BUCKLEY COMMERCIAL TRAFFIC IMPACT ANALYSIS

City of Buckley, WA

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BUCKLEY COMMERCIAL
TRAFFIC IMPACT ANALYSIS

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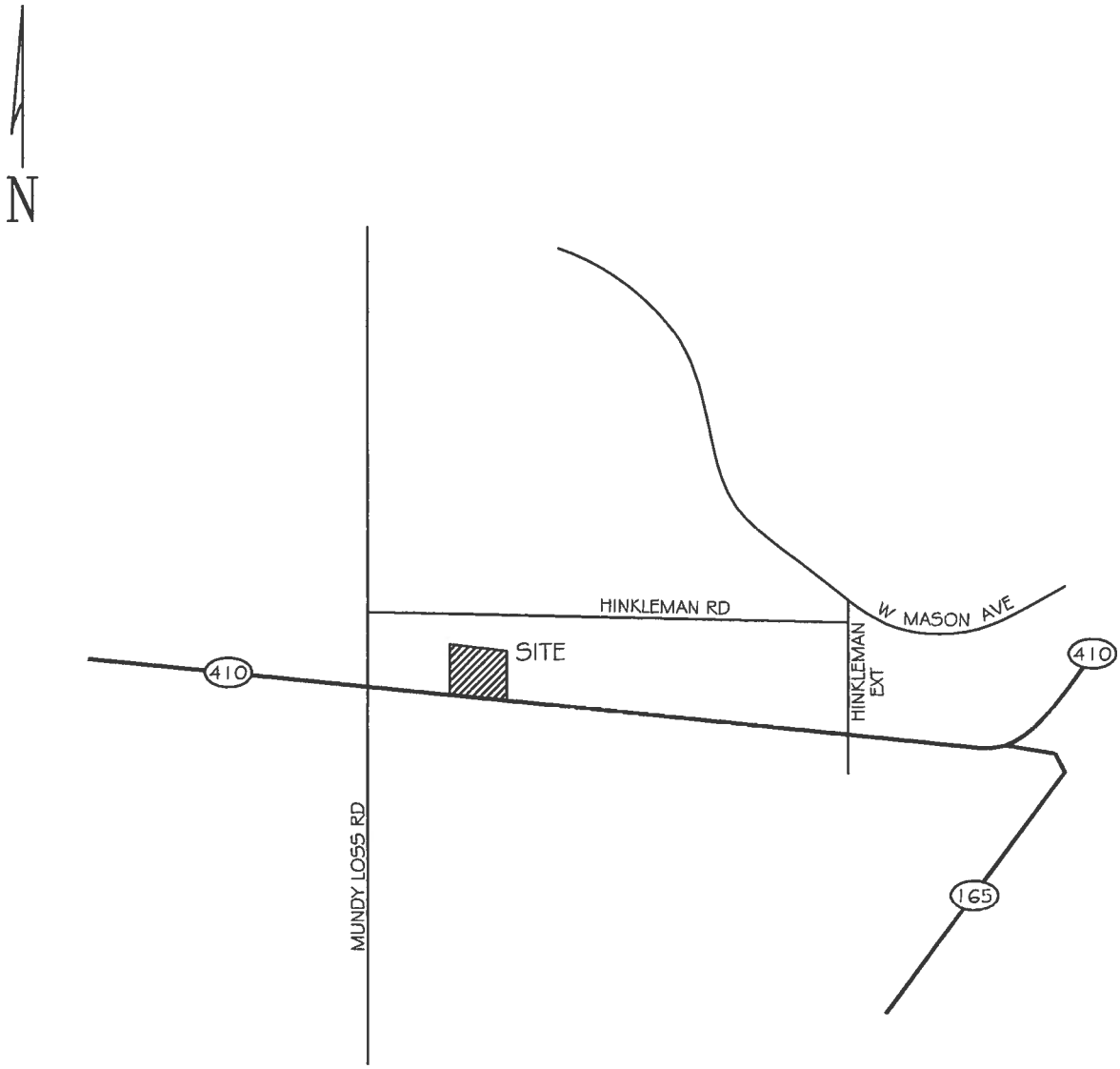
I. INTRODUCTION

This study serves to assess the traffic impacts associated with the proposed Buckley Commercial within the City of Buckley, Washington. In order to make an accurate assessment of traffic impacts, an extended five-step investigation procedure is employed. The first step involves the collection of site-specific roadway information and traffic data in the form of peak hour intersection counts and observations of area wide traffic operations. Next, a comprehensive level of service analysis of the primary intersections is made to ascertain the present degree of congestion at the key locations. Based on this analysis of existing conditions, forecasts of future traffic conditions on the surrounding street system are then made. Standardized trip generation and distribution techniques are used in this step to determine the magnitude and specific locations of project impacts. Following this forecast of traffic conditions, the future service levels for the key intersections are determined using expected trip generation loads. As a final step, appropriate conclusions and mitigating measures are defined. The underlying objective of this work is to ensure safe and efficient circulation of traffic in the area.

II. PROJECT DESCRIPTION

The proposed project is defined as a business park with a total building square footage of 31,820 square feet. There are two lots proposed with 15,320 square feet in one building on the westerly lot and 16,500 square feet in two buildings on the easterly lot. The project is located in the city of Buckley on the north side of SR-410 just east of Mundy-Loss Road. The project will access SR-410 via a new driveway to SR-410 that will be shared by the two lots. Land use surrounding the site is primarily commercial on both sides of SR-410 with residential/agricultural to the north of the project. The anticipated buildout year is assumed to be 2017, with 2020 chosen for a horizon year yielding a 5-year outlook.

Figure 1 on the following page shows the general location of the site, as well as the surrounding street system. The proposed site plan showing the overall configuration and location of proposed access to project in Figure 2.



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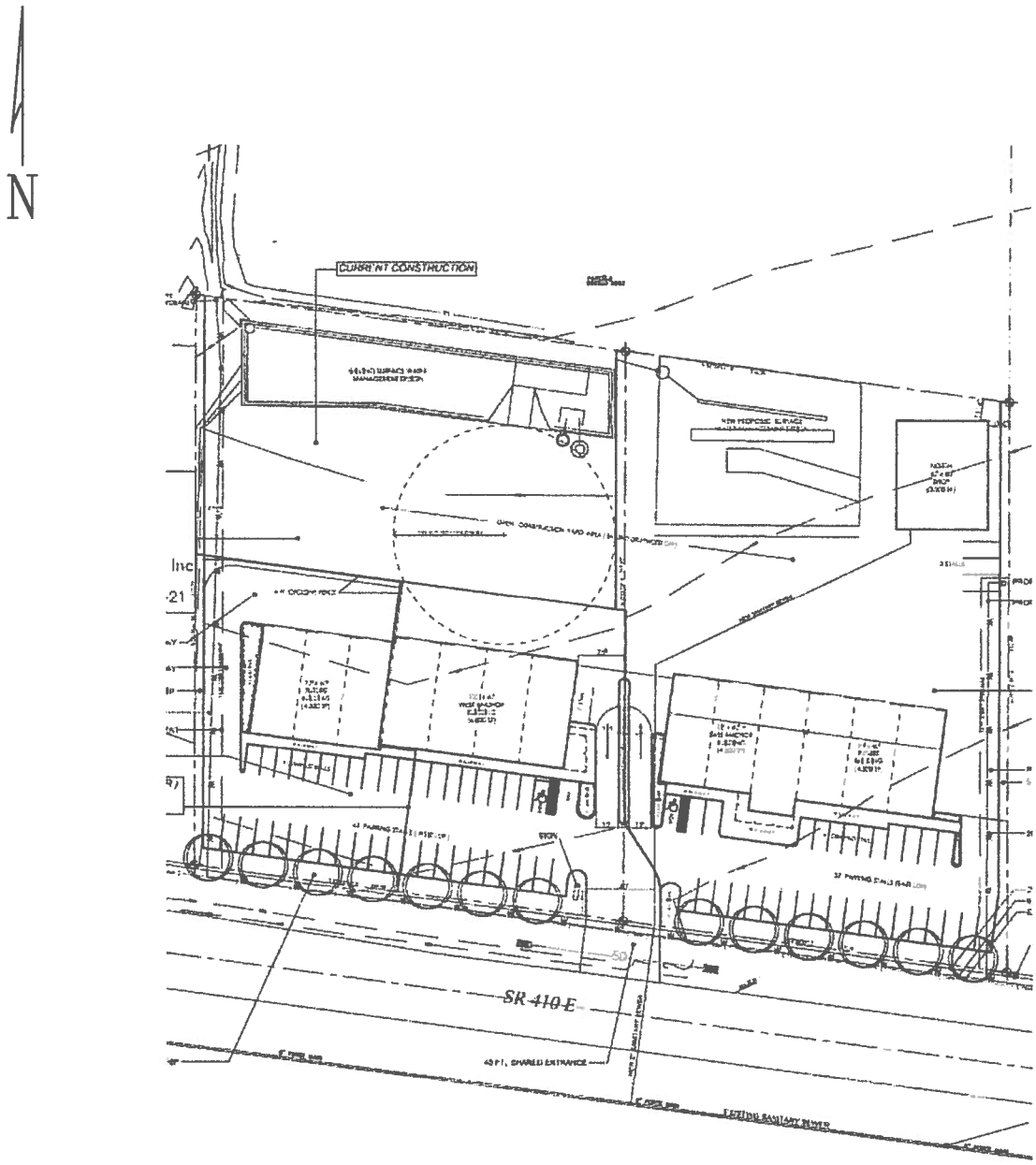
VICINITY MAP & ROADWAY SYSTEM

FIGURE 1



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SITE PLAN

FIGURE 2

III. EXISTING CONDITIONS

A. Existing Street System

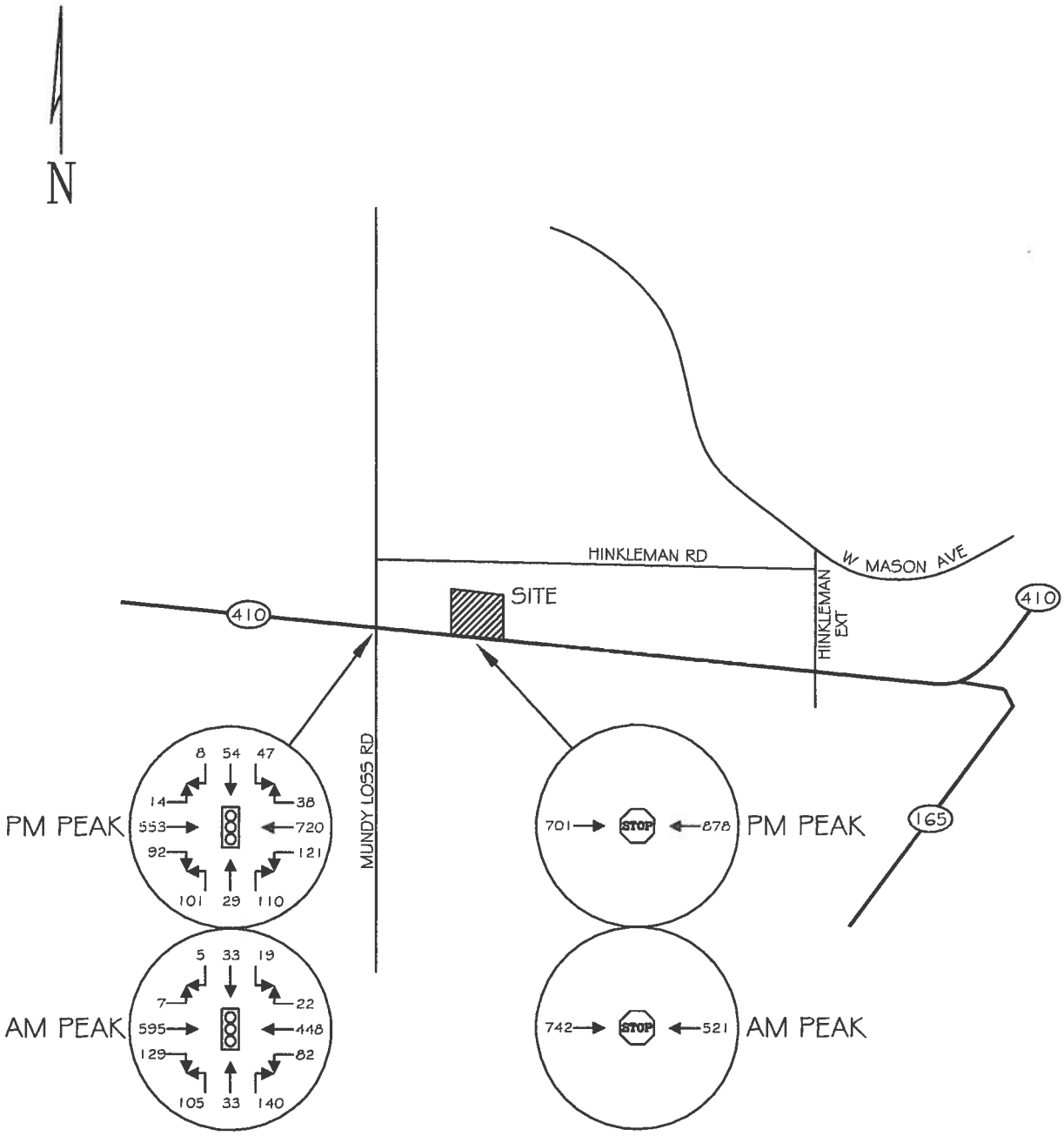
The main road servicing the project is SR-410. SR-410 is a generally east-west state route which borders the south side of the project. The posted speed limit in the vicinity of the project is 35 mph, and pavement surfacing consists of asphalt with asphalt shoulders. Lane widths are generally 12 feet while shoulders are 4 to 6 feet wide. Grades are generally flat. The roadway has a two way left turn lane located just west of the project frontage.

