TERMINAL 91
2017 TRAFFIC MONITORING STUDY

Prepared for:
Port of Seattle

January 17, 2018

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Introduction

The purpose of this report is to summarize the 2017 traffic monitoring study conducted for the Port of Seattle at Terminal 91. This study is conducted annually, as was originally outlined in the Terminal 91 Short Fill Redevelopment Agreement (SFRA) between the neighborhood community councils of Magnolia and Queen Anne and the Port of Seattle. As part of this study, traffic counts at and around Terminal 91 are conducted and an evaluation is performed on the transportation system based on the performance measures and thresholds identified in the SFRA. The results of this study are compared to each of the annual reports dating back to 2012. Prior to 2016, the traffic monitoring study was prepared by Heffron Transportation.

Short Fill Redevelopment Agreement and the Monitoring Process

The SFRA was established as a method of resolving disputes surrounding the Port's short fill redevelopment of Terminal 91. There were concerns from local residents and neighborhood community councils that the Port's redevelopment would cause significant adverse impacts to the surrounding roadway network. The SFRA outlines an annual monitoring program and a set of thresholds for traffic volumes and intersection level of service that were agreed upon by the Port and the neighborhood community councils. If these thresholds are exceeded, the SFRA states that further intensive review by the Port will be required as well as any mitigation measures, if deemed necessary.

Key steps within the monitoring program stated in the SFRA are as follows:

- ***Gates:*** The Port will obtain daily (24 hour), AM and PM peak period gate counts of trucks and autos entering or leaving all Terminal 91 gates for one week each quarter. Gate counts will be reported as trip ends. A trip end is an arrival or a departure. As such, a single vehicle which enters and then leaves the terminal will generate two trip ends.

- ***Intersections:*** Congestion and delay at intersections are measured in terms of Level of Service (LOS) under a system described in the Highway Capacity Manual. Levels of service range from A through F, with LOS A representing congestion-free service and LOS F representing jammed conditions. The Port will obtain LOS determinations for the peak hours at the following intersections once a year:

    - Elliott Avenue West and West Galer Street (now the Galer Street flyover)
    - Elliott Avenue West/15th Avenue West and West Garfield Street
    - 15th Avenue West and West Dravus Street (no longer counted due to north gate closure)
    - Elliott Avenue West and West Mercer Place
    - 20th Avenue West and West Dravus Street (no longer counted due to north gate closure)

According to industry standard, the methodology to determine level of service has been updated many times since the original SFRA agreement was drafted. The original methodology for determining level of service was via hand-calculations. Software now allows more accurate measurement of intersection operations and vehicle delays, and was used to perform the analysis in this report. Intersection LOS is based on the average delay per vehicle traveling through that intersection. Appendix B provides a breakdown of how much delay equates to each LOS. For this report, Trafficware's Synchro software (version 9) was used to perform LOS calculations.

Another change that has occurred since the SFRA was created is construction of the Galer Street Flyover. The Galer Street Flyover/Elliott Avenue West intersection was evaluated instead of the West Galer Street/Elliott Avenue West intersection because the Galer Street Flyover is the new access roadway for Terminal 91, and the West Galer Street railroad crossing is closed to vehicle traffic. Additionally, because the Center Gate to Terminal 91 is currently closed, no analysis was performed along the Magnolia Bridge. With the closure of the north gate, no intersections on West Dravus Street were counted or included in the study.

The SFRA established thresholds for both automobile and truck traffic volumes over three specific time periods. The time periods and volume thresholds are summarized in Table 1. The SFRA defines a 75-minute period for the AM peak and a 105-minute period for the PM peak. This differs from a typical traffic analysis, where a 60-minute peak period is used.

Table 1. SFRA Traffic Volume Threshold Criteria

	Time Period	Automobiles	Trucks
AM Peak	7:15 – 8:30 A.M.	395	25
PM Peak	3:45 – 5:30 P.M.	612	48
Daily	24 hours	3,500	325

Traffic Counts

Vehicle Classification Count Locations

During the course of this study there were two locations where vehicular traffic could enter and exit Terminal 91; these are shown in Figure 1.

