Laulaunui St	Signal	**101.9**	**1.19**	F	29.8	0.86	C
8	Fort Weaver Rd / Old Fort Weaver Rd	Signal	**63.0**	**1.12**	E	22.8	0.92	C
9	Fort Weaver Rd / Renton Rd	Signal	**98.7**	**1.19**	F	**161.5**	**1.40**	F
10	Farrington Hwy / East Old Fort Weaver Rd	TWSC	18.1 (SWB)	0.21 (SWB)	C	**89.1 (SWB)**	**1.09 (SWB)**	F
11	Farrington Hwy / West Old Fort Weaver Rd	TWSC	21.2 (NB)	0.18 (NB)	C	24.8 (NB)	0.15 (NB)	C
12	Farrington Hwy / Fort Barrette Rd	Signal	**56.4**	**0.99**	E	**56.9**	**1.01**	E

Source: Wilbur Smith Associates, 2007

NOTES:
AWSC – All-way Stop Control
TWSC – Two-way Stop Control
Signal – Traffic Signal
Delay presented in seconds per vehicle.
Delay and LOS presented for worst approach for two-way stop controlled intersections.
Bold type indicates unacceptable values.

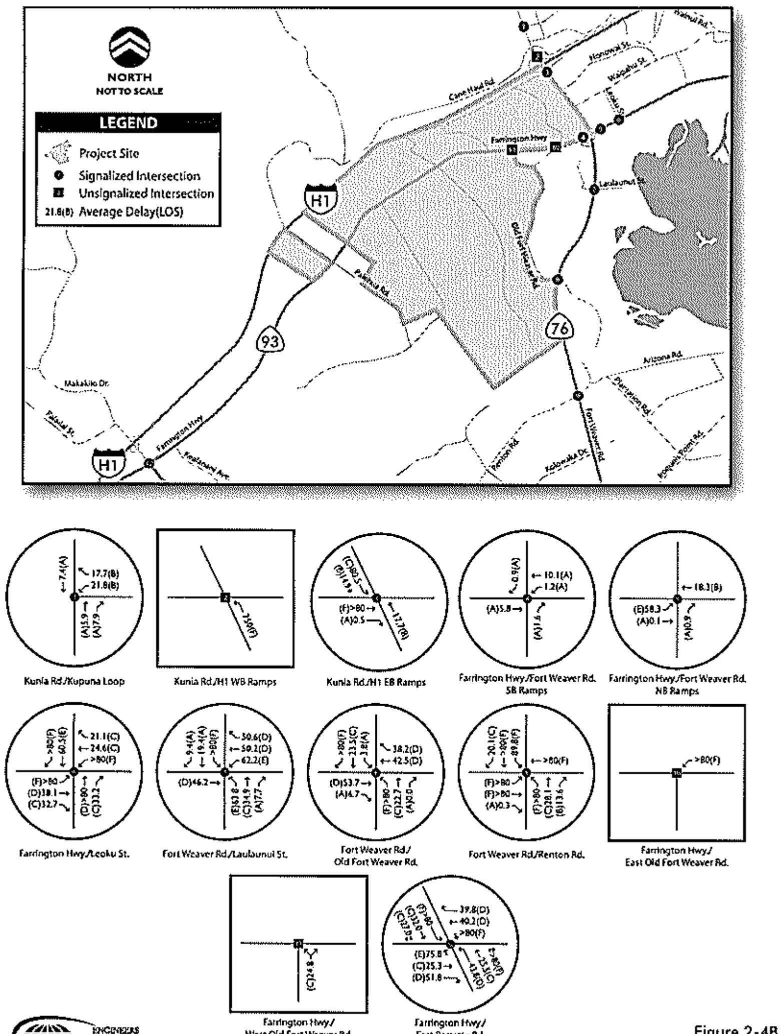


Figure 2-4B
PM PEAK HOUR INTERSECTION LOS AND DELAY VALUES
EXISTING CONDITIONS
100061/BASE - 12/19/06

Wilbur Smith Associates

2.7.2 Existing Freeway Segment Operating Conditions

Roadway and traffic control information was obtained through field reconnaissance by Wilbur Smith Associates (WSA) during April 2006. The roadway inventory included those items needed to estimate roadway capacities specifically, number and width of lanes, shoulder conditions, types of traffic controls, and traffic signal phasing and timing. Peak hour freeway segment volumes were obtained from the 24-Hour Traffic Count Station Summaries of the State of Hawaii, Department of Transportation.

The existing mainline freeway characteristics including number of lanes, volumes and posted speed limits were used to calculate the levels of service for each of the 10 existing freeway segments during each peak hour. The results of the existing freeway segment analysis using *Highway Capacity Software* (HCS), which is developed following the method described in the 2000 *Highway Capacity Manual* (HCM) are presented in Table 2.7 and the calculation worksheets are included in Appendix B-1.

Under AM peak hour conditions, 9 freeway segments operate under acceptable conditions (LOS D or better), while one (1) of the freeway segment, H-1 Eastbound (west of Pāiwa Street) operates under unacceptable conditions, LOS E.

Under PM peak hour conditions, eight of the 10 study freeway segments operate under acceptable conditions (LOS D or better), while the remaining two freeway segments H-1 Westbound (west of Pāiwa Street) and H-1 Westbound (east of Kamehameha Highway) operate under unacceptable conditions (LOS E or worse).

Figure 2-5 presents the existing freeway operating conditions.

Table 2.7
Peak Hour Freeway Segment Operations – Existing Conditions

#	Freeway	Segment	AM Peak			PM Peak		
			Volume	Density	LOS	Volume	Density	LOS
1	H-1 EB	S/O Makakilo Dr.	1582	10.6	A	1762	11.8	B
2	H-1 EB	W/O Kunia Rd.	3808	25.5	C	4077	27.3	D
3	H-1 EB	W/O Pāiwa St.	7067	35.7	E	4446	21.7	C
4	H-1 EB	E/O Kamehameha Hwy.	4468	28.4	D	2652	17.7	B
5	H-2 NB	At Ka Uka Blvd.	1777	11.9	B	3196	21.4	C
6	H-1 WB	S/O Makakilo Dr.	1482	9.9	A	2223	14.9	B
7	H-1 WB	W/O Kunia Rd.	3331	22.3	C	4079	25.1	C
8	H-1 WB	W/O Pāiwa St.	4366	21.3	C	7425	38.6	E
9	H-1 WB	E/O Kamehameha Hwy.	3069	20.5	C	5824	42.8	E
10	H-2 SB	At Ka Uka Blvd.	4078	27.3	D	2534	16.9	B

Source: Wilbur Smith Associates, 2007

NOTES:
Density is given in pc/mi/ln

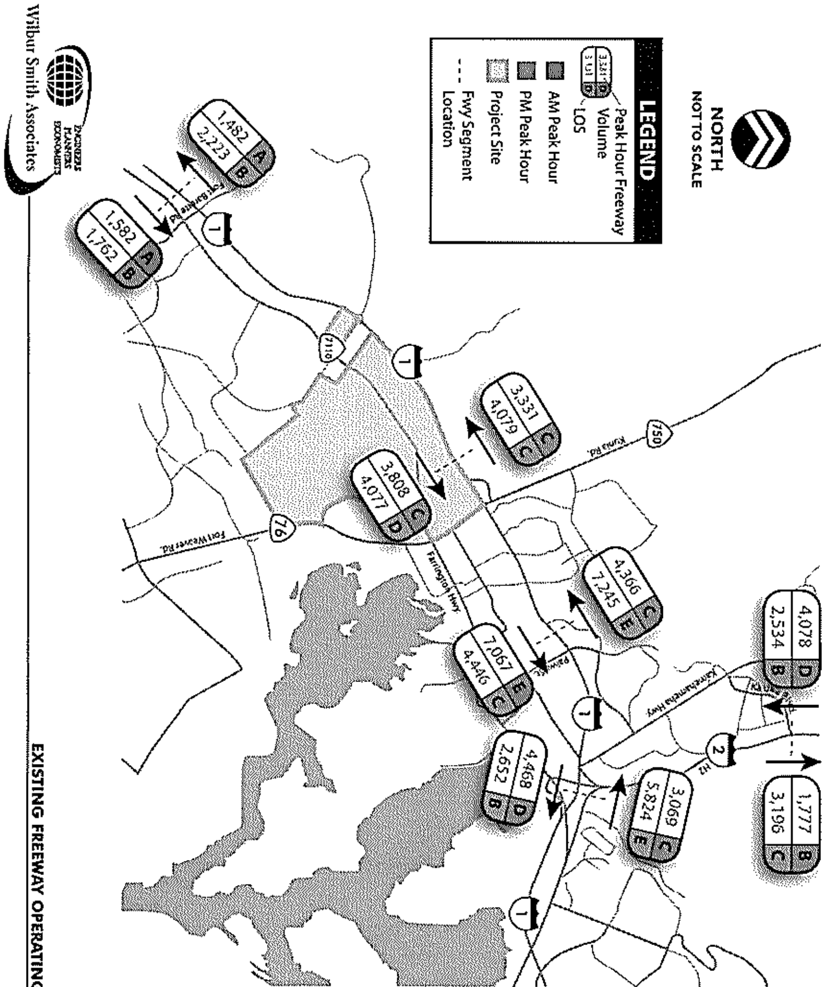


Figure 2-5
EXISTING FREEWAY OPERATING CONDITIONS

2.7.3 Existing Ramp-Freeway Junction Operating Conditions

Similar to freeway segments, *HCS* software was used to analyze the ramp-freeway junctions. Table 2.8 exhibits the operating conditions of the existing ramp-freeway junctions; the calculation worksheets are included in Appendix C-1.

Under existing conditions, eastbound on-ramp at H-1/ Fort Weaver Road has three lanes. It should be noted that *HCS* software has a limitation in that it can only analyze up to a maximum of two lanes per ramp. Therefore, the LOS and density values of ramp-freeway junction H-1/ Fort Weaver Road (Eastbound On-Ramp) could not be determined.

Under existing AM peak hour conditions, four ramp-freeway junctions operate at LOS C or better (acceptable conditions).

Under PM peak hour conditions, two ramp-freeway junctions H-1/ Fort Weaver Road (Westbound Of-Ramp) and H-1/ Fort Weaver Road (Westbound Loop Off-Ramp) operate at LOS F. The remaining two ramp-freeway junctions operate under acceptable conditions.

Table 2.8
Ramp-Freeway Junction Operations – Existing Conditions

#	Location	Ramps	Peak Hour	Density	LOS
1	H-1/ Fort Weaver Road	WB Off-Ramp	AM Peak	31.1	D
2	H-1/ Fort Weaver Road	WB Loop Off-Ramp	AM Peak	20.1	C
3	H-1/ Fort Weaver Road	WB On-Ramp	AM Peak	20.7	C
4	H-1/ Fort Weaver Road	EB Off-Ramp	AM Peak	24.9	C
5	H-1/ Fort Weaver Road	EB On-Ramp	AM Peak	N.D.	N.D.
6	H-1/ Fort Weaver Road	WB Off-Ramp	PM Peak	DEC	F
7	H-1/ Fort Weaver Road	WB Loop Off-Ramp	PM Peak	DEC	F
8	H-1/ Fort Weaver Road	WB On-Ramp	PM Peak	25.1	C
9	H-1/ Fort Weaver Road	EB Off-Ramp	PM Peak	25.8	C
10	H-1/ Fort Weaver Road	EB On-Ramp	PM Peak	N.D.	N.D.

Source: Wilbur Smith Associates, 2007

NOTES:
DEC – Demand Exceeds Capacity
N.D. – Could not be determined
Density is presented in pc/mi/ln.
Bold type indicates LOS F.

Chapter 3
2030 BASELINE CONDITIONS

This chapter discusses the methodology involved in the development of 2030 Baseline Conditions (without the proposed project) traffic volumes, and the operations of the study intersections. These conditions form the basis against which transportation impacts related to the proposed project will be identified.

Year 2030 represents the full buildout year of the Ho'opili Project, with all phases of the proposed project expected to be completed. As such, year 2030 has been selected as the future year of analysis to identify the operating conditions of the transportation network located in the vicinity of the proposed project under with and without Project conditions.

3.1 YEAR 2030 TRANSPORTATION SYSTEM IMPROVEMENTS

This section documents the planned transportation and circulation system improvements currently identified and approved by the Oahu Metropolitan Planning Organization (OMPO). The Oahu Regional Transportation Plan (ORTP) 2030 identifies a number of improvements to existing regional roadways and the construction of new facilities. In addition, some improvements are identified in the ongoing 'Ewa Connectivity study. The regional circulation improvements in the vicinity of the study area are located along the following corridors:

- H-1 Freeway
- Farrington Highway
- Fort Barrette Road
- Fort Weaver Road
- East-West Connector Road
- Kapolei Parkway
- Kunia Road
- Makakilo Drive
- North-South Road

Table 3.1 describes the planned and approved transportation improvement projects that are located in the vicinity of the study area. The corridors planned to be improved, the locations along the corridor, and the programmed improvements at those locations are summarized in Table 3.1.

3.2 STUDY AREA – 2030 BASELINE CONDITIONS

Due to the planned improvement of existing transportation network near the project site, the study area would include the new intersections located along North-South Road under 2030 Baseline Conditions. The following seven new intersections would be studied under Year 2030 Conditions in addition to the 12 study intersections analyzed under Existing Conditions:

- North-South Road/ H-1 Westbound Ramps
- North-South Road/ H-1 Eastbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ North University of Hawai'i Connector

- North-South Road/ South University of Hawai'i Connector
- North-South Road/ Kapolei Parkway
- East-West Road/ Old Fort Weaver Road

Figure 3-1 depicts the locations of the study intersections for 2030 Baseline Conditions, while Figures 3-2A and 3-2B presents the Year 2030 lane configurations of the study intersections.

The three unsignalized intersections -- Kunia Road/ H-1 Westbound On-Ramp, Farrington Highway/ East Old Fort Weaver Road, and Farrington Highway/ West Old Fort Weaver Road – were analyzed to assess whether installation of traffic signal controls would be appropriate under Year 2030 Conditions. The Peak Hour traffic signal analysis (MUTCD Warrant #3) for the unsignalized study intersections indicated that the forecast conditions at the intersection of Kunia Road with the H-1 Westbound On-Ramp would satisfy the signal warrant analysis. As such, for analysis purposes the intersection of Kunia Road/ H-1 Westbound On-Ramp has been considered as a signalized intersection under Year 2030 Conditions. Traffic signal warrant analysis sheets for Year 2030 Conditions are included in Appendix D-1.

Therefore, Year 2030 Conditions encompass 19 study intersections, of which 17 intersections are signalized and two are two-way stop-controlled intersections. The two unsignalized intersections are Farrington Highway/ East Old Fort Weaver Road and Farrington Highway/ West Old Fort Weaver Road.

The new interchange of the North-South Road with H-1 Freeway would be operational in year 2030. Therefore, under Year 2030 Conditions, the following four additional ramp-freeway junctions would be analyzed along with the five study ramp-freeway junctions studied under Existing Conditions:

- North-South Road/ H-1 (Eastbound On-Ramp)
- North-South Road/ H-1 (Eastbound Off-Ramp)
- North-South Road/ H-1 (Westbound On-Ramp)
- North-South Road/ H-1 (Westbound Off-Ramp)

HO'OPILI TIAR

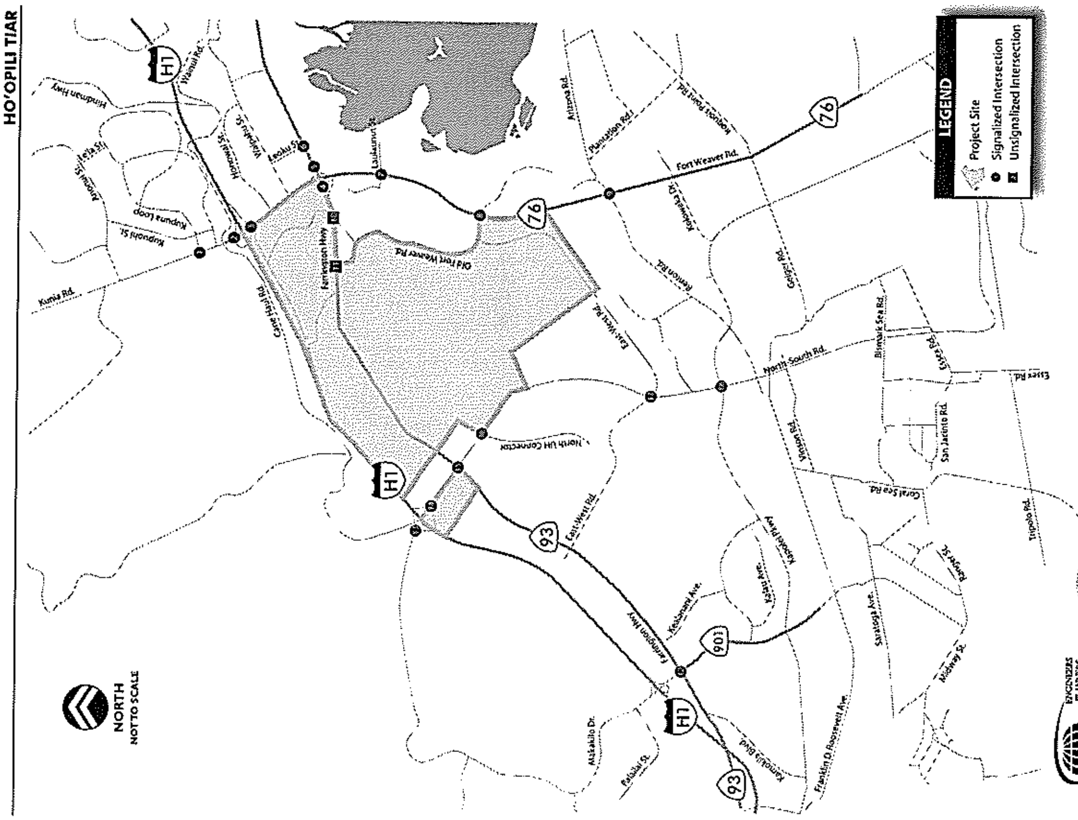


Figure 3-1
STUDY INTERSECTIONS - YEAR 2030 CONDITIONS

Table 3.1
Planned and Approved Transportation Network Improvement Projects

#	Roadway	Location	Proposed Improvement
1	H-1 Freeway	Ke'ehi Interchange – Kunia Interchange	Construct WB zipper lane for PM peak period
		City of Kapolei	Construct a new interchange between Pālailai and Makakilo Interchanges
		Makakilo Interchange	Construct a new EB off-ramp and a new WB on-ramp
		Waiawa Interchange – Makakilo Interchange	Construct 1 HOV lane in each direction
		Waiawa Interchange – Paiwa Interchange	Widen H-1 WB from 2 to 3 lanes in AM peak, from 4 to 5 lanes in PM peak
2	Farrington Hwy.	Kapolei.Golf Course Rd. – W/O Fort Weaver Rd.	Widen from 2 to 4 lanes
		W/O Fort Weaver Rd. – Waiawa Interchange	Widen by 1 lane in each direction
3	Fort Barrette Rd.	Farrington Hwy. – Franklin D Roosevelt Ave.	Widen from 2 to 4 lanes
4	Fort Weaver Rd.	Farrington Hwy. – Geiger Rd.	Widen from 4 to 6 lanes
5	Kapolei Pkwy.	Kamokila Blvd. – Fort Barrette Rd.	Construct 6-lane parkway extension
		'Ewa Village Boundary – Renton Rd.	Construct 6-lane parkway extension
		Geiger Rd. – Papipi Rd.	Construct 4-lane parkway extension
		Ali'inui Dr. – Hanua St.	Construct 4-lane parkway extension
		Hānu'a St. – Kalaeloa Blvd.	Construct 6 lane parkway extension
6	Kunia Rd.	Anonui St. – Kupuna Loop	Widen from 2 to 4 lanes
		Kupuna Loop – Farrington Hwy.	Widen from 4 to 6 lanes
		Intersection Kunia Rd./ H-1 EB Ramps	Add 1 lane EB loop on-ramp
7	Makakilo Dr.	Makakilo Dr. – North South Rd.	Extend Makakilo Dr. south to H-1 Freeway as 4-lane roadway
8	North-South Rd.	Kapolei Pkwy. – Interstate Route H-1	Widen from 3 to 6 lines
		Kapolei Pkwy. – Franklin D Roosevelt Ave.	Construct 6-lane extension
9.	East-West Rd	North-South Road – Old Fort Weaver Rd	Construct new road

Source: Oahu Regional Transportation Plan 2030 & on-going EWA Roadway Connectivity Study

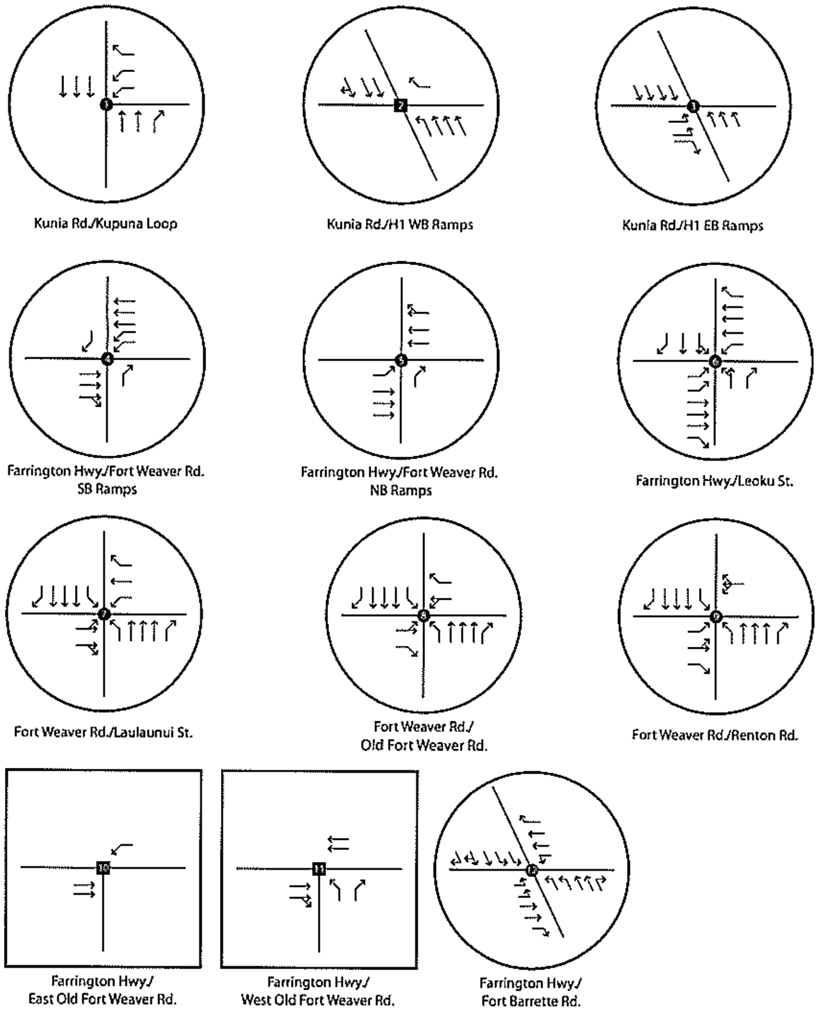


Figure 3-2A
INTERSECTION GEOMETRIC CONFIGURATIONS
YEAR 2030 (NO PROJECT) CONDITIONS
100061/DEC 2007-12/10/07

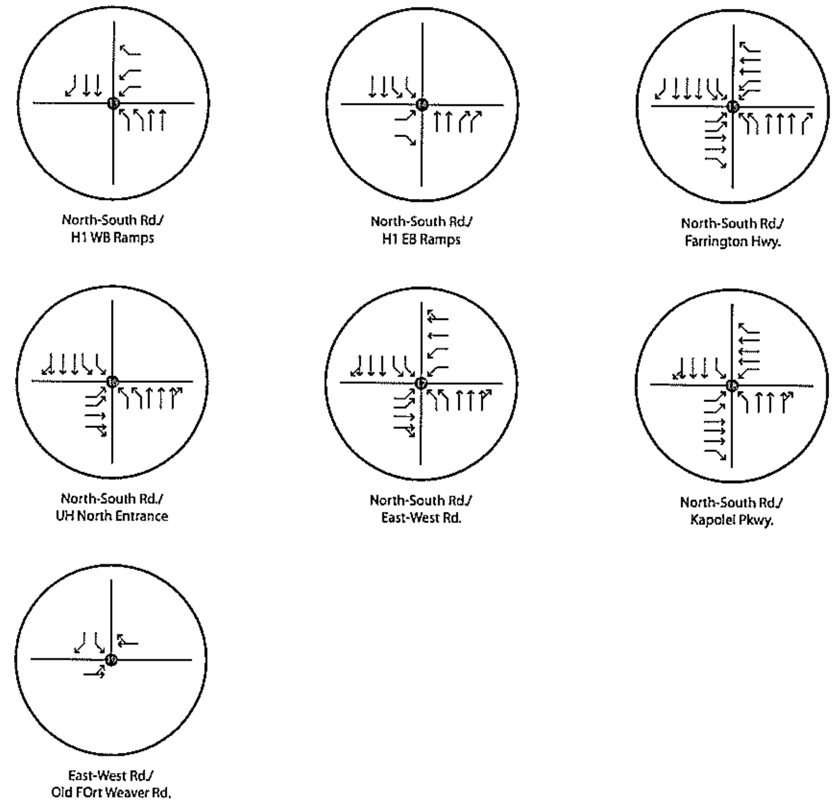


Figure 3-2B
INTERSECTION GEOMETRIC CONFIGURATIONS
YEAR 2030 (NO PROJECT) CONDITIONS
100061/DEC 2007-12/10/07

3.3 2030 BASELINE CONDITIONS TRAFFIC ESTIMATE

Traffic volumes under Year 2030 Conditions were estimated based on the forecasts provided by the Year 2030 Oahu Metropolitan Planning Organization (OMPO) Transportation Model. Appendix E-1 presents the land use assumptions contained in the OMPO Model. This approach results in a cumulative impact assessment for future conditions and takes into account any anticipated developments expected by year 2030 near the project, plus the expected growth in housing and employment for the remainder of the region.

The OMPO Model study area is divided into 23 districts. The most recent version of the OMPO Model estimates future travel demand for the entire O'ahu region based on the UrbanSim modeling forecasts for year 2030.

Within the OMPO model, the entire study area covering the O'ahu region is divided into approximately 763 geographic areas, known as Transportation Analysis Zones (TAZs). For each TAZ, the model estimates the travel demand based on the population and employment assumptions, determines the origin, destination, and mode of travel for each trip and assigns those trips to the transportation network. This model output was used to determine the traffic volumes at the study intersections and the freeway segments for year 2030.

Since the OMPO model was developed as a tool to forecast future traffic volumes on major regional traffic facilities and on major local streets, post-processing of the model output was conducted to identify future intersection turning movement volumes. The AM and PM peak hour roadway segment volumes for each of the approaches of the intersections under year 2030 conditions as predicted by the OMPO Transportation Model were utilized to calculate the turning movement volumes for year 2030. These Year 2030 intersection turning movement volumes were developed using 'Furness' process. The 'Furness' process used by WSA is in accordance with *NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning & Design (Chapter 8)*. This process involves balancing the intersection volumes using an iterative process to compare them to the existing traffic distribution. The iterative process seeks to balance the total inbound and outbound volumes from each approach as projected by the transportation model.

Figures 3-3A, 3-3B, and 3-3C depict the Year 2030 peak hour intersection turning movement volumes as developed using the methodology described in the preceding paragraphs.

The traffic study conducted for the University of Hawai'i West Oahu campus indicates that several major roadways also considered part of the proposed project would be improved by 2009 and 2025. The following improvements would take place by year 2009: H-1 Freeway and Farrington Highway are assumed to be widened, and a new North-South Road, interchange at H-1 Freeway and connection to the completed Kapolei Parkway are anticipated. Based on the 2030 O'ahu Regional Transportation Plan (ORTP), the high-occupancy vehicle (HOV) lanes on H-1 Freeway are planned to be extended from Waiawa Interchange (H-1/H-2 Merge) to the Makakilo Interchange.

Note that both the State of Hawai'i Department of Transportation (HDOT) and the City and County of Honolulu were consulted on the potential timing of these projects. Road improvements anticipated by Year 2025 include the widening of Fort Barrette Road and Forth Weaver Road, additional roadways proposed by Ho'opili and East Kapolei I and the completion of the East-West Connector Road between Farrington Highway and Fort Weaver Road. As such, these improvements were assumed to be in place under Year 2030 conditions.

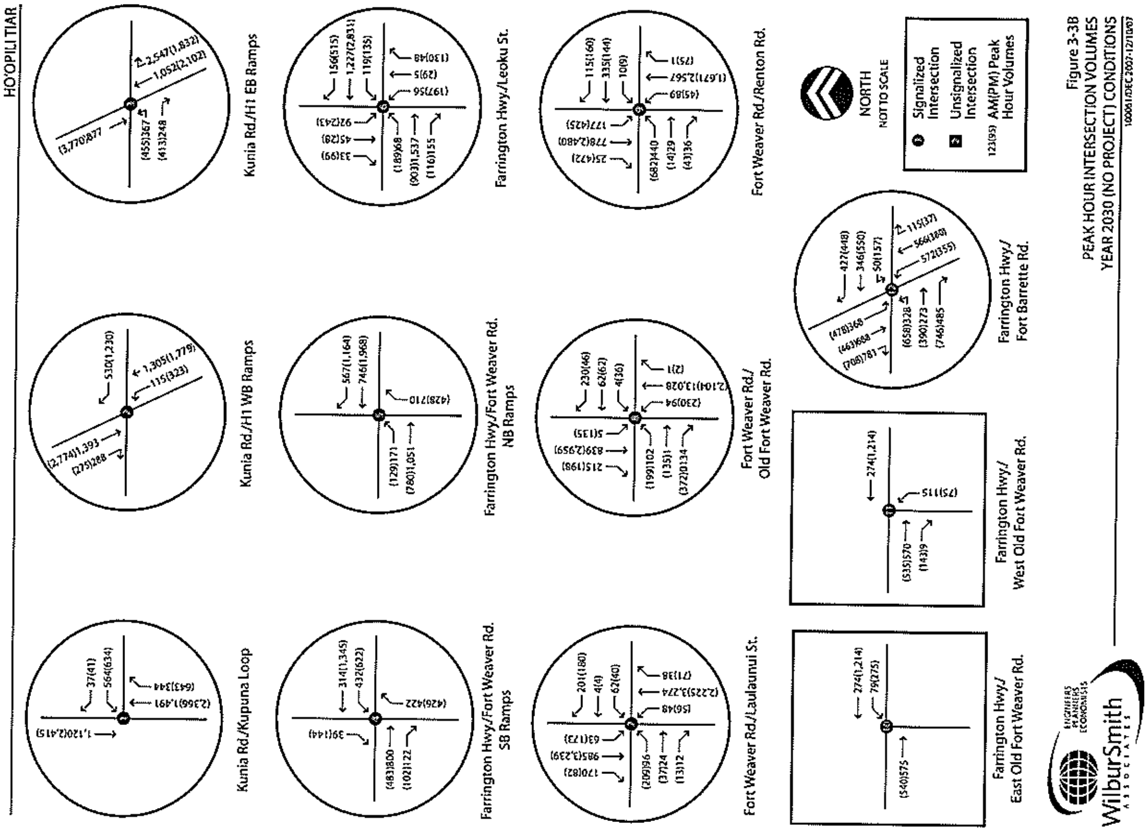


Figure 3-3B
PEAK HOUR INTERSECTION VOLUMES
YEAR 2030 (NO PROJECT) CONDITIONS
100061/DEC 2007-12/10/07

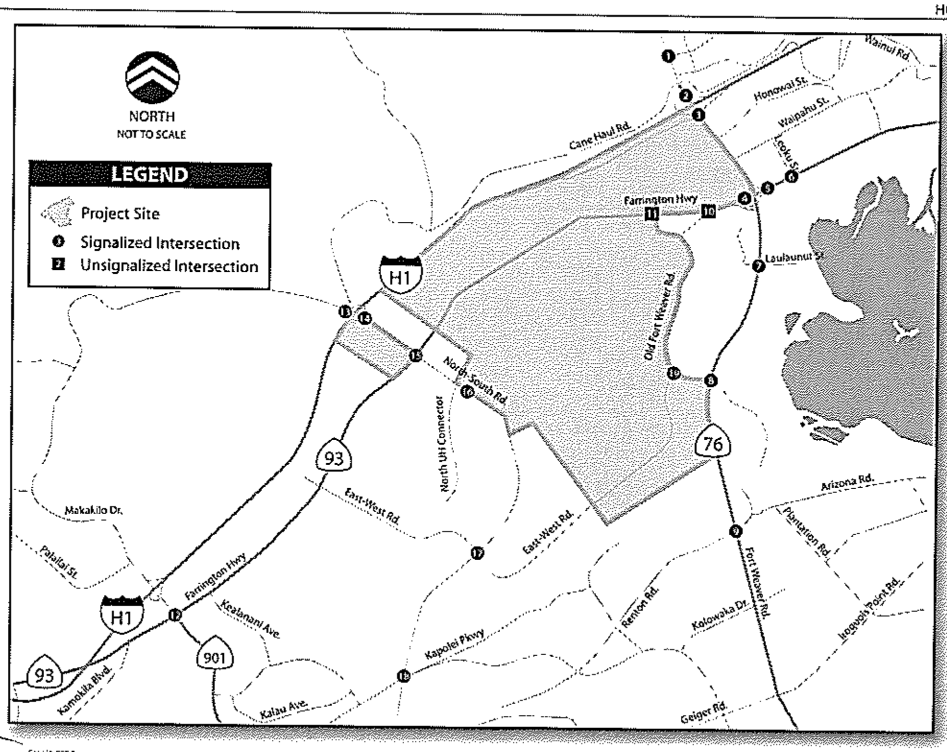


Figure 3-3A
PEAK HOUR INTERSECTION VOLUMES
YEAR 2030 (NO PROJECT) CONDITIONS
100061/Draft October/Figure 3-3A map - 10/17/07

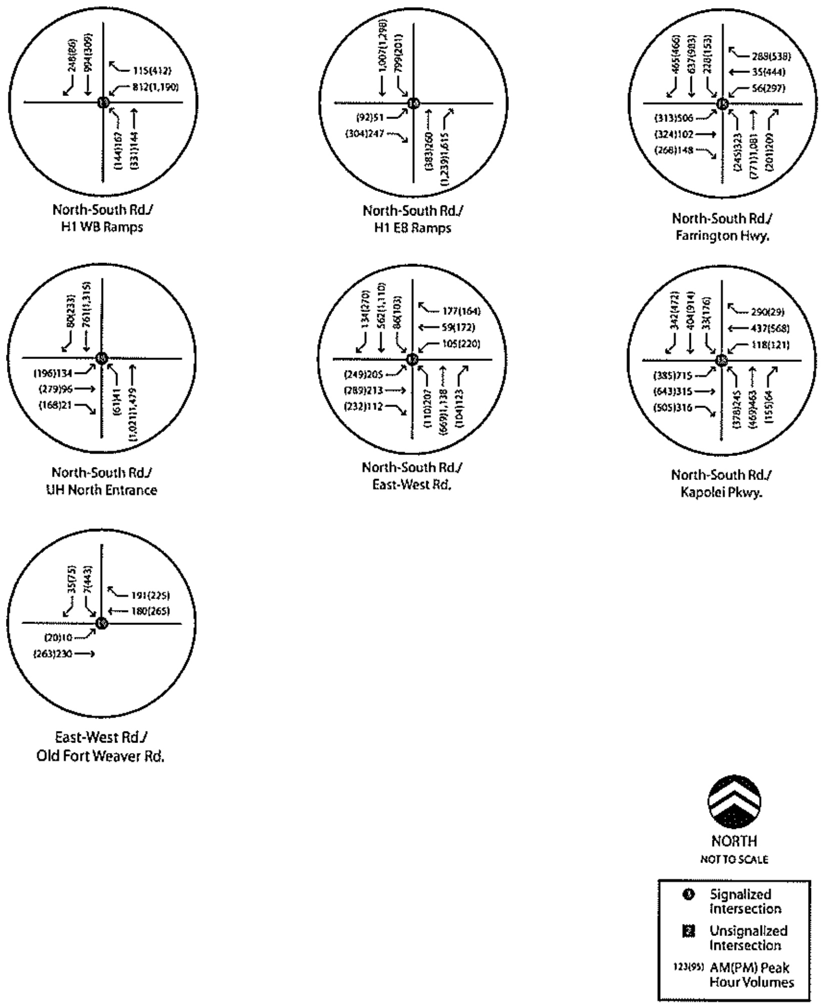


Figure 3-3C
PEAK HOUR INTERSECTION VOLUMES
YEAR 2030 (NO PROJECT) CONDITIONS
100061/DEC 2007-12/10/07

3.4 2030 BASELINE INTERSECTION OPERATING CONDITIONS

Using the volumes presented in Figure 3-3 and with the proposed improvement plans in Year 2030 as discussed in *Section 3.2*, the traffic conditions at the study intersections were calculated for the Year 2030 Baseline AM and PM peak hours. Table 3.2 presents the Year 2030 Baseline delays and LOS values of the study intersections, while the intersection analysis worksheets are included in Appendix A-2.

During the Year 2030 AM peak hour, 17 of the 19 study intersections would operate under acceptable conditions (LOS D or better). The two study intersections that would operate under unacceptable conditions (LOS E or worse) are:

- Fort Weaver Road/ Renton Road
- Farrington Highway/ Fort Barrette Road

During Year 2030 PM peak period, the study intersections would operate at LOS D or better with the exception of the following three intersections:

- Fort Weaver Road/ Renton Road
- Farrington Highway/ West Old Fort Weaver Road
- Farrington Highway/ Fort Barrette Road

The intersection at Farrington Highway/ West Old Fort Weaver Road would operate at LOS F, while the other two intersections would operate at LOS E.

Figures 3-4A1, 3-4A2, and 3-4A3; 3-4B1, 3-4B2, and 3-4BC exhibit the LOS and delay values for each of the turning movements at the study intersections during the AM and PM Peak Hour, respectively.

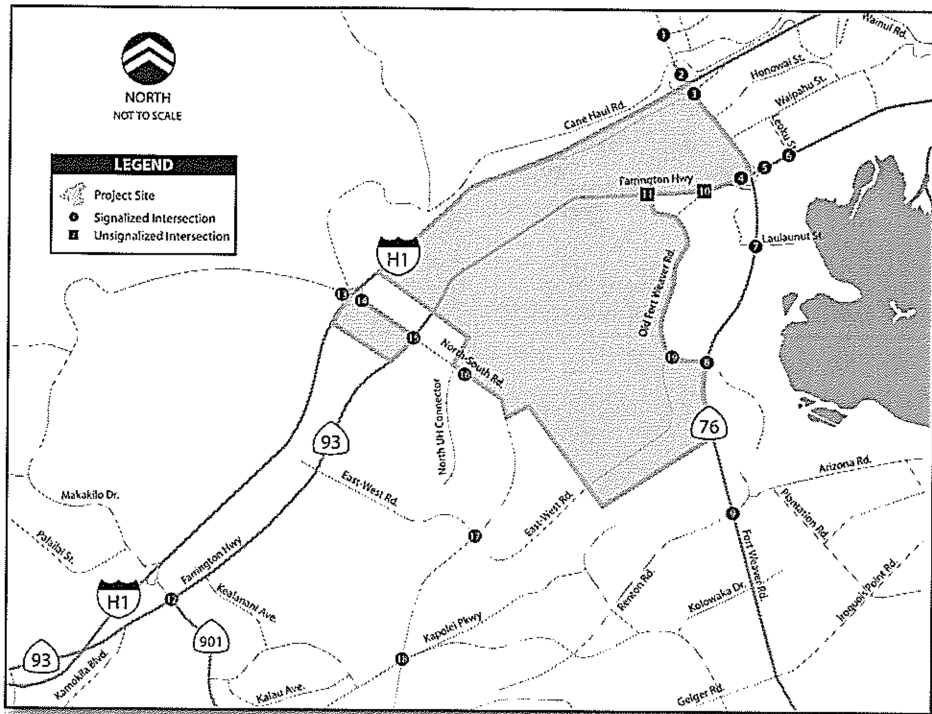


Figure 3-4A1
AM PEAK HOUR LOS AND DELAY VALUES
YEAR 2030 (NO PROJECT) CONDITIONS
100061/Draft October/Figure 3-4A map - 10/17/07

Table 3.2
Peak Hour Intersection Operations – Year 2030 Conditions

#	Intersection	Control	Year 2030					
			AM Peak			PM Peak		
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS
1	Kunia Rd./ Kunia Loop	Signal	12.8	0.70	B	17.1	0.90	B
2	Kunia Rd./ H-1 WB On-Ramp[A]	Signal	3.3	0.47	A	14.1	0.92	B
3	Kunia Rd./ H-1 EB Ramps	Signal	8.9	0.37	A	8.8	0.85	A
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	5.2	0.41	A	14.0	0.42	B
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	3.0	0.48	A	8.0	0.83	A
6	Farrington Hwy./ Leokū St.	Signal	18.0	0.63	B	47.7	0.88	D
7	Fort Weaver Rd./ Laulaunui St.	Signal	29.8	0.90	C	26.3	0.89	C
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	16.7	0.89	B	45.0	1.03	D
9	Fort Weaver Rd./ Renton Rd.	Signal	**78.1**	**1.08**	**E**	**63.4**	**1.03**	**E**
10	Farrington Hwy./ East Old Fort Weaver Rd.	TWSC	16.4 (WB)	0.21 (WB)	C	32.0 (WB)	0.71 (WB)	D
11	Farrington Hwy./ West Old Fort Weaver Rd.	TWSC	22.0 (NB)	0.37 (NB)	C	**55.4 (NB)**	**0.55 (NB)**	**F**
12	Farrington Hwy./ Fort Barrette Rd.	Signal	62.7	0.77	**E**	67.5	0.88	E
13	North-South Rd./ H-1 WB Ramps	Signal	32.4	0.68	C	25.6	0.59	C
14	North-South Rd./ H-1 EB Ramps	Signal	38.1	0.74	D	15.7	0.62	B
15	North-South Rd./ Farrington Hwy.	Signal	35.2	0.61	D	35.8	0.76	D
16	North-South Rd./ North UH Connector	Signal	7.3	0.39	A	13.5	0.47	B
17	North-South Rd./ East-West Road	Signal	27.0	0.63	C	28.6	0.62	C
18	North-South Rd./ Kapolei Pkwy.	Signal	34.8	0.75	C	54.2	0.88	D
19	East-West Rd./ Old Fort Weaver Rd.	Signal	22.3	0.24	C	20.6	0.62	C

Source: Wilbur Smith Associates, 2007

NOTES:
A - This location is stop-controlled under existing conditions, but is signalized after meeting the traffic signal warrants under year 2030 conditions.
TWSC – Two-way Stop-Control
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

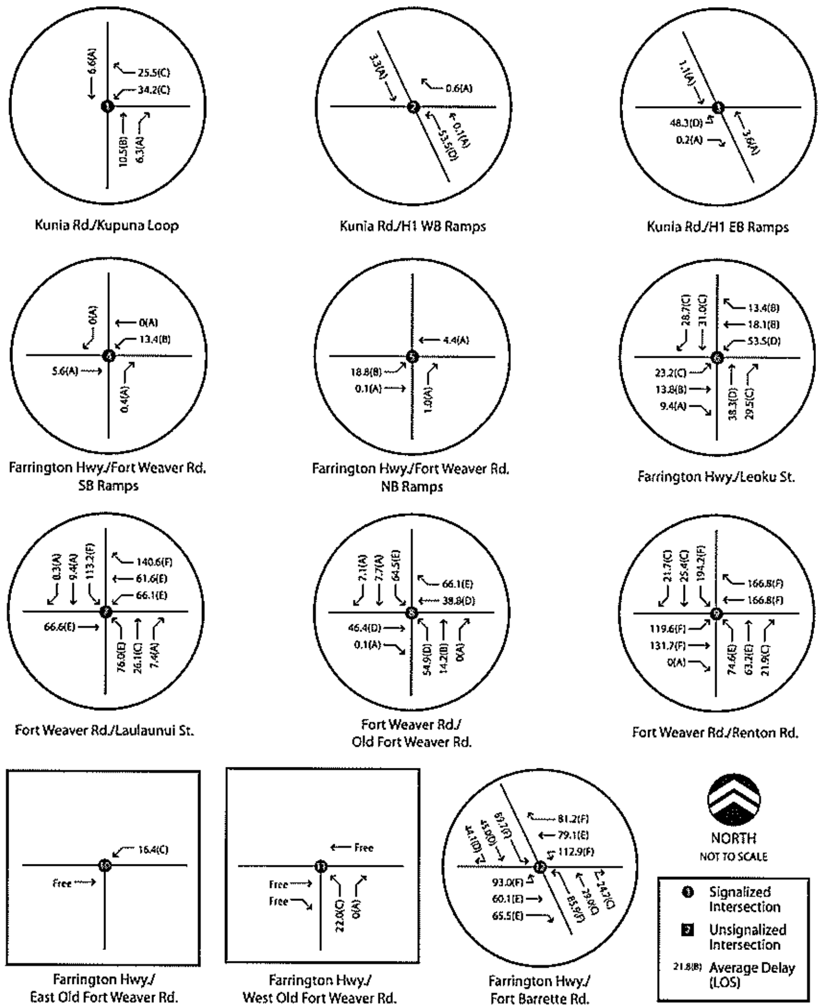


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Figure 3-4A2
AM PEAK HOUR LOS AND DELAY VALUES
YEAR 2030 (NO PROJECT) CONDITIONS

100061/DEC 2007-12/10/07

HO'OPILI TIAR

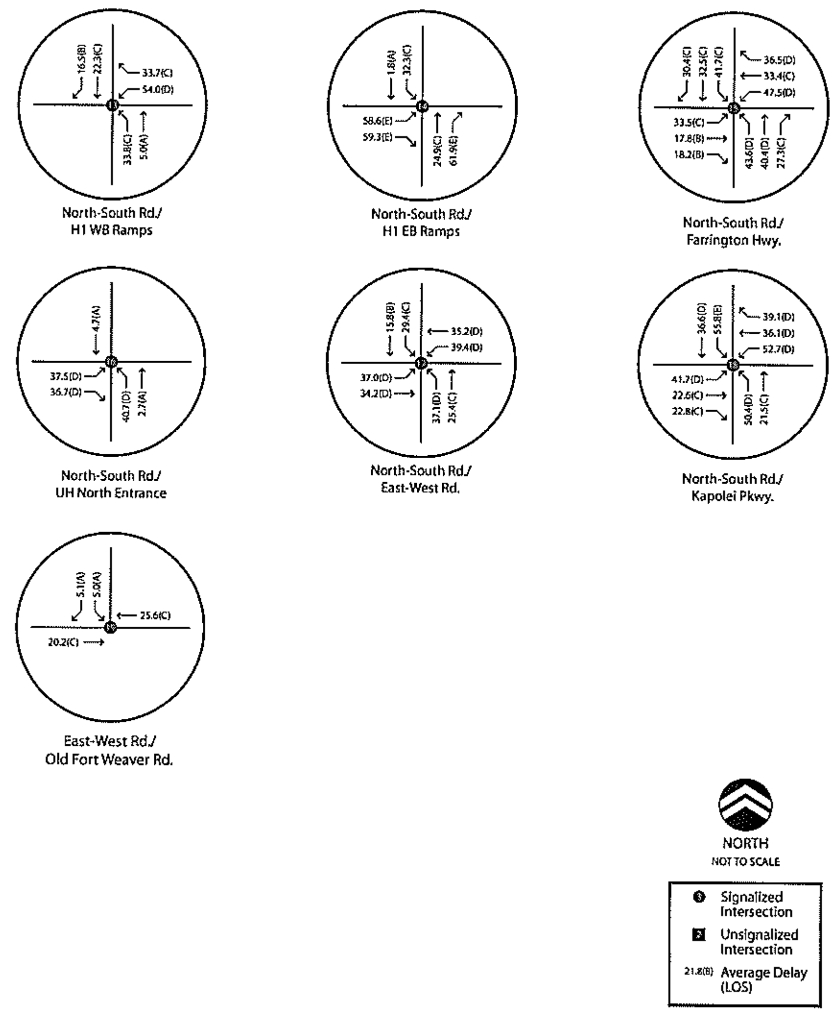

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Figure 3-4A3
AM PEAK HOUR LOS AND DELAY VALUES
YEAR 2030 (NO PROJECT) CONDITIONS

100061/DEC 2007-12/10/07

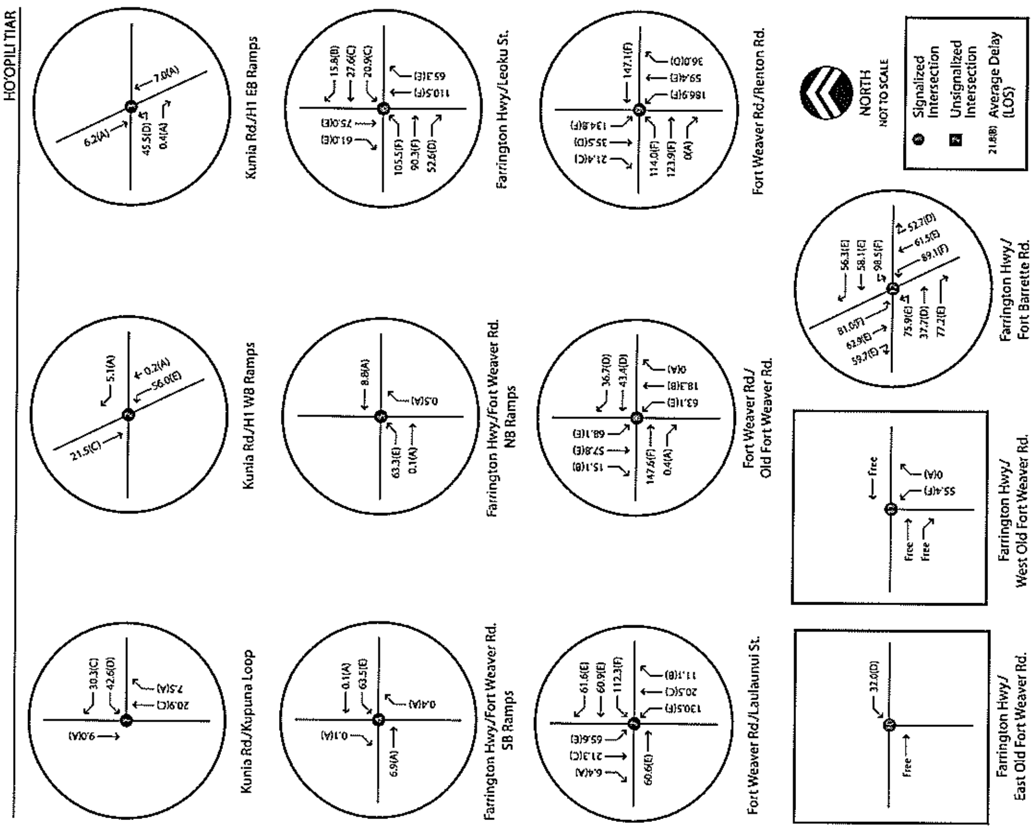


Figure 3-4B2
PM PEAK HOUR LOS AND DELAY VALUES
YEAR 2030 (NO PROJECT) CONDITIONS

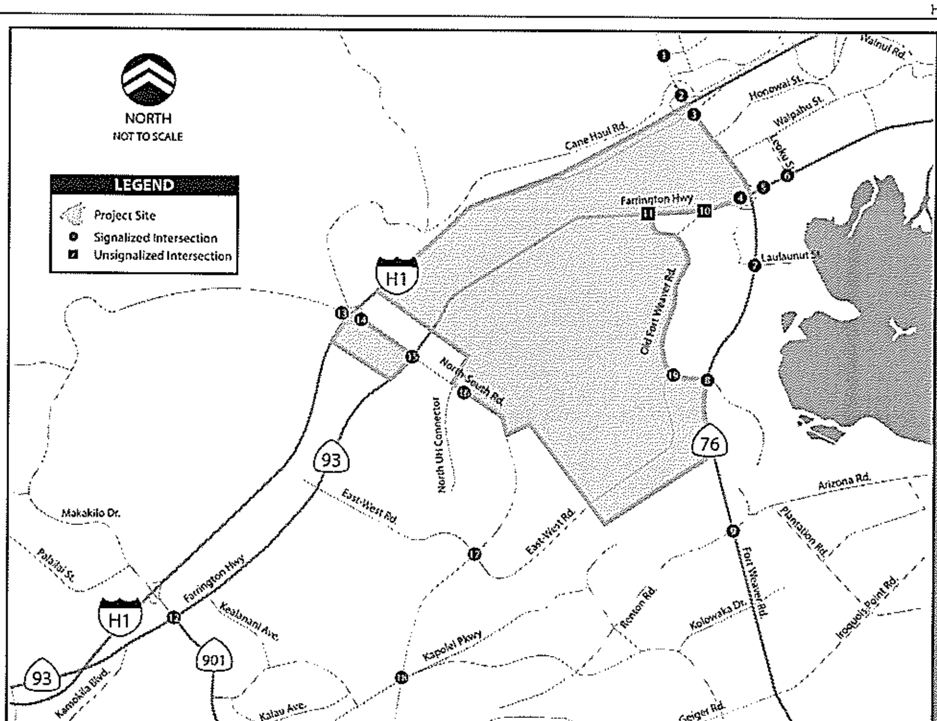


Figure 3-4B1
PM PEAK HOUR LOS AND DELAY VALUES
YEAR 2030 (NO PROJECT) CONDITIONS
100061/Draft October/Figure 3-4A map - 10/17/07

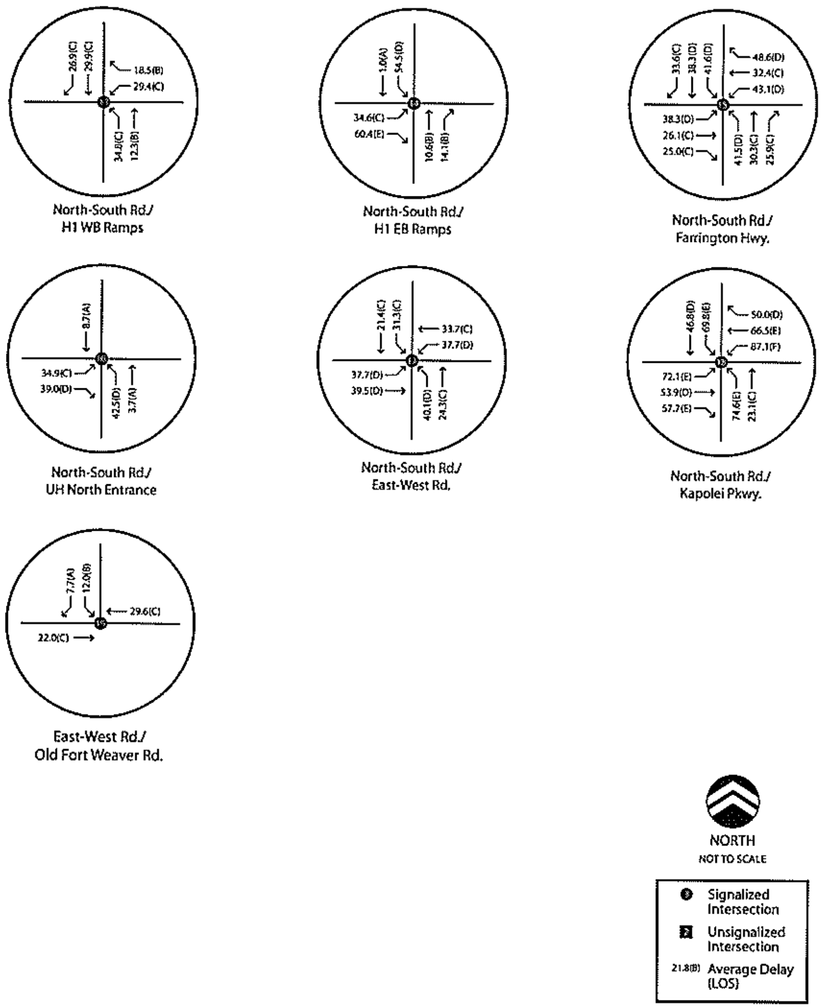


Figure 3-4B3
PM PEAK HOUR LOS AND DELAY VALUES
YEAR 2030 (NO PROJECT) CONDITIONS

3.5 FREEWAY SEGMENT OPERATING CONDITIONS

Table 3.3 presents the operating conditions of the study freeway segments for year 2030 AM and PM peak hours. During the Year 2030 AM peak hour, six of the 10 study freeway segments would operate under acceptable conditions (LOS D or better). Freeway segments that would operate under unacceptable conditions (LOS E or worse) are:

- H-1 Eastbound (south of Makakilo Drive) – LOS E
- H-1 Eastbound (west of Kunia Road) – LOS F
- H-1 Eastbound (west of Pāiwa Street) – LOS E
- H-1 Eastbound (east of Kamehameha Highway) – LOS E

Under Year 2030 PM peak hour conditions, the following four freeway segments would operate under unacceptable conditions:

- H-2 Northbound (at Ka Uka Boulevard) – LOS F
- H-1 Westbound (south of Makakilo Drive) – LOS F
- H-1 Westbound (west of Kunia Road) – LOS E
- H-1 Westbound (east of Kamehameha Highway) – LOS E

The other six freeway segments would operate at LOS D or better. Figure 3-5 exhibits the volumes and LOS values of the study freeway segments under Year 2030 Conditions.

Table 3.3
Peak Hour Freeway Segment Operations – Year 2030 Conditions

#	Freeway	Segment	AM Peak Volume	AM Peak Density[1]	AM Peak LOS	PM Peak Volume	PM Peak Density	PM Peak LOS
1	H-1 EB	S/O Makakilo Dr.	5434	**37.8**	**E**	4680	31.3	D
2	H-1 EB	W/O Kunia Rd.	8197	**>45**	**F**	5833	28.5	D
3	H-1 EB	W/O Pāiwa St.	9906	**43.4**	**E**	7137	27.2	D
4	H-1 EB	E/O Kamehameha Hwy.	7512	**38.8**	**E**	4249	28.4	D
5	H-2 NB	At Ka Uka Blvd.	3184	21.3	C	6220	**>45**	**F**
6	H-1 WB	S/O Makakilo Dr.	3259	21.8	C	6365	**>45**	**F**
7	H-1 WB	W/O Kunia Rd.	3735	18.3	C	7860	**43.3**	**E**
8	H-1 WB	W/O Pāiwa St.	4366	16.6	B	7931	25.2	C
9	H-1 WB	E/O Kamehameha Hwy.	3069	20.5	C	7766	**42.2**	**E**
10	H-2 SB	At Ka Uka Blvd.	6273	30.7	D	4616	22.5	C

Source: Wilbur Smith Associates, 2007

NOTES:
Density is given in pc/mi/ln.
Bold represents LOS E or F.
1 – Lower density does not necessarily indicate a lower LOS. This is because the LOS is calculated based upon a number of factors including: merge influence area, length of the acceleration lane, etc. See Appendix F for the HCM methodology used to calculate the LOS for Freeway Segments.

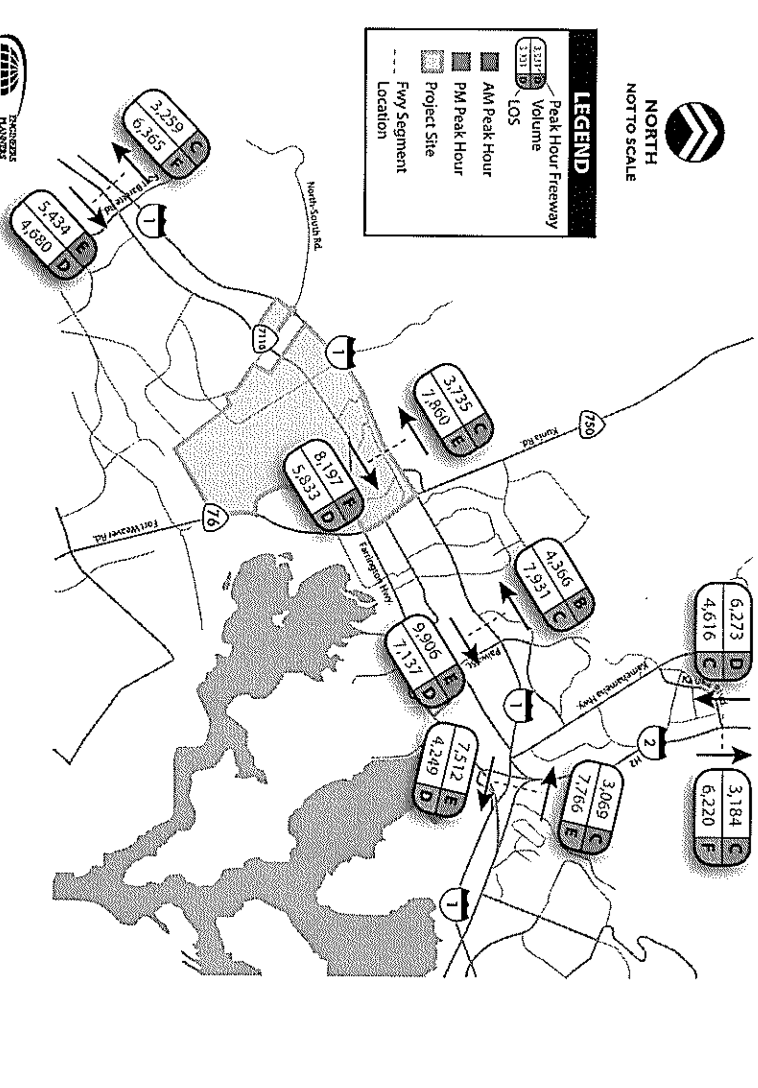
3.6 RAMP-FREEWAY JUNCTION OPERATING CONDITIONS

Table 3.4 presents the operating conditions of the ramp-freeway junctions under Year 2030 Conditions (Future Conditions). The calculation worksheets are included in Appendix C-2.

Under Year 2030 AM peak hour conditions, seven of the 10 study ramp-freeway junctions would operate at LOS D or better (acceptable conditions). The three ramp-freeway junctions that would operate under unacceptable conditions are:

- H-1/ Fort Weaver Road (Eastbound Off-Ramp)
- H-1/ Fort Weaver Road (Eastbound On-Ramp)
- H-1/ Fort Weaver Road (Eastbound Loop On-Ramp)

Similar to AM peak hour, during PM peak hour, seven of the 10 study ramp-freeway junctions would operate under acceptable conditions (LOS D or better). The remaining three that would operate under unacceptable conditions (LOS E or worse) are: H-1/ Fort Weaver Road (Westbound Off-Ramp), H-1/ Fort Weaver Road (Westbound Loop Off-Ramp), and H-1/ North-South Road (Westbound Off-Ramp).



Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

Figure 3-5
YEAR 2030 (NO PROJECT) FREEWAY OPERATING CONDITIONS
100061/BASE - 12/20/06

Table 3.4
Ramp-Freeway Junction Operations – Year 2030 Conditions

#	Location	Ramps	Peak Hour	Density	LOS
1	H-1/ Fort Weaver Road	WB Off-Ramp	AM Peak	16.0	B
2	H-1/ Fort Weaver Road	WB Loop Off-Ramp	AM Peak	1.3	A
3	H-1/ Fort Weaver Road	WB On-Ramp	AM Peak	15.0	B
4	H-1/ Fort Weaver Road	EB Off-Ramp	AM Peak	37.4	E
5	H-1/ Fort Weaver Road	EB On-Ramp	AM Peak	24.8	F
6	H-1/ Fort Weaver Road	EB Loop On-Ramp	AM Peak	26.3	F
7	H-1/ North-South Road	WB Off-Ramp	AM Peak	20.3	C
8	H-1/ North-South Road	WB On-Ramp	AM Peak	13.5	B
9	H-1/ North-South Road	EB Off-Ramp	AM Peak	25.0	C
10	H-1/ North-South Road	EB On-Ramp	AM Peak	28.8	D
11	H-1/ Fort Weaver Road	WB Off-Ramp	PM Peak	38.0	F
12	H-1/ Fort Weaver Road	WB Loop Off-Ramp	PM Peak	19.9	F
13	H-1/ Fort Weaver Road	WB On-Ramp	PM Peak	26.0	C
14	H-1/ Fort Weaver Road	EB Off-Ramp	PM Peak	28.8	D
15	H-1/ Fort Weaver Road	EB On-Ramp	PM Peak	18.3	B
16	H-1/ Fort Weaver Road	EB Loop On-Ramp	PM Peak	20.4	C
17	H-1/ North-South Road	WB Off-Ramp	PM Peak	41.1	F
18	H-1/ North-South Road	WB On-Ramp	PM Peak	27.7	C
19	H-1/ North-South Road	EB Off-Ramp	PM Peak	21.0	C
20	H-1/ North-South Road	EB On-Ramp	PM Peak	17.0	B

Source: Wilbur Smith Associates, 2007

NOTES:
DEC – Demand Exceeds Capacity
Density is presented in pc/mi/ln.
Bold type indicates LOS F.

Chapter 4
PROJECT TRAFFIC ESTIMATE

This chapter discusses the methodology and assumptions used to estimate the traffic characteristics of the proposed Project. The initial process involves the estimation of trips that would be generated by the proposed Project, and the distribution and assignment of these trips on the area roadways.

This chapter presents the generation distribution, and assignment (routing) of trips to/from the proposed project under the following two scenarios:

- **Scenario A: With Transit Corridor** – Under this scenario, it is assumed that the Honolulu High-Capacity Transit Corridor is constructed and would pass through the proposed Project site. The presence of transit corridor within the project site would affect the numbers of vehicle-trips generated by the proposed project land uses. The transit facility would attract an increased portion of the person-trips generated from the proposed Project; thus increasing the project-related transit trips and reducing the project-related vehicle trips. Thus a transit reduction factor was applied while developing the Project trip generation under this scenario;

  The proposed transit alignment would run diagonal in Ho'opili along the University of Hawai'i Road B, turn down North-South Road in the median, and stop at the Kroc Center in the North-South median. The median would follow the grasslined channel of the realigned Kaloi gultch. Two stops are proposed within Ho'opili, the exact locations of which are still being determined. It should be noted that increased ridership is likely to occur depending on the location of the stops, particularly based on the density of the area surrounding the stop.

- **Scenario B: Without Transit Corridor** – Under this scenario, it is assumed that the Honolulu High-Capacity Transit Corridor is either not constructed under the Year 2030 Conditions (Future Conditions) or is not passing through the proposed project site. In this scenario, no transit reduction factor was applied while developing the project trip generation.

The amount of traffic associated with a project is estimated using a three step process:

1. Trip generation
2. Trip distribution
3. Trip assignment

In the first step, the amount of traffic entering and exiting the Project land uses is estimated on a daily and peak hour basis. In the second step, the directions that vehicles use to approach and depart the project site are estimated. In the final step, the trips are assigned to specific street segments and intersection turning movements.

4.1 PROJECT TRIP GENERATION

This section discusses the methodology involved in the estimation of the project traffic and provides an estimate of the total number of inbound and outbound trips generated by the project during weekday AM and PM peak hours. The methodologies involved in the estimation of project trips are discussed in the following sub-sections. The approach for estimating the project trip generation is as follows:

1. Categorize project land uses into appropriate Institute of Transportation Engineers (ITE) Trip Generation or San Diego Council of Governments (SANDAG) or URBEMIS Categories
2. Identify trip generation rates and/or trip generation equations
3. Apply trip generation reductions
4. Calculate Final Trip Generation

The trip generation model for the project includes adjustments for internal project trips, as well as reductions resulting from the mixed uses and transit oriented development components. Trip Generation rates are reported in Tables 4.1 and 4.2 for Scenario A: With Transit Corridor Scenario and Scenario B: Without Transit Corridor Scenario, respectively.

It should be noted that for those land uses where an equation is applied to calculate the project trip generation, the trip generation rate represents the calculated rate based on the results of the equation. For those uses when a trip generation rate is applied, the ITE based trip generation rate or the SANDAG based trip generation is reported

Using the information provided above, the proposed project under "With Transit Scenario Corridor" is estimated to generate 140,920 daily trips, 7,069 morning peak hour trips (3,183 inbound and 3,886 outbound), and 12,077 evening peak hour trips (6,122 inbound and 5,955 outbound).

Under "Without Transit Corridor Scenario", the proposed project is estimated to generate 158,669 daily trips, 9,172 morning peak hour trips (4,167 inbound and 4,996 outbound), and 13,776 evening peak hour trips (6,970 inbound and 6,806 outbound).

4.1.1 ITE Trip Generation

This calculation involved using Institute of Transportation Engineers (ITE) *Trip Generation, 7th Edition* handbook to evaluate the total traffic generated by the proposed project. The trip generation rates and equations provided in the *ITE Trip Generation, 7th Edition* handbook for the various land uses present in the proposed project were used to calculate the trips generated/attracted by each of the components of the project. For certain land uses, the ITE trip generation rates might not be appropriate to use in this study. The trip generation rates provided by San Diego Association of Governments (SANDAG)[1] were used for identifying the trip generation for the following land uses:

[1]San Diego Traffic Generators, April 2002, San Diego Association of Governments

- Specialty Retail Center
- Regional Park
- Multi-Purpose Recreational Facility

An appropriate ITE category was applied to each of the proposed land uses within the project site. The following section explains each trip generation rate applied for each land use.

Retail Uses: The specialty retail trip generation rate (SANDAG code: Specialty Retail/Strip Commercial) was applied to the retail sections within the Live-Work High Density and Live-Work Mixed Use areas. Specialty retail is described as small strip shopping centers and would be applicable to these developments as it is assumed there is no heavy commercial with the live-work high density and mixed-use areas. The retail developments within the business and commercial areas are assumed to be large shopping centers and ITE code 820 was used to identify the trip generation.

Residential Uses: The project description indicates that the residential uses on the site will contain medium to high-density residential units. These units could consist of condominiums, attached town homes, or small-lot single-family homes. Given the variety of possible housing types on this site, a general residential category (Land Use Code 230 – Residential Condos/Townhouses), was employed. The residential units for both the Live-Work High Density section and the Live-Work Mixed Use are assumed to be Residential Condominiums or Townhouses, which fall under ITE Trip Generation Code 230. The fitted curve equation that best fits this type of land use is an exponential equation that determines the number of trips generated based on the number of dwelling units. Since the equation is not linear the trip generation rate per dwelling unit varies depending on the number of units. In this case, as the number of dwelling units increase, the trip generation rate per unit decreases. This may be explained by carpooling with neighbors or an increase in internal social visits.

Office Uses: The office units for the Live-Work High Density section, the business and commercial areas and within the light industrial and business areas are assumed to be General Office Buildings, which fall under ITE Trip Generation Code 710.

Industrial Uses: The industrial units for the Light Industrial/Business section are assumed to be General Light Industries, which fall under ITE Trip Generation Code 110.

Park Uses: The park units for the Parks within the development include regional parks and multi-purpose recreational facilities, for which the park trip generation rate (SANDAG code: Parks) was applied.

School Uses: The school units for the Schools section include middle schools, high schools and elementary schools which fall under ITE Trip Generation Code 522, ITE Trip Generation Code 530, and ITE Trip Generation Code 520, respectively.

4.1.2 External Trip Estimation

The estimated numbers of vehicle trips, as based on the ITE, San Diego, and URBEMIS trip rates, were adjusted as described in the following paragraphs to estimate the number of vehicle trips that would be made to/from areas outside the Project. These reflect both reductions in the number of vehicle trips (transit, TDM actions) and those trips that would be made within the Project area.

4.1.2.1 Transit Trip Reduction

The 2030 OMPO Travel Demand Forecasting Model (released August 11, 2006) was used to identify the travel mode splits of the trips generated by the proposed project. As per the OMPO model, the proposed project was contained within three Traffic Analysis Zones (TAZs), namely, TAZs 545, 550, and parts of TAZ 546. Based on the OMPO model results, 6.625 percent of the total daily trips generated by the project were attributed to daily transit trips. The total daily trips were then converted to peak hour trips based on the time-of-day factors (OMPO model documentation, December 17, 2002). This data indicated that 26 percent of the trips would occur during the AM peak period and 17.2 percent of the trips would occur during the PM peak period. Overall, this resulted in a peak hour factor of 14.3 percent for the AM peak hour and 10 percent for the PM peak hour.