B. Existing Peak Hour Volumes

Field data for this study was collected in November of 2015. Traffic counts were taken during the evening peak period between the hours of 4 PM and 6 PM as the highest traffic volume time period and the morning peak periods between 7 AM and 9 AM. Figure 3 on the following page shows the peak hour counts taken at the primary intersection of SR-410 and Mundy-Loss Road along with the access just east of the project in order to capture traffic across the project frontage.

C. Existing Level of Service

Existing peak hour delays were determined using the *Highway Capacity Manual*. Capacity analysis is used to determine level of service (LOS) which is an established measure of congestion for transportation facilities. LOS is defined for a variety of facilities including intersections, freeways, arterials, etc. A complete definition of level of service and related criteria can be found in the HCM. The methodology for determining the LOS at signalized intersections strives to determine the volume to capacity (v/c) ratios for the various intersection movements as well as the average control delay for those movements. *Delay* is generally used to measure the degree of driver discomfort, frustration, fuel consumption, and lost time. *Control delay*, in particular, includes movements at slower speeds and stops on intersection approaches as vehicles move up in queue position or slow down upstream of an intersection. Aside from the overall quantity of traffic, three specific factors influence signalized intersection LOS. These include the type of signal operation provided, the signal phasing pattern, and the specific allocation of green time.



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EXISTING 2015 AM AND PM PEAK HOUR VOLUMES

FIGURE 3

The methodology for determining the LOS at unsignalized intersections strives to determine the potential capacities for the various vehicle movements and ultimately determines the average total delay for each movement. *Potential Capacity* represents the number of additional vehicles that could effectively utilize a particular movement, which is essentially the equivalent of the difference between the movement capacity and the existing movement volume. *Total delay* is described as the elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line. *Average total delay* is simply the mean total delay over the entire stream. A number of factors influence potential capacity and total delay including the availability/usefulness of gaps. The range for intersection level of service is LOS A to LOS F with the former indicating the best operating conditions with low control delays and the latter indicating the worst conditions with heavy control delays. Existing LOS is shown in Table 1. This analysis involved use of the *Synchro 9* program.

Table 1 below shows the current LOS at the nearby SR-410 and Mundy-Loss Road intersection. Current delays are moderate to heavy with the northbound movement experiencing delays up to LOS F.

TABLE 1
Existing Level of Service
Delays given in seconds per vehicle

Intersection	*Control*	*Approach*	*LOS*	*Delay*
SR-410/Mundy-Loss	Signal	Eastbound	C	22.8
AM		Westbound	B	16.7
		Northbound	E	66.9
		Southbound	B	17.9
		Overall	C	28.2
PM		Eastbound	B	16.1
		Westbound	C	25.7
		Northbound	F	132.8
		Southbound	E	59.5
		Overall	D	37.4

D. Pedestrian and Bicycle Activity

Pedestrian and bicycle activity was observed near the project entrance along SR-410. Observations were made during routine peak hour movement counts and during several site visits. Mild pedestrian and bicycle volumes were noted and no significant impact is expected due to non-motorist traffic.

E. Public Transit

A review of the Pierce Transit regional bus schedule shows transit not available near the site at this time. The nearest bus service is in Sumner.

F. Sight Distance at Access Driveways

The access for the project will be on SR-410. A preliminary examination of the proposed site access was made to determine whether adequate entering and stopping sight distance could be provided for inbound and outbound project traffic. In accordance with AASHTO Green Book standards, a minimum entering sight distance of 445 feet is typically required for a 40 mph design speed. Based on field reviews of the proposed access location, it appears that this requirements would be met, with clear sight in either direction well above the minimum.

IV. FORECASTED TRAFFIC DEMAND AND ANALYSIS

A. Trip Generation

Trip generation is used to determine the magnitude of project impacts on the surrounding street system. This is usually denoted by the quantity or specific number of new trips that enter and exit a project during a designated time period, such as a specific peak hour (AM or PM) or an entire day. Data presented in this report was taken from the Institute of Transportation Engineer's publication *Trip Generation, Ninth Edition*. Two land use codes were considered for this speculative project with Industrial Park (LUC 130) and Business Park (LUC 770) deemed as candidates. ITE considers them somewhat similar as comparable. The data for Business Park has fewer data points and has not been specifically analyzed during the 4 PM to 6 PM timeframe. The zoning for the site is also defined as industrial. For these reasons Industrial Park (LUC 130) was chosen as the best use for the project from a traffic standpoint.

Table 2 below, gives a summary of the estimated project trip generation. Included are the average weekday volume and the AM and PM peak hour volumes. ITE rates were used.

TABLE 2
Project Trip Generation
31,820 SF Industrial Park

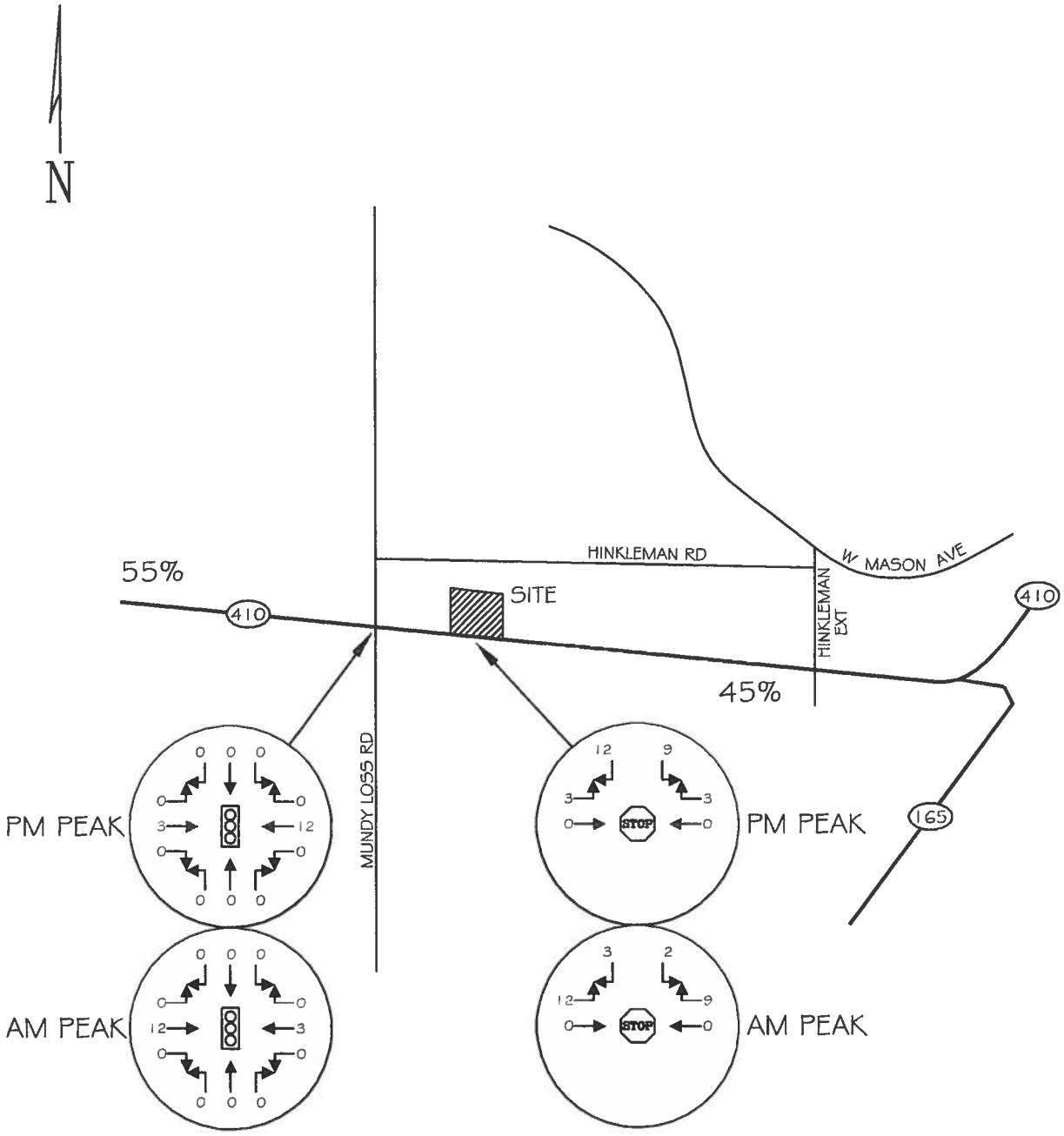
Time Period	*Project Trips*
AWDT Total	217 vpd
AM Peak Inbound	21 vph
AM Peak Outbound	5 vph
AM Peak Total	26 vph
PM Peak Inbound	6 vph
PM Peak Outbound	21 vph
PM Peak Total	27 vph

B. Trip Assignment and Distribution

The destination and origination of the generated traffic primarily influences the project entrances and the key intersections which would effectively receive the majority of project related traffic. In traffic engineering, trip assignment and distribution is used to determine and apply the expected future project traffic to the road system and the primary roadways. The trips generated by the project are expected to follow the general patterns as shown in Figure 4 on the following page. As shown, the split immediately from the site is expected to be 55 percent westerly and 45 percent easterly on SR-410. Percentages are generally reflective of the through volumes currently on SR-410 as indicative of commuter travel in the Buckley area.

C. Future Traffic Volumes With and Without the Project

The year 2020 was used for a 5 year horizon forecast. Future 2020 traffic volumes without the project were derived by applying a 3.0 percent growth rate per year to the existing traffic volumes shown in Figure 3. This rate of growth was used as representing a conservative estimate of future traffic. Future 2020 volumes without project traffic are shown in Figure 5. Future 2020 volumes with the Buckley Commercial traffic are shown in Figure 6.



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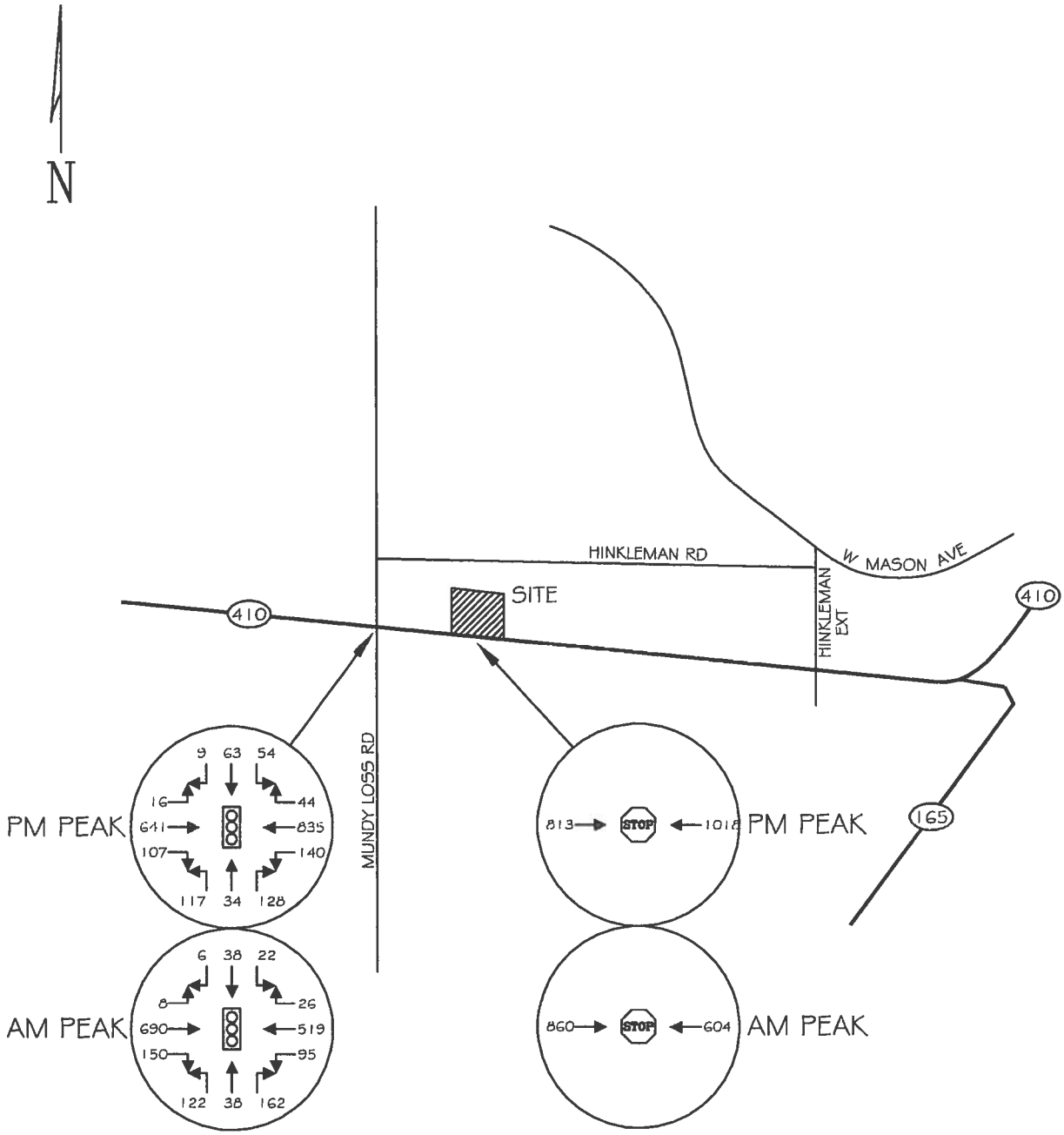
PROJECT TRIP DISTRIBUTION AND ASSIGNMENT