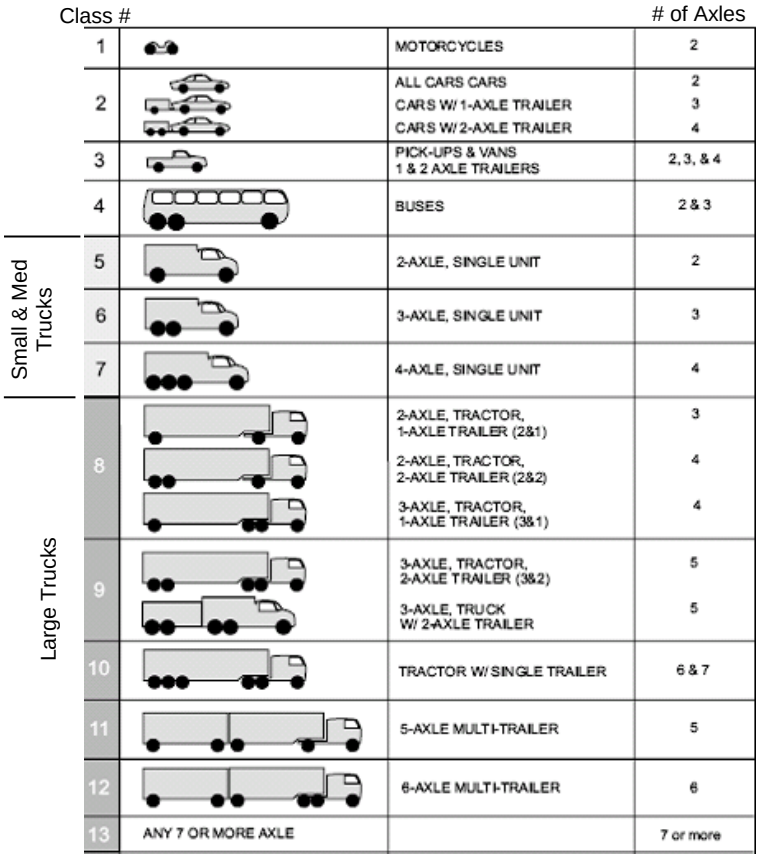
1. **East Gate** – This gate is located off Alaskan Way West, and is accessed by the Galer Street Flyover.
2. **West Gate** – On days with cruise activity, a retractable gate at the west end of the Magnolia Bridge is open. Vehicles can enter this gate and park, or traverse the area beneath the Magnolia Bridge to access Pier 91 south of the bridge. Vehicles also exit the parking lot via this gate. When cruise vessels are at sea, the gate is locked to the public in order to secure cruise parking lot D. The lot is accessed from the on/off-ramps at the west end of the Magnolia Bridge which also provide access to Elliott Bay Marina, but this non-Port-terminal traffic is not included.

Figure 1. Terminal 91 Access Locations

Vehicle classification counts were performed at both Terminal 91 gates in late August and early September 2017. The classification counts (performed by pneumatic tube counters) track the types of vehicles entering and exiting the terminals for each hour of the day. These tube counters are thin tubes, laid across the study roadway in pairs a set distance apart, that use pressure measurements to record when a vehicle passes over them. The tubes are able to count the number of axles per vehicle to determine the classification of the vehicle. These data were collected over a ten-day period from Friday, August 25, 2017 through Sunday, September 03, 2017.

To complement the tube counts, camera counts were performed at the same locations for four days: Thursday, August 24; Friday, August 25; Saturday, August 26; and Sunday, August 27. Three of these days, Friday, Saturday, and Sunday were cruise days and Thursday was a non-cruise day. These counts were performed during the peak hours for disembarkation (7:30 to 9:45 A.M.) and embarkation (11:00 A.M. to 12:45 P.M.). The cameras were mounted upon existing light or maintenance poles that record video of a specific location