This resulted in a reduction of 1,747 trips in the AM peak hour and 1,156 trips in the PM peak hour as a result of transit trips. In other words, there was a reduction of around 15% trips generated in the AM Peak hour and a reduction of around 6% trips in the PM peak hour based on the OMPO model results and the on-board survey data.

4.1.2.2 Pass-By Trip Reduction

The numbers of vehicle trips entering or exiting a retail development include both new vehicle trips and additional stops by vehicles that would be traveling through the development. These additional stops by traffic passing the site to use the retail and services uses are referred to as "pass-by trips." Pass-by trips are made as intermediate stops on the way from an origin to a primary trip destination without a route diversion. For example, trips associated with a gas station or a convenience stop near major highways make intermediate stops while traveling between other destinations. The ITE Trip Generation Handbook (*Trip Generation Handbook, An ITE Recommended Practice, Institute of Transportation Engineers, June 2004, Chapter 5 "Passby, Primary, and Diverted Linked Trips"*) provides a methodology and equations for estimating the proportion of the project-related vehicle trips that would be pass-by trips. This ITE methodology was used in this study and applied to appropriate land uses as show in Tables 4-1 and 4-2.

4.1.2.3 Transportation Demand Management (TDM) Reduction

The URBEMIS model (Version 9.2) was applied to determine trip reductions from the TDM program assumed to be in place as part of the proposed project. It should be noted that this model

has been adopted by California's Air Districts and funded by Caltrans to estimate trips for Smart Growth and Transit Oriented Development projects.

WSA assumed that the proposed project would adopt a TDM program composed of the following measures:

- Free transit passes,
- Employee Telecommuting Program with 1.5 percent participating an average of 1.6 days
- Secure bicycle parking (minimum of 1 space per 20 vehicles)
- Shower and changing facilities
- Guaranteed Ride Home
- Carsharing services
- Information provided on transportation alternatives
- Dedicated Employee Transportation Coordinator
- Vanpooling/Carpooling (preferential parking).

The reduced project trip generation is summarized in Tables 4-1 and 4-2.

4.1.2.4 Internal Trip Capture Reduction

Mixed-use trips (internal capture) refer to any project trips that start and end within a development. For example, a project consisting of both residences and office buildings will generate some mixed-use trips if any of the office workers live in the adjacent residences. The guidelines provided in the ITE Trip Generation Handbook (*Trip Generation Handbook, An ITE Recommended Practice, Institute of Transportation Engineers, June 2004, Chapter 7 "Multi-Use Development"*), together with the OMPO Travel Demand Model were used to estimate this trip reduction. The guidelines were also used to determine if it is appropriate to apply an internal capture factor.

The 2030 OMPO Travel Demand Model designated a certain percentage as internal trips, which originate and end in the project site without leaving the TAZ. The internal trip percentages as calculated from the OMPO model data for residential, office, and retail landuses are 8.4 percent, 7.1 percent, and 10.0 percent, respectively. This trip reduction was applied in the Project trip generation calculations as summarized in Tables 4.1 and 4.2.

Estimated External Project Vehicle Trips

Overall, the proposed Project would generate a total of 140,920 daily trips to or from areas external to the Project. During the weekday AM peak hour, the project is expected to generate 7,069 trips (3,183 inbound/3,886 outbound). During the PM peak hour, the proposed project would generate a total of 12,077 trips (6,122 inbound/5,955 outbound).

4.1.5 Trip Generation Values

Tables 4.1 and 4.2 present the project trips generated during the weekday AM and PM peak periods for Scenario A: With Transit Corridor and Scenario B: Without Transit Corridor, respectively.

Table 4.1
External Trip Estimation - Scenario A: With Transit Corridor Scenario

Land Use	ITE Code	Size /c/	Unit	Average Trip Generation Rate /g/ Daily	Weekday AM	Weekday PM	Directional Split Weekday AM In	Weekday AM Out	Weekday PM In	Weekday PM Out	Trip Generation Daily	Weekday AM Peak Hour In	Weekday AM Peak Hour Out	Weekday AM Peak Hour Total	Weekday PM Peak Hour In	Weekday PM Peak Hour Out	Weekday PM Peak Hour Total
Single-Family Detached Housing /a/	210	5,100	DU	7.59	0.70	0.72	25%	75%	63%	37%	38,717	895	2,685	3,579	2,325	1,365	3,690
Live-Work High Density																	
Residential Condominium/Townhouse /b/	URBEMIS	5,200	DU	2.21	0.23	0.30	17%	83%	67%	33%	18,452	207	1,011	1,218	1,028	507	1,535
Specialty Retail Center /c/	URBEMIS	715.890	ksf	34.87	3% of Daily	9% of Daily	60%	40%	50%	50%	24,963	449	300	749	1,124	1,124	2,247
General Office Building	URBEMIS	393.890	ksf	8.48	1.43	1.32	88%	12%	17%	83%	3,834	494	67	562	88	432	520
Live-Work Mixed Use Commercial HD Residential																	
Residential Condominium/Townhouse /b/	URBEMIS	1,450	DU	2.21	0.30	0.37	17%	83%	67%	33%	6,232	75	364	439	361	178	539
Specialty Retail Center /c/	URBEMIS	123.710	ksf	34.87	3% of Daily	9% of Daily	60%	40%	50%	50%	4,314	77	52	129	194	194	388
Business Commercial																	
General Office Building	710	200.657	ksf	11.37	1.63	1.51	88%	12%	17%	83%	2,281	288	39	327	52	252	304
Shopping Centers /d/																	
Zone F2	820	321.621	ksf	45.12	0.98	4.21	61%	39%	48%	52%	14,511	192	123	315	650	704	1,353
Zone F3	820	354.634	ksf	43.60	0.94	4.07	61%	39%	48%	52%	15,463	204	130	335	693	751	1,444
Zone P1	820	211.335	ksf	52.26	1.16	4.85	61%	39%	48%	52%	11,045	150	96	245	492	533	1,026
Zone V1	820	72.998	ksf	75.82	1.78	6.97	61%	39%	48%	52%	5,535	79	51	130	244	264	509
Zone V3	820	100.582	ksf	67.77	1.56	6.25	61%	39%	48%	52%	6,817	96	61	157	302	327	628
Zone W1	820	339.230	ksf	44.29	0.96	4.13	61%	39%	48%	52%	15,023	199	127	326	673	729	1,402
Light Industrial / Business																	
General Light Industrial	110	800.000	ksf	7.34	1.07	1.23	83%	17%	21%	79%	5,874	709	145	855	206	775	981
General Office Building	710	125.453	ksf	12.66	1.79	1.75	88%	12%	17%	83%	1,589	198	27	225	37	182	219
Parks																	
Regional Parks	SANDAG	33.000	acres	20.00	4% of Daily	8% of Daily	50%	50%	50%	50%	660	13	13	26	27	26	53
Multi-Purpose Recreation Facility	SANDAG	27.000	acres	90.00	2% of Daily	6% of Daily	50%	50%	50%	50%	2,430	25	24	49	73	73	146
Schools																	
Middle School	522	600	Students	1.62	0.41	0.15	55%	45%	52%	48%	972	135	111	246	47	43	90
High School	530	1,000	Students	1.73	0.41	0.31	69%	31%	32%	68%	1,729	281	126	407	99	210	309
Elementary School	520	210	Employees	18.88	7.30	3.41	54%	46%	45%	55%	3,965	828	705	1,533	322	393	715
Total											184,405	5,594	6,257	11,851	9,037	9,062	18,099
Transit Reduction /e/		6.6%									*[illegible]*	*[illegible]*	*[illegible]*	*[illegible]*	*[illegible]*	*[illegible]*	*1,156*
Internal Trip Reduction														15%			6%
Residential		8.4%									5,326	99	341	440	312	172	484
Light Industrial / Office Building		7.1%									964	120	20	140	27	117	144
Retail		10.0%									9,763	145	94	239	437	463	900
Other (Parks) /h/		80.0%									2,472	30	30	60	80	79	159
Schools /j/																	
Middle School		82%	Students/Staff								800	111	91	202	39	35	74
High School		82%	Students/Staff								1,424	231	104	335	82	173	255
Elementary School		82%	Students/Staff								3,265	682	581	1,263	265	324	589
Subtotal											*24,018*	*1,416*	*1,261*	*2,679*	*1,342*	*1,263*	*2,605*
Pass-by Trip Reduction /f/																	
Zone F2		*27.8%*							48%	52%	377				181	196	377
Zone F3		*27.0%*							48%	52%	390				187	203	390
Zone P1		*31.4%*							48%	52%	322				155	167	322
Zone V3		*39.0%*							48%	52%	245				118	127	245
Zone W1		*27.4%*							48%	52%	384				184	200	384
Subtotal											*1,718*	*0*	*0*	*0*	*825*	*893*	*1,718*
TDM Reduction /i/		3.0%									*5,532*	*165*	*188*	*354*	*271*	*272*	*543*
Total											140,920	3,183	3,886	7,049	6,122	5,955	12,077

Source: Wilbur Smith Associates, September 2007

NOTES:
- /a/ All residential low-medium density units are assumed to be single-family detached housing units.
- /b/ All high density live-work residential units are assumed to be residential condominium/townhouses.
- /c/ All retail uses located within the live-work zones are assumed to be Specialty Retail Centers. URBEMIS trip generation rates have been used for Specialty Retail Center. URBEMIS adjusts trip rates based on residential housing density and also includes adjustments based on pedestrian-friendly projects, in which residential land uses are in close proximity to retail and employment land uses.
- /d/ All retail uses located within the commercial zones are assumed to be Shopping Centers.
- /e/ Transit reduction applied to take into account the trips reduced due to the *Honolulu High Capacity Transit Corridor*.
- /f/ Pass-by trip reduction applied only to commercial trips (shopping centers). It was assumed that there would be no pass-by trips in the AM peak period from 6 AM to 8 AM.
- /g/ Average trip generation rates are obtained as a ratio of the total trip generation rates, calculated using *ITE Trip Generation Handbook*.
- /h/ The 80 percent internal trip reduction for parks in the neighborhood is similar to the internal trip reduction for schools.
- /i/ TDM reduction takes into account trip reduction due to TDM alternatives such as staggered work week, telecommuting etc.
- /j/ Internal trip reduction due to schools assumes walking, bicycling and drop-offs by private transit car as the main modes of transportation used by students and staff.

4.2 PROJECT TRIP DISTRIBUTION

This section provides a description of various travel patterns of the project trips from and to the project under Year 2030 Baseline Plus Project Conditions. The Year 2030 OMPO Transportation Model was used to identify the trip distribution of the project. Using the OMPO Model, a select link analysis was performed using the OMPO model to determine separate trip distribution percentages for each land use: office, retail, and residential. Each of these trip distributions present the percentage of vehicles traveling between the project site and each of the different areas surrounding the project site.

Table 4.3 summarizes the trip distribution patterns provided by the OMPO Model under the Year 2030 conditions; Figures 4-1 A, 4-1 B, 4-1 C exhibit the trip distribution patterns for residential, office, and retail land uses, respectively. These three figures present the trip distribution percentages only for the external vehicle trips.

4.3 PROJECT TRIP ASSIGNMENT

Trips generated solely by the proposed Ho'opili Development during the peak hour under Scenario A: With Transit Corridor are presented in Figures 4-2A, 4-2B, and 4-2C; while project trips generated during the peak hour under Scenario B: Without the Transit Corridor are presented in Figures 4-3A, 4-3B, and 4-3C.

Trips generated by the proposed Ho'opili Development are assigned to the roadway system based on the trip generation and trip distribution described in Section 4.1 and 4.2. The resulting intersection turning movement volumes under plus project conditions are discussed and presented in Chapter 5.

Table 4.2
External Trip Estimation - Scenario B: Without Transit Corridor Scenario

Land Use	ITE Code	Size /c/	Unit	Avg. Trip Gen. Rate /g/: Daily	Weekday AM	Weekday PM	Directional Split: Weekday AM In	Weekday AM Out	Weekday PM In	Weekday PM Out	Trip Generation: Daily	Weekday AM Peak Hour In	AM Out	AM Total	Weekday PM Peak Hour In	PM Out	PM Total
Single-Family Detached Housing /a/	210	5,100	DU	7.59	0.70	0.72	25%	75%	63%	37%	38,717	895	2,685	3,579	2,325	1,365	3,690
Live-Work High Density																	
Residential Condominium/Townhouse /b/	URBEMIS	5,200	DU	2.21	0.23	0.30	17%	83%	67%	33%	18,452	207	1,011	1,218	1,028	507	1,535
Specialty Retail Center /c/	URBEMIS	715,890	ksf	34.87	3% of Daily	9% of Daily	60%	40%	50%	50%	24,963	449	300	749	1,124	1,124	2,247
General Office Building	URBEMIS	393,890	ksf	8.48	1.43	1.32	88%	12%	17%	83%	3,334	494	67	562	88	432	520
Live-Work Mixed Use Commercial HD Residential																	
Residential Condominium/Townhouse /b/	URBEMIS	1,450	DU	2.21	0.30	0.37	17%	83%	67%	33%	6,232	75	364	439	361	178	539
Specialty Retail Center /c/	URBEMIS	123,710	ksf	34.87	3% of Daily	9% of Daily	60%	40%	50%	50%	4,314	77	52	129	194	194	388
Business Commercial																	
General Office Building	710	200.657	ksf	11.37	1.63	1.51	88%	12%	17%	83%	2,281	288	39	327	52	252	304
Shopping Centers /d/																	
Zone F2	820	321.621	ksf	45.12	0.98	4.21	61%	39%	48%	52%	14,511	192	123	315	650	704	1,353
Zone F3	820	354.634	ksf	43.60	0.94	4.07	61%	39%	48%	52%	15,463	204	130	335	693	751	1,444
Zone P1	820	211.333	ksf	52.26	1.16	4.85	61%	39%	48%	52%	11,045	150	96	245	492	533	1,026
Zone V1	820	72.998	ksf	75.82	1.78	6.97	61%	39%	48%	52%	5,535	79	51	130	244	264	509
Zone V3	820	100.592	ksf	67.77	1.56	6.25	61%	39%	48%	52%	6,817	96	61	157	302	327	629
Zone W1	820	339.230	ksf	44.29	0.96	4.13	61%	39%	48%	52%	15,023	199	127	326	673	729	1,402
Light Industrial / Business																	
General Light Industrial	110	800.000	ksf	7.34	1.07	1.23	83%	17%	21%	79%	5,874	709	145	855	206	775	981
General Office Building	710	125.453	ksf	12.66	1.79	1.75	88%	12%	17%	83%	1,588	198	27	225	37	182	219
Parks																	
Regional Parks	SANDAG	33.000	acres	20.00	4% of Daily	8% of Daily	50%	50%	50%	50%	660	13	13	26	27	26	53
Multi-Purpose Recreation Facility	SANDAG	27.000	acres	90.00	2% of Daily	6% of Daily	50%	50%	50%	50%	2,430	25	24	49	73	73	146
Schools																	
Middle School	522	600	Students	1.62	0.41	0.15	55%	45%	52%	48%	972	135	111	246	47	43	90
High School	530	1,000	Students	1.73	0.41	0.31	69%	31%	32%	68%	1,729	281	126	407	99	210	309
Elementary School	520	210	Employees	18.88	7.30	3.41	54%	46%	45%	55%	3,965	828	705	1,533	322	393	715
Total											184,405	5,594	6,257	11,851	9,037	9,062	18,099
Transit Reduction /e/		0.0%									0	0	0	0	0	0	0
Internal Trip Reduction														0%			0%
Residential		8.4%									5,326	99	341	440	312	172	484
Light Industrial / Office Building		7.1%									964	120	20	140	27	117	144
Retail		10.0%									9,767	145	94	239	437	463	900
Other (Parks) /h/		80.0%									2,472	30	30	60	80	79	159
Schools /j/																	
Middle School		82%	Students/Staff								800	111	91	202	39	35	74
High School		82%	Students/Staff								1,424	231	104	335	82	173	255
Elementary School		82%	Students/Staff								3,265	682	581	1,263	265	324	589
Subtotal											24,015	1,418	1,261	2,679	1,242	1,363	2,605
Pass-by Trip Reduction /f/																	
Zone F2		27.8%							48%	52%	377				181	196	377
Zone F3		27.0%							48%	52%	390				187	203	390
Zone P1		31.4%							48%	52%	322				155	167	322
Zone V3		39.0%							48%	52%	245				118	127	245
Zone W1		27.4%							48%	52%	384				184	200	384
Subtotal											1,718	0	0	0	835	883	1,718
TDM Reduction /i/		0.0%									0	0	0	0	0	0	0
Total											158,664	4,176	4,996	9,172	6,978	6,806	13,776

Source: Wilbur Smith Associates, September 2007

NOTES:
/a/ All residential low-medium density units are assumed to be single-family detached housing units.
/b/ All high density live-work residential units are assumed to be residential condominiums/townhouses.
/c/ All retail uses located within the live-work zones are assumed to be Specialty Retail Centers. URBEMIS trip generation rates have been used for Specialty Retail Center. URBEMIS adjusts trip rates based on residential housing density and also includes adjustments based on pedestrian-friendly projects, in which residential land uses are in close proximity to retail and employment land uses.
/d/ All retail units located within the commercial zones are assumed to be Shopping Centers.
/e/ Transit reduction applied to take into account the trips reduced due to the Honolulu High Capacity Transit Corridor.
/f/ Pass-by trip reduction applied only to commercial trips (shopping centers). It was assumed that there would be no pass-by trips in the AM peak period from 6 AM-8 AM.
/g/ Average trip generation rates are obtained as a ratio of the total trip generation rates, calculated using ITE Trip Generation Handbook.
/h/ The 80 percent internal trip reduction for parks in the neighborhood is similar to the internal trip reduction for schools.
/i/ TDM reduction taken into account trip reduction due to TDM alternatives such as staggered work week, telecommuting etc.
/j/ Internal trip reduction due to schools assumes walking, bicycling and drop-offs by private transit/car as the main modes of transportation used by students and staff

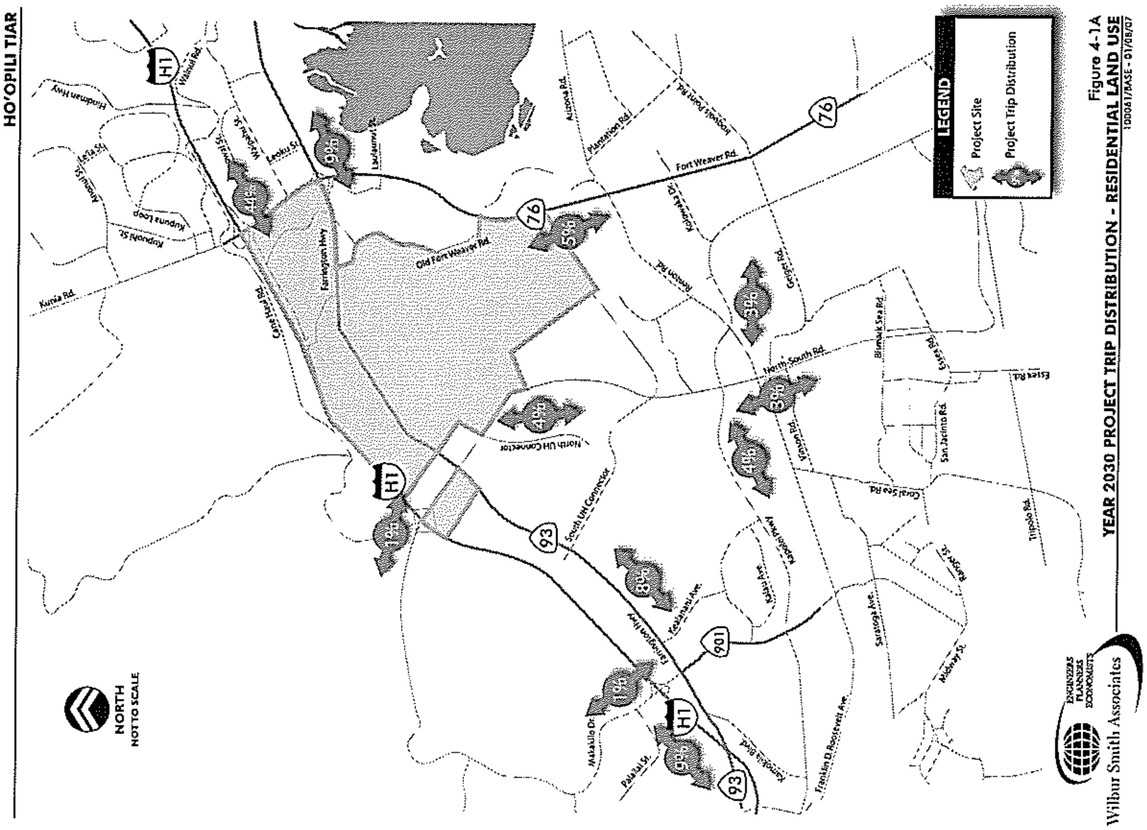


Figure 4-1A
YEAR 2030 PROJECT TRIP DISTRIBUTION - RESIDENTIAL LAND USE

Table 4.3
Project Trip Distribution

#	Screenline: Roadway	Screenline: Location	Landuse: Residential	Landuse: Office	Landuse: Retail
1	Kunia Rd	N/O Kunia Loop	6.3%	3.9%	2.9%
2	Kunia Loop	E/O Kunia Rd	2.1%	3.5%	4.5%
3	Farrington Hwy	E/O Leoku St	8.5%	8.4%	9.1%
4	Laulaunui St	E/O Fort Weaver Rd	0.6%	0.9%	1.2%
5	Kawa Dr	E/O Fort Weaver Rd	0.7%	2.3%	4.6%
6	Renton Rd	E/O Fort Weaver Rd	0.4%	2.1%	4.1%
7	Fort Weaver Rd	S/O Renton Rd	3.7%	7.4%	9.0%
8	North-South Rd	N/O H-1	0.6%	2.4%	3.6%
9	N UHWO Connector	W/O North-South Rd	2.9%	3.2%	4.4%
10	S UHWO Connector	W/O North-South Rd	0.9%	1.1%	1.3%
11	Kapolei Parkway	W/O North South Rd	3.8%	4.4%	3.6%
12	North South Rd	S/O Kapolei Parkway	2.2%	1.1%	0.7%
13	Renton Rd	W/O Kapolei Parkway	0.0%	0.1%	0.1%
14	Kapolei Parkway	S/O Renton Rd	1.8%	3.8%	4.5%
15	Pahika	S/O Renton Rd	0.6%	0.6%	0.4%
16	Makakilo Dr	N/O H-1	0.7%	2.4%	2.6%
17	H-1	W/O Makakilo Dr	8.3%	8.7%	8.7%
18	Farrington Hwy	W/O Fort Barette Rd	3.1%	3.2%	2.6%
19	Fort Barette Rd	S/O Farrington Hwy	3.1%	3.3%	2.7%
20	H-1	E/O Kunia Rd	40.0%	29.3%	17.4%
21	Farrington Hwy	W/O North-South Rd	1.2%	1.0%	1.0%
22	Internal		8.4%	7.1%	10.0%
	Total		**100.00%**	**100.00%**	**100.00%**

Source: Wilbur Smith Associates, 2007

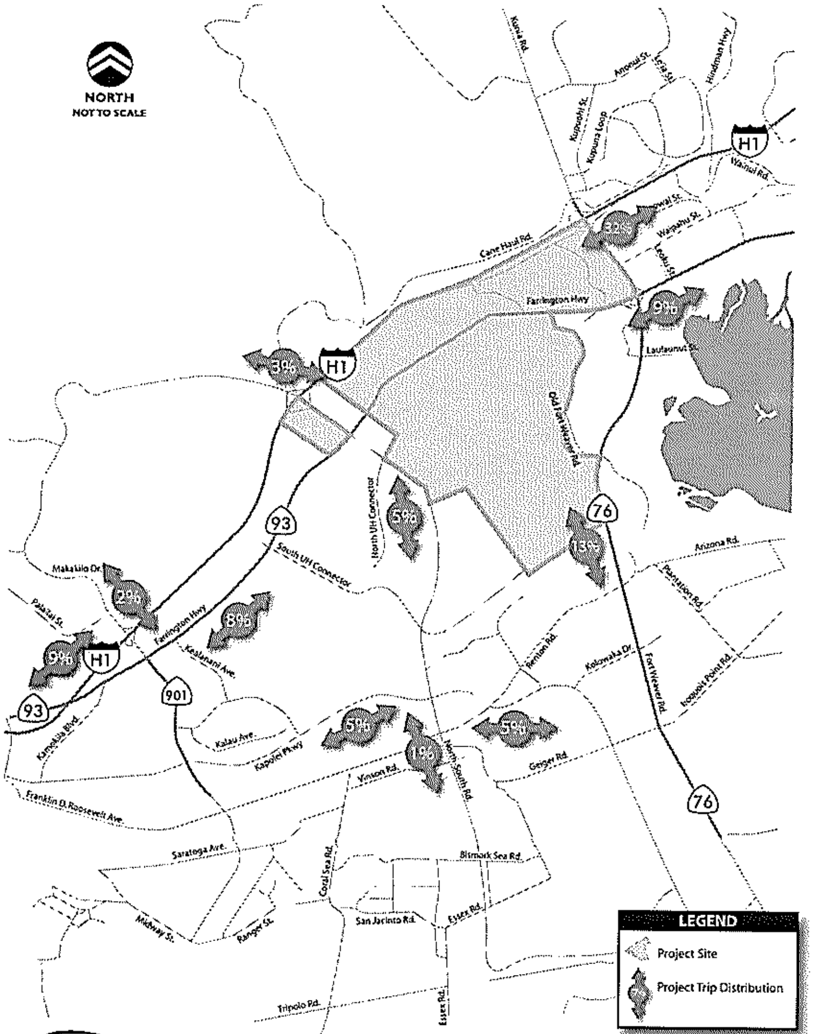


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Figure 4-1B
YEAR 2030 PROJECT TRIP DISTRIBUTION - OFFICE LAND USE
100061/BASE - 01/08/07

HO'OPILI TIAR

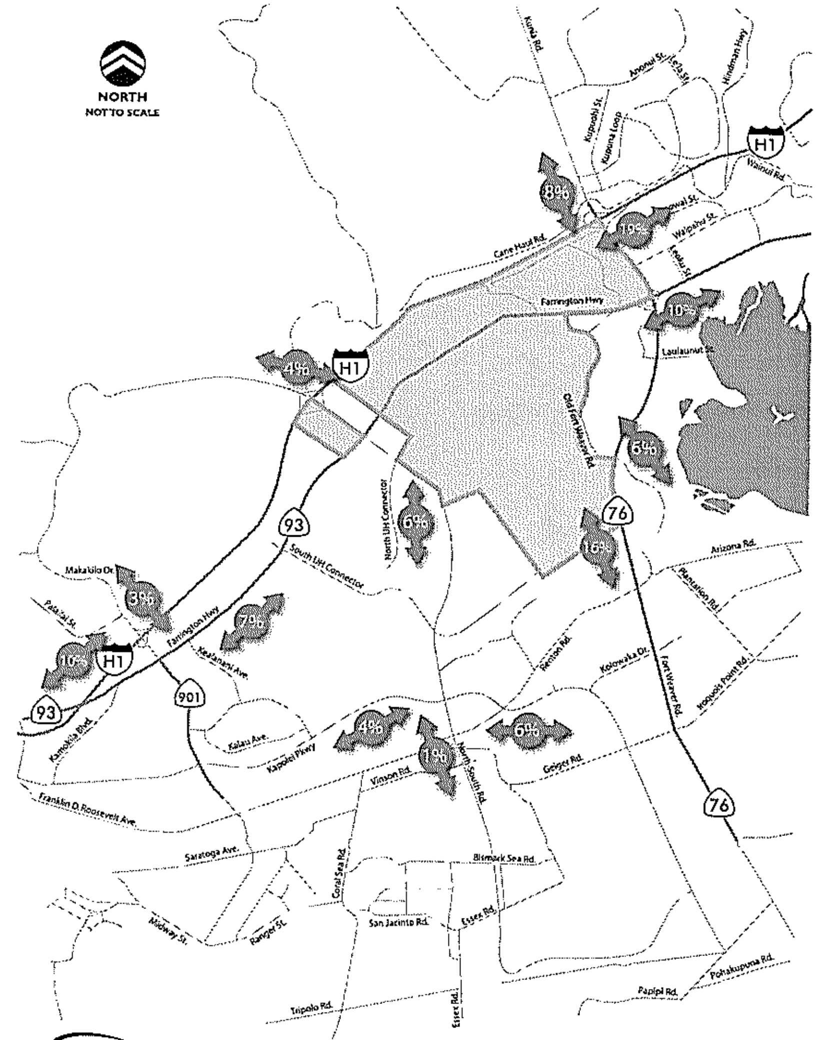

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Figure 4-1C
YEAR 2030 PROJECT TRIP DISTRIBUTION - RETAIL LAND USE
100061/BASE - 01/08/07

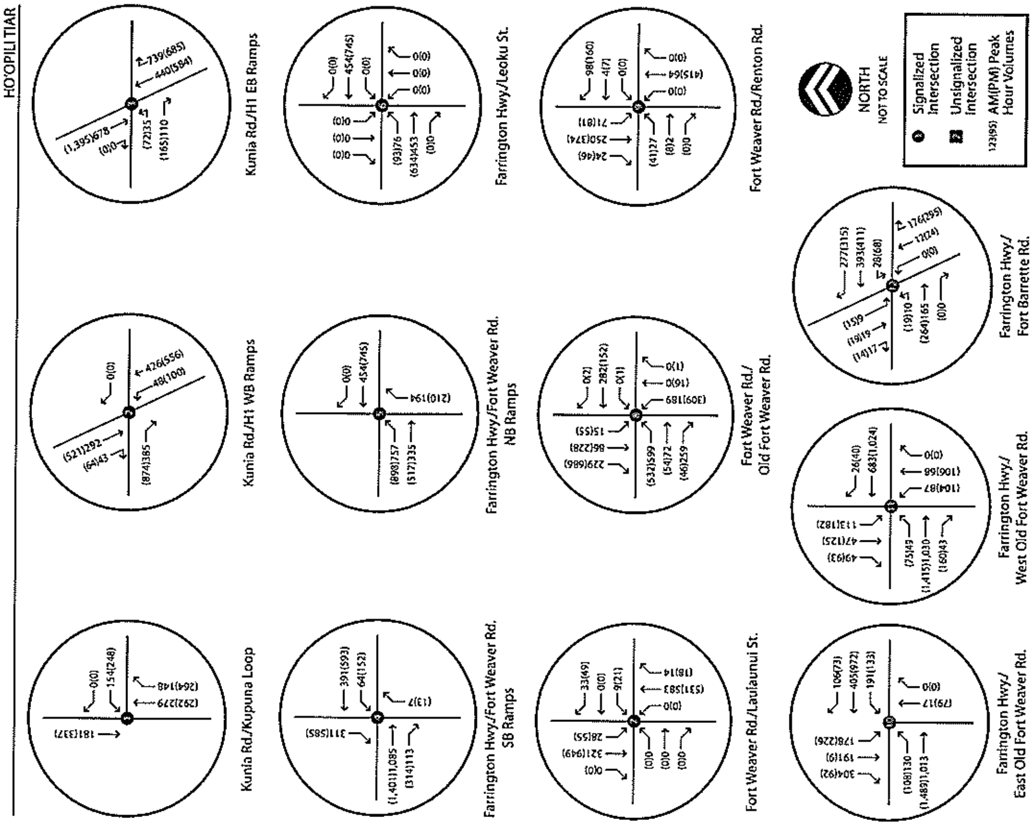

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Figure 4-2B
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PROJECT ONLY CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

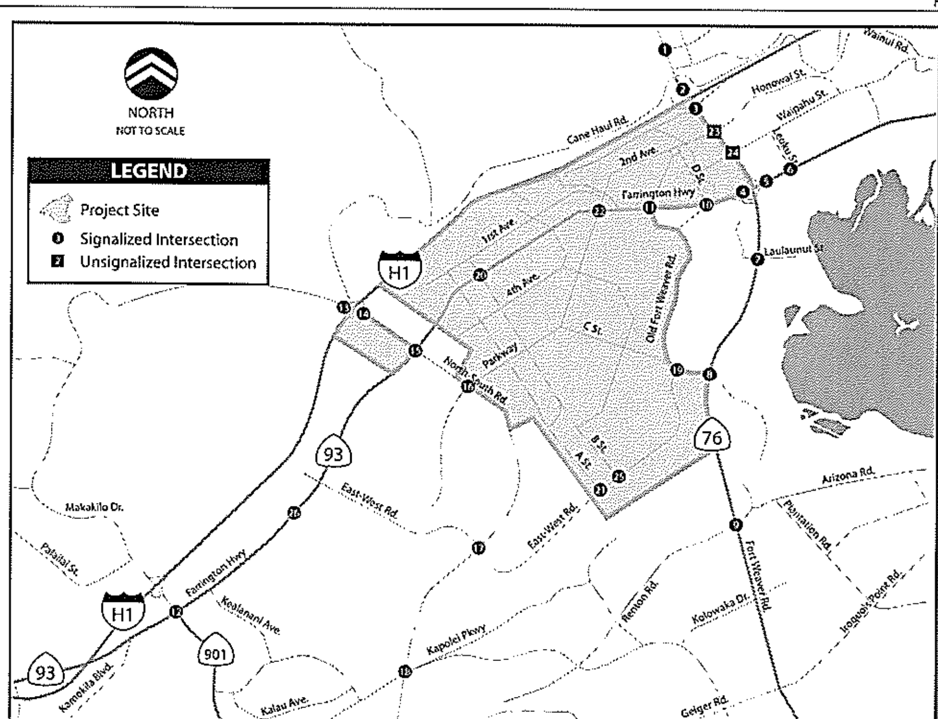

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Figure 4-2A
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PROJECT ONLY CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

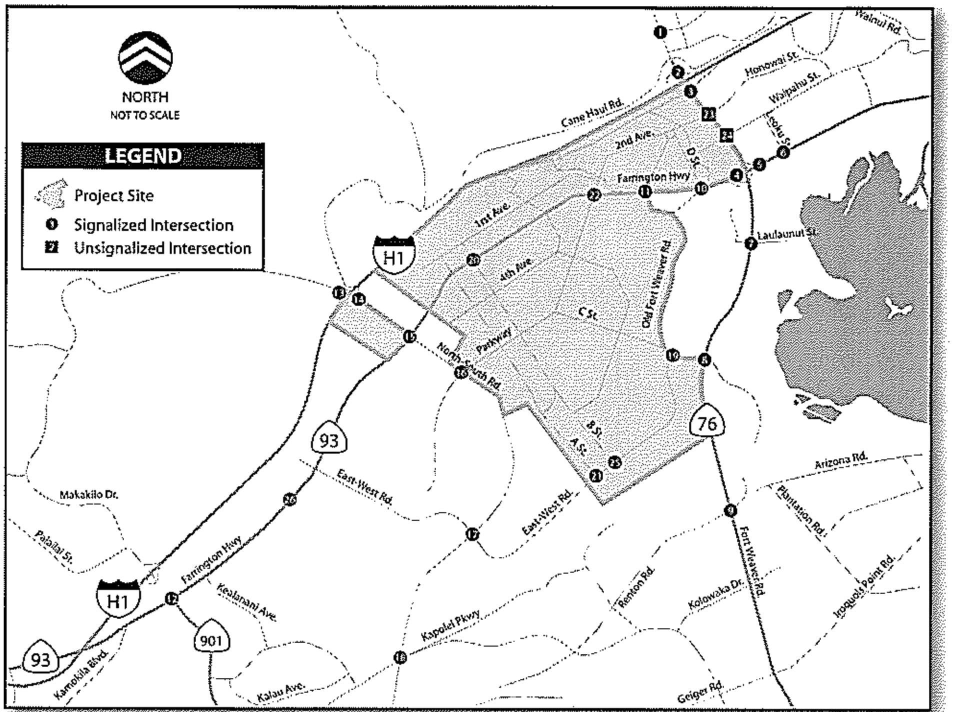

Figure 4-3A
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PROJECT ONLY CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

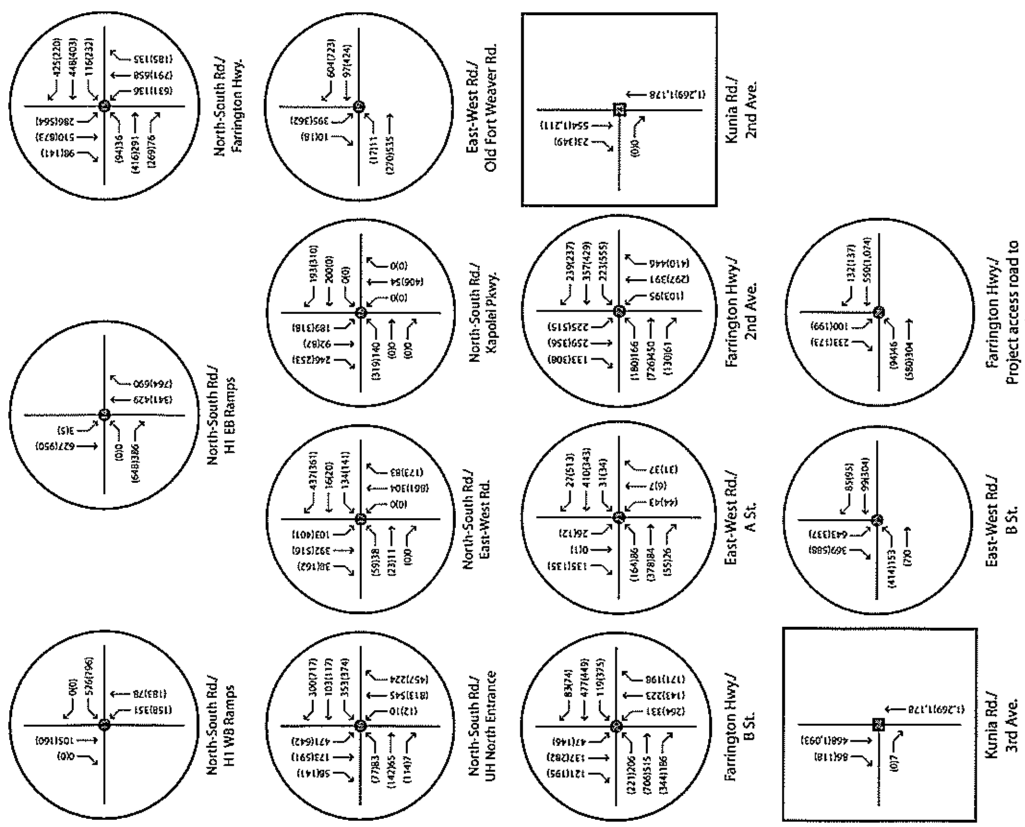

Figure 4-2C
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PROJECT ONLY CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

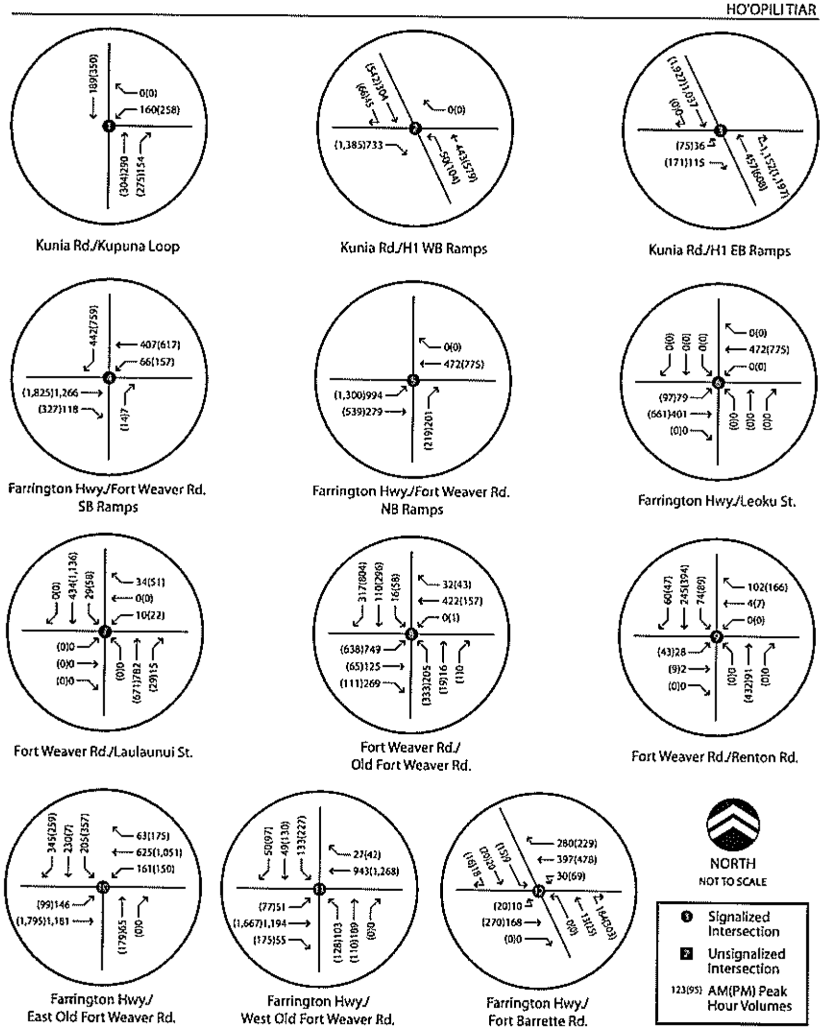

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Figure 4-3B
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PLUS PROJECT ONLY CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

100061/DEC 2007-12/10/07

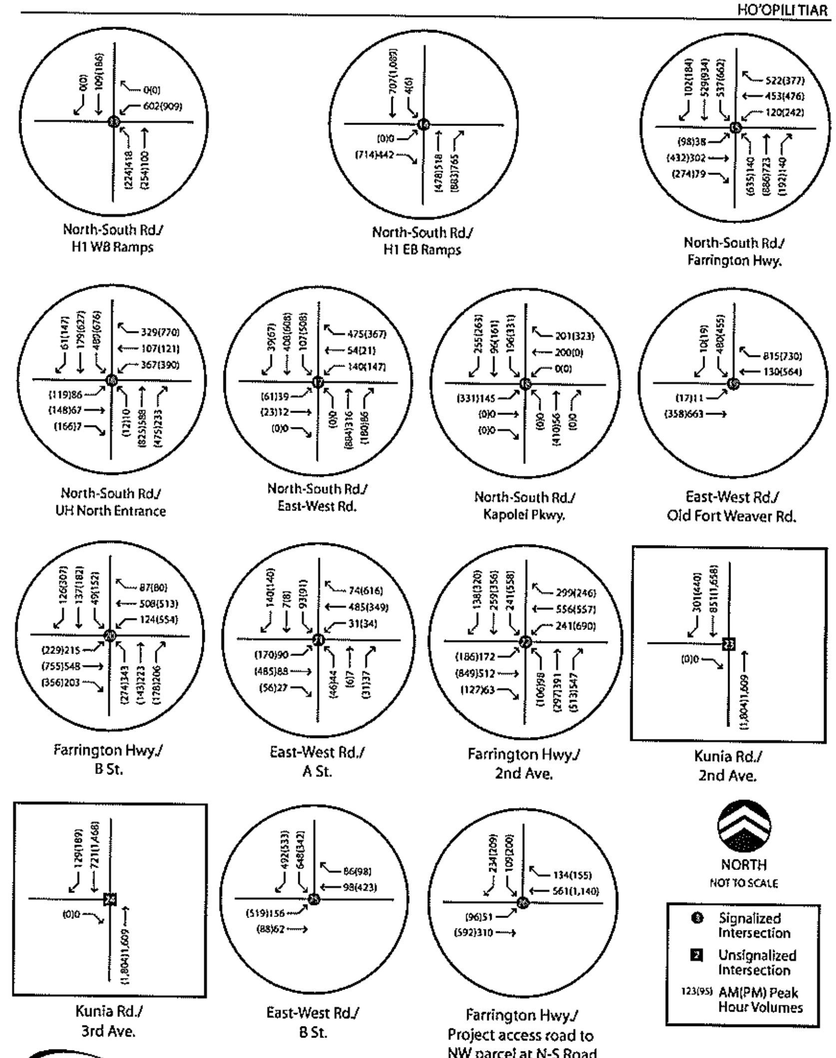

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Figure 4-3C
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PROJECT ONLY CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

100061/DEC 2007-12/10/07

Chapter 5
YEAR 2030 BASELINE PLUS PROJECT CONDITIONS

This chapter describes the Year 2030 transportation conditions including intersection, freeway, and freeway-ramp junction operations as a result of the construction of the proposed Project. Additionally, the transportation impacts associated with the proposed project were identified.

The operating conditions of the study intersections, freeway segments, and ramp-freeway junctions were studied under two scenarios as described in *Chapter 4:* "Without Transit Corridor Scenario A" and "With Transit Corridor Scenario B",. Levels of Service of the study intersections, freeway segments, and ramp-freeway junctions under Scenarios A and B were identified using the same methodologies as described in Chapter 2 for existing conditions.

5.1 THRESHOLDS OF SIGNIFICANCE

Neither the City and County of Honolulu nor the State of Hawai'i have guidelines for identifying the transportation impacts caused by a project. Therefore, WSA used the guidelines provided in *Sections 5.1.1, 5.1.2, and 5.1.3* to identify the transportation impacts at the intersections, freeway segments, and ramp-freeway junctions.

5.1.1 Intersections

The thresholds of significance for the intersections are as follows:

1. A project would cause a transportation impact at an intersection if it degrades the LOS of the intersection to LOS E or worse.
2. A project would cause a transportation impact at an intersection operating at LOS E or F if it degrades the volume-to-capacity ratio of the intersection by more than 10 percent.

5.1.2 Freeway Segments

The thresholds of significance for the freeway segments are as follows:

1. A project would cause a transportation impact at a freeway segment if it degrades the LOS of the freeway segment to LOS E or worse.

5.1.3 Ramp-Freeway Junctions

The thresholds of significance for the ramp-freeway junctions are as follows:

1. A project would cause a transportation impact at a ramp-freeway junction if it degrades the LOS of the ramp-freeway to LOS E or worse.

5.2 SCENARIO A: WITH TRANSIT CORRIDOR

5.2.1 Study Area – Scenario A

Figure 5-1 presents the proposed internal circulation within the project site. The names of the major streets have been assumed for analysis purposes. As part of the Ho'opili project, several new study intersections would be created between Project roadways and the major area roadways located adjacent to the project site. The new study intersections that are located within the project site and included in this analysis are:

- Farrington Highway/ B Street
- East-West Road/ A Street
- Farrington Highway/ Parkway/ 2nd Avenue
- Kunia Road/ 2nd Avenue
- Kunia Road/ 3rd Avenue
- East-West Road/ B Street
- Farrington Hwy/ Project Access Road to NW Parcel

Traffic signal warrant analysis has been performed on the new study intersections under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario" (Scenario A) and all the intersections except the following two, which are both right-turn-in-only intersections, satisfied the MUTCD Warrant #3 for installation of a traffic signal:

- Kunia Road/ 2nd Avenue
- Kunia Road/ 3rd Avenue

For this analysis, the other 5 intersections of the major Project roadways with the major roadways were assumed to be signalized. The intersections Kunia Road/ 2nd Avenue as well as Kunia Road/ 3rd Avenue would only allow right turns from Kunia Road into the Project site and are assumed to be free-flow.

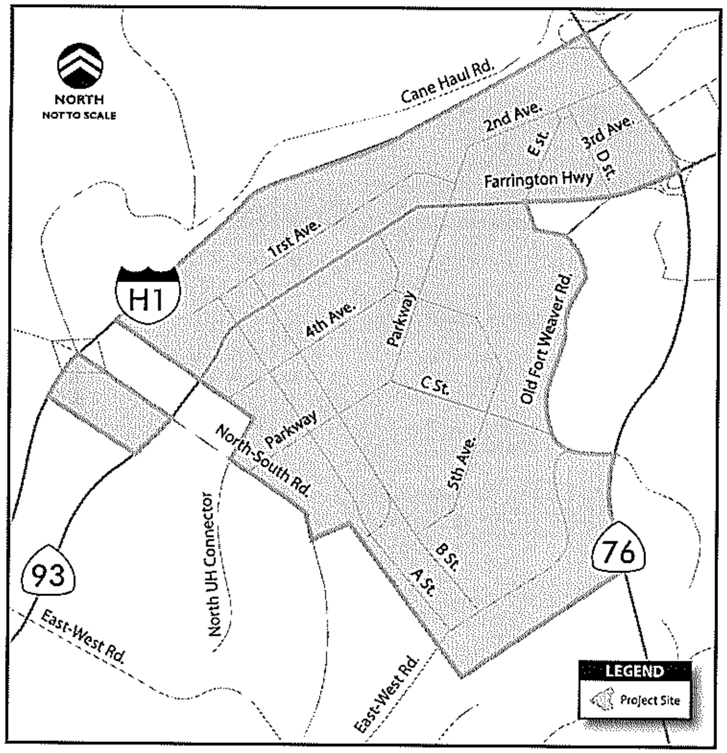

Figure 5-1
PROJECT INTERNAL CIRCULATION
100061/BASE - 01/09/07

To accommodate the increased traffic due to the Project, the proposed geometric layout of the following four study intersections are proposed for modification from the lanes used in the Year 2030 Baseline Conditions:

- Farrington Highway/ East Old Fort Weaver Road
- Farrington Highway/ West Old Fort Weaver Road
- North-South Road/ North University of Hawai'i Connector

Of the above three intersections, the two intersections Farrington Highway/ East Old Fort Weaver Road and Farrington Highway/ West Old Fort Weaver Road are unsignalized under Year 2030 Baseline Conditions. Traffic signal warrant analysis has been performed on both these intersections under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario" and both the intersections have satisfied the criteria to allow consideration of signal installation. Therefore, for the purpose of this analysis, intersections Farrington Highway/ East Old Fort Weaver Road and Farrington Highway/ West Old Fort Weaver Road have been considered to be signalized under 'With Transit Corridor Scenario".

Additionally, to accommodate the increased traffic volumes along the roadways adjacent to the Project site, increased traffic lanes would be provided at the following three study intersections:

Farrington Highway/ East Old Fort Weaver Road

1. Install traffic signal.
2. Eastbound Approach: Construct one additional through lane and one exclusive left-turn lane.
3. Westbound Approach: Construct one additional shared through-right lane.
4. Southbound Approach: Construct one shared left-through-right lane and one exclusive left-turn lane.
5. Northbound Approach: Construct one additional shared left-through-right lane.

Farrington Highway/ West Old Fort Weaver Road

1. Install traffic signal.
2. Eastbound Approach: Convert existing exclusive right-turn lane to shared through-right lane, construct one exclusive left-turn lane.
3. Westbound Approach: Construct one additional shared through-right lane.
4. Southbound Approach: Construct one shared through-right lane and one exclusive left-turn lane
5. Northbound Approach: Convert existing exclusive left-turn lane to shared left-through-right lane.

North-South Road/ North University of Hawaii Connector

1. Eastbound Approach: Convert existing exclusive right-turn lane to shared through-right lane.
2. Westbound Approach: Construct one through lane, two exclusive left-turn lanes, and two exclusive right-turn lanes.
3. Southbound Approach: Construct two additional exclusive left-turn lanes.
4. Northbound Approach: Construct one additional exclusive right-turn lane.

Figure 5-2 displays all the study intersections under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario"; whereas, Figures 5-3A and 5-3B presents the proposed geometric configurations of the new study intersections and the three modified study intersections under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario", as described above.

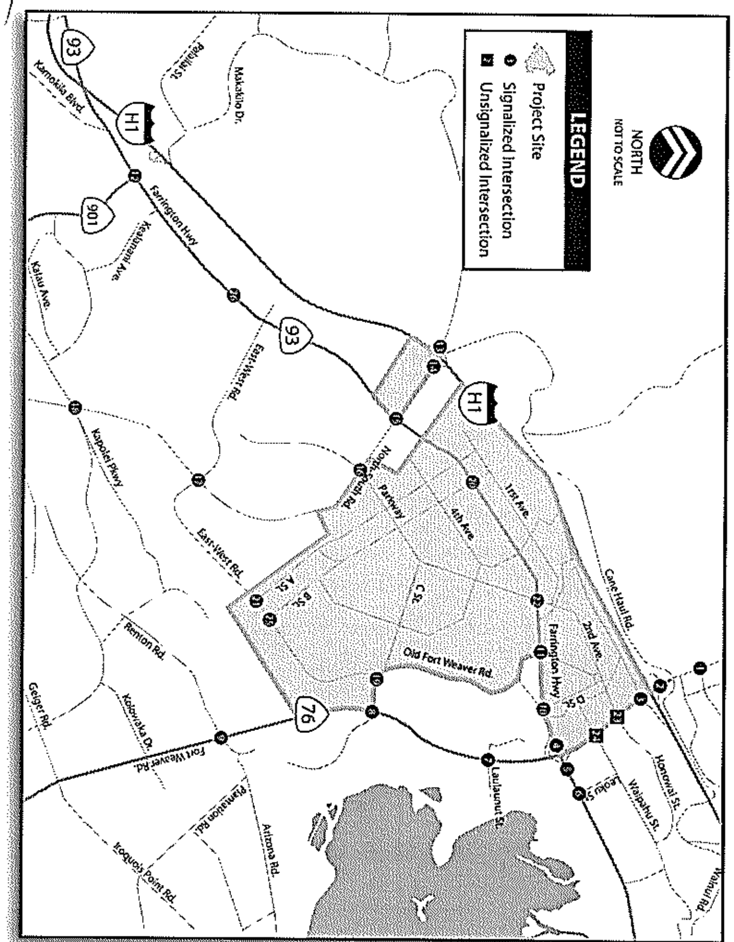

Figure 5-2
STUDY INTERSECTIONS
YEAR 2030 + PROJECT CONDITIONS
100061/Draft October - 10/17/07

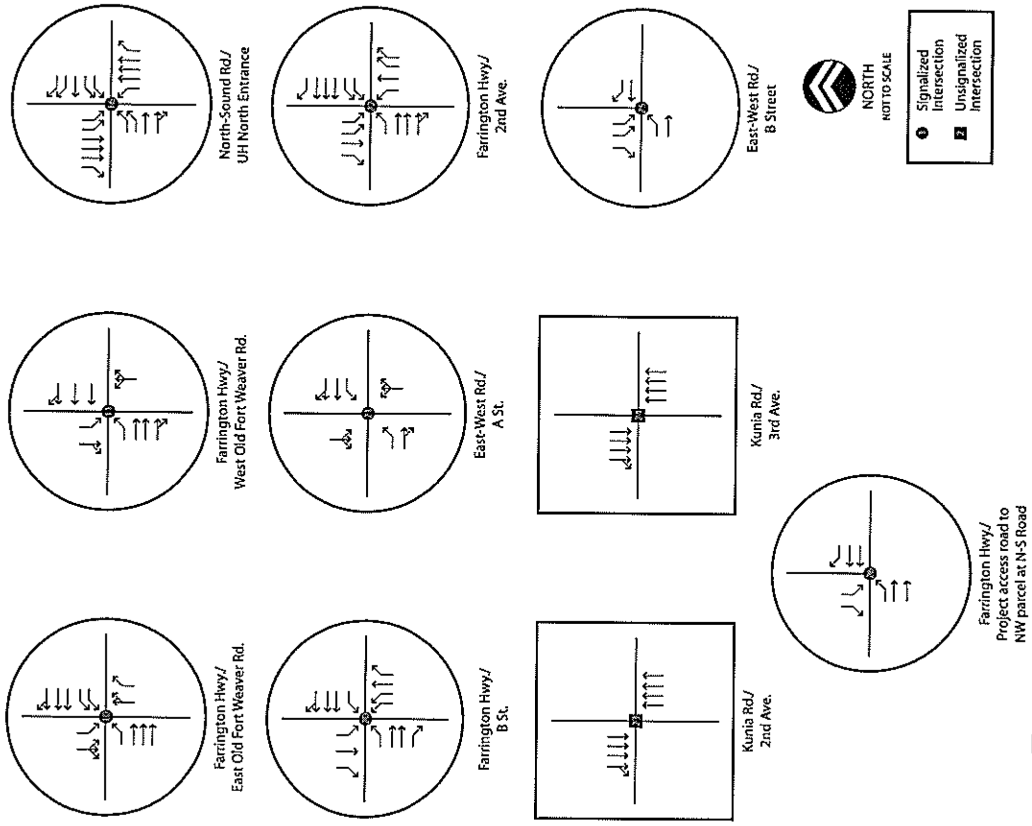

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Figure 5-3B
PROPOSED GEOMETRIES OF NEW INTERSECTIONS
YEAR 2030 PLUS PROJECT CONDITIONS
100061/Draft October - 10/19/07

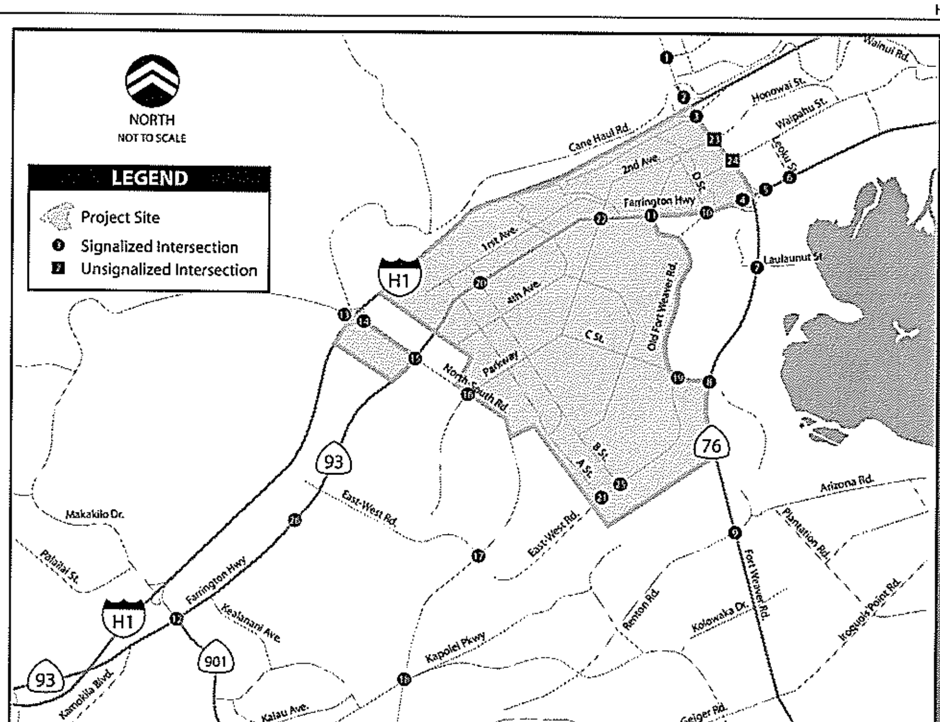

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Figure 5-3A
PROPOSED GEOMETRIES OF NEW INTERSECTIONS
YEAR 2030 PLUS PROJECT CONDITIONS
100061/Draft October - 10/17/07

5.2.2 Intersection Operating Conditions – Scenario A

Using the trip distribution pattern described in *Chapter 4*, the project trips generated under "With Transit Corridor Scenario" were distributed throughout the study area. The resulting turning movement volumes at the study intersections under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario" are exhibited in Figures 5-4 A, 5-4 B, and 5-4 C.

The LOS of the study intersections, the study freeway segments, and the study freeway-ramp junctions were calculated using the same methodologies described in *Chapter 2*. The study intersection operations under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario" are presented in Table 5.1. The LOS and delay values of the study intersections located outside the proposed Project site (external intersections) are exhibited in Tables 5.1 (a) and 5.2 (a) for AM and PM peak hour conditions respectively, while Tables 5.1 (b) and 5.2 (b) display the operations of the study intersections located within the proposed project site (internal intersections) under AM and PM peak hour conditions, respectively. Also identified in Tables 5.1 and 5.2 are the locations of transportation impacts under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario".

During the AM peak hour, 22 of the 26 study intersections would operate under acceptable conditions (LOS D or better). The 4 intersections that would operate at LOS E or F are:

- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/ Fort Barrette Road
- North-South Road/ Farrington Highway

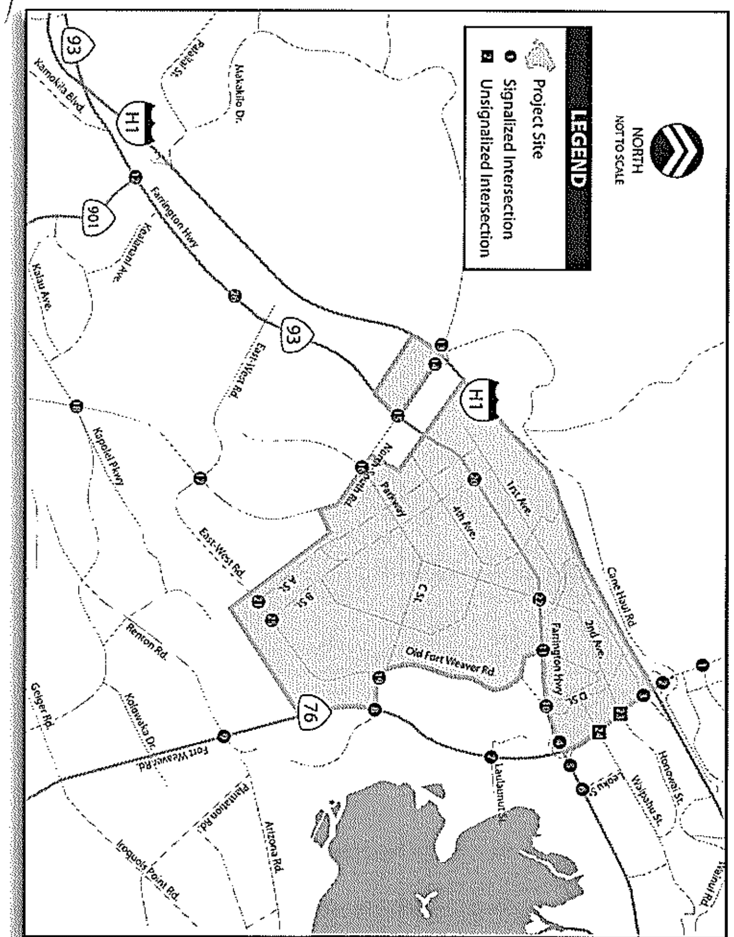

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Figure 5-4A
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR
100061/Draft October/Figure 5-4 map - 10/17/07

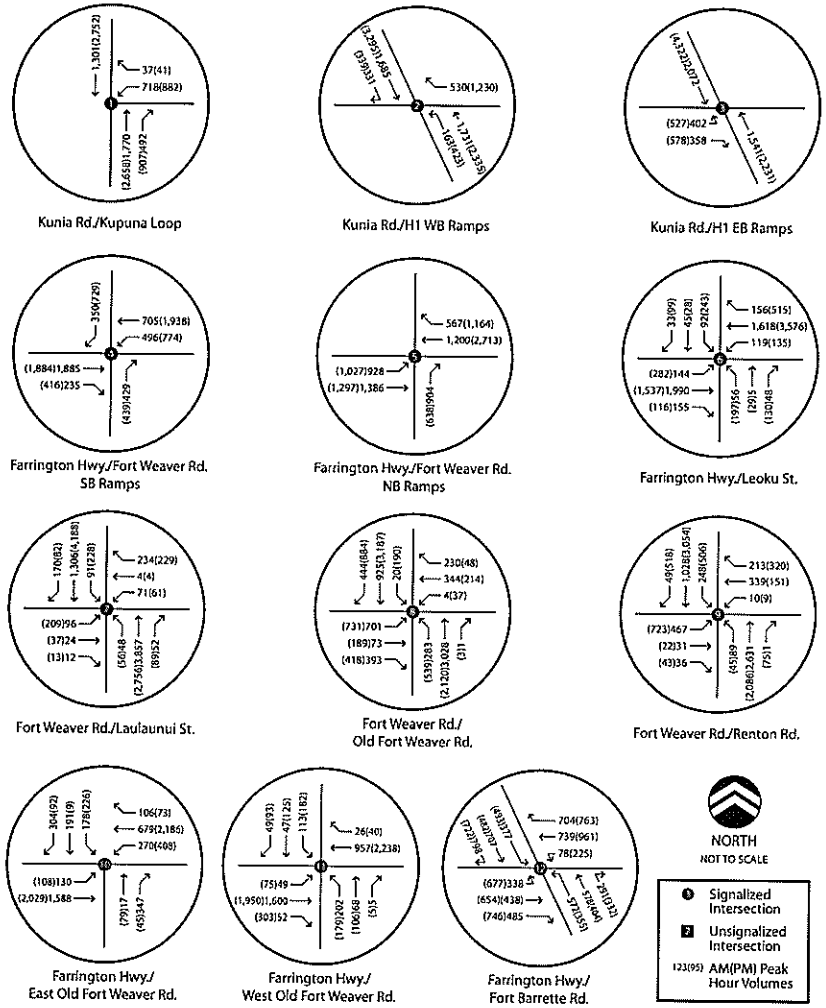

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Figure 5-4B
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

100061/DEC 2007-12/10/07

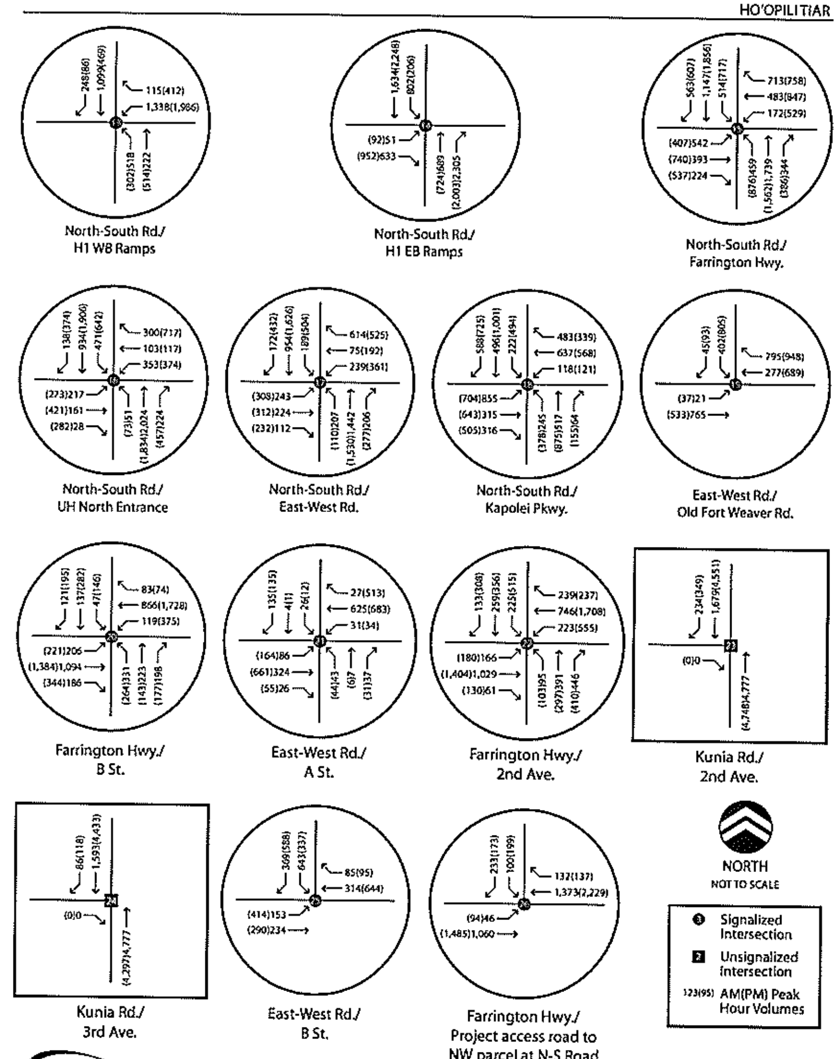

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Figure 5-4C
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

100061/DEC 2007-12/10/07

Table 5.1 (b)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A (Internal Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	-	-	-	30.2	0.69	C	N.A.
21	East-West Rd./ A St.	Signal	-	-	-	21.0	0.59	C	N.A.
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	-	-	-	33.0	0.65	C	N.A.
23	Kunia Rd./ 2nd Ave.	OWSC	-	-	-	0.0 (NB)	0.76 (NB)	A	N.A.
24	Kunia Rd./ 3rd Ave.	OWSC	-	-	-	11.9 (EB)	0.01 (EB)	B	N.A.
25	East-West Rd./ B St.	Signal	-	-	-	27.3	0.82	C	N.A.
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	-	-	-	17.8	0.65	B	N.A.

Source: Wilbur Smith Associates – 2007

NOTES:
OWSC – One-way Stop-Control
N.A. – Not Applicable
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

Source: Wilbur Smith Associates – 2007

Table 5.1 (a)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A (External Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	12.8	0.70	B	15.7	0.78	B	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	3.3	0.47	A	4.5	0.58	A	No
3	Kunia Rd./ H-1 EB Ramps	Signal	8.9	0.37	A	8.4	0.52	A	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	5.2	0.41	A	9.9	0.66	A	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	3.0	0.48	A	25.4	0.92	C	No
6	Farrington Hwy./ Leokū St.	Signal	18.0	0.63	B	19.2	0.73	B	No
7	Fort Weaver Rd./ Laulaunui St.	Signal	29.8	0.90	C	42.6	0.99	D	No
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	16.7	0.89	B	**176.6**	**1.69**	**F**	**Yes**
9	Fort Weaver Rd./ Renton Rd.	Signal	**78.1**	**1.08**	**E**	**111.8**	**1.23**	**F**	**Yes**
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	16.4 (WB)	0.21 (WB)	C	31.4	0.81	C	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	22.0 (NB)	0.37 (NB)	C	17.2	0.62	B	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**62.7**	**0.77**	**E**	**75.9**	**0.93**	**E**	**Yes**
13	North-South Rd./ H-1 WB Ramps	Signal	42.7	0.95	D	42.2	0.95	D	No
14	North-South Rd./ H-1 EB Ramps/	Signal	38.1	0.74	D	30.0	0.92	C	No
15	North-South Rd./ Farrington Hwy.	Signal	35.2	0.61	D	**76.7**	**1.04**	**E**	**Yes**
16	North-South Rd./ North UH Connector	Signal	7.3	0.39	A	38.6	0.87	D	No
17	North-South Rd./ East-West Rd.	Signal	27.0	0.63	C	37.0	0.79	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	34.8	0.75	C	43.1	0.86	D	No
19	East-West Rd./ Old Fort Weaver Rd.	Signal	22.3	0.24	C	14.3	0.61	B	No

NOTES:
A - This location is stop-controlled under existing conditions, but is signalized after meeting the traffic signal warrants under year 2030 conditions.
B - This location is stop-controlled under year 2030 conditions, but is signalized after meeting the traffic signal warrants under year 2030 plus project conditions.
TWSC – Two-way Stop-Control
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

Under Year 2030 Baseline plus Project "With Transit Corridor Scenario" PM peak hour conditions, 9 of the 26 study intersections would operate under unacceptable conditions (LOS E or worse). The other 17 study intersections would operate at acceptable conditions (LOS D or better). The study intersections operating at LOS E or F in the PM peak hour are:

- Farrington Highway/ Fort Weaver Road Northbound Ramps
- Farrington Highway/ Leokū Street
- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/ Fort Barrette Road
- North-South Road/ H-1 Eastbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ Kapolei Parkway
- East-West Road/ Old Fort Weaver Road

Of these, five intersections would operate at LOS E and five intersections would operate at LOS F.

The Farrington Highway intersection with Fort Barrette Road would operate at LOS E without or with the Project and is not significantly impacted by the Project.

Of the 4 intersections operating at LOS E or F conditions during the AM peak hour, all 4 would also operate unacceptably during the PM peak hour. Therefore under the "With Transit Corridor Scenario", the project traffic would result in transportation impacts at a total of 9 intersections during one or both peak hours.

Synchro calculation worksheets under Year 2025 Baseline plus Project conditions "With Transit Corridor Scenario" are included in Appendix A-3; Figure 5-5A1, 5-5A2, 5-5A3, 5-5B1, 5-5B2, and 5-5B3 present the LOS and delay values of all the turning movements at the study intersections under Year 2030 Baseline plus Project "With Transit Corridor Scenario" AM and PM peak hour conditions.