FIGURE 4



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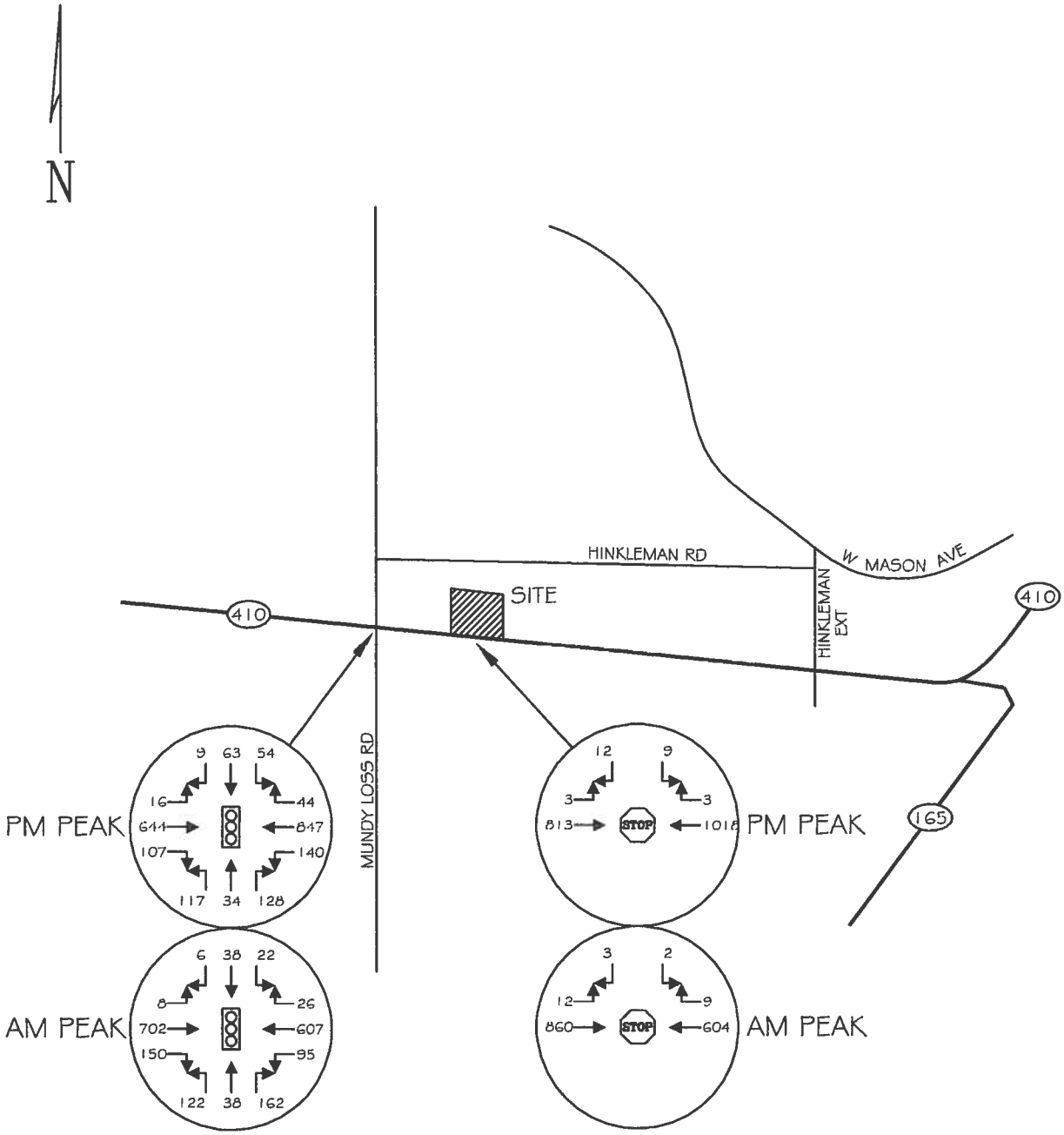
2020 AM AND PM PEAK HOUR VOLUMES WITHOUT PROJECT

FIGURE 5



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2020 AM AND PM PEAK HOUR VOLUMES WITH PROJECT

FIGURE 6

D. Future Level of Service Results

A level of service analysis was made of the future peak hour volumes with and without project generated trips added to the primary intersections and entrance nodes. Results for intersection delay conditions were again determined using the *HCS 2010* program. A summary of the analysis results is shown in Table 3.

TABLE 3
Future 2020 Level of Service
Delays given in seconds per vehicle

			Without Project		With Project	
Intersection	*Control*	*Geometry*	*LOS*	*Delay*	*LOS*	*Delay*
SR-410/Mundy-Loss	Signal	Eastbound	C	26.7	C	28.3
AM		Westbound	B	18.4	C	20.0
		Northbound	F	122.3	F	122.9
		Southbound	C	21.3	C	21.7
		Overall	D	40.1	D	40.4
PM		Eastbound	B	19.2	B	19.3
		Westbound	C	27.6	C	28.5
		Northbound	F	187.0	F	188.9
		Southbound	F	86.6	F	87.9
		Overall	D	48.4	D	49.0
SR-410/Entrance	Stop	Eastbound LT	-	-	A	8.8
AM		Southbound	-	-	C	21.1
PM		Eastbound LT	-	-	B	10.4
		Southbound	-	-	E	39.2

Future delays with or without project are shown to experience moderate to heavy delays, specifically northbound and southbound movements. The northbound and southbound delays result from the current lane configurations along Mundy Loss Road, which include a shared through and left-turn movement for both northbound and southbound legs. Right-turn movements have their own laneage. Thus, observed delays occur when a left-turn movement awaits for an opening from oncoming traffic to complete its turn. Delays are then created for other left-turn and through vehicular traffic waiting for the completed movement. However, if restriping were to occur, giving the left-turn movement its own lane while having a shared through and right-turn lane, many of the delays would diminish. Table 4, on the following page shows LOS with the aforementioned lane configurations.

TABLE 4
Future 2020 Level of Service With Project and Restriping
Delays given in seconds per vehicle

Intersection	*Control*	*Approach*	*LOS*	*Delay*
SR-410/Mundy-Loss	Signal	Eastbound	C	28.3
AM		Westbound	C	20.0
		Northbound	B	19.6
		Southbound	B	17.5
		Overall	C	23.5
PM		Eastbound	B	19.3
		Westbound	C	28.5
		Northbound	C	26.2
		Southbound	C	24.9
		Overall	C	24.8

With the new lane configurations, LOS would decrease from LOS F to LOS C.

E. Turn Lane Warrants

Left turn lanes are a means of providing necessary storage space for left turning vehicles at intersections. For a two-lane or four-lane highway with no left turn storage, delays are often created by vehicles waiting to complete the desired left turn movement. These turning vehicles typically block the heavier through movement, thereby causing some disruption to traffic flow and subsequent congestion. Methods have been developed by various agencies to determine under what circumstances a left turn lane would be needed. For this impact study, procedures described by WSDOT Design Manual (Figure 910-12a) were used to ascertain storage requirements on SR-410 at the project entrance based on 2020 volumes with the project. The results of this assessment indicate that a left turn lane *would not be warranted.* Refer to the appendix for input values and the WSDOT left turn warrant chart.

V. CONCLUSIONS AND MITIGATION MEASURES

The proposed Buckley Commercial is an industrial park use located in the City of Buckley. The overall project trip generation is estimated at 217 average daily trips. During the PM peak hour approximately 27 trips would be expected, with 6 of them being inbound trips and 21 of them outbound trips. The AM peak hour is estimated at 26 trips with 21 trips inbound and 5 trips outbound. Sight distance at the access point onto SR-410 is excellent for the 40 mph assumed design speed. Non-motorist traffic in the area is mild.

Based on the LOS analysis consideration to restripe the north and south legs of Mundy-Loss Road at SR-410 could be considered.

Proposed mitigation for the Buckley Commercial is as follows:

1. Pay traffic impact fees as required by the city of Buckley.
2. Coordinate with WSDOT in terms of access to SR-410.

No other mitigation is identified at this time.

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TRAFFIC IMPACT ANALYSIS

APPENDIX

LEVEL OF SERVICE

The following are excerpts from the *2010 Highway Capacity Manual - Transportation Research Board Special Report 209.*

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six LOS are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions.

Level-of-Service definitions

The following definitions generally define the various levels of service for arterials.

Level of service A represents primarily free-flow operations at average travel speeds, usually about 90 percent of the free-flow speed for the arterial classification. Vehicles are seldom impeded in their ability to maneuver in the traffic stream. Delay at signalized intersections is minimal.

Level of service B represents reasonably unimpeded operations at average travel speeds, usually about 70 percent of the free-flow speed for the arterial classification. The ability to maneuver in the traffic stream is only slightly restricted and delays are not bothersome.

Level of service C represents stable operations; however, ability to maneuver and change lanes in midblock locations may be more restricted than in LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50 percent of the average free-flow speed for the arterial classification.

Level of service D borders on a range in which small increases in flow may cause substantial increases in approach delay and hence decreases in arterial speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40 percent of free-flow speed.

Level of service E is characterized by significant delays and average travel speeds of one-third the free-flow speed or less. Such operations are caused by some combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.

Level of service F characterizes arterial flow at extremely low speeds, from less than one-third to one-quarter of the free-flow speed. Intersection congestion is likely at critical signalized locations, with long delays and extensive queuing.

These definitions are general and conceptual in nature, and they apply primarily to uninterrupted flow. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them.

For each type of facility, levels of service are defined based on one or more operational parameters that best describe operating quality for the subject facility type. While the concept of level of service attempts to address a wide range of operating conditions, limitations on data collection and availability make it impractical to treat the full range of operational parameters for every type of facility. The parameters selected to define levels of service for each facility type are called "measures of effectiveness" or "MOE's", and represent available measures that best describe the quality of operation on the subject facility type.

Each level of service represents a range of conditions, as defined by a range in the parameters given. Thus, a level of service is not a discrete condition, but rather a range of conditions for which boundaries are established.

The following tables describe levels of service for signalized and unsignalized intersections. Level of service for signalized intersections is defined in terms of average control delay. Delay is a measure of driver discomfort, frustration, fuel consumption and lost travel time, as well as time from movements at slower speeds and stops on intersection approaches as vehicles move up in queue position or slow down upstream of an intersection. Level of service for unsignalized intersections is determined by the computed or measured control delay and is determined for each minor movement.

Signalized Intersections - Level of Service

Level of Service	Control Delay per Vehicle (sec)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Unsignalized Intersections - Level of Service

Level of Service	Average Total Delay per Vehicle (sec)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

As described in the 2000 Highway Capacity Manual, level of service breakpoints for all-way stop controlled (AWSC) intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from distinct kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an AWSC intersection. Thus, a higher level of control delay is acceptable at a signalized intersection for the same level of service.

AWSC Intersections - Level of Service

Level of Service	Average Total Delay per Vehicle (sec)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Trip Generation Data
For 31.82 Th.Sq.Ft. GFA of Industrial Park(130) - [R]

Project: Buckley Commercial
Phase:

Open Date:
Analysis Date:

Description:

	Avg. Rate	Min. Rate	Max. Rate	Std. Dev.	No. Stud.	% Enter	% Exit
Avg. Weekday 2-Way Trip	6.83	0.91	36.97	5.57	52	0.50	0.50
7-9 AM Pk. Hr. - Total	0.82	0.12	2.28	1.02	43	0.82	0.18
4-6 PM Pk. Hr. - Total	0.85	0.13	2.85	1.06	45	0.21	0.79
AM Pk. Hr. of Generator - Total	0.80	0.12	2.28	1.02	39	0.87	0.13
PM Pk. Hr. of Generator - Total	0.84	0.13	2.95	1.08	39	0.21	0.79
Saturday 2-Way Trips	2.49	0.18	43.00	3.28	14	0.50	0.50
Saturday Pk. Hr. - Total	0.35	0.31	0.60	0.60	3	0.32	0.68
Sunday 2-Way Trips	0.73	0.07	2.49	1.03	14	0.50	0.50
Sunday Pk. Hr. - Total	0.07	0.05	0.28	0.28	3	0.46	0.54

Note: A zero indicates no data available.
Source: Institute of Transportation Engineers
Trip Generation Manual, 9th Edition, 2012

TRIP GENERATION 2013, TRAFFICWARE, LLC

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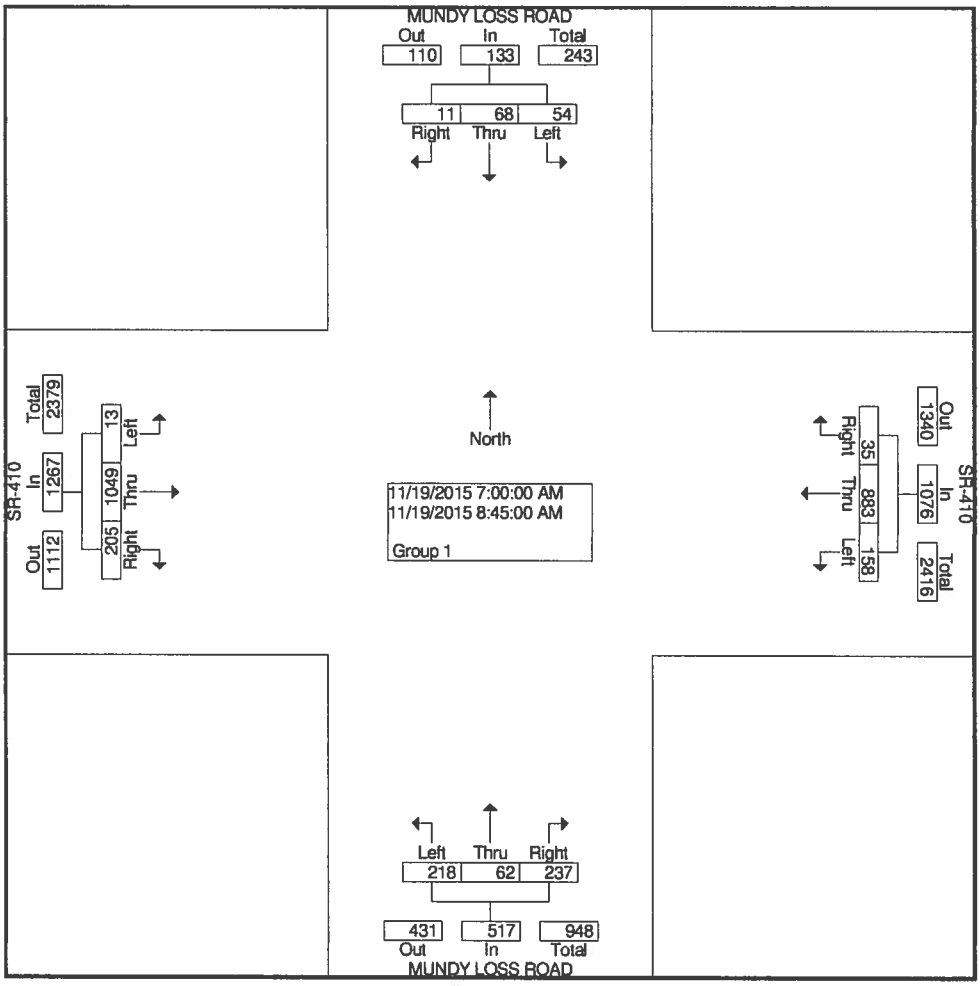
Puyallup, WA 98371

File Name : 3706a
Site Code : 00003706
Start Date : 11/19/2015
Page No : 1

Groups Printed- Group 1

	MUNDY LOSS ROAD Southbound			SR-410 Westbound			MUNDY LOSS ROAD Northbound			SR-410 Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	1	17	7	5	134	26	22	6	32	48	114	2	414
07:15 AM	0	11	5	3	91	20	47	12	28	47	145	0	409
07:30 AM	4	3	4	4	104	16	41	7	29	13	174	2	401
07:45 AM	0	2	3	10	119	20	30	8	16	21	162	3	394
Total	5	33	19	22	448	82	140	33	105	129	595	7	1618
08:00 AM	2	7	8	3	104	8	11	9	21	17	118	2	310
08:15 AM	1	5	7	1	110	19	15	4	17	15	110	2	306
08:30 AM	2	10	9	3	95	18	29	6	23	18	111	1	325
08:45 AM	1	13	11	6	126	31	42	10	52	26	115	1	434
Total	6	35	35	13	435	76	97	29	113	76	454	6	1375
Grand Total	11	68	54	35	883	158	237	62	218	205	1049	13	2993
Apprch %	8.3	51.1	40.6	3.3	82.1	14.7	45.8	12.0	42.2	16.2	82.8	1.0	
Total %	0.4	2.3	1.8	1.2	29.5	5.3	7.9	2.1	7.3	6.8	35.0	0.4	



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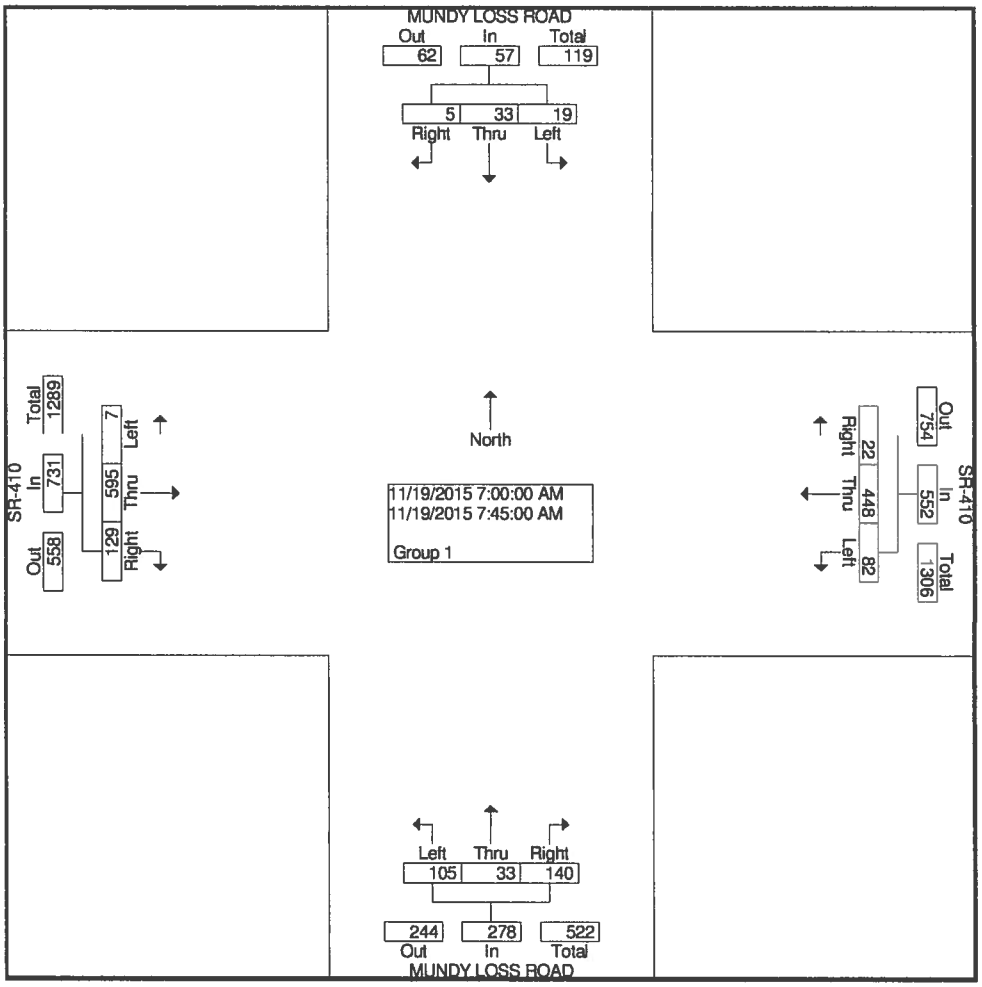
Puyallup, WA 98371

File Name : 3706a
Site Code : 00003706
Start Date : 11/19/2015
Page No : 2

	MUNDY LOSS ROAD Southbound				SR-410 Westbound				MUNDY LOSS ROAD Northbound				SR-410 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Intersection	07:00 AM																
Volume	5	33	19	57	22	448	82	552	140	33	105	278	129	595	7	731	1618
Percent	8.8	57.9	33.3		4.0	81.2	14.9		50.4	11.9	37.8		17.6	81.4	1.0		
07:00 Volume	1	17	7	25	5	134	26	165	22	6	32	60	48	114	2	164	414
Peak Factor																	0.977
High Int.	07:00 AM				07:00 AM				07:15 AM				07:15 AM				
Volume	1	17	7	25	5	134	26	165	47	12	28	87	47	145	0	192	
Peak Factor				0.570				0.836				0.799				0.952	



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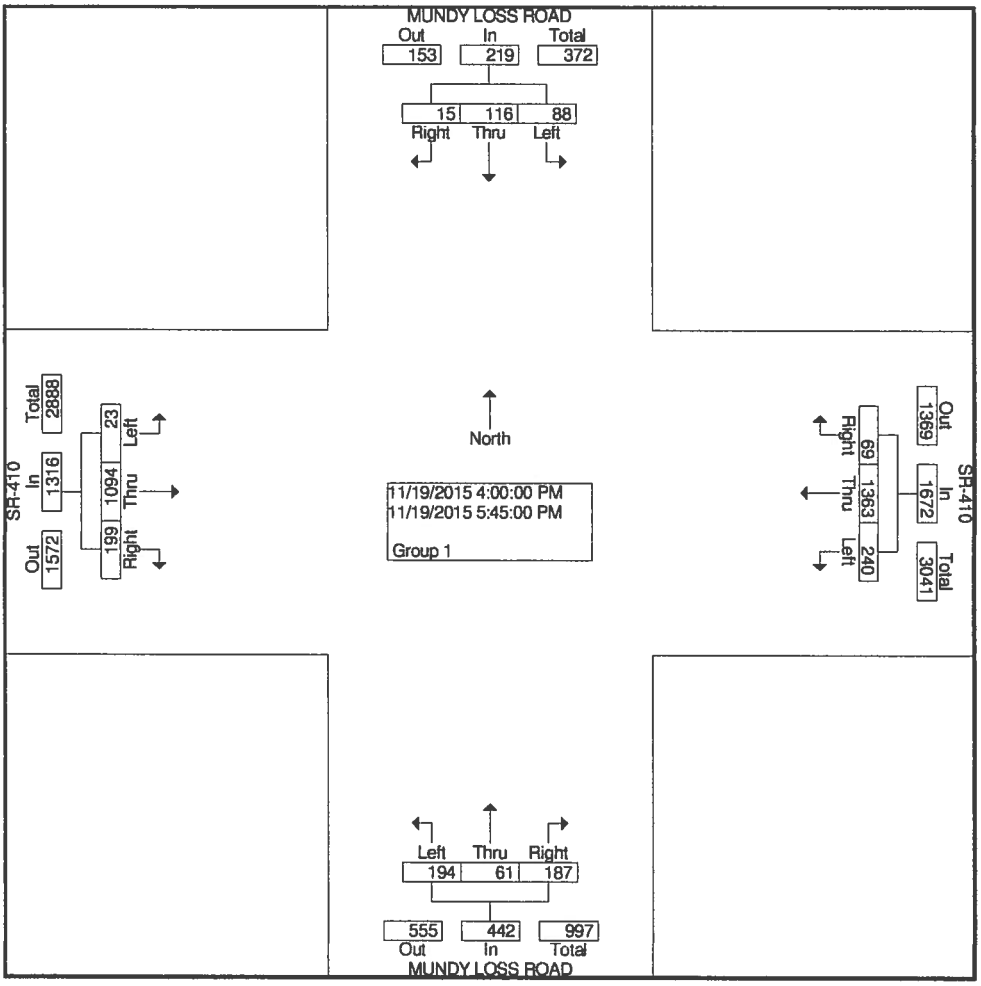
File Name : 3706B
Site Code : 00003706
Start Date : 11/19/2015
Page No : 1