Table 5.2 (a)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A (External Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	17.1	0.90	B	36.8	1.05	D	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	14.1	0.92	B	18.6	1.03	B	No
3	Kunia Rd./ H-1 EB Ramps	Signal	8.8	0.85	A	11.3	0.90	B	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	14.0	0.42	B	10.0	0.80	B	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	8.0	0.83	A	**134.2**	**1.41**	**F**	**Yes**
6	Farrington Hwy./ Leokū St.	Signal	47.4	0.88	D	**61.9**	**1.05**	**E**	**Yes**
7	Fort Weaver Rd./ Laulaunui St.	Signal	26.3	0.89	C	44.9	1.01	D	No
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	45.0	1.03	D	**289.5**	**2.01**	**F**	**Yes**
9	Fort Weaver Rd./ Renton Rd.	Signal	**63.4**	**1.03**	**E**	**125.3**	**1.25**	**F**	**Yes**
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	32.0 (WB)	0.71 (WB)	D	20.6	0.75	C	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	55.4 (NB)	0.55 (NB)	F	25.9	0.88	C	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**67.5**	**0.88**	**E**	**74.4**	**0.91**	**E**	**Yes**
13	North-South Rd./ H-1 WB Ramps	Signal	25.6	0.59	C	38.2	0.86	D	No
14	North-South Rd./ H-1 EB Ramps	Signal	15.7	0.62	B	**87.5**	**1.30**	**F**	**Yes**
15	North-South Rd./ Farrington Hwy.	Signal	35.8	0.76	D	**136.3**	**1.28**	**F**	**Yes**
16	North-South Rd./ North UH Connector	Signal	13.5	0.47	B	49.0	0.92	D	No
17	North-South Rd./ East-West Rd.	Signal	34.3	0.76	C	43.1	0.87	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	54.2	0.88	D	**58.5**	**0.95**	**E**	**Yes**
19	East-West Rd./ Old Fort Weaver Rd.	Signal	20.6	0.62	C	**62.6**	**0.56**	**E**	**Yes**

Source: Wilbur Smith Associates – 2007

NOTES:
A - This location is stop-controlled under existing conditions, but is signalized after meeting the traffic signal warrants under year 2030 conditions.
B - This location is stop-controlled under year 2030 conditions, but is signalized after meeting the traffic signal warrants under year 2030 plus project conditions.
TWSC – Two-way Stop-Control
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

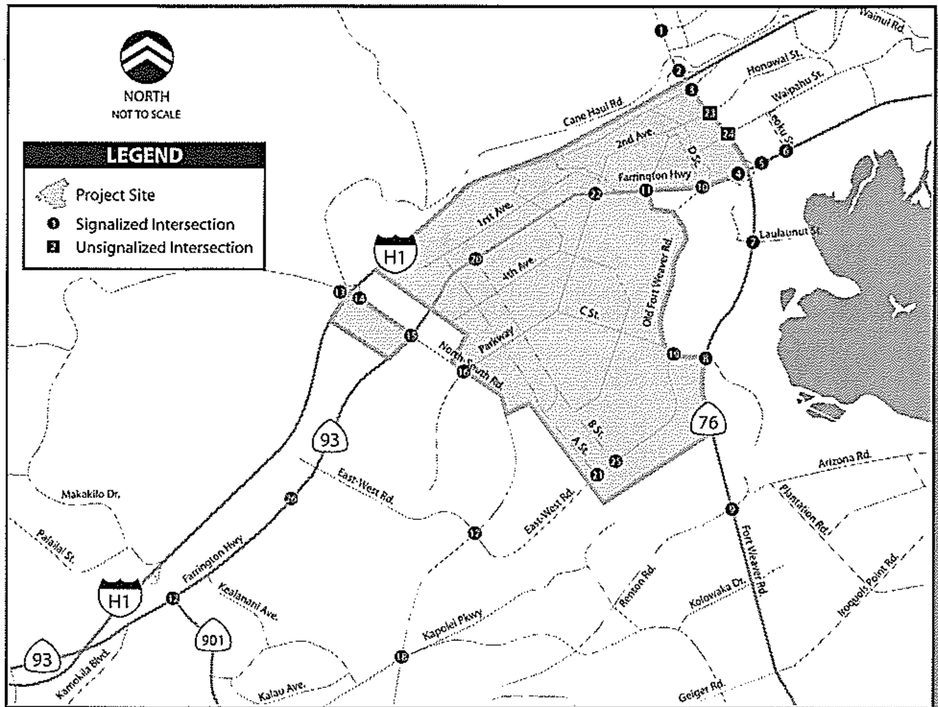

Figure 5-5A1
AM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR
100061/Draft October - 10/17/07

Table 5.2 (b)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A (Internal Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	-	-	-	41.7	0.88	D	N.A.
21	East-West Rd./ A St.	Signal	-	-	-	17.5	0.61	B	N.A.
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	-	-	-	**71.1**	**1.07**	E	N.A.
23	Kunia Rd./ 2nd Ave.	OWSC	-	-	-	0.0 (SB)	0.83 (SB)	A	N.A.
24	Kunia Rd./ 3rd Ave.	OWSC	-	-	-	0.0 (SB)	0.81 (SB)	A	N.A.
25	East-West Rd./ B St.	Signal	-	-	-	46.6	0.92	D	N.A.
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	-	-	-	16.3	1.18	B	N.A.

Source: Wilbur Smith Associates – 2007

NOTES:
OWSC – All-way Stop-Control
N.A. – Not Applicable
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

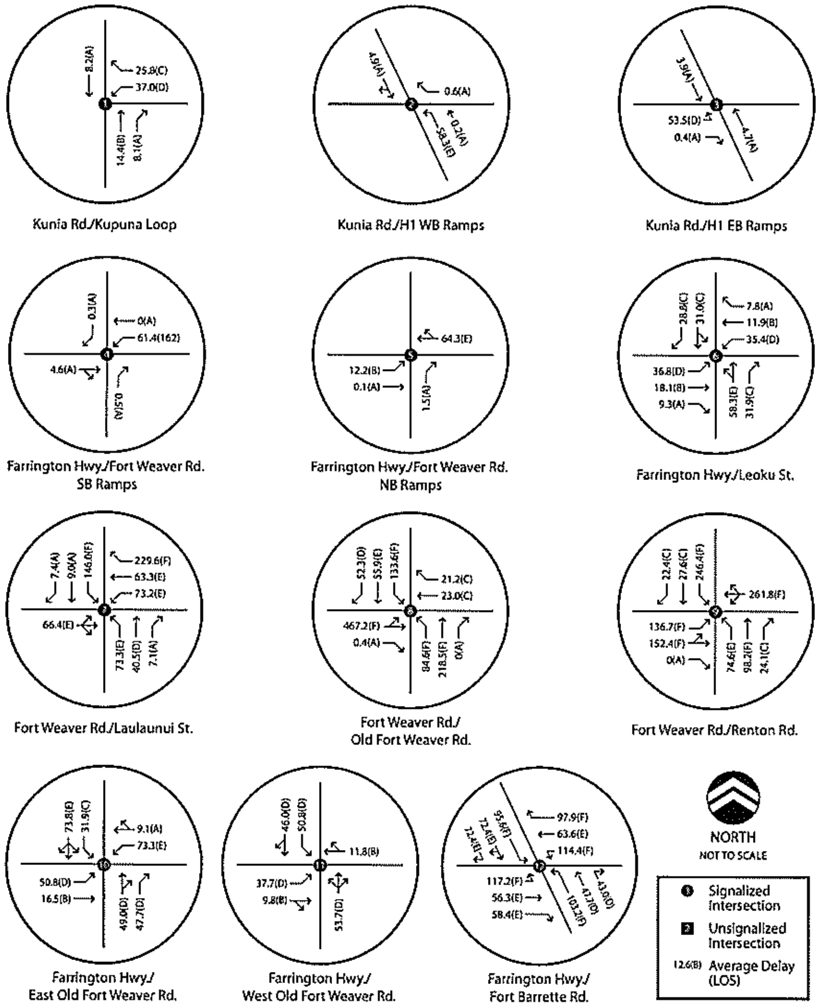

Figure 5-5A2
AM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

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HO'OPILI TIAR

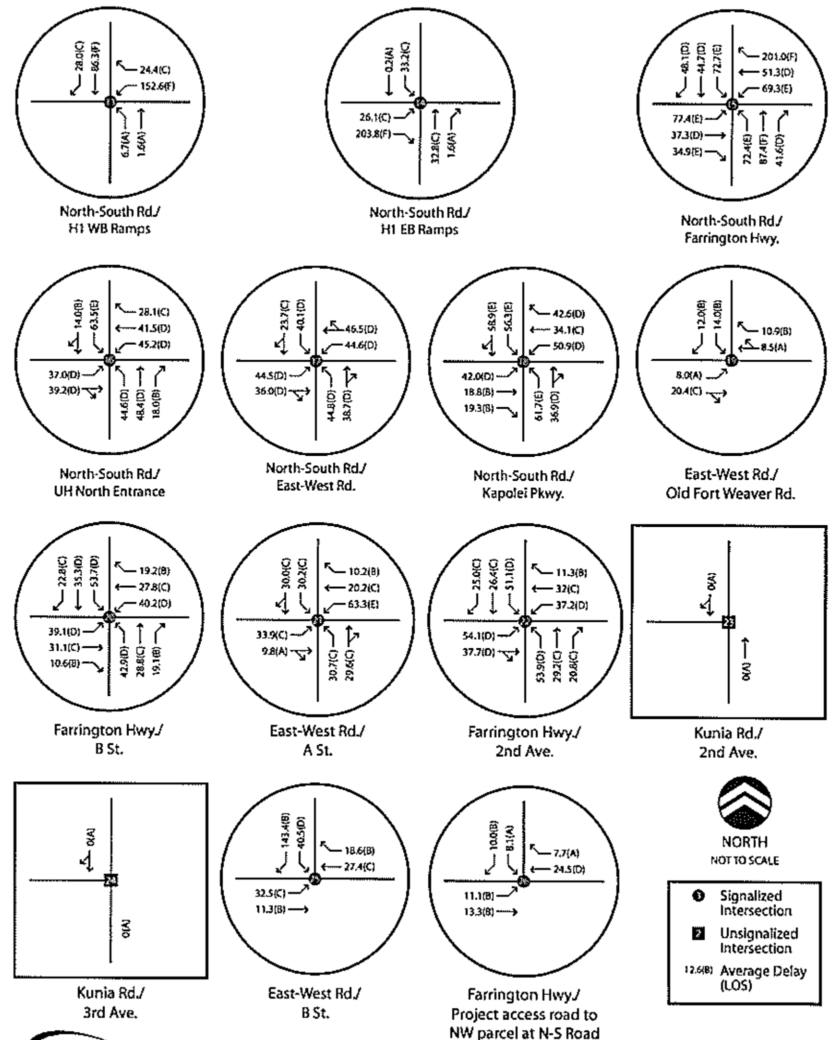

Figure 5-5A3
AM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

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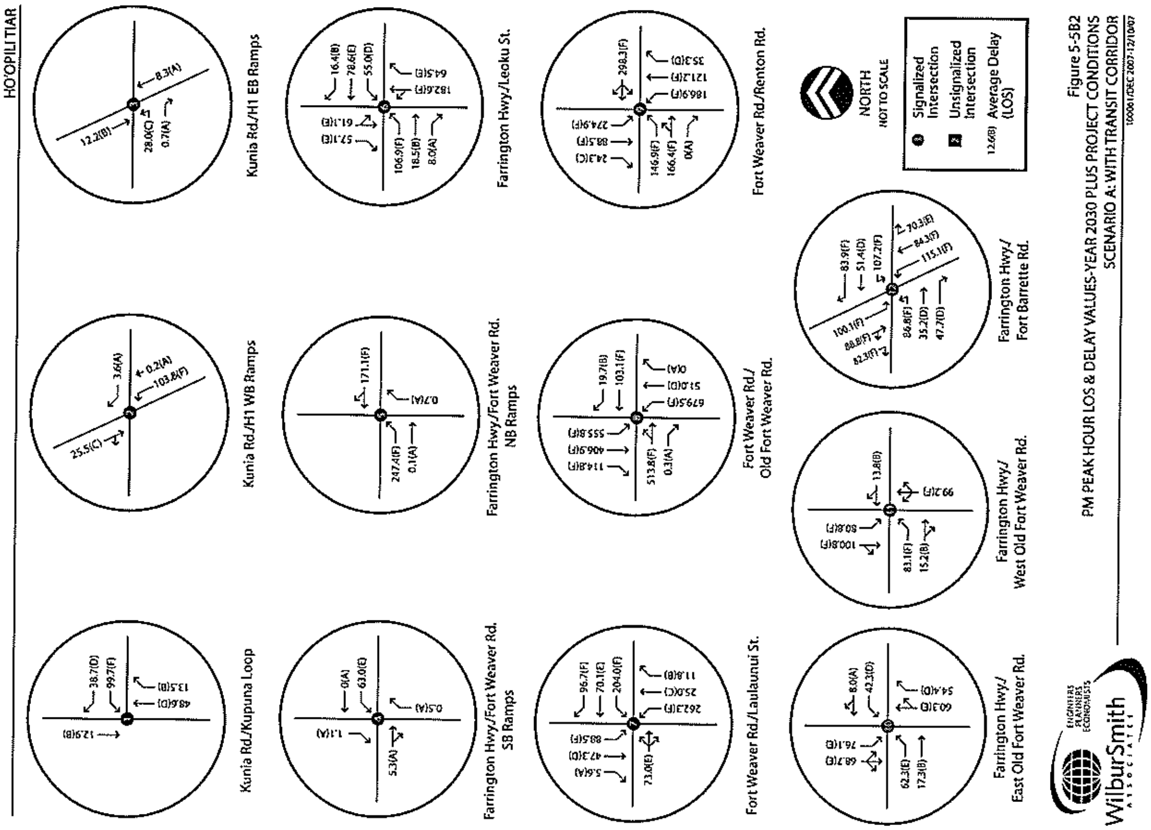

Figure 5-5B2
PM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR
100061/DEC 2007-12/10/07

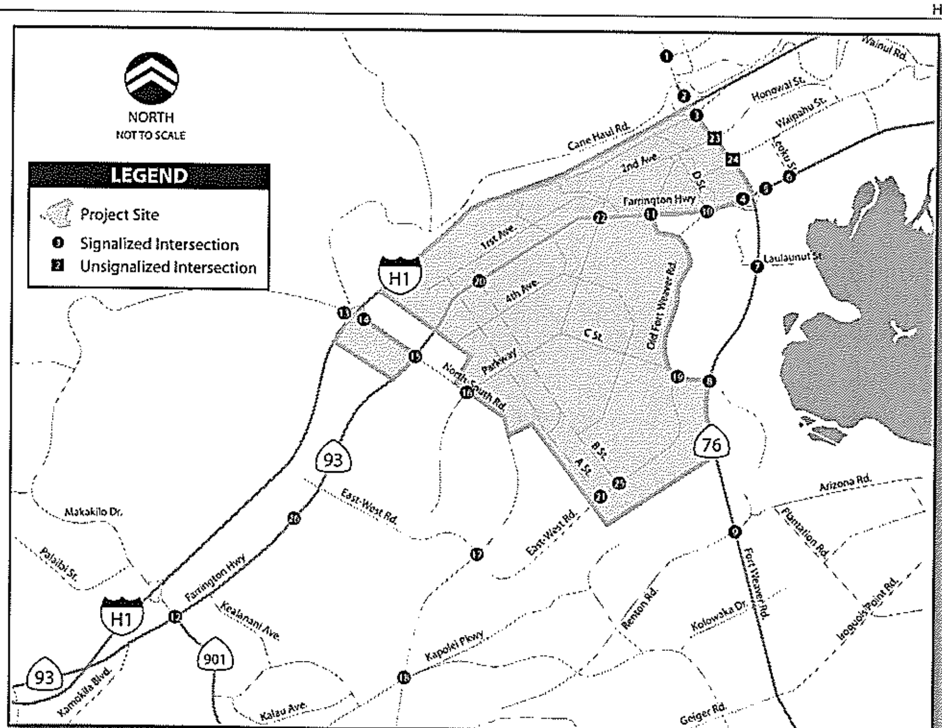

Figure 5-5B1
PM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR
100061/Draft October - 10/17/07

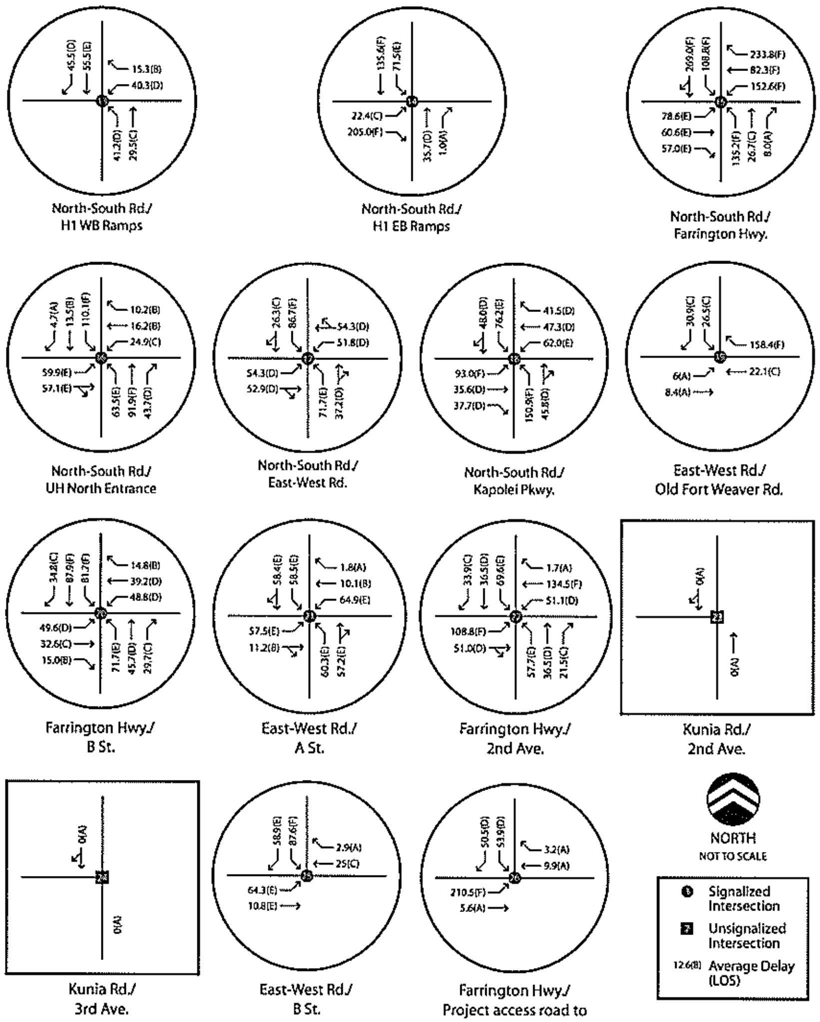

Figure 5-5B3
PM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

5.2.3 Freeway Operating Conditions – Scenario A

Figure 5-6 presents the freeway segment operations for Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario" and Table 5.3 compares the freeway segment operations under Year 2030 Baseline plus Project conditions with that for the baseline Year 2030 conditions.

For the morning peak period, four freeway segments would operate under unacceptable conditions (LOS E or worse), of which freeway segments H-1 Eastbound south of Makakilo Drive and H-1 Eastbound west of Kunia Road would operate at LOS E and LOS F, respectively under both Year 2030 Baseline and Year 2030 Baseline plus Project "With Transit Corridor Scenario" conditions. The other two freeway segments that would operate at LOS E or F in the Year 2030 plus Project scenario are H-1 Eastbound west of Pāiwa Street, and H-1 Eastbound east of Kamehameha Highway.

For the afternoon peak period, 7 of the 10 study freeway segments would operate under unacceptable conditions (LOS E or worse). Of the seven, two freeway segments operate at LOS F under both Year 2030 Baseline and Year 2030 Baseline plus Project conditions. The other five freeway segments operating under unacceptable conditions are H-1 Eastbound south of Makakilo Drive, H-1 Eastbound west of Pāiwa Street, H-1 Eastbound east of Kamehameha Highway, H-1 Westbound west of Kunia Road, and H-1 Westbound east of Kamehameha Highway.

Therefore, the proposed Project would result in potential cumulative impacts under "With Transit Corridor Scenario" at the following five freeway segments:

- H-1 Eastbound (south of Makakilo Drive)
- H-1 Eastbound (west of Pāiwa Street)
- H-1 Eastbound (east of Kamehameha Highway)
- H-1 Westbound (west of Kunia Road)
- H-1 Westbound (east of Kamehameha Highway)

Table 5.3
Peak Hour Freeway Segment Operations – Year 2030 Conditions Scenario A

#	Freeway	Segment	Year 2030 Volume	Year 2030 Density	Year 2030 LOS	Year 2030 plus Project Volume	Year 2030 plus Project Density	Year 2030 plus Project LOS	Impact?
AM Peak									
1	H-1 EB	S/O Makakilo Dr.	5434	**37.8**	**E**	5892	**43.9**	**E**	No
2	H-1 EB	W/O Kunia Rd.	8197	**>45**	**F**	9143	**>45**	**F**	No
3	H-1 EB	W/O Pāiwa St.	9906	**43.4**	**E**	11906	**>45**	**F**	**Yes**
4	H-1 EB	E/O Kamehameha Hwy.	7512	**38.8**	**E**	8435	**>45**	**F**	**Yes**
5	H-2 NB	At Ka Uka Blvd.	3184	21.3	C	3597	24.1	C	No
6	H-1 WB	S/O Makakilo Dr.	3259	21.8	C	3756	25.1	C	No
7	H-1 WB	W/O Kunia Rd.	3735	18.3	C	4491	21.9	C	No
8	H-1 WB	W/O Pāiwa St.	4366	16.6	B	5858	22.3	C	No
9	H-1 WB	E/O Kamehameha Hwy.	3069	20.5	C	3757	25.1	C	No
10	H-2 SB	At Ka Uka Blvd.	6273	30.7	D	6581	32.5	D	No
PM Peak									
1	H-1 EB	S/O Makakilo Dr.	4680	31.3	D	5334	**36.7**	**E**	**Yes**
2	H-1 EB	W/O Kunia Rd.	5833	28.5	D	6891	34.5	D	No
3	H-1 EB	W/O Pāiwa St.	7137	27.2	D	9139	**37.0**	**E**	**Yes**
4	H-1 EB	E/O Kamehameha Hwy.	4249	28.4	D	5173	**35.2**	**E**	**Yes**
5	H-2 NB	At Ka Uka Blvd.	6220	**>45**	**F**	6663	**>45**	**F**	No
6	H-1 WB	S/O Makakilo Dr.	6365	**>45**	**F**	7022	**>45**	**F**	No
7	H-1 WB	W/O Kunia Rd.	7860	**43.3**	**E**	8875	**>45**	**F**	**Yes**
8	H-1 WB	W/O Pāiwa St.	7931	25.2	C	10131	32.9	D	No
9	H-1 WB	E/O Kamehameha Hwy.	7766	**42.2**	**E**	8781	**>45**	**F**	**Yes**
10	H-2 SB	At Ka Uka Blvd.	4616	22.5	C	5070	24.8	C	No

Source: Wilbur Smith Associates, 2007

NOTES:
Density is given in pc/mi/ln.
Bold represents LOS E or F.

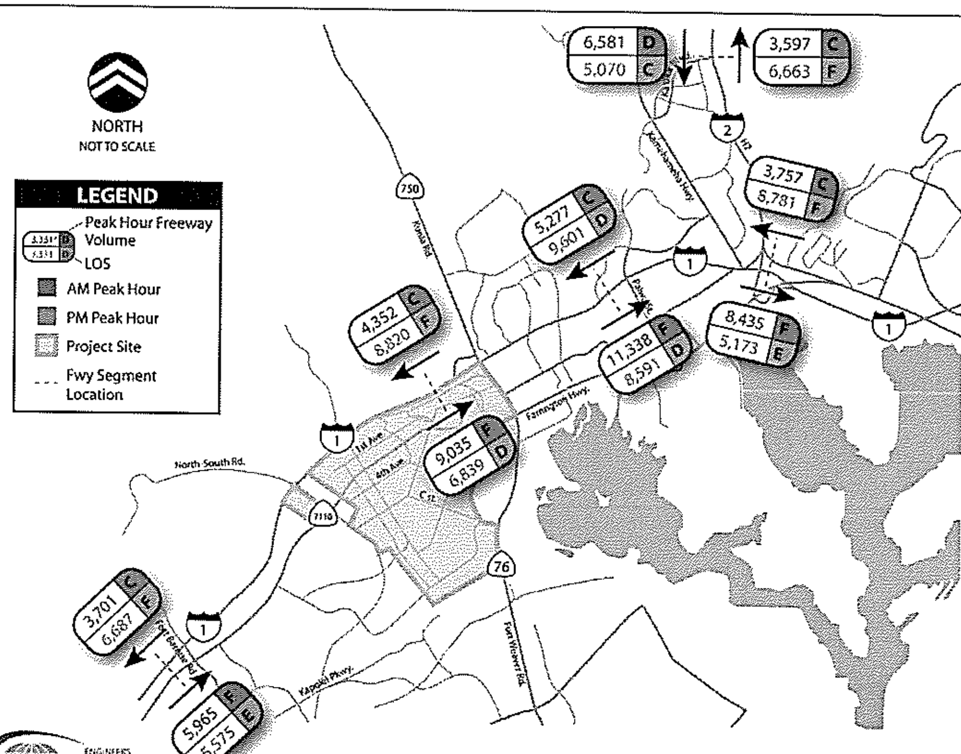

Figure 5-6
YEAR 2030 PLUS PROJECT FREEWAY OPERATING CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR

5.2.4 Freeway-Ramp Junction Operating Conditions – Scenario A

Table 5.4 presents the density and LOS values of the study ramp-freeway junctions under Year 2030 Baseline plus Project "With Transit Corridor Scenario". The North-South Road Interchange ramps were analyzed based on the planned initial diamond-type interchange configuration (Refer to Appendix E-2). Additionally, it should be noted that the analysis for the North-South Road Interchange was based on a ramp acceleration/deceleration lane length of 500 ft (in the absence of detailed information).

During Year 2030 plus Project "With Transit Corridor Scenario" AM peak hour, 7 of the 10 ramp-freeway junctions would operate under acceptable conditions (LOS D or better) with the Project. The four ramp-freeway junctions that would operate at LOS E or F conditions are: H-1/ Fort Weaver Road (Eastbound Off-Ramp), H-1/ Fort Weaver Road (Eastbound On-Ramp), and H-1/ North-South Road (Eastbound On-Ramp).

Similar to the AM peak hour, 7 of the 10 study ramp-freeway junctions would operate under acceptable conditions (LOS D or better) during the PM peak hour. The remaining three ramp-freeway junctions that would operate under unacceptable conditions (LOS E or F) are: H-1/ Fort Weaver Road (Westbound Loop Off-Ramp), H-1/ Fort Weaver Road (Eastbound On-Ramp), and H-1/ Fort Weaver Road (Westbound On-Ramp). Two of these ramp-freeway junctions would worsen to unacceptable levels with the addition of the Project traffic:

- H-1/ Fort Weaver Road (Eastbound On-Ramp)
- H-1/ North-South Road (Westbound On-Ramp)

In considering both peak hours, the Project would significantly affect conditions at a total of five ramp junctions:

- H-1/ Fort Weaver Road (Westbound Loop Off-Ramp)
- H-1/ Fort Weaver Road (Eastbound Off-Ramp)
- H-1/ Fort Weaver Road (Eastbound On-Ramp)
- H-1/ North-South Road (Westbound On-Ramp)
- H-1/ North-South Road (Eastbound On-Ramp)

Table 5.4
Peak Hour Ramp-Freeway Junction Operations – Year 2030 Conditions Scenario A

#	Location	Ramps	Peak Hour	2030 Baseline		2030 Scenario A	
				Density[1]	LOS	Density	LOS
1	H-1/ Fort Weaver Road	WB Off-Ramp	AM Peak	16.0	B	16.0	B
2	H-1/ Fort Weaver Road	WB Loop Off-Ramp	AM Peak	1.3	A	8.2	A
3	H-1/ Fort Weaver Road	WB On-Ramp	AM Peak	15.0	B	15.7	B
4	H-1/ Fort Weaver Road	EB Off-Ramp	AM Peak	37.4	E	38.9	**F**
5	H-1/ Fort Weaver Road	EB On-Ramp	AM Peak	24.8	**F**	36.1	**F**
6	H-1/ Fort Weaver Road	EB Loop On-Ramp	AM Peak	26.3	**F**	26.3	**F**
7	H-1/ North-South Road	WB Off-Ramp	AM Peak	20.3	C	26.3	C
8	H-1/ North-South Road	WB On-Ramp	AM Peak	13.5	B	16.9	B
9	H-1/ North-South Road	EB Off-Ramp	AM Peak	25.0	C	29.1	D
10	H-1/ North-South Road	EB On-Ramp	AM Peak	28.8	D	38.3	**F**
1	H-1/ Fort Weaver Road	WB Off-Ramp	PM Peak	38.0	**F**	38.0	**F**
2	H-1/ Fort Weaver Road	WB Loop Off-Ramp	PM Peak	19.9	**F**	30.7	**F**
3	H-1/ Fort Weaver Road	WB On-Ramp	PM Peak	26.0	C	26.3	C
4	H-1/ Fort Weaver Road	EB Off-Ramp	PM Peak	28.8	D	31.1	D
5	H-1/ Fort Weaver Road	EB On-Ramp	PM Peak	18.3	B	29.3	**F**
6	H-1/ Fort Weaver Road	EB Loop On-Ramp	PM Peak	20.4	C	20.4	C
7	H-1/ North-South Road	WB Off-Ramp	PM Peak	41.1	**F**	49.3	**F**
8	H-1/ North-South Road	WB On-Ramp	PM Peak	27.7	C	27.1	**F**
9	H-1/ North-South Road	EB Off-Ramp	PM Peak	21.0	C	27.3	C
10	H-1/ North-South Road	EB On-Ramp	PM Peak	17.0	B	25.8	C

Source: Wilbur Smith Associates, 2007

NOTES:
DEC – Demand Exceeds Capacity
Density is presented in pc/mi/ln.
Bold type indicates LOS F.

1 – Lower density does not necessarily indicate a lower LOS. This is because the LOS is calculated based upon a number of factors including: merge influence area, length of the acceleration lane, etc. See Appendix F for the HCM methodology used to calculate the LOS for Freeway Segments.

5.3 SCENARIO B: WITHOUT TRANSIT CORRIDOR

5.3.1 Project Study Area – Scenario B

Under Year 2025 Baseline plus Project conditions "Without Transit Corridor Scenario" (Scenario B), the study area and the proposed geometric configurations of 15 new study intersections as well as three modified study intersections would remain same as discussed in *Section 5.1.1* under Year 2025 Baseline plus Project conditions "With Transit Corridor Scenario" (Figures 5-2 and 5-3).

5.3.2 Intersection Operating Conditions – Scenario B

The intersection turning movement volumes under Year 2030 Baseline plus Project conditions "Without Transit Corridor Scenario" are exhibited in Figure 5-7 A, 5-7 B, and 5-7 C.

The intersection operations under Year 2030 Baseline plus Project conditions "Without Transit Corridor Scenario" are presented in Tables 5.5 and 5.6. The LOS and delay values of the study intersections located outside the proposed project site (external intersections) are exhibited in Table 5.5 (a) and 5.6 (a) for AM and PM peak hour conditions respectively, while Tables 5.5 (b) and 5.6 (b) display the operations of the study intersections located within the proposed project site (internal intersections) for AM and PM peak hour conditions.

During the AM peak period, the intersection operations under "Without Transit Corridor Scenario" are similar to that under "With Transit Scenario." Of the 26 study intersections, 20 would operate under acceptable conditions (LOS D or better) and the following six intersections would operate at LOS E or F:

- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/Fort Barrette Road
- North-South Road/ H-1 Westbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ Kapolei Parkway

During the PM peak period, the intersection operations under "Without Transit Corridor Scenario" marginally worsen compared to "With Transit Scenario." Of the 26 study intersections, 17 would operate under acceptable conditions (LOS D or better) and the following nine intersections would operate at LOS E or F:

- Farrington Hwy/ Fort Weaver Road Northbound Ramps
- Farrington Hwy/ Leokū Street
- Fort Weaver Road/ Laulaunui Street
- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/Fort Barrette Road
- North-South Road/ H-1 Eastbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ Kapolei Parkway

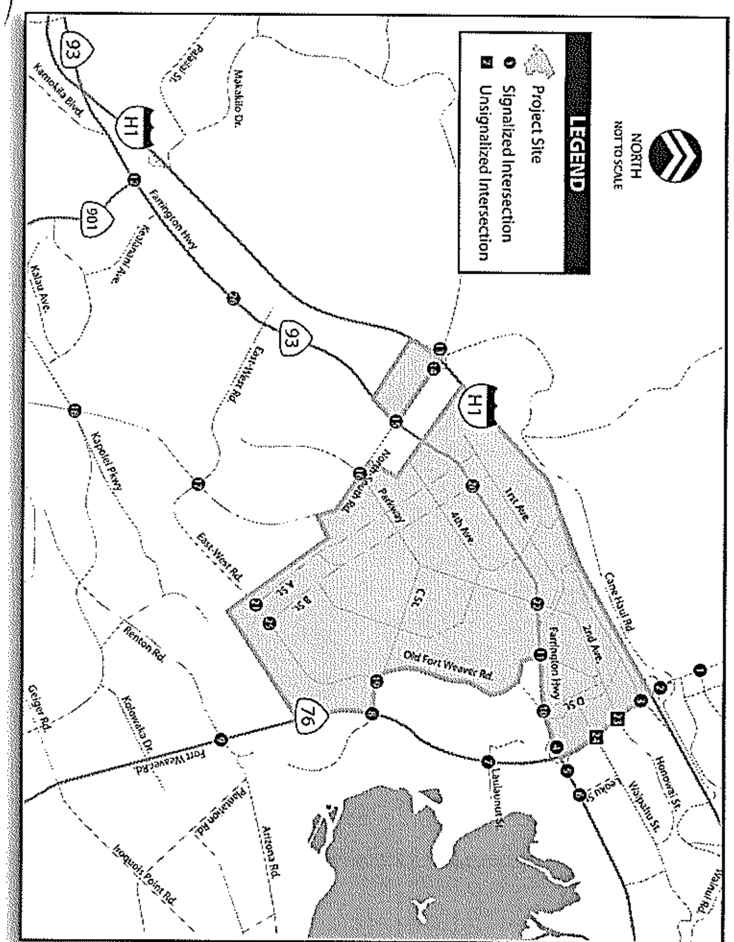

Figure 5-7A
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

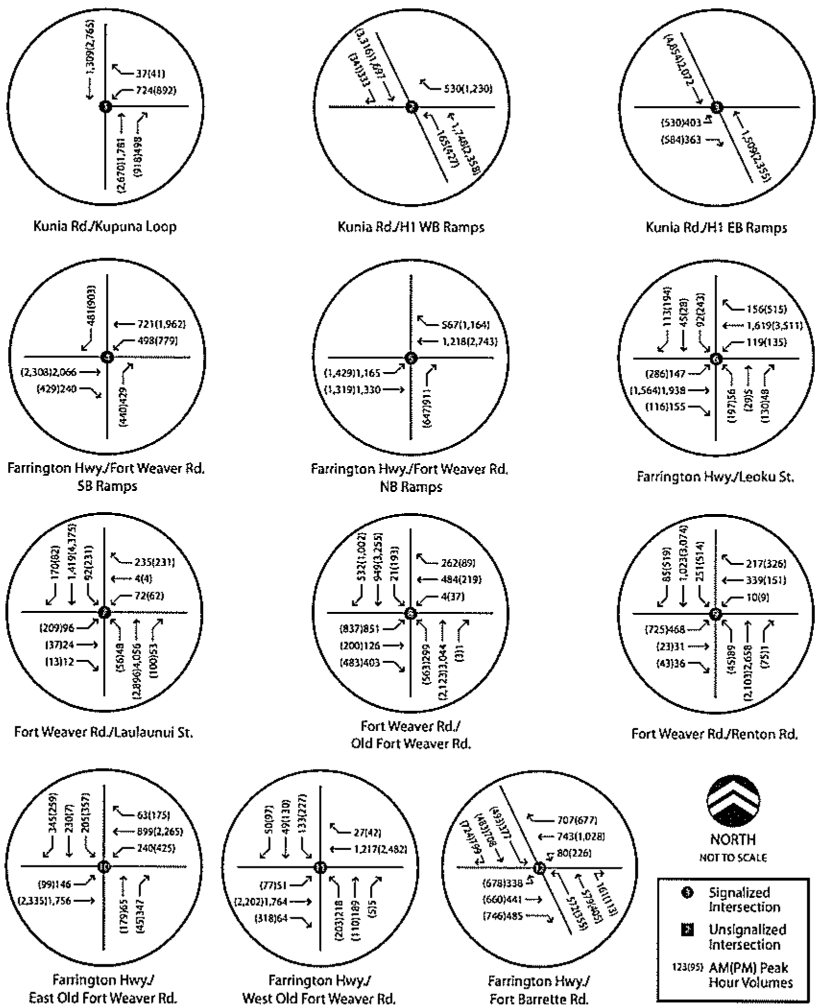

Figure 5-7B
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

WilburSmith Associates — Engineers Planners Economists

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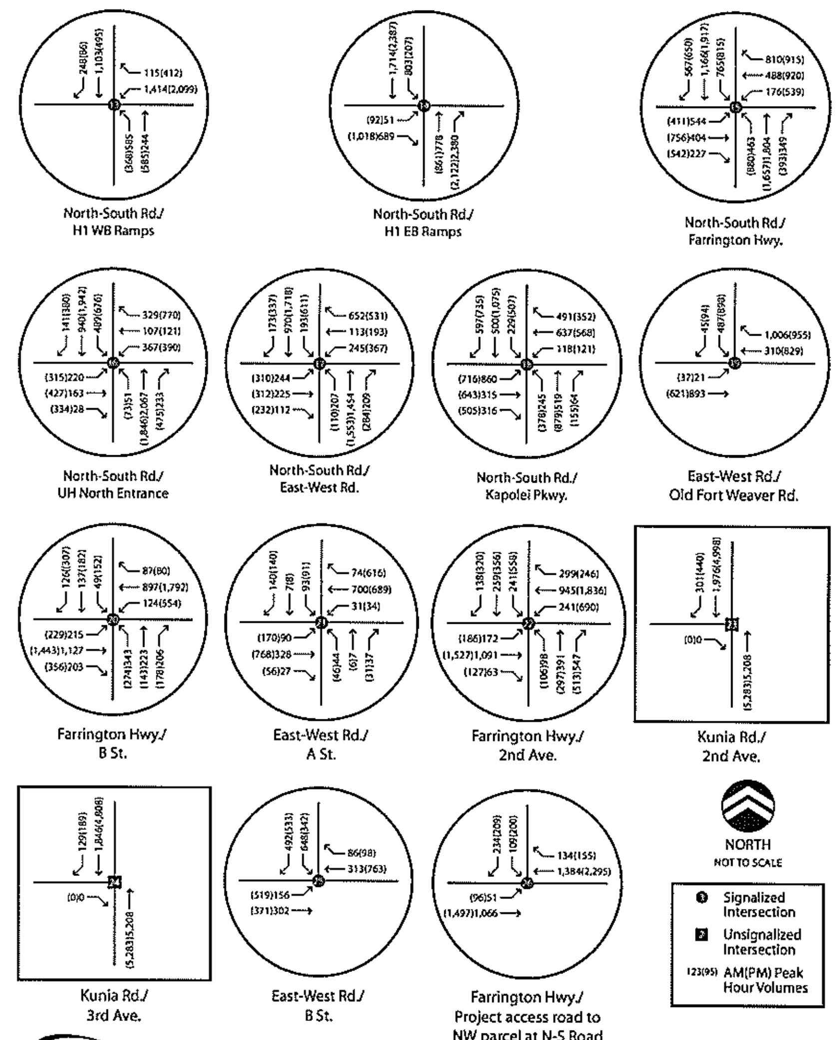

Figure 5-7C
PEAK HOUR INTERSECTION VOLUMES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

WilburSmith Associates — Engineers Planners Economists

100061/DEC 2007-12/10/07

Table 5.5 (b)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B (Internal Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	-	-	-	30.6	0.71	C	N.A.
21	East-West Rd./ A St.	Signal	-	-	-	24.6	0.69	C	N.A.
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	-	-	-	33.2	0.66	C	N.A.
23	Kunia Rd./ 2nd Ave.	OWSC	-	-	-	0.0 (NB)	0.83 (NB)	A	N.A.
24	Kunia Rd./ 3rd Ave.	OWSC	-	-	-	12.3 (EB)	0.02 (EB)	B	N.A.
25	East-West Rd./ B St.	Signal	-	-	-	23.9	0.84	C	N.A.
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	-	-	-	18.3	0.66	B	N.A.

Source: Wilbur Smith Associates – 2007

NOTES:
AWSC – All-way Stop-Control
TWSC – Two-way Stop-Control
N.A. – Not Applicable
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

Table 5.5 (a)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B (External Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	12.8	0.70	B	17.9	0.85	B	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	3.3	0.47	A	4.5	0.59	A	No
3	Kunia Rd./ H-1 EB Ramps	Signal	8.9	0.37	A	8.4	0.52	A	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	5.2	0.41	A	10.3	0.71	B	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	3.0	0.48	A	38.4	1.07	D	No
6	Farrington Hwy./ Leokū St.	Signal	18.0	0.63	B	23.6	0.66	C	No
7	Fort Weaver Rd./ Laulaunui St.	Signal	29.8	0.90	C	53.9	1.03	D	No
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	16.7	0.89	B	**268.8**	**2.43**	**F**	**Yes**
9	Fort Weaver Rd./ Renton Rd.	Signal	**78.1**	**1.08**	**E**	**114.8**	**1.24**	**F**	**Yes**
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	16.4 (WB)	0.21 (WB)	C	40.1	0.91	D	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	22.0 (NB)	0.37 (NB)	C	24.8	0.77	C	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**62.7**	**0.77**	**E**	**71.6**	**0.90**	**E**	**Yes**
13	North-South Rd./ H-1 WB Ramps	Signal	32.4	0.68	C	**99.4**	**1.00**	**F**	**Yes**
14	North-South Rd./ H-1 EB Ramps	Signal	38.1	0.74	D	37.3	0.98	D	No
15	North-South Rd./ Farrington Hwy.	Signal	35.2	0.61	D	**105.4**	**1.23**	**F**	**Yes**
16	North-South Rd./ North UH Connector	Signal	7.3	0.39	A	33.4	0.76	C	No
17	North-South Rd./ East-West Rd.	Signal	27.0	0.63	C	40.8	0.77	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	34.8	0.75	C	**62.7**	**0.92**	**E**	**Yes**
19	East-West Rd./ Old Fort Weaver Rd.	Signal	22.3	0.24	C	14.1	0.74	B	No

Source: Wilbur Smith Associates – 2007

NOTES:
A - This location is stop-controlled under existing conditions, but is signalized after meeting the traffic signal warrants under year 2030 conditions.
B - This location is stop-controlled under year 2030 conditions, but is signalized after meeting the traffic signal warrants under year 2030 plus project conditions.
TWSC – Two-way Stop-Control
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

Table 5.6 (b)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B (Internal Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	-	-	-	38.4	0.87	D	N.A.
21	East-West Rd./ A St.	Signal	-	-	-	26.2	0.74	C	N.A.
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	-	-	-	42.8	0.97	D	N.A.
23	Kunia Rd./ 2nd Ave.	OWSC	-	-	-	0.0 (SB)	0.91 (SB)	A	N.A.
24	Kunia Rd./ 3rd Ave.	OWSC	-	-	-	0 (SB)	0.12 (SB)	A	N.A.
25	East-West Rd./ B St.	Signal	-	-	-	60.8	1.01	E	N.A.
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	-	-	-	17.0	1.21	B	N.A.

Source: Wilbur Smith Associates – 2007

NOTES:
AWSC – All-way Stop-Control
TWSC – Two-way Stop-Control
N.A. – Not Applicable
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

Table 5.6 (a)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B (External Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	17.1	0.90	B	40.1	1.04	D	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	14.1	0.92	B	15.4	0.97	B	No
3	Kunia Rd./ H-1 EB Ramps	Signal	8.8	0.85	A	19.4	0.93	B	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	14.0	0.42	B	9.4	0.78	A	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	8.0	0.83	A	**221.0**	**1.65**	**F**	**Yes**
6	Farrington Hwy./ Leokū St.	Signal	47.4	0.88	D	**57.6**	**1.01**	**E**	**Yes**
7	Fort Weaver Rd./ Laulaunui St.	Signal	26.3	0.89	C	**56.3**	**1.05**	**E**	**Yes**
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	45.0	1.03	D	**322.9**	**2.17**	**F**	**Yes**
9	Fort Weaver Rd./ Renton Rd.	Signal	**63.4**	**1.03**	**E**	**130.6**	**1.30**	**F**	**Yes**
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	32.0 (WB)	0.71 (WB)	D	40.9	0.91	D	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	55.4 (NB)	0.55 (NB)	F	30.5	0.89	C	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**67.5**	**0.88**	**E**	**67.0**	**0.86**	**E**	**Yes**
13	North-South Rd./ H-1 WB Ramps	Signal	25.6	0.59	C	54.0	0.94	D	No
14	North-South Rd./ H-1 EB Ramps	Signal	15.7	0.62	B	**105.4**	**1.39**	**F**	**Yes**
15	North-South Rd./ Farrington Hwy.	Signal	35.8	0.76	D	**117.1**	**1.27**	**F**	**Yes**
16	North-South Rd./ North UH Connector	Signal	13.5	0.47	B	50.3	0.94	D	No
17	North-South Rd./ East-West Rd.	Signal	34.3	0.76	C	45.9	0.85	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	54.2	0.88	D	**68.3**	**0.95**	**E**	**Yes**
19	East-West Rd./ Old Fort Weaver Rd.	Signal	20.6	0.62	C	13.6	0.72	B	No

Source: Wilbur Smith Associates – 2007

NOTES:
A - This location is stop-controlled under existing conditions, but is signalized after meeting the traffic signal warrants under year 2030 conditions.
B - This location is stop-controlled under year 2030 conditions, but is signalized after meeting the traffic signal warrants under year 2030 plus project conditions.
TWSC – Two-way Stop-Control
Signal – Traffic Signal
Delay represents average delay presented in seconds per vehicle.
Delay and LOS are presented for worst approach for two-way stop controlled intersections.
Bold type indicates LOS E or F.

Overall, in considering both peak hours, under Year 2030 Baseline plus Project conditions "Without Transit Corridor Scenario", 10 of the 26 study intersections would operate under unacceptable conditions (LOS E or worse). The other 16 study intersections would operate under acceptable conditions (LOS D or better). The study intersections operating at LOS E or F are:

- Farrington Highway/ Fort Weaver Road Northbound Ramps
- Farrington Highway / Leokū Street
- Fort Weaver Road/ Laulaunui Street
- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/Fort Barrette Road
- North-South Road/ H-1 Eastbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ Kapolei Parkway

Intersections Farrington Highway/ Leokū Street, Fort Weaver Road/ Laulaunui Street, Farrington Highway/Fort Barrette Road, and North-South Road/ Kapolei Parkway would operate at LOS E, while the remaining 6 intersections would operate at LOS F.

Of the 10 intersections operating under unacceptable conditions during the PM peak hour, six intersections also operate unacceptably during the AM peak hour. Even though the Fort Weaver Road/ Old Fort Weaver Road intersection would operate at LOS F under both Year 2030 Baseline and Year 2030 Baseline plus Project "Without Transit Corridor Scenario" conditions, the difference in volume-to-capacity ratio is greater than 10 percent. Therefore under "Without Transit Corridor Scenario", the proposed Project would result in transportation impacts at all 10 intersections operating under unacceptable conditions during the PM peak period. A detailed description is presented in *Section 6.2.2.*

Synchro calculation worksheets under Year 2030 Baseline plus Project conditions "Without Transit Corridor Scenario" are included in Appendix A-4; whereas, Figures 5-8A1, 5-8A2, 5-8A3, 5-8B1, 5-8B2, and 5-8B3 present the LOS and delay values of all the turning movements at the study intersections under Year 2030 Baseline plus Project "Without Transit Corridor Scenario" AM and PM peak hour conditions.

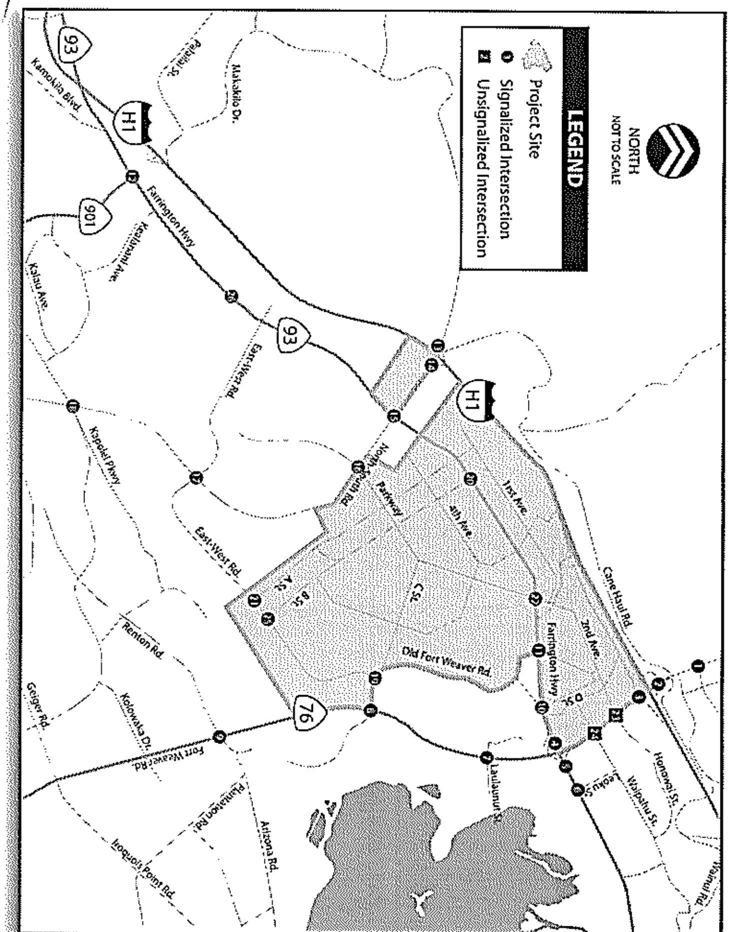

Figure 5-8A1
AM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR
100061/Draft October - 10/17/07

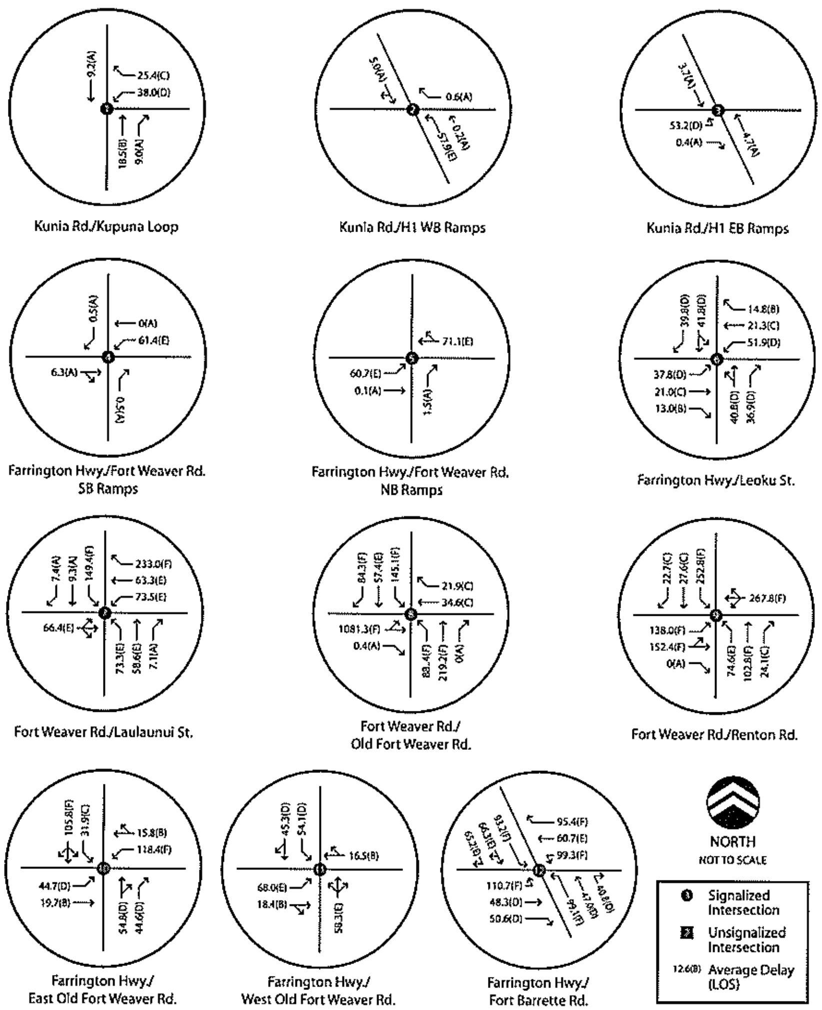

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Figure 5-8A2
AM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

100061/DEC 2007-12/10/07

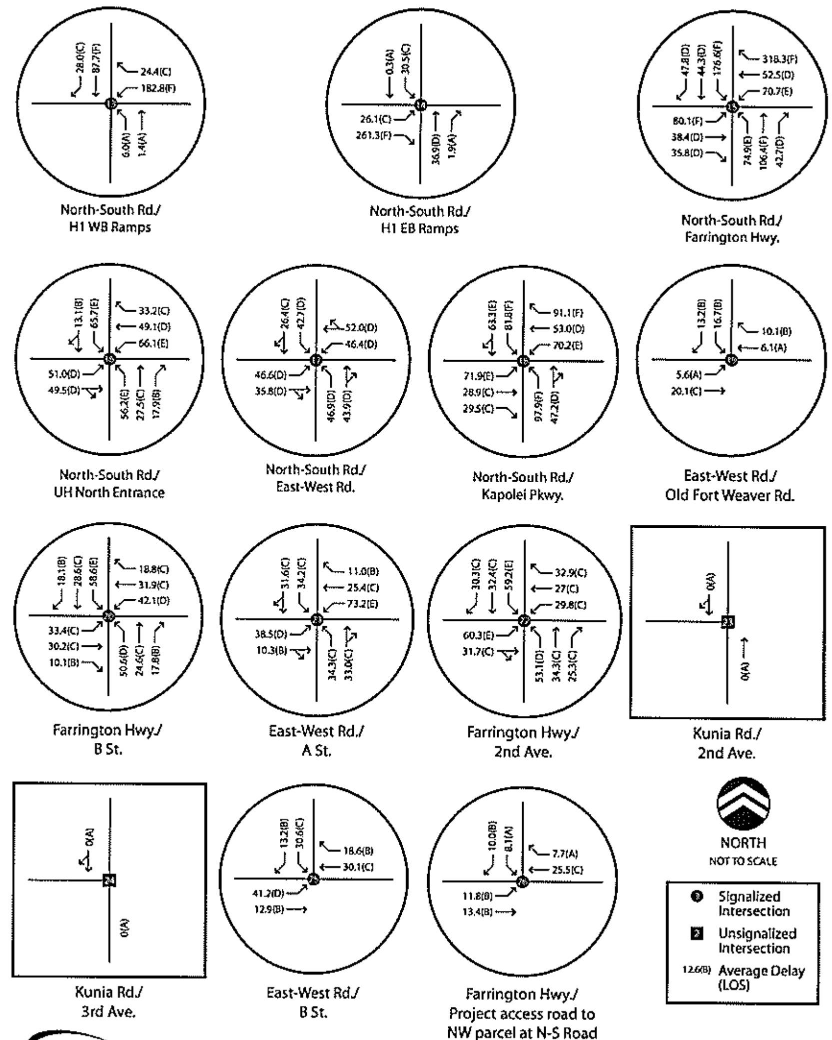

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Figure 5-8A3
AM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

100061/DEC 2007-12/10/07

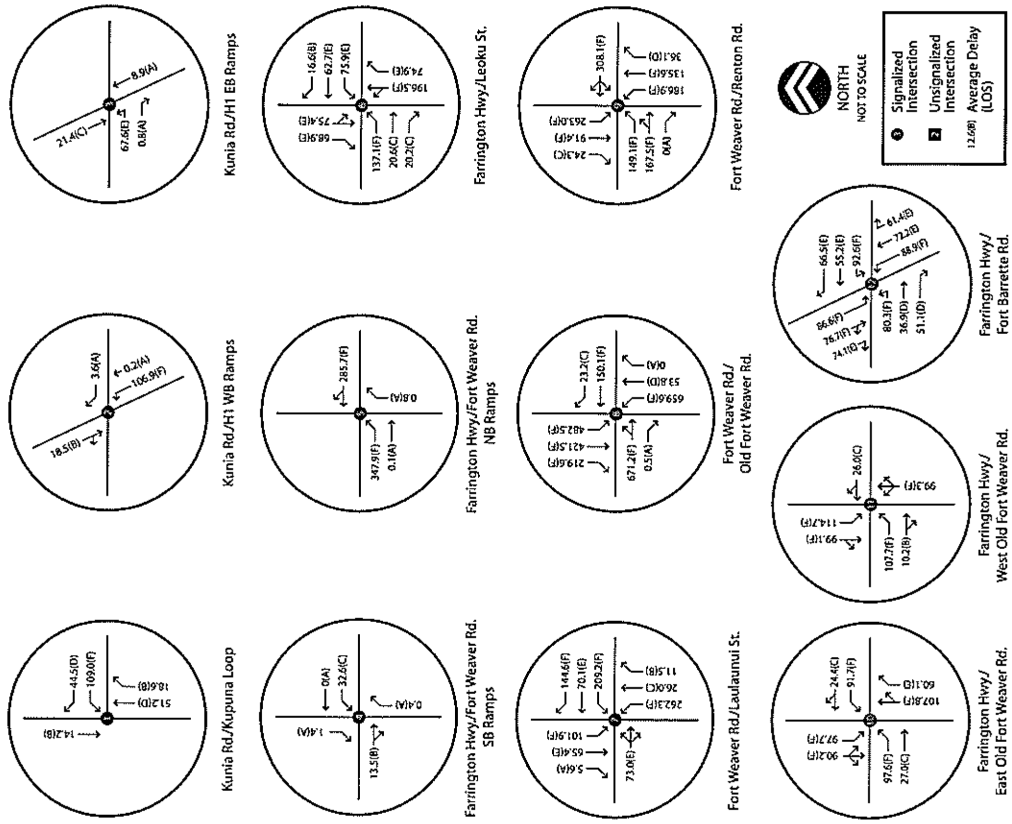

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Figure 5-8B2
PM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR
100061/DEC 2007-12/10/07

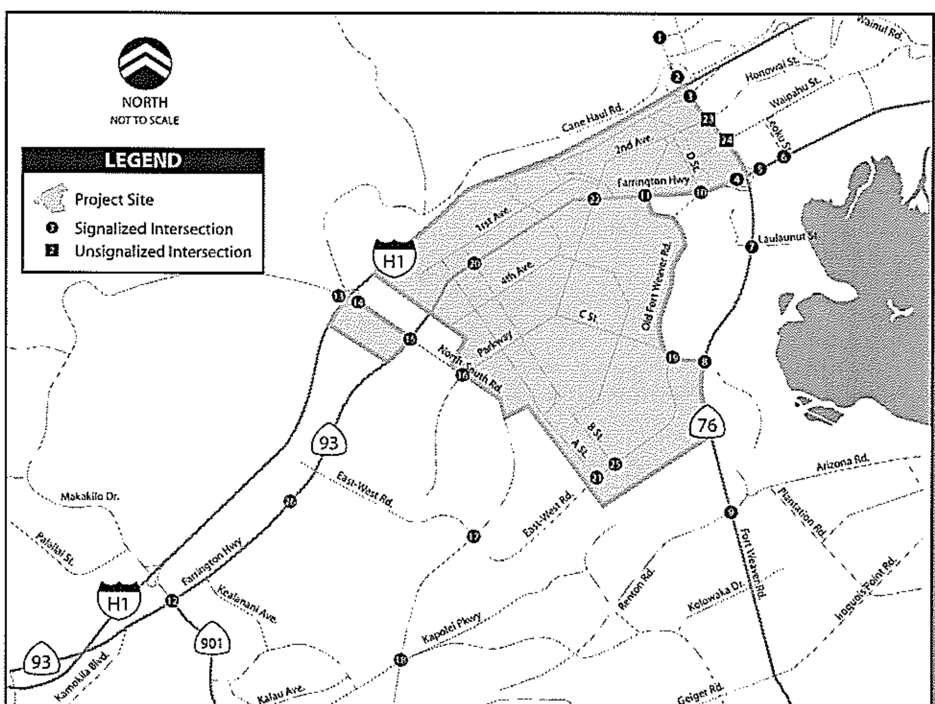

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Figure 5-8B1
PM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR
100061/Draft October - 10/17/07

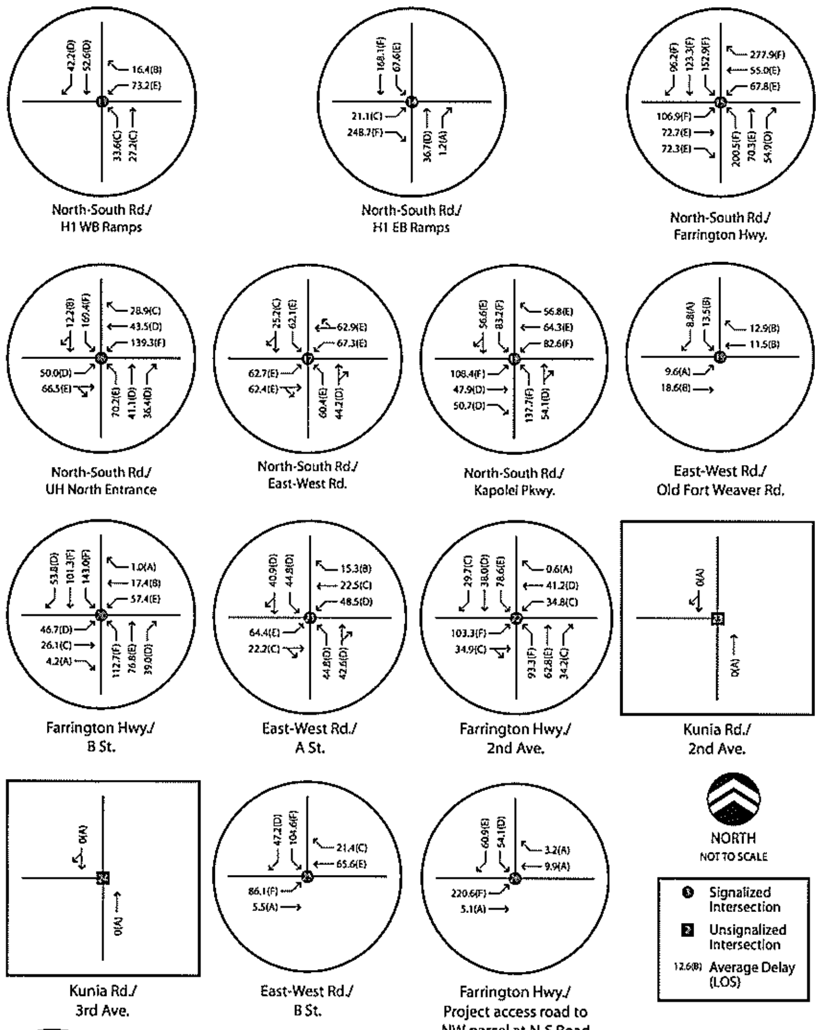

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Figure 5-8B3
PM PEAK HOUR LOS & DELAY VALUES-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR

100061/DEC 2007-12/10/07

5.3.3 Freeway Operating Conditions - Scenario B

Figure 5-9 presents the freeway segment operations under Year 2030 Baseline plus Project conditions "Without Transit Corridor Scenario." Table 5.7 compares the freeway segment operations under Year 2030 Baseline plus Project conditions with that under Year 2030 Baseline conditions.

Similar to "With Transit Corridor Scenario, during the AM peak period, four freeway segments would operate under unacceptable conditions (LOS E or worse), of which freeway segments H-1 Eastbound (south of Makakilo Drive) and H-1 Eastbound (west of Kunia Road) would operate at LOS E and LOS F, respectively under both Year 2030 Baseline and Year 2030 Baseline plus Project "Without Transit Corridor Scenario" conditions. The other two freeway segments that would operate at LOS E or F under Year 2030 Baseline plus Project conditions are H-1 Eastbound (west of Pāiwa Street), and H-1 Eastbound (east of Kamehameha Highway).

During PM peak period, two of the 10 study freeway segments would operate under acceptable conditions (LOS D or better); all other eight freeway segments operate under unacceptable conditions (LOS E or worse). Of the eight segments, two freeway segments operate at LOS F under Year 2030 Baseline as well as Year 2030 Baseline plus Project conditions. The other six freeway segments operating under unacceptable conditions are H-1 Eastbound (south of Makakilo Drive), H-1 Eastbound (west of Kunia Road), H-1 Eastbound (west of Pāiwa Street), H-1 Eastbound (east of Kamehameha Highway), H-1 Westbound (west of Kunia Road), and H-1 Westbound (east of Kamehameha Highway). It should be noted that while the freeway segments H-2 Northbound/ At Ka Uka Boulevard and H-1 Westbound/ S/O Makakilo Drive operate at LOS F under 2030 plus Project conditions, no impact would result at these locations as they would already operate unsatisfactorily under 2030 Baseline conditions.

Therefore, the proposed Project would result in potential cumulative impacts under "Without Transit Corridor Scenario" at the following six freeway segments:

- H-1 Eastbound (south of Makakilo Drive)
- H-1 Eastbound (west of Kunia Road)
- H-1 Eastbound (west of Pāiwa Street)
- H-1 Eastbound (east of Kamehameha Highway)
- H-1 Westbound (west of Kunia Road)
- H-1 Westbound (east of Kamehameha Highway

Table 5.7
Peak Hour Freeway Segment Operations – Year 2030 Conditions Scenario B

#	Freeway	Segment	Year 2030 Volume	Year 2030 Density	Year 2030 LOS	Year 2030 plus Project Volume	Year 2030 plus Project Density	Year 2030 plus Project LOS	Impact?
AM Peak									
1	H-1 EB	S/O Makakilo Dr.	5434	37.8	E	5928	44.5	E	No
2	H-1 EB	W/O Kunia Rd.	8197	>45	F	9217	>45	F	No
3	H-1 EB	W/O Pāiwa St.	9906	43.4	E	12062	>45	F	Yes
4	H-1 EB	E/O Kamehameha Hwy.	7512	38.8	E	8507	>45	F	Yes
5	H-2 NB	At Ka Uka Blvd.	3184	21.3	C	3629	24.3	C	No
6	H-1 WB	S/O Makakilo Dr.	3259	21.8	C	3794	25.4	C	No
7	H-1 WB	W/O Kunia Rd.	3735	18.3	C	4549	22.2	C	No
8	H-1 WB	W/O Pāiwa St.	4366	16.6	B	5974	22.8	C	No
9	H-1 WB	E/O Kamehameha Hwy.	3069	20.5	C	3811	25.5	C	No
10	H-2 SB	At Ka Uka Blvd.	6273	30.7	D	6605	32.6	D	No
PM Peak									
1	H-1 EB	S/O Makakilo Dr.	4680	31.3	D	5392	38.7	E	Yes
2	H-1 EB	W/O Kunia Rd.	5833	28.5	D	6985	35.1	E	Yes
3	H-1 EB	W/O Pāiwa St.	7137	27.2	D	9309	38.2	E	Yes
4	H-1 EB	E/O Kamehameha Hwy.	4249	28.4	D	5251	35.9	E	Yes
5	H-2 NB	At Ka Uka Blvd.	6220	>45	F	6668	>45	F	No
6	H-1 WB	S/O Makakilo Dr.	6365	>45	F	7080	>45	F	No
7	H-1 WB	W/O Kunia Rd.	7860	43.3	E	8964	>45	F	Yes
8	H-1 WB	W/O Pāiwa St.	7931	25.2	C	10317	33.7	D	No
9	H-1 WB	E/O Kamehameha Hwy.	7766	42.2	E	8867	>45	F	Yes
10	H-2 SB	At Ka Uka Blvd.	4616	22.5	C	5108	25.0	C	No

Source: Wilbur Smith Associates, 2007

NOTES:
Density is given in pc/mi/ln.
Bold represents LOS E or F.

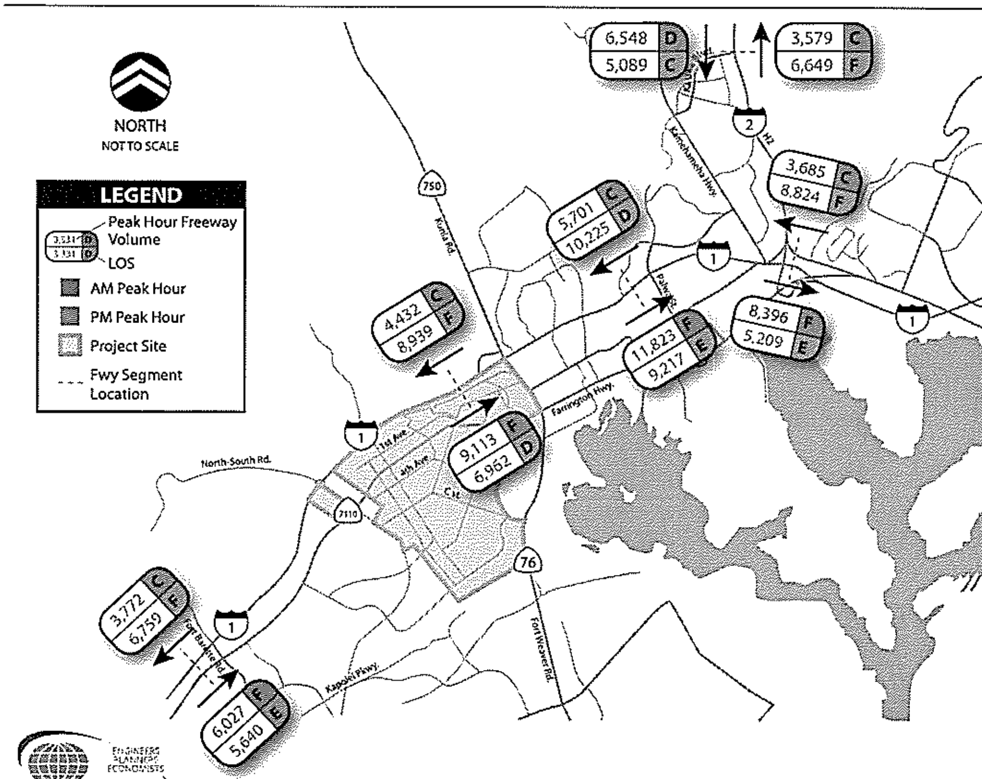


Figure 5-9
YEAR 2030 PLUS PROJECT FREEWAY OPERATING CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR
100061/DEC 2007-12/10/07

5.3.4 Freeway-Ramp Junction Operating Conditions – Scenario B

Table 5.8 exhibits the density and LOS values of the study ramp-freeway junctions under Year 2030 Baseline plus Project "Without Transit Corridor Scenario". As previously mentioned, the analysis performed for the North-South Road Interchange was based on a ramp acceleration/deceleration lane length of 500 feet.

For the Year 2030 Baseline plus Project "Without Transit Corridor Scenario," eight of the 10 ramp-freeway junctions would operate under acceptable conditions during the AM peak hour. The two ramp-freeway junctions that would operate under unacceptable conditions are: H-1/ Fort Weaver Road (Eastbound On-Ramp), and H-1/ North-South Road (Eastbound On-Ramp).