Groups Printed- Group 1

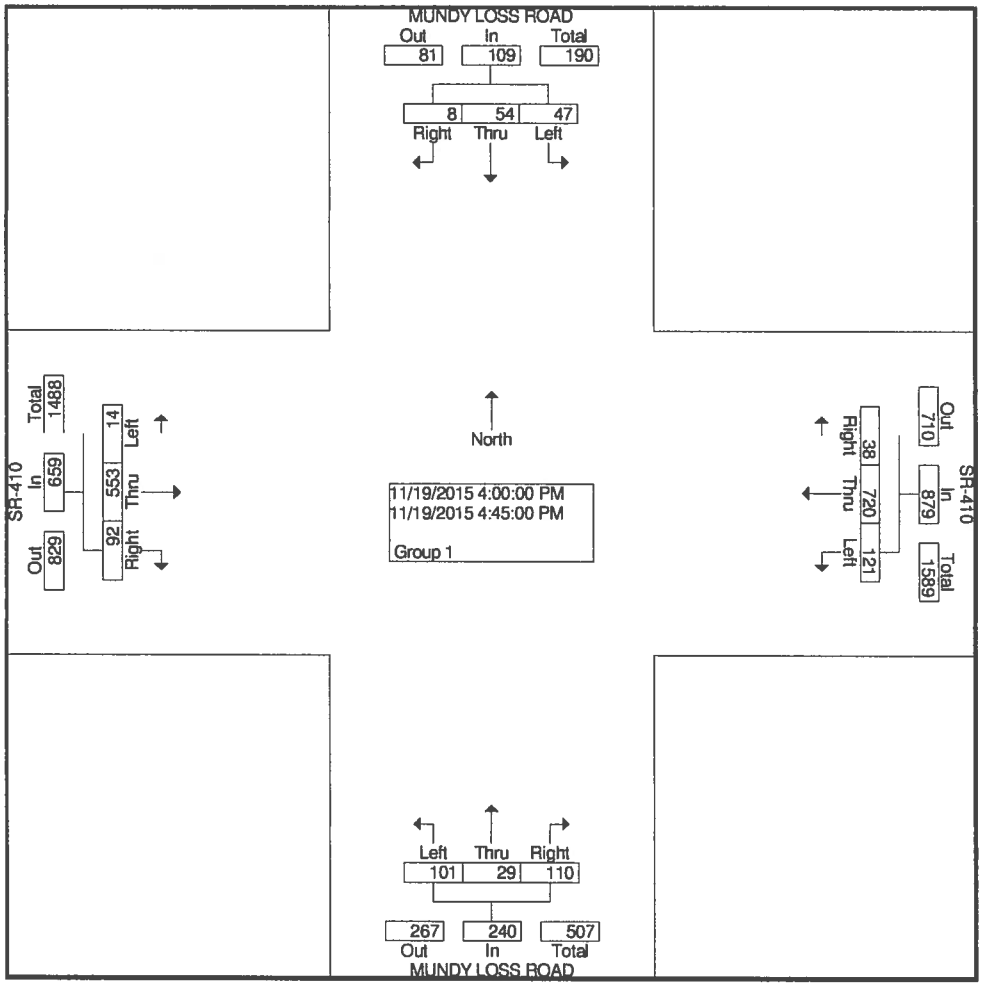
	MUNDY LOSS ROAD Southbound			SR-410 Westbound			MUNDY LOSS ROAD Northbound			SR-410 Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	2	10	11	13	181	28	31	11	19	21	156	4	487
04:15 PM	3	20	15	11	178	40	23	6	24	19	119	3	461
04:30 PM	1	12	8	9	185	27	27	6	36	28	129	2	470
04:45 PM	2	12	13	5	176	26	29	6	22	24	149	5	469
Total	8	54	47	38	720	121	110	29	101	92	553	14	1887
05:00 PM	1	18	10	4	178	31	16	6	25	19	140	3	451
05:15 PM	2	17	9	7	182	37	20	4	27	25	121	1	452
05:30 PM	0	13	13	9	146	29	19	15	24	27	130	1	426
05:45 PM	4	14	9	11	137	22	22	7	17	36	150	4	433
Total	7	62	41	31	643	119	77	32	93	107	541	9	1762
Grand Total	15	116	88	69	1363	240	187	61	194	199	1094	23	3649
Apprch %	6.8	53.0	40.2	4.1	81.5	14.4	42.3	13.8	43.9	15.1	83.1	1.7	
Total %	0.4	3.2	2.4	1.9	37.4	6.6	5.1	1.7	5.3	5.5	30.0	0.6	



Heath & Associates, Inc.
2214 Tacoma Road
Puyallup, WA 98371

File Name : 3706B
Site Code : 00003706
Start Date : 11/19/2015
Page No : 2

	MUNDY LOSS ROAD Southbound				SR-410 Westbound				MUNDY LOSS ROAD Northbound				SR-410 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Intersection	04:00 PM																
Volume	8	54	47	109	38	720	121	879	110	29	101	240	92	553	14	659	1887
Percent	7.3	49.5	43.1		4.3	81.9	13.8		45.8	12.1	42.1		14.0	83.9	2.1		
04:00 Volume	2	10	11	23	13	181	28	222	31	11	19	61	21	156	4	181	487
Peak Factor																	0.969
High Int.	04:15 PM				04:15 PM				04:30 PM				04:00 PM				
Volume	3	20	15	38	11	178	40	229	27	6	36	69	21	156	4	181	
Peak Factor				0.717				0.960				0.870				0.910	

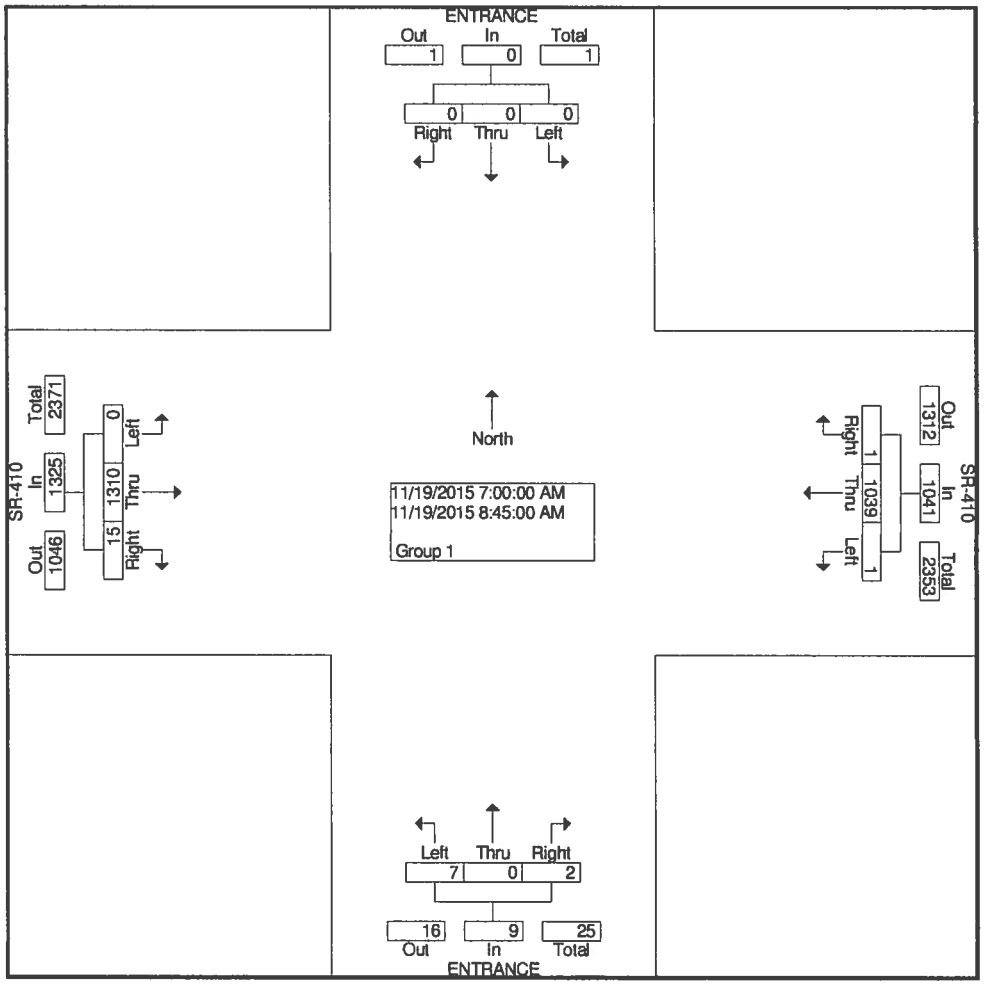


Heath & Associates, Inc.
2214 Tacoma Road
Puyallup, WA 98371

File Name : 3706c
Site Code : 00003706
Start Date : 11/19/2015
Page No : 1

Groups Printed- Group 1

	ENTRANCE Southbound			SR-410 Westbound			ENTRANCE Northbound			SR-410 Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	0	1	133	0	0	0	0	2	139	0	275
07:15 AM	0	0	0	0	117	0	0	0	1	1	173	0	292
07:30 AM	0	0	0	0	120	0	0	0	1	1	217	0	339
07:45 AM	0	0	0	0	148	1	0	0	1	4	205	0	359
Total	0	0	0	1	518	1	0	0	3	8	734	0	1265
08:00 AM	0	0	0	0	112	0	0	0	2	1	139	0	254
08:15 AM	0	0	0	0	131	0	0	0	0	1	130	0	262
08:30 AM	0	0	0	0	113	0	1	0	2	2	135	0	253
08:45 AM	0	0	0	0	165	0	1	0	0	3	172	0	341
Total	0	0	0	0	521	0	2	0	4	7	576	0	1110
Grand Total	0	0	0	1	1039	1	2	0	7	15	1310	0	2375
Apprch %	0.0	0.0	0.0	0.1	99.8	0.1	22.2	0.0	77.8	1.1	98.9	0.0	
Total %	0.0	0.0	0.0	0.0	43.7	0.0	0.1	0.0	0.3	0.6	55.2	0.0	



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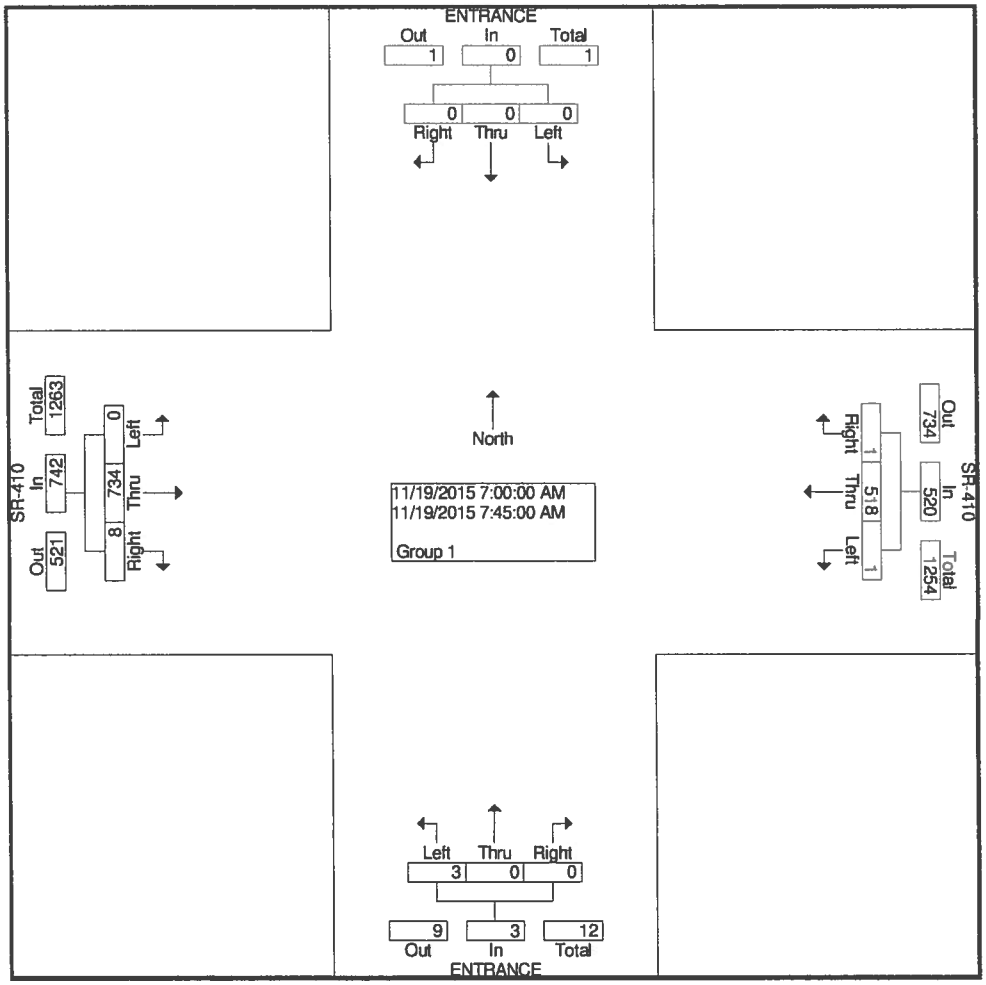
Puyallup, WA 98371