During the PM peak hour, six of the 10 study ramp-freeway junctions would operate under acceptable conditions (LOS D or better). The remaining four ramp-freeway junctions that would operate under unacceptable conditions (LOS E or worse) are: H-1/ Fort Weaver Road (Westbound Loop Off-Ramp), H-1/ Fort Weaver Road (Westbound On-Ramp), H-1/ Fort Weaver Road (Eastbound On-Ramp), and H-1/ North-South Road (Westbound On-Ramp).

Therefore under Year 2030 Baseline plus Project "Without Transit Corridor Scenario" conditions, the proposed Project would cause transportation impacts at the following five ramp-freeway junctions:

- H-1/ Fort Weaver Road (Westbound Loop Off-Ramp)
- H-1/ Fort Weaver Road (Westbound On-Ramp)
- H-1/ Fort Weaver Road (Eastbound On-Ramp)
- H-1/ North-South Road (Westbound On-Ramp)
- H-1/ North-South Road (Eastbound On-Ramp)

Table 5.8
Peak Hour Ramp-Freeway Junction Operations – Year 2030 Conditions Scenario B

#	Location	Ramps	Peak Hour	2030 Baseline		2030 Scenario B	
				Density[1]	LOS	Density	LOS
1	H-1/ Fort Weaver Road	WB Off-Ramp	AM Peak	16.0	B	16.0	B
2	H-1/ Fort Weaver Road	WB Loop Off-Ramp	AM Peak	1.3	A	9.6	A
3	H-1/ Fort Weaver Road	WB On-Ramp	AM Peak	15.0	B	15.7	B
4	H-1/ Fort Weaver Road	EB Off-Ramp	AM Peak	37.4	E	39.0	F
5	H-1/ Fort Weaver Road	EB On-Ramp	AM Peak	24.8	F	37.7	F
6	H-1/ Fort Weaver Road	EB Loop On-Ramp	AM Peak	26.3	F	26.3	F
7	H-1/ North-South Road	WB Off-Ramp	AM Peak	20.3	C	26.9	C
8	H-1/ North-South Road	WB On-Ramp	AM Peak	13.5	B	17.2	B
9	H-1/ North-South Road	EB Off-Ramp	AM Peak	25.0	C	29.6	D
10	H-1/ North-South Road	EB On-Ramp	AM Peak	28.8	D	37.4	F
1	H-1/ Fort Weaver Road	WB Off-Ramp	PM Peak	38.0	F	38.0	F
2	H-1/ Fort Weaver Road	WB Loop Off-Ramp	PM Peak	19.9	F	33.0	F
3	H-1/ Fort Weaver Road	WB On-Ramp	PM Peak	26.0	C	26.3	F
4	H-1/ Fort Weaver Road	EB Off-Ramp	PM Peak	28.8	D	31.3	D
5	H-1/ Fort Weaver Road	EB On-Ramp	PM Peak	18.3	B	31.3	F
6	H-1/ Fort Weaver Road	EB Loop On-Ramp	PM Peak	20.4	C	20.4	C
7	H-1/ North-South Road	WB Off-Ramp	PM Peak	41.1	F	50.2	F
8	H-1/ North-South Road	WB On-Ramp	PM Peak	27.7	C	27.2	F
9	H-1/ North-South Road	EB Off-Ramp	PM Peak	21.0	C	27.9	C
10	H-1/ North-South Road	EB On-Ramp	PM Peak	17.0	B	26.7	C

Source: Wilbur Smith Associates, 2007

NOTES:
DEC – Demand Exceeds Capacity
Density is presented in pc/mi/ln.
Bold type indicates LOS F.
1 – Lower density does not necessarily indicate a lower LOS. This is because the LOS is calculated based upon a number of factors including: merge influence area, length of the acceleration lane, etc. See Appendix F for the HCM methodology used to calculate the LOS for Freeway Segments.

Chapter 6
PROJECT IMPACTS AND MITIGATION MEASURES

This chapter identifies potential transportation impacts on the roadway network due to travel demand generated by the proposed Project. Recommended improvements to the surrounding transportation system are proposed at the locations where significant impacts are identified. In addition, descriptions pertaining to project site access, on-site circulation, and transit services as well as pedestrian facilities that would be located within the project site are provided.

Some of the mitigation measures in this TIAR propose additional laneage at the intersections analyzed. Land acquisition and dedication for additional rights of way where land is owned or controlled by the Project is readily accommodated. Land acquisition outside the Project site, if necessary, may require assistance from City and State as part of the overall regional plan of roadway improvements. As such, in cases where there may be contention regarding land acquisition, the appropriate governmental bodies should actively seek to acquire said land or otherwise protect it for future use. Most of the off-site roadway improvements are the result of the cumulative traffic increases from both adjacent developments and from through traffic, therefore regional consideration should be taken into account when determining responsibility for implementation.

6.1 SCENARIO A: WITH TRANSIT CORRIDOR

6.1.1 Project Impacts - Year 2030 plus Project Conditions "Scenario A"

As indicated in *Section 5.2.2*, the proposed Project would cause transportation impacts at the following 9 study intersections under Year 2030 Baseline plus Project conditions "With Transit Corridor Scenario":

- Farrington Highway/Fort Weaver NB Ramps
- Farrington Highway/ Leokū St.
- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/ Fort Barrette Road
- North-South Road/H-1 EB Ramps
- North-South Rd./Farrington Highway
- North-South Rd. Kapolei Pkwy
- East-West Rd./Old Fort Weaver Rd.

Tables 6.1(a), 6.1(b), 6.2(a), and 6.2(b) present the AM and PM peak hour intersection operations for Year 2030 Scenario B with Mitigations Conditions. Descriptions of transportation impacts and the proposed improvements to mitigate them at each of the above identified intersections are discussed in *Section 6.1.2*.

Table 6.1 (a)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A with Mitigations (External Intersections)

#	Intersection	Control	Year 2030 plus Project			Mitigation Measures			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	15.7	0.78	B	15.8	0.78	B	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	4.5	0.58	A	4.5	0.58	A	No
3	Kunia Rd./ H-1 EB Ramps	Signal	8.4	0.52	A	7.7	0.52	A	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	9.9	0.66	A	5.7	0.66	A	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	25.4	0.92	C	13.0	0.63	B	No
6	Farrington Hwy./ Leokū St.	Signal	19.2	0.73	B	19.3	0.72	B	No
7	Fort Weaver Rd./ Laulaunui St.	Signal	42.6	0.99	D	44.2	0.98	D	No
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	**176.6**	**1.69**	**F**	37.5	0.98	D	No
9	Fort Weaver Rd./ Renton Rd.	Signal	**111.8**	**1.23**	**F**	**59.2**	**1.01**	**E**	**Yes**
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	31.4	0.81	C	37.1	0.81	D	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	17.2	0.62	B	18.1	0.57	B	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**75.9**	**0.93**	**E**	48.9	0.88	D	No
13	North-South Rd./ H-1 WB Ramps	Signal	42.7	0.95	D	42.2	0.95	D	No
14	North-South Rd./ H-1 EB Ramps	Signal	30.0	0.92	C	14.7	0.74	B	No
15	North-South Rd./ Farrington Hwy.	Signal	**76.7**	**1.04**	**E**	46.8	0.84	D	No
16	North-South Rd./ North UH Connector	Signal	38.6	0.87	D	38.7	0.87	D	No
17	North-South Rd./ East-West Rd.	Signal	37.0	0.79	D	35.1	0.74	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	43.1	0.86	D	36.1	0.76	D	No
19	East-West Rd./ Old Fort Weaver Rd.	Signal	14.3	0.61	B	20.5	0.59	C	No

Source: Wilbur Smith Associates

Table 6.2 (a)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A with Mitigations (External Intersections)

#	Intersection	Control	Year 2030 plus Project			Mitigation Measures			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	36.8	1.05	D	37.5	1.05	D	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	18.6	1.03	B	22.9	1.03	C	No
3	Kunia Rd./ H-1 EB Ramps	Signal	11.3	0.90	B	8.2	0.90	A	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	10.0	0.80	B	10.0	0.80	A	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	**134.2**	**1.41**	**F**	34.7	1.10	C	No
6	Farrington Hwy./ Leokū St.	Signal	**61.9**	**1.05**	**E**	**69.4**	**1.07**	**E**	**Yes**
7	Fort Weaver Rd./ Laulaunui St.	Signal	44.9	1.01	D	46.1	1.02	D	No
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	**289.5**	**2.01**	**F**	**62.8**	**1.10**	**E**	**Yes**
9	Fort Weaver Rd./ Renton Rd.	Signal	**125.3**	**1.25**	**F**	**60.4**	**0.99**	**E**	**Yes**
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	20.6	0.75	C	22.2	0.76	C	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	25.9	0.88	C	20.5	0.82	C	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**74.4**	**0.91**	**E**	53.0	0.93	D	No
13	North-South Rd./ H-1 WB Ramps	Signal	38.2	0.86	D	36.1	0.86	D	No
14	North-South Rd./ H-1 EB Ramps	Signal	**87.5**	**1.30**	**F**	42.7	1.08	D	No
15	North-South Rd./ Farrington Hwy.	Signal	**136.3**	**1.28**	**F**	53.9	0.98	D	No
16	North-South Rd./ North UH Connector	Signal	49.0	0.92	D	44.3	0.89	D	No
17	North-South Rd./ East-West Rd.	Signal	43.1	0.87	D	40.5	0.78	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	**58.5**	**0.95**	**E**	51.8	0.87	D	No
19	East-West Rd./ Old Fort Weaver Rd.	Signal	**62.6**	**0.56**	**E**	16.3	0.69	B	No

Source: Wilbur Smith Associates

Table 6.1 (b)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A with Mitigations (Internal Intersections)

#	Intersection	Control	Year 2030 plus Project			Mitigation Measures			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	30.2	0.69	C	30.3	0.66	C	No
21	East-West Rd./ A St.	Signal	21.0	0.59	C	20.4	0.59	C	No
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	33.0	0.65	C	40.3	0.60	D	No
23	Kunia Rd./ 2nd Ave.	OWSC	0.0 (NB)	0.76 (NB)	A	0.0 (NB)	0.76 (NB)	A	No
24	Kunia Rd./ 3rd Ave.	OWSC	11.9 (EB)	0.01 (EB)	B	11.9 (EB)	0.01 (EB)	B	No
25	East-West Rd./ B St.	Signal	27.3	0.82	C	32.3	0.75	C	No
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	17.8	0.65	B	15.2	0.55	B	No

Source: Wilbur Smith Associates

Table 6.2 (b)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario A with Mitigations (Internal Intersections)

#	Intersection	Control	Year 2030 plus Project			Mitigation Measures			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	41.7	0.88	D	40.4	0.87	D	No
21	East-West Rd./ A St.	Signal	17.5	0.61	B	16.9	0.61	B	No
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	71.1	1.07	E	48.3	0.98	D	No
23	Kunia Rd./ 2nd Ave.	OWSC	13.9 (SB)	0.03 (SB)	B	0.0 (SB)	0.83 (SB)	B	No
24	Kunia Rd./ 3rd Ave.	OWSC	13.8 (EB)	0.10 (EB)	B	0.0 (SB)	0.81 (EB)	A	No
25	East-West Rd./ B St.	Signal	46.6	0.92	D	59.4	0.92	E	**Yes**
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	16.3	1.18	B	16.3	1.18	B	No.

Source: Wilbur Smith Associates

6.1.2: Mitigation Measures - Year 2030 plus Project Conditions "Scenario A"

Improvements have been identified to mitigate impacts at the above intersections with these including 1) additional traffic lanes at intersections and/or changed usage of existing lanes; 2) by programming an alternate signal timing plans that would be in operation during specified peak commute periods; and 3) by restricting pedestrian crossings on one or more of the intersection approaches in order to allow unconstrained right-turn movement.

The application of contra-flow lanes should be considered for the existing and new major roadways in the region, particularly Fort Weaver Road and sections of Farrington Highway. Contra-flow lanes have not been proposed as Project mitigation because the forecast directional flows during the peak periods do not strongly favor such operations on these facilities. However, the potential for future contra-flow lanes should be accommodated within the design of the new and widened major roadways in the event that the actual future peak period directional volumes would result in efficient use of contra-flow lanes. Such contra-flow lanes could be open to general traffic use or could be limited to public transit and/or carpools in order to further encourage use of transportation alternatives to driving.

Several of the offsite intersection improvements may require additional right-of-way to accommodate the additional turn lane(s). Since the traffic problems at those locations would result from the cumulative traffic increases from other ongoing and new developments, the assistance of the City or State may be appropriate to facilitate the acquisition of rights-of-way needed for the improvement, or reservation and protection of rights-of-way that may be needed to implement these future improvements.

Impact 6.1.2A: Transportation Impact at Farrington Highway/ Fort Weaver Road Northbound Ramps under "With Transit Corridor Scenario"

For the Year 2030 Baseline scenario, the Farrington Highway intersection with the Fort Weaver Road northbound ramps would operate at LOS A conditions during AM and PM peak hours. For the Year 2030 Baseline plus Project "With Transit Corridor Scenario," conditions at the intersection would worsen to LOS D and LOS F during the AM and PM peak hours respectively. Since the proposed Project would worsen the operating conditions of this intersection to LOS F during the PM peak hour, roadway modifications are proposed to mitigate the transportation impact. The primary contributor of the forecast delays is the high eastbound left-turn volumes (928 vph in AM peak hour and 1027 vph in PM peak hour) and high westbound right-turn volumes (567 vph during AM peak hour and 1164 during PM peak hour).

Mitigation: The following mitigation measures are proposed:

1. Eastbound Approach: Construct one additional exclusive left-turn lane to provide dual left-turn lanes.
2. Westbound Approach: Convert existing shared through-right lane to through lane and construct a separate right-turn lane.

3. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigation measures, the operating conditions of the intersection Farrington Highway/ Fort Weaver Road Northbound Ramps would improve to LOS B and LOS C during the AM and PM peak hour conditions respectively.

Impact 6.1.2B: Transportation Impact at Farrington Highway/ Leokū Street under "With Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Farrington Highway/ Leokū Street would operate at operate at LOS B (volume-to-capacity ratio of 0.63) during the AM peak hour and deteriorate to LOS D (volume to capacity ratio 0.88) during the PM peak hour. Under Baseline Year 2030 plus project "With Transit Corridor Conditions", the intersection would continue to operate at LOS B during the AM (volume-to-capacity ratio of 0.73) but worsen to LOS E during the PM (volume to capacity ratio 1.05) peak periods. As such, a transportation impact would result.

Mitigation: The majority of the Project-related traffic volumes would be added to the westbound through movements along Farrington Highway. Note that this section on Farrington Highway is planned to be widened to a six-lane roadway by Year 2030. To mitigate this impact, additional lanes would need to be constructed to accommodate through traffic, requiring acquisition of a new right-of-way. As such, it would not be feasible to add additional through lanes along Farrington Highway due to right-of-way constraints. However, implementation of the Transportation Demand Management (TDM) strategies discussed in *Section 6.3* could reduce the peak hour traffic volumes and Project impacts at this intersection.

Impact after Mitigation: Significant and unavoidable.

Impact 6.1.2C: Transportation Impact at Fort Weaver Road/ Old Fort Weaver Road under "With Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Fort Weaver Road/ Old Fort Weaver Road would operate at operate at LOS B (volume-to-capacity ratio of 0.89) during the AM peak hour and deteriorate to LOS D (volume to capacity ratio 1.03) during the PM peak hour. Under Baseline Year 2030 plus project "With Transit Corridor Conditions", the intersection would worsen to LOS F during the AM (volume-to-capacity ratio of 1.69) and PM (volume to capacity ratio 2.01) peak periods. As such, a transportation impact would result.

Mitigation: The following mitigation measures are proposed to improve the operating conditions at this intersection:

1. Northbound Approach: Construct one additional exclusive left-turn lane to provide dual left turn lanes. Convert one of the existing through lanes to a shared through-right lane.
2. Eastbound Approach: Convert existing shared through-left turn lane to a through lane and construct 3 exclusive left turn lanes to allow a triple left-turn movement from Old Fort Weaver Road. Right-of-way acquisition may be required for the eastbound approach.
3. Signal Timing: For the eastbound and westbound directions, convert the signal timing from permitted to split phasing. In addition, provide free right-turns for eastbound and westbound movements.

Impact After Mitigation: Less than significant impact during the AM peak hour. Significant and unavoidable impact for the PM peak hour.

With the proposed mitigation measures, the intersection would improve from LOS F to LOS D during the AM peak hour but operate at LOS E for the PM peak hour. The delays may encourage some of the forecast traffic to use alternative routes to/from the Project and other land uses along the Old Fort Weaver Road.

Impact 6.1.2D: Transportation Impact at Fort Weaver Road/ Renton Road under "With Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Fort Weaver Road/ Renton Road would operate at LOS E with a volume-to-capacity ratio of 1.08 during the AM peak hour and LOS E with a volume-to-capacity ratio of 1.03 during the PM peak hour. Under Year 2030 Baseline plus Project "With Transit Scenario" conditions, the intersection would worsen to LOS F during the AM (volume-to-capacity ratio of 1.23) and PM (volume-to-capacity ratio of 1.25) peak hours.

Mitigation: The following mitigation measures are proposed:

1. Westbound Approach: Convert existing shared left-through-right lane to shared through-left lane and construct one exclusive right-turn lane.

With the proposed mitigation measure, this intersection would operate at LOS E for both AM and PM peak hours. However, the additional lane would offset the estimated Project impacts and result in an improvement in average delays and volume-to-capacity ratios in both the AM and PM peak hours as compared to the Baseline conditions without the Project.

Impact after Mitigation: Less-than-significant level.

Impact 6.1.2E: Transportation Impact at Farrington Highway/ Fort Barrette Road under "With Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Farrington Highway/ Fort Barrette Road would operate at LOS E for both AM and PM peak hours. Under Year 2030 Baseline plus Project "With Transit Scenario" conditions, the intersection would continue to operate at LOS E for both AM and PM peak hours, but the volume-to-capacity ratio would worsen by more than 10 percent for the AM peak hour. Since the proposed Project would worsen the volume-to-capacity ratio for the AM peak hour by more than 10 percent, a transportation impact would result. High left-turn volumes from south-westbound Farrington Highway are primarily responsible for worsening the intersection operating conditions under Year 2030 Baseline plus Project "With Transit Corridor Scenario" conditions.

Mitigation: The following mitigation measure is proposed:

1. Signal Timing: Change the cycle length from 210 seconds to 120 seconds. Also, convert the southeast and northwest right-turn phases from permitted to permitted plus overlap phases.
2. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigation measure, the operating conditions of this intersection would improve to LOS D for both AM and PM peak hours.

Impact 6.1.2F: Transportation Impact at North-South Road/ H-1 Eastbound Ramps under "With Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection North-South Road/ H-1 Eastbound Ramps would operate at LOS D during the AM peak hour and LOS B during the PM peak hour. Under Year 2030 Baseline plus Project "With Transit Scenario" conditions, the intersection would continue to operate at LOS D under AM peak hour conditions but would worsen to LOS F during the PM peak hour conditions. Since the proposed Project would worsen the operating conditions of this intersection to LOS F during PM peak hour conditions, a transportation impact would result.

Mitigation: The following mitigation measures are proposed:

1. Eastbound Approach: Construct one additional right-turn lane to provide dual right-turn lanes.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigation measures, the operating conditions of this intersection would operate at LOS C during the AM peak hour but would improve the LOS from LOS F to LOS D during the PM peak hour.

Impact 6.1.2G: Transportation Impact at Farrington Highway/ North-South Road under "With Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Farrington Highway/ North-South Road would operate at LOS D during both the AM and PM peak hours. Under Year 2030 Baseline plus Project "With Transit Scenario" conditions, this intersection would operate at LOS E for the AM peak hour and LOS F for the PM peak hour. Since the proposed Project would worsen the operating conditions of this intersection from LOS D to LOS E for the AM peak hour and LOS F during the PM peak hour, a transportation impact would result.

Mitigation Option 1: Proposed as part of the Ho'opili TIAR

1. Southeast-bound Approach: Convert the shared through-right lane to an exclusive right-turn lane
2. Southwest-bound Approach: Construct one additional exclusive right-turn lane to provide dual right-turn lanes.
3. Northwest-bound Approach: Construct an additional left-turn lane to provide three exclusive left-turn lanes. This would also require widening Farrington Highway west of the intersection to provide three westbound departure lanes to receive the triple left-turn lane movement.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigation measures, this intersection would operate at LOS D for both AM and PM peak hours.

Mitigation Option 2: Incorporated from the University of Hawai'i West O'ahu Traffic Study Report

As an alternative to the above mitigation measure, the mitigation measure proposed as part of the University of Hawai'i West O'ahu (UHWO) could also be implemented as a mitigation measure at this intersection. The UHWO Traffic Study Report suggests that a grade separation could be provided to improve future conditions. The potential configuration for grade separation would be to carry the Farrington Highway eastbound and westbound through movements over the intersection. The North-South Road through lanes would remain as an at-grade facility and all turning movements would occur at the at-grade intersection. By removing the Farrington Highway through movements from the intersection, more signal green time could be allocated to the other movements to better accommodate the projected traffic volumes.

Impact 6.1.2H: Transportation Impact at North-South Road/ Kapolei Parkway under "With Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, the North-South Road/Kapolei Parkway intersection would operate at LOS C during the AM peak hour and LOS D during the PM peak hour. Under Year 2030 Baseline plus project "With Transit Corridor Scenario, the intersection operates at LOS D for the AM peak hour and operates at LOS E during the PM peak hour. Since the intersection would operate at LOS level E, a transportation impact would result.

Mitigation:

1. Southbound Approach: Convert shared through-right lane to exclusive right-turn lane to provide three through lanes and one right-turn lane.
2. Northbound Approach: Convert shared through-right lane to exclusive right-turn lane to provide three through lanes and one right-turn lane.

With this mitigation, the intersection would operate at LOS D during the AM and the PM peak periods.

Impact after Mitigation: Less-than-significant level.

Figures 6-1A and 6-1B exhibit the proposed intersection improvements under Year 2030 Baseline plus Project "With Transit Corridor Scenario".

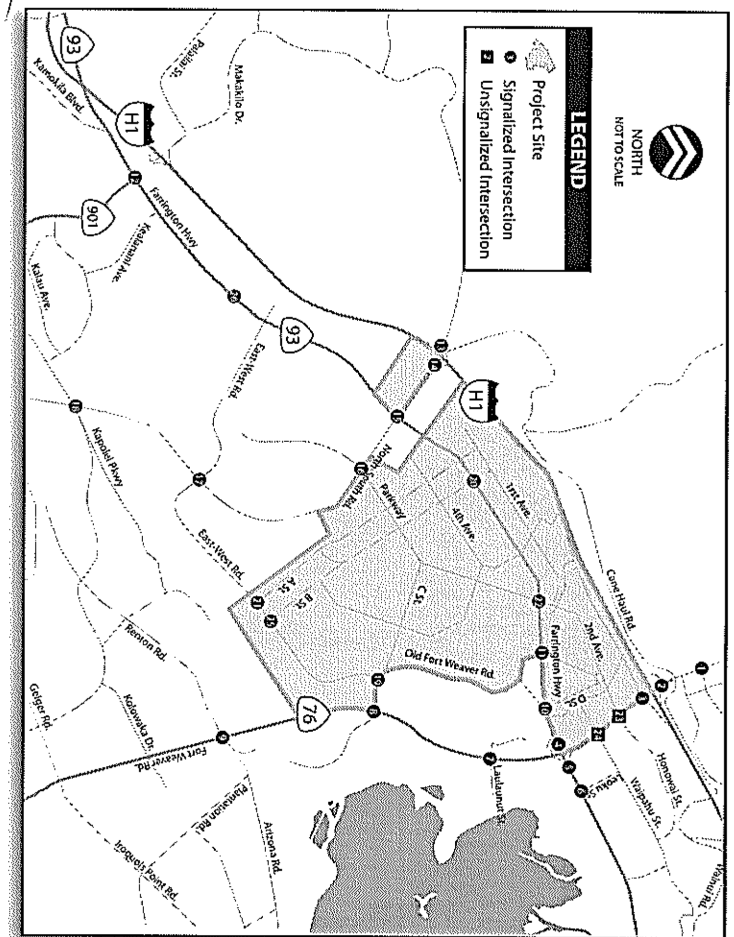


Figure 6-1A
PROPOSED INTERSECTION IMPROVEMENTS-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR
100061/Draft October - 10/17/07

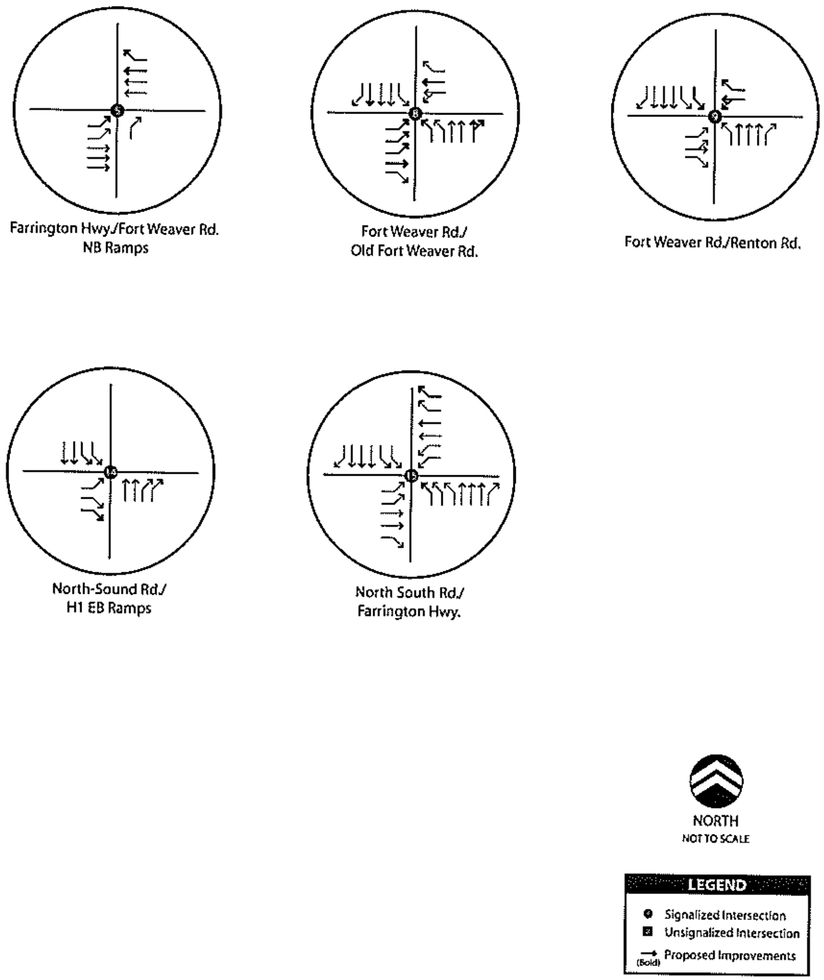


Figure 6-1B
PROPOSED INTERSECTION IMPROVEMENTS-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR SCENARIO

Wilbur Smith Associates — ENGINEERS PLANNERS ECONOMISTS — 100061/DEC 2007-12/10/07

6.2 SCENARIO B: WITHOUT TRANSIT CORRIDOR

6.2.1 Project Impacts - Year 2030 plus Project Conditions "Scenario B"

As described in *Section 5.3.2*, the proposed Project would cause transportation impacts at the following 9 study intersections under Year 2030 Baseline plus Project conditions "Without Transit Corridor Scenario":

- Farrington Highway/ Fort Weaver Road Northbound Ramps
- Farrington Highway/ Leokū Street
- Fort Weaver Road/ Laulaunui Street
- Fort Weaver Road/ Old Fort Weaver Road
- Fort Weaver Road/ Renton Road
- Farrington Highway/ Fort Barrette Road
- North-South Road/ H-1 Eastbound Ramps
- North-South Road/ Farrington Highway
- North-South Road/ Kapolei Parkway

Descriptions of transportation impacts and the proposed improvements to mitigate them at each of the above identified intersections are discussed in *Section 6.2.2*. Tables 6.3(a), 6.3(b), 6.4(a), and 6.4(b) present the AM and PM peak hour intersection operations for Year 2030 Scenario B with Mitigations Conditions.

Table 6.3(b)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B with Mitigations (Internal Intersections)

#	Intersection	Control	Year 2030 plus Project			Mitigation Measures			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	30.6	0.71	C	31.0	0.70	C	No
21	East-West Rd./ A St.	Signal	24.6	0.69	C	24.4	0.72	C	No
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	33.2	0.66	C	46.0	0.66	D	No
23	Kunia Rd./ 2nd Ave.	OWSC	0.0 (NB)	0.83 (NB)	A	0.0 (NB)	0.83 (NB)	A	No
24	Kunia Rd./ 3rd Ave.	OWSC	12.3 (EB)	0.02 (EB)	B	12.3 (EB)	0.02	B	No
25	East-West Rd./ B St.	Signal	23.9	0.84	C	28.6	0.71	C	No
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	18.3	0.66	B	15.3	0.55	B	No

Source: Wilbur Smith Associates

Table 6.3 (a)
AM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B with Mitigations (External Intersections)

#	Intersection	Control	Year 2030 plus Project			Mitigation Measures			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	17.9	0.85	B	17.9	0.85	B	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	4.5	0.59	A	4.5	0.59	A	No
3	Kunia Rd./ H-1 EB Ramps	Signal	8.4	0.52	A	8.4	0.52	A	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	10.3	0.71	B	11.7	0.71	B	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	38.4	1.07	D	16.0	0.71	B	No
6	Farrington Hwy./ Leokū St.	Signal	23.6	0.66	C	19.3	0.66	B	No
7	Fort Weaver Rd./ Laulaunui St.	Signal	53.9	1.03	D	52.0	1.02	D	No
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	**268.8**	**2.43**	**F**	**97.2**	**1.14**	**F**	**Yes**
9	Fort Weaver Rd./ Renton Rd.	Signal	**114.8**	**1.24**	**F**	**60.5**	**0.98**	**E**	No
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	40.1	0.91	D	42.4	0.91	D	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	24.8	0.77	C	20.5	0.65	C	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**71.6**	**0.90**	**E**	52.0	0.97	D	No
13	North-South Rd./ H-1 WB Ramps	Signal	**99.4**	**1.00**	**F**	50.1	1.00	D	No
14	North-South Rd./ H-1 EB Ramps	Signal	37.3	0.98	D	14.6	0.80	B	No
15	North-South Rd./ Farrington Hwy.	Signal	**105.4**	**1.23**	**F**	46.5	0.98	D	No
16	North-South Rd./ North UH Connector	Signal	33.4	0.76	C	33.4	0.76	C	No
17	North-South Rd./ East-West Rd.	Signal	40.8	0.77	D	41.1	0.81	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	**62.7**	**0.92**	**E**	42.5	0.85	D	No
19	East-West Rd./ Old Fort Weaver Rd.	Signal	14.1	0.74	B	19.7	0.69	B	No

Source: Wilbur Smith Associates

Table 6.4(b)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B with Mitigations (Internal Intersections)

#	Intersection	Control	Year 2030			Year 2030 plus Project			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
20	Farrington Hwy./ B St.	Signal	38.4	0.87	D	45.4	0.91	D	No
21	East-West Rd./ A St.	Signal	26.2	0.74	C	32.1	0.69	C	No
22	Farrington Hwy./ Parkway/ 2nd Ave.	Signal	42.8	0.97	D	47.1	0.97	D	No
23	Kunia Rd./ 2nd Ave.	OWSC	0.0 (SB)	0.91 (SB)	A	0.0 (SB)	0.91 (SB)	A	No
24	Kunia Rd./ 3rd Ave.	OWSC	0.0 (SB)	0.12 (SB)	A	0.0 (SB)	0.88 (SB)	A	No
25	East-West Rd./ B St.	Signal	**60.8**	**1.01**	E	50.5	0.85	D	No
26	Farrington Hwy/Project Access Road to NW Parcel at N-S Road	Signal	17.0	1.21	B	17.0	12.1	B	No

Source: Wilbur Smith Associates

Table 6.4 (a)
PM Peak Hour Intersection Operations – Year 2030 Conditions Scenario B with Mitigations(External Intersections)

#	Intersection	Control	Year 2030 plus Project			Mitigation Measures			Impact?
			Delay	V/C Ratio	LOS	Delay	V/C Ratio	LOS	
1	Kunia Rd./ Kunia Loop	Signal	40.1	1.04	D	40.8	1.04	D	No
2	Kunia Rd./ H-1 WB On-Ramp[A]	TWSC	15.4	0.97	B	14.2	0.97	B	No
3	Kunia Rd./ H-1 EB Ramps	Signal	19.4	0.93	B	16.4	0.93	B	No
4	Farrington Hwy./ Fort Weaver Rd. SB Ramps	Signal	9.4	0.78	A	8.8	0.77	A	No
5	Farrington Hwy./ Fort Weaver Rd. NB Ramps	Signal	**221.0**	**1.65**	F	48.1	1.23	D	No
6	Farrington Hwy./ Leokū St.	Signal	**57.6**	**1.01**	E	**66.5**	**1.03**	E	**Yes**
7	Fort Weaver Rd./ Laulaunui St.	Signal	**56.3**	**1.05**	E	54.1	1.05	D	No
8	Fort Weaver Rd./ Old Fort Weaver Rd.	Signal	**322.9**	**2.17**	F	**86.2**	**1.20**	F	**Yes**
9	Fort Weaver Rd./ Renton Rd.	Signal	**130.6**	**1.30**	F	**57.1**	**1.08**	E	**Yes**
10	Farrington Hwy./ East Old Fort Weaver Rd.[B]	TWSC	40.9	0.91	D	37.3	0.89	D	No
11	Farrington Hwy./ West Old Fort Weaver Rd.[B]	TWSC	30.5	0.89	C	25.2	0.82	C	No
12	Farrington Hwy./ Fort Barrette Rd.	Signal	**67.0**	**0.86**	E	52.9	0.87	D	No
13	North-South Rd./ H-1 WB Ramps	Signal	54.0	0.94	D	54.1	0.94	D	No
14	North-South Rd./ H-1 EB Ramps	Signal	**105.4**	**1.39**	F	22.0	0.86	C	No
15	North-South Rd./ Farrington Hwy.	Signal	**117.1**	**1.27**	F	**69.1**	**1.08**	E	**Yes**
16	North-South Rd./ North UH Connector	Signal	50.3	0.94	D	51.4	0.94	D	No
17	North-South Rd./ East-West Rd.	Signal	45.9	0.85	D	44.7	0.91	D	No
18	North-South Rd./ Kapolei Pkwy.	Signal	**68.3**	**0.95**	E	48.8	0.87	D	No
19	East-West Rd./ Old Fort Weaver Rd.	Signal	13.6	0.72	B	32.8	0.64	C	No

Source: Wilbur Smith Associates

6.2.2 Mitigation Measures - Year 2030 plus Project Conditions "Scenario B"

Impact 6.2.2A: Transportation Impact at Farrington Highway/ Fort Weaver Road Northbound Ramps under "Without Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Farrington Highway/ Fort Weaver Road Northbound Ramps would operate at LOS A during both AM and PM peak hours. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the LOS of the intersection would worsen to LOS D during the AM peak hour and LOS F during both the PM peak hour. Since the proposed Project would worsen the operating conditions of this intersection to LOS F during the PM peak hour, a transportation impact would result. The primary contributor of the forecast delays is the high eastbound left-turn volumes (1165 vph in the AM peak hour and 1429 vph in the PM peak hour) and high westbound right-turn volumes (567 vph during AM peak hour and 1164 during PM peak hour).

Mitigation: The following mitigation measures are proposed:

1. Eastbound Approach: Construct one additional exclusive left-turn lane to provide dual left-turn lanes.
2. Westbound Approach: Convert existing shared through-right lane to through lane and construct a separate free right-turn lane.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigations, the operating condition of this intersection would improve from LOS D to LOS B during the AM peak hour and from LOS F to LOS D during the PM peak hour.

Impact 6.2.2B: Transportation Impact at Farrington Highway/ Leokū Street under "Without Transit Corridor Scenario"

Under Year 2030 Baseline conditions, intersection Farrington Highway/ Leokū Street would operate at LOS B during the AM peak hour and LOS D during the PM peak hour. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the LOS of the intersection would operate at LOS C during AM peak hour, but would worsen to LOS E during the PM peak hour. Since the associated trips from the proposed Project would worsen the LOS from LOS D to LOS E during the PM peak hour, this would result in a significant impact that this intersection. High volumes on the westbound approach to Farrington Highway is primarily responsible for the poor operating conditions at this intersection.

Mitigation: The majority of the project-related traffic volumes would be added to the eastbound and westbound through movements along Farrington Highway. To mitigate this impact, additional lanes would need to be constructed to accommodate through traffic, requiring acquisition of a new right-of-way. Note that this section of Farrington Highway is planned to be widened to a six-lane roadway by Year 2030. As such these actions would not be feasible.

However, the Transportation Demand Management (TDM) strategies discussed in *Section 6.3* are proposed to reduce the peak hour traffic volumes and Project impacts at this intersection.

Impact after Mitigation: Significant and unavoidable.

Impact 6.2.2C: Transportation Impact at Fort Weaver Road/ Laulaunui Street under "Without Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Fort Weaver Road/ Laulaunui Street would operate at LOS C for both AM and PM peak hours. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the LOS of the intersection would worsen to LOS D for the AM peak hour and LOS E during the PM peak hour. Since the proposed Project would worsen the operating conditions of this intersection to LOS E during the PM peak hour, a transportation impact would result.

Mitigation:

1. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.
2. Eastbound Approach: Construct an exclusive left-turn lane in addition to the shared through-left lane.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigation measures, the intersection would continue to operate at LOS D for the AM peak hour, but would improve operational conditions for the PM peak hour from LOS E to LOS D.

Impact 6.2.2D: Transportation Impact at Fort Weaver Road/ Old Fort Weaver Road under "Without Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Fort Weaver Road/ Old Fort Weaver Road would operate at LOS B during the AM peak hour and LOS D during the PM peak hour. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the LOS of the intersection would worsen to LOS F under both AM and PM peak hours with volume-to-capacity ratios of 2.43 and 2.17 during AM and PM peak hours, respectively. Since the proposed project would worsen the LOS for both AM and PM peak hours, this will result in a significant impact at this intersection.

Mitigation: The proposed project would add the majority of traffic volumes to the northbound, southbound, and eastbound approaches at the intersection of Fort Weaver Road/ Old Fort Weaver Road. The following mitigation measures are proposed to improve the operating conditions of eastbound left-turning, northbound left-turning and southbound right-turning movements of this intersection:

1. Northbound Approach: Construct one additional exclusive left-turn lane to provide dual left-turn lanes. Convert exclusive right-turn lane to shared through-right since there isn't sufficient traffic to warrant an exclusive right-turn lane.
2. Eastbound Approach: Convert existing shared through-left lane to a through lane and construct triple left-turn lanes. Right-of-way acquisition may be required for the eastbound approach.
3. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.

Impact after Mitigation: Significant and Unavoidable

Due to limited right of way in the westbound direction, additional capacity cannot be provided in this direction. With the proposed mitigation measures, the intersection would continue to operate at LOS F for both AM and PM peak hours. However, with the proposed mitigation measures, the volume-to-capacity ratio would improve from 2.43 for the AM peak hour to 1.14 and from 2.17 for the PM peak hour to 1.20. Some of the traffic forecast to use this intersection to access the Project and other land uses along Old Fort Weaver Road may have to use alternative routes.

Impact 6.2.2E: Transportation Impact at Fort Weaver Road/ Renton Road under "Without Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Fort Weaver Road/ Renton Road would operate at LOS E during both AM and PM peak hours. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the operational conditions would worsen and the intersection would operate at LOS F for both AM and PM peak hours. Since the proposed Project would worsen LOS for both AM and PM peak hours to LOS F, a transportation impact would result.

Mitigation: The following mitigation measures are proposed:

1. Southbound Approach: Construct one additional exclusive left-turn lane to provide dual left-turn lanes.
2. Westbound Approach: Convert existing shared left-through-right lane to shared through-left lane and construct one exclusive right-turn lane.
3. Eastbound Approach: Due to limited right-of-way, additional capacity cannot be provided in this direction.

Impact after Mitigation: Significant and Unavoidable

With the proposed mitigation measures, this intersection would operate at LOS E for both AM and PM peak hours.

Impact 6.2.2F: Transportation Impact at Farrington Highway/ Fort Barrette Road under "Without Transit Corridor Scenario"

west direction to connect to North-South Road at the ninth vehicular access point from the south edge of the Proposed Project.

INTERNAL ROADWAYS

As previously stated, the proposed Project would include construction of numerous internal streets to accommodate on-site circulation. Included in this section are descriptions of the internal street network.

First Avenue is an east-west avenue connector street that runs from Second Avenue to A Street providing internal roadway connections from the fifth vehicular access point to the project site.

Second Avenue is an east-west avenue connector street that runs from Fort Weaver Road to Farrington Highway providing internal roadway connections between the first to the fifth vehicular access points.

Third Avenue is an east-west avenue connector street that runs from Fort Weaver Road to Second Avenue providing internal roadway connections between the second vehicular access point and Second Avenue via E and D streets.

Fourth Avenue is an east-west avenue connector street that runs between Parkway and C Street providing key internal connections to the core of the Proposed Project.

Fifth Avenue is a north-south avenue connector street that turns between Parkway and B Street providing internal roadway connections near the core of the Proposed Project.

A Street is a north-south street that runs between First Avenue and East-West Road.

B Street is a north-south street that runs between Farrington Highway and East-West Road providing internal roadway connections between the sixth vehicular access point and the Proposed Project.

C Street is an east-west street that runs between Fort Weaver Road and Parkway providing key internal roadway connections via the eighth vehicular access point, Old Fort Weaver Road, and East-West Road, to the Proposed Project.

D Street is a north-south street that runs between Second Avenue and Farrington Highway providing internal roadway connections via Third Street, E Street, Second Avenue, and Farrington Highway to the Proposed Project.

E Street is a north-south street that runs between Second Avenue and Farrington Highway providing internal roadway connections via Third Street, Farrington Highway to the Proposed Project.

Under Year 2030 Baseline Conditions, intersection Farrington Highway/ Fort Barrette Road would operate at LOS E for both AM and PM peak hours. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the LOS of the intersection would remain at LOS E during AM peak hour conditions, but the volume-to-capacity ratio would worsen from 0.77 to 0.90. For the PM peak hour, the LOS would worsen from LOS E to LOS F. Since the proposed Project would worsen the operating conditions of this intersection to LOS F during PM peak hour conditions, a transportation impact would result. High left-turn volumes from south-westbound Farrington Highway are primarily responsible for worsening the intersection operating conditions under Year 2030 Baseline plus Project "Without Transit Corridor Scenario" conditions.

Mitigation: The following mitigation measure is proposed:

1. Signal Timing: Change the cycle length from 210 seconds to 120 seconds. Also, convert the southeast and northwest right-turn phases from permitted to permitted plus overlap phases.
2. Signal Optimization: Optimization of intersection splits and cycle lengths along with the intersection offsets.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigation measure, the operating condition of this intersection would improve from LOS F to LOS D for both AM and PM peak hours.

Impact 6.2.2G: Transportation Impact at North-South Road/ H-1 Eastbound Ramps under "Without Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection North-South Road/ H-1 Eastbound Ramps would operate at LOS D during the AM peak hour and LOS B during the PM peak hour. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the intersection would continue to operate at LOS D for the AM peak hour but would worsen to LOS F during the PM peak hour. Since the proposed Project would worsen the operating conditions of this intersection to LOS F during the PM peak hour conditions, a transportation impact would result.

Mitigation: The following mitigation measures are proposed:

1. Southeast-bound Approach: Construct one additional through lane to provide three through lanes.
2. Eastbound Approach: Construct one additional right-turn lane to provide dual right-turn lanes.

Impact after Mitigation: Less-than-significant level.

With the proposed mitigation measures, the operating condition of this intersection would improve from LOS F to LOS C during the PM peak hour.

Impact 6.2.2H: Transportation Impact at Farrington Highway/ North-South Road under "Without Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection Farrington Highway/ North-South Road would operate at LOS D during both the AM and PM peak hours. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, this intersection would operate at LOS F with volume-to-capacity ratios of 1.23 and 1.27 during the AM and PM peak hours, respectively. Since the proposed Project would worsen the operating conditions of this intersection to LOS F during AM and PM peak hour conditions, a transportation impact would result.

Mitigation Option 1: Proposed as part of the Ho'opili TIAR

1. Southwest-bound Approach: Construct one additional exclusive right-turn lane to provide dual right-turn lanes.
2. Southeast-bound Approach: Convert the existing permissive right-turn to a free right-turn.
3. Northeast-bound Approach: Convert the existing permissive right-turn to a dual free right-turn. Construct an additional right-turn lane.
4. Northwest-bound Approach: Construct an additional left-turn lane to provide triple left-turn lanes.
5. Signal Timing: Change the cycle length from 150 seconds to 140 seconds.

Additionally, TDM strategies discussed in *Section 6.3* are proposed to reduce the peak hour intersection traffic volumes.

Impact after Mitigation: Less than significant for the AM peak hour but significant and unavoidable for the PM peak hour.

With the proposed mitigation measures, this intersection would operate at LOS D under AM peak hour conditions and LOS E during PM peak hour conditions, while the volume-to-capacity ratios would improve from 1.23 to 0.98 during the AM peak hours and from 1.27 to 1.08 during the PM peak hours, respectively. In addition, the intersection delays would improve from 105 to 47 seconds during the AM peak hour and from 117 to 69 seconds during the PM peak hour.

Mitigation Option 2: Incorporated from the University of Hawai'i West O'ahu Traffic Study Report

As an alternative to the above mitigation measure, the mitigation measure proposed as part of the University of Hawai'i West O'ahu (UHWO) could also be implemented as a mitigation measure at this intersection. The UHWO Traffic Study Report suggests a potential configuration for a grade separation to carry the Farrington Highway through movements over the intersection. North-South Road through lanes would remain as an at-grade facility and all turning movements would occur at-grade at the intersection. By removing the Farrington Highway through movements from the intersection, more green time could be allocated to the other movements to accommodate the projected traffic volumes.

Impact 6.2.21: Transportation Impact at North-South Road/ Kapolei Parkway under "Without Transit Corridor Scenario"

Under Year 2030 Baseline Conditions, intersection North-South Road/ Kapolei Parkway would operate at LOS C during the AM peak hour and LOS D during the PM peak hour. Under Year 2030 Baseline plus Project "Without Transit Scenario" conditions, the LOS of the intersection would be LOS E during both AM and PM peak hour conditions. Since the proposed Project would worsen the operating conditions of this intersection to LOS E during both AM and PM peak hour conditions, a transportation impact would result. High southbound left turn volumes (507 during PM peak hour and 229 during AM peak hour) and high southbound right turn volumes (735 vph during PM peak hour and 597 vph during AM peak hour) are the primary contributors to the intersection's poor operating conditions under Year 2030 Baseline plus Project "Without Transit Corridor Scenario" conditions.

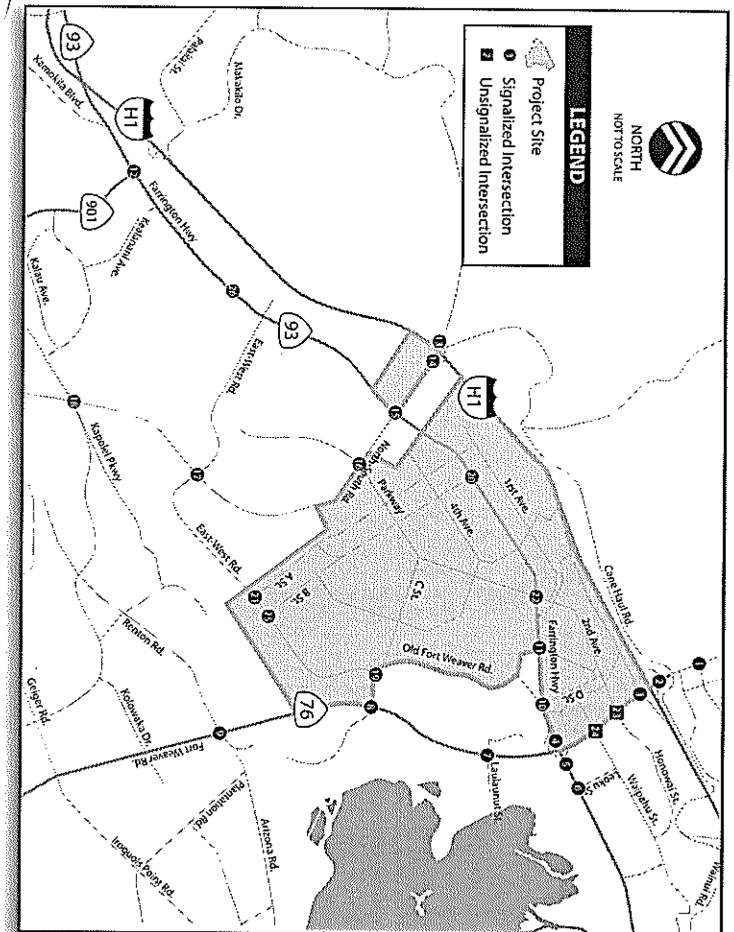
Mitigation: The following mitigation measure is proposed:

1. Southbound Approach: Convert shared through-right lane to exclusive right-turn lane to provide three through lanes and one right-turn lane.

With the mitigation, the intersection would operate at LOS D during the AM and the PM peak periods.

Impact after Mitigation: Less-than-significant level.

Figures 6-2A and 6-2B exhibit the proposed intersection improvements under Year 2030 Baseline plus Project "Without Transit Corridor Scenario".



WilburSmith

Figure 6-2A
PROPOSED INTERSECTION IMPROVEMENTS-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR
100061/Draft October - 10/17/07

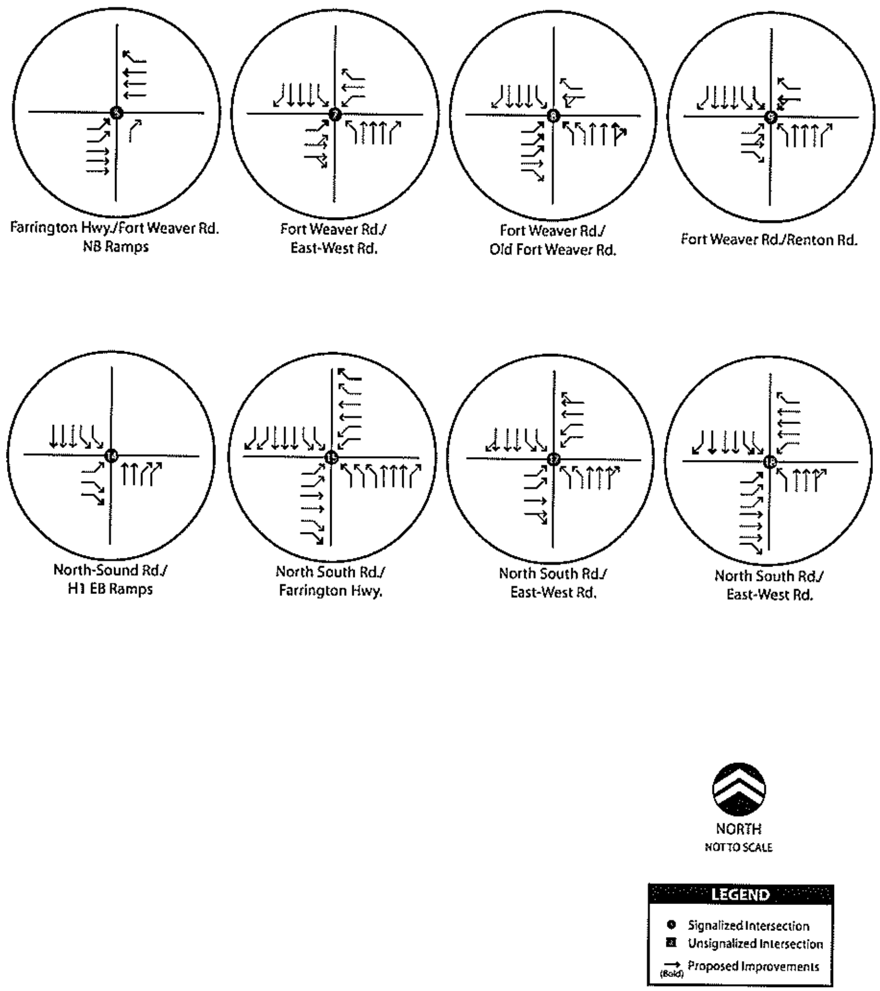


Figure 6-28
PROPOSED INTERSECTION IMPROVEMENTS-YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR SCENARIO

6.3 TRANSPORTATION DEMAND STRATEGIES

Transportation Demand Management (TDM) strategies address traffic congestion by reducing the amount of vehicle miles traveled, thereby reducing overall travel demand. The aim of these strategies is focused on promoting travel alternatives such as increased transit usage, walking, and bicycling to help achieve this goal. It should be noted that TDM strategies can be used in combination to create a comprehensive TDM Program that can affect a significant portion of total travel. Furthermore, TDM strategies can be tailored to achieve many objectives, specifically helping change travel behavior by correcting misperceptions regarding the true costs involved with driving and finding suitable alternatives. As previously noted, the Leeward Oahu Transportation Management Association (LOTMA) provides TDM services in the vicinity of the proposed Project. It is anticipated that the proposed Project will continue to support the existing programs and services in place. It should be noted however that based on the proposed Project's trip generation during the AM and PM peak hours, the Project Sponsor may want to consider additional TDM strategies as a means of managing and improving travel demand. The following strategies are suggested for consideration:

- **Carsharing** – Project Sponsors could make carsharing available for residents of the Proposed development. Carsharing would provide residents access to a car on an "as needed" basis without incurring the fixed costs associated with owning and operating a personal automobile. Users could pick up a car at a designated vehicle location (typically located throughout a given jurisdiction) and would be charged a standard fee for its usage. The rate would typically include gas, maintenance, and insurance.

- **Carpool/Vanpool** – Developers and employers could promote carpool or vanpool programs for commuters who either live or work in the proposed Project and share the same schedule, through subsidizing the cost of vehicles and fuel costs. The remaining costs would be divided among program participants who would pay a fee for mileage used.

- **Preferential HOV Parking** – Developers or employers could provide incentives for use of alternative modes of travel to the single occupancy vehicle by reserving close-in, secure, covered, or otherwise preferable parking spaces for high-occupancy vehicles. It should be noted that the carpool spaces should be those closest to the building entrance or elevator, however not closer than parking designated for use of the disabled.

- **Rent subsidies** – Developers of residential developments could offer tenants rent subsidies (reductions in rent) equivalent to the amount of money they would typically pay for a parking space included in the price of their rent if they forego the use of a parking space. For example, suppose each 1 bedroom unit is allocated one parking stall. Tenants who do not own or choose not to have a car would receive a reduction off their monthly rent equivalent to the value/cost of the parking stall.

- **Transit Subsidies** – Developers and employers could encourage the use of transit by offering a discounted monthly pass to its residents and employees.

- **Bicycle Parking and Shower Facilities** – Both businesses and developers can provide bicycle parking, storage, and shower facilities to promote and encourage the use of bicycles for work and home trips. It is important to consider the provision of both short-term and long-term parking facilities. Notably, long term bicycle parking should be provided for residents or those who stay at the site for several hours and offer secure and weather protected places to store bicycles. In contrast, short-term parking should be provided for shoppers, customers, and other visitors who park for two hours or less, and be located in readily accessible places (e.g. within 50 feet of the entrance the cyclists use).

- **Staggered Class Schedules** – The University of Hawai'i and Department of Education (DOE) schools should consider following an alternative class schedules where courses begin at 9:00 AM so as to avoid the peak commute period (6:00AM to 8:00 AM).

6.4 SITE ACCESS AND ON-SITE CIRCULATION

The proposed Project would be primarily accessed along major defined roadways including, Farrington Highway, Fort Weaver Road, and North-South Road. Circulation within the proposed Project however would be made possible through a number of different access points. The vehicular circulation within the site includes ten new major internal streets and nine primary vehicular access locations. Note that a map of the Project site is included in Appendix E. The first access point is located at the intersection of Fort Weaver Road and Second Avenue, a new east-west internal road that would be constructed as part of the Proposed Project. A secondary vehicular access point is proposed at the junction of a new east-west internal street, named Third Avenue, with Fort Weaver Road. Third Avenue extends west connecting Fort Weaver Road to Second Avenue via two new north-south internal streets, E and D Streets. It should be noted that two vehicular access points at Fort Weaver Road would only allow southbound right turns into the Project.

A third vehicular access point would be located at the intersection of D Street, Farrington Highway, and Old Fort Weaver Road East. A fourth vehicular access point would be located immediately adjacent to the third, at the intersection of E Street, Farrington Highway, and Old Fort Weaver Road West. As Farrington Highway continues in the west direction, the fifth vehicular entrance will be located along Farrington Highway accessible from Second Avenue to the north (with connecting access to a new east-west internal street named First Avenue) and Parkway, a new north-south internal street to the south. A sixth access point is proposed at the intersection of Farrington Highway and a new north-south internal street named "B Street."

The proposed Project would also include additional vehicular access points from the west and south. A seventh access point would be located at the intersection of North-South Road and Parkway, providing access to/from the west side of the project site. It should be noted that Parkway runs east-west and would connect with yet another east-west internal street named C Street. C Street extends further east to connect with Old Fort Weaver Road and East-West Road where the eighth vehicular entrance/exit would be located. East-West Road continues in the

6.5 MULTI-MODAL TRANSPORTATION

As previously described, TheBus transit service is provided in the vicinity of the proposed Ho'Opili development. Given the size and nature of the proposed development the Project Sponsor should work closely with the City and County, and TheBus staff to identify possibilities for future expanded bus service in the vicinity of the Proposed Project. As part of this process, discussions between the Project Sponsor, the City and TheBus staff should include provision of bus stops and shelters and the identification of their appropriate placement such that they serve local schools, commercial, and recreational facilities in the area. In addition, the project should ensure that connecting pedestrian linkages are provided for future proposed bus stop locations. Proposed changes to should be carried out in accordance with existing American with Disabilities Act Accessibility Guidelines (ADAAG).

The City's planned guideway project will offer prime multi-modal transportation to the residents and visitors to Ho'opili. The Ho'opili land use plan effectively promotes and encourages the use of the guideway through its full range of mixed land uses, including a wide range of places of live, work, shop, recreate and learn and will aspire to achieve a job-housing balance. Furthermore, the project is designed to maximize connectivity (transit, pedestrian, bicycle and vehicular) with surrounding streets and communities (including DHHL and UHWO), while minimizing cul-de-sacs and dead-end streets. It is worth noting that the final selection of the transit station locations will also encourage higher levels of development intensity as well as density as they tend to concentrate around transit stations. As such, the guideway provides multiple opportunities to promote and advance multi-modal transportation within the Ho'opili development and its surrounding areas.

Chapter 7
CONCLUSION

To assess the transportation impacts associated with the construction of the proposed Ho'opili Development in O'ahu, Hawai'i, a Traffic Impact Analysis Report was conducted. The analysis evaluated the operations of twelve key intersections under Existing Conditions and thirty-four key intersections for Future 2030 Baseline Conditions, Future 2030 plus Project Conditions "With Transit Corridor Scenario", and Future 2030 plus Project Conditions "Without Transit Corridor Scenario" during the morning and evening peak hours.

The proposed Project includes approximately 2835 thousand square feet (ksf) of retail/office building floor area, 925 ksf of industrial building floor area, and approximately 11,750 dwelling units as per the Ho'opili Town master plan. The site is located in the 'Ewa District of O'ahu, within close proximity of the H-1 Freeway, Farrington Highway, and State Route 76 (Fort Weaver Road). The proposed Project "With Transit Scenario Corridor" Project is estimated to generate 140,920 daily trips, 7,069 morning peak hour trips (3,183 inbound and 3,886 outbound), and 12,077 evening peak hour trips (6,122 inbound and 5,955 outbound). The Proposed project "Without Transit Corridor Scenario" would generate 158,669 daily trips, 9,172 morning peak hour trips (4,176 inbound and 4,996 outbound), and 13,776 evening peak hour trips (6,970 inbound and 6,806 outbound).

Impacts of the proposed project on the study intersections were evaluated with level of service calculations. The results of the analysis indicate that the proposed Project would result in significant impacts to only one intersection under 2030 Baseline plus Project conditions "With Transit Corridor Scenario." In addition, the proposed Project would also result in significant impacts at two intersections under 2030 Baseline plus Project conditions "Without Transit Corridor Scenario."

Vehicular access to the proposed Project site would be made possible via multiple points. From the north, vehicles would approach the Project from the Kunia Road/ H-1 interchange and have access to the site at the intersections of Fort Weaver Road/ Second Avenue1[1] and Fort Weaver Road/ Third Avenue[1]. Access in to the Project site from the south would be provided from the intersections of North-South Road/East-West Road and Fort Weaver Road/C Street. From the west vehicles would approach the proposed Project from the Farrington Highway/North-South Road intersection and gain access to the site at the intersection of Farrington Highway/B Street[1]. As vehicles travel from the east there are more opportunities to enter the Project site at the following access points along Farrington Highway; Farrington Highway/Second Avenue, Farrington Highway/West Old Fort Weaver Road, and Farrington Highway/East Old Fort Weaver Road.

[1] See Chapter 6 for description of the street. It should be noted that use of this street is only assumed as part of this study.

APPENDIX

APPENDIX A

INTERSECTION LOS ANALYSIS

APPENDIX A-1

EXISTING CONDITIONS

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

Existing AM Peak

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00	0.95	1.00		0.95
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	3539	1583		3539
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	3539	1583		3539
Volume (vph)	613	21	829	340	0	843
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	666	23	901	370	0	916
RTOR Reduction (vph)	0	16	0	171	0	0
Lane Group Flow (vph)	666	7	901	199	0	916
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	15.5	15.5	27.2	27.2		27.2
Effective Green, g (s)	15.5	15.5	27.2	27.2		27.2
Actuated g/C Ratio	0.31	0.31	0.54	0.54		0.54
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	1050	484	1899	849		1899
v/s Ratio Prot	c0.19		0.25			c0.26
v/s Ratio Perm		0.00		0.13		
v/c Ratio	0.63	0.01	0.47	0.23		0.48
Uniform Delay, d1	15.2	12.3	7.3	6.2		7.3
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	1.3	0.0	0.9	0.6		0.9
Delay (s)	16.4	12.3	8.2	6.9		8.2
Level of Service	B	B	A	A		A
Approach Delay (s)	16.3		7.8			8.2
Approach LOS	B		A			A

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	50.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations					↑			↑↑↱				
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	232	0	0	1259	197	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	252	0	0	1368	214	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								1180			617	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94					0.94		
vC, conflicting volume	1602	1476	791	684	1583	0	0			1583		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1576	1442	714	600	1556	0	0			1556		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	100	100	0	100	100			100		
cM capacity (veh/h)	0	123	351	362	105	1084	1622			396		

Direction, Lane #	WB 1	SE 1	SE 2
Volume Total	252	912	670
Volume Left	0	0	0
Volume Right	0	0	214
cSH	105	1700	1700
Volume to Capacity	2.40	0.54	0.39
Queue Length 95th (ft)	564	0	0
Control Delay (s)	723.3	0.0	0.0
Lane LOS	F		
Approach Delay (s)	723.3	0.0	
Approach LOS	F		

Intersection Summary			
Average Delay	99.4		
Intersection Capacity Utilization	106.2%	ICU Level of Service	G
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: H-1 Off Ramp & Kunia Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↰	↱				↰↰	↑↑↑			↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				0.97	0.91			0.95	
Frt		1.00	0.85				1.00	1.00			1.00	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1770	1583				3433	5085			3539	
Flt Permitted		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (perm)		1770	1583				3433	5085			3539	
Volume (vph)	318	0	438	0	0	0	1097	1927	0	0	478	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	346	0	476	0	0	0	1192	2095	0	0	520	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	346	476	0	0	0	1192	2095	0	0	520	0
Turn Type	Split		Free				Prot					
Protected Phases	4	4					1	6			2	
Permitted Phases			Free									
Actuated Green, G (s)		17.0	74.0				28.9	49.0			16.1	
Effective Green, g (s)		17.0	74.0				28.9	49.0			16.1	
Actuated g/C Ratio		0.23	1.00				0.39	0.66			0.22	
Clearance Time (s)		4.0					4.0	4.0			4.0	
Vehicle Extension (s)		3.0					3.0	3.0			3.0	
Lane Grp Cap (vph)		407	1583				1341	3367			770	
v/s Ratio Prot		c0.20					c0.35	c0.41			0.15	
v/s Ratio Perm			0.30									
v/c Ratio		0.85	0.30				0.89	0.62			0.68	
Uniform Delay, d1		27.3	0.0				21.1	7.2			26.6	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		15.5	0.5				7.5	0.9			4.7	
Delay (s)		42.8	0.5				28.6	8.1			31.3	
Level of Service		D	A				C	A			C	
Approach Delay (s)		18.3			0.0			15.5			31.3	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↱		↰	↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.95		1.00	0.95				1.00			1.00
Frt		0.99		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		3521		1770	3539				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		3521		1770	3539				1611			1611
Volume (vph)	0	711	26	253	231	0	0	0	822	0	0	119
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	773	28	275	251	0	0	0	893	0	0	129
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	798	0	275	251	0	0	0	893	0	0	129
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		37.8		14.2	60.0				60.0			60.0
Effective Green, g (s)		37.8		14.2	60.0				60.0			60.0
Actuated g/C Ratio		0.63		0.24	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2218		419	3539				1611			1611
v/s Ratio Prot		0.23		0.16	0.07							
v/s Ratio Perm									c0.55			0.08
v/c Ratio		0.36		0.66	0.07				0.55			0.08
Uniform Delay, d1		5.3		20.7	0.0				0.0			0.0
Progression Factor		1.00		0.46	1.00				1.00			1.00
Incremental Delay, d2		0.5		3.1	0.0				1.4			0.1
Delay (s)		5.8		12.5	0.0				1.4			0.1
Level of Service		A		B	A				A			A
Approach Delay (s)		5.8			6.5			1.4			0.1	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	4.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↑↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	0.95			0.95				1.00			
Frt	1.00	1.00			0.96				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	3539			3397				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	3539			3397				1611			
Volume (vph)	444	1089	0	0	484	177	0	0	894	0	0	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	483	1184	0	0	526	192	0	0	972	0	0	0
RTOR Reduction (vph)	0	0	0	0	62	0	0	0	0	0	0	0
Lane Group Flow (vph)	483	1184	0	0	656	0	0	0	972	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	31.0	60.0			21.0				60.0			
Effective Green, g (s)	31.0	60.0			21.0				60.0			
Actuated g/C Ratio	0.52	1.00			0.35				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	915	3539			1189				1611			
v/s Ratio Prot	0.27	0.33			0.19							
v/s Ratio Perm									c0.60			
v/c Ratio	0.53	0.33			0.55				0.60			
Uniform Delay, d1	9.6	0.0			15.7				0.0			
Progression Factor	1.10	1.00			1.00				1.00			
Incremental Delay, d2	0.5	0.2			1.8				1.7			
Delay (s)	11.1	0.2			17.6				1.7			
Level of Service	B	A			B				A			
Approach Delay (s)		3.4			17.6			1.7			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰	↑↑	↱		↰↑	↱		↰↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00		1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583		1792	1583		3433	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583		1792	1583		3433	1583
Volume (vph)	546	891	546	52	375	152	186	50	19	51	31	150
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	593	968	593	57	408	165	202	54	21	55	34	163
RTOR Reduction (vph)	0	0	342	0	0	133	0	0	11	0	0	148
Lane Group Flow (vph)	593	968	251	57	408	32	0	256	10	0	89	15
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	16.7	26.8	26.8	2.2	12.3	12.3		12.4	12.4		5.9	5.9
Effective Green, g (s)	16.7	26.8	26.8	2.2	12.3	12.3		12.4	12.4		5.9	5.9
Actuated g/C Ratio	0.26	0.42	0.42	0.03	0.19	0.19		0.20	0.20		0.09	0.09
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	906	1498	670	62	688	308		351	310		320	148
v/s Ratio Prot	c0.17	c0.27		0.03	0.12			c0.14			c0.03	
v/s Ratio Perm			0.16			0.02			0.01			0.01
v/c Ratio	0.65	0.65	0.37	0.92	0.59	0.10		0.73	0.03		0.28	0.10
Uniform Delay, d1	20.7	14.5	12.5	30.5	23.2	21.0		23.9	20.6		26.7	26.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	1.7	1.0	0.4	84.9	1.4	0.1		12.5	0.2		0.5	0.3
Delay (s)	22.4	15.5	12.9	115.3	24.6	21.1		36.4	20.8		27.2	26.6
Level of Service	C	B	B	F	C	C		D	C		C	C
Approach Delay (s)		16.7			31.9			35.2			26.8	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	63.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Laulaunui Street & Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3393		1770	1863	1583	1770	3539	1583	1770	5085	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3393		1770	1863	1583	1770	3539	1583	1770	5085	1583
Volume (vph)	67	20	4	99	5	198	47	2983	40	68	1435	200
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	73	22	4	108	5	215	51	3242	43	74	1560	217
RTOR Reduction (vph)	0	2	0	0	0	99	0	0	6	0	0	61
Lane Group Flow (vph)	0	97	0	108	5	116	51	3242	37	74	1560	156
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		9.5		8.0	8.0	8.0	7.0	105.0	105.0	5.9	103.9	103.9
Effective Green, g (s)		9.5		8.0	8.0	8.0	7.0	105.0	105.0	5.9	103.9	103.9
Actuated g/C Ratio		0.07		0.06	0.06	0.06	0.05	0.73	0.73	0.04	0.72	0.72
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		223		98	103	88	86	2573	1151	72	3659	1139
v/s Ratio Prot		c0.03		0.06	0.00		0.03	c0.92		c0.04	0.31	
v/s Ratio Perm						c0.07			0.02			0.10
v/c Ratio		0.44		1.10	0.05	1.32	0.59	1.26	0.03	1.03	0.43	0.14
Uniform Delay, d1		64.9		68.2	64.6	68.2	67.3	19.7	5.5	69.2	8.2	6.3
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.4		121.1	0.2	202.2	10.5	120.3	0.1	114.0	0.4	0.3
Delay (s)		66.2		189.3	64.8	270.4	77.8	140.0	5.6	183.2	8.6	6.6
Level of Service		E		F	E	F	E	F	A	F	A	A
Approach Delay (s)		66.2			240.5			137.3			15.3	
Approach LOS		E			F			F			B	

Intersection Summary			
HCM Average Control Delay	101.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	144.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	108.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Old Fort Weaver Road & Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1817	1583		1800	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.79	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1482	1583		1468	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	3	3	52	114	49	210	98	2857	26	47	1485	6
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	3	57	124	53	228	107	3105	28	51	1614	7
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	0	0	0	2
Lane Group Flow (vph)	0	6	57	0	177	191	107	3105	28	51	1614	5
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		16.0	150.0		16.0	16.0	13.4	118.0	150.0	4.0	108.6	108.6
Effective Green, g (s)		16.0	150.0		16.0	16.0	13.4	118.0	150.0	4.0	108.6	108.6
Actuated g/C Ratio		0.11	1.00		0.11	0.11	0.09	0.79	1.00	0.03	0.72	0.72
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		158	1583		157	169	158	2784	1583	47	2562	1146
v/s Ratio Prot							0.06	c0.88		c0.03	0.46	
v/s Ratio Perm		0.00	0.04		0.12	c0.12			0.02			0.00
v/c Ratio		0.04	0.04		1.13	1.13	0.68	1.12	0.02	1.09	0.63	0.00
Uniform Delay, d1		60.1	0.0		67.0	67.0	66.2	16.0	0.0	73.0	10.5	5.7
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.1	0.0		110.1	109.3	10.9	57.5	0.0	157.2	1.2	0.0
Delay (s)		60.2	0.0		177.1	176.3	77.1	73.5	0.0	230.2	11.7	5.7
Level of Service		E	A		F	F	E	E	A	F	B	A
Approach Delay (s)		5.8			176.6			73.0			18.3	
Approach LOS		A			F			E			B	

Intersection Summary			
HCM Average Control Delay	63.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