File Name : 3706c
Site Code : 00003706
Start Date : 11/19/2015
Page No : 2

	ENTRANCE Southbound				SR-410 Westbound				ENTRANCE Northbound				SR-410 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Intersection	07:00 AM																
Volume	0	0	0	0	1	518	1	520	0	0	3	3	8	734	0	742	1265
Percent	0.0	0.0	0.0		0.2	99.6	0.2		0.0	0.0	100.0		1.1	98.9	0.0		
07:45 Volume	0	0	0	0	0	148	1	149	0	0	1	1	4	205	0	209	359
Peak Factor																	0.881
High Int.	6:45:00 AM				07:45 AM				07:15 AM				07:30 AM				
Volume	0	0	0	0	0	148	1	149	0	0	1	1	1	217	0	218	
Peak Factor								0.872				0.750				0.851	



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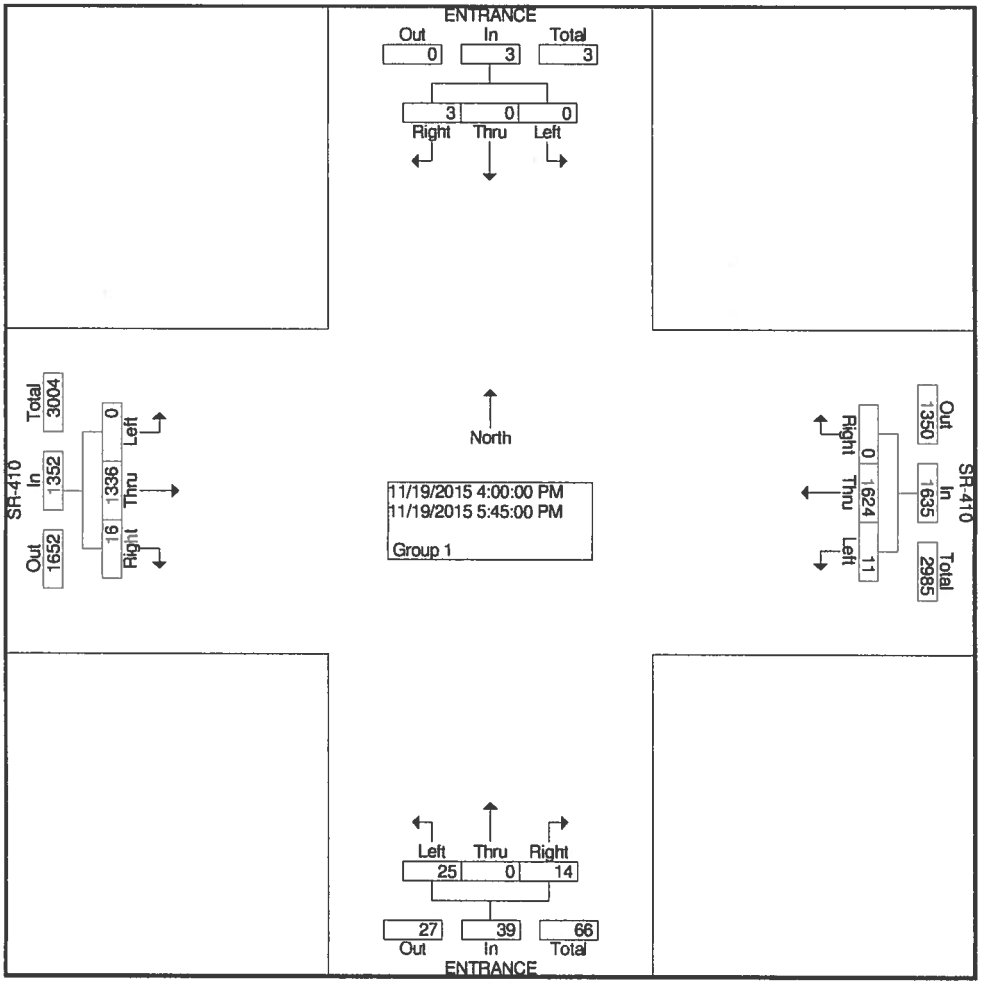
File Name : 3706d
Site Code : 00003706
Start Date : 11/19/2015
Page No : 1

Groups Printed- Group 1

	ENTRANCE Southbound			SR-410 Westbound			ENTRANCE Northbound			SR-410 Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	0	0	0	210	2	0	0	3	1	188	0	404
04:15 PM	0	0	0	0	221	1	3	0	5	5	153	0	388
04:30 PM	1	0	0	0	224	2	0	0	2	5	156	0	390
04:45 PM	2	0	0	0	207	3	5	0	5	2	191	0	415
Total	3	0	0	0	862	8	8	0	15	13	688	0	1597
05:00 PM	0	0	0	0	196	1	2	0	1	1	163	0	364
05:15 PM	0	0	0	0	215	1	2	0	4	0	150	0	372
05:30 PM	0	0	0	0	182	1	1	0	4	2	159	0	349
05:45 PM	0	0	0	0	169	0	1	0	1	0	176	0	347
Total	0	0	0	0	762	3	6	0	10	3	648	0	1432
Grand Total	3	0	0	0	1624	11	14	0	25	16	1336	0	3029
Apprch %	100.0	0.0	0.0	0.0	99.3	0.7	35.9	0.0	64.1	1.2	98.8	0.0	
Total %	0.1	0.0	0.0	0.0	53.6	0.4	0.5	0.0	0.8	0.5	44.1	0.0	



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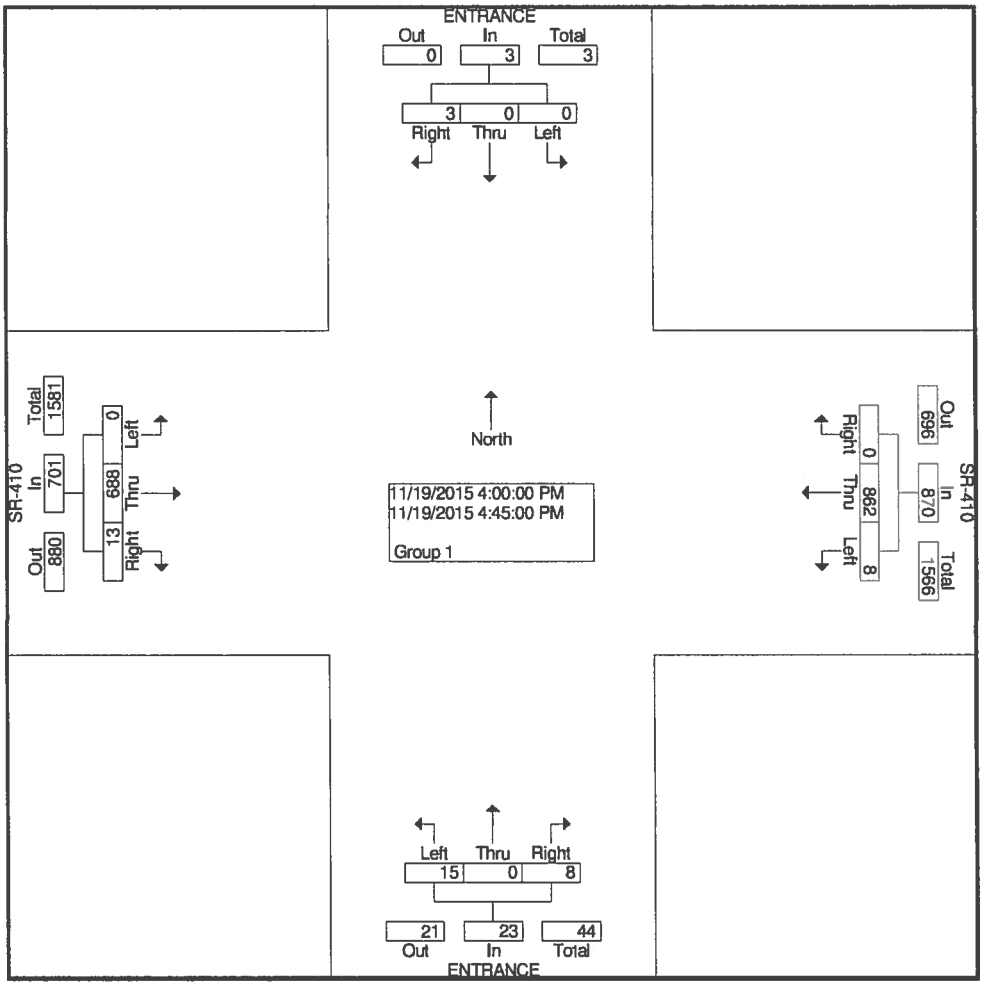
2214 Tacoma Road
Puyallup, WA 98371

File Name : 3706d
Site Code : 00003706
Start Date : 11/19/2015
Page No : 2

	ENTRANCE Southbound				SR-410 Westbound				ENTRANCE Northbound				SR-410 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Intersection	04:00 PM																
Volume	3	0	0	3	0	862	8	870	8	0	15	23	13	688	0	701	1597
Percent	100.0	0.0	0.0		0.0	99.1	0.9		34.8	0.0	65.2		1.9	98.1	0.0		
04:45 Volume	2	0	0	2	0	207	3	210	5	0	5	10	2	191	0	193	415
Peak Factor																	0.962
High Int.	04:45 PM				04:30 PM				04:45 PM				04:45 PM				
Volume	2	0	0	2	0	224	2	226	5	0	5	10	2	191	0	193	
Peak Factor				0.375				0.962				0.575				0.908	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	595	129	82	448	22	105	33	140	19	33	5
Future Volume (veh/h)	7	595	129	82	448	22	105	33	140	19	33	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1900	1881	1881	1900	1881	1881
Adj Flow Rate, veh/h	7	607	132	84	457	22	107	34	143	19	34	5
Adj No. of Lanes	1	1	1	1	1	0	0	1	1	0	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	16	707	601	116	769	37	112	21	511	87	117	511
Arrive On Green	0.01	0.38	0.38	0.06	0.43	0.43	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1792	1881	1599	1792	1780	86	0	66	1599	0	367	1599
Grp Volume(v), veh/h	7	607	132	84	0	479	141	0	143	53	0	5
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1866	66	0	1599	367	0	1599
Q Serve(g_s), s	0.2	16.7	3.2	2.6	0.0	11.1	0.0	0.0	3.8	0.0	0.0	0.1
Cycle Q Clear(g_c), s	0.2	16.7	3.2	2.6	0.0	11.1	18.0	0.0	3.8	18.0	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.05	0.76		1.00	0.36		1.00
Lane Grp Cap(c), veh/h	16	707	601	116	0	806	134	0	511	204	0	511
V/C Ratio(X)	0.42	0.86	0.22	0.72	0.00	0.59	1.06	0.00	0.28	0.26	0.00	0.01
Avail Cap(c_a), veh/h	159	785	667	159	0	806	134	0	511	204	0	511
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.8	16.2	12.0	25.8	0.0	12.2	25.4	0.0	14.3	15.3	0.0	13.1
Incr Delay (d2), s/veh	16.3	8.7	0.2	9.7	0.0	1.2	93.4	0.0	1.4	3.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	10.3	1.4	1.6	0.0	5.9	5.5	0.0	1.8	0.7	0.0	0.1
LnGrp Delay(d),s/veh	44.1	24.9	12.1	35.6	0.0	13.4	118.9	0.0	15.7	18.4	0.0	13.1
LnGrp LOS	D	C	B	D		B	F		B	B		B
Approach Vol, veh/h		746			563			284			58	
Approach Delay, s/veh		22.8			16.7			66.9			17.9	
Approach LOS		C			B			E			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		22.5	8.2	25.7		22.5	5.0	28.8
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.0	5.0	23.5		18.0	5.0	23.5
Max Q Clear Time (g_c+I1), s		20.0	4.6	18.7		20.0	2.2	13.1
Green Ext Time (p_c), s		0.0	0.0	2.4		0.0	0.0	5.4

Intersection Summary	
HCM 2010 Ctrl Delay	28.2
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	690	150	95	519	26	122	38	162	22	38	6
Future Volume (veh/h)	8	690	150	95	519	26	122	38	162	22	38	6
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1900	1881	1881	1900	1881	1881
Adj Flow Rate, veh/h	8	704	153	97	530	27	124	39	165	22	39	6
Adj No. of Lanes	1	1	1	1	1	0	0	1	1	0	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	19	778	662	124	839	43	102	19	478	79	106	478
Arrive On Green	0.01	0.41	0.41	0.07	0.47	0.47	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1792	1881	1599	1792	1775	90	0	64	1599	0	355	1599
Grp Volume(v), veh/h	8	704	153	97	0	557	163	0	165	61	0	6
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1865	64	0	1599	355	0	1599
Q Serve(g_s), s	0.3	21.7	3.8	3.3	0.0	13.9	0.0	0.0	5.0	0.0	0.0	0.2
Cycle Q Clear(g_c), s	0.3	21.7	3.8	3.3	0.0	13.9	18.5	0.0	5.0	18.5	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.05	0.76		1.00	0.36		1.00
Lane Grp Cap(c), veh/h	19	778	662	124	0	882	121	0	478	185	0	478
V/C Ratio(X)	0.43	0.90	0.23	0.78	0.00	0.63	1.34	0.00	0.35	0.33	0.00	0.01
Avail Cap(c_a), veh/h	145	835	710	159	0	882	121	0	478	185	0	478
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.5	17.0	11.8	28.3	0.0	12.3	28.1	0.0	17.0	17.6	0.0	15.3
Incr Delay (d2), s/veh	14.9	12.7	0.2	16.9	0.0	1.5	198.9	0.0	2.0	4.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	13.9	1.7	2.2	0.0	7.5	8.8	0.0	2.4	1.0	0.0	0.1
LnGrp Delay(d),s/veh	45.4	29.7	11.9	45.3	0.0	13.7	227.0	0.0	19.0	22.3	0.0	15.3
LnGrp LOS	D	C	B	D		B	F		B	C		B
Approach Vol, veh/h		865			654			328			67	
Approach Delay, s/veh		26.7			18.4			122.3			21.6	
Approach LOS		C			B			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.0	8.8	30.1		23.0	5.1	33.8
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.5	5.5	27.5		18.5	5.0	28.0
Max Q Clear Time (g_c+I1), s		20.5	5.3	23.7		20.5	2.3	15.9
Green Ext Time (p_c), s		0.0	0.0	1.9		0.0	0.0	7.0