9: Renton Road & Fort Weaver Road

Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑	↱		✥		↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1705	1583		1835		1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1705	1583		1835		1770	3539	1583	1770	3539	1583
Volume (vph)	565	82	278	1	31	4	356	2352	2	176	1277	248
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	614	89	302	1	34	4	387	2557	2	191	1388	270
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	0	143
Lane Group Flow (vph)	342	361	302	0	36	0	387	2557	2	191	1388	127
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	27.0	27.0	149.2		3.2		33.0	90.0	90.0	13.0	70.0	70.0
Effective Green, g (s)	27.0	27.0	149.2		3.2		33.0	90.0	90.0	13.0	70.0	70.0
Actuated g/C Ratio	0.18	0.18	1.00		0.02		0.22	0.60	0.60	0.09	0.47	0.47
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	304	309	1583		39		391	2135	955	154	1660	743
v/s Ratio Prot	0.20	c0.21			c0.02		0.22	c0.72		c0.11	0.39	
v/s Ratio Perm			0.19						0.00			0.08
v/c Ratio	1.12	1.17	0.19		0.92		0.99	1.20	0.00	1.24	0.84	0.17
Uniform Delay, d1	61.1	61.1	0.0		72.9		57.9	29.6	11.8	68.1	34.6	22.8
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	89.7	104.9	0.3		113.6		42.3	93.8	0.0	151.2	5.2	0.5
Delay (s)	150.8	166.0	0.3		186.5		100.2	123.4	11.8	219.3	39.8	23.3
Level of Service	F	F	A		F		F	F	B	F	D	C
Approach Delay (s)		111.0			186.5			120.3			55.9	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	98.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	149.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	109.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

10: Farrington Hwy & East Old Fort Weaver Road

Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑									↑	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	672	0	0	0	0	0	0	0	0	69	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	730	0	0	0	0	0	0	0	0	75	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					846							
pX, platoon unblocked												
vC, conflicting volume	0			730			768	730	730	730	730	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			730			768	730	730	730	730	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	79	100
cM capacity (veh/h)	1623			874			266	349	422	338	349	1085

Direction, Lane #	EB 1	SW 1
Volume Total	730	75
Volume Left	0	0
Volume Right	0	0
cSH	1700	349
Volume to Capacity	0.43	0.21
Queue Length 95th (ft)	0	20
Control Delay (s)	0.0	18.1
Lane LOS		C
Approach Delay (s)	0.0	18.1
Approach LOS		C

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
11: Farrington Hwy & West Old Fort Weaver Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	Y	
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	664	30	0	281	38	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	722	33	0	305	41	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			754		1043	738
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			754		1043	738
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		84	98
cM capacity (veh/h)			856		254	418

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	754	305	50
Volume Left	0	0	41
Volume Right	33	0	9
cSH	1700	1700	272
Volume to Capacity	0.44	0.18	0.18
Queue Length 95th (ft)	0	0	16
Control Delay (s)	0.0	0.0	21.2
Lane LOS			C
Approach Delay (s)	0.0	0.0	21.2
Approach LOS			C

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
12: Farrington Hwy & Fort Barrette Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↱	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	3390	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583	3433	3390	1441	3433	3539	1583
Volume (vph)	325	201	483	42	344	425	570	488	34	359	605	779
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	353	218	525	46	374	462	620	530	37	390	658	847
RTOR Reduction (vph)	0	0	339	0	0	317	0	0	23	0	0	172
Lane Group Flow (vph)	353	218	186	46	374	145	620	530	14	390	658	675
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			2
Actuated Green, G (s)	9.0	22.7	22.7	2.4	16.1	16.1	16.0	34.8	34.8	14.3	33.1	33.1
Effective Green, g (s)	9.0	22.7	22.7	2.4	16.1	16.1	16.0	34.8	34.8	14.3	33.1	33.1
Actuated g/C Ratio	0.10	0.25	0.25	0.03	0.18	0.18	0.18	0.39	0.39	0.16	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	343	891	398	47	632	283	609	1308	556	544	1299	581
v/s Ratio Prot	c0.10	0.06		0.03	c0.11		c0.18	0.16		0.11	0.19	
v/s Ratio Perm			0.12			0.09			0.01			c0.43
v/c Ratio	1.03	0.24	0.47	0.98	0.59	0.51	1.02	0.41	0.03	0.72	0.51	1.16
Uniform Delay, d1	40.6	26.9	28.6	43.9	34.0	33.5	37.1	20.2	17.2	36.0	22.2	28.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	56.3	0.1	0.9	122.0	1.5	1.6	41.1	0.9	0.1	4.5	1.4	91.0
Delay (s)	96.9	27.1	29.5	165.9	35.5	35.1	78.2	21.1	17.3	40.5	23.6	119.5
Level of Service	F	C	C	F	D	D	E	C	B	D	C	F
Approach Delay (s)		50.7			42.1			50.8			70.0	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	56.4	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

Existing PM

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↓↓
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00	0.95	1.00		0.95
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	3539	1583		3539
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	3539	1583		3539
Volume (vph)	415	12	1000	812	0	1314
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	451	13	1087	883	0	1428
RTOR Reduction (vph)	0	10	0	313	0	0
Lane Group Flow (vph)	451	3	1087	570	0	1428
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	12.4	12.4	37.1	37.1		37.1
Effective Green, g (s)	12.4	12.4	37.1	37.1		37.1
Actuated g/C Ratio	0.22	0.22	0.65	0.65		0.65
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	740	341	2283	1021		2283
v/s Ratio Prot	c0.13		0.31			c0.40
v/s Ratio Perm		0.00		0.36		
v/c Ratio	0.61	0.01	0.48	0.56		0.63
Uniform Delay, d1	20.4	17.7	5.2	5.7		6.1
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	1.4	0.0	0.7	2.2		1.3
Delay (s)	21.8	17.7	5.9	7.9		7.4
Level of Service	C	B	A	A		A
Approach Delay (s)	21.7		6.8			7.4
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	57.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations					↑			↑↑→				
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	323	0	0	1454	275	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	351	0	0	1580	299	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								1180			617	
pX, platoon unblocked	0.75	0.75	0.75	0.75	0.75					0.75		
vC, conflicting volume	1905	1730	940	790	1879	0	0			1879		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1873	1638	577	377	1838	0	0			1838		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	100	100	0	100	100			100		
cM capacity (veh/h)	0	74	342	414	56	1084	1622			244		

Direction, Lane #	WB 1	SE 1	SE 2
Volume Total	351	1054	826
Volume Left	0	0	0
Volume Right	0	0	299
cSH	56	1700	1700
Volume to Capacity	6.30	0.62	0.49
Queue Length 95th (ft)	Err	0	0
Control Delay (s)	Err	0.0	0.0
Lane LOS	F		
Approach Delay (s)	Err	0.0	
Approach LOS	F		

Intersection Summary			
Average Delay	1573.9		
Intersection Capacity Utilization	162.7%	ICU Level of Service	H
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: H-1 Off Ramp & Kunia Road

Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↰↑	↱				↰↰	↑↑↑			↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				0.97	0.91			0.95	
Frt		1.00	0.85				1.00	1.00			1.00	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1770	1583				3433	5085			3539	
Flt Permitted		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (perm)		1770	1583				3433	5085			3539	
Volume (vph)	210	0	287	0	0	0	724	3387	0	0	770	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	228	0	312	0	0	0	787	3682	0	0	837	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	228	312	0	0	0	787	3682	0	0	837	0
Turn Type	Split		Free				Prot					
Protected Phases	4	4					1	6			2	
Permitted Phases			Free									
Actuated Green, G (s)		10.0	75.0				21.1	57.0			31.9	
Effective Green, g (s)		10.0	75.0				21.1	57.0			31.9	
Actuated g/C Ratio		0.13	1.00				0.28	0.76			0.43	
Clearance Time (s)		4.0					4.0	4.0			4.0	
Vehicle Extension (s)		3.0					3.0	3.0			3.0	
Lane Grp Cap (vph)		236	1583				966	3865			1505	
v/s Ratio Prot		c0.13					0.23	c0.72			0.24	
v/s Ratio Perm			0.20									
v/c Ratio		0.97	0.20				0.81	0.95			0.56	
Uniform Delay, d1		32.3	0.0				25.1	7.8			16.2	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		48.6	0.3				5.4	7.0			1.5	
Delay (s)		80.9	0.3				30.5	14.9			17.7	
Level of Service		F	A				C	B			B	
Approach Delay (s)		34.3			0.0			17.6			17.7	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp

Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↱		↰	↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.95		1.00	0.95				1.00			1.00
Frt		0.99		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		3498		1770	3539				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		3498		1770	3539				1611			1611
Volume (vph)	0	273	23	442	952	0	0	0	870	0	0	652
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	297	25	480	1035	0	0	0	946	0	0	709
RTOR Reduction (vph)	0	11	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	311	0	480	1035	0	0	0	946	0	0	709
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		17.0		35.0	60.0				60.0			60.0
Effective Green, g (s)		17.0		35.0	60.0				60.0			60.0
Actuated g/C Ratio		0.28		0.58	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		991		1033	3539				1611			1611
v/s Ratio Prot		0.09		0.27	0.29							
v/s Ratio Perm									c0.59			0.44
v/c Ratio		0.31		0.46	0.29				0.59			0.44
Uniform Delay, d1		16.9		7.1	0.0				0.0			0.0
Progression Factor		1.00		0.15	1.00				1.00			1.00
Incremental Delay, d2		0.8		0.1	0.1				1.6			0.9
Delay (s)		17.7		1.2	0.1				1.6			0.9
Level of Service		B		A	A				A			A
Approach Delay (s)		17.7			0.4			1.6			0.9	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	2.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	39.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps

Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	0.95			0.95				1.00			
Frt	1.00	1.00			0.96				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	3539			3381				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	3539			3381				1611			
Volume (vph)	315	828	0	0	1394	592	0	0	666	0	0	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	342	900	0	0	1515	643	0	0	724	0	0	0
RTOR Reduction (vph)	0	0	0	0	38	0	0	0	0	0	0	0
Lane Group Flow (vph)	342	900	0	0	2120	0	0	0	724	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	12.0	60.0			40.0				60.0			
Effective Green, g (s)	12.0	60.0			40.0				60.0			
Actuated g/C Ratio	0.20	1.00			0.67				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	354	3539			2254				1611			
v/s Ratio Prot	c0.19	0.25			c0.63							
v/s Ratio Perm									0.45			
v/c Ratio	0.97	0.25			0.94				0.45			
Uniform Delay, d1	23.8	0.0			8.9				0.0			
Progression Factor	0.96	1.00			1.00				1.00			
Incremental Delay, d2	35.3	0.1			9.4				0.9			
Delay (s)	58.3	0.1			18.3				0.9			
Level of Service	E	A			B				A			
Approach Delay (s)		16.2			18.3			0.9			0.0	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street

Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰	↑↑	↱		↰↑	↱		↰↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00		1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583		1786	1583		3425	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583		1786	1583		3425	1583
Volume (vph)	532	645	317	85	1025	316	573	91	59	167	85	438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	578	701	345	92	1114	343	623	99	64	182	92	476
RTOR Reduction (vph)	0	0	226	0	0	196	0	0	7	0	0	222
Lane Group Flow (vph)	578	701	119	92	1114	147	0	722	57	0	274	254
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	20.0	48.3	48.3	11.7	40.0	40.0		46.0	46.0		18.0	18.0
Effective Green, g (s)	20.0	48.3	48.3	11.7	40.0	40.0		46.0	46.0		18.0	18.0
Actuated g/C Ratio	0.14	0.34	0.34	0.08	0.29	0.29		0.33	0.33		0.13	0.13
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	490	1221	546	148	1011	452		587	520		440	204
v/s Ratio Prot	c0.17	0.20		0.05	c0.31			c0.40			0.08	
v/s Ratio Perm			0.08			0.09			0.04			c0.16
v/c Ratio	1.18	0.57	0.22	0.62	1.10	0.33		1.23	0.11		0.62	1.24
Uniform Delay, d1	60.0	37.4	32.5	62.0	50.0	39.4		47.0	32.7		57.8	61.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	100.3	0.7	0.2	7.9	60.4	0.4		117.9	0.4		2.7	144.1
Delay (s)	160.3	38.1	32.7	69.9	110.4	39.8		164.9	33.2		60.5	205.1
Level of Service	F	D	C	E	F	D		F	C		E	F
Approach Delay (s)		80.4			92.4			154.2			152.3	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	108.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	102.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Laulaunui Street & Fort Weaver Road

Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3373		1770	1863	1583	1770	3539	1583	1770	5085	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3373		1770	1863	1583	1770	3539	1583	1770	5085	1583
Volume (vph)	159	22	9	36	10	141	123	2002	44	110	2323	184
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	173	24	10	39	11	153	134	2176	48	120	2525	200
RTOR Reduction (vph)	0	4	0	0	0	142	0	0	14	0	0	80
Lane Group Flow (vph)	0	203	0	39	11	11	134	2176	34	120	2525	120
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		11.6		4.0	4.0	4.0	10.5	66.0	66.0	8.0	63.5	63.5
Effective Green, g (s)		11.6		4.0	4.0	4.0	10.5	66.0	66.0	8.0	63.5	63.5
Actuated g/C Ratio		0.11		0.04	0.04	0.04	0.10	0.62	0.62	0.08	0.60	0.60
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		371		67	71	60	176	2212	989	134	3058	952
v/s Ratio Prot		c0.06		c0.02	0.01		c0.08	c0.61		0.07	0.50	
v/s Ratio Perm						0.01			0.02			0.08
v/c Ratio		0.87dl		0.58	0.15	0.18	0.76	0.98	0.03	0.90	0.83	0.13
Uniform Delay, d1		44.5		50.0	49.2	49.2	46.3	19.3	7.6	48.4	16.7	9.1
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.7		12.2	1.0	1.4	17.5	15.7	0.1	47.3	2.7	0.3
Delay (s)		46.2		62.2	50.2	50.6	63.8	34.9	7.7	95.7	19.4	9.4
Level of Service		D		E	D	D	E	C	A	F	B	A
Approach Delay (s)		46.2			52.8			36.0			21.9	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	29.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Old Fort Weaver Road & Fort Weaver Road

Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1857	1583		1797	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.98	1.00		0.47	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1833	1583		884	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	10	167	1264	37	14	77	23	2082	36	92	2274	2
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	182	1374	40	15	84	25	2263	39	100	2472	2
RTOR Reduction (vph)	0	0	0	0	0	62	0	0	0	0	0	1
Lane Group Flow (vph)	0	193	1374	0	55	22	25	2263	39	100	2472	1
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		14.1	101.1		14.1	14.1	1.6	69.0	101.1	6.0	73.4	73.4
Effective Green, g (s)		14.1	101.1		14.1	14.1	1.6	69.0	101.1	6.0	73.4	73.4
Actuated g/C Ratio		0.14	1.00		0.14	0.14	0.02	0.68	1.00	0.06	0.73	0.73
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		256	1583		123	221	28	2415	1583	105	2569	1149
v/s Ratio Prot							0.01	0.64		0.06	c0.70	
v/s Ratio Perm		0.11	c0.87		0.06	0.01			0.02			0.00
v/c Ratio		0.75	0.87		0.45	0.10	0.89	0.94	0.02	0.95	0.96	0.00
Uniform Delay, d1		41.8	0.0		39.9	38.0	49.7	14.1	0.0	47.4	12.6	3.8
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		11.9	6.7		2.6	0.2	123.8	8.5	0.0	72.2	10.9	0.0
Delay (s)		53.7	6.7		42.5	38.2	173.4	22.7	0.0	119.6	23.5	3.8
Level of Service		D	A		D	D	F	C	A	F	C	A
Approach Delay (s)		12.5			39.9			23.9			27.2	
Approach LOS		B			D			C			C	

Intersection Summary			
HCM Average Control Delay	22.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	101.1	Sum of lost time (s)	0.0
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Renton Road & Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑	↱		✥		↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1681	1689	1583		1805		1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	0.95	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1681	1689	1583		1805		1770	3539	1583	1770	3539	1583
Volume (vph)	610	14	302	1	13	4	347	1587	113	172	2818	515
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	663	15	328	1	14	4	377	1725	123	187	3063	560
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	9	0	0	139
Lane Group Flow (vph)	332	346	328	0	15	0	377	1725	114	187	3063	421
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	24.0	24.0	148.4		2.3		21.0	87.7	87.7	18.4	85.1	85.1
Effective Green, g (s)	24.0	24.0	148.4		2.3		21.0	87.7	87.7	18.4	85.1	85.1
Actuated g/C Ratio	0.16	0.16	1.00		0.02		0.14	0.59	0.59	0.12	0.57	0.57
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	272	273	1583		28		250	2091	936	219	2029	908
v/s Ratio Prot	0.20	c0.20			0.01		c0.21	0.49		0.11	c0.87	
v/s Ratio Perm			c0.21						0.07			0.27
v/c Ratio	1.22	1.27	0.21		0.54		1.51	0.82	0.12	0.85	1.51	0.46
Uniform Delay, d1	62.2	62.2	0.0		72.5		63.7	24.2	13.4	63.7	31.6	18.4
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	127.7	146.1	0.3		18.4		248.3	3.9	0.3	26.1	231.9	1.7
Delay (s)	189.9	208.3	0.3		90.9		312.0	28.1	13.6	89.8	263.6	20.1
Level of Service	F	F	A		F		F	C	B	F	F	C
Approach Delay (s)		134.4			90.9			75.4			219.3	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM Average Control Delay	161.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.40		
Actuated Cycle Length (s)	148.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	131.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
10: Farrington Hwy & East Old Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑									↑	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	258	0	0	0	0	0	0	0	0	632	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	280	0	0	0	0	0	0	0	0	687	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					846							
pX, platoon unblocked												
vC, conflicting volume	0			280			624	280	280	280	280	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			280			624	280	280	280	280	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			0	100	100	100	0	100
cM capacity (veh/h)	1623			1282			0	628	758	672	628	1085

Direction, Lane #	EB 1	SW 1
Volume Total	280	687
Volume Left	0	0
Volume Right	0	0
cSH	1700	628
Volume to Capacity	0.16	1.09
Queue Length 95th (ft)	0	504
Control Delay (s)	0.0	89.1
Lane LOS		F
Approach Delay (s)	0.0	89.1
Approach LOS		F

Intersection Summary			
Average Delay	63.2		
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
11: Farrington Hwy & West Old Fort Weaver Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	Y	
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	250	27	0	972	21	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	272	29	0	1057	23	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			301		1343	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			301		1343	286
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		86	99
cM capacity (veh/h)			1260		168	753

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	301	1057	32
Volume Left	0	0	23
Volume Right	29	0	9
cSH	1700	1700	213
Volume to Capacity	0.18	0.62	0.15
Queue Length 95th (ft)	0	0	13
Control Delay (s)	0.0	0.0	24.8
Lane LOS			C
Approach Delay (s)	0.0	0.0	24.8
Approach LOS			C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
12: Farrington Hwy & Fort Barrette Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↱	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.91	0.91	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	3390	1441	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583	3433	3390	1441	3433	3539	1583
Volume (vph)	754	388	744	71	267	323	352	371	35	476	446	704
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	820	422	809	77	290	351	383	403	38	517	485	765
RTOR Reduction (vph)	0	0	332	0	0	244	0	0	28	0	0	171
Lane Group Flow (vph)	820	422	477	77	290	107	383	403	10	517	485	594
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			2
Actuated Green, G (s)	23.0	32.6	32.6	5.0	14.6	14.6	11.0	26.0	26.0	19.0	34.0	34.0
Effective Green, g (s)	23.0	32.6	32.6	5.0	14.6	14.6	11.0	26.0	26.0	19.0	34.0	34.0
Actuated g/C Ratio	0.23	0.33	0.33	0.05	0.15	0.15	0.11	0.26	0.26	0.19	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	801	1170	523	90	524	234	383	894	380	662	1220	546
v/s Ratio Prot	c0.24	0.12		0.04	0.08		c0.11	0.12		0.15	0.14	
v/s Ratio Perm			c0.30			0.07			0.01			c0.38
v/c Ratio	1.02	0.36	0.91	0.86	0.55	0.46	1.00	0.45	0.03	0.78	0.40	1.09
Uniform Delay, d1	37.8	25.1	31.6	46.4	39.0	38.4	43.8	30.3	26.9	37.8	24.5	32.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	38.0	0.2	20.2	50.6	1.3	1.4	46.0	1.6	0.1	6.0	1.0	64.6
Delay (s)	75.8	25.3	51.8	97.1	40.2	39.8	89.8	32.0	27.0	43.8	25.5	96.9
Level of Service	E	C	D	F	D	D	F	C	C	D	C	F
Approach Delay (s)		55.9			46.1			58.6			61.7	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM Average Control Delay	56.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	98.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX A-2
YEAR 2030 CONDITIONS

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

Year 2030 AM

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00	0.95	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	3539	1583		5085
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	3539	1583		5085
Volume (vph)	564	37	1491	344	0	1120
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	613	40	1621	374	0	1217
RTOR Reduction (vph)	0	19	0	124	0	0
Lane Group Flow (vph)	613	21	1621	250	0	1217
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	21.0	21.0	58.2	58.2		58.2
Effective Green, g (s)	21.0	21.0	58.2	58.2		58.2
Actuated g/C Ratio	0.24	0.24	0.67	0.67		0.67
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	827	381	2362	1057		3394
v/s Ratio Prot	c0.18		c0.46			0.24
v/s Ratio Perm		0.01		0.16		
v/c Ratio	0.74	0.06	0.69	0.24		0.36
Uniform Delay, d1	30.6	25.5	8.9	5.7		6.3
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	3.6	0.1	1.6	0.5		0.3
Delay (s)	34.2	25.5	10.5	6.3		6.6
Level of Service	C	C	B	A		A
Approach Delay (s)	33.7		9.7			6.6
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	87.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

Year 2030 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	0.91			0.91	
Frt						0.86	1.00	1.00			0.97	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5085			4955	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5085			4955	
Volume (vph)	0	0	0	0	0	530	115	1305	0	0	1393	288
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	576	125	1418	0	0	1514	313
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	16	0
Lane Group Flow (vph)	0	0	0	0	0	576	125	1418	0	0	1811	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						100.0	11.2	100.0			80.8	
Effective Green, g (s)						100.0	11.2	100.0			80.8	
Actuated g/C Ratio						1.00	0.11	1.00			0.81	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	198	5085			4004	
v/s Ratio Prot							c0.07	0.28			c0.37	
v/s Ratio Perm						0.36						
v/c Ratio						0.36	0.63	0.28			0.45	
Uniform Delay, d1						0.0	42.4	0.0			2.9	
Progression Factor						1.00	1.12	1.00			1.00	
Incremental Delay, d2						0.6	6.0	0.1			0.4	
Delay (s)						0.6	53.5	0.1			3.3	
Level of Service						A	D	A			A	
Approach Delay (s)		0.0			0.6			4.5			3.3	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: H-1 EB & Kunia Road

Year 2030 AM

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↓↓↓↓			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.86			0.91
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3433	1583	6408			5085
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3433	1583	6408			5085
Volume (vph)	367	248	877	0	0	1052
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	399	270	953	0	0	1143
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	399	270	953	0	0	1143
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	14.9	100.0	77.1			77.1
Effective Green, g (s)	14.9	100.0	77.1			77.1
Actuated g/C Ratio	0.15	1.00	0.77			0.77
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	512	1583	4941			3921
v/s Ratio Prot	c0.12		0.15			c0.22
v/s Ratio Perm		0.17				
v/c Ratio	0.78	0.17	0.19			0.29
Uniform Delay, d1	41.0	0.0	3.1			3.4
Progression Factor	1.00	1.00	0.34			1.00
Incremental Delay, d2	7.4	0.2	0.1			0.2
Delay (s)	48.3	0.2	1.1			3.6
Level of Service	D	A	A			A
Approach Delay (s)	28.9		1.1			3.6
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp

Year 2030 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.91		0.97	0.91				1.00			1.00
Frt		0.98		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		4984		3433	5085				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		4984		3433	5085				1611			1611
Volume (vph)	0	800	122	432	314	0	0	0	422	0	0	39
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	870	133	470	341	0	0	0	459	0	0	42
RTOR Reduction (vph)	0	39	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	964	0	470	341	0	0	0	459	0	0	42
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		21.7		10.3	40.0				40.0			40.0
Effective Green, g (s)		21.7		10.3	40.0				40.0			40.0
Actuated g/C Ratio		0.54		0.26	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2704		884	5085				1611			1611
v/s Ratio Prot		c0.19		c0.14	0.07							
v/s Ratio Perm									0.28			0.03
v/c Ratio		0.36		0.53	0.07				0.28			0.03
Uniform Delay, d1		5.2		12.8	0.0				0.0			0.0
Progression Factor		1.00		1.00	1.00				1.00			1.00
Incremental Delay, d2		0.4		0.6	0.0				0.4			0.0
Delay (s)		5.6		13.4	0.0				0.4			0.0
Level of Service		A		B	A				A			A
Approach Delay (s)		5.6			7.8			0.4			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑			↑↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	0.91			0.91				1.00			
Frt	1.00	1.00			0.94				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	5085			4756				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	5085			4756				1611			
Volume (vph)	171	1051	0	0	746	567	0	0	710	0	0	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	186	1142	0	0	811	616	0	0	772	0	0	0
RTOR Reduction (vph)	0	0	0	0	203	0	0	0	0	0	0	0
Lane Group Flow (vph)	186	1142	0	0	1224	0	0	0	772	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	8.4	45.0			28.6				45.0			
Effective Green, g (s)	8.4	45.0			28.6				45.0			
Actuated g/C Ratio	0.19	1.00			0.64				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	330	5085			3023				1611			
v/s Ratio Prot	0.11	0.22			0.26							
v/s Ratio Perm									c0.48			
v/c Ratio	0.56	0.22			0.40				0.48			
Uniform Delay, d1	16.6	0.0			4.0				0.0			
Progression Factor	1.00	1.00			1.00				1.00			
Incremental Delay, d2	2.2	0.1			0.4				1.0			
Delay (s)	18.8	0.1			4.4				1.0			
Level of Service	B	A			A				A			
Approach Delay (s)		2.7			4.4			1.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	3.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰↑	↱		↰↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00		1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	3433	5085	1583	1770	5085	1583		1780	1583		3424	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (perm)	3433	5085	1583	1770	5085	1583		1780	1583		3424	1583
Volume (vph)	68	1537	155	119	1227	156	56	5	48	92	45	33
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	74	1671	168	129	1334	170	61	5	52	100	49	36
RTOR Reduction (vph)	0	0	84	0	0	103	0	0	47	0	0	33
Lane Group Flow (vph)	74	1671	84	129	1334	67	0	66	5	0	149	3
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.5	34.6	34.6	6.4	27.5	27.5		6.1	6.1		6.5	6.5
Effective Green, g (s)	13.5	34.6	34.6	6.4	27.5	27.5		6.1	6.1		6.5	6.5
Actuated g/C Ratio	0.19	0.50	0.50	0.09	0.40	0.40		0.09	0.09		0.09	0.09
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	666	2528	787	163	2009	625		156	139		320	148
v/s Ratio Prot	0.02	c0.33		c0.07	0.26			c0.04			c0.04	
v/s Ratio Perm			0.05			0.04			0.00			0.00
v/c Ratio	0.11	0.66	0.11	0.79	0.66	0.11		0.42	0.03		0.47	0.02
Uniform Delay, d1	23.1	13.1	9.3	30.9	17.3	13.3		30.1	29.1		29.9	28.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	0.7	0.1	22.5	0.8	0.1		8.2	0.4		1.1	0.1
Delay (s)	23.2	13.8	9.4	53.5	18.1	13.4		38.3	29.5		31.0	28.7
Level of Service	C	B	A	D	B	B		D	C		C	C
Approach Delay (s)		13.7			20.4			34.4			30.5	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	69.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Laulaunui Street & Fort Weaver Road

Year 2030 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		*0.99		1.00	1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	96	24	12	62	4	201	48	3274	38	63	985	170
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	104	26	13	67	4	218	52	3559	41	68	1071	185
RTOR Reduction (vph)	0	6	0	0	0	90	0	0	8	0	0	59
Lane Group Flow (vph)	0	137	0	67	4	128	52	3559	33	68	1071	126
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		11.0		12.0	12.0	12.0	7.5	100.0	100.0	6.8	99.3	99.3
Effective Green, g (s)		11.0		12.0	12.0	12.0	7.5	100.0	100.0	6.8	99.3	99.3
Actuated g/C Ratio		0.08		0.08	0.08	0.08	0.05	0.69	0.69	0.05	0.68	0.68
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		265		146	153	130	91	3794	1086	83	3768	1078
v/s Ratio Prot		c0.04		0.04	0.00		0.03	c0.64		c0.04	0.19	
v/s Ratio Perm						c0.08			0.02			0.08
v/c Ratio		0.52		0.46	0.03	0.99	0.57	0.94	0.03	0.82	0.28	0.12
Uniform Delay, d1		64.9		63.8	61.5	66.8	67.6	20.2	7.3	68.9	9.2	8.1
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.7		2.3	0.1	73.8	8.4	5.9	0.1	44.3	0.2	0.2
Delay (s)		66.6		66.1	61.6	140.6	76.0	26.1	7.4	113.2	9.4	8.3
Level of Service		E		E	E	F	E	C	A	F	A	A
Approach Delay (s)		66.6			122.2			26.6			14.6	
Approach LOS		E			F			C			B	

Intersection Summary			
HCM Average Control Delay	29.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	145.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Old Fort Weaver Road & Fort Weaver Road

Year 2030 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1775	1583		1858	1583	1770	5085	1583	1770	5085	1583
Flt Permitted		0.68	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1259	1583		1836	1583	1770	5085	1583	1770	5085	1583
Volume (vph)	102	1	134	4	62	230	94	3028	1	5	839	215
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	111	1	146	4	67	250	102	3291	1	5	912	234
RTOR Reduction (vph)	0	0	0	0	0	56	0	0	0	0	0	82
Lane Group Flow (vph)	0	112	146	0	71	194	102	3291	1	5	912	152
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		14.5	100.4		14.5	14.5	8.7	73.1	100.4	0.8	65.2	65.2
Effective Green, g (s)		14.5	100.4		14.5	14.5	8.7	73.1	100.4	0.8	65.2	65.2
Actuated g/C Ratio		0.14	1.00		0.14	0.14	0.09	0.73	1.00	0.01	0.65	0.65
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		182	1583		265	229	153	3702	1583	14	3302	1028
v/s Ratio Prot							c0.06	c0.65		0.00	0.18	
v/s Ratio Perm		0.09	0.09		0.04	c0.12			0.00			0.10
v/c Ratio		0.62	0.09		0.27	0.85	0.67	0.89	0.00	0.36	0.28	0.15
Uniform Delay, d1		40.3	0.0		38.2	41.9	44.4	10.5	0.0	49.5	7.5	6.8
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		6.1	0.1		0.5	24.2	10.5	3.6	0.0	14.9	0.2	0.3
Delay (s)		46.4	0.1		38.8	66.1	54.9	14.2	0.0	64.5	7.7	7.1
Level of Service		D	A		D	E	D	B	A	E	A	A
Approach Delay (s)		20.2			60.1			15.4			7.9	
Approach LOS		C			E			B			A	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	100.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Renton Road & Fort Weaver Road

Year 2030 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑	↱		✥		↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00		1.00		1.00	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	0.85		0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1766	1583		1798		1770	5532	1583	1770	5532	1583
Flt Permitted	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1766	1583		1798		1770	5532	1583	1770	5532	1583
Volume (vph)	440	29	36	10	335	115	89	2567	1	177	778	25
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	444	29	36	10	338	116	90	2593	1	179	786	25
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	0	13
Lane Group Flow (vph)	231	242	36	0	456	0	90	2593	1	179	786	12
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	20.0	20.0	150.0		32.0		12.3	69.0	69.0	13.0	69.7	69.7
Effective Green, g (s)	20.0	20.0	150.0		32.0		12.3	69.0	69.0	13.0	69.7	69.7
Actuated g/C Ratio	0.13	0.13	1.00		0.21		0.08	0.46	0.46	0.09	0.46	0.46
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	234	235	1583		384		145	2545	728	153	2571	736
v/s Ratio Prot	0.13	c0.14			c0.25		0.05	c0.47		c0.10	0.14	
v/s Ratio Perm			c0.02						0.00			0.01
v/c Ratio	0.99	1.03	0.02		1.19		0.62	1.02	0.00	1.17	0.31	0.02
Uniform Delay, d1	64.9	65.0	0.0		59.0		66.6	40.5	21.9	68.5	25.1	21.7
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	54.7	66.7	0.0		107.8		8.0	22.7	0.0	125.7	0.3	0.0
Delay (s)	119.6	131.7	0.0		166.8		74.6	63.2	21.9	194.2	25.4	21.7
Level of Service	F	F	A		F		E	E	C	F	C	C
Approach Delay (s)		116.9			166.8			63.6			55.8	
Approach LOS		F			F			E			E	

Intersection Summary			
HCM Average Control Delay	78.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	110.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
10: Farrington Hwy & East Old Fort Weaver Road

Year 2030 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations		↑↑							↰	
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Volume (veh/h)	0	570	0	0	0	0	0	0	79	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	620	0	0	0	0	0	0	86	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type							None		None	
Median storage veh)										
Upstream signal (ft)					942					
pX, platoon unblocked										
vC, conflicting volume	0			620			662	620	620	0
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	0			620			662	620	620	0
tC, single (s)	4.1			4.1			7.5	6.5	6.5	6.9
tC, 2 stage (s)										
tF (s)	2.2			2.2			3.5	4.0	4.0	3.3
p0 queue free %	100			100			100	100	79	100
cM capacity (veh/h)	1622			957			290	403	403	1084

Direction, Lane #	EB 1	EB 2	SW 1
Volume Total	310	310	86
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	403
Volume to Capacity	0.18	0.18	0.21
Queue Length 95th (ft)	0	0	20
Control Delay (s)	0.0	0.0	16.4
Lane LOS			C
Approach Delay (s)	0.0		16.4
Approach LOS			C

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
11: Farrington Hwy & West Old Fort Weaver Road

Year 2030 AM

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑	↰	↱
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	570	9	0	274	115	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	620	10	0	298	125	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			629		773	315
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			629		773	315
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		63	100
cM capacity (veh/h)			949		335	681

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	413	216	149	149	125	0
Volume Left	0	0	0	0	125	0
Volume Right	0	10	0	0	0	0
cSH	1700	1700	1700	1700	335	1700
Volume to Capacity	0.24	0.13	0.09	0.09	0.37	0.00
Queue Length 95th (ft)	0	0	0	0	42	0
Control Delay (s)	0.0	0.0	0.0	0.0	22.0	0.0
Lane LOS					C	A
Approach Delay (s)	0.0		0.0		22.0	
Approach LOS					C	

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	29.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
12: Fort Barrette Road & Farrington Hwy

Year 2030 AM

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↱	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3252	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3252	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	368	688	781	572	566	115	328	273	485	50	346	427
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	400	748	849	622	615	125	357	297	527	54	376	464
RTOR Reduction (vph)	0	15	159	0	0	63	0	0	315	0	0	305
Lane Group Flow (vph)	400	1013	410	622	615	62	357	297	212	54	376	159
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	26.1	81.0	81.0	37.9	92.8	92.8	23.2	43.4	43.4	8.1	28.3	28.3
Effective Green, g (s)	26.1	81.0	81.0	37.9	92.8	92.8	23.2	43.4	43.4	8.1	28.3	28.3
Actuated g/C Ratio	0.14	0.43	0.43	0.20	0.50	0.50	0.12	0.23	0.23	0.04	0.15	0.15
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	481	1413	626	698	1762	788	427	824	369	77	537	240
v/s Ratio Prot	0.12	c0.31		c0.18	0.17		c0.10	0.08		0.03	c0.11	
v/s Ratio Perm			0.28			0.04			0.13			0.10
v/c Ratio	0.83	0.72	0.66	0.89	0.35	0.08	0.84	0.36	0.57	0.70	0.70	0.66
Uniform Delay, d1	78.0	43.3	41.7	72.2	28.4	24.5	79.7	59.9	63.3	88.0	75.0	74.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.7	1.8	2.5	13.6	0.5	0.2	13.3	0.3	2.2	25.0	4.1	6.7
Delay (s)	89.7	45.0	44.1	85.9	29.0	24.7	93.0	60.1	65.5	112.9	79.1	81.2
Level of Service	F	D	D	F	C	C	F	E	E	F	E	F
Approach Delay (s)		53.7			54.6			72.5			82.2	
Approach LOS		D			D			E			F	

Intersection Summary			
HCM Average Control Delay	62.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	186.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
13: WB Ramps & North-South Road

Year 2030 AM

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰		↱				↑↑	↱	↰↰	↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97		1.00				0.95	1.00	0.97	0.95	
Frt	1.00		0.85				1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433		1583				3539	1583	3433	3539	
Flt Permitted	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433		1583				3539	1583	3433	3539	
Volume (vph)	812	0	115	0	0	0	994	248	167	144	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	883	0	125	0	0	0	1080	270	182	157	0
RTOR Reduction (vph)	0	0	89	0	0	0	0	122	0	0	0
Lane Group Flow (vph)	883	0	36	0	0	0	1080	148	182	157	0
Turn Type	Prot		custom					Perm	Prot		
Protected Phases	8		8				6		5	2	
Permitted Phases								6			
Actuated Green, G (s)	37.6		37.6				68.5	68.5	11.9	84.4	
Effective Green, g (s)	37.6		37.6				68.5	68.5	11.9	84.4	
Actuated g/C Ratio	0.29		0.29				0.53	0.53	0.09	0.65	
Clearance Time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0				3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	993		458				1865	834	314	2298	
v/s Ratio Prot	c0.26		0.02				c0.31		c0.05	0.04	
v/s Ratio Perm								0.09			
v/c Ratio	0.89		0.08				0.58	0.18	0.58	0.07	
Uniform Delay, d1	44.2		33.6				20.9	16.0	56.7	8.4	
Progression Factor	1.00		1.00				1.00	1.00	0.55	0.59	
Incremental Delay, d2	9.8		0.1				1.3	0.5	2.6	0.1	
Delay (s)	54.0		33.7				22.3	16.5	33.8	5.0	
Level of Service	D		C				C	B	C	A	
Approach Delay (s)		51.5		0.0			21.1			20.4	
Approach LOS		D		A			C			C	

Intersection Summary			
HCM Average Control Delay	32.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: EB Ramps & North-South Road

Year 2030 AM

Movement	EBL2	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰		↱			↰↰	↑↑			↑↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00			0.97	*0.99			*0.99	*0.99
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583			3433	3688			3688	3135
Flt Permitted	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (perm)	1770		1583			3433	3688			3688	3135
Volume (vph)	51	0	247	0	0	799	1007	0	0	260	1615
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	52	0	249	0	0	807	1017	0	0	263	1631
RTOR Reduction (vph)	0	0	197	0	0	0	0	0	0	0	368
Lane Group Flow (vph)	52	0	52	0	0	807	1017	0	0	263	1263
Turn Type	Prot		custom			Prot					Perm
Protected Phases	4		4			1	6			2	
Permitted Phases											2
Actuated Green, G (s)	10.2		10.2			55.0	111.8			52.8	52.8
Effective Green, g (s)	10.2		10.2			55.0	111.8			52.8	52.8
Actuated g/C Ratio	0.08		0.08			0.42	0.86			0.41	0.41
Clearance Time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	139		124			1452	3172			1498	1273
v/s Ratio Prot	0.03		c0.03			c0.24	0.28			0.07	
v/s Ratio Perm											c0.40
v/c Ratio	0.37		0.42			0.56	0.32			0.18	0.99
Uniform Delay, d1	56.9		57.1			28.3	1.8			24.7	38.4
Progression Factor	1.00		1.00			1.13	0.90			1.00	1.00
Incremental Delay, d2	1.7		2.3			0.3	0.2			0.3	23.5
Delay (s)	58.6		59.3			32.3	1.8			24.9	61.9
Level of Service	E		E			C	A			C	E
Approach Delay (s)		59.2		0.0			15.3			56.8	
Approach LOS		E		A			B			E	

Intersection Summary			
HCM Average Control Delay	38.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: North-South Road & Farrington Hwy

Year 2030 AM

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	3433	3539	1583	3433	3539	1583
Volume (vph)	228	637	465	323	1081	209	506	102	148	56	35	288
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	248	692	505	351	1175	227	550	111	161	61	38	313
RTOR Reduction (vph)	0	0	382	0	0	167	0	0	96	0	0	244
Lane Group Flow (vph)	248	692	123	351	1175	60	550	111	65	61	38	69
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	12.1	23.6	23.6	14.1	25.6	25.6	26.0	39.0	39.0	3.9	16.9	16.9
Effective Green, g (s)	12.1	23.6	23.6	14.1	25.6	25.6	26.0	39.0	39.0	3.9	16.9	16.9
Actuated g/C Ratio	0.13	0.24	0.24	0.15	0.27	0.27	0.27	0.40	0.40	0.04	0.17	0.17
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	430	1242	387	501	1348	420	924	1429	639	139	619	277
v/s Ratio Prot	0.07	0.14		c0.10	c0.23		c0.16	0.03		0.02	0.01	
v/s Ratio Perm			0.08			0.04			0.04			c0.04
v/c Ratio	0.58	0.56	0.32	0.70	0.87	0.14	0.60	0.08	0.10	0.44	0.06	0.25
Uniform Delay, d1	39.8	31.9	29.9	39.2	33.9	27.1	30.7	17.7	17.9	45.3	33.2	34.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.5	0.5	4.4	6.5	0.2	2.8	0.1	0.3	2.2	0.2	2.1
Delay (s)	41.7	32.5	30.4	43.6	40.4	27.3	33.5	17.8	18.2	47.5	33.4	36.5
Level of Service	D	C	C	D	D	C	C	B	B	D	C	D
Approach Delay (s)		33.3			39.3			28.4			37.8	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM Average Control Delay	35.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	96.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: North-South Road & North UH Connector

Year 2030 AM

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑↱		↰↰	↑↱				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	0.97	0.91			0.91		0.97	0.95				
Frt	1.00	1.00			0.99		1.00	0.97				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	3433	5085			5013		3433	3443				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	3433	5085			5013		3433	3443				
Volume (vph)	41	1479	0	0	761	80	134	96	21	0	0	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	45	1608	0	0	827	87	146	104	23	0	0	0
RTOR Reduction (vph)	0	0	0	0	6	0	0	21	0	0	0	0
Lane Group Flow (vph)	45	1608	0	0	908	0	146	106	0	0	0	0
Turn Type	Prot			Perm			Split					
Protected Phases	5	2			6		4	4				
Permitted Phases				6								
Actuated Green, G (s)	4.4	70.3			61.9		9.0	9.0				
Effective Green, g (s)	4.4	70.3			61.9		9.0	9.0				
Actuated g/C Ratio	0.05	0.81			0.71		0.10	0.10				
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0				
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	173	4095			3554		354	355				
v/s Ratio Prot	0.01	c0.32			0.18		c0.04	0.03				
v/s Ratio Perm												
v/c Ratio	0.26	0.39			0.26		0.41	0.30				
Uniform Delay, d1	39.9	2.4			4.5		36.7	36.2				
Progression Factor	1.00	1.00			1.00		1.00	1.00				
Incremental Delay, d2	0.8	0.3			0.2		0.8	0.5				
Delay (s)	40.7	2.7			4.7		37.5	36.7				
Level of Service	D	A			A		D	D				
Approach Delay (s)		3.7			4.7			37.1			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	87.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰↰	↑↱		↰↰	↑↑↱		↰↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95		0.97	0.95		0.97	0.91		0.97	0.91	
Frt	1.00	0.95		1.00	0.89		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3433	3356		3433	3141		3433	5011		3433	4938	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3433	3356		3433	3141		3433	5011		3433	4938	
Volume (vph)	205	213	112	105	59	177	207	1138	123	86	562	134
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	223	232	122	114	64	192	225	1237	134	93	611	146
RTOR Reduction (vph)	0	72	0	0	169	0	0	12	0	0	35	0
Lane Group Flow (vph)	223	282	0	114	87	0	225	1359	0	93	722	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	10.8	14.2		6.9	10.3		10.8	33.1		17.1	39.4	
Effective Green, g (s)	10.8	14.2		6.9	10.3		10.8	33.1		17.1	39.4	
Actuated g/C Ratio	0.12	0.16		0.08	0.12		0.12	0.38		0.20	0.45	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	425	546		271	371		425	1900		672	2229	
v/s Ratio Prot	c0.06	c0.08		0.03	0.03		c0.07	c0.27		0.03	c0.15	
v/s Ratio Perm												
v/c Ratio	0.52	0.52		0.42	0.23		0.53	0.72		0.14	0.32	
Uniform Delay, d1	35.8	33.4		38.3	34.9		35.9	23.1		29.0	15.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.8		1.1	0.3		1.2	2.3		0.4	0.4	
Delay (s)	37.0	34.2		39.4	35.2		37.1	25.4		29.4	15.8	
Level of Service	D	C		D	D		D	C		C	B	
Approach Delay (s)		35.3			36.5			27.1			17.3	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	27.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	87.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	0.98		1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4992		1770	4735		3433	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	4992		1770	4735		3433	5085	1583	1770	5085	1583
Volume (vph)	245	463	64	33	404	342	715	315	316	118	437	290
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	266	503	70	36	439	372	777	342	343	128	475	315
RTOR Reduction (vph)	0	17	0	0	145	0	0	0	231	0	0	158
Lane Group Flow (vph)	266	556	0	36	666	0	777	342	112	128	475	157
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	17.1	33.6		3.3	19.8		24.1	30.2	30.2	9.4	15.5	15.5
Effective Green, g (s)	17.1	33.6		3.3	19.8		24.1	30.2	30.2	9.4	15.5	15.5
Actuated g/C Ratio	0.18	0.36		0.04	0.21		0.26	0.33	0.33	0.10	0.17	0.17
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	327	1813		63	1014		894	1660	517	180	852	265
v/s Ratio Prot	c0.15	0.11		0.02	c0.14		c0.23	0.07		0.07	0.09	
v/s Ratio Perm									0.07			c0.10
v/c Ratio	0.81	0.31		0.57	0.66		0.87	0.21	0.22	0.71	0.56	0.59
Uniform Delay, d1	36.2	21.1		43.9	33.2		32.7	22.5	22.6	40.2	35.4	35.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.3	0.4		11.9	3.3		9.0	0.1	0.2	12.4	0.8	3.5
Delay (s)	50.4	21.5		55.8	36.6		41.7	22.6	22.8	52.7	36.1	39.1
Level of Service	D	C		E	D		D	C	C	D	D	D
Approach Delay (s)		30.7			37.4			32.8			39.5	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	92.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		1.00	0.93		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1859	1733		1770	1583
Flt Permitted		0.94	1.00		0.95	1.00
Satd. Flow (perm)		1760	1733		1770	1583
Volume (vph)	10	230	180	191	7	35
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	250	196	208	8	38
RTOR Reduction (vph)	0	0	63	0	0	15
Lane Group Flow (vph)	0	261	341	0	8	23
Turn Type	Perm					Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)		16.5	16.5		36.3	36.3
Effective Green, g (s)		16.5	16.5		36.3	36.3
Actuated g/C Ratio		0.27	0.27		0.60	0.60
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		478	470		1057	945
v/s Ratio Prot			c0.20		0.00	
v/s Ratio Perm		0.15				c0.01
v/c Ratio		0.55	0.72		0.01	0.02
Uniform Delay, d1		18.9	20.1		5.0	5.0
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		1.3	5.5		0.0	0.0
Delay (s)		20.2	25.6		5.0	5.1
Level of Service		C	C		A	A
Approach Delay (s)		20.2	25.6		5.0	
Approach LOS		C	C		A	

Intersection Summary			
HCM Average Control Delay	22.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	60.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

Year 2030 PM

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	*0.99	1.00	*0.99	1.00		*0.99
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3504	1583	3688	1583		5532
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3504	1583	3688	1583		5532
Volume (vph)	634	41	2366	643	0	2415
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	640	41	2390	649	0	2439
RTOR Reduction (vph)	0	7	0	198	0	0
Lane Group Flow (vph)	640	34	2390	451	0	2439
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	22.0	22.0	68.1	68.1		68.1
Effective Green, g (s)	22.0	22.0	68.1	68.1		68.1
Actuated g/C Ratio	0.22	0.22	0.69	0.69		0.69
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	786	355	2560	1099		3840
v/s Ratio Prot	c0.18		c0.65			0.44
v/s Ratio Perm		0.02		0.28		
v/c Ratio	0.81	0.10	0.93	0.41		0.64
Uniform Delay, d1	36.1	30.2	13.0	6.4		8.2
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	6.5	0.1	7.8	1.1		0.8
Delay (s)	42.6	30.3	20.9	7.5		9.0
Level of Service	D	C	C	A		A
Approach Delay (s)	41.9		18.0			9.0
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	98.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

Year 2030 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	0.91			0.91	
Frt						0.86	1.00	1.00			0.99	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5085			5016	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5085			5016	
Volume (vph)	0	0	0	0	0	1230	323	1779	0	0	2774	275
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	1337	351	1934	0	0	3015	299
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	11	0
Lane Group Flow (vph)	0	0	0	0	0	1337	351	1934	0	0	3303	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						100.0	22.8	100.0			69.2	
Effective Green, g (s)						100.0	22.8	100.0			69.2	
Actuated g/C Ratio						1.00	0.23	1.00			0.69	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	404	5085			3471	
v/s Ratio Prot							0.20	0.38			c0.66	
v/s Ratio Perm						c0.83						
v/c Ratio						0.83	0.87	0.38			0.95	
Uniform Delay, d1						0.0	37.2	0.0			13.9	
Progression Factor						1.00	1.08	1.00			1.00	
Incremental Delay, d2						5.1	15.8	0.2			7.6	
Delay (s)						5.1	56.0	0.2			21.5	
Level of Service						A	E	A			C	
Approach Delay (s)		0.0			5.1			8.8			21.5	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↑↑↑↑			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.86			0.91
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3433	1583	6408			5085
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3433	1583	6408			5085
Volume (vph)	455	413	3770	0	0	2102
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	495	449	4098	0	0	2285
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	495	449	4098	0	0	2285
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	18.3	100.0	73.7			73.7
Effective Green, g (s)	18.3	100.0	73.7			73.7
Actuated g/C Ratio	0.18	1.00	0.74			0.74
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	628	1583	4723			3748
v/s Ratio Prot	c0.14		c0.64			0.45
v/s Ratio Perm		0.28				
v/c Ratio	0.79	0.28	0.87			0.61
Uniform Delay, d1	39.0	0.0	9.6			6.3
Progression Factor	1.00	1.00	0.42			1.00
Incremental Delay, d2	6.5	0.4	2.2			0.7
Delay (s)	45.5	0.4	6.2			7.0
Level of Service	D	A	A			A
Approach Delay (s)	24.1		6.2			7.0
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.91		0.97	0.91				1.00			1.00
Frt		0.97		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		4952		3433	5085				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		4952		3433	5085				1611			1611
Volume (vph)	0	483	102	622	1345	0	0	0	426	0	0	144
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	525	111	676	1462	0	0	0	463	0	0	157
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	627	0	676	1462	0	0	0	463	0	0	157
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		90.7		31.3	130.0				130.0			130.0
Effective Green, g (s)		90.7		31.3	130.0				130.0			130.0
Actuated g/C Ratio		0.70		0.24	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		3455		827	5085				1611			1611
v/s Ratio Prot		0.13		c0.20	c0.29							
v/s Ratio Perm									0.29			0.10
v/c Ratio		0.18		0.82	0.29				0.29			0.10
Uniform Delay, d1		6.8		46.6	0.0				0.0			0.0
Progression Factor		1.00		1.29	1.00				1.00			1.00
Incremental Delay, d2		0.1		3.3	0.1				0.4			0.1
Delay (s)		6.9		63.5	0.1				0.4			0.1
Level of Service		A		E	A				A			A
Approach Delay (s)		6.9			20.1			0.4			0.1	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps

Year 2030 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑			↑↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	0.91			0.91				1.00			
Frt	1.00	1.00			0.94				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	5085			4802				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	5085			4802				1611			
Volume (vph)	129	780	0	0	1968	1164	0	0	428	0	0	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	140	848	0	0	2139	1265	0	0	465	0	0	0
RTOR Reduction (vph)	0	0	0	0	47	0	0	0	0	0	0	0
Lane Group Flow (vph)	140	848	0	0	3357	0	0	0	465	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	14.4	130.0			107.6				130.0			
Effective Green, g (s)	14.4	130.0			107.6				130.0			
Actuated g/C Ratio	0.11	1.00			0.83				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	196	5085			3975				1611			
v/s Ratio Prot	c0.08	0.17			c0.70							
v/s Ratio Perm									0.29			
v/c Ratio	0.71	0.17			0.92dr				0.29			
Uniform Delay, d1	55.8	0.0			6.4				0.0			
Progression Factor	0.93	1.00			1.00				1.00			
Incremental Delay, d2	11.5	0.1			2.4				0.5			
Delay (s)	63.3	0.1			8.8				0.5			
Level of Service	E	A			A				A			
Approach Delay (s)		9.0			8.8			0.5			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street

Year 2030 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰↑	↱		↰↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	1.00	*0.99	1.00		1.00	1.00		*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (perm)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Volume (vph)	189	903	116	135	2831	515	197	29	130	243	28	99
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	191	912	117	136	2860	520	199	29	131	245	28	100
RTOR Reduction (vph)	0	0	98	0	0	167	0	0	42	0	0	87
Lane Group Flow (vph)	191	912	19	136	2860	353	0	228	89	0	273	13
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.0	24.7	24.7	73.3	89.0	89.0		20.0	20.0		15.0	15.0
Effective Green, g (s)	9.0	24.7	24.7	73.3	89.0	89.0		20.0	20.0		15.0	15.0
Actuated g/C Ratio	0.06	0.17	0.17	0.49	0.60	0.60		0.13	0.13		0.10	0.10
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	212	917	262	871	3304	946		240	212		355	159
v/s Ratio Prot	c0.05	c0.16		0.08	c0.52			c0.13			c0.08	
v/s Ratio Perm			0.01			0.22			0.06			0.01
v/c Ratio	0.90	0.99	0.07	0.16	0.87	0.37		0.95	0.42		1.38dl	0.08
Uniform Delay, d1	69.6	62.1	52.5	20.8	25.0	15.5		64.0	59.2		65.3	60.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	35.9	28.2	0.1	0.1	2.6	0.2		46.5	6.1		9.6	0.2
Delay (s)	105.5	90.3	52.6	20.9	27.6	15.8		110.5	65.3		75.0	61.0
Level of Service	F	F	D	C	C	B		F	E		E	E
Approach Delay (s)		89.0			25.6			94.0			71.2	
Approach LOS		F			C			F			E	

Intersection Summary			
HCM Average Control Delay	47.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	149.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Laulaunui Street & Fort Weaver Road

Year 2030 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		*0.99		1.00	1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3519		1770	1863	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3519		1770	1863	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	209	37	13	40	4	180	56	2225	71	173	3239	82
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	227	40	14	43	4	196	61	2418	77	188	3521	89
RTOR Reduction (vph)	0	3	0	0	0	190	0	0	28	0	0	26
Lane Group Flow (vph)	0	278	0	43	4	6	61	2418	49	188	3521	63
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		14.4		4.0	4.0	4.0	5.0	76.0	76.0	18.0	89.0	89.0
Effective Green, g (s)		14.4		4.0	4.0	4.0	5.0	76.0	76.0	18.0	89.0	89.0
Actuated g/C Ratio		0.11		0.03	0.03	0.03	0.04	0.59	0.59	0.14	0.69	0.69
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		395		55	58	49	69	3274	937	248	3834	1097
v/s Ratio Prot		c0.08		c0.02	0.00		0.03	c0.44		0.11	c0.64	
v/s Ratio Perm						0.00			0.03			0.04
v/c Ratio		1.14dl		0.78	0.07	0.12	0.88	0.74	0.05	0.76	0.92	0.06
Uniform Delay, d1		54.9		61.8	60.4	60.5	61.4	19.0	11.0	53.1	16.6	6.3
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		5.6		50.5	0.5	1.1	69.1	1.5	0.1	12.4	4.7	0.1
Delay (s)		60.6		112.3	60.9	61.6	130.5	20.5	11.1	65.6	21.3	6.4
Level of Service		E		F	E	E	F	C	B	E	C	A
Approach Delay (s)		60.6			70.6			22.9			23.2	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM Average Control Delay	26.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	128.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.2%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Old Fort Weaver Road & Fort Weaver Road

Year 2030 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1809	1583		1829	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.72	1.00		0.47	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1339	1583		880	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	199	135	372	36	62	46	230	2104	2	135	2959	198
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	201	136	376	36	63	46	232	2125	2	136	2989	200
RTOR Reduction (vph)	0	0	0	0	0	36	0	0	0	0	0	96
Lane Group Flow (vph)	0	337	376	0	99	10	232	2125	2	136	2989	104
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		26.0	119.2		26.0	26.0	19.4	69.0	119.2	12.2	61.8	61.8
Effective Green, g (s)		26.0	119.2		26.0	26.0	19.4	69.0	119.2	12.2	61.8	61.8
Actuated g/C Ratio		0.22	1.00		0.22	0.22	0.16	0.58	1.00	0.10	0.52	0.52
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		292	1583		192	345	288	3202	1583	181	2868	821
v/s Ratio Prot							c0.13	0.38		0.08	c0.54	
v/s Ratio Perm		c0.25	0.24		0.11	0.01			0.00			0.07
v/c Ratio		1.15	0.24		0.52	0.03	0.81	0.66	0.00	0.75	1.04	0.13
Uniform Delay, d1		46.6	0.0		41.1	36.7	48.1	17.2	0.0	52.0	28.7	14.8
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		101.0	0.4		2.3	0.0	15.0	1.1	0.0	16.0	29.1	0.3
Delay (s)		147.6	0.4		43.4	36.7	63.1	18.3	0.0	68.1	57.8	15.1
Level of Service		F	A		D	D	E	B	A	E	E	B
Approach Delay (s)		70.0			41.3			22.7			55.7	
Approach LOS		E			D			C			E	

Intersection Summary			
HCM Average Control Delay	45.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	119.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	106.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Renton Road & Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑	↱		↰↑↱		↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00		1.00		1.00	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	0.85		0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1760	1583		1731		1770	5532	1583	1770	5532	1583
Flt Permitted	0.95	0.95	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1760	1583		1731		1770	5532	1583	1770	5532	1583
Volume (vph)	682	14	43	9	144	160	45	1671	75	425	2480	472
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	689	14	43	9	145	162	45	1688	76	429	2505	477
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	9	0	0	229
Lane Group Flow (vph)	345	358	43	0	291	0	45	1688	67	429	2505	248
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	29.0	29.0	150.0		23.0		4.0	49.0	49.0	33.0	78.0	78.0
Effective Green, g (s)	29.0	29.0	150.0		23.0		4.0	49.0	49.0	33.0	78.0	78.0
Actuated g/C Ratio	0.19	0.19	1.00		0.15		0.03	0.33	0.33	0.22	0.52	0.52
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	339	340	1583		265		47	1807	517	389	2877	823
v/s Ratio Prot	0.20	c0.20			c0.17		0.03	c0.31		c0.24	0.45	
v/s Ratio Perm			0.03						0.04			0.16
v/c Ratio	1.02	1.05	0.03		1.10		0.96	0.93	0.13	1.10	0.87	0.30
Uniform Delay, d1	60.5	60.5	0.0		63.5		72.9	48.9	35.5	58.5	31.6	20.5
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	53.5	63.4	0.0		83.6		114.0	10.4	0.5	76.3	3.9	0.9
Delay (s)	114.0	123.9	0.0		147.1		186.9	59.4	36.0	134.8	35.5	21.4
Level of Service	F	F	A		F		F	E	D	F	D	C
Approach Delay (s)		112.2			147.1			61.6			46.0	
Approach LOS		F			F			E			D	

Intersection Summary			
HCM Average Control Delay	63.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	106.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
10: Farrington Hwy & East Old Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations		↑↑							↰	
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Volume (veh/h)	0	540	0	0	0	0	0	0	275	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	587	0	0	0	0	0	0	299	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type							None		None	
Median storage veh)										
Upstream signal (ft)					942					
pX, platoon unblocked										
vC, conflicting volume	0			587			736	587	587	0
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	0			587			736	587	587	0
tC, single (s)	4.1			4.1			7.5	6.5	6.5	6.9
tC, 2 stage (s)										
tF (s)	2.2			2.2			3.5	4.0	4.0	3.3
p0 queue free %	100			100			100	100	29	100
cM capacity (veh/h)	1622			984			130	420	420	1084

Direction, Lane #	EB 1	EB 2	SW 1
Volume Total	293	293	299
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	420
Volume to Capacity	0.17	0.17	0.71
Queue Length 95th (ft)	0	0	136
Control Delay (s)	0.0	0.0	32.0
Lane LOS			D
Approach Delay (s)	0.0		32.0
Approach LOS			D

Intersection Summary			
Average Delay	10.8		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
11: Farrington Hwy & West Old Fort Weaver Road

Year 2030 PM

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑	↰	↱
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	535	143	0	1214	75	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	582	155	0	1320	82	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			737		1319	368
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			737		1319	368
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		45	100
cM capacity (veh/h)			865		148	629

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	388	349	660	660	82	0
Volume Left	0	0	0	0	82	0
Volume Right	0	155	0	0	0	0
cSH	1700	1700	1700	1700	148	1700
Volume to Capacity	0.23	0.21	0.39	0.39	0.55	0.00
Queue Length 95th (ft)	0	0	0	0	69	0
Control Delay (s)	0.0	0.0	0.0	0.0	55.4	0.0
Lane LOS					F	A
Approach Delay (s)	0.0		0.0		55.4	
Approach LOS					F	

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
12: Fort Barrette Road & Farrington Hwy

Year 2030 PM

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↱	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3245	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3245	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	478	463	708	355	380	37	658	390	746	157	550	448
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	520	503	770	386	413	40	715	424	811	171	598	487
RTOR Reduction (vph)	0	17	315	0	0	31	0	0	228	0	0	260
Lane Group Flow (vph)	520	687	254	386	413	9	715	424	583	171	598	227
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	31.2	48.1	48.1	23.1	40.0	40.0	41.4	67.8	67.8	20.5	46.9	46.9
Effective Green, g (s)	31.2	48.1	48.1	23.1	40.0	40.0	41.4	67.8	67.8	20.5	46.9	46.9
Actuated g/C Ratio	0.18	0.27	0.27	0.13	0.23	0.23	0.24	0.39	0.39	0.12	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	610	889	395	452	807	361	810	1367	612	207	946	423
v/s Ratio Prot	c0.15	c0.21		0.11	0.12		c0.21	0.12		0.10	0.17	
v/s Ratio Perm			0.18			0.01			c0.37			0.14
v/c Ratio	0.85	0.77	0.64	0.85	0.51	0.03	0.88	0.31	0.95	0.83	0.63	0.54
Uniform Delay, d1	69.9	58.7	56.1	74.6	59.2	52.6	64.7	37.5	52.3	75.8	56.7	55.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.1	4.2	3.6	14.5	2.3	0.1	11.2	0.1	24.9	22.8	1.4	1.3
Delay (s)	81.0	62.9	59.7	89.1	61.5	52.7	75.9	37.7	77.2	98.5	58.1	56.3
Level of Service	F	E	E	F	E	D	E	D	E	F	E	E
Approach Delay (s)		67.1			73.8			68.1			62.9	
Approach LOS		E			E			E			E	

Intersection Summary			
HCM Average Control Delay	67.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	175.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰		↱				↑↑	↱	↰↰	↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97		1.00				0.95	1.00	0.97	0.95	
Frt	1.00		0.85				1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433		1583				3539	1583	3433	3539	
Flt Permitted	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433		1583				3539	1583	3433	3539	
Volume (vph)	1190	0	412	0	0	0	309	86	144	331	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1293	0	448	0	0	0	336	93	157	360	0
RTOR Reduction (vph)	0	0	211	0	0	0	0	67	0	0	0
Lane Group Flow (vph)	1293	0	237	0	0	0	336	26	157	360	0
Turn Type	Prot		custom					Perm	Prot		
Protected Phases	8		8				6		5	2	
Permitted Phases								6			
Actuated Green, G (s)	44.4		44.4				27.6	27.6	16.0	47.6	
Effective Green, g (s)	44.4		44.4				27.6	27.6	16.0	47.6	
Actuated g/C Ratio	0.44		0.44				0.28	0.28	0.16	0.48	
Clearance Time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0				3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1524		703				977	437	549	1685	
v/s Ratio Prot	c0.38		0.15				c0.09		c0.05	0.10	
v/s Ratio Perm								0.02			
v/c Ratio	0.85		0.34				0.34	0.06	0.29	0.21	
Uniform Delay, d1	24.8		18.2				29.0	26.6	37.0	15.3	
Progression Factor	1.00		1.00				1.00	1.00	0.93	0.78	
Incremental Delay, d2	4.6		0.3				1.0	0.3	0.3	0.3	
Delay (s)	29.4		18.5				29.9	26.9	34.8	12.3	
Level of Service	C		B				C	C	C	B	
Approach Delay (s)		26.6		0.0			29.3			19.1	
Approach LOS		C		A			C			B	

Intersection Summary			
HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL2	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰		↱			↰↰	↑↑			↑↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00			0.97	0.95			0.95	0.88
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583			3433	3539			3539	2787
Flt Permitted	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (perm)	1770		1583			3433	3539			3539	2787
Volume (vph)	92	0	304	0	0	201	1298	0	0	383	1239
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	0	330	0	0	218	1411	0	0	416	1347
RTOR Reduction (vph)	0	0	59	0	0	0	0	0	0	0	532
Lane Group Flow (vph)	100	0	271	0	0	218	1411	0	0	416	815
Turn Type	Prot		custom			Prot					Perm
Protected Phases	4		4			1	6			2	
Permitted Phases											2
Actuated Green, G (s)	19.7		19.7			11.0	72.3			57.3	57.3
Effective Green, g (s)	19.7		19.7			11.0	72.3			57.3	57.3
Actuated g/C Ratio	0.20		0.20			0.11	0.72			0.57	0.57
Clearance Time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	349		312			378	2559			2028	1597
v/s Ratio Prot	0.06		c0.17			0.06	c0.40			0.12	
v/s Ratio Perm											0.29
v/c Ratio	0.29		0.87			0.58	0.55			0.21	0.51
Uniform Delay, d1	34.2		38.9			42.3	6.4			10.3	12.9
Progression Factor	1.00		1.00			1.26	0.06			1.00	1.00
Incremental Delay, d2	0.5		21.5			1.4	0.6			0.2	1.2
Delay (s)	34.6		60.4			54.5	1.0			10.6	14.1
Level of Service	C		E			D	A			B	B
Approach Delay (s)		54.4		0.0			8.1			13.2	
Approach LOS		D		A			A			B	

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: North-South Road & Farrington Hwy

Year 2030 PM

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	3433	3539	1583	3433	3539	1583
Volume (vph)	153	983	466	245	771	201	313	324	268	297	444	538
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	1068	507	266	838	218	340	352	291	323	483	585
RTOR Reduction (vph)	0	0	271	0	0	157	0	0	201	0	0	251
Lane Group Flow (vph)	166	1068	236	266	838	61	340	352	90	323	483	334
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	9.9	24.4	24.4	12.5	27.0	27.0	18.0	29.8	29.8	13.3	25.1	25.1
Effective Green, g (s)	9.9	24.4	24.4	12.5	27.0	27.0	18.0	29.8	29.8	13.3	25.1	25.1
Actuated g/C Ratio	0.10	0.25	0.25	0.13	0.28	0.28	0.19	0.31	0.31	0.14	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	354	1292	402	447	1430	445	644	1099	491	476	925	414
v/s Ratio Prot	0.05	c0.21		c0.08	c0.16		c0.10	0.10		c0.09	0.14	
v/s Ratio Perm			0.15			0.04			0.06			c0.21
v/c Ratio	0.47	0.83	0.59	0.60	0.59	0.14	0.53	0.32	0.18	0.68	0.52	0.81
Uniform Delay, d1	40.6	33.8	31.4	39.4	29.7	25.8	35.2	25.3	24.2	39.3	30.3	33.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	4.5	2.2	2.1	0.6	0.1	3.1	0.8	0.8	3.8	2.1	15.4
Delay (s)	41.6	38.3	33.6	41.5	30.3	25.9	38.3	26.1	25.0	43.1	32.4	48.6
Level of Service	D	D	C	D	C	C	D	C	C	D	C	D
Approach Delay (s)		37.2			31.8			30.0			41.7	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM Average Control Delay	35.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	96.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: North-South Road & North UH Connector

Year 2030 PM

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↱	↱	↰↰	↑↑↱		↰↰	↑↱				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	0.97	*0.99			*0.99		*0.99	0.95				
Frt	1.00	1.00			0.98		1.00	0.94				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	3433	5532			5408		3504	3340				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	3433	5532			5408		3504	3340				
Volume (vph)	61	1021	0	0	1315	233	196	279	168	0	0	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	62	1031	0	0	1328	235	198	282	170	0	0	0
RTOR Reduction (vph)	0	0	0	0	19	0	0	98	0	0	0	0
Lane Group Flow (vph)	62	1031	0	0	1544	0	198	354	0	0	0	0
Turn Type	Prot		Perm	Perm			Split					
Protected Phases	5	2			6		4	4				
Permitted Phases			2	6								
Actuated Green, G (s)	5.9	70.0			60.1		15.4	15.4				
Effective Green, g (s)	5.9	70.0			60.1		15.4	15.4				
Actuated g/C Ratio	0.06	0.75			0.64		0.16	0.16				
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0				
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	217	4146			3480		578	551				
v/s Ratio Prot	0.02	c0.19			c0.29		0.06	c0.11				
v/s Ratio Perm												
v/c Ratio	0.29	0.25			0.44		0.34	0.64				
Uniform Delay, d1	41.7	3.6			8.3		34.5	36.4				
Progression Factor	1.00	1.00			1.00		1.00	1.00				
Incremental Delay, d2	0.7	0.1			0.4		0.4	2.6				
Delay (s)	42.5	3.7			8.7		34.9	39.0				
Level of Service	D	A			A		C	D				
Approach Delay (s)		5.9			8.7			37.7			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	93.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: East-West Rd & North-South Road

Year 2030 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰↰	↑↱		↰↰	↑↑↱		↰↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95		0.97	0.95		0.97	0.91		0.97	0.91	
Frt	1.00	0.93		1.00	0.93		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3433	3303		3433	3280		3433	4983		3433	4936	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3433	3303		3433	3280		3433	4983		3433	4936	
Volume (vph)	249	289	232	220	172	164	110	669	104	103	1110	270
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	271	314	252	239	187	178	120	727	113	112	1207	293
RTOR Reduction (vph)	0	150	0	0	149	0	0	19	0	0	34	0
Lane Group Flow (vph)	271	416	0	239	216	0	120	821	0	112	1466	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	12.1	15.3		11.3	14.5		7.0	30.0		16.1	39.1	
Effective Green, g (s)	12.1	15.3		11.3	14.5		7.0	30.0		16.1	39.1	
Actuated g/C Ratio	0.14	0.17		0.13	0.16		0.08	0.34		0.18	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	468	570		437	536		271	1685		623	2176	
v/s Ratio Prot	c0.08	c0.13		0.07	0.07		c0.03	0.16		0.03	c0.30	
v/s Ratio Perm												
v/c Ratio	0.58	0.73		0.55	0.40		0.44	0.49		0.18	0.67	
Uniform Delay, d1	35.9	34.7		36.3	33.2		39.0	23.3		30.7	19.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	4.8		1.4	0.5		1.2	1.0		0.6	1.7	
Delay (s)	37.7	39.5		37.7	33.7		40.1	24.3		31.3	21.4	
Level of Service	D	D		D	C		D	C		C	C	
Approach Delay (s)		38.9			35.3			26.2			22.1	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	88.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: North-South Road & Kapolei Parkway

Year 2030 PM

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	0.96		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	4896		1770	4825		3433	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	4896		1770	4825		3433	5085	1583	1770	5085	1583
Volume (vph)	378	469	155	176	914	472	385	643	505	121	568	29
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	411	510	168	191	993	513	418	699	549	132	617	32
RTOR Reduction (vph)	0	40	0	0	65	0	0	0	340	0	0	27
Lane Group Flow (vph)	411	638	0	191	1441	0	418	699	209	132	617	5
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	34.0	62.2		19.0	47.2		19.0	25.9	25.9	12.3	19.2	19.2
Effective Green, g (s)	34.0	62.2		19.0	47.2		19.0	25.9	25.9	12.3	19.2	19.2
Actuated g/C Ratio	0.25	0.46		0.14	0.35		0.14	0.19	0.19	0.09	0.14	0.14
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	444	2249		248	1682		482	973	303	161	721	224
v/s Ratio Prot	c0.23	0.13		0.11	c0.30		c0.12	0.14		0.07	c0.12	
v/s Ratio Perm									0.13			0.00
v/c Ratio	0.93	0.28		0.77	0.86		0.87	0.72	0.69	0.82	0.86	0.02
Uniform Delay, d1	49.5	22.8		56.1	41.0		57.0	51.3	51.0	60.5	56.7	50.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	25.1	0.3		13.7	5.9		15.1	2.6	6.6	26.7	9.8	0.0
Delay (s)	74.6	23.1		69.8	46.8		72.1	53.9	57.7	87.1	66.5	50.0
Level of Service	E	C		E	D		E	D	E	F	E	D
Approach Delay (s)		42.5			49.4			59.7			69.3	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM Average Control Delay	54.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	135.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑↱		↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		1.00	0.94		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1856	1747		1770	1583
Flt Permitted		0.76	1.00		0.95	1.00
Satd. Flow (perm)		1424	1747		1770	1583
Volume (vph)	20	263	265	225	443	75
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	286	288	245	482	82
RTOR Reduction (vph)	0	0	44	0	0	37
Lane Group Flow (vph)	0	308	489	0	482	45
Turn Type	Perm					Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)		24.3	24.3		38.5	38.5
Effective Green, g (s)		24.3	24.3		38.5	38.5
Actuated g/C Ratio		0.34	0.34		0.54	0.54
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		489	600		963	861
v/s Ratio Prot			c0.28		c0.27	
v/s Ratio Perm		0.22				0.03
v/c Ratio		0.63	0.81		0.50	0.05
Uniform Delay, d1		19.5	21.2		10.1	7.6
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		2.5	8.4		1.9	0.1
Delay (s)		22.0	29.6		12.0	7.7
Level of Service		C	C		B	A
Approach Delay (s)		22.0	29.6		11.4	
Approach LOS		C	C		B	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	70.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX A-3
YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR SCENARIO

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00	0.95	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	3539	1583		5085
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	3539	1583		5085
Volume (vph)	718	37	1770	492	0	1301
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	725	37	1788	497	0	1314
RTOR Reduction (vph)	0	15	0	174	0	0
Lane Group Flow (vph)	725	22	1788	323	0	1314
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	25.1	25.1	61.2	61.2		61.2
Effective Green, g (s)	25.1	25.1	61.2	61.2		61.2
Actuated g/C Ratio	0.27	0.27	0.65	0.65		0.65
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	914	421	2297	1027		3300
v/s Ratio Prot	c0.21		c0.51			0.26
v/s Ratio Perm		0.01		0.20		
v/c Ratio	0.79	0.05	0.78	0.31		0.40
Uniform Delay, d1	32.2	25.8	11.7	7.3		7.8
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	4.8	0.1	2.7	0.8		0.4
Delay (s)	37.0	25.8	14.4	8.1		8.2
Level of Service	D	C	B	A		A
Approach Delay (s)	36.4		13.0			8.2
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	94.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	0.91			0.91	
Frt						0.86	1.00	1.00			0.98	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5085			4960	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5085			4960	
Volume (vph)	0	0	0	0	0	530	163	1731	0	0	1685	331
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	576	177	1882	0	0	1832	360
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	15	0
Lane Group Flow (vph)	0	0	0	0	0	576	177	1882	0	0	2177	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						110.0	15.0	110.0			87.0	
Effective Green, g (s)						110.0	15.0	110.0			87.0	
Actuated g/C Ratio						1.00	0.14	1.00			0.79	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	241	5085			3923	
v/s Ratio Prot							c0.10	0.37			c0.44	
v/s Ratio Perm						0.36						
v/c Ratio						0.36	0.73	0.37			0.55	
Uniform Delay, d1						0.0	45.6	0.0			4.3	
Progression Factor						1.00	1.06	1.00			1.00	
Incremental Delay, d2						0.6	9.7	0.2			0.6	
Delay (s)						0.6	58.3	0.2			4.9	
Level of Service						A	E	A			A	
Approach Delay (s)		0.0			0.6			5.2			4.9	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	4.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: H-1 EB & Kunia Road

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↑↑↑↑			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.86			0.91
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3433	1583	6408			5085
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3433	1583	6408			5085
Volume (vph)	402	358	2072	0	0	1541
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	437	389	2252	0	0	1675
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	437	389	2252	0	0	1675
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	17.3	110.0	84.7			84.7
Effective Green, g (s)	17.3	110.0	84.7			84.7
Actuated g/C Ratio	0.16	1.00	0.77			0.77
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	540	1583	4934			3915
v/s Ratio Prot	c0.13		c0.35			0.33
v/s Ratio Perm		0.25				
v/c Ratio	0.81	0.25	0.46			0.43
Uniform Delay, d1	44.8	0.0	4.5			4.3
Progression Factor	1.00	1.00	0.80			1.00
Incremental Delay, d2	8.7	0.4	0.3			0.3
Delay (s)	53.5	0.4	3.9			4.7
Level of Service	D	A	A			A
Approach Delay (s)	28.5		3.9			4.7
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.91		0.97	0.91				1.00			1.00
Frt		0.98		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		5001		3433	5085				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		5001		3433	5085				1611			1611
Volume (vph)	0	1885	235	496	705	0	0	0	429	0	0	350
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2049	255	539	766	0	0	0	466	0	0	380
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2294	0	539	766	0	0	0	466	0	0	380
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		79.7		22.3	110.0				110.0			110.0
Effective Green, g (s)		79.7		22.3	110.0				110.0			110.0
Actuated g/C Ratio		0.72		0.20	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		3623		696	5085				1611			1611
v/s Ratio Prot		c0.46		c0.16	0.15							
v/s Ratio Perm									0.29			0.24
v/c Ratio		0.63		0.77	0.15				0.29			0.24
Uniform Delay, d1		7.7		41.5	0.0				0.0			0.0
Progression Factor		0.51		1.44	1.00				1.00			1.00
Incremental Delay, d2		0.6		1.8	0.0				0.5			0.3
Delay (s)		4.6		61.4	0.0				0.5			0.3
Level of Service		A		E	A				A			A
Approach Delay (s)		4.6			25.4			0.5			0.3	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑			↑↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	*0.99			*0.99				1.00			
Frt	1.00	1.00			0.95				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	5532			5266				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	5532			5266				1611			
Volume (vph)	928	1386	0	0	1200	567	0	0	904	0	0	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	937	1400	0	0	1212	573	0	0	913	0	0	0
RTOR Reduction (vph)	0	0	0	0	78	0	0	0	0	0	0	0
Lane Group Flow (vph)	937	1400	0	0	1707	0	0	0	913	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	67.0	110.0			35.0				110.0			
Effective Green, g (s)	67.0	110.0			35.0				110.0			
Actuated g/C Ratio	0.61	1.00			0.32				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	1078	5532			1676				1611			
v/s Ratio Prot	c0.53	0.25			c0.32							
v/s Ratio Perm									0.57			
v/c Ratio	0.87	0.25			1.02				0.57			
Uniform Delay, d1	17.9	0.0			37.5				0.0			
Progression Factor	0.33	1.00			1.00				1.00			
Incremental Delay, d2	6.4	0.1			26.8				1.5			
Delay (s)	12.2	0.1			64.3				1.5			
Level of Service	B	A			E				A			
Approach Delay (s)		5.0			64.3			1.5			0.0	
Approach LOS		A			E			A			A	

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰↑	↱		↰↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00		1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	3433	5085	1583	1770	5085	1583		1780	1583		3424	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (perm)	3433	5085	1583	1770	5085	1583		1780	1583		3424	1583
Volume (vph)	144	1990	155	119	1601	156	56	5	48	92	45	113
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	157	2163	168	129	1740	170	61	5	52	100	49	123
RTOR Reduction (vph)	0	0	83	0	0	89	0	0	49	0	0	109
Lane Group Flow (vph)	157	2163	85	129	1740	81	0	66	3	0	149	14
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.4	36.5	36.5	7.0	34.1	34.1		4.0	4.0		8.4	8.4
Effective Green, g (s)	9.4	36.5	36.5	7.0	34.1	34.1		4.0	4.0		8.4	8.4
Actuated g/C Ratio	0.13	0.51	0.51	0.10	0.47	0.47		0.06	0.06		0.12	0.12
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	449	2581	804	172	2412	751		99	88		400	185
v/s Ratio Prot	0.05	c0.43		c0.07	0.34			c0.04			c0.04	
v/s Ratio Perm			0.05			0.05			0.00			0.01
v/c Ratio	0.35	0.84	0.11	0.75	0.72	0.11		0.67	0.03		0.37	0.08
Uniform Delay, d1	28.5	15.2	9.2	31.6	15.1	10.5		33.3	32.1		29.3	28.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	2.5	0.1	16.7	1.1	0.1		30.3	0.7		0.6	0.2
Delay (s)	28.9	17.7	9.3	48.3	16.2	10.5		63.6	32.8		29.9	28.5
Level of Service	C	B	A	D	B	B		E	C		C	C
Approach Delay (s)		17.8			17.8			50.0			29.3	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	71.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Laulaunui Street & Fort Weaver Road

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		*0.99		1.00	1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	96	24	12	71	4	234	48	3857	52	91	1306	170
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	97	24	12	72	4	236	48	3896	53	92	1319	172
RTOR Reduction (vph)	0	6	0	0	0	102	0	0	10	0	0	52
Lane Group Flow (vph)	0	127	0	72	4	134	48	3896	43	92	1319	120
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		10.6		10.0	10.0	10.0	7.4	101.0	101.0	7.9	101.5	101.5
Effective Green, g (s)		10.6		10.0	10.0	10.0	7.4	101.0	101.0	7.9	101.5	101.5
Actuated g/C Ratio		0.07		0.07	0.07	0.07	0.05	0.69	0.69	0.05	0.70	0.70
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		256		122	128	109	90	3840	1099	96	3859	1104
v/s Ratio Prot		c0.04		0.04	0.00		0.03	c0.70		c0.05	0.24	
v/s Ratio Perm						c0.08			0.03			0.08
v/c Ratio		0.50		0.59	0.03	1.23	0.53	1.01	0.04	0.96	0.34	0.11
Uniform Delay, d1		64.9		65.8	63.2	67.8	67.4	22.2	7.0	68.6	8.7	7.2
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.5		7.4	0.1	161.9	6.0	18.3	0.1	77.4	0.2	0.2
Delay (s)		66.4		73.2	63.3	229.6	73.3	40.5	7.1	146.0	9.0	7.4
Level of Service		E		E	E	F	E	D	A	F	A	A
Approach Delay (s)		66.4			191.4			40.5			16.8	
Approach LOS		E			F			D			B	

Intersection Summary			
HCM Average Control Delay	42.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	145.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	104.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Old Fort Weaver Rd & Fort Weaver Road

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1782	1583		1862	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.43	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		803	1583		1846	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	701	73	393	4	344	230	283	3028	1	20	925	444
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	708	74	397	4	347	232	286	3059	1	20	934	448
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	0	0	0	286
Lane Group Flow (vph)	0	782	397	0	351	195	286	3059	1	20	934	162
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		75.0	149.2		75.0	75.0	27.1	59.8	149.2	2.4	35.1	35.1
Effective Green, g (s)		75.0	149.2		75.0	75.0	27.1	59.8	149.2	2.4	35.1	35.1
Actuated g/C Ratio		0.50	1.00		0.50	0.50	0.18	0.40	1.00	0.02	0.24	0.24
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		404	1583		928	796	321	2217	1583	28	1301	372
v/s Ratio Prot							c0.16	c0.55		0.01	0.17	
v/s Ratio Perm		c0.97	0.25		0.19	0.12			0.00			0.10
v/c Ratio		1.94	0.25		0.38	0.25	0.89	1.38	0.00	0.71	0.72	0.44
Uniform Delay, d1		37.1	0.0		22.8	21.0	59.6	44.7	0.0	73.1	52.5	48.6
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		430.1	0.4		0.3	0.2	25.0	173.8	0.0	60.5	3.4	3.7
Delay (s)		467.2	0.4		23.0	21.2	84.6	218.5	0.0	133.6	55.9	52.3
Level of Service		F	A		C	C	F	F	A	F	E	D
Approach Delay (s)		310.0			22.3			207.0			55.9	
Approach LOS		F			C			F			E	

Intersection Summary			
HCM Average Control Delay	176.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.69		
Actuated Cycle Length (s)	149.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	136.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

9: Renton Road & Fort Weaver Road

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑	↱		✣		↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00		1.00		1.00	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1766	1583		1766		1770	5532	1583	1770	5532	1583
Flt Permitted	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1766	1583		1766		1770	5532	1583	1770	5532	1583
Volume (vph)	467	31	36	10	339	213	89	2631	1	248	1028	49
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	472	31	36	10	342	215	90	2658	1	251	1038	49
RTOR Reduction (vph)	0	0	0	0	15	0	0	0	0	0	0	27
Lane Group Flow (vph)	245	258	36	0	552	0	90	2658	1	251	1038	22
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	20.0	20.0	150.0		33.0		12.3	65.0	65.0	16.0	68.7	68.7
Effective Green, g (s)	20.0	20.0	150.0		33.0		12.3	65.0	65.0	16.0	68.7	68.7
Actuated g/C Ratio	0.13	0.13	1.00		0.22		0.08	0.43	0.43	0.11	0.46	0.46
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	234	235	1583		389		145	2397	686	189	2534	725
v/s Ratio Prot	0.14	c0.15			c0.31		0.05	c0.48		c0.14	c0.19	
v/s Ratio Perm			0.02						0.00			0.01
v/c Ratio	1.05	1.10	0.02		1.42		0.62	1.11	0.00	1.33	0.41	0.03
Uniform Delay, d1	65.0	65.0	0.0		58.5		66.6	42.5	24.1	67.0	27.1	22.3
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	71.7	87.4	0.0		203.3		8.0	55.7	0.0	179.4	0.5	0.1
Delay (s)	136.7	152.4	0.0		261.8		74.6	98.2	24.1	246.4	27.6	22.4
Level of Service	F	F	A		F		E	F	C	F	C	C
Approach Delay (s)		135.1			261.8			97.4			68.5	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	111.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	123.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

10: Farrington Hwy & D Street

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑		↰↰	↑↑↑↱			↑↱	↱	↰	✣	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.91		0.97	0.91			0.95	0.95	0.95	0.95	
Frt	1.00	1.00		1.00	0.98			0.86	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5085		3433	4982			1528	1504	1681	1607	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5085		3433	4982			1528	1504	1681	1607	
Volume (vph)	130	1588	0	270	679	106	0	17	347	178	191	304
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	131	1604	0	273	686	107	0	17	351	180	193	307
RTOR Reduction (vph)	0	0	0	0	16	0	0	161	162	0	52	0
Lane Group Flow (vph)	131	1604	0	273	777	0	0	31	14	180	448	0
Turn Type	Prot			Prot					Perm	Split		
Protected Phases	5	2		1	6			8		4	4	
Permitted Phases									8			
Actuated Green, G (s)	12.9	45.0		9.0	41.1			8.5	8.5	31.5	31.5	
Effective Green, g (s)	12.9	45.0		9.0	41.1			8.5	8.5	31.5	31.5	
Actuated g/C Ratio	0.12	0.41		0.08	0.37			0.08	0.08	0.29	0.29	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	208	2080		281	1861			118	116	481	460	
v/s Ratio Prot	0.07	c0.32		c0.08	0.16			c0.02		0.11	c0.28	
v/s Ratio Perm									0.01			
v/c Ratio	0.63	0.77		0.97	0.42			0.26	0.12	0.37	0.97	
Uniform Delay, d1	46.3	28.1		50.4	25.6			47.8	47.3	31.4	38.8	
Progression Factor	0.99	0.50		0.55	0.33			1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.9	2.4		45.4	0.7			1.2	0.5	0.5	34.9	
Delay (s)	50.8	16.5		73.3	9.1			49.0	47.7	31.9	73.8	
Level of Service	D	B		E	A			D	D	C	E	
Approach Delay (s)		19.1			25.5			48.4			62.7	
Approach LOS		B			C			D			E	

Intersection Summary			
HCM Average Control Delay	31.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Farrington Hwy & E Street

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱			↑↑↱			✣		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91			0.91			1.00		1.00	1.00	
Frt	1.00	1.00			1.00			1.00		1.00	0.92	
Flt Protected	0.95	1.00			1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1770	5061			5065			1792		1770	1720	
Flt Permitted	0.95	1.00			1.00			0.96		0.95	1.00	
Satd. Flow (perm)	1770	5061			5065			1792		1770	1720	
Volume (vph)	49	1600	52	0	957	26	202	68	5	113	47	49
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	49	1616	53	0	967	26	204	69	5	114	47	49
RTOR Reduction (vph)	0	2	0	0	2	0	0	1	0	0	36	0
Lane Group Flow (vph)	49	1667	0	0	991	0	0	277	0	114	60	0
Turn Type	Prot						Split			Split		
Protected Phases	5	2			6		8	8		4	4	
Permitted Phases												
Actuated Green, G (s)	7.2	64.3			53.1			21.5		12.2	12.2	
Effective Green, g (s)	7.2	64.3			53.1			21.5		12.2	12.2	
Actuated g/C Ratio	0.07	0.58			0.48			0.20		0.11	0.11	
Clearance Time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	116	2958			2445			350		196	191	
v/s Ratio Prot	0.03	c0.33			0.20			c0.15		c0.06	0.04	
v/s Ratio Perm												
v/c Ratio	0.42	0.56			0.41			0.79		0.58	0.32	
Uniform Delay, d1	49.4	14.2			18.3			42.1		46.5	45.1	
Progression Factor	0.72	0.65			0.62			1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.6			0.4			11.6		4.3	1.0	
Delay (s)	37.7	9.8			11.8			53.7		50.8	46.0	
Level of Service	D	A			B			D		D	D	
Approach Delay (s)		10.6			11.8			53.7			48.6	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
12: Fort Barrette Road & Farrington Hwy

2030 + PRO (with Transit Corridor) - AM Peak

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↱	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3250	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3250	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	377	707	798	572	578	159	338	438	485	78	739	704
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	381	714	806	578	584	161	341	442	490	79	746	711
RTOR Reduction (vph)	0	17	131	0	0	94	0	0	253	0	0	254
Lane Group Flow (vph)	381	970	402	578	584	67	341	442	237	79	746	457
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	26.7	66.7	66.7	35.9	75.9	75.9	21.4	68.4	68.4	13.6	60.6	60.6
Effective Green, g (s)	26.7	66.7	66.7	35.9	75.9	75.9	21.4	68.4	68.4	13.6	60.6	60.6
Actuated g/C Ratio	0.13	0.33	0.33	0.18	0.38	0.38	0.11	0.34	0.34	0.07	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	457	1081	479	614	1339	599	366	1207	540	120	1069	478
v/s Ratio Prot	0.11	c0.30		c0.17	0.17		c0.10	0.12		0.04	0.21	
v/s Ratio Perm			0.28			0.04			0.15			c0.29
v/c Ratio	0.83	0.90	0.84	0.94	0.44	0.11	0.93	0.37	0.44	0.66	0.70	0.96
Uniform Delay, d1	84.8	63.7	62.0	81.3	46.4	40.5	88.9	49.8	51.2	91.2	61.9	68.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.3	9.9	12.2	22.8	1.0	0.4	30.1	0.2	0.6	12.3	2.0	30.0
Delay (s)	97.1	73.5	74.2	104.1	47.5	40.8	119.0	50.0	51.8	103.5	63.9	98.6
Level of Service	F	E	E	F	D	D	F	D	D	F	E	F
Approach Delay (s)		78.5			71.4			69.2			82.0	
Approach LOS		E			E			E			F	

Intersection Summary			
HCM Average Control Delay	75.9	HCM Level of Service	E
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	200.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
13: WB Ramps & North-South Road

2030 + PRO (with Transit Corridor) - AM Peak

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰		↱				↑↑	↱	↰↰	↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Lane Util. Factor	*0.99		1.00				*0.99	1.00	0.97	*0.99	
Frt	1.00		0.85				1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3504		1583				3688	1583	3433	3688	
Flt Permitted	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3504		1583				3688	1583	3433	3688	
Volume (vph)	1338	0	115	0	0	0	1099	248	518	222	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1352	0	116	0	0	0	1110	251	523	224	0
RTOR Reduction (vph)	0	0	71	0	0	0	0	168	0	0	0
Lane Group Flow (vph)	1352	0	45	0	0	0	1110	83	523	224	0
Turn Type	Prot		custom					Perm	Prot		
Protected Phases	8		8				6		5	2	
Permitted Phases								6			
Actuated Green, G (s)	39.0		39.0				33.0	33.0	16.0	53.0	
Effective Green, g (s)	39.0		39.0				33.0	33.0	16.0	53.0	
Actuated g/C Ratio	0.39		0.39				0.33	0.33	0.16	0.53	
Clearance Time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0				3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1367		617				1217	522	549	1955	
v/s Ratio Prot	c0.39		0.03				c0.30		c0.15	0.06	
v/s Ratio Perm								0.05			
v/c Ratio	0.99		0.07				0.91	0.16	0.95	0.11	
Uniform Delay, d1	30.3		19.2				32.1	23.7	41.6	11.8	
Progression Factor	1.00		1.00				1.00	1.00	0.62	0.04	
Incremental Delay, d2	21.5		0.1				11.8	0.6	22.9	0.1	
Delay (s)	51.8		19.2				43.9	24.3	48.9	0.6	
Level of Service	D		B				D	C	D	A	
Approach Delay (s)		49.2		0.0			40.3			34.4	
Approach LOS		D		A			D			C	

Intersection Summary			
HCM Average Control Delay	42.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: EB Ramps & North-South Road

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL2	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰		↱			↰↰	↑↑			↑↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00			0.97	*0.99			*0.99	*0.99
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583			3433	3688			3688	3135
Flt Permitted	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (perm)	1770		1583			3433	3688			3688	3135
Volume (vph)	51	0	633	0	0	802	1634	0	0	689	2305
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	52	0	639	0	0	810	1651	0	0	696	2328
RTOR Reduction (vph)	0	0	23	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	52	0	616	0	0	810	1651	0	0	696	2328
Turn Type	Prot		custom			Prot					Free
Protected Phases	4		4			1	6			2	
Permitted Phases											Free
Actuated Green, G (s)	29.0		29.0			30.4	63.0			28.6	100.0
Effective Green, g (s)	29.0		29.0			30.4	63.0			28.6	100.0
Actuated g/C Ratio	0.29		0.29			0.30	0.63			0.29	1.00
Clearance Time (s)	4.0		4.0			4.0	4.0			4.0	
Vehicle Extension (s)	3.0		3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	513		459			1044	2323			1055	3135
v/s Ratio Prot	0.03		c0.39			0.24	0.45			0.19	
v/s Ratio Perm											c0.74
v/c Ratio	0.10		1.34			0.78	0.71			0.66	0.74
Uniform Delay, d1	26.0		35.5			31.7	12.4			31.4	0.0
Progression Factor	1.00		1.00			1.15	0.90			1.00	1.00
Incremental Delay, d2	0.1		168.3			1.2	0.6			3.2	1.6
Delay (s)	26.1		203.8			37.7	11.7			34.7	1.6
Level of Service	C		F			D	B			C	A
Approach Delay (s)		190.4		0.0			20.3			9.2	
Approach LOS		F		A			C			A	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: North-South Road & Farrington Hwy

2030 + PRO (with Transit Corridor) - AM Peak

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	5532	1583	3504	5532	1583	3504	3688	1583	3504	3688	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	5532	1583	3504	5532	1583	3504	3688	1583	3504	3688	1583
Volume (vph)	514	1147	563	459	1739	344	542	393	224	172	483	713
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	519	1159	569	464	1757	347	547	397	226	174	488	720
RTOR Reduction (vph)	0	0	224	0	0	154	0	0	150	0	0	227
Lane Group Flow (vph)	519	1159	345	464	1757	193	547	397	76	174	488	493
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	25.3	47.1	47.1	23.2	45.0	45.0	26.0	49.9	49.9	12.2	36.1	36.1
Effective Green, g (s)	25.3	47.1	47.1	23.2	45.0	45.0	26.0	49.9	49.9	12.2	36.1	36.1
Actuated g/C Ratio	0.17	0.32	0.32	0.16	0.30	0.30	0.18	0.34	0.34	0.08	0.24	0.24
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	597	1756	502	548	1677	480	614	1240	532	288	897	385
v/s Ratio Prot	c0.15	0.21		0.13	c0.32		c0.16	0.11		0.05	0.13	
v/s Ratio Perm			0.22			0.12			0.05			c0.31
v/c Ratio	0.87	0.66	0.69	0.85	1.05	0.40	0.89	0.32	0.14	0.60	0.54	1.28
Uniform Delay, d1	59.9	43.7	44.2	60.9	51.7	41.0	59.8	36.6	34.3	65.8	49.0	56.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.8	0.9	3.9	11.6	35.7	0.6	17.6	0.7	0.6	3.6	2.4	144.8
Delay (s)	72.7	44.7	48.1	72.4	87.4	41.6	77.4	37.3	34.9	69.3	51.3	201.0
Level of Service	E	D	D	E	F	D	E	D	C	E	D	F
Approach Delay (s)		52.0			78.5			55.6			131.6	
Approach LOS		D			E			E			F	

Intersection Summary			
HCM Average Control Delay	76.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	148.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	103.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: North-South Road & North UH Connector

2030 + PRO (with Transit Corridor) - AM Peak

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑↱	↱	↰↰	↑↑↑↱		↰↰	↑↱		↰↰	↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	0.97	0.91		0.97	0.95		0.97	1.00	0.88
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	4806	1362	3433	4987		3433	3461		3433	1863	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	4806	1362	3433	4987		3433	3461		3433	1863	2787
Volume (vph)	51	2024	224	471	934	138	217	161	28	353	103	300
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	52	2044	226	476	943	139	219	163	28	357	104	303
RTOR Reduction (vph)	0	0	105	0	14	0	0	15	0	0	0	70
Lane Group Flow (vph)	52	2044	121	476	1068	0	219	176	0	357	104	233
Turn Type	Prot		Perm	Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		7	4		3	8	1
Permitted Phases			2									8
Actuated Green, G (s)	4.4	39.8	39.8	14.0	49.4		14.0	11.2		13.1	10.3	24.3
Effective Green, g (s)	4.4	39.8	39.8	14.0	49.4		14.0	11.2		13.1	10.3	24.3
Actuated g/C Ratio	0.05	0.42	0.42	0.15	0.52		0.15	0.12		0.14	0.11	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	161	2033	576	511	2618		511	412		478	204	838
v/s Ratio Prot	0.02	c0.43		c0.14	0.21		0.06	0.05		c0.10	c0.06	0.04
v/s Ratio Perm			0.09									0.04
v/c Ratio	0.32	1.01	0.21	0.93	0.41		0.43	0.43		0.75	0.51	0.28
Uniform Delay, d1	43.4	27.2	17.2	39.6	13.5		36.4	38.5		38.9	39.5	27.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.2	21.3	0.8	23.9	0.5		0.6	0.7		6.3	2.0	0.2
Delay (s)	44.6	48.4	18.0	63.5	14.0		37.0	39.2		45.2	41.5	28.1
Level of Service	D	D	B	E	B		D	D		D	D	C
Approach Delay (s)		45.4			29.1			38.0			37.9	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: East-West Rd. & North-South Road

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰↰	↑↱		↰↰	↑↑↱		↰↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95		0.97	0.95		0.97	0.91		0.97	0.91	
Frt	1.00	0.95		1.00	0.87		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3433	3362		3433	3066		3433	4990		3433	4969	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3433	3362		3433	3066		3433	4990		3433	4969	
Volume (vph)	243	224	112	239	75	614	207	1442	206	189	954	172
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	245	226	113	241	76	620	209	1457	208	191	964	174
RTOR Reduction (vph)	0	54	0	0	206	0	0	17	0	0	21	0
Lane Group Flow (vph)	245	285	0	241	490	0	209	1648	0	191	1117	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	12.4	20.5		12.2	20.3		11.2	37.2		16.1	42.1	
Effective Green, g (s)	12.4	20.5		12.2	20.3		11.2	37.2		16.1	42.1	
Actuated g/C Ratio	0.12	0.20		0.12	0.20		0.11	0.36		0.16	0.41	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	417	676		411	610		377	1820		542	2051	
v/s Ratio Prot	c0.07	0.08		0.07	c0.16		c0.06	c0.33		0.06	c0.22	
v/s Ratio Perm												
v/c Ratio	0.59	0.42		0.59	1.19dr		0.55	0.91		0.35	0.54	
Uniform Delay, d1	42.4	35.6		42.5	38.9		43.0	30.7		38.3	22.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	0.4		2.1	7.6		1.8	8.0		1.8	1.0	
Delay (s)	44.5	36.0		44.6	46.5		44.8	38.7		40.1	23.7	
Level of Service	D	D		D	D		D	D		D	C	
Approach Delay (s)		39.6			46.0			39.4			26.1	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	37.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	102.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: North-South Road & Kapolei Parkway

2030 + PRO (with Transit Corridor) - AM Peak

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.99		1.00	*0.99		*0.99	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	0.98		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5440		1770	5082		3504	5532	1583	1770	5532	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5440		1770	5082		3504	5532	1583	1770	5532	1583
Volume (vph)	245	517	64	222	496	588	855	315	316	118	637	483
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	247	522	65	224	501	594	864	318	319	119	643	488
RTOR Reduction (vph)	0	17	0	0	211	0	0	0	195	0	0	249
Lane Group Flow (vph)	247	570	0	224	884	0	864	318	124	119	643	239
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	15.2	17.8		14.6	17.2		26.4	36.7	36.7	9.4	19.7	19.7
Effective Green, g (s)	15.2	17.8		14.6	17.2		26.4	36.7	36.7	9.4	19.7	19.7
Actuated g/C Ratio	0.16	0.19		0.15	0.18		0.28	0.39	0.39	0.10	0.21	0.21
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	285	1025		273	925		979	2148	615	176	1153	330
v/s Ratio Prot	c0.14	0.10		0.13	c0.17		c0.25	0.06		0.07	0.12	
v/s Ratio Perm									0.08			c0.15
v/c Ratio	0.87	0.56		0.82	1.19dr		0.88	0.15	0.20	0.68	0.56	0.73
Uniform Delay, d1	38.7	34.8		38.7	38.3		32.6	18.8	19.2	41.1	33.5	34.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.0	2.2		17.6	20.6		9.5	0.0	0.2	9.8	0.6	7.7
Delay (s)	61.7	36.9		56.3	58.9		42.0	18.8	19.3	50.9	34.1	42.6
Level of Service	E	D		E	E		D	B	B	D	C	D
Approach Delay (s)		44.3			58.5			32.3			39.0	
Approach LOS		D			E			C			D	

Intersection Summary			
HCM Average Control Delay	43.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	94.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: East-West Rd. & Old Fort Weaver Rd

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1583	3433	1583
Flt Permitted	0.58	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1080	1863	3539	1583	3433	1583
Volume (vph)	21	765	277	795	402	45
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	21	773	280	803	406	45
RTOR Reduction (vph)	0	0	0	407	0	28
Lane Group Flow (vph)	21	773	280	396	406	17
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	29.8	29.8	29.8	29.8	22.7	22.7
Effective Green, g (s)	29.8	29.8	29.8	29.8	22.7	22.7
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	532	918	1743	780	1288	594
v/s Ratio Prot		c0.41	0.08		c0.12	
v/s Ratio Perm	0.02			0.25		0.01
v/c Ratio	0.04	0.84	0.16	0.51	0.32	0.03
Uniform Delay, d1	7.9	13.3	8.5	10.4	13.4	11.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	7.1	0.0	0.5	0.6	0.1
Delay (s)	8.0	20.4	8.5	10.9	14.0	12.0
Level of Service	A	C	A	B	B	B
Approach Delay (s)		20.1	10.3		13.8	
Approach LOS		C	B		B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: Farrington Hwy & B Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑	↱	↰↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	1863	1583	3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	1863	1583	3433	1863	1583
Volume (vph)	206	1094	186	119	866	83	47	137	121	331	223	198
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	224	1189	202	129	941	90	51	149	132	360	242	215
RTOR Reduction (vph)	0	0	94	0	0	58	0	0	14	0	0	63
Lane Group Flow (vph)	224	1189	108	129	941	32	51	149	118	360	242	152
Turn Type	Prot		pm+ov	Prot		Perm	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2	3	1	6		7	4	5	3	8	1
Permitted Phases			2			6			4			8
Actuated Green, G (s)	11.2	35.9	49.1	8.4	33.1	33.1	4.4	18.2	29.4	13.2	27.0	35.4
Effective Green, g (s)	11.2	35.9	49.1	8.4	33.1	33.1	4.4	18.2	29.4	13.2	27.0	35.4
Actuated g/C Ratio	0.12	0.39	0.54	0.09	0.36	0.36	0.05	0.20	0.32	0.14	0.29	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	419	1385	917	314	1277	571	85	370	577	494	549	680
v/s Ratio Prot	c0.07	c0.34	0.02	0.04	0.27		0.03	0.08	0.02	c0.10	c0.13	0.02
v/s Ratio Perm			0.05			0.02			0.05			0.08
v/c Ratio	0.53	0.86	0.12	0.41	0.74	0.06	0.60	0.40	0.20	0.73	0.44	0.22
Uniform Delay, d1	37.8	25.6	10.6	39.3	25.5	19.1	42.8	32.0	22.6	37.5	26.2	18.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	5.5	0.1	0.9	2.3	0.0	11.4	3.2	0.2	5.3	2.6	0.2
Delay (s)	39.1	31.1	10.6	40.2	27.8	19.2	54.1	35.3	22.8	42.9	28.8	19.1
Level of Service	D	C	B	D	C	B	D	D	C	D	C	B
Approach Delay (s)		29.6			28.5			33.2			32.4	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	91.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: East-West Rd. & A Street

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.85		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1842		1770	1863	1583	1770	1591		1770	1630	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1842		1770	1863	1583	1770	1591		1770	1630	
Volume (vph)	86	324	26	31	625	27	26	4	135	43	7	37
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	93	352	28	34	679	29	28	4	147	47	8	40
RTOR Reduction (vph)	0	2	0	0	0	14	0	132	0	0	36	0
Lane Group Flow (vph)	93	378	0	34	679	15	28	19	0	47	12	0
Turn Type	Prot			Prot		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases						6						
Actuated Green, G (s)	7.3	39.6		2.1	34.4	34.4	7.5	7.5		7.6	7.6	
Effective Green, g (s)	7.3	39.6		2.1	34.4	34.4	7.5	7.5		7.6	7.6	
Actuated g/C Ratio	0.10	0.54		0.03	0.47	0.47	0.10	0.10		0.10	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	177	1002		51	880	748	182	164		185	170	
v/s Ratio Prot	c0.05	0.21		0.02	c0.36		c0.02	0.01		c0.03	0.01	
v/s Ratio Perm						0.01						
v/c Ratio	0.53	0.38		0.67	0.77	0.02	0.15	0.12		0.25	0.07	
Uniform Delay, d1	31.1	9.5		35.0	15.9	10.2	29.8	29.6		30.0	29.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	0.2		28.3	4.2	0.0	0.4	0.3		0.7	0.2	
Delay (s)	33.9	9.8		63.3	20.2	10.2	30.2	30.0		30.7	29.6	
Level of Service	C	A		E	C	B	C	C		C	C	
Approach Delay (s)		14.5			21.8			30.0			30.2	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	72.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Farrington Hwy & 2nd Avenue

2030 + PRO (with Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.95	1.00	1.00	0.95	0.88	0.97	0.95	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5043		3433	3539	1583	1770	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5043		3433	3539	1583	1770	3539	2787	3433	3539	1583
Volume (vph)	166	1029	61	223	746	239	95	391	446	225	259	133
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	180	1118	66	242	811	260	103	425	485	245	282	145
RTOR Reduction (vph)	0	6	0	0	0	188	0	0	20	0	0	96
Lane Group Flow (vph)	180	1178	0	242	811	72	103	425	465	245	282	49
Turn Type	Prot			Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases						6			8			4
Actuated Green, G (s)	15.7	34.0		12.0	30.3	30.3	10.5	36.0	48.0	12.0	37.5	37.5
Effective Green, g (s)	15.7	34.0		12.0	30.3	30.3	10.5	36.0	48.0	12.0	37.5	37.5
Actuated g/C Ratio	0.14	0.31		0.11	0.28	0.28	0.10	0.33	0.44	0.11	0.34	0.34
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	253	1559		375	975	436	169	1158	1317	375	1206	540
v/s Ratio Prot	0.10	c0.23		0.07	c0.23		c0.06	c0.12	0.04	c0.07	0.08	
v/s Ratio Perm						0.05			0.13			0.03
v/c Ratio	0.71	0.76		0.65	0.83	0.16	0.61	0.37	0.35	0.65	0.23	0.09
Uniform Delay, d1	45.0	34.3		47.0	37.5	30.2	47.8	28.3	20.7	47.0	26.0	24.7
Progression Factor	1.00	1.00		0.72	0.65	0.35	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.1	3.5		3.5	7.6	0.7	6.1	0.9	0.2	4.1	0.5	0.3
Delay (s)	54.1	37.7		37.2	32.0	11.3	53.9	29.2	20.8	51.1	26.4	25.0
Level of Service	D	D		D	C	B	D	C	C	D	C	C
Approach Delay (s)		39.9			28.9			27.7			35.1	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations			↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	1679	234	0	4777
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1825	254	0	5192
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			870			
pX, platoon unblocked						
vC, conflicting volume	3250	583			2079	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3250	583			2079	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	7	455			263	

Direction, Lane #	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	521	521	521	515	1298	1298	1298	1298
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	254	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.31	0.31	0.31	0.30	0.76	0.76	0.76	0.76
Queue Length 95th (ft)	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS								
Approach Delay (s)	0.0				0.0			
Approach LOS								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations		↱	↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	7	1593	86	0	4777
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	1732	93	0	5192
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1234			
pX, platoon unblocked						
vC, conflicting volume	3076	480			1825	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3076	480			1825	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	9	532			331	

Direction, Lane #	EB 1	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	8	495	495	495	341	1298	1298	1298	1298
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	8	0	0	0	93	0	0	0	0
cSH	532	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.29	0.29	0.29	0.20	0.76	0.76	0.76	0.76
Queue Length 95th (ft)	1	0	0	0	0	0	0	0	0
Control Delay (s)	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B								
Approach Delay (s)	11.9	0.0				0.0			
Approach LOS	B								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
25: East-West Rd. & B Street

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations	↰	↑	↑	↱	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Volume (vph)	153	234	314	85	643	369
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	254	341	92	699	401
RTOR Reduction (vph)	0	0	0	68	0	179
Lane Group Flow (vph)	166	254	341	24	699	222
Turn Type	Prot			Prot		Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases						
Actuated Green, G (s)	9.5	30.4	16.9	16.9	27.6	27.6
Effective Green, g (s)	9.5	30.4	16.9	16.9	27.6	27.6
Actuated g/C Ratio	0.14	0.46	0.26	0.26	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	255	858	477	405	740	662
v/s Ratio Prot	c0.09	0.14	c0.18	0.01	c0.40	0.14
v/s Ratio Perm						
v/c Ratio	0.65	0.30	0.71	0.06	0.94	0.34
Uniform Delay, d1	26.7	11.1	22.4	18.5	18.5	13.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.8	0.2	5.0	0.1	22.0	1.4
Delay (s)	32.5	11.3	27.4	18.6	40.5	14.4
Level of Service	C	B	C	B	D	B
Approach Delay (s)		19.7	25.5		31.0	
Approach LOS		B	C		C	

Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	66.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
26: Farrington Hwy &

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	*0.99	*0.99	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3688	3688	1583
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	466	3688	3688	1583
Volume (vph)	100	233	46	1060	1373	132
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	101	235	46	1071	1387	133
RTOR Reduction (vph)	0	5	0	0	0	80
Lane Group Flow (vph)	101	230	46	1071	1387	53
Turn Type		Perm	Perm			Perm
Protected Phases	6			4	8	
Permitted Phases		6	4			8
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	708	633	186	1475	1475	633
v/s Ratio Prot	0.06			0.29	c0.38	
v/s Ratio Perm		c0.15	0.10			0.03
v/c Ratio	0.14	0.36	0.25	0.73	0.94	0.08
Uniform Delay, d1	7.6	8.4	8.0	10.1	11.5	7.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	1.6	3.2	3.2	13.0	0.3
Delay (s)	8.1	10.0	11.1	13.3	24.5	7.7
Level of Service	A	B	B	B	C	A
Approach Delay (s)	9.4			13.2	23.0	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

2030 + PRO (With Transit Corridor) - PM Peak

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	*0.99	1.00	*0.99	1.00		*0.99
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3504	1583	3688	1583		5532
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3504	1583	3688	1583		5532
Volume (vph)	882	41	2658	907	0	2752
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	891	41	2685	916	0	2780
RTOR Reduction (vph)	0	4	0	206	0	0
Lane Group Flow (vph)	891	37	2685	710	0	2780
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	31.0	31.0	91.0	91.0		91.0
Effective Green, g (s)	31.0	31.0	91.0	91.0		91.0
Actuated g/C Ratio	0.24	0.24	0.70	0.70		0.70
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	836	377	2582	1108		3872
v/s Ratio Prot	c0.25		c0.73			0.50
v/s Ratio Perm		0.02		0.45		
v/c Ratio	1.07	0.10	1.04	0.64		0.72
Uniform Delay, d1	49.5	38.6	19.5	10.6		11.8
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	50.2	0.1	29.1	2.9		1.2
Delay (s)	99.7	38.7	48.6	13.5		12.9
Level of Service	F	D	D	B		B
Approach Delay (s)	97.0		39.7			12.9
Approach LOS	F		D			B

Intersection Summary			
HCM Average Control Delay	36.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	*0.99			*0.99	
Frt						0.86	1.00	1.00			0.99	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5532			5455	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5532			5455	
Volume (vph)	0	0	0	0	0	1230	423	2335	0	0	3295	339
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	0	0	0	0	1242	427	2359	0	0	3328	342
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	20	0
Lane Group Flow (vph)	0	0	0	0	0	1242	427	2359	0	0	3650	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						70.0	15.0	70.0			47.0	
Effective Green, g (s)						70.0	15.0	70.0			47.0	
Actuated g/C Ratio						1.00	0.21	1.00			0.67	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	379	5532			3663	
v/s Ratio Prot							c0.24	0.43			c0.67	
v/s Ratio Perm						0.77						
v/c Ratio						0.77	1.13	0.43			1.00	
Uniform Delay, d1						0.0	27.5	0.0			11.4	
Progression Factor						1.00	0.90	1.00			1.00	
Incremental Delay, d2						3.6	79.1	0.2			14.1	
Delay (s)						3.6	103.8	0.2			25.5	
Level of Service						A	F	A			C	
Approach Delay (s)		0.0			3.6			16.1			25.5	
Approach LOS		A			A			B			C	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: H-1 EB & Kunia Road

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↓↓↓↓			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	*0.99	1.00	*0.99			*0.99
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3504	1583	7376			5532
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3504	1583	7376			5532
Volume (vph)	527	578	4322	0	0	2231
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	573	628	4698	0	0	2425
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	573	628	4698	0	0	2425
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	16.0	70.0	46.0			46.0
Effective Green, g (s)	16.0	70.0	46.0			46.0
Actuated g/C Ratio	0.23	1.00	0.66			0.66
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	801	1583	4847			3635
v/s Ratio Prot	c0.16		c0.64			0.44
v/s Ratio Perm		0.40				
v/c Ratio	0.72	0.40	0.97			0.67
Uniform Delay, d1	24.9	0.0	11.3			7.3
Progression Factor	1.00	1.00	0.49			1.00
Incremental Delay, d2	3.1	0.7	6.7			1.0
Delay (s)	28.0	0.7	12.2			8.3
Level of Service	C	A	B			A
Approach Delay (s)	13.7		12.2			8.3
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	130.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.91		0.97	0.91				1.00			1.00
Frt		0.97		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		4947		3433	5085				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		4947		3433	5085				1611			1611
Volume (vph)	0	1884	416	774	1938	0	0	0	439	0	0	729
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2048	452	841	2107	0	0	0	477	0	0	792
RTOR Reduction (vph)	0	19	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2481	0	841	2107	0	0	0	477	0	0	792
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		81.8		40.2	130.0				130.0			130.0
Effective Green, g (s)		81.8		40.2	130.0				130.0			130.0
Actuated g/C Ratio		0.63		0.31	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		3113		1062	5085				1611			1611
v/s Ratio Prot		c0.50		c0.24	0.41							
v/s Ratio Perm									0.30			0.49
v/c Ratio		0.80		0.79	0.41				0.30			0.49
Uniform Delay, d1		17.9		41.1	0.0				0.0			0.0
Progression Factor		0.22		1.53	1.00				1.00			1.00
Incremental Delay, d2		1.4		0.4	0.0				0.5			1.1
Delay (s)		5.3		63.0	0.0				0.5			1.1
Level of Service		A		E	A				A			A
Approach Delay (s)		5.3			18.0			0.5			1.1	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑			↑↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	*0.99			*0.99				1.00			
Frt	1.00	1.00			0.95				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	5532			5283				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	5532			5283				1611			
Volume (vph)	1027	1297	0	0	2713	1164	0	0	638	0	0	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1037	1310	0	0	2740	1176	0	0	644	0	0	0
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	0	0	0	0
Lane Group Flow (vph)	1037	1310	0	0	3902	0	0	0	644	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	51.0	130.0			71.0				130.0			
Effective Green, g (s)	51.0	130.0			71.0				130.0			
Actuated g/C Ratio	0.39	1.00			0.55				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	694	5532			2885				1611			
v/s Ratio Prot	c0.59	0.24			c0.74							
v/s Ratio Perm									0.40			
v/c Ratio	1.49	0.24			1.35				0.40			
Uniform Delay, d1	39.5	0.0			29.5				0.0			
Progression Factor	0.50	1.00			0.41				1.00			
Incremental Delay, d2	227.7	0.1			158.8				0.7			
Delay (s)	247.4	0.1			171.1				0.7			
Level of Service	F	A			F				A			
Approach Delay (s)		109.4			171.1			0.7			0.0	
Approach LOS		F			F			A			A	

Intersection Summary			
HCM Average Control Delay	134.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.41		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	142.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰↑	↱		↰↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	1.00	*0.99	1.00		1.00	1.00		*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (perm)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Volume (vph)	282	1537	116	135	3481	515	197	29	130	243	28	194
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	285	1553	117	136	3516	520	199	29	131	245	28	196
RTOR Reduction (vph)	0	0	56	0	0	158	0	0	47	0	0	106
Lane Group Flow (vph)	285	1553	61	136	3516	362	0	228	84	0	273	90
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	10.6	67.6	67.6	18.0	75.0	75.0		14.0	14.0		14.4	14.4
Effective Green, g (s)	10.6	67.6	67.6	18.0	75.0	75.0		14.0	14.0		14.4	14.4
Actuated g/C Ratio	0.08	0.52	0.52	0.14	0.58	0.58		0.11	0.11		0.11	0.11
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	286	2877	823	245	3192	913		192	170		391	175
v/s Ratio Prot	c0.08	0.28		0.08	c0.64			c0.13			c0.08	
v/s Ratio Perm			0.04			0.23			0.05			0.06
v/c Ratio	1.00	0.54	0.07	0.56	1.10	0.40		1.19	0.49		1.26dl	0.52
Uniform Delay, d1	59.7	20.8	15.6	52.3	27.5	15.1		58.0	54.7		55.7	54.5
Progression Factor	0.93	0.85	0.51	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	51.2	0.7	0.2	2.7	51.1	1.3		124.6	9.8		5.4	2.6
Delay (s)	106.9	18.5	8.0	55.0	78.6	16.4		182.6	64.5		61.1	57.1
Level of Service	F	B	A	D	E	B		F	E		E	E
Approach Delay (s)		30.8			70.1			139.5			59.4	
Approach LOS		C			E			F			E	

Intersection Summary			
HCM Average Control Delay	61.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	105.4%	ICU Level of Service	G
Analysis Period (min)	15		
dl Defacto Left Lane. Recode with 1 though lane as a left lane.			
c Critical Lane Group			

7: Laulaunui Street & Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		*0.99		1.00	1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3518		1770	1863	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3518		1770	1863	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	209	37	13	61	4	229	56	2756	89	228	4188	82
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	211	37	13	62	4	231	57	2784	90	230	4230	83
RTOR Reduction (vph)	0	3	0	0	0	196	0	0	25	0	0	18
Lane Group Flow (vph)	0	258	0	62	4	35	57	2784	65	230	4230	65
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		14.8		5.0	5.0	5.0	4.0	91.0	91.0	22.0	109.0	109.0
Effective Green, g (s)		14.8		5.0	5.0	5.0	4.0	91.0	91.0	22.0	109.0	109.0
Actuated g/C Ratio		0.10		0.03	0.03	0.03	0.03	0.61	0.61	0.15	0.73	0.73
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		350		59	63	53	48	3383	968	262	4052	1160
v/s Ratio Prot		c0.07		c0.04	0.00		c0.03	0.50		0.13	c0.76	
v/s Ratio Perm						0.02			0.04			0.04
v/c Ratio		1.19dl		1.05	0.06	0.66	1.19	0.82	0.07	0.88	1.04	0.06
Uniform Delay, d1		65.1		71.9	69.6	71.1	72.4	22.6	11.7	62.1	19.9	5.6
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		7.9		132.1	0.4	25.7	189.9	2.4	0.1	26.4	27.4	0.1
Delay (s)		73.0		204.0	70.1	96.7	262.3	25.0	11.8	88.5	47.3	5.6
Level of Service		E		F	E	F	F	C	B	F	D	A
Approach Delay (s)		73.0			118.7			29.2			48.6	
Approach LOS		E			F			C			D	

Intersection Summary			
HCM Average Control Delay	44.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	148.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

8: Old Fort Weaver Rd & Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1792	1583		1849	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.53	1.00		0.29	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		995	1583		537	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	731	189	418	37	214	48	539	2120	3	190	3187	884
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	738	191	422	37	216	48	544	2141	3	192	3219	893
RTOR Reduction (vph)	0	0	0	0	0	26	0	0	0	0	0	330
Lane Group Flow (vph)	0	929	422	0	253	22	544	2141	3	192	3219	563
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		59.0	130.0		59.0	59.0	17.0	52.0	130.0	7.0	42.0	42.0
Effective Green, g (s)		59.0	130.0		59.0	59.0	17.0	52.0	130.0	7.0	42.0	42.0
Actuated g/C Ratio		0.45	1.00		0.45	0.45	0.13	0.40	1.00	0.05	0.32	0.32
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		452	1583		244	718	231	2213	1583	95	1787	511
v/s Ratio Prot							c0.31	0.39		0.11	c0.58	
v/s Ratio Perm		c0.93	0.27		0.47	0.01			0.00			0.36
v/c Ratio		2.06	0.27		1.04	0.03	2.35	0.97	0.00	2.02	1.80	1.10
Uniform Delay, d1		35.5	0.0		35.5	19.7	56.5	38.2	0.0	61.5	44.0	44.0
Progression Factor		0.91	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		481.4	0.3		67.6	0.0	623.0	12.9	0.0	494.3	362.9	70.8
Delay (s)		513.6	0.3		103.1	19.7	679.5	51.0	0.0	555.8	406.9	114.8
Level of Service		F	A		F	B	F	D	A	F	F	F
Approach Delay (s)		353.3			89.8			178.2			352.9	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	289.5	HCM Level of Service	F
HCM Volume to Capacity ratio	2.01		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	168.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Renton Road & Fort Weaver Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑	↱		✥		↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00		1.00		1.00	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	0.85		0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1761	1583		1694		1770	5532	1583	1770	5532	1583
Flt Permitted	0.95	0.95	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1761	1583		1694		1770	5532	1583	1770	5532	1583
Volume (vph)	723	22	43	9	151	320	45	2086	75	506	3054	518
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	730	22	43	9	153	323	45	2107	76	511	3085	523
RTOR Reduction (vph)	0	0	0	0	48	0	0	0	8	0	0	205
Lane Group Flow (vph)	366	386	43	0	437	0	45	2107	68	511	3085	318
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	28.0	28.0	150.0		26.0		4.0	50.0	50.0	30.0	76.0	76.0
Effective Green, g (s)	28.0	28.0	150.0		26.0		4.0	50.0	50.0	30.0	76.0	76.0
Actuated g/C Ratio	0.19	0.19	1.00		0.17		0.03	0.33	0.33	0.20	0.51	0.51
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	327	329	1583		294		47	1844	528	354	2803	802
v/s Ratio Prot	0.21	c0.22			c0.26		0.03	0.38		c0.29	c0.56	
v/s Ratio Perm			0.03						0.04			0.20
v/c Ratio	1.12	1.17	0.03		1.49		0.96	1.14	0.13	1.44	1.10	0.40
Uniform Delay, d1	61.0	61.0	0.0		62.0		72.9	50.0	34.8	60.0	37.0	22.8
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	85.9	105.4	0.0		236.3		114.0	71.2	0.5	214.9	51.5	1.5
Delay (s)	146.9	166.4	0.0		298.3		186.9	121.2	35.3	274.9	88.5	24.3
Level of Service	F	F	A		F		F	F	D	F	F	C
Approach Delay (s)		148.4			298.3			119.6			103.4	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	125.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	130.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Farrington Hwy & D Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑		↰↰	↑↑↑↱			↑↱	↱	↰	✥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	*0.99		*0.99	*0.99			*0.99	*0.99	*0.99	*0.99	
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	0.98	
Satd. Flow (prot)	1770	5532		3504	5506			1844	1567	1752	1660	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	0.98	
Satd. Flow (perm)	1770	5532		3504	5506			1844	1567	1752	1660	
Volume (vph)	108	2029	0	408	2186	73	0	79	45	226	9	92
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	117	2205	0	443	2376	79	0	86	49	246	10	100
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	45	0	33	0
Lane Group Flow (vph)	117	2205	0	443	2452	0	0	86	4	173	150	0
Turn Type	Prot			Prot					Perm	Split		
Protected Phases	5	2		1	6			8		4	4	
Permitted Phases									8			
Actuated Green, G (s)	12.7	66.8		20.1	74.2			11.3	11.3	15.8	15.8	
Effective Green, g (s)	12.7	66.8		20.1	74.2			11.3	11.3	15.8	15.8	
Actuated g/C Ratio	0.10	0.51		0.15	0.57			0.09	0.09	0.12	0.12	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	173	2843		542	3143			160	136	213	202	
v/s Ratio Prot	0.07	c0.40		0.13	c0.45			c0.05		c0.10	0.09	
v/s Ratio Perm									0.00			
v/c Ratio	0.68	0.78		0.82	0.78			0.54	0.03	0.81	0.74	
Uniform Delay, d1	56.7	25.5		53.2	21.6			56.8	54.3	55.7	55.1	
Progression Factor	0.99	0.62		0.63	0.29			1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.5	1.4		8.6	1.8			3.4	0.1	20.5	13.6	
Delay (s)	62.3	17.3		42.3	8.0			60.3	54.4	76.1	68.7	
Level of Service	E	B		D	A			E	D	E	E	
Approach Delay (s)		19.5			13.3			58.2			72.3	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Farrington Hwy & E Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱			↑↑↱			✥		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor	1.00	*0.99			*0.99			1.00		1.00	1.00	
Frt	1.00	0.98			1.00			1.00		1.00	0.94	
Flt Protected	0.95	1.00			1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1770	5421			5518			1803		1770	1744	
Flt Permitted	0.95	1.00			1.00			0.97		0.95	1.00	
Satd. Flow (perm)	1770	5421			5518			1803		1770	1744	
Volume (vph)	75	1950	303	0	2238	40	179	106	5	182	125	93
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	2120	329	0	2433	43	195	115	5	198	136	101
RTOR Reduction (vph)	0	18	0	0	1	0	0	1	0	0	21	0
Lane Group Flow (vph)	82	2431	0	0	2475	0	0	314	0	198	216	0
Turn Type	Prot						Split			Split		
Protected Phases	5	2			6		8	8		4	4	
Permitted Phases												
Actuated Green, G (s)	7.0	78.0			67.0			23.0		17.0	17.0	
Effective Green, g (s)	7.0	78.0			67.0			23.0		17.0	17.0	
Actuated g/C Ratio	0.05	0.60			0.52			0.18		0.13	0.13	
Clearance Time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	95	3253			2844			319		231	228	
v/s Ratio Prot	0.05	c0.45			c0.45			c0.17		0.11	c0.12	
v/s Ratio Perm												
v/c Ratio	0.86	0.75			0.87			0.98		0.86	0.95	
Uniform Delay, d1	61.0	18.9			27.7			53.3		55.3	56.1	
Progression Factor	0.86	0.76			0.41			1.00		1.00	1.00	
Incremental Delay, d2	30.4	0.8			2.4			45.9		25.5	44.7	
Delay (s)	83.1	15.2			13.8			99.2		80.8	100.8	
Level of Service	F	B			B			F		F	F	
Approach Delay (s)		17.4			13.8			99.2			91.7	
Approach LOS		B			B			F			F	

Intersection Summary			
HCM Average Control Delay	25.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
12: Fort Barrette Road & Farrington Hwy

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↱	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	*0.99	*0.99	*0.99	1.00	*0.99	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	3540	1567	3504	3688	1583	3504	3688	1583	1770	3688	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	3540	1567	3504	3688	1583	3504	3688	1583	1770	3688	1583
Volume (vph)	493	482	722	355	404	111	677	654	746	225	961	763
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	498	487	729	359	408	112	684	661	754	227	971	771
RTOR Reduction (vph)	0	19	309	0	0	94	0	0	217	0	0	189
Lane Group Flow (vph)	498	647	241	359	408	18	684	661	537	227	971	582
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	30.4	39.8	39.8	21.4	30.8	30.8	42.5	88.8	88.8	28.6	74.9	74.9
Effective Green, g (s)	30.4	39.8	39.8	21.4	30.8	30.8	42.5	88.8	88.8	28.6	74.9	74.9
Actuated g/C Ratio	0.16	0.20	0.20	0.11	0.16	0.16	0.22	0.46	0.46	0.15	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	547	724	320	385	584	251	765	1683	722	260	1419	609
v/s Ratio Prot	c0.14	c0.18		0.10	0.11		c0.20	0.18		0.13	0.26	
v/s Ratio Perm			0.15			0.01			0.34			c0.37
v/c Ratio	0.91	0.89	0.75	0.93	0.70	0.07	0.89	0.39	0.74	0.87	0.68	0.96
Uniform Delay, d1	80.8	75.3	72.8	85.9	77.5	69.7	73.9	35.0	43.5	81.2	50.0	58.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.3	13.4	9.6	29.2	6.8	0.5	12.9	0.2	4.1	25.9	1.4	25.7
Delay (s)	100.1	88.8	82.3	115.1	84.3	70.3	86.8	35.2	47.7	107.2	51.4	83.9
Level of Service	F	F	F	F	F	E	F	D	D	F	D	F
Approach Delay (s)		90.0			95.1			56.5			70.5	
Approach LOS		F			F			E			E	

Intersection Summary			
HCM Average Control Delay	74.4	HCM Level of Service	E
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	194.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
13: WB Ramps & North-South Road

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰		↱				↑↑	↱	↰↰	↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Lane Util. Factor	*0.99		1.00				*0.99	1.00	0.97	*0.99	
Frt	1.00		0.85				1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3504		1583				3688	1583	3433	3688	
Flt Permitted	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3504		1583				3688	1583	3433	3688	
Volume (vph)	1986	0	412	0	0	0	469	86	302	514	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	2006	0	416	0	0	0	474	87	305	519	0
RTOR Reduction (vph)	0	0	63	0	0	0	0	70	0	0	0
Lane Group Flow (vph)	2006	0	353	0	0	0	474	17	305	519	0
Turn Type	Prot		custom					Perm	Prot		
Protected Phases	8		8				6		5	2	
Permitted Phases								6			
Actuated Green, G (s)	82.8		82.8				28.1	28.1	17.1	49.2	
Effective Green, g (s)	82.8		82.8				28.1	28.1	17.1	49.2	
Actuated g/C Ratio	0.59		0.59				0.20	0.20	0.12	0.35	
Clearance Time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0				3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	2072		936				740	318	419	1296	
v/s Ratio Prot	c0.57		0.22				c0.13		c0.09	0.14	
v/s Ratio Perm								0.01			
v/c Ratio	0.97		0.38				0.64	0.05	0.73	0.40	
Uniform Delay, d1	27.3		15.0				51.3	45.2	59.2	34.3	
Progression Factor	1.00		1.00				1.00	1.00	0.60	0.84	
Incremental Delay, d2	13.0		0.3				4.2	0.3	5.6	0.8	
Delay (s)	40.3		15.3				55.5	45.5	41.2	29.5	
Level of Service	D		B				E	D	D	C	
Approach Delay (s)		36.0		0.0			54.0			33.8	
Approach LOS		D		A			D			C	

Intersection Summary			
HCM Average Control Delay	38.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	107.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: EB Ramps & North-South Road

Movement	EBL2	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰		↱			↰↰	↑↑			↑↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00			0.97	*0.99			*0.99	*0.99
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583			3433	3688			3688	3135
Flt Permitted	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (perm)	1770		1583			3433	3688			3688	3135
Volume (vph)	92	0	952	0	0	206	2248	0	0	724	2003
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	93	0	962	0	0	208	2271	0	0	731	2023
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	93	0	961	0	0	208	2271	0	0	731	2023
Turn Type	Prot		custom			Prot					Free
Protected Phases	4		4			1	6			2	
Permitted Phases											Free
Actuated Green, G (s)	63.0		63.0			12.7	69.0			52.3	140.0
Effective Green, g (s)	63.0		63.0			12.7	69.0			52.3	140.0
Actuated g/C Ratio	0.45		0.45			0.09	0.49			0.37	1.00
Clearance Time (s)	4.0		4.0			4.0	4.0			4.0	
Vehicle Extension (s)	3.0		3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	797		712			311	1818			1378	3135
v/s Ratio Prot	0.05		c0.61			0.06	c0.62			0.20	
v/s Ratio Perm											0.65
v/c Ratio	0.12		1.35			0.67	1.25			0.53	0.65
Uniform Delay, d1	22.3		38.5			61.6	35.5			34.3	0.0
Progression Factor	1.00		1.00			1.12	0.61			1.00	1.00
Incremental Delay, d2	0.1		166.5			2.2	114.1			1.5	1.0
Delay (s)	22.4		205.0			71.5	135.6			35.7	1.0
Level of Service	C		F			E	F			D	A
Approach Delay (s)		188.9		0.0			130.3			10.2	
Approach LOS		F		A			F			B	

Intersection Summary			
HCM Average Control Delay	87.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	107.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: North-South Road & Farrington Hwy

2030 + PRO (With Transit Corridor) - PM Peak

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99		*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	5328		3504	5532	1583	3504	3688	1583	3504	3688	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	5328		3504	5532	1583	3504	3688	1583	3504	3688	1583
Volume (vph)	717	1856	607	876	1562	386	407	740	537	529	847	758
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	724	1875	613	885	1578	390	411	747	542	534	856	766
RTOR Reduction (vph)	0	45	0	0	0	190	0	0	284	0	0	265
Lane Group Flow (vph)	724	2443	0	885	1578	200	411	747	258	534	856	501
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases						2			4			8
Actuated Green, G (s)	25.0	40.0		27.0	42.0	42.0	17.0	30.0	30.0	17.0	30.0	30.0
Effective Green, g (s)	25.0	40.0		27.0	42.0	42.0	17.0	30.0	30.0	17.0	30.0	30.0
Actuated g/C Ratio	0.19	0.31		0.21	0.32	0.32	0.13	0.23	0.23	0.13	0.23	0.23
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	674	1639		728	1787	511	458	851	365	458	851	365
v/s Ratio Prot	0.21	c0.46		c0.25	0.29		0.12	c0.20		0.15	0.23	
v/s Ratio Perm						0.13			0.16			c0.32
v/c Ratio	1.07	1.49		1.22	0.88	0.39	0.90	0.88	0.71	1.17	1.01	1.37
Uniform Delay, d1	52.5	45.0		51.5	41.7	34.1	55.6	48.2	46.0	56.5	50.0	50.0
Progression Factor	1.00	1.00		0.63	0.56	0.21	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	56.3	224.0		102.9	3.2	1.0	23.0	12.4	11.0	96.1	32.3	183.8
Delay (s)	108.8	269.0		135.2	26.7	8.0	78.6	60.6	57.0	152.6	82.3	233.8
Level of Service	F	F		F	C	A	E	E	E	F	F	F
Approach Delay (s)		232.9			57.8			63.8			153.5	
Approach LOS		F			E			E			F	

Intersection Summary			
HCM Average Control Delay	136.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	123.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: North-South Road & North UH Connector

2030 + PRO (With Transit Corridor) - PM Peak

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↱	↱	↰↰	↑↑↑	↱	↰↰	↑↱		↰↰	↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	*0.99	0.86	*0.99	*0.99	1.00	*0.99	*0.99		*0.99	1.00	*0.99
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	5532	1362	3504	5532	1583	3504	3466		3504	1863	3135
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	5532	1362	3504	5532	1583	3504	3466		3504	1863	3135
Volume (vph)	73	1834	457	642	1906	374	273	421	282	374	117	717
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	74	1853	462	648	1925	378	276	425	285	378	118	724
RTOR Reduction (vph)	0	0	215	0	0	173	0	90	0	0	0	26
Lane Group Flow (vph)	74	1853	247	648	1925	205	276	620	0	378	118	698
Turn Type	Prot		Perm	Prot		pm+ov	Prot			Prot		pm+ov
Protected Phases	5	2		1	6	7	7	4		3	8	1
Permitted Phases			2			6						8
Actuated Green, G (s)	5.6	40.3	40.3	20.8	55.5	70.5	15.0	27.8		25.1	37.9	58.7
Effective Green, g (s)	5.6	40.3	40.3	20.8	55.5	70.5	15.0	27.8		25.1	37.9	58.7
Actuated g/C Ratio	0.04	0.31	0.31	0.16	0.43	0.54	0.12	0.21		0.19	0.29	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	148	1715	422	561	2362	858	404	741		677	543	1416
v/s Ratio Prot	0.02	c0.33		c0.18	0.35	0.03	0.08	c0.18		c0.11	0.06	0.08
v/s Ratio Perm			0.18			0.10						0.14
v/c Ratio	0.50	1.08	0.59	1.16	0.81	0.24	0.68	0.84		0.56	0.22	0.49
Uniform Delay, d1	60.8	44.9	37.8	54.6	32.7	15.6	55.2	48.9		47.4	34.8	25.2
Progression Factor	1.00	1.00	1.00	0.70	0.40	0.30	1.00	1.00		0.52	0.46	0.40
Incremental Delay, d2	2.6	47.1	5.9	71.9	0.3	0.0	4.7	8.2		0.3	0.1	0.1
Delay (s)	63.5	91.9	43.7	110.1	13.5	4.7	59.9	57.1		24.9	16.2	10.2
Level of Service	E	F	D	F	B	A	E	E		C	B	B
Approach Delay (s)		81.7			33.6			57.9			15.4	
Approach LOS		F			C			E			B	

Intersection Summary			
HCM Average Control Delay	49.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: East-West Rd & North-South Road

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰↰	↑↱		↰↰	↑↑↱		↰↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	*0.99	0.95		0.97	*0.99		*0.99	*0.99		*0.99	*0.99	
Frt	1.00	0.94		1.00	0.89		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3504	3313		3433	3283		3504	5405		3504	5358	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3504	3313		3433	3283		3504	5405		3504	5358	
Volume (vph)	308	312	232	361	192	525	110	1530	277	504	1626	432
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	311	315	234	365	194	530	111	1545	280	509	1642	436
RTOR Reduction (vph)	0	81	0	0	163	0	0	24	0	0	39	0
Lane Group Flow (vph)	311	468	0	365	561	0	111	1801	0	509	2039	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.4	20.6		17.2	23.4		5.0	45.1		17.0	57.1	
Effective Green, g (s)	14.4	20.6		17.2	23.4		5.0	45.1		17.0	57.1	
Actuated g/C Ratio	0.12	0.18		0.15	0.20		0.04	0.39		0.15	0.49	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	435	589		509	663		151	2103		514	2640	
v/s Ratio Prot	0.09	0.14		c0.11	c0.17		0.03	c0.33		c0.15	0.38	
v/s Ratio Perm												
v/c Ratio	0.71	0.79		0.72	1.11dr		0.74	0.86		0.99	0.77	
Uniform Delay, d1	48.8	45.6		47.0	44.5		54.8	32.4		49.4	24.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.5	7.3		4.8	9.8		16.9	4.7		37.4	2.3	
Delay (s)	54.3	52.9		51.8	54.3		71.7	37.2		86.7	26.3	
Level of Service	D	D		D	D		E	D		F	C	
Approach Delay (s)		53.4			53.5			39.2			38.2	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	43.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	115.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: North-South Road & Kapolei Parkway

2030 + PRO (With Transit Corridor) - PM Peak

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.99		1.00	*0.99		*0.99	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	0.98		1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5407		1770	5184		3504	5532	1583	1770	5532	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5407		1770	5184		3504	5532	1583	1770	5532	1583
Volume (vph)	378	875	155	494	1001	725	704	643	505	121	568	339
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	382	884	157	499	1011	732	711	649	510	122	574	342
RTOR Reduction (vph)	0	26	0	0	118	0	0	0	297	0	0	292
Lane Group Flow (vph)	382	1015	0	499	1625	0	711	649	213	122	574	50
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	20.0	25.0		31.0	36.0		21.0	26.5	26.5	10.4	15.9	15.9
Effective Green, g (s)	20.0	25.0		31.0	36.0		21.0	26.5	26.5	10.4	15.9	15.9
Actuated g/C Ratio	0.18	0.23		0.28	0.33		0.19	0.24	0.24	0.10	0.15	0.15
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	325	1241		504	1714		676	1346	385	169	808	231
v/s Ratio Prot	c0.22	0.19		c0.28	c0.31		c0.20	0.12		0.07	c0.10	
v/s Ratio Perm									0.13			0.03
v/c Ratio	1.18	0.82		0.99	1.15dr		1.05	0.48	0.55	0.72	0.71	0.22
Uniform Delay, d1	44.5	39.8		38.8	35.5		44.0	35.3	36.0	47.8	44.3	41.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	106.4	6.1		37.4	12.5		49.0	0.3	1.7	14.1	3.0	0.5
Delay (s)	150.9	45.8		76.2	48.0		93.0	35.6	37.7	62.0	47.3	41.5
Level of Service	F	D		E	D		F	D	D	E	D	D
Approach Delay (s)		74.0			54.3			58.0			47.1	
Approach LOS		E			D			E			D	

Intersection Summary			
HCM Average Control Delay	58.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	108.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.9%	ICU Level of Service	G
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: East-West Rd & Old Fort Weaver Rd

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1583	3433	1583
Flt Permitted	0.29	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	546	1863	3539	1583	3433	1583
Volume (vph)	37	533	689	948	805	93
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	37	538	696	958	813	94
RTOR Reduction (vph)	0	0	0	0	0	48
Lane Group Flow (vph)	37	538	696	958	813	46
Turn Type	Perm			pm+ov		Perm
Protected Phases		4	8	6	6	
Permitted Phases	4			8		6
Actuated Green, G (s)	58.7	58.7	58.7	122.0	63.3	63.3
Effective Green, g (s)	58.7	58.7	58.7	122.0	63.3	63.3
Actuated g/C Ratio	0.45	0.45	0.45	0.94	0.49	0.49
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	247	841	1598	1583	1672	771
v/s Ratio Prot		0.29	0.20	c0.29	0.24	
v/s Ratio Perm	0.07			0.31		0.03
v/c Ratio	0.15	0.64	0.44	0.61	0.49	0.06
Uniform Delay, d1	21.0	27.5	24.3	0.6	22.4	17.6
Progression Factor	0.27	0.25	0.89	1.00	1.19	1.75
Incremental Delay, d2	0.2	1.3	0.0	0.1	0.4	0.1
Delay (s)	5.8	8.1	21.7	0.6	27.0	30.8
Level of Service	A	A	C	A	C	C
Approach Delay (s)		8.0	9.5		27.4	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: Farrington Hwy & B Street

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑	↱	↰↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	*0.99	1.00	0.97	*0.99	1.00	1.00	1.00	1.00	*0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3688	1583	3433	3688	1583	1770	1863	1583	3504	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3688	1583	3433	3688	1583	1770	1863	1583	3504	1863	1583
Volume (vph)	221	1384	344	375	1728	74	146	282	195	264	143	171
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	223	1398	347	379	1745	75	147	285	197	267	144	173
RTOR Reduction (vph)	0	0	46	0	0	27	0	0	5	0	0	23
Lane Group Flow (vph)	223	1398	301	379	1745	48	147	285	192	267	144	150
Turn Type	Prot		pm+ov	Prot		Perm	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2	3	1	6		7	4	5	3	8	1
Permitted Phases			2			6			4			8
Actuated Green, G (s)	12.7	51.0	61.0	17.9	56.2	56.2	11.0	18.0	30.7	10.0	17.0	34.9
Effective Green, g (s)	12.7	51.0	61.0	17.9	56.2	56.2	11.0	18.0	30.7	10.0	17.0	34.9
Actuated g/C Ratio	0.11	0.45	0.54	0.16	0.50	0.50	0.10	0.16	0.27	0.09	0.15	0.31
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	386	1666	855	544	1836	788	172	297	430	310	281	545
v/s Ratio Prot	0.06	0.38	0.03	c0.11	c0.47		0.08	c0.15	0.05	c0.08	0.08	0.04
v/s Ratio Perm			0.16			0.03			0.07			0.05
v/c Ratio	0.58	0.84	0.35	0.70	0.95	0.06	0.85	0.96	0.45	0.86	0.51	0.28
Uniform Delay, d1	47.6	27.3	14.7	44.9	27.0	14.7	50.2	47.1	34.1	50.8	44.1	29.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	5.3	0.3	3.9	12.2	0.1	31.5	40.8	0.7	20.9	1.6	0.3
Delay (s)	49.6	32.6	15.0	48.8	39.2	14.8	81.7	87.9	34.8	71.7	45.7	29.7
Level of Service	D	C	B	D	D	B	F	F	C	E	D	C
Approach Delay (s)		31.4			40.0			69.8			52.9	
Approach LOS		C			D			E			D	

Intersection Summary			
HCM Average Control Delay	41.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	112.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: East-West Rd & A Street

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↱		↰	↑	↱	↰	↑↱		↰	↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.85		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1841		1770	1863	1583	1770	1585		1770	1631	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1841		1770	1863	1583	1770	1585		1770	1631	
Volume (vph)	164	661	55	34	683	513	12	1	135	44	6	31
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	178	718	60	37	742	558	13	1	147	48	7	34
RTOR Reduction (vph)	0	2	0	0	0	174	0	138	0	0	32	0
Lane Group Flow (vph)	178	776	0	37	742	384	13	10	0	48	9	0
Turn Type	Prot			Prot		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases						6						
Actuated Green, G (s)	19.9	92.7		4.8	77.6	77.6	7.7	7.7		8.8	8.8	
Effective Green, g (s)	19.9	92.7		4.8	77.6	77.6	7.7	7.7		8.8	8.8	
Actuated g/C Ratio	0.15	0.71		0.04	0.60	0.60	0.06	0.06		0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	271	1313		65	1112	945	105	94		120	110	
v/s Ratio Prot	c0.10	0.42		0.02	c0.40		c0.01	0.01		c0.03	0.01	
v/s Ratio Perm						0.24						
v/c Ratio	0.66	0.59		0.57	0.67	0.41	0.12	0.10		0.40	0.08	
Uniform Delay, d1	51.8	9.3		61.6	17.6	13.9	58.0	57.9		58.1	56.8	
Progression Factor	1.00	1.00		0.97	0.49	0.09	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.6	2.0		5.2	1.5	0.6	0.5	0.5		2.2	0.3	
Delay (s)	57.5	11.2		64.9	10.0	1.8	58.5	58.4		60.3	57.2	
Level of Service	E	B		E	B	A	E	E		E	E	
Approach Delay (s)		19.8			8.1			58.4			58.8	
Approach LOS		B			A			E			E	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Farrington Hwy & 2nd Avenue

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰↰	↑↑	↱	↰	↑↑	↱↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.95	1.00	1.00	0.95	0.88	0.97	0.95	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5021		3433	3539	1583	1770	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5021		3433	3539	1583	1770	3539	2787	3433	3539	1583
Volume (vph)	180	1404	130	555	1708	237	103	297	410	515	356	308
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	1526	141	603	1857	258	112	323	446	560	387	335
RTOR Reduction (vph)	0	8	0	0	0	81	0	0	6	0	0	181
Lane Group Flow (vph)	196	1659	0	603	1857	177	112	323	440	560	387	154
Turn Type	Prot			Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases						6			8			4
Actuated Green, G (s)	15.0	46.0		23.0	54.0	54.0	11.0	23.0	46.0	22.0	34.0	34.0
Effective Green, g (s)	15.0	46.0		23.0	54.0	54.0	11.0	23.0	46.0	22.0	34.0	34.0
Actuated g/C Ratio	0.12	0.35		0.18	0.42	0.42	0.08	0.18	0.35	0.17	0.26	0.26
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	204	1777		607	1470	658	150	626	986	581	926	414
v/s Ratio Prot	0.11	c0.33		0.18	c0.52		c0.06	c0.09	0.08	c0.16	0.11	
v/s Ratio Perm						0.11			0.08			0.10
v/c Ratio	0.96	0.93		0.99	1.26	0.27	0.75	0.52	0.45	0.96	0.42	0.37
Uniform Delay, d1	57.2	40.5		53.4	38.0	25.0	58.1	48.5	32.2	53.6	39.8	39.3
Progression Factor	1.00	1.00		0.53	0.35	0.05	0.76	0.71	0.66	1.01	0.90	0.84
Incremental Delay, d2	51.6	10.5		22.7	121.0	0.4	13.8	2.2	0.2	15.5	0.5	1.0
Delay (s)	108.8	51.0		51.1	134.5	1.7	57.7	36.5	21.5	69.6	36.5	33.9
Level of Service	F	D		D	F	A	E	D	C	E	D	C
Approach Delay (s)		57.1			103.4			31.6			50.3	
Approach LOS		E			F			C			D	

Intersection Summary			
HCM Average Control Delay	71.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	93.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations			↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	4551	349	0	4748
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	4947	379	0	5161
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			868			
pX, platoon unblocked	0.39	0.39			0.39	
vC, conflicting volume	6427	1426			5326	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	10281	0			7432	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	0	419			1	

Direction, Lane #	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	1413	1413	1413	1086	1290	1290	1290	1290
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	379	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.83	0.83	0.83	0.64	0.76	0.76	0.76	0.76
Queue Length 95th (ft)	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS								
Approach Delay (s)	0.0				0.0			
Approach LOS								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations			↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	4433	118	0	4297
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	4818	128	0	4671
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1232			
pX, platoon unblocked	0.42	0.42			0.42	
vC, conflicting volume	6050	1269			4947	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	8872	0			6250	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	0	456			2	

Direction, Lane #	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	1377	1377	1377	817	1168	1168	1168	1168
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	128	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.81	0.81	0.81	0.48	0.69	0.69	0.69	0.69
Queue Length 95th (ft)	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS								
Approach Delay (s)	0.0				0.0			
Approach LOS								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
25: East-West Rd & B Street

2030 + PRO (With Transit Corridor) - PM Peak

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Volume (vph)	414	290	644	95	337	588
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	450	315	700	103	366	639
RTOR Reduction (vph)	0	0	0	44	0	398
Lane Group Flow (vph)	450	315	700	59	366	241
Turn Type	Prot			Prot		Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases						
Actuated Green, G (s)	34.7	94.0	55.3	55.3	28.0	28.0
Effective Green, g (s)	34.7	94.0	55.3	55.3	28.0	28.0
Actuated g/C Ratio	0.27	0.72	0.43	0.43	0.22	0.22
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	472	1347	792	673	381	341
v/s Ratio Prot	c0.25	0.17	c0.38	0.04	c0.21	0.15
v/s Ratio Perm						
v/c Ratio	0.95	0.23	0.88	0.09	0.96	0.71
Uniform Delay, d1	46.9	6.0	34.4	22.3	50.5	47.2
Progression Factor	0.81	1.74	0.36	0.15	1.00	1.00
Incremental Delay, d2	26.4	0.3	13.0	0.2	37.2	11.7
Delay (s)	64.3	10.8	25.4	3.7	87.6	58.9
Level of Service	E	B	C	A	F	E
Approach Delay (s)		42.3	22.7		69.4	
Approach LOS		D	C		E	

Intersection Summary			
HCM Average Control Delay	46.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
26: Farrington Hwy &

2030 + PRO (With Transit Corridor) - PM Peak

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	*0.99	*0.99	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3688	3688	1583
Flt Permitted	0.95	1.00	0.05	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	98	3688	3688	1583
Volume (vph)	199	173	94	1485	2229	137
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	201	175	95	1500	2252	138
RTOR Reduction (vph)	0	16	0	0	0	33
Lane Group Flow (vph)	201	159	95	1500	2252	105
Turn Type		Perm	Perm			Perm
Protected Phases	6			4	8	
Permitted Phases		6	4			8
Actuated Green, G (s)	16.0	16.0	76.0	76.0	76.0	76.0
Effective Green, g (s)	16.0	16.0	76.0	76.0	76.0	76.0
Actuated g/C Ratio	0.16	0.16	0.76	0.76	0.76	0.76
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	283	253	74	2803	2803	1203
v/s Ratio Prot	c0.11			0.41	0.61	
v/s Ratio Perm		0.10	c0.97			0.07
v/c Ratio	0.71	0.63	1.28	0.54	0.80	0.09
Uniform Delay, d1	39.8	39.2	12.0	4.9	7.4	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.1	11.3	198.5	0.7	2.6	0.1
Delay (s)	53.9	50.5	210.5	5.6	9.9	3.2
Level of Service	D	D	F	A	A	A
Approach Delay (s)	52.3			17.8	9.6	
Approach LOS	D			B	A	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX A-4
YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO B: WITHOUT TRANSIT CORRIDOR SCENARIO

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00	0.95	1.00		0.95
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	3539	1583		3539
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	3539	1583		3539
Volume (vph)	915	41	1730	948	0	2297
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	995	45	1880	1030	0	2497
RTOR Reduction (vph)	0	18	0	317	0	0
Lane Group Flow (vph)	995	27	1880	713	0	2497
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	35.0	35.0	87.0	87.0		87.0
Effective Green, g (s)	35.0	35.0	87.0	87.0		87.0
Actuated g/C Ratio	0.27	0.27	0.67	0.67		0.67
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	924	426	2368	1059		2368
v/s Ratio Prot	c0.29		0.53			c0.71
v/s Ratio Perm		0.02		0.45		
v/c Ratio	1.08	0.06	0.79	0.67		1.05
Uniform Delay, d1	47.5	35.3	15.2	12.9		21.5
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	52.5	0.1	2.8	3.4		34.9
Delay (s)	100.0	35.4	18.0	16.4		56.4
Level of Service	F	D	B	B		E
Approach Delay (s)	97.2		17.4			56.4
Approach LOS	F		B			E

Intersection Summary			
HCM Average Control Delay	45.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	0.95			0.91	
Frt						0.86	1.00	1.00			0.99	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	3539			5016	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	3539			5016	
Volume (vph)	0	0	0	0	0	303	367	2420	0	0	2922	290
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	329	399	2630	0	0	3176	315
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	0	0	0	0	329	399	2630	0	0	3483	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						150.0	34.6	150.0			107.4	
Effective Green, g (s)						150.0	34.6	150.0			107.4	
Actuated g/C Ratio						1.00	0.23	1.00			0.72	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	408	3539			3591	
v/s Ratio Prot							c0.23	0.74			c0.69	
v/s Ratio Perm						0.20						
v/c Ratio						0.20	0.98	0.74			0.97	
Uniform Delay, d1						0.0	57.3	0.0			19.8	
Progression Factor						1.00	1.12	1.00			1.00	
Incremental Delay, d2						0.3	28.5	0.9			9.5	
Delay (s)						0.3	92.5	0.9			29.3	
Level of Service						A	F	A			C	
Approach Delay (s)		0.0			0.3			12.9			29.3	
Approach LOS		A			A			B			C	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

2030 + PRO (without Transit Corridor) - AM Peak

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00	0.95	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	3539	1583		5085
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	3539	1583		5085
Volume (vph)	724	37	1781	498	0	1309
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	787	40	1936	541	0	1423
RTOR Reduction (vph)	0	10	0	196	0	0
Lane Group Flow (vph)	787	30	1936	345	0	1423
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	26.8	26.8	61.1	61.1		61.1
Effective Green, g (s)	26.8	26.8	61.1	61.1		61.1
Actuated g/C Ratio	0.28	0.28	0.64	0.64		0.64
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	959	442	2255	1009		3240
v/s Ratio Prot	c0.23		c0.55			0.28
v/s Ratio Perm		0.02		0.22		
v/c Ratio	0.82	0.07	0.86	0.34		0.44
Uniform Delay, d1	32.3	25.4	13.9	8.1		8.8
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	5.7	0.1	4.5	0.9		0.4
Delay (s)	38.0	25.4	18.5	9.0		9.2
Level of Service	D	C	B	A		A
Approach Delay (s)	37.4		16.4			9.2
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	0.91			0.91	
Frt						0.86	1.00	1.00			0.98	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5085			4960	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5085			4960	
Volume (vph)	0	0	0	0	0	530	165	1748	0	0	1697	333
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	576	179	1900	0	0	1845	362
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	15	0
Lane Group Flow (vph)	0	0	0	0	0	576	179	1900	0	0	2192	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						110.0	15.2	110.0			86.8	
Effective Green, g (s)						110.0	15.2	110.0			86.8	
Actuated g/C Ratio						1.00	0.14	1.00			0.79	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	245	5085			3914	
v/s Ratio Prot							c0.10	0.37			c0.44	
v/s Ratio Perm						0.36						
v/c Ratio						0.36	0.73	0.37			0.56	
Uniform Delay, d1						0.0	45.4	0.0			4.4	
Progression Factor						1.00	1.07	1.00			1.00	
Incremental Delay, d2						0.6	9.5	0.2			0.6	
Delay (s)						0.6	57.9	0.2			5.0	
Level of Service						A	E	A			A	
Approach Delay (s)		0.0			0.6			5.2			5.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	4.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: H-1 EB & Kunia Road

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↓↓↓↓			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.86			0.91
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3433	1583	6408			5085
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3433	1583	6408			5085
Volume (vph)	403	363	2072	0	0	1509
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	438	395	2252	0	0	1640
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	438	395	2252	0	0	1640
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	17.4	110.0	84.6			84.6
Effective Green, g (s)	17.4	110.0	84.6			84.6
Actuated g/C Ratio	0.16	1.00	0.77			0.77
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	543	1583	4928			3911
v/s Ratio Prot	c0.13		c0.35			0.32
v/s Ratio Perm		0.25				
v/c Ratio	0.81	0.25	0.46			0.42
Uniform Delay, d1	44.7	0.0	4.5			4.3
Progression Factor	1.00	1.00	0.76			1.01
Incremental Delay, d2	8.6	0.4	0.3			0.3
Delay (s)	53.2	0.4	3.7			4.7
Level of Service	D	A	A			A
Approach Delay (s)	28.2		3.7			4.7
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.91		0.97	0.91				1.00			1.00
Frt		0.98		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		5006		3433	5085				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		5006		3433	5085				1611			1611
Volume (vph)	0	2066	240	498	721	0	0	0	429	0	0	481
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2246	261	541	784	0	0	0	466	0	0	523
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2498	0	541	784	0	0	0	466	0	0	523
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		79.5		22.5	110.0				110.0			110.0
Effective Green, g (s)		79.5		22.5	110.0				110.0			110.0
Actuated g/C Ratio		0.72		0.20	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		3618		702	5085				1611			1611
v/s Ratio Prot		c0.50		c0.16	0.15							
v/s Ratio Perm									0.29			0.32
v/c Ratio		0.69		0.77	0.15				0.29			0.32
Uniform Delay, d1		8.4		41.3	0.0				0.0			0.0
Progression Factor		0.65		1.45	1.00				1.00			1.00
Incremental Delay, d2		0.8		1.6	0.0				0.5			0.5
Delay (s)		6.3		61.4	0.0				0.5			0.5
Level of Service		A		E	A				A			A
Approach Delay (s)		6.3			25.1			0.5			0.5	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑			↑↑↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	*0.99			*0.99				1.00			
Frt	1.00	1.00			0.95				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	5532			5269				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	5532			5269				1611			
Volume (vph)	1165	1330	0	0	1218	567	0	0	911	0	0	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1177	1343	0	0	1230	573	0	0	920	0	0	0
RTOR Reduction (vph)	0	0	0	0	57	0	0	0	0	0	0	0
Lane Group Flow (vph)	1177	1343	0	0	1746	0	0	0	920	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	67.0	110.0			35.0				110.0			
Effective Green, g (s)	67.0	110.0			35.0				110.0			
Actuated g/C Ratio	0.61	1.00			0.32				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	1078	5532			1677				1611			
v/s Ratio Prot	c0.67	0.24			c0.33							
v/s Ratio Perm									0.57			
v/c Ratio	1.09	0.24			1.04				0.57			
Uniform Delay, d1	21.5	0.0			37.5				0.0			
Progression Factor	0.34	1.00			1.00				1.00			
Incremental Delay, d2	53.4	0.1			33.6				1.5			
Delay (s)	60.7	0.1			71.1				1.5			
Level of Service	E	A			E				A			
Approach Delay (s)		28.4			71.1			1.5			0.0	
Approach LOS		C			E			A			A	

Intersection Summary			
HCM Average Control Delay	38.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	107.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰↑	↱		↰↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	1.00	*0.99	1.00		1.00	1.00		*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	3504	5532	1583	1770	5532	1583		1780	1583		3568	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (perm)	3504	5532	1583	1770	5532	1583		1780	1583		3568	1583
Volume (vph)	147	1938	155	119	1619	156	56	5	48	92	45	113
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	160	2107	168	129	1760	170	61	5	52	100	49	123
RTOR Reduction (vph)	0	0	74	0	0	91	0	0	45	0	0	111
Lane Group Flow (vph)	160	2107	94	129	1760	79	0	66	7	0	149	12
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.7	48.2	48.2	10.2	44.7	44.7		12.8	12.8		9.6	9.6
Effective Green, g (s)	13.7	48.2	48.2	10.2	44.7	44.7		12.8	12.8		9.6	9.6
Actuated g/C Ratio	0.14	0.50	0.50	0.11	0.46	0.46		0.13	0.13		0.10	0.10
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	496	2755	788	187	2555	731		235	209		354	157
v/s Ratio Prot	c0.05	c0.38		c0.07	0.32			c0.04			c0.04	
v/s Ratio Perm			0.06			0.05			0.00			0.01
v/c Ratio	0.32	0.76	0.12	0.69	0.69	0.11		0.28	0.03		0.42	0.08
Uniform Delay, d1	37.4	19.7	13.0	41.8	20.6	14.8		37.9	36.6		41.0	39.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	1.3	0.1	10.1	0.8	0.1		3.0	0.3		0.8	0.2
Delay (s)	37.8	21.0	13.0	51.9	21.3	14.8		40.8	36.9		41.8	39.8
Level of Service	D	C	B	D	C	B		D	D		D	D
Approach Delay (s)		21.6			22.7			39.1			40.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	96.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Laulaunui Street & Fort Weaver Road

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		*0.99		1.00	1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	96	24	12	72	4	235	48	4056	53	92	1419	170
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	97	24	12	73	4	237	48	4097	54	93	1433	172
RTOR Reduction (vph)	0	6	0	0	0	102	0	0	10	0	0	52
Lane Group Flow (vph)	0	127	0	73	4	135	48	4097	44	93	1433	120
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		10.6		10.0	10.0	10.0	7.4	101.0	101.0	7.9	101.5	101.5
Effective Green, g (s)		10.6		10.0	10.0	10.0	7.4	101.0	101.0	7.9	101.5	101.5
Actuated g/C Ratio		0.07		0.07	0.07	0.07	0.05	0.69	0.69	0.05	0.70	0.70
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		256		122	128	109	90	3840	1099	96	3859	1104
v/s Ratio Prot		c0.04		0.04	0.00		0.03	c0.74		c0.05	0.26	
v/s Ratio Perm						c0.09			0.03			0.08
v/c Ratio		0.50		0.60	0.03	1.24	0.53	1.07	0.04	0.97	0.37	0.11
Uniform Delay, d1		64.9		65.8	63.2	67.8	67.4	22.2	7.0	68.7	9.0	7.2
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.5		7.7	0.1	165.3	6.0	36.3	0.1	80.7	0.3	0.2
Delay (s)		66.4		73.5	63.3	233.0	73.3	58.6	7.1	149.4	9.3	7.4
Level of Service		E		E	E	F	E	E	A	F	A	A
Approach Delay (s)		66.4			193.8			58.1			16.7	
Approach LOS		E			F			E			B	

Intersection Summary			
HCM Average Control Delay	53.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	145.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	108.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Old Fort Weaver Road & Fort Weaver Road

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1785	1583		1862	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.32	1.00		0.70	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		596	1583		1311	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	851	126	403	4	484	262	299	3044	1	21	949	532
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	860	127	407	4	489	265	302	3075	1	21	959	537
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	0	0	0	204
Lane Group Flow (vph)	0	987	407	0	493	228	302	3075	1	21	959	333
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		75.0	149.6		75.0	75.0	27.9	60.2	149.6	2.4	34.7	34.7
Effective Green, g (s)		75.0	149.6		75.0	75.0	27.9	60.2	149.6	2.4	34.7	34.7
Actuated g/C Ratio		0.50	1.00		0.50	0.50	0.19	0.40	1.00	0.02	0.23	0.23
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		299	1583		657	794	330	2226	1583	28	1283	367
v/s Ratio Prot							c0.17	c0.56		0.01	0.17	
v/s Ratio Perm		c1.66	0.26		0.38	0.14			0.00			0.21
v/c Ratio		3.30	0.26		0.75	0.29	0.92	1.38	0.00	0.75	0.75	0.91
Uniform Delay, d1		37.3	0.0		29.8	21.7	59.7	44.7	0.0	73.3	53.4	55.9
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1044.0	0.4		4.8	0.2	28.7	174.5	0.0	71.8	4.0	28.4
Delay (s)		1081.3	0.4		34.6	21.9	88.4	219.2	0.0	145.1	57.4	84.3
Level of Service		F	A		C	C	F	F	A	F	E	F
Approach Delay (s)		765.7			30.2			207.5			68.1	
Approach LOS		F			C			F			E	

Intersection Summary			
HCM Average Control Delay	268.8	HCM Level of Service	F
HCM Volume to Capacity ratio	2.43		
Actuated Cycle Length (s)	149.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	154.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

9: Renton Road & Fort Weaver Road — 2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↑	↱		✥		↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00		1.00		1.00	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1766	1583		1765		1770	5532	1583	1770	5532	1583
Flt Permitted	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1766	1583		1765		1770	5532	1583	1770	5532	1583
Volume (vph)	468	31	36	10	339	217	89	2658	1	251	1023	85
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	473	31	36	10	342	219	90	2685	1	254	1033	86
RTOR Reduction (vph)	0	0	0	0	15	0	0	0	0	0	0	47
Lane Group Flow (vph)	246	258	36	0	556	0	90	2685	1	254	1033	39
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	20.0	20.0	150.0		33.0		12.3	65.0	65.0	16.0	68.7	68.7
Effective Green, g (s)	20.0	20.0	150.0		33.0		12.3	65.0	65.0	16.0	68.7	68.7
Actuated g/C Ratio	0.13	0.13	1.00		0.22		0.08	0.43	0.43	0.11	0.46	0.46
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	234	235	1583		388		145	2397	686	189	2534	725
v/s Ratio Prot	0.14	c0.15			c0.32		0.05	c0.49		c0.14	c0.19	
v/s Ratio Perm			0.02						0.00			0.02
v/c Ratio	1.05	1.10	0.02		1.43		0.62	1.12	0.00	1.34	0.41	0.05
Uniform Delay, d1	65.0	65.0	0.0		58.5		66.6	42.5	24.1	67.0	27.1	22.6
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	73.0	87.4	0.0		209.3		8.0	60.3	0.0	185.8	0.5	0.1
Delay (s)	138.0	152.4	0.0		267.8		74.6	102.8	24.1	252.8	27.6	22.7
Level of Service	F	F	A		F		E	F	C	F	C	C
Approach Delay (s)		135.6			267.8			101.9			68.9	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	114.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	124.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

10: Farrington Hwy & D Street — 2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑		↰↰	↑↑↑↱			↑↱	↱	↰	✥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	*0.99		*0.99	*0.99			*0.99	*0.99	*0.99	*0.99	
Frt	1.00	1.00		1.00	0.99			0.91	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5532		3504	5478			1669	1567	1752	1678	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5532		3504	5478			1669	1567	1752	1678	
Volume (vph)	146	1756	0	240	899	63	0	65	347	205	230	345
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	147	1774	0	242	908	64	0	66	351	207	232	348
RTOR Reduction (vph)	0	0	0	0	8	0	0	59	212	0	49	0
Lane Group Flow (vph)	147	1774	0	242	964	0	0	120	26	207	531	0
Turn Type	Prot			Prot					Perm	Split		
Protected Phases	5	2		1	6			8		4	4	
Permitted Phases									8			
Actuated Green, G (s)	12.1	42.8		7.0	37.7			12.2	12.2	32.0	32.0	
Effective Green, g (s)	12.1	42.8		7.0	37.7			12.2	12.2	32.0	32.0	
Actuated g/C Ratio	0.11	0.39		0.06	0.34			0.11	0.11	0.29	0.29	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	195	2152		223	1877			185	174	510	488	
v/s Ratio Prot	0.08	c0.32		c0.07	0.18			c0.07		0.12	c0.32	
v/s Ratio Perm									0.02			
v/c Ratio	0.75	0.82		1.09	0.51			0.65	0.15	0.41	1.09	
Uniform Delay, d1	47.5	30.2		51.5	28.8			46.9	44.2	31.4	39.0	
Progression Factor	0.72	0.57		0.66	0.52			1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.6	2.6		84.4	1.0			7.9	0.4	0.5	66.8	
Delay (s)	44.7	19.7		118.4	15.9			54.8	44.6	31.9	105.8	
Level of Service	D	B		F	B			D	D	C	F	
Approach Delay (s)		21.6			36.3			49.0			86.3	
Approach LOS		C			D			D			F	

Intersection Summary			
HCM Average Control Delay	40.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Farrington Hwy & E Street

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱			↑↑↱			✥		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor	1.00	*0.99			*0.99			1.00		1.00	1.00	
Frt	1.00	0.99			1.00			1.00		1.00	0.92	
Flt Protected	0.95	1.00			1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1770	5503			5515			1812		1770	1722	
Flt Permitted	0.95	1.00			1.00			0.97		0.95	1.00	
Satd. Flow (perm)	1770	5503			5515			1812		1770	1722	
Volume (vph)	51	1764	64	0	1217	27	218	189	5	133	49	50
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	1917	70	0	1323	29	237	205	5	145	53	54
RTOR Reduction (vph)	0	4	0	0	2	0	0	1	0	0	34	0
Lane Group Flow (vph)	55	1983	0	0	1350	0	0	446	0	145	73	0
Turn Type	Prot						Split			Split		
Protected Phases	5	2			6		8	8		4	4	
Permitted Phases												
Actuated Green, G (s)	4.8	54.6			45.8			30.0		13.4	13.4	
Effective Green, g (s)	4.8	54.6			45.8			30.0		13.4	13.4	
Actuated g/C Ratio	0.04	0.50			0.42			0.27		0.12	0.12	
Clearance Time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	77	2731			2296			494		216	210	
v/s Ratio Prot	0.03	c0.36			0.24			c0.25		c0.08	0.04	
v/s Ratio Perm												
v/c Ratio	0.71	0.73			0.59			0.90		0.67	0.35	
Uniform Delay, d1	51.9	21.8			24.8			38.6		46.2	44.3	
Progression Factor	0.90	0.78			0.63			1.00		1.00	1.00	
Incremental Delay, d2	21.3	1.3			0.9			19.7		7.9	1.0	
Delay (s)	68.0	18.4			16.5			58.3		54.1	45.3	
Level of Service	E	B			B			E		D	D	
Approach Delay (s)		19.7			16.5			58.3			50.4	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
12: Fort Barrette Road & Farrington Hwy

2030 + PRO (without Transit Corridor) - AM Peak

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↱	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	*0.99	*0.99	*0.99	1.00	*0.99	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	3538	1567	3504	3688	1583	3504	3688	1583	1770	3688	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	3538	1567	3504	3688	1583	3504	3688	1583	1770	3688	1583
Volume (vph)	377	708	799	572	579	161	338	441	485	80	743	707
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	381	715	807	578	585	163	341	445	490	81	751	714
RTOR Reduction (vph)	0	20	155	0	0	98	0	0	247	0	0	253
Lane Group Flow (vph)	381	951	386	578	585	65	341	445	243	81	751	461
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	26.1	64.0	64.0	34.9	72.8	72.8	21.1	67.2	67.2	13.9	60.0	60.0
Effective Green, g (s)	26.1	64.0	64.0	34.9	72.8	72.8	21.1	67.2	67.2	13.9	60.0	60.0
Actuated g/C Ratio	0.13	0.33	0.33	0.18	0.37	0.37	0.11	0.34	0.34	0.07	0.31	0.31
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	467	1155	512	624	1370	588	377	1264	543	126	1129	485
v/s Ratio Prot	0.11	c0.27		c0.16	0.16		c0.10	0.12		0.05	0.20	
v/s Ratio Perm			0.25			0.04			0.15			c0.29
v/c Ratio	0.82	0.83	0.75	0.93	0.43	0.11	0.90	0.35	0.45	0.64	0.67	0.95
Uniform Delay, d1	82.6	61.0	59.0	79.3	46.0	40.4	86.5	48.1	50.0	88.6	59.2	66.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	5.3	6.2	19.8	1.0	0.4	24.3	0.2	0.6	10.7	1.5	28.8
Delay (s)	93.2	66.3	65.2	99.1	47.0	40.8	110.7	48.3	50.6	99.3	60.7	95.4
Level of Service	F	E	E	F	D	D	F	D	D	F	E	F
Approach Delay (s)		71.4			68.9			65.9			78.8	
Approach LOS		E			E			E			E	

Intersection Summary			
HCM Average Control Delay	71.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	196.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
13: WB Ramps & North-South Road

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰		↱				↑↑	↱	↰↰	↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Lane Util. Factor	*0.99		1.00				*0.99	1.00	0.97	*0.99	
Frt	1.00		0.85				1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3504		1583				3688	1583	3433	3688	
Flt Permitted	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3504		1583				3688	1583	3433	3688	
Volume (vph)	1414	0	115	0	0	0	1103	248	585	244	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1428	0	116	0	0	0	1114	251	591	246	0
RTOR Reduction (vph)	0	0	70	0	0	0	0	173	0	0	0
Lane Group Flow (vph)	1428	0	46	0	0	0	1114	78	591	246	0
Turn Type	Prot		custom					Perm	Prot		
Protected Phases	8		8				6		5	2	
Permitted Phases								6			
Actuated Green, G (s)	40.0		40.0				31.0	31.0	17.0	52.0	
Effective Green, g (s)	40.0		40.0				31.0	31.0	17.0	52.0	
Actuated g/C Ratio	0.40		0.40				0.31	0.31	0.17	0.52	
Clearance Time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0				3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1402		633				1143	491	584	1918	
v/s Ratio Prot	c0.41		0.03				c0.30		c0.17	0.07	
v/s Ratio Perm								0.05			
v/c Ratio	1.02		0.07				0.97	0.16	1.01	0.13	
Uniform Delay, d1	30.0		18.5				34.1	25.0	41.5	12.3	
Progression Factor	1.00		1.00				1.00	1.00	0.40	0.48	
Incremental Delay, d2	28.8		0.0				21.2	0.7	34.6	0.1	
Delay (s)	58.8		18.6				55.3	25.7	51.1	6.0	
Level of Service	E		B				E	C	D	A	
Approach Delay (s)		55.8		0.0			49.9			37.9	
Approach LOS		E		A			D			D	

Intersection Summary			
HCM Average Control Delay	49.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: EB Ramps & North-South Road

Movement	EBL2	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰		↱			↰↰	↑↑			↑↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00			0.97	*0.99			*0.99	*0.99
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583			3433	3688			3688	3135
Flt Permitted	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (perm)	1770		1583			3433	3688			3688	3135
Volume (vph)	51	0	689	0	0	803	1714	0	0	778	2380
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	52	0	696	0	0	811	1731	0	0	786	2404
RTOR Reduction (vph)	0	0	18	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	52	0	678	0	0	811	1731	0	0	786	2404
Turn Type	Prot		custom			Prot					Free
Protected Phases	4		4			1	6			2	
Permitted Phases											Free
Actuated Green, G (s)	29.0		29.0			29.4	63.0			29.6	100.0
Effective Green, g (s)	29.0		29.0			29.4	63.0			29.6	100.0
Actuated g/C Ratio	0.29		0.29			0.29	0.63			0.30	1.00
Clearance Time (s)	4.0		4.0			4.0	4.0			4.0	
Vehicle Extension (s)	3.0		3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	513		459			1009	2323			1092	3135
v/s Ratio Prot	0.03		c0.43			0.24	0.47			0.21	
v/s Ratio Perm											c0.77
v/c Ratio	0.10		1.48			0.80	0.75			0.72	0.77
Uniform Delay, d1	26.0		35.5			32.6	12.9			31.5	0.0
Progression Factor	1.00		1.00			0.94	0.29			1.00	1.00
Incremental Delay, d2	0.1		225.8			1.1	0.5			4.1	1.9
Delay (s)	26.1		261.3			31.6	4.3			35.6	1.9
Level of Service	C		F			C	A			D	A
Approach Delay (s)		244.9		0.0			13.0			10.2	
Approach LOS		F		A			B			B	

Intersection Summary			
HCM Average Control Delay	38.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: North-South Road & Farrington Hwy

2030 + PRO (without Transit Corridor) - AM Peak

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	5532	1583	3504	5532	1583	3504	3688	1583	3504	3688	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	5532	1583	3504	5532	1583	3504	3688	1583	3504	3688	1583
Volume (vph)	765	1166	567	463	1804	349	544	404	227	176	488	810
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	773	1178	573	468	1822	353	549	408	229	178	493	818
RTOR Reduction (vph)	0	0	221	0	0	152	0	0	153	0	0	228
Lane Group Flow (vph)	773	1178	352	468	1822	201	549	408	76	178	493	590
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	27.0	48.7	48.7	23.3	45.0	45.0	26.0	49.7	49.7	12.3	36.0	36.0
Effective Green, g (s)	27.0	48.7	48.7	23.3	45.0	45.0	26.0	49.7	49.7	12.3	36.0	36.0
Actuated g/C Ratio	0.18	0.32	0.32	0.16	0.30	0.30	0.17	0.33	0.33	0.08	0.24	0.24
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	631	1796	514	544	1660	475	607	1222	525	287	885	380
v/s Ratio Prot	c0.22	0.21		0.13	c0.33		c0.16	0.11		0.05	0.13	
v/s Ratio Perm			c0.22			0.13			0.05			c0.37
v/c Ratio	1.23	0.66	0.69	0.86	1.10	0.42	0.90	0.33	0.14	0.62	0.56	1.55
Uniform Delay, d1	61.5	43.5	44.0	61.8	52.5	42.1	60.8	37.7	35.2	66.6	50.0	57.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	114.9	0.9	3.8	13.1	53.9	0.6	19.4	0.7	0.6	4.1	2.5	261.3
Delay (s)	176.4	44.3	47.8	74.9	106.4	42.7	80.1	38.4	35.8	70.7	52.5	318.3
Level of Service	F	D	D	E	F	D	F	D	D	E	D	F
Approach Delay (s)		85.6			92.3			57.2			200.7	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM Average Control Delay	105.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	110.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: North-South Road & North UH Connector

2030 + PRO (without Transit Corridor) - AM Peak

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑↑↱	↱	↰↰	↑↑↱		↰↰	↑↱		↰↰	↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	*0.99	0.86	*0.99	*0.99		*0.99	*0.99		*0.99	1.00	*0.99
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	5532	1362	3504	5424		3504	3608		3504	1863	3135
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	5532	1362	3504	5424		3504	3608		3504	1863	3135
Volume (vph)	51	2067	233	489	940	141	220	163	28	367	107	329
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	52	2088	235	494	949	142	222	165	28	371	108	332
RTOR Reduction (vph)	0	0	105	0	17	0	0	13	0	0	0	38
Lane Group Flow (vph)	52	2088	130	494	1074	0	222	180	0	371	108	294
Turn Type	Prot		Perm	Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		7	4		3	8	1
Permitted Phases			2									8
Actuated Green, G (s)	6.7	54.9	54.9	17.9	66.1		12.4	11.9		14.0	13.5	31.4
Effective Green, g (s)	6.7	54.9	54.9	17.9	66.1		12.4	11.9		14.0	13.5	31.4
Actuated g/C Ratio	0.06	0.48	0.48	0.16	0.58		0.11	0.10		0.12	0.12	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	103	2648	652	547	3126		379	374		428	219	968
v/s Ratio Prot	0.03	c0.38		c0.14	0.20		0.06	0.05		c0.11	c0.06	0.05
v/s Ratio Perm			0.10									0.05
v/c Ratio	0.50	0.79	0.20	0.90	0.34		0.59	0.48		0.87	0.49	0.30
Uniform Delay, d1	52.4	25.0	17.2	47.5	12.8		48.7	48.5		49.4	47.4	33.0
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.9	2.5	0.7	18.2	0.3		2.3	1.0		16.6	1.7	0.2
Delay (s)	56.2	27.5	17.9	65.7	13.1		51.0	49.5		66.1	49.1	33.2
Level of Service	E	C	B	E	B		D	D		E	D	C
Approach Delay (s)		27.2			29.5			50.3			50.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	33.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	114.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰↰	↑↱		↰↰	↑↑↱		↰↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	*0.99	0.95		0.97	*0.99		*0.99	*0.99		*0.99	*0.99	
Frt	1.00	0.95		1.00	0.87		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3504	3363		3433	3217		3504	5428		3504	5407	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3504	3363		3433	3217		3504	5428		3504	5407	
Volume (vph)	244	225	112	245	113	652	207	1454	209	193	970	173
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	265	245	122	266	123	709	225	1580	227	210	1054	188
RTOR Reduction (vph)	0	51	0	0	196	0	0	19	0	0	25	0
Lane Group Flow (vph)	265	316	0	266	636	0	225	1788	0	210	1217	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.0	23.4		13.3	23.7		11.7	37.1		16.0	41.4	
Effective Green, g (s)	13.0	23.4		13.3	23.7		11.7	37.1		16.0	41.4	
Actuated g/C Ratio	0.12	0.22		0.13	0.22		0.11	0.35		0.15	0.39	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	431	744		432	721		387	1903		530	2116	
v/s Ratio Prot	0.08	0.09		c0.08	c0.20		c0.06	c0.33		c0.06	0.23	
v/s Ratio Perm												
v/c Ratio	0.61	0.42		0.62	1.30dr		0.58	0.94		0.40	0.58	
Uniform Delay, d1	44.0	35.4		43.8	39.7		44.7	33.3		40.5	25.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	0.4		2.6	12.3		2.2	10.6		2.2	1.1	
Delay (s)	46.6	35.8		46.4	52.0		46.9	43.9		42.7	26.4	
Level of Service	D	D		D	D		D	D		D	C	
Approach Delay (s)		40.3			50.7			44.2			28.8	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	40.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	105.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	0.98		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5001		1770	4670		3433	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5001		1770	4670		3433	5085	1583	1770	5085	1583
Volume (vph)	245	519	64	229	500	597	860	315	316	118	637	491
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	266	564	70	249	543	649	935	342	343	128	692	534
RTOR Reduction (vph)	0	11	0	0	154	0	0	0	213	0	0	230
Lane Group Flow (vph)	266	623	0	249	1038	0	935	342	130	128	692	304
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	22.0	33.7		22.3	34.0		39.0	52.6	52.6	14.6	28.2	28.2
Effective Green, g (s)	22.0	33.7		22.3	34.0		39.0	52.6	52.6	14.6	28.2	28.2
Actuated g/C Ratio	0.16	0.24		0.16	0.24		0.28	0.38	0.38	0.10	0.20	0.20
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	280	1211		284	1141		962	1921	598	186	1030	321
v/s Ratio Prot	c0.15	0.12		0.14	c0.22		c0.27	0.07		0.07	0.14	
v/s Ratio Perm									0.08			c0.19
v/c Ratio	0.95	0.51		0.88	1.20dr		0.97	0.18	0.22	0.69	0.67	0.95
Uniform Delay, d1	58.1	45.7		57.1	51.1		49.6	28.9	29.3	60.1	51.2	54.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	39.8	1.6		24.7	12.2		22.3	0.0	0.2	10.1	1.7	36.3
Delay (s)	97.9	47.2		81.8	63.3		71.9	28.9	29.5	70.2	53.0	91.1
Level of Service	F	D		F	E		E	C	C	E	D	F
Approach Delay (s)		62.2			66.5			53.8			69.6	
Approach LOS		E			E			D			E	

Intersection Summary			
HCM Average Control Delay	62.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: East-West Rd. & Old Fort Weaver Rd

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1583	3433	1583
Flt Permitted	0.56	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1046	1863	3539	1583	3433	1583
Volume (vph)	21	893	310	1006	487	45
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	21	902	313	1016	492	45
RTOR Reduction (vph)	0	0	0	461	0	31
Lane Group Flow (vph)	21	902	313	555	492	14
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	29.3	29.3	29.3	29.3	16.3	16.3
Effective Green, g (s)	29.3	29.3	29.3	29.3	16.3	16.3
Actuated g/C Ratio	0.55	0.55	0.55	0.55	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	572	1018	1935	865	1044	481
v/s Ratio Prot		c0.48	0.09		c0.14	
v/s Ratio Perm	0.02			0.35		0.01
v/c Ratio	0.04	0.89	0.16	0.64	0.47	0.03
Uniform Delay, d1	5.6	10.7	6.0	8.5	15.1	13.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	9.4	0.0	1.6	1.5	0.1
Delay (s)	5.6	20.1	6.1	10.1	16.7	13.2
Level of Service	A	C	A	B	B	B
Approach Delay (s)		19.7	9.2		16.4	
Approach LOS		B	A		B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: Farrington Hwy & B Street

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	1863	1583	3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	1863	1583	3433	1863	1583
Volume (vph)	215	1127	203	124	897	87	49	137	126	343	223	206
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	234	1225	221	135	975	95	53	149	137	373	242	224
RTOR Reduction (vph)	0	0	107	0	0	64	0	0	10	0	0	58
Lane Group Flow (vph)	234	1225	114	135	975	31	53	149	127	373	242	166
Turn Type	Prot		pm+ov	Prot		Perm	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2	3	1	6		7	4	5	3	8	1
Permitted Phases			2			6			4			8
Actuated Green, G (s)	10.4	31.0	41.0	5.0	25.6	25.6	3.5	17.7	28.1	10.0	24.2	29.2
Effective Green, g (s)	10.4	31.0	41.0	5.0	25.6	25.6	3.5	17.7	28.1	10.0	24.2	29.2
Actuated g/C Ratio	0.13	0.39	0.51	0.06	0.32	0.32	0.04	0.22	0.35	0.13	0.30	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	448	1377	894	215	1137	508	78	414	638	431	566	659
v/s Ratio Prot	c0.07	c0.35	0.02	0.04	0.28		0.03	0.08	0.03	c0.11	c0.13	0.02
v/s Ratio Perm			0.06			0.02			0.05			0.09
v/c Ratio	0.52	0.89	0.13	0.63	0.86	0.06	0.68	0.36	0.20	0.87	0.43	0.25
Uniform Delay, d1	32.3	22.8	10.1	36.4	25.3	18.7	37.5	26.2	18.0	34.2	22.2	17.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	7.4	0.1	5.6	6.6	0.0	21.0	2.4	0.2	16.4	2.4	0.2
Delay (s)	33.4	30.2	10.1	42.1	31.9	18.8	58.6	28.6	18.1	50.6	24.6	17.8
Level of Service	C	C	B	D	C	B	E	C	B	D	C	B
Approach Delay (s)		28.0			32.0			29.1			34.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	79.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: East-West Rd. & A Street

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.86		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1842		1770	1863	1583	1770	1597		1770	1630	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1842		1770	1863	1583	1770	1597		1770	1630	
Volume (vph)	90	328	27	31	700	74	93	7	140	44	7	37
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	357	29	34	761	80	101	8	152	48	8	40
RTOR Reduction (vph)	0	2	0	0	0	34	0	134	0	0	36	0
Lane Group Flow (vph)	98	384	0	34	761	46	101	26	0	48	12	0
Turn Type	Prot			Prot		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases						6						
Actuated Green, G (s)	7.8	44.1		2.2	38.5	38.5	9.7	9.7		7.7	7.7	
Effective Green, g (s)	7.8	44.1		2.2	38.5	38.5	9.7	9.7		7.7	7.7	
Actuated g/C Ratio	0.10	0.55		0.03	0.48	0.48	0.12	0.12		0.10	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	173	1019		49	900	765	215	194		171	157	
v/s Ratio Prot	c0.06	0.21		0.02	c0.41		c0.06	0.02		c0.03	0.01	
v/s Ratio Perm						0.03						
v/c Ratio	0.57	0.38		0.69	0.85	0.06	0.47	0.14		0.28	0.08	
Uniform Delay, d1	34.3	10.0		38.4	18.0	11.0	32.6	31.3		33.4	32.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.2	0.2		34.8	7.4	0.0	1.6	0.3		0.9	0.2	
Delay (s)	38.5	10.3		73.2	25.4	11.0	34.2	31.6		34.3	33.0	
Level of Service	D	B		E	C	B	C	C		C	C	
Approach Delay (s)		16.0			25.9			32.6			33.6	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	79.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Farrington Hwy & 2nd Avenue

2030 + PRO (without Transit Corridor) - AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.95	1.00	1.00	0.95	0.88	0.97	0.95	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5044		3433	3539	1583	1770	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5044		3433	3539	1583	1770	3539	2787	3433	3539	1583
Volume (vph)	172	1091	63	241	945	299	98	391	547	241	259	138
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	187	1186	68	262	1027	325	107	425	595	262	282	150
RTOR Reduction (vph)	0	6	0	0	0	213	0	0	17	0	0	109
Lane Group Flow (vph)	187	1248	0	262	1027	112	107	425	578	262	282	41
Turn Type	Prot			Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases						6			8			4
Actuated Green, G (s)	15.0	40.0		13.0	38.0	38.0	11.0	30.2	43.2	10.8	30.0	30.0
Effective Green, g (s)	15.0	40.0		13.0	38.0	38.0	11.0	30.2	43.2	10.8	30.0	30.0
Actuated g/C Ratio	0.14	0.36		0.12	0.35	0.35	0.10	0.27	0.39	0.10	0.27	0.27
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	241	1834		406	1223	547	177	972	1196	337	965	432
v/s Ratio Prot	0.11	c0.25		0.08	c0.29		0.06	0.12	c0.06	c0.08	0.08	
v/s Ratio Perm						0.07			0.15			0.03
v/c Ratio	0.78	0.68		0.65	0.84	0.21	0.60	0.44	0.48	0.78	0.29	0.09
Uniform Delay, d1	45.9	29.6		46.3	33.2	25.4	47.4	32.9	25.0	48.4	31.6	29.9
Progression Factor	1.00	1.00		0.59	0.64	1.27	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.4	2.1		2.8	5.6	0.7	5.7	1.4	0.3	10.8	0.8	0.4
Delay (s)	60.3	31.7		29.8	27.0	32.9	53.1	34.3	25.3	59.2	32.4	30.3
Level of Service	E	C		C	C	C	D	C	C	E	C	C
Approach Delay (s)		35.4			28.6			31.4			42.0	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations		↱	↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	1976	301	0	5208
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	2148	327	0	5661
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			870			
pX, platoon unblocked	0.91	0.91			0.91	
vC, conflicting volume	3727	701			2475	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3698	358			2317	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	3	578			192	

Direction, Lane #	EB 1	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	0	614	614	614	634	1415	1415	1415	1415
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	327	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.36	0.36	0.36	0.37	0.83	0.83	0.83	0.83
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A								
Approach Delay (s)	0.0	0.0				0.0			
Approach LOS	A								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations		↱	↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	7	1846	129	0	5208
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	2007	140	0	5661
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1234			
pX, platoon unblocked	0.98	0.98			0.98	
vC, conflicting volume	3492	572			2147	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3483	510			2113	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			100	
cM capacity (veh/h)	5	499			251	

Direction, Lane #	EB 1	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	8	573	573	573	427	1415	1415	1415	1415
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	8	0	0	0	140	0	0	0	0
cSH	499	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.34	0.34	0.34	0.25	0.83	0.83	0.83	0.83
Queue Length 95th (ft)	1	0	0	0	0	0	0	0	0
Control Delay (s)	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B								
Approach Delay (s)	12.3	0.0				0.0			
Approach LOS	B								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations	↰	↑	↑	↱	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Volume (vph)	156	302	313	86	648	492
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	170	328	340	93	704	535
RTOR Reduction (vph)	0	0	0	71	0	268
Lane Group Flow (vph)	170	328	340	22	704	267
Turn Type	Prot			Prot		Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases						
Actuated Green, G (s)	7.9	26.9	15.0	15.0	28.1	28.1
Effective Green, g (s)	7.9	26.9	15.0	15.0	28.1	28.1
Actuated g/C Ratio	0.13	0.43	0.24	0.24	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	222	795	444	377	789	706
v/s Ratio Prot	c0.10	0.18	c0.18	0.01	c0.40	0.17
v/s Ratio Perm						
v/c Ratio	0.77	0.41	0.77	0.06	0.89	0.38
Uniform Delay, d1	26.7	12.6	22.4	18.5	16.1	11.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.5	0.3	7.7	0.1	14.5	1.5
Delay (s)	41.2	12.9	30.1	18.6	30.6	13.2
Level of Service	D	B	C	B	C	B
Approach Delay (s)		22.6	27.6		23.1	
Approach LOS		C	C		C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	63.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	*0.99	*0.99	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3688	3688	1583
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	466	3688	3688	1583
Volume (vph)	109	234	51	1066	1384	134
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	110	236	52	1077	1398	135
RTOR Reduction (vph)	0	5	0	0	0	81
Lane Group Flow (vph)	110	231	52	1077	1398	54
Turn Type		Perm	Perm			Perm
Protected Phases	6			4	8	
Permitted Phases		6	4			8
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	708	633	186	1475	1475	633
v/s Ratio Prot	0.06			0.29	c0.38	
v/s Ratio Perm		c0.15	0.11			0.03
v/c Ratio	0.16	0.36	0.28	0.73	0.95	0.09
Uniform Delay, d1	7.7	8.4	8.1	10.2	11.6	7.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	1.6	3.7	3.2	13.9	0.3
Delay (s)	8.1	10.0	11.8	13.4	25.5	7.7
Level of Service	A	B	B	B	C	A
Approach Delay (s)	9.4			13.3	23.9	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	18.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

2030 + PRO (without Transit Corridor) - PM Peak

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	*0.99	1.00	*0.99	1.00		*0.99
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3504	1583	3688	1583		5532
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3504	1583	3688	1583		5532
Volume (vph)	892	41	2670	918	0	2765
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	901	41	2697	927	0	2793
RTOR Reduction (vph)	0	4	0	180	0	0
Lane Group Flow (vph)	901	37	2697	747	0	2793
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	36.0	36.0	106.0	106.0		106.0
Effective Green, g (s)	36.0	36.0	106.0	106.0		106.0
Actuated g/C Ratio	0.24	0.24	0.71	0.71		0.71
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	841	380	2606	1119		3909
v/s Ratio Prot	c0.26		c0.73			0.50
v/s Ratio Perm		0.02		0.47		
v/c Ratio	1.07	0.10	1.03	0.67		0.71
Uniform Delay, d1	57.0	44.4	22.0	12.2		13.0
Progression Factor	1.00	1.00	1.14	1.31		1.00
Incremental Delay, d2	52.0	0.1	26.1	2.7		1.1
Delay (s)	109.0	44.5	51.2	18.6		14.2
Level of Service	F	D	D	B		B
Approach Delay (s)	106.2		42.9			14.2
Approach LOS	F		D			B

Intersection Summary			
HCM Average Control Delay	40.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	*0.99			*0.99	
Frt						0.86	1.00	1.00			0.99	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5532			5455	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5532			5455	
Volume (vph)	0	0	0	0	0	1230	427	2358	0	0	3316	341
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	0	0	0	0	1242	431	2382	0	0	3349	344
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	0	0	0	0	1242	431	2382	0	0	3684	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						150.0	35.0	150.0			107.0	
Effective Green, g (s)						150.0	35.0	150.0			107.0	
Actuated g/C Ratio						1.00	0.23	1.00			0.71	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	413	5532			3891	
v/s Ratio Prot							c0.24	0.43			c0.68	
v/s Ratio Perm						0.77						
v/c Ratio						0.77	1.04	0.43			0.95	
Uniform Delay, d1						0.0	57.5	0.0			19.0	
Progression Factor						1.00	0.93	1.00			0.76	
Incremental Delay, d2						3.6	53.4	0.2			4.0	
Delay (s)						3.6	106.9	0.2			18.5	
Level of Service						A	F	A			B	
Approach Delay (s)		0.0			3.6			16.6			18.5	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: H-1 EB & Kunia Road

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↑↑↑↑			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	*0.99	1.00	*0.99			*0.99
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3504	1583	7376			5532
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3504	1583	7376			5532
Volume (vph)	530	584	4854	0	0	2355
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	635	5276	0	0	2560
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	576	635	5276	0	0	2560
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	29.2	150.0	112.8			112.8
Effective Green, g (s)	29.2	150.0	112.8			112.8
Actuated g/C Ratio	0.19	1.00	0.75			0.75
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	682	1583	5547			4160
v/s Ratio Prot	c0.16		c0.72			0.46
v/s Ratio Perm		0.40				
v/c Ratio	0.84	0.40	0.95			0.62
Uniform Delay, d1	58.2	0.0	16.2			8.6
Progression Factor	1.00	1.00	1.01			0.97
Incremental Delay, d2	9.4	0.8	5.0			0.6
Delay (s)	67.6	0.8	21.4			8.9
Level of Service	E	A	C			A
Approach Delay (s)	32.6		21.4			8.9
Approach LOS	C		C			A

Intersection Summary			
HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	141.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		*0.99		*0.99	*0.99				1.00			1.00
Frt		0.98		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		5402		3504	5532				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		5402		3504	5532				1611			1611
Volume (vph)	0	2308	429	779	1962	0	0	0	440	0	0	903
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	2331	433	787	1982	0	0	0	444	0	0	912
RTOR Reduction (vph)	0	21	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2743	0	787	1982	0	0	0	444	0	0	912
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		79.0		63.0	150.0				150.0			150.0
Effective Green, g (s)		79.0		63.0	150.0				150.0			150.0
Actuated g/C Ratio		0.53		0.42	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2845		1472	5532				1611			1611
v/s Ratio Prot		c0.51		0.22	0.36							
v/s Ratio Perm									0.28			c0.57
v/c Ratio		0.96		0.53	0.36				0.28			0.57
Uniform Delay, d1		34.1		32.5	0.0				0.0			0.0
Progression Factor		0.23		1.00	1.00				1.00			1.00
Incremental Delay, d2		5.7		0.0	0.0				0.4			1.4
Delay (s)		13.5		32.6	0.0				0.4			1.4
Level of Service		B		C	A				A			A
Approach Delay (s)		13.5			9.3			0.4			1.4	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps — 2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑			↑↑↱				↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0				4.0			
Lane Util. Factor	1.00	*0.99			*0.99				1.00			
Frt	1.00	1.00			0.96				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1770	5532			5285				1611			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1770	5532			5285				1611			
Volume (vph)	1429	1319	0	0	2743	1164	0	0	647	0	0	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1443	1332	0	0	2771	1176	0	0	654	0	0	0
RTOR Reduction (vph)	0	0	0	0	9	0	0	0	0	0	0	0
Lane Group Flow (vph)	1443	1332	0	0	3938	0	0	0	654	0	0	0
Turn Type	Prot								Free			
Protected Phases	5	2			6							
Permitted Phases									Free			
Actuated Green, G (s)	71.0	150.0			71.0				150.0			
Effective Green, g (s)	71.0	150.0			71.0				150.0			
Actuated g/C Ratio	0.47	1.00			0.47				1.00			
Clearance Time (s)	4.0	4.0			4.0							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	838	5532			2502				1611			
v/s Ratio Prot	c0.82	0.24			c0.75							
v/s Ratio Perm									0.41			
v/c Ratio	1.72	0.24			1.57				0.41			
Uniform Delay, d1	39.5	0.0			39.5				0.0			
Progression Factor	0.52	1.00			0.69				1.00			
Incremental Delay, d2	327.4	0.1			258.5				0.8			
Delay (s)	347.9	0.1			285.7				0.8			
Level of Service	F	A			F				A			
Approach Delay (s)		180.9			285.7			0.8			0.0	
Approach LOS		F			F			A			A	

Intersection Summary			
HCM Average Control Delay	221.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.65		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	164.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street — 2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰	↱		↰↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	1.00	*0.99	1.00		1.00	1.00		*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (perm)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Volume (vph)	286	1564	116	135	3511	515	197	29	130	243	28	194
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	289	1580	117	136	3546	520	199	29	131	245	28	196
RTOR Reduction (vph)	0	0	49	0	0	136	0	0	41	0	0	106
Lane Group Flow (vph)	289	1580	68	136	3546	384	0	228	90	0	273	90
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	11.9	86.6	86.6	16.3	91.0	91.0		16.0	16.0		15.1	15.1
Effective Green, g (s)	11.9	86.6	86.6	16.3	91.0	91.0		16.0	16.0		15.1	15.1
Actuated g/C Ratio	0.08	0.58	0.58	0.11	0.61	0.61		0.11	0.11		0.10	0.10
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	278	3194	914	192	3356	960		190	169		355	159
v/s Ratio Prot	c0.08	0.29		c0.08	c0.64			c0.13			c0.08	
v/s Ratio Perm			0.04			0.24			0.06			0.06
v/c Ratio	1.04	0.49	0.07	0.71	1.06	0.40		1.20	0.53		1.39dl	0.57
Uniform Delay, d1	69.0	18.8	14.0	64.6	29.5	15.3		67.0	63.5		65.8	64.3
Progression Factor	1.06	1.07	1.44	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	63.8	0.5	0.2	11.3	33.2	1.2		129.5	11.5		9.6	4.5
Delay (s)	137.1	20.6	20.2	75.9	62.7	16.6		196.5	74.9		75.4	68.9
Level of Service	F	C	C	E	E	B		F	E		E	E
Approach Delay (s)		37.5			57.4			152.1			72.7	
Approach LOS		D			E			F			E	

Intersection Summary			
HCM Average Control Delay	57.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		
dl Defacto Left Lane. Recode with 1 though lane as a left lane.			
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Laulaunui Street & Fort Weaver Road

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		*0.99		1.00	1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3518		1770	1863	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3518		1770	1863	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	209	37	13	62	4	231	56	2896	100	231	4375	82
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	211	37	13	63	4	233	57	2925	101	233	4419	83
RTOR Reduction (vph)	0	3	0	0	0	187	0	0	27	0	0	17
Lane Group Flow (vph)	0	258	0	63	4	46	57	2925	74	233	4419	66
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		14.8		5.0	5.0	5.0	4.0	92.0	92.0	21.0	109.0	109.0
Effective Green, g (s)		14.8		5.0	5.0	5.0	4.0	92.0	92.0	21.0	109.0	109.0
Actuated g/C Ratio		0.10		0.03	0.03	0.03	0.03	0.62	0.62	0.14	0.73	0.73
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		350		59	63	53	48	3420	979	250	4052	1160
v/s Ratio Prot		c0.07		c0.04	0.00		c0.03	0.53		0.13	c0.80	
v/s Ratio Perm						0.03			0.05			0.04
v/c Ratio		1.19dl		1.07	0.06	0.86	1.19	0.86	0.08	0.93	1.09	0.06
Uniform Delay, d1		65.1		71.9	69.6	71.5	72.4	23.0	11.4	63.2	19.9	5.6
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		7.9		137.3	0.4	73.0	189.9	3.0	0.2	38.7	45.5	0.1
Delay (s)		73.0		209.2	70.1	144.6	262.3	26.0	11.5	101.9	65.4	5.6
Level of Service		E		F	E	F	F	C	B	F	E	A
Approach Delay (s)		73.0			157.2			29.9			66.2	
Approach LOS		E			F			C			E	

Intersection Summary			
HCM Average Control Delay	56.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	148.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	116.1%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Old Fort Weaver Road & Fort Weaver Road

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1790	1583		1849	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.52	1.00		0.26	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		969	1583		493	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	837	200	483	37	219	89	563	2123	3	193	3255	1002
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	845	202	488	37	221	90	569	2144	3	195	3288	1012
RTOR Reduction (vph)	0	0	0	0	0	42	0	0	0	0	0	315
Lane Group Flow (vph)	0	1047	488	0	258	48	569	2144	3	195	3288	697
Turn Type	Perm		Free	Perm		Perm	Prot		Free	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		8			Free			6
Actuated Green, G (s)		68.0	150.0		68.0	68.0	21.0	61.0	150.0	9.0	49.0	49.0
Effective Green, g (s)		68.0	150.0		68.0	68.0	21.0	61.0	150.0	9.0	49.0	49.0
Actuated g/C Ratio		0.45	1.00		0.45	0.45	0.14	0.41	1.00	0.06	0.33	0.33
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		439	1583		223	718	248	2250	1583	106	1807	517
v/s Ratio Prot							c0.32	0.39		0.11	c0.59	
v/s Ratio Perm		c1.08	0.31		0.52	0.03			0.00			0.44
v/c Ratio		2.38	0.31		1.16	0.07	2.29	0.95	0.00	1.84	1.82	1.35
Uniform Delay, d1		41.0	0.0		41.0	23.1	64.5	43.1	0.0	70.5	50.5	50.5
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		630.2	0.5		109.1	0.0	595.1	10.7	0.0	412.0	371.0	169.1
Delay (s)		671.2	0.5		150.1	23.2	659.6	53.8	0.0	482.5	421.5	219.6
Level of Service		F	A		F	C	F	D	A	F	F	F
Approach Delay (s)		458.0			117.3			180.7			378.7	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	322.9	HCM Level of Service	F
HCM Volume to Capacity ratio	2.17		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	177.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Renton Road & Fort Weaver Road

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00		1.00		1.00	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	0.85		0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1761	1583		1693		1770	5532	1583	1770	5532	1583
Flt Permitted	0.95	0.96	1.00		1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1761	1583		1693		1770	5532	1583	1770	5532	1583
Volume (vph)	725	23	43	9	151	326	45	2103	75	514	3074	519
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	732	23	43	9	153	329	45	2124	76	519	3105	524
RTOR Reduction (vph)	0	0	0	0	49	0	0	0	7	0	0	205
Lane Group Flow (vph)	368	387	43	0	442	0	45	2124	69	519	3105	319
Turn Type	Split		Free	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free						2			6
Actuated Green, G (s)	28.0	28.0	150.0		26.0		4.0	49.0	49.0	31.0	76.0	76.0
Effective Green, g (s)	28.0	28.0	150.0		26.0		4.0	49.0	49.0	31.0	76.0	76.0
Actuated g/C Ratio	0.19	0.19	1.00		0.17		0.03	0.33	0.33	0.21	0.51	0.51
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	327	329	1583		293		47	1807	517	366	2803	802
v/s Ratio Prot	0.21	c0.22			c0.26		0.03	c0.38		c0.29	0.56	
v/s Ratio Perm			0.03						0.04			0.20
v/c Ratio	1.13	1.18	0.03		1.51		0.96	1.18	0.13	1.42	1.11	0.40
Uniform Delay, d1	61.0	61.0	0.0		62.0		72.9	50.5	35.5	59.5	37.0	22.9
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	88.1	106.5	0.0		246.1		114.0	85.1	0.5	203.5	54.4	1.5
Delay (s)	149.1	167.5	0.0		308.1		186.9	135.6	36.1	263.0	91.4	24.3
Level of Service	F	F	A		F		F	F	D	F	F	C
Approach Delay (s)		150.0			308.1			133.3			104.4	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	130.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	131.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Farrington Hwy & D Street

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	*0.99		*0.99	*0.99			*0.99	*0.99	*0.99	*0.99	
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	0.99	
Satd. Flow (prot)	1770	5532		3504	5473			1844	1567	1752	1614	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	0.99	
Satd. Flow (perm)	1770	5532		3504	5473			1844	1567	1752	1614	
Volume (vph)	99	2335	0	425	2265	175	0	179	45	357	7	259
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	100	2359	0	429	2288	177	0	181	45	361	7	262
RTOR Reduction (vph)	0	0	0	0	6	0	0	0	40	0	82	0
Lane Group Flow (vph)	100	2359	0	429	2459	0	0	181	5	291	257	0
Turn Type	Prot			Prot					Perm	Split		
Protected Phases	5	2		1	6			8		4	4	
Permitted Phases									8			
Actuated Green, G (s)	10.0	72.6		19.0	81.6			16.0	16.0	26.4	26.4	
Effective Green, g (s)	10.0	72.6		19.0	81.6			16.0	16.0	26.4	26.4	
Actuated g/C Ratio	0.07	0.48		0.13	0.54			0.11	0.11	0.18	0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	118	2677		444	2977			197	167	308	284	
v/s Ratio Prot	0.06	c0.43		c0.12	0.45			c0.10		c0.17	0.16	
v/s Ratio Perm									0.00			
v/c Ratio	0.85	0.88		0.97	0.83			0.92	0.03	0.94	0.90	
Uniform Delay, d1	69.2	34.8		65.2	28.3			66.4	60.0	61.1	60.6	
Progression Factor	1.03	0.70		0.91	0.77			1.00	1.00	1.00	1.00	
Incremental Delay, d2	26.4	2.8		32.1	2.6			41.5	0.1	36.6	29.6	
Delay (s)	97.6	27.0		91.7	24.4			107.8	60.1	97.7	90.2	
Level of Service	F	C		F	C			F	E	F	F	
Approach Delay (s)		29.9			34.4			98.3			93.6	
Approach LOS		C			C			F			F	

Intersection Summary			
HCM Average Control Delay	40.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Farrington Hwy & E Street

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱			↑↑↱			✥		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor	1.00	*0.99			*0.99			1.00		1.00	1.00	
Frt	1.00	0.98			1.00			1.00		1.00	0.94	
Flt Protected	0.95	1.00			1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1770	5428			5519			1801		1770	1743	
Flt Permitted	0.95	1.00			1.00			0.97		0.95	1.00	
Satd. Flow (perm)	1770	5428			5519			1801		1770	1743	
Volume (vph)	77	2202	318	0	2482	42	203	110	5	227	130	97
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	78	2224	321	0	2507	42	205	111	5	229	131	98
RTOR Reduction (vph)	0	14	0	0	1	0	0	0	0	0	18	0
Lane Group Flow (vph)	78	2531	0	0	2548	0	0	321	0	229	211	0
Turn Type	Prot						Split			Split		
Protected Phases	5	2			6		8	8		4	4	
Permitted Phases												
Actuated Green, G (s)	7.0	90.2			79.2			27.8		20.0	20.0	
Effective Green, g (s)	7.0	90.2			79.2			27.8		20.0	20.0	
Actuated g/C Ratio	0.05	0.60			0.53			0.19		0.13	0.13	
Clearance Time (s)	4.0	4.0			4.0			4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	83	3264			2914			334		236	232	
v/s Ratio Prot	0.04	c0.47			c0.46			c0.18		c0.13	0.12	
v/s Ratio Perm												
v/c Ratio	0.94	0.78			0.87			0.96		0.97	0.91	
Uniform Delay, d1	71.3	22.3			31.0			60.6		64.7	64.1	
Progression Factor	0.73	0.41			0.77			1.00		1.00	1.00	
Incremental Delay, d2	55.9	1.1			2.1			38.8		50.0	35.0	
Delay (s)	107.7	10.2			26.0			99.3		114.7	99.1	
Level of Service	F	B			C			F		F	F	
Approach Delay (s)		13.1			26.0			99.3			106.9	
Approach LOS		B			C			F			F	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
12: Fort Barrette Road & Farrington Hwy

2030 + PRO (without Transit Corridor) - PM Peak

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↱	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	*0.99	*0.99	*0.99	1.00	*0.99	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	3533	1567	3504	3688	1583	3504	3688	1583	1770	3688	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	3533	1567	3504	3688	1583	3504	3688	1583	1770	3688	1583
Volume (vph)	493	483	724	355	405	113	678	660	746	226	1028	677
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	498	488	731	359	409	114	685	667	754	228	1038	684
RTOR Reduction (vph)	0	21	286	0	0	94	0	0	232	0	0	202
Lane Group Flow (vph)	498	657	255	359	409	20	685	667	522	228	1038	482
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	28.8	38.3	38.3	21.8	31.3	31.3	38.7	74.0	74.0	27.2	62.5	62.5
Effective Green, g (s)	28.8	38.3	38.3	21.8	31.3	31.3	38.7	74.0	74.0	27.2	62.5	62.5
Actuated g/C Ratio	0.16	0.22	0.22	0.12	0.18	0.18	0.22	0.42	0.42	0.15	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	569	763	339	431	651	279	765	1539	661	272	1300	558
v/s Ratio Prot	c0.14	c0.19		0.10	0.11		c0.20	0.18		0.13	0.28	
v/s Ratio Perm			0.16			0.01			0.33			c0.30
v/c Ratio	0.88	0.86	0.75	0.83	0.63	0.07	0.90	0.43	0.79	0.84	0.80	0.86
Uniform Delay, d1	72.5	66.9	65.1	76.0	67.6	60.9	67.3	36.7	44.9	72.9	51.7	53.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.1	9.8	9.1	12.9	4.5	0.5	13.0	0.2	6.2	19.7	3.5	13.1
Delay (s)	86.6	76.7	74.1	88.9	72.2	61.4	80.3	36.9	51.1	92.6	55.2	66.5
Level of Service	F	E	E	F	E	E	F	D	D	F	E	E
Approach Delay (s)		78.8			77.6			56.1			63.6	
Approach LOS		E			E			E			E	

Intersection Summary			
HCM Average Control Delay	67.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	177.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
13: WB Ramps & North-South Road

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰		↱				↑↑	↱	↰↰	↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Lane Util. Factor	*0.99		1.00				*0.99	1.00	0.97	*0.99	
Frt	1.00		0.85				1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3504		1583				3688	1583	3433	3688	
Flt Permitted	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3504		1583				3688	1583	3433	3688	
Volume (vph)	2099	0	412	0	0	0	495	86	368	585	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	2120	0	416	0	0	0	500	87	372	591	0
RTOR Reduction (vph)	0	0	32	0	0	0	0	73	0	0	0
Lane Group Flow (vph)	2120	0	384	0	0	0	500	14	372	591	0
Turn Type	Prot		custom					Perm	Prot		
Protected Phases	8		8				6		5	2	
Permitted Phases								6			
Actuated Green, G (s)	81.6		81.6				20.5	20.5	15.9	40.4	
Effective Green, g (s)	81.6		81.6				20.5	20.5	15.9	40.4	
Actuated g/C Ratio	0.63		0.63				0.16	0.16	0.12	0.31	
Clearance Time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0				3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	2199		994				582	250	420	1146	
v/s Ratio Prot	c0.61		0.24				c0.14		c0.11	0.16	
v/s Ratio Perm								0.01			
v/c Ratio	0.96		0.39				0.86	0.05	0.89	0.52	
Uniform Delay, d1	22.8		11.9				53.3	46.5	56.2	36.8	
Progression Factor	1.00		1.00				1.00	1.00	0.61	0.97	
Incremental Delay, d2	11.9		0.3				15.2	0.4	16.4	1.3	
Delay (s)	34.7		12.1				68.6	46.9	50.9	37.0	
Level of Service	C		B				E	D	D	D	
Approach Delay (s)		31.0		0.0			65.3			42.4	
Approach LOS		C		A			E			D	

Intersection Summary			
HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	115.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: EB Ramps & North-South Road

Movement	EBL2	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰		↱			↰↰	↑↑			↑↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00			0.97	*0.99			*0.99	*0.99
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583			3433	3688			3688	3135
Flt Permitted	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (perm)	1770		1583			3433	3688			3688	3135
Volume (vph)	92	0	1018	0	0	207	2387	0	0	861	2122
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	93	0	1028	0	0	209	2411	0	0	870	2143
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	93	0	1027	0	0	209	2411	0	0	870	2143
Turn Type	Prot		custom			Prot					Free
Protected Phases	4		4			1	6			2	
Permitted Phases											Free
Actuated Green, G (s)	58.0		58.0			12.6	64.0			47.4	130.0
Effective Green, g (s)	58.0		58.0			12.6	64.0			47.4	130.0
Actuated g/C Ratio	0.45		0.45			0.10	0.49			0.36	1.00
Clearance Time (s)	4.0		4.0			4.0	4.0			4.0	
Vehicle Extension (s)	3.0		3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	790		706			333	1816			1345	3135
v/s Ratio Prot	0.05		c0.65			0.06	c0.65			0.24	
v/s Ratio Perm											0.68
v/c Ratio	0.12		1.46			0.63	1.33			0.65	0.68
Uniform Delay, d1	21.0		36.0			56.4	33.0			34.3	0.0
Progression Factor	1.00		1.00			1.15	0.70			1.00	1.00
Incremental Delay, d2	0.1		212.7			1.2	148.8			2.4	1.2
Delay (s)	21.1		248.7			66.0	171.9			36.8	1.2
Level of Service	C		F			E	F			D	A
Approach Delay (s)		229.9		0.0			163.5			11.5	
Approach LOS		F		A			F			B	

Intersection Summary			
HCM Average Control Delay	106.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	115.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: North-South Road & Farrington Hwy

2030 + PRO (without Transit Corridor) - PM Peak

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	5532	1583	3504	5532	1583	3504	3688	1583	3504	3688	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	5532	1583	3504	5532	1583	3504	3688	1583	3504	3688	1583
Volume (vph)	815	1917	650	880	1657	393	411	756	542	539	920	915
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	823	1936	657	889	1674	397	415	764	547	544	929	924
RTOR Reduction (vph)	0	0	166	0	0	186	0	0	258	0	0	269
Lane Group Flow (vph)	823	1936	491	889	1674	212	415	764	289	544	929	655
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	30.0	46.0	46.0	29.0	45.0	45.0	18.0	34.0	34.0	25.0	41.0	41.0
Effective Green, g (s)	30.0	46.0	46.0	29.0	45.0	45.0	18.0	34.0	34.0	25.0	41.0	41.0
Actuated g/C Ratio	0.20	0.31	0.31	0.19	0.30	0.30	0.12	0.23	0.23	0.17	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	701	1696	485	677	1660	475	420	836	359	584	1008	433
v/s Ratio Prot	0.23	c0.35		c0.25	0.30		0.12	c0.21		0.16	0.25	
v/s Ratio Perm			0.31			0.13			0.18			c0.41
v/c Ratio	1.17	1.14	1.01	1.31	1.01	0.45	0.99	0.91	0.81	0.93	0.92	1.51
Uniform Delay, d1	60.0	52.0	52.0	60.5	52.5	42.4	65.9	56.6	54.9	61.7	52.9	54.5
Progression Factor	1.00	1.00	1.00	0.88	0.97	1.25	1.00	1.00	1.00	0.91	0.90	0.77
Incremental Delay, d2	92.9	71.3	44.2	147.4	19.3	1.8	41.1	16.1	17.4	11.6	7.4	236.0
Delay (s)	152.9	123.3	96.2	200.5	70.3	54.9	106.9	72.7	72.3	67.8	55.0	277.9
Level of Service	F	F	F	F	E	D	F	E	E	E	E	F
Approach Delay (s)		125.2			107.4			80.8			143.8	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	117.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	112.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: North-South Road & North UH Connector

2030 + PRO (without Transit Corridor) - PM Peak

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↑↑↱	↱	↰↰	↑↑↑↱		↰↰	↑↱		↰↰	↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	*0.99	0.86	*0.99	*0.99		*0.99	*0.99		*0.99	1.00	*0.99
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	5532	1362	3504	5397		3504	3445		3504	1863	3135
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	5532	1362	3504	5397		3504	3445		3504	1863	3135
Volume (vph)	73	1846	475	676	1942	380	315	427	334	390	121	770
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	74	1865	480	683	1962	384	318	431	337	394	122	778
RTOR Reduction (vph)	0	0	169	0	18	0	0	87	0	0	0	34
Lane Group Flow (vph)	74	1865	311	683	2328	0	318	681	0	394	122	744
Turn Type	Prot		Perm	Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		7	4		3	8	1
Permitted Phases			2									8
Actuated Green, G (s)	8.0	63.0	63.0	23.0	78.0		33.6	34.0		14.0	14.4	37.4
Effective Green, g (s)	8.0	63.0	63.0	23.0	78.0		33.6	34.0		14.0	14.4	37.4
Actuated g/C Ratio	0.05	0.42	0.42	0.15	0.52		0.22	0.23		0.09	0.10	0.25
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	183	2323	572	537	2806		785	781		327	179	865
v/s Ratio Prot	0.02	0.34		c0.19	c0.43		0.09	c0.20		c0.11	0.07	0.13
v/s Ratio Perm			0.23									0.11
v/c Ratio	0.40	0.80	0.54	1.27	0.83		0.41	0.87		1.20	0.68	0.86
Uniform Delay, d1	68.7	38.1	32.7	63.5	30.4		49.7	55.9		68.0	65.6	53.8
Progression Factor	1.00	1.00	1.00	0.72	0.39		1.00	1.00		0.65	0.65	0.52
Incremental Delay, d2	1.5	3.1	3.7	123.7	0.3		0.3	10.5		95.0	1.0	0.9
Delay (s)	70.2	41.1	36.4	169.4	12.2		50.0	66.5		139.3	43.5	28.9
Level of Service	E	D	D	F	B		D	E		F	D	C
Approach Delay (s)		41.1			47.7			61.6			63.9	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM Average Control Delay	50.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	105.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: East-West Rd. & North-South Road

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰↰	↑↱		↰↰	↑↑↱		↰↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	*0.99	0.95		0.97	*0.99		*0.99	*0.99		*0.99	*0.99	
Frt	1.00	0.94		1.00	0.89		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3504	3313		3433	3283		3504	5404		3504	5396	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3504	3313		3433	3283		3504	5404		3504	5396	
Volume (vph)	310	312	232	367	193	531	110	1553	284	611	1718	337
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	313	315	234	371	195	536	111	1569	287	617	1735	340
RTOR Reduction (vph)	0	94	0	0	237	0	0	23	0	0	25	0
Lane Group Flow (vph)	313	455	0	371	494	0	111	1833	0	617	2050	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.9	20.9		16.4	22.4		7.7	48.1		26.0	66.4	
Effective Green, g (s)	14.9	20.9		16.4	22.4		7.7	48.1		26.0	66.4	
Actuated g/C Ratio	0.12	0.16		0.13	0.18		0.06	0.38		0.20	0.52	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	410	543		442	577		212	2040		715	2812	
v/s Ratio Prot	0.09	0.14		c0.11	c0.15		0.03	c0.34		c0.18	0.38	
v/s Ratio Perm												
v/c Ratio	0.76	0.84		0.84	1.05dr		0.52	0.90		0.86	0.73	
Uniform Delay, d1	54.5	51.6		54.2	50.9		58.1	37.4		49.0	23.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.2	10.8		13.1	12.0		2.3	6.8		13.1	1.7	
Delay (s)	62.7	62.4		67.3	62.9		60.4	44.2		62.1	25.2	
Level of Service	E	E		E	E		E	D		E	C	
Approach Delay (s)		62.5			64.4			45.1			33.7	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM Average Control Delay	45.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	127.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.4%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: North-South Road & Kapolei Parkway

2030 + PRO (without Transit Corridor) - PM Peak

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.99		1.00	*0.99		*0.99	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	0.98		1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5408		1770	5196		3504	5532	1583	1770	5532	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5408		1770	5196		3504	5532	1583	1770	5532	1583
Volume (vph)	378	879	155	507	1075	735	716	643	505	121	568	352
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	382	888	157	512	1086	742	723	649	510	122	574	356
RTOR Reduction (vph)	0	19	0	0	82	0	0	0	290	0	0	305
Lane Group Flow (vph)	382	1026	0	512	1746	0	723	649	220	122	574	51
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	29.0	37.9		44.1	53.0		29.0	36.4	36.4	13.6	21.0	21.0
Effective Green, g (s)	29.0	37.9		44.1	53.0		29.0	36.4	36.4	13.6	21.0	21.0
Actuated g/C Ratio	0.20	0.26		0.30	0.36		0.20	0.25	0.25	0.09	0.14	0.14
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	347	1385		527	1861		687	1361	389	163	785	225
v/s Ratio Prot	c0.22	0.19		c0.29	c0.34		c0.21	0.12		0.07	c0.10	
v/s Ratio Perm									0.14			0.03
v/c Ratio	1.10	0.74		0.97	1.15dr		1.05	0.48	0.56	0.75	0.73	0.22
Uniform Delay, d1	59.5	50.5		51.3	45.9		59.5	47.7	48.9	65.5	60.8	56.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	78.2	3.6		31.8	10.7		48.9	0.3	1.9	17.0	3.5	0.5
Delay (s)	137.7	54.1		83.2	56.6		108.4	47.9	50.7	82.6	64.3	56.8
Level of Service	F	D		F	E		F	D	D	F	E	E
Approach Delay (s)		76.5			62.4			71.9			63.9	
Approach LOS		E			E			E			E	

Intersection Summary			
HCM Average Control Delay	68.3	HCM Level of Service	E
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	148.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: East-West Rd. & Old Fort Weaver Rd

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1583	3433	1583
Flt Permitted	0.25	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	466	1863	3539	1583	3433	1583
Volume (vph)	37	621	829	955	898	94
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	37	627	837	965	907	95
RTOR Reduction (vph)	0	0	0	560	0	55
Lane Group Flow (vph)	37	627	837	405	907	40
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	21.0	21.0	21.0	21.0	21.0	21.0
Effective Green, g (s)	21.0	21.0	21.0	21.0	21.0	21.0
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	196	782	1486	665	1442	665
v/s Ratio Prot		c0.34	0.24		c0.26	
v/s Ratio Perm	0.08			0.26		0.03
v/c Ratio	0.19	0.80	0.56	0.61	0.63	0.06
Uniform Delay, d1	9.1	12.7	11.0	11.3	11.4	8.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	5.9	0.5	1.6	2.1	0.2
Delay (s)	9.6	18.6	11.5	12.9	13.5	8.8
Level of Service	A	B	B	B	B	A
Approach Delay (s)		18.1	12.3		13.1	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: Farrington Hwy & B Street

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑	↱	↰↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	*0.99	1.00	0.97	*0.99	1.00	1.00	1.00	1.00	*0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3688	1583	3433	3688	1583	1770	1863	1583	3504	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3688	1583	3433	3688	1583	1770	1863	1583	3504	1863	1583
Volume (vph)	229	1443	356	554	1792	80	152	182	307	274	143	178
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	231	1458	360	560	1810	81	154	184	310	277	144	180
RTOR Reduction (vph)	0	0	45	0	0	23	0	0	8	0	0	16
Lane Group Flow (vph)	231	1458	315	560	1810	58	154	184	302	277	144	164
Turn Type	Prot		pm+ov	Prot		Perm	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2	3	1	6		7	4	5	3	8	1
Permitted Phases			2			6			4			8
Actuated Green, G (s)	24.0	73.3	85.3	31.7	81.0	81.0	13.0	17.0	41.0	12.0	16.0	47.7
Effective Green, g (s)	24.0	73.3	85.3	31.7	81.0	81.0	13.0	17.0	41.0	12.0	16.0	47.7
Actuated g/C Ratio	0.16	0.49	0.57	0.21	0.54	0.54	0.09	0.11	0.27	0.08	0.11	0.32
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	549	1802	942	726	1992	855	153	211	433	280	199	546
v/s Ratio Prot	0.07	c0.40	0.03	0.16	c0.49		c0.09	c0.10	0.11	0.08	0.08	0.06
v/s Ratio Perm			0.17			0.04			0.08			0.04
v/c Ratio	0.42	0.81	0.33	0.77	0.91	0.07	1.01	0.87	0.70	0.99	0.72	0.30
Uniform Delay, d1	56.7	32.4	17.2	55.7	31.2	16.5	68.5	65.4	48.9	68.9	64.9	38.6
Progression Factor	0.82	0.76	0.24	0.99	0.45	0.06	1.00	1.00	1.00	1.00	0.93	1.01
Incremental Delay, d2	0.2	1.5	0.1	2.1	3.3	0.1	74.5	35.8	4.8	44.0	16.3	0.2
Delay (s)	46.7	26.1	4.2	57.4	17.4	1.0	143.0	101.3	53.8	112.7	76.8	39.0
Level of Service	D	C	A	E	B	A	F	F	D	F	E	D
Approach Delay (s)		24.6			26.0			88.5			82.0	
Approach LOS		C			C			F			F	

Intersection Summary			
HCM Average Control Delay	38.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: East-West Rd. & A Street

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↱		↰	↑	↱	↰	↑↱		↰	↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.86		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1844		1770	1863	1583	1770	1599		1770	1631	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1844		1770	1863	1583	1770	1599		1770	1631	
Volume (vph)	170	768	56	34	689	616	91	8	140	46	6	31
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	185	835	61	37	749	670	99	9	152	50	7	34
RTOR Reduction (vph)	0	2	0	0	0	285	0	136	0	0	31	0
Lane Group Flow (vph)	185	894	0	37	749	385	99	25	0	50	10	0
Turn Type	Prot			Prot		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases						6						
Actuated Green, G (s)	12.6	59.8		5.3	52.5	52.5	10.7	10.7		8.2	8.2	
Effective Green, g (s)	12.6	59.8		5.3	52.5	52.5	10.7	10.7		8.2	8.2	
Actuated g/C Ratio	0.13	0.60		0.05	0.52	0.52	0.11	0.11		0.08	0.08	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	223	1103		94	978	831	189	171		145	134	
v/s Ratio Prot	0.10	c0.48		0.02	c0.40		c0.06	0.02		c0.03	0.01	
v/s Ratio Perm						0.24						
v/c Ratio	0.83	0.81		0.39	0.77	0.46	0.52	0.15		0.34	0.07	
Uniform Delay, d1	42.7	15.7		45.8	18.9	14.9	42.2	40.5		43.4	42.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	21.8	6.5		2.7	3.6	0.4	2.6	0.4		1.4	0.2	
Delay (s)	64.4	22.2		48.5	22.5	15.3	44.8	40.9		44.8	42.6	
Level of Service	E	C		D	C	B	D	D		D	D	
Approach Delay (s)		29.4			19.9			42.4			43.8	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Farrington Hwy & 2nd Avenue

2030 + PRO (without Transit Corridor) - PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰↰	↑↑	↱	↰	↑↑	↱↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.99		*0.99	*0.99	1.00	1.00	0.95	*0.99	*0.99	0.95	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5469		3504	3688	1583	1770	3539	3135	3504	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5469		3504	3688	1583	1770	3539	3135	3504	3539	1583
Volume (vph)	186	1527	127	690	1836	246	106	297	513	558	356	320
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	188	1542	128	697	1855	248	107	300	518	564	360	323
RTOR Reduction (vph)	0	7	0	0	0	70	0	0	5	0	0	161
Lane Group Flow (vph)	188	1663	0	697	1855	178	107	300	513	564	360	162
Turn Type	Prot			Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases						6			8			4
Actuated Green, G (s)	16.0	54.0		34.0	72.0	72.0	11.5	23.0	57.0	23.0	34.5	34.5
Effective Green, g (s)	16.0	54.0		34.0	72.0	72.0	11.5	23.0	57.0	23.0	34.5	34.5
Actuated g/C Ratio	0.11	0.36		0.23	0.48	0.48	0.08	0.15	0.38	0.15	0.23	0.23
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	189	1969		794	1770	760	136	543	1275	537	814	364
v/s Ratio Prot	c0.11	0.30		0.20	c0.50		c0.06	c0.08	0.09	c0.16	0.10	
v/s Ratio Perm						0.11			0.07			0.10
v/c Ratio	0.99	0.84		0.88	1.05	0.23	0.79	0.55	0.40	1.05	0.44	0.45
Uniform Delay, d1	67.0	44.1		56.0	39.0	22.9	68.0	58.7	34.0	63.5	49.5	49.5
Progression Factor	0.79	0.72		0.53	0.31	0.01	1.00	1.00	1.00	0.80	0.76	0.59
Incremental Delay, d2	50.7	3.1		5.2	29.0	0.3	25.2	4.0	0.2	27.8	0.2	0.4
Delay (s)	103.3	34.9		34.8	41.2	0.6	93.3	62.8	34.2	78.6	38.0	29.7
Level of Service	F	C		C	D	A	F	E	C	E	D	C
Approach Delay (s)		41.8			36.0			50.3			54.2	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	42.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

23: 2nd Avenue & Kunia Road

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations		↱	↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	4998	440	0	5283
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5433	478	0	5742
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			870			
pX, platoon unblocked						
vC, conflicting volume	7107	1597			5911	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	7107	1597			5911	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	0	95			7	

Direction, Lane #	EB 1	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	0	1552	1552	1552	1254	1436	1436	1436	1436
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	478	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.91	0.91	0.91	0.74	0.84	0.84	0.84	0.84
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A								
Approach Delay (s)	0.0	0.0				0.0			
Approach LOS	A								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

24: 3rd Avenue & Kunia Road

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations		↱	↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	4808	189	0	5283
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5226	205	0	5742
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1234			
pX, platoon unblocked						
vC, conflicting volume	6764	1409			5432	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6764	1409			5432	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	0	128			11	

Direction, Lane #	EB 1	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	0	1493	1493	1493	952	1436	1436	1436	1436
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	205	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.88	0.88	0.88	0.56	0.84	0.84	0.84	0.84
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A								
Approach Delay (s)	0.0	0.0				0.0			
Approach LOS	A								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		

25: East-West Rd. & B Street

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	1863	1583	1752	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	1863	1583	1752	1583
Volume (vph)	519	371	763	98	342	533
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	524	375	771	99	345	538
RTOR Reduction (vph)	0	0	0	43	0	407
Lane Group Flow (vph)	524	375	771	56	345	131
Turn Type	Prot			Prot		Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases						
Actuated Green, G (s)	35.0	89.0	50.0	50.0	23.0	23.0
Effective Green, g (s)	35.0	89.0	50.0	50.0	23.0	23.0
Actuated g/C Ratio	0.29	0.74	0.42	0.42	0.19	0.19
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	516	1382	776	660	336	303
v/s Ratio Prot	c0.30	0.20	c0.41	0.04	c0.20	0.08
v/s Ratio Perm						
v/c Ratio	1.02	0.27	0.99	0.09	1.03	0.43
Uniform Delay, d1	42.5	5.0	34.8	21.2	48.5	42.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	43.6	0.5	30.8	0.3	56.1	4.4
Delay (s)	86.1	5.5	65.6	21.4	104.6	47.2
Level of Service	F	A	E	C	F	D
Approach Delay (s)		52.5	60.6		69.6	
Approach LOS		D	E		E	

Intersection Summary			
HCM Average Control Delay	60.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

26: Btwn Fort Barret Rd and N/S Rd & Farrington Hwy

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	*0.99	*0.99	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3688	3688	1583
Flt Permitted	0.95	1.00	0.05	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	98	3688	3688	1583
Volume (vph)	200	209	96	1497	2295	155
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	202	211	97	1512	2318	157
RTOR Reduction (vph)	0	14	0	0	0	38
Lane Group Flow (vph)	202	197	97	1512	2318	119
Turn Type		Perm	Perm			Perm
Protected Phases	6			4	8	
Permitted Phases		6	4			8
Actuated Green, G (s)	16.0	16.0	76.0	76.0	76.0	76.0
Effective Green, g (s)	16.0	16.0	76.0	76.0	76.0	76.0
Actuated g/C Ratio	0.16	0.16	0.76	0.76	0.76	0.76
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	283	253	74	2803	2803	1203
v/s Ratio Prot	0.11			0.41	0.63	
v/s Ratio Perm		c0.12	c0.99			0.08
v/c Ratio	0.71	0.78	1.31	0.54	0.83	0.10
Uniform Delay, d1	39.8	40.3	12.0	4.9	7.8	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.3	20.6	208.6	0.2	2.1	0.0
Delay (s)	54.1	60.9	220.6	5.1	9.9	3.2
Level of Service	D	E	F	A	A	A
Approach Delay (s)	57.6			18.1	9.5	
Approach LOS	E			B	A	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX A-5

MITIGATIONS
YEAR 2030 PLUS PROJECT CONDITIONS
SCENARIO A: WITH TRANSIT CORRIDOR SCENARIO

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00	0.95	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	3539	1583		5085
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	3539	1583		5085
Volume (vph)	718	37	1770	492	0	1301
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	725	37	1788	497	0	1314
RTOR Reduction (vph)	0	17	0	171	0	0
Lane Group Flow (vph)	725	20	1788	326	0	1314
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	25.0	25.0	63.1	63.1		63.1
Effective Green, g (s)	25.0	25.0	63.1	63.1		63.1
Actuated g/C Ratio	0.26	0.26	0.66	0.66		0.66
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	893	412	2324	1039		3339
v/s Ratio Prot	c0.21		c0.51			0.26
v/s Ratio Perm		0.01		0.21		
v/c Ratio	0.81	0.05	0.77	0.31		0.39
Uniform Delay, d1	33.3	26.6	11.5	7.1		7.6
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	5.7	0.0	2.5	0.8		0.3
Delay (s)	39.0	26.7	14.0	7.9		8.0
Level of Service	D	C	B	A		A
Approach Delay (s)	38.4		12.7			8.0
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	96.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	0.91			0.91	
Frt						0.86	1.00	1.00			0.98	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5085			4960	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5085			4960	
Volume (vph)	0	0	0	0	0	530	163	1731	0	0	1685	331
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	576	177	1882	0	0	1832	360
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	15	0
Lane Group Flow (vph)	0	0	0	0	0	576	177	1882	0	0	2177	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						110.0	15.0	110.0			87.0	
Effective Green, g (s)						110.0	15.0	110.0			87.0	
Actuated g/C Ratio						1.00	0.14	1.00			0.79	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	241	5085			3923	
v/s Ratio Prot							c0.10	0.37			c0.44	
v/s Ratio Perm						0.36						
v/c Ratio						0.36	0.73	0.37			0.55	
Uniform Delay, d1						0.0	45.6	0.0			4.3	
Progression Factor						1.00	1.07	1.00			1.00	
Incremental Delay, d2						0.6	9.7	0.2			0.6	
Delay (s)						0.6	58.7	0.2			4.9	
Level of Service						A	E	A			A	
Approach Delay (s)		0.0			0.6			5.2			4.9	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	4.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: H-1 EB & Kunia Road
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↑↑↑↑			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.86			0.91
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3433	1583	6408			5085
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3433	1583	6408			5085
Volume (vph)	402	358	2072	0	0	1541
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	437	389	2252	0	0	1675
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	437	389	2252	0	0	1675
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	17.9	110.0	84.1			84.1
Effective Green, g (s)	17.9	110.0	84.1			84.1
Actuated g/C Ratio	0.16	1.00	0.76			0.76
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	559	1583	4899			3888
v/s Ratio Prot	c0.13		c0.35			0.33
v/s Ratio Perm		0.25				
v/c Ratio	0.78	0.25	0.46			0.43
Uniform Delay, d1	44.2	0.0	4.7			4.5
Progression Factor	1.00	1.00	0.53			0.92
Incremental Delay, d2	7.0	0.4	0.3			0.3
Delay (s)	51.2	0.4	2.8			4.5
Level of Service	D	A	A			A
Approach Delay (s)	27.3		2.8			4.5
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.91		0.97	0.91				1.00			1.00
Frt		0.98		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		5001		3433	5085				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		5001		3433	5085				1611			1611
Volume (vph)	0	1885	235	496	705	0	0	0	429	0	0	350
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2049	255	539	766	0	0	0	466	0	0	380
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2294	0	539	766	0	0	0	466	0	0	380
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		81.4		20.6	110.0				110.0			110.0
Effective Green, g (s)		81.4		20.6	110.0				110.0			110.0
Actuated g/C Ratio		0.74		0.19	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		3701		643	5085				1611			1611
v/s Ratio Prot		c0.46		c0.16	0.15							
v/s Ratio Perm									0.29			0.24
v/c Ratio		0.62		0.84	0.15				0.29			0.24
Uniform Delay, d1		6.9		43.1	0.0				0.0			0.0
Progression Factor		0.42		0.54	1.00				1.00			1.00
Incremental Delay, d2		0.6		8.6	0.1				0.5			0.3
Delay (s)		3.5		31.8	0.1				0.5			0.3
Level of Service		A		C	A				A			A
Approach Delay (s)		3.5			13.2			0.5			0.3	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑			↑↑↑	↱			↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0			
Lane Util. Factor	0.97	*0.99			*0.99	1.00			1.00			
Frt	1.00	1.00			1.00	0.85			0.86			
Flt Protected	0.95	1.00			1.00	1.00			1.00			
Satd. Flow (prot)	3433	5532			5532	1583			1611			
Flt Permitted	0.95	1.00			1.00	1.00			1.00			
Satd. Flow (perm)	3433	5532			5532	1583			1611			
Volume (vph)	928	1386	0	0	1200	567	0	0	904	0	0	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	937	1400	0	0	1212	573	0	0	913	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	68	0	0	0	0	0	0
Lane Group Flow (vph)	937	1400	0	0	1212	505	0	0	913	0	0	0
Turn Type	Prot					Perm			Free			
Protected Phases	5	2			6							
Permitted Phases						6			Free			
Actuated Green, G (s)	51.1	110.0			50.9	50.9			110.0			
Effective Green, g (s)	51.1	110.0			50.9	50.9			110.0			
Actuated g/C Ratio	0.46	1.00			0.46	0.46			1.00			
Clearance Time (s)	4.0	4.0			4.0	4.0						
Vehicle Extension (s)	3.0	3.0			3.0	3.0						
Lane Grp Cap (vph)	1595	5532			2560	732			1611			
v/s Ratio Prot	0.27	0.25			0.22							
v/s Ratio Perm						c0.32			c0.57			
v/c Ratio	0.59	0.25			0.47	0.69			0.57			
Uniform Delay, d1	21.7	0.0			20.3	23.3			0.0			
Progression Factor	1.07	1.00			1.00	1.00			1.00			
Incremental Delay, d2	0.5	0.1			0.6	5.3			1.5			
Delay (s)	23.7	0.1			21.0	28.6			1.5			
Level of Service	C	A			C	C			A			
Approach Delay (s)		9.5			23.4			1.5			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰↑	↱		↰↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00		1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (prot)	3433	5085	1583	1770	5085	1583		1780	1583		3424	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.97	1.00
Satd. Flow (perm)	3433	5085	1583	1770	5085	1583		1780	1583		3424	1583
Volume (vph)	144	1990	155	119	1681	156	56	5	48	92	45	33
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	157	2163	168	129	1827	170	61	5	52	100	49	36
RTOR Reduction (vph)	0	0	78	0	0	82	0	0	47	0	0	33
Lane Group Flow (vph)	157	2163	90	129	1827	88	0	66	5	0	149	3
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.2	44.5	44.5	7.6	42.9	42.9		8.1	8.1		7.0	7.0
Effective Green, g (s)	9.2	44.5	44.5	7.6	42.9	42.9		8.1	8.1		7.0	7.0
Actuated g/C Ratio	0.11	0.53	0.53	0.09	0.52	0.52		0.10	0.10		0.08	0.08
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	380	2720	847	162	2622	816		173	154		288	133
v/s Ratio Prot	0.05	c0.43		c0.07	0.36			c0.04			c0.04	
v/s Ratio Perm			0.06			0.06			0.00			0.00
v/c Ratio	0.41	0.80	0.11	0.80	0.70	0.11		0.38	0.03		0.52	0.02
Uniform Delay, d1	34.5	15.7	9.5	37.0	15.2	10.3		35.2	34.0		36.5	35.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.7	1.7	0.1	23.1	0.8	0.1		6.3	0.4		1.6	0.1
Delay (s)	35.2	17.3	9.6	60.1	16.1	10.4		41.5	34.4		38.1	35.0
Level of Service	D	B	A	E	B	B		D	C		D	D
Approach Delay (s)		17.9			18.3			38.4			37.5	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	83.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		*0.99		1.00	1.00	1.00	1.00	*0.99	1.00	1.00	*0.99	1.00
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Flt Permitted		0.96		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3510		1770	1863	1583	1770	5532	1583	1770	5532	1583
Volume (vph)	96	24	12	71	4	234	48	3857	52	91	1306	170
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	97	24	12	72	4	236	48	3896	53	92	1319	172
RTOR Reduction (vph)	0	6	0	0	0	110	0	0	10	0	0	53
Lane Group Flow (vph)	0	127	0	72	4	126	48	3896	43	92	1319	119
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		10.6		11.0	11.0	11.0	6.9	99.0	99.0	8.8	100.9	100.9
Effective Green, g (s)		10.6		11.0	11.0	11.0	6.9	99.0	99.0	8.8	100.9	100.9
Actuated g/C Ratio		0.07		0.08	0.08	0.08	0.05	0.68	0.68	0.06	0.69	0.69
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		256		134	141	120	84	3767	1078	107	3839	1099
v/s Ratio Prot		c0.04		0.04	0.00		0.03	c0.70		c0.05	0.24	
v/s Ratio Perm						c0.08			0.03			0.08
v/c Ratio		0.50		0.54	0.03	1.05	0.57	1.03	0.04	0.86	0.34	0.11
Uniform Delay, d1		64.8		64.7	62.2	67.2	67.8	23.2	7.6	67.7	8.9	7.4
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.5		4.1	0.1	96.2	9.1	24.5	0.1	45.5	0.2	0.2
Delay (s)		66.4		68.8	62.3	163.4	76.9	47.7	7.7	113.2	9.2	7.6
Level of Service		E		E	E	F	E	D	A	F	A	A
Approach Delay (s)		66.4			140.3			47.5			15.1	
Approach LOS		E			F			D			B	

Intersection Summary			
HCM Average Control Delay	44.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	145.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	104.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰↰	↑	↱		↰↑	↱	↰↰	↑↑↱		↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.94	1.00	1.00		0.95	1.00	0.97	*0.99		1.00	*0.99	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	4990	1863	1583		3537	1583	3433	5532		1770	5532	1583
Flt Permitted	0.95	1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	4990	1863	1583		3537	1583	3433	5532		1770	5532	1583
Volume (vph)	701	73	393	4	344	230	283	3028	1	20	925	444
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	708	74	397	4	347	232	286	3059	1	20	934	448
RTOR Reduction (vph)	0	0	0	0	0	57	0	0	0	0	0	246
Lane Group Flow (vph)	708	74	397	0	351	175	286	3060	0	20	934	202
Turn Type	Split		Free	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8						6
Actuated Green, G (s)	15.9	15.9	100.9		11.0	11.0	12.6	56.4		1.6	45.4	45.4
Effective Green, g (s)	15.9	15.9	100.9		11.0	11.0	12.6	56.4		1.6	45.4	45.4
Actuated g/C Ratio	0.16	0.16	1.00		0.11	0.11	0.12	0.56		0.02	0.45	0.45
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	786	294	1583		386	173	429	3092		28	2489	712
v/s Ratio Prot	c0.14	0.04			0.10		c0.08	c0.55		0.01	0.17	
v/s Ratio Perm			0.25			c0.11						0.13
v/c Ratio	0.90	0.25	0.25		0.91	1.01	0.67	0.99		0.71	0.38	0.28
Uniform Delay, d1	41.7	37.3	0.0		44.5	45.0	42.1	22.0		49.4	18.4	17.5
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	13.4	0.5	0.4		24.5	71.4	3.9	13.9		60.5	0.4	1.0
Delay (s)	55.2	37.7	0.4		69.0	116.4	46.0	35.9		110.0	18.8	18.5
Level of Service	E	D	A		E	F	D	D		F	B	B
Approach Delay (s)		35.6			87.9			36.8			20.0	
Approach LOS		D			F			D			B	

Intersection Summary			
HCM Average Control Delay	37.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Renton Road & Fort Weaver Road
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00		1.00	1.00	1.00	*0.99	1.00	0.97	*0.99	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1766	1583		1860	1583	1770	5532	1583	3433	5532	1583
Flt Permitted	0.95	0.96	1.00		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1766	1583		1860	1583	1770	5532	1583	3433	5532	1583
Volume (vph)	467	31	36	10	339	213	89	2631	1	248	1028	49
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	472	31	36	10	342	215	90	2658	1	251	1038	49
RTOR Reduction (vph)	0	0	0	0	0	112	0	0	0	0	0	26
Lane Group Flow (vph)	245	258	36	0	352	103	90	2658	1	251	1038	23
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	16.0	16.0	130.0		23.0	23.0	13.0	64.0	64.0	11.0	62.0	62.0
Effective Green, g (s)	16.0	16.0	130.0		23.0	23.0	13.0	64.0	64.0	11.0	62.0	62.0
Actuated g/C Ratio	0.12	0.12	1.00		0.18	0.18	0.10	0.49	0.49	0.08	0.48	0.48
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	216	217	1583		329	280	177	2723	779	290	2638	755
v/s Ratio Prot	0.14	c0.15			c0.19		0.05	c0.48		c0.07	0.19	
v/s Ratio Perm			c0.02			0.07			0.00			0.01
v/c Ratio	1.13	1.19	0.02		1.07	0.37	0.51	0.98	0.00	0.87	0.39	0.03
Uniform Delay, d1	57.0	57.0	0.0		53.5	47.1	55.5	32.3	16.8	58.8	21.9	18.1
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	102.1	121.5	0.0		69.4	0.8	2.3	12.5	0.0	22.6	0.4	0.1
Delay (s)	159.1	178.5	0.0		122.9	47.9	57.8	44.7	16.8	81.3	22.3	18.1
Level of Service	F	F	A		F	D	E	D	B	F	C	B
Approach Delay (s)		157.8			94.5			45.2			33.3	
Approach LOS		F			F			D			C	

Intersection Summary			
HCM Average Control Delay	59.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Farrington Hwy & D Street
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.91		0.97	0.91			0.95	0.95	0.95	0.95	
Frt	1.00	1.00		1.00	0.98			0.86	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5085		3433	4982			1528	1504	1681	1607	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5085		3433	4982			1528	1504	1681	1607	
Volume (vph)	130	1588	0	270	679	106	0	17	347	178	191	304
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	131	1604	0	273	686	107	0	17	351	180	193	307
RTOR Reduction (vph)	0	0	0	0	17	0	0	161	162	0	52	0
Lane Group Flow (vph)	131	1604	0	273	776	0	0	31	14	180	448	0
Turn Type	Prot			Prot					Perm	Split		
Protected Phases	5	2		1	6			8		4	4	
Permitted Phases									8			
Actuated Green, G (s)	12.8	45.0		9.0	41.2			8.5	8.5	31.5	31.5	
Effective Green, g (s)	12.8	45.0		9.0	41.2			8.5	8.5	31.5	31.5	
Actuated g/C Ratio	0.12	0.41		0.08	0.37			0.08	0.08	0.29	0.29	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	206	2080		281	1866			118	116	481	460	
v/s Ratio Prot	0.07	c0.32		c0.08	0.16			c0.02		0.11	c0.28	
v/s Ratio Perm									0.01			
v/c Ratio	0.64	0.77		0.97	0.42			0.26	0.12	0.37	0.97	
Uniform Delay, d1	46.4	28.1		50.4	25.5			47.8	47.3	31.4	38.8	
Progression Factor	0.75	0.84		0.79	0.57			1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.4	2.4		45.4	0.7			1.2	0.5	0.5	34.9	
Delay (s)	40.1	26.1		85.3	15.1			49.0	47.7	31.9	73.8	
Level of Service	D	C		F	B			D	D	C	E	
Approach Delay (s)		27.2			33.1			48.4			62.7	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM Average Control Delay	37.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Farrington Hwy & E Street

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑↱			↑↑↑↱		↰	↑↱		↰	↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.91			0.91		1.00	1.00		1.00	1.00	
Frt	1.00	1.00			1.00		1.00	0.99		1.00	0.92	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	5061			5065		1770	1844		1770	1720	
Flt Permitted	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	5061			5065		1770	1844		1770	1720	
Volume (vph)	49	1600	52	0	957	26	202	68	5	113	47	49
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	49	1616	53	0	967	26	204	69	5	114	47	49
RTOR Reduction (vph)	0	2	0	0	2	0	0	3	0	0	36	0
Lane Group Flow (vph)	49	1667	0	0	991	0	204	71	0	114	60	0
Turn Type	Prot						Split			Split		
Protected Phases	5	2			6		8	8		4	4	
Permitted Phases												
Actuated Green, G (s)	8.0	68.7			56.7		17.2	17.2		12.1	12.1	
Effective Green, g (s)	8.0	68.7			56.7		17.2	17.2		12.1	12.1	
Actuated g/C Ratio	0.07	0.62			0.52		0.16	0.16		0.11	0.11	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	129	3161			2611		277	288		195	189	
v/s Ratio Prot	0.03	c0.33			0.20		c0.12	0.04		c0.06	0.03	
v/s Ratio Perm												
v/c Ratio	0.38	0.53			0.38		0.74	0.25		0.58	0.31	
Uniform Delay, d1	48.6	11.6			16.1		44.2	40.7		46.6	45.1	
Progression Factor	1.00	1.00			0.65		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.6			0.3		9.8	0.5		4.4	1.0	
Delay (s)	50.5	12.2			10.8		54.0	41.2		51.0	46.1	
Level of Service	D	B			B		D	D		D	D	
Approach Delay (s)		13.3			10.8			50.6			48.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	18.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
12: Fort Barrette Road & Farrington Hwy

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰↰	↑↱	↱	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3263	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3263	1441	3433	3539	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	377	707	798	572	578	159	338	438	485	78	739	704
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	381	714	806	578	584	161	341	442	490	79	746	711
RTOR Reduction (vph)	0	21	14	0	0	70	0	0	61	0	0	49
Lane Group Flow (vph)	381	931	554	578	584	91	341	442	429	79	746	662
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	1	6	7	5	2	3	7	4	5	3	8	1
Permitted Phases			6			2			4			8
Actuated Green, G (s)	22.0	44.1	58.2	24.1	46.2	56.3	14.1	36.6	60.7	10.1	32.6	54.6
Effective Green, g (s)	22.0	44.1	58.2	24.1	46.2	56.3	14.1	36.6	60.7	10.1	32.6	54.6
Actuated g/C Ratio	0.17	0.34	0.44	0.18	0.35	0.43	0.11	0.28	0.46	0.08	0.25	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	577	1099	685	632	1249	729	370	990	782	137	881	709
v/s Ratio Prot	0.11	c0.29	c0.09	0.17	0.17	0.01	0.10	0.12	c0.10	0.04	0.21	c0.16
v/s Ratio Perm			0.30			0.05			0.17			0.26
v/c Ratio	0.66	0.85	0.81	0.91	0.47	0.12	0.92	0.45	0.55	0.58	0.85	0.93
Uniform Delay, d1	51.0	40.3	31.5	52.4	32.8	22.5	57.9	38.8	25.2	58.3	46.8	36.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	6.2	7.0	17.8	1.3	0.1	27.9	0.3	0.8	5.8	7.6	19.3
Delay (s)	53.8	46.5	38.5	70.2	34.1	22.5	85.7	39.1	26.0	64.1	54.3	55.7
Level of Service	D	D	D	E	C	C	F	D	C	E	D	E
Approach Delay (s)		45.5			48.5			46.6			55.5	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	48.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
13: WB Ramps & North-South Road

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰		↱				↑↑	↱	↰↰	↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Lane Util. Factor	*0.99		1.00				*0.99	1.00	0.97	*0.99	
Frt	1.00		0.85				1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3504		1583				3688	1583	3433	3688	
Flt Permitted	0.95		1.00				1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3504		1583				3688	1583	3433	3688	
Volume (vph)	1338	0	115	0	0	0	1099	248	518	222	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1352	0	116	0	0	0	1110	251	523	224	0
RTOR Reduction (vph)	0	0	71	0	0	0	0	168	0	0	0
Lane Group Flow (vph)	1352	0	45	0	0	0	1110	83	523	224	0
Turn Type	Prot		custom					Perm	Prot		
Protected Phases	8		8				6		5	2	
Permitted Phases								6			
Actuated Green, G (s)	39.0		39.0				33.0	33.0	16.0	53.0	
Effective Green, g (s)	39.0		39.0				33.0	33.0	16.0	53.0	
Actuated g/C Ratio	0.39		0.39				0.33	0.33	0.16	0.53	
Clearance Time (s)	4.0		4.0				4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0				3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1367		617				1217	522	549	1955	
v/s Ratio Prot	c0.39		0.03				c0.30		c0.15	0.06	
v/s Ratio Perm								0.05			
v/c Ratio	0.99		0.07				0.91	0.16	0.95	0.11	
Uniform Delay, d1	30.3		19.2				32.1	23.7	41.6	11.8	
Progression Factor	1.00		1.00				1.00	1.00	0.43	0.67	
Incremental Delay, d2	21.5		0.1				11.8	0.6	24.1	0.1	
Delay (s)	51.8		19.2				43.9	24.3	42.1	8.0	
Level of Service	D		B				D	C	D	A	
Approach Delay (s)		49.2		0.0			40.3			31.9	
Approach LOS		D		A			D			C	

Intersection Summary			
HCM Average Control Delay	42.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: EB Ramps & North-South Road

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL2	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰		↱↱			↰↰	↑↑			↑↑	↱↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		0.88			0.97	*0.99			*0.99	*0.99
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		2787			3433	3688			3688	3135
Flt Permitted	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (perm)	1770		2787			3433	3688			3688	3135
Volume (vph)	51	0	633	0	0	802	1634	0	0	689	2305
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	52	0	639	0	0	810	1651	0	0	696	2328
RTOR Reduction (vph)	0	0	36	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	52	0	603	0	0	810	1651	0	0	696	2328
Turn Type	Prot		custom			Prot					Free
Protected Phases	4		4			1	6			2	
Permitted Phases											Free
Actuated Green, G (s)	25.8		25.8			29.7	66.2			32.5	100.0
Effective Green, g (s)	25.8		25.8			29.7	66.2			32.5	100.0
Actuated g/C Ratio	0.26		0.26			0.30	0.66			0.32	1.00
Clearance Time (s)	4.0		4.0			4.0	4.0			4.0	
Vehicle Extension (s)	3.0		3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	457		719			1020	2441			1199	3135
v/s Ratio Prot	0.03		0.22			0.24	0.45			0.19	
v/s Ratio Perm											c0.74
v/c Ratio	0.11		0.84			0.79	0.68			0.58	0.74
Uniform Delay, d1	28.4		35.1			32.3	10.3			28.1	0.0
Progression Factor	1.00		1.00			1.01	0.49			1.00	1.00
Incremental Delay, d2	0.1		8.5			1.4	0.5			2.1	1.6
Delay (s)	28.5		43.6			34.2	5.5			30.1	1.6
Level of Service	C		D			C	A			C	A
Approach Delay (s)		42.4		0.0			15.0			8.2	
Approach LOS		D		A			B			A	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: North-South Road & Farrington Hwy — 2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	1.00	*0.99	*0.99	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3504	5532	1583	5256	5532	1583	3504	3688	1583	3504	3688	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3504	5532	1583	5256	5532	1583	3504	3688	1583	3504	3688	2787
Volume (vph)	514	1147	563	459	1739	344	542	393	224	172	483	713
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	519	1159	569	464	1757	347	547	397	226	174	488	720
RTOR Reduction (vph)	0	0	273	0	0	193	0	0	186	0	0	386
Lane Group Flow (vph)	519	1159	296	464	1757	154	547	397	40	174	488	334
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Actuated Green, G (s)	20.3	35.5	35.5	26.8	42.0	42.0	22.0	21.0	21.0	20.0	19.0	19.0
Effective Green, g (s)	20.3	35.5	35.5	26.8	42.0	42.0	22.0	21.0	21.0	20.0	19.0	19.0
Actuated g/C Ratio	0.17	0.30	0.30	0.22	0.35	0.35	0.18	0.18	0.18	0.17	0.16	0.16
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	596	1646	471	1181	1948	557	646	649	279	587	587	444
v/s Ratio Prot	c0.15	0.21		0.09	c0.32		c0.16	0.11		0.05	c0.13	
v/s Ratio Perm			0.19			0.10			0.03			0.12
v/c Ratio	0.87	0.70	0.63	0.39	0.90	0.28	0.85	0.61	0.14	0.30	0.83	0.75
Uniform Delay, d1	48.2	37.2	36.2	39.3	36.7	27.7	47.0	45.4	41.5	43.5	48.6	47.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.1	1.4	2.6	0.2	6.3	0.3	13.0	4.3	1.1	0.3	12.9	11.2
Delay (s)	61.4	38.6	38.8	39.5	42.9	28.0	60.0	49.7	42.6	43.8	61.5	59.1
Level of Service	E	D	D	D	D	C	E	D	D	D	E	E
Approach Delay (s)		43.9			40.3			53.1			58.0	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	46.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	119.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: North-South Road & North UH Connector — 2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.86	0.86	0.97	0.91		0.97	0.95		0.97	1.00	0.88
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	4806	1362	3433	4987		3433	3461		3433	1863	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	4806	1362	3433	4987		3433	3461		3433	1863	2787
Volume (vph)	51	2024	224	471	934	138	217	161	28	353	103	300
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	52	2044	226	476	943	139	219	163	28	357	104	303
RTOR Reduction (vph)	0	0	105	0	17	0	0	14	0	0	0	70
Lane Group Flow (vph)	52	2044	121	476	1065	0	219	177	0	357	104	233
Turn Type	Prot		Perm	Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		7	4		3	8	1
Permitted Phases			2									8
Actuated Green, G (s)	4.1	40.8	40.8	13.0	49.7		14.0	10.9		13.9	10.8	23.8
Effective Green, g (s)	4.1	40.8	40.8	13.0	49.7		14.0	10.9		13.9	10.8	23.8
Actuated g/C Ratio	0.04	0.43	0.43	0.14	0.53		0.15	0.12		0.15	0.11	0.25
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	77	2073	587	472	2620		508	399		504	213	819
v/s Ratio Prot	0.03	c0.43		c0.14	0.21		0.06	0.05		c0.10	c0.06	0.04
v/s Ratio Perm			0.09									0.04
v/c Ratio	0.68	0.99	0.21	1.01	0.41		0.43	0.44		0.71	0.49	0.28
Uniform Delay, d1	44.6	26.6	16.8	40.8	13.6		36.7	39.0		38.4	39.3	28.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	20.9	16.7	0.8	43.6	0.5		0.6	0.8		4.5	1.8	0.2
Delay (s)	65.5	43.3	17.6	84.4	14.0		37.3	39.8		42.9	41.1	28.7
Level of Service	E	D	B	F	B		D	D		D	D	C
Approach Delay (s)		41.3			35.5			38.4			37.1	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	38.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	94.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: East-West Rd. & North-South Road
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰↰	↑↱		↰↰	↑↑↑	↱	↰↰	↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	0.95		0.97	0.95		0.97	0.91	1.00	0.97	0.91	
Frt	1.00	0.95		1.00	0.87		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3362		3433	3066		3433	5085	1583	3433	4969	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3362		3433	3066		3433	5085	1583	3433	4969	
Volume (vph)	243	224	112	239	75	614	207	1442	206	189	954	172
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	245	226	113	241	76	620	209	1457	208	191	964	174
RTOR Reduction (vph)	0	59	0	0	183	0	0	0	129	0	23	0
Lane Group Flow (vph)	245	280	0	241	513	0	209	1457	79	191	1115	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	12.6	21.3		11.7	20.4		10.2	40.1	40.1	16.0	45.9	
Effective Green, g (s)	12.6	21.3		11.7	20.4		10.2	40.1	40.1	16.0	45.9	
Actuated g/C Ratio	0.12	0.20		0.11	0.19		0.10	0.38	0.38	0.15	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	412	681		382	595		333	1940	604	523	2170	
v/s Ratio Prot	c0.07	0.08		0.07	c0.17		c0.06	c0.29		0.06	c0.22	
v/s Ratio Perm									0.05			
v/c Ratio	0.59	0.41		0.63	1.27dr		0.63	0.75	0.13	0.37	0.51	
Uniform Delay, d1	43.8	36.4		44.6	41.0		45.6	28.2	21.2	40.0	21.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.3	0.4		3.4	12.3		3.7	2.7	0.5	2.0	0.9	
Delay (s)	46.1	36.9		48.0	53.3		49.3	30.9	21.6	42.0	22.4	
Level of Service	D	D		D	D		D	C	C	D	C	
Approach Delay (s)		40.7			51.9			31.9			25.2	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	35.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	105.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: North-South Road & Kapolei Parkway
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑↑↑	↱	↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.99	1.00	1.00	*0.99	1.00	*0.99	*0.99	1.00	1.00	*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5532	1583	1770	5532	1583	3504	5532	1583	1770	5532	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5532	1583	1770	5532	1583	3504	5532	1583	1770	5532	1583
Volume (vph)	245	517	64	222	496	588	855	315	316	118	637	483
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	247	522	65	224	501	594	864	318	319	119	643	488
RTOR Reduction (vph)	0	0	51	0	0	375	0	0	202	0	0	253
Lane Group Flow (vph)	247	522	14	224	501	219	864	318	117	119	643	235
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Actuated Green, G (s)	15.9	21.2	21.2	14.8	20.1	20.1	25.9	35.4	35.4	9.2	18.7	18.7
Effective Green, g (s)	15.9	21.2	21.2	14.8	20.1	20.1	25.9	35.4	35.4	9.2	18.7	18.7
Actuated g/C Ratio	0.16	0.22	0.22	0.15	0.21	0.21	0.27	0.37	0.37	0.10	0.19	0.19
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	291	1214	347	271	1151	329	939	2027	580	169	1071	306
v/s Ratio Prot	c0.14	0.09		0.13	0.09		c0.25	0.06		0.07	0.12	
v/s Ratio Perm			0.01			c0.14			0.07			c0.15
v/c Ratio	0.85	0.43	0.04	0.83	0.44	0.66	0.92	0.16	0.20	0.70	0.60	0.77
Uniform Delay, d1	39.2	32.5	29.7	39.7	33.3	35.2	34.3	20.6	20.9	42.4	35.5	36.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.0	1.1	0.2	18.3	1.2	10.2	13.9	0.0	0.2	12.5	1.0	11.0
Delay (s)	59.2	33.6	29.9	57.9	34.5	45.3	48.2	20.6	21.1	54.9	36.5	47.8
Level of Service	E	C	C	E	C	D	D	C	C	D	D	D
Approach Delay (s)		40.9			43.3			36.6			42.7	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	40.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	96.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: East-West Rd. & Old Fort Weaver Rd
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1583	3433	1583
Flt Permitted	0.58	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1080	1863	3539	1583	3433	1583
Volume (vph)	21	765	277	795	402	45
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	21	773	280	803	406	45
RTOR Reduction (vph)	0	0	0	426	0	25
Lane Group Flow (vph)	21	773	280	377	406	20
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	39.7	39.7	39.7	39.7	36.8	36.8
Effective Green, g (s)	39.7	39.7	39.7	39.7	36.8	36.8
Actuated g/C Ratio	0.47	0.47	0.47	0.47	0.44	0.44
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	507	875	1663	744	1495	689
v/s Ratio Prot		c0.41	0.08		c0.12	
v/s Ratio Perm	0.02			0.24		0.01
v/c Ratio	0.04	0.88	0.17	0.51	0.27	0.03
Uniform Delay, d1	12.1	20.3	12.9	15.6	15.3	13.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	10.5	0.0	0.5	0.4	0.1
Delay (s)	12.1	30.8	12.9	16.1	15.7	13.7
Level of Service	B	C	B	B	B	B
Approach Delay (s)		30.3	15.3		15.5	
Approach LOS		C	B		B	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	84.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: Farrington Hwy & B Street
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰	↑	↱	↰↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	1863	1583	3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	1863	1583	3433	1863	1583
Volume (vph)	206	1094	186	119	866	83	47	137	121	331	223	198
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	224	1189	202	129	941	90	51	149	132	360	242	215
RTOR Reduction (vph)	0	0	95	0	0	57	0	0	17	0	0	52
Lane Group Flow (vph)	224	1189	107	129	941	33	51	149	115	360	242	163
Turn Type	Prot		pm+ov	Prot		Perm	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2	3	1	6		7	4	5	3	8	1
Permitted Phases			2			6			4			8
Actuated Green, G (s)	11.1	35.4	48.2	8.7	33.0	33.0	3.9	18.1	29.2	12.8	27.0	35.7
Effective Green, g (s)	11.1	35.4	48.2	8.7	33.0	33.0	3.9	18.1	29.2	12.8	27.0	35.7
Actuated g/C Ratio	0.12	0.39	0.53	0.10	0.36	0.36	0.04	0.20	0.32	0.14	0.30	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	419	1377	908	328	1283	574	76	371	578	483	553	691
v/s Ratio Prot	c0.07	c0.34	0.02	0.04	0.27		0.03	0.08	0.02	c0.10	c0.13	0.02
v/s Ratio Perm			0.05			0.02			0.05			0.08
v/c Ratio	0.53	0.86	0.12	0.39	0.73	0.06	0.67	0.40	0.20	0.75	0.44	0.24
Uniform Delay, d1	37.5	25.6	10.7	38.7	25.2	18.9	42.9	31.7	22.4	37.5	25.9	18.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	5.9	0.1	0.8	2.2	0.0	20.8	3.2	0.2	6.2	2.5	0.2
Delay (s)	38.8	31.4	10.8	39.5	27.4	18.9	63.8	35.0	22.6	43.7	28.4	18.7
Level of Service	D	C	B	D	C	B	E	C	C	D	C	B
Approach Delay (s)		29.9			28.1			34.5			32.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	91.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: East-West Rd. & A Street

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.85		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1842		1770	1863	1583	1770	1591		1770	1630	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1842		1770	1863	1583	1770	1591		1770	1630	
Volume (vph)	86	324	26	31	625	27	26	4	135	43	7	37
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	93	352	28	34	679	29	28	4	147	47	8	40
RTOR Reduction (vph)	0	2	0	0	0	13	0	132	0	0	36	0
Lane Group Flow (vph)	93	378	0	34	679	16	28	19	0	47	12	0
Turn Type	Prot			Prot		Perm	Split			Split		
Protected Phases	5	2		1	6		4	4		8	8	
Permitted Phases						6						
Actuated Green, G (s)	7.6	38.9		3.0	34.3	34.3	7.3	7.3		7.4	7.4	
Effective Green, g (s)	7.6	38.9		3.0	34.3	34.3	7.3	7.3		7.4	7.4	
Actuated g/C Ratio	0.10	0.54		0.04	0.47	0.47	0.10	0.10		0.10	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	185	987		73	880	748	178	160		180	166	
v/s Ratio Prot	c0.05	0.21		0.02	c0.36		c0.02	0.01		c0.03	0.01	
v/s Ratio Perm						0.01						
v/c Ratio	0.50	0.38		0.47	0.77	0.02	0.16	0.12		0.26	0.07	
Uniform Delay, d1	30.7	9.8		34.0	15.9	10.2	29.8	29.7		30.1	29.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	0.2		4.6	4.2	0.0	0.4	0.3		0.8	0.2	
Delay (s)	32.9	10.1		38.7	20.1	10.2	30.3	30.0		30.9	29.7	
Level of Service	C	B		D	C	B	C	C		C	C	
Approach Delay (s)		14.6			20.6			30.1			30.3	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	72.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Farrington Hwy & 2nd Avenue

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91		0.97	0.95	1.00	1.00	0.95	0.88	0.97	0.95	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5043		3433	3539	1583	1770	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	5043		3433	3539	1583	1770	3539	2787	3433	3539	1583
Volume (vph)	166	1029	61	223	746	239	95	391	446	225	259	133
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	180	1118	66	242	811	260	103	425	485	245	282	145
RTOR Reduction (vph)	0	5	0	0	0	176	0	0	58	0	0	108
Lane Group Flow (vph)	180	1179	0	242	811	84	103	425	427	245	282	37
Turn Type	Prot			Prot		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases						6			8			4
Actuated Green, G (s)	26.0	52.8		15.2	42.0	42.0	12.7	27.0	42.2	19.0	33.3	33.3
Effective Green, g (s)	26.0	52.8		15.2	42.0	42.0	12.7	27.0	42.2	19.0	33.3	33.3
Actuated g/C Ratio	0.20	0.41		0.12	0.32	0.32	0.10	0.21	0.32	0.15	0.26	0.26
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	354	2048		401	1143	511	173	735	905	502	907	405
v/s Ratio Prot	0.10	c0.23		0.07	c0.23		0.06	c0.12	0.06	c0.07	0.08	
v/s Ratio Perm						0.05			0.10			0.02
v/c Ratio	0.51	0.58		0.60	0.71	0.16	0.60	0.58	0.47	0.49	0.31	0.09
Uniform Delay, d1	46.3	29.9		54.5	38.6	31.5	56.2	46.4	35.0	51.0	39.1	36.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	1.2		2.6	3.7	0.7	5.4	3.3	0.4	0.7	0.9	0.4
Delay (s)	47.5	31.1		57.1	42.4	32.1	61.6	49.7	35.4	51.8	40.0	37.3
Level of Service	D	C		E	D	C	E	D	D	D	D	D
Approach Delay (s)		33.3			43.1			44.1			43.7	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM Average Control Delay	40.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: 2nd Avenue & Kunia Road
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations		↱	↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	1679	234	0	4777
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1825	254	0	5192
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			870			
pX, platoon unblocked						
vC, conflicting volume	3250	583			2079	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3250	583			2079	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	7	455			263	

Direction, Lane #	EB 1	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	0	521	521	521	515	1298	1298	1298	1298
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	254	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.31	0.31	0.31	0.30	0.76	0.76	0.76	0.76
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A								
Approach Delay (s)	0.0	0.0				0.0			
Approach LOS	A								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
24: 3rd Avenue & Kunia Road
2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations		↱	↑↑↑↱			↑↑↑↑
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	7	1593	86	0	4777
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	1732	93	0	5192
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1234			
pX, platoon unblocked						
vC, conflicting volume	3076	480			1825	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3076	480			1825	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	9	532			331	

Direction, Lane #	EB 1	SE 1	SE 2	SE 3	SE 4	NW 1	NW 2	NW 3	NW 4
Volume Total	8	495	495	495	341	1298	1298	1298	1298
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	8	0	0	0	93	0	0	0	0
cSH	532	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.29	0.29	0.29	0.20	0.76	0.76	0.76	0.76
Queue Length 95th (ft)	1	0	0	0	0	0	0	0	0
Control Delay (s)	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B								
Approach Delay (s)	11.9	0.0				0.0			
Approach LOS	B								

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
25: East-West Rd. & B Street

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations	↰	↑	↑	↱	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Volume (vph)	153	234	314	85	643	369
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	254	341	92	699	401
RTOR Reduction (vph)	0	0	0	72	0	157
Lane Group Flow (vph)	166	254	341	20	699	244
Turn Type	Prot			Prot		Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases						
Actuated Green, G (s)	15.2	45.1	25.9	25.9	65.5	65.5
Effective Green, g (s)	15.2	45.1	25.9	25.9	65.5	65.5
Actuated g/C Ratio	0.13	0.38	0.22	0.22	0.55	0.55
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	227	708	407	346	978	874
v/s Ratio Prot	c0.09	0.14	c0.18	0.01	c0.40	0.15
v/s Ratio Perm						
v/c Ratio	0.73	0.36	0.84	0.06	0.71	0.28
Uniform Delay, d1	49.7	26.4	44.3	36.7	19.6	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.5	0.3	14.0	0.1	4.5	0.8
Delay (s)	61.2	26.7	58.3	36.8	24.1	14.9
Level of Service	E	C	E	D	C	B
Approach Delay (s)		40.3	53.7		20.7	
Approach LOS		D	D		C	

Intersection Summary			
HCM Average Control Delay	32.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	118.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
26: Farrington Hwy &

2030 + PRO (with Transit Corridor) - AM Peak Mitigations

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	*0.99	*0.99	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3688	3688	1583
Flt Permitted	0.95	1.00	0.13	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	240	3688	3688	1583
Volume (vph)	100	233	46	1060	1373	132
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	101	235	46	1071	1387	133
RTOR Reduction (vph)	0	31	0	0	0	55
Lane Group Flow (vph)	101	204	46	1071	1387	78
Turn Type		Perm	Perm			Perm
Protected Phases	6			4	8	
Permitted Phases		6	4			8
Actuated Green, G (s)	33.0	33.0	59.0	59.0	59.0	59.0
Effective Green, g (s)	33.0	33.0	59.0	59.0	59.0	59.0
Actuated g/C Ratio	0.33	0.33	0.59	0.59	0.59	0.59
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	584	522	142	2176	2176	934
v/s Ratio Prot	0.06			0.29	c0.38	
v/s Ratio Perm		c0.13	0.19			0.05
v/c Ratio	0.17	0.39	0.32	0.49	0.64	0.08
Uniform Delay, d1	23.8	25.8	10.4	11.8	13.5	8.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.2	6.0	0.8	1.4	0.2
Delay (s)	24.4	28.0	16.3	12.6	14.9	9.0
Level of Service	C	C	B	B	B	A
Approach Delay (s)	26.9			12.8	14.4	
Approach LOS	C			B	B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kunia Loop & Kunia Road
2030 + PRO (With Transit Corridor) - PM Peak Mitigations

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑	↱		↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	*0.99	1.00	*0.99	1.00		*0.99
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3504	1583	3688	1583		5532
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3504	1583	3688	1583		5532
Volume (vph)	882	41	2658	907	0	2752
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	891	41	2685	916	0	2780
RTOR Reduction (vph)	0	4	0	206	0	0
Lane Group Flow (vph)	891	37	2685	710	0	2780
Turn Type		Perm		Perm		
Protected Phases	8		2			6
Permitted Phases		8		2		
Actuated Green, G (s)	32.0	32.0	90.0	90.0		90.0
Effective Green, g (s)	32.0	32.0	90.0	90.0		90.0
Actuated g/C Ratio	0.25	0.25	0.69	0.69		0.69
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	863	390	2553	1096		3830
v/s Ratio Prot	c0.25		c0.73			0.50
v/s Ratio Perm		0.02		0.45		
v/c Ratio	1.03	0.10	1.05	0.65		0.73
Uniform Delay, d1	49.0	37.8	20.0	11.2		12.4
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	39.3	0.1	33.3	3.0		1.2
Delay (s)	88.3	37.9	53.3	14.1		13.6
Level of Service	F	D	D	B		B
Approach Delay (s)	86.1		43.3			13.6
Approach LOS	F		D			B

Intersection Summary			
HCM Average Control Delay	37.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: H-1 WB On-Ramp & Kunia Road
2030 + PRO (With Transit Corridor) - PM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						↱	↰	↑↑↑			↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.0	4.0	4.0			4.0	
Lane Util. Factor						1.00	1.00	*0.99			*0.99	
Frt						0.86	1.00	1.00			0.99	
Flt Protected						1.00	0.95	1.00			1.00	
Satd. Flow (prot)						1611	1770	5532			5455	
Flt Permitted						1.00	0.95	1.00			1.00	
Satd. Flow (perm)						1611	1770	5532			5455	
Volume (vph)	0	0	0	0	0	1230	423	2335	0	0	3295	339
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	0	0	0	0	1242	427	2359	0	0	3328	342
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	20	0
Lane Group Flow (vph)	0	0	0	0	0	1242	427	2359	0	0	3650	0
Turn Type						Free	Prot					
Protected Phases							5	2			6	
Permitted Phases						Free						
Actuated Green, G (s)						70.0	17.0	70.0			45.0	
Effective Green, g (s)						70.0	17.0	70.0			45.0	
Actuated g/C Ratio						1.00	0.24	1.00			0.64	
Clearance Time (s)							4.0	4.0			4.0	
Vehicle Extension (s)							3.0	3.0			3.0	
Lane Grp Cap (vph)						1611	430	5532			3507	
v/s Ratio Prot							c0.24	0.43			c0.67	
v/s Ratio Perm						0.77						
v/c Ratio						0.77	0.99	0.43			1.04	
Uniform Delay, d1						0.0	26.4	0.0			12.5	
Progression Factor						1.00	0.96	1.00			1.00	
Incremental Delay, d2						3.6	35.1	0.2			27.2	
Delay (s)						3.6	60.5	0.2			39.7	
Level of Service						A	E	A			D	
Approach Delay (s)		0.0			3.6			9.4			39.7	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM Average Control Delay	22.9	HCM Level of Service	C
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: H-1 EB & Kunia Road
2030 + PRO (With Transit Corridor) - PM Peak Mitigations

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↰	↱	↑↑↑↑			↑↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	*0.99	1.00	*0.99			*0.99
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3504	1583	7376			5532
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3504	1583	7376			5532
Volume (vph)	527	578	4322	0	0	2231
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	573	628	4698	0	0	2425
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	573	628	4698	0	0	2425
Turn Type		Free				
Protected Phases	4		6			2
Permitted Phases		Free				
Actuated Green, G (s)	13.7	70.0	48.3			48.3
Effective Green, g (s)	13.7	70.0	48.3			48.3
Actuated g/C Ratio	0.20	1.00	0.69			0.69
Clearance Time (s)	4.0		4.0			4.0
Vehicle Extension (s)	3.0		3.0			3.0
Lane Grp Cap (vph)	686	1583	5089			3817
v/s Ratio Prot	c0.16		c0.64			0.44
v/s Ratio Perm		0.40				
v/c Ratio	0.84	0.40	0.92			0.64
Uniform Delay, d1	27.1	0.0	9.3			6.0
Progression Factor	1.00	1.00	0.37			1.00
Incremental Delay, d2	8.7	0.7	3.2			0.8
Delay (s)	35.7	0.7	6.6			6.8
Level of Service	D	A	A			A
Approach Delay (s)	17.4		6.6			6.8
Approach LOS	B		A			A

Intersection Summary			
HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	130.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Farrington Hwy & Fort Weaver Road SB Ramp
2030 + PRO (With Transit Corridor) - PM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰↰	↑↑↑				↱			↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0				4.0			4.0
Lane Util. Factor		0.91		0.97	0.91				1.00			1.00
Frt		0.97		1.00	1.00				0.86			0.86
Flt Protected		1.00		0.95	1.00				1.00			1.00
Satd. Flow (prot)		4947		3433	5085				1611			1611
Flt Permitted		1.00		0.95	1.00				1.00			1.00
Satd. Flow (perm)		4947		3433	5085				1611			1611
Volume (vph)	0	1884	416	774	1938	0	0	0	439	0	0	729
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2048	452	841	2107	0	0	0	477	0	0	792
RTOR Reduction (vph)	0	15	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2485	0	841	2107	0	0	0	477	0	0	792
Turn Type				Prot					Free			Free
Protected Phases		2		1	6							
Permitted Phases									Free			Free
Actuated Green, G (s)		78.0		44.0	130.0				130.0			130.0
Effective Green, g (s)		78.0		44.0	130.0				130.0			130.0
Actuated g/C Ratio		0.60		0.34	1.00				1.00			1.00
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2968		1162	5085				1611			1611
v/s Ratio Prot		c0.50		c0.24	0.41							
v/s Ratio Perm									0.30			0.49
v/c Ratio		0.84		0.72	0.41				0.30			0.49
Uniform Delay, d1		20.9		37.7	0.0				0.0			0.0
Progression Factor		0.33		1.35	1.00				1.00			1.00
Incremental Delay, d2		1.8		1.3	0.1				0.5			1.1
Delay (s)		8.7		52.2	0.1				0.5			1.1
Level of Service		A		D	A				A			A
Approach Delay (s)		8.7			15.0			0.5			1.1	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Farrington Hwy & Fort Weaver Road NB Ramps 2030 + PRO (With Transit Corridor) - PM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑			↑↑↑	↱			↱			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0			
Lane Util. Factor	0.97	*0.99			*0.99	1.00			1.00			
Frt	1.00	1.00			1.00	0.85			0.86			
Flt Protected	0.95	1.00			1.00	1.00			1.00			
Satd. Flow (prot)	3433	5532			5532	1583			1611			
Flt Permitted	0.95	1.00			1.00	1.00			1.00			
Satd. Flow (perm)	3433	5532			5532	1583			1611			
Volume (vph)	1027	1297	0	0	2713	1164	0	0	638	0	0	0
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1037	1310	0	0	2740	1176	0	0	644	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	16	0	0	0	0	0	0
Lane Group Flow (vph)	1037	1310	0	0	2740	1160	0	0	644	0	0	0
Turn Type	Prot					Perm			Free			
Protected Phases	5	2			6							
Permitted Phases						6			Free			
Actuated Green, G (s)	47.8	130.0			74.2	74.2			130.0			
Effective Green, g (s)	47.8	130.0			74.2	74.2			130.0			
Actuated g/C Ratio	0.37	1.00			0.57	0.57			1.00			
Clearance Time (s)	4.0	4.0			4.0	4.0						
Vehicle Extension (s)	3.0	3.0			3.0	3.0						
Lane Grp Cap (vph)	1262	5532			3157	904			1611			
v/s Ratio Prot	c0.30	0.24			0.50							
v/s Ratio Perm						c0.73			0.40			
v/c Ratio	0.82	0.24			0.87	1.28			0.40			
Uniform Delay, d1	37.2	0.0			23.7	27.9			0.0			
Progression Factor	0.48	1.00			0.69	0.65			1.00			
Incremental Delay, d2	3.0	0.1			0.3	128.1			0.7			
Delay (s)	20.7	0.1			16.7	146.3			0.7			
Level of Service	C	A			B	F			A			
Approach Delay (s)		9.2			55.6			0.7			0.0	
Approach LOS		A			E			A			A	

Intersection Summary			
HCM Average Control Delay	34.7	HCM Level of Service	C
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	108.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Farrington Hwy & Leoku Street 2030 + PRO (With Transit Corridor) - PM Peak Mitigations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑	↱		↰	↱		↰↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	*0.99	*0.99	1.00	1.00	*0.99	1.00		1.00	1.00		*0.99	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (perm)	3504	5532	1583	1770	5532	1583		1785	1583		3530	1583
Volume (vph)	282	1537	116	135	3576	515	197	29	130	243	28	99
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	285	1553	117	136	3612	520	199	29	131	245	28	100
RTOR Reduction (vph)	0	0	56	0	0	154	0	0	47	0	0	89
Lane Group Flow (vph)	285	1553	61	136	3612	366	0	228	84	0	273	11
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	10.6	67.6	67.6	18.0	75.0	75.0		14.0	14.0		14.4	14.4
Effective Green, g (s)	10.6	67.6	67.6	18.0	75.0	75.0		14.0	14.0		14.4	14.4
Actuated g/C Ratio	0.08	0.52	0.52	0.14	0.58	0.58		0.11	0.11		0.11	0.11
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	286	2877	823	245	3192	913		192	170		391	175
v/s Ratio Prot	c0.08	0.28		0.08	c0.65			c0.13			c0.08	
v/s Ratio Perm			0.04			0.23			0.05			0.01
v/c Ratio	1.00	0.54	0.07	0.56	1.13	0.40		1.19	0.49		1.26dl	0.06
Uniform Delay, d1	59.7	20.8	15.6	52.3	27.5	15.1		58.0	54.7		55.7	51.8
Progression Factor	0.86	1.01	1.16	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	51.2	0.7	0.2	2.7	63.7	1.3		124.6	9.8		5.4	0.2
Delay (s)	102.7	21.8	18.2	55.0	91.2	16.4		182.6	64.5		61.1	51.9
Level of Service	F	C	B	D	F	B		F	E		E	D
Approach Delay (s)		33.4			81.0			139.5			58.6	
Approach LOS		C			F			F			E	

Intersection Summary			
HCM Average Control Delay	69.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	107.3%	ICU Level of Service	G
Analysis Period (min)	15		
dl Defacto Left Lane. Recode with 1 though lane as a left lane.			
c Critical Lane Group			