Intersection Summary	
HCM 2010 Ctrl Delay	40.1
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	702	150	95	607	26	122	38	162	22	38	6
Future Volume (veh/h)	8	702	150	95	607	26	122	38	162	22	38	6
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1900	1881	1881	1900	1881	1881
Adj Flow Rate, veh/h	8	716	153	97	619	27	124	39	165	22	39	6
Adj No. of Lanes	1	1	1	1	1	0	0	1	1	0	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	19	780	663	124	848	37	102	19	477	79	106	477
Arrive On Green	0.01	0.41	0.41	0.07	0.47	0.47	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1792	1881	1599	1792	1789	78	0	64	1599	0	355	1599
Grp Volume(v), veh/h	8	716	153	97	0	646	163	0	165	61	0	6
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1867	64	0	1599	355	0	1599
Q Serve(g_s), s	0.3	22.3	3.8	3.3	0.0	17.3	0.0	0.0	5.0	0.0	0.0	0.2
Cycle Q Clear(g_c), s	0.3	22.3	3.8	3.3	0.0	17.3	18.5	0.0	5.0	18.5	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.04	0.76		1.00	0.36		1.00
Lane Grp Cap(c), veh/h	19	780	663	124	0	885	121	0	477	185	0	477
V/C Ratio(X)	0.43	0.92	0.23	0.78	0.00	0.73	1.34	0.00	0.35	0.33	0.00	0.01
Avail Cap(c_a), veh/h	144	834	709	159	0	885	121	0	477	185	0	477
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.5	17.2	11.8	28.4	0.0	13.1	28.2	0.0	17.0	17.6	0.0	15.3
Incr Delay (d2), s/veh	14.9	14.4	0.2	17.0	0.0	3.1	199.8	0.0	2.0	4.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	14.7	1.7	2.2	0.0	9.6	8.8	0.0	2.4	1.0	0.0	0.1
LnGrp Delay(d),s/veh	45.4	31.6	11.9	45.4	0.0	16.2	228.0	0.0	19.0	22.3	0.0	15.4
LnGrp LOS	D	C	B	D		B	F		B	C		B
Approach Vol, veh/h		877			743			328			67	
Approach Delay, s/veh		28.3			20.0			122.9			21.7	
Approach LOS		C			C			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.0	8.8	30.2		23.0	5.1	33.9
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.5	5.5	27.5		18.5	5.0	28.0
Max Q Clear Time (g_c+I1), s		20.5	5.3	24.3		20.5	2.3	19.3
Green Ext Time (p_c), s		0.0	0.0	1.4		0.0	0.0	5.8

Intersection Summary	
HCM 2010 Ctrl Delay	40.4
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	12	860	604	9	2	3
Future Vol, veh/h	12	860	604	9	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	80	80
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	12	878	616	9	3	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	626	0	-	0	1523	621
Stage 1	-	-	-	-	621	-
Stage 2	-	-	-	-	902	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	960	-	-	-	131	491
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	399	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	960	-	-	-	128	491
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	389	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	960	-	-	-	230
HCM Lane V/C Ratio	0.013	-	-	-	0.027
HCM Control Delay (s)	8.8	0	-	-	21.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	553	92	121	720	121	101	29	110	47	54	8
Future Volume (veh/h)	14	553	92	121	720	121	101	29	110	47	54	8
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1900	1881	1881	1900	1881	1881
Adj Flow Rate, veh/h	14	570	95	125	742	125	104	30	113	48	56	8
Adj No. of Lanes	1	1	1	1	1	0	0	1	1	0	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	30	876	744	159	844	142	88	15	417	72	60	417
Arrive On Green	0.02	0.47	0.47	0.09	0.54	0.54	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1792	1881	1599	1792	1570	264	0	57	1599	0	230	1599
Grp Volume(v), veh/h	14	570	95	125	0	867	134	0	113	104	0	8
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1835	57	0	1599	230	0	1599
Q Serve(g_s), s	0.6	16.9	2.5	5.0	0.0	30.2	0.0	0.0	4.1	0.0	0.0	0.3
Cycle Q Clear(g_c), s	0.6	16.9	2.5	5.0	0.0	30.2	19.0	0.0	4.1	19.0	0.0	0.3
Prop In Lane	1.00		1.00	1.00		0.14	0.78		1.00	0.46		1.00
Lane Grp Cap(c), veh/h	30	876	744	159	0	986	103	0	417	132	0	417
V/C Ratio(X)	0.46	0.65	0.13	0.79	0.00	0.88	1.31	0.00	0.27	0.79	0.00	0.02
Avail Cap(c_a), veh/h	123	996	847	219	0	1069	103	0	417	132	0	417
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.5	14.9	11.1	32.5	0.0	14.8	33.7	0.0	21.4	26.2	0.0	20.0
Incr Delay (d2), s/veh	10.5	1.3	0.1	12.1	0.0	8.2	191.6	0.0	1.6	36.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	9.0	1.1	3.0	0.0	17.4	7.5	0.0	2.0	3.4	0.0	0.1
LnGrp Delay(d),s/veh	46.0	16.2	11.2	44.6	0.0	23.0	225.3	0.0	23.0	62.6	0.0	20.1
LnGrp LOS	D	B	B	D		C	F		C	E		C
Approach Vol, veh/h		679			992			247			112	
Approach Delay, s/veh		16.1			25.7			132.8			59.5	
Approach LOS		B			C			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.5	11.0	38.4		23.5	5.7	43.7
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		19.0	8.9	38.6		19.0	5.0	42.5
Max Q Clear Time (g_c+I1), s		21.0	7.0	18.9		21.0	2.6	32.2
Green Ext Time (p_c), s		0.0	0.1	11.0		0.0	0.0	6.9

Intersection Summary	
HCM 2010 Ctrl Delay	37.4
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	641	107	140	835	44	117	34	128	54	63	9
Future Volume (veh/h)	16	641	107	140	835	44	117	34	128	54	63	9
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1900	1881	1881	1900	1881	1881
Adj Flow Rate, veh/h	16	661	110	144	861	45	121	35	132	56	65	9
Adj No. of Lanes	1	1	1	1	1	0	0	1	1	0	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	34	868	738	181	963	50	86	15	409	71	59	409
Arrive On Green	0.02	0.46	0.46	0.10	0.54	0.54	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1792	1881	1599	1792	1772	93	0	57	1599	0	229	1599
Grp Volume(v), veh/h	16	661	110	144	0	906	156	0	132	121	0	9
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1865	57	0	1599	229	0	1599
Q Serve(g_s), s	0.7	21.7	3.0	5.8	0.0	32.0	0.0	0.0	5.0	0.0	0.0	0.3
Cycle Q Clear(g_c), s	0.7	21.7	3.0	5.8	0.0	32.0	19.0	0.0	5.0	19.0	0.0	0.3
Prop In Lane	1.00		1.00	1.00		0.05	0.78		1.00	0.46		1.00
Lane Grp Cap(c), veh/h	34	868	738	181	0	1014	101	0	409	130	0	409
V/C Ratio(X)	0.47	0.76	0.15	0.80	0.00	0.89	1.55	0.00	0.32	0.93	0.00	0.02
Avail Cap(c_a), veh/h	121	962	818	229	0	1067	101	0	409	130	0	409
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	36.1	16.6	11.6	32.7	0.0	15.1	34.4	0.0	22.4	28.5	0.0	20.7
Incr Delay (d2), s/veh	9.8	3.3	0.1	14.2	0.0	9.5	290.0	0.0	2.1	63.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	12.0	1.3	3.6	0.0	19.0	10.2	0.0	2.4	4.7	0.0	0.1
LnGrp Delay(d),s/veh	45.9	19.9	11.7	46.8	0.0	24.6	324.4	0.0	24.5	91.5	0.0	20.8
LnGrp LOS	D	B	B	D		C	F		C	F		C
Approach Vol, veh/h		787			1050			288			130	
Approach Delay, s/veh		19.2			27.6			187.0			86.6	
Approach LOS		B			C			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.5	12.0	38.8		23.5	5.9	44.9
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		19.0	9.5	38.0		19.0	5.0	42.5
Max Q Clear Time (g_c+I1), s		21.0	7.8	23.7		21.0	2.7	34.0
Green Ext Time (p_c), s		0.0	0.1	9.6		0.0	0.0	6.3

Intersection Summary	
HCM 2010 Ctrl Delay	48.4
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	644	107	140	847	44	117	34	128	54	63	9
Future Volume (veh/h)	16	644	107	140	847	44	117	34	128	54	63	9
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1900	1881	1881	1900	1881	1881
Adj Flow Rate, veh/h	16	664	110	144	873	45	121	35	132	56	65	9
Adj No. of Lanes	1	1	1	1	1	0	0	1	1	0	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	34	872	741	181	968	50	86	15	407	71	58	407
Arrive On Green	0.02	0.46	0.46	0.10	0.55	0.55	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1792	1881	1599	1792	1774	91	0	57	1599	0	229	1599
Grp Volume(v), veh/h	16	664	110	144	0	918	156	0	132	121	0	9
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1865	57	0	1599	229	0	1599
Q Serve(g_s), s	0.7	21.8	3.0	5.9	0.0	32.9	0.0	0.0	5.0	0.0	0.0	0.3
Cycle Q Clear(g_c), s	0.7	21.8	3.0	5.9	0.0	32.9	19.0	0.0	5.0	19.0	0.0	0.3
Prop In Lane	1.00		1.00	1.00		0.05	0.78		1.00	0.46		1.00
Lane Grp Cap(c), veh/h	34	872	741	181	0	1018	100	0	407	129	0	407
V/C Ratio(X)	0.47	0.76	0.15	0.80	0.00	0.90	1.56	0.00	0.32	0.94	0.00	0.02
Avail Cap(c_a), veh/h	120	958	814	228	0	1062	100	0	407	129	0	407
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	36.2	16.6	11.5	32.8	0.0	15.2	34.6	0.0	22.6	28.7	0.0	20.8
Incr Delay (d2), s/veh	9.9	3.3	0.1	14.3	0.0	10.4	293.2	0.0	2.1	64.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	12.1	1.3	3.6	0.0	19.5	10.2	0.0	2.4	4.8	0.0	0.2
LnGrp Delay(d),s/veh	46.1	19.9	11.6	47.1	0.0	25.6	327.8	0.0	24.7	92.9	0.0	20.9
LnGrp LOS	D	B	B	D		C	F		C	F		C
Approach Vol, veh/h		790			1062			288			130	
Approach Delay, s/veh		19.3			28.5			188.9			87.9	
Approach LOS		B			C			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.5	12.0	39.1		23.5	5.9	45.2
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		19.0	9.5	38.0		19.0	5.0	42.5
Max Q Clear Time (g_c+I1), s		21.0	7.9	23.8		21.0	2.7	34.9
Green Ext Time (p_c), s		0.0	0.1	9.6		0.0	0.0	5.8

Intersection Summary	
HCM 2010 Ctrl Delay	49.0
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	3	813	1018	3	9	12
Future Vol, veh/h	3	813	1018	3	9	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	80	80
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	3	838	1049	3	11	15

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1053	0	-	0	1895	1051
Stage 1	-	-	-	-	1051	-
Stage 2	-	-	-	-	844	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	665	-	-	-	78	278
Stage 1	-	-	-	-	339	-
Stage 2	-	-	-	-	425	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	665	-	-	-	77	278
Mov Cap-2 Maneuver	-	-	-	-	77	-
Stage 1	-	-	-	-	339	-
Stage 2	-	-	-	-	422	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	39.2
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	665	-	-	-	131
HCM Lane V/C Ratio	0.005	-	-	-	0.2
HCM Control Delay (s)	10.4	0	-	-	39.2
HCM Lane LOS	B	A	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	702	150	95	607	26	122	38	162	22	38	6
Future Volume (veh/h)	8	702	150	95	607	26	122	38	162	22	38	6
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1881	1881	1900	1881	1881	1900
Adj Flow Rate, veh/h	8	716	153	97	619	27	124	39	165	22	39	6
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	19	780	663	124	848	37	500	94	397	352	475	73
Arrive On Green	0.01	0.41	0.41	0.07	0.47	0.47	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1792	1881	1599	1792	1789	78	1369	315	1331	1185	1593	245
Grp Volume(v), veh/h	8	716	153	97	0	646	124	0	204	22	0	45
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1867	1369	0	1646	1185	0	1838
Q Serve(g_s), s	0.3	22.3	3.8	3.3	0.0	17.3	4.4	0.0	6.2	0.9	0.0	1.1
Cycle Q Clear(g_c), s	0.3	22.3	3.8	3.3	0.0	17.3	5.5	0.0	6.2	7.1	0.0	1.1
Prop In Lane	1.00		1.00	1.00		0.04	1.00		0.81	1.00		0.13
Lane Grp Cap(c), veh/h	19	780	663	124	0	885	500	0	491	352	0	548
V/C Ratio(X)	0.43	0.92	0.23	0.78	0.00	0.73	0.25	0.00	0.42	0.06	0.00	0.08
Avail Cap(c_a), veh/h	144	834	709	159	0	885	500	0	491	352	0	548
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.5	17.2	11.8	28.4	0.0	13.1	17.7	0.0	17.4	20.3	0.0	15.7
Incr Delay (d2), s/veh	14.9	14.4	0.2	17.0	0.0	3.1	1.2	0.0	2.6	0.3	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	14.7	1.7	2.2	0.0	9.6	1.9	0.0	3.1	0.3	0.0	0.6
LnGrp Delay(d),s/veh	45.4	31.6	11.9	45.4	0.0	16.2	18.8	0.0	20.0	20.6	0.0	16.0
LnGrp LOS	D	C	B	D		B	B		C	C		B
Approach Vol, veh/h		877			743			328			67	
Approach Delay, s/veh		28.3			20.0			19.6			17.5	
Approach LOS		C			C			B			B	

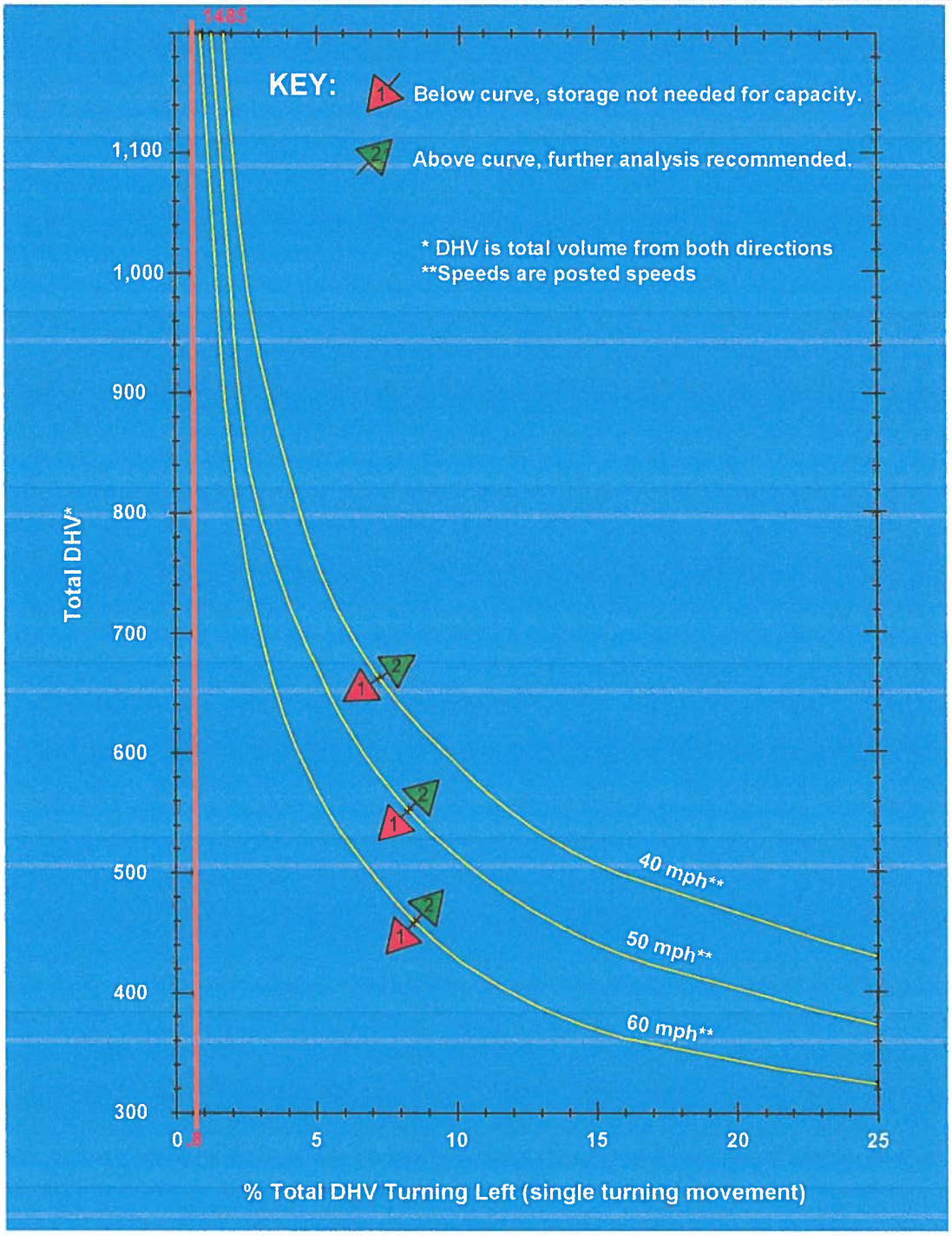
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.0	8.8	30.2		23.0	5.1	33.9
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		18.5	5.5	27.5		18.5	5.0	28.0
Max Q Clear Time (g_c+I1), s		8.2	5.3	24.3		9.1	2.3	19.3
Green Ext Time (p_c), s		1.4	0.0	1.4		1.4	0.0	5.8

Intersection Summary	
HCM 2010 Ctrl Delay	23.5
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	644	107	140	847	44	117	34	128	54	63	9
Future Volume (veh/h)	16	644	107	140	847	44	117	34	128	54	63	9
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1900	1881	1881	1900	1881	1881	1900
Adj Flow Rate, veh/h	16	664	110	144	873	45	121	35	132	56	65	9
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	34	872	741	181	968	50	394	88	332	306	412	57
Arrive On Green	0.02	0.46	0.46	0.10	0.55	0.55	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1792	1881	1599	1792	1774	91	1333	346	1305	1226	1618	224
Grp Volume(v), veh/h	16	664	110	144	0	918	121	0	167	56	0	74
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1792	0	1865	1333	0	1651	1226	0	1842
Q Serve(g_s), s	0.7	21.8	3.0	5.9	0.0	32.9	5.8	0.0	6.3	3.0	0.0	2.3
Cycle Q Clear(g_c), s	0.7	21.8	3.0	5.9	0.0	32.9	8.1	0.0	6.3	9.2	0.0	2.3
Prop In Lane	1.00		1.00	1.00		0.05	1.00		0.79	1.00		0.12
Lane Grp Cap(c), veh/h	34	872	741	181	0	1018	394	0	420	306	0	469
V/C Ratio(X)	0.47	0.76	0.15	0.80	0.00	0.90	0.31	0.00	0.40	0.18	0.00	0.16
Avail Cap(c_a), veh/h	120	958	814	228	0	1062	394	0	420	306	0	469
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	36.2	16.6	11.5	32.8	0.0	15.2	24.7	0.0	23.1	26.9	0.0	21.6
Incr Delay (d2), s/veh	9.9	3.3	0.1	14.3	0.0	10.4	2.0	0.0	2.8	1.3	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	12.1	1.3	3.6	0.0	19.5	2.3	0.0	3.2	1.1	0.0	1.3
LnGrp Delay(d),s/veh	46.1	19.9	11.6	47.1	0.0	25.6	26.8	0.0	25.9	28.2	0.0	22.3
LnGrp LOS	D	B	B	D		C	C		C	C		C
Approach Vol, veh/h		790			1062			288			130	
Approach Delay, s/veh		19.3			28.5			26.2			24.9	
Approach LOS		B			C			C			C	

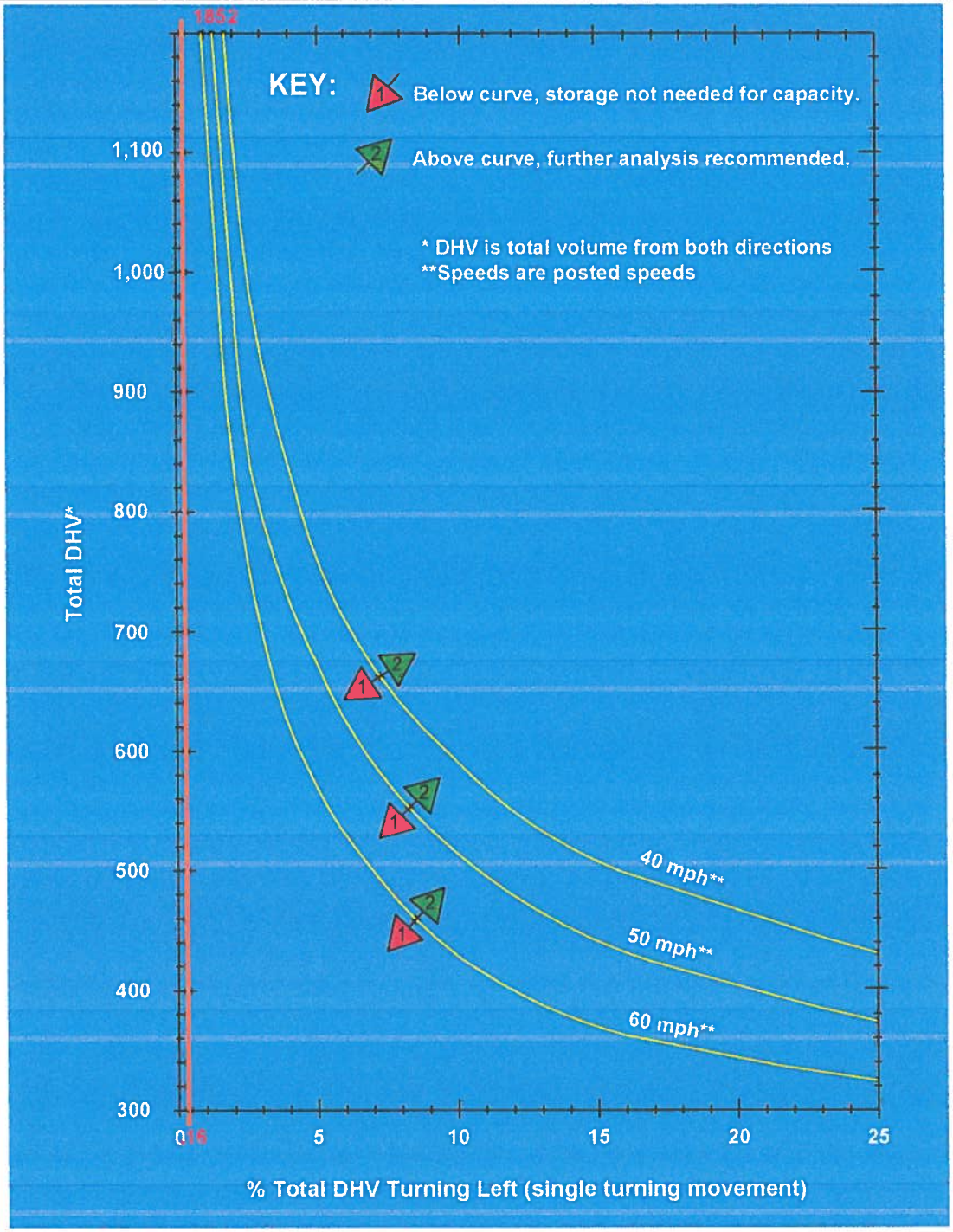
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.5	12.0	39.1		23.5	5.9	45.2
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		19.0	9.5	38.0		19.0	5.0	42.5
Max Q Clear Time (g_c+I1), s		10.1	7.9	23.8		11.2	2.7	34.9
Green Ext Time (p_c), s		1.4	0.1	9.6		1.2	0.0	5.8

Intersection Summary	
HCM 2010 Ctrl Delay	24.8
HCM 2010 LOS	C



SR-410 & Project Entrance
2019 AM Peak Hour Volumes With Project
Total AM DHV: 1485 vph
Left Turn %: 12/1485 = 0.8%
LEFT TURN LANE NOT WARRANTED

Left-Turn Storage Guidelines: Two-Lane, Unsignalized
Exhibit 1310-7a



SR-410 & Project Entrance
<u>2019 PM Peak Hour Volumes With Project</u>
Total PM DHV: 1485 vph
Left Turn %: 12/1485 = 0.8%
LEFT TURN LANE NOT WARRANTED

Left-Turn Storage Guidelines: <u>Two</u>-Lane, Unsignalized
Exhibit 1310-<u>7</u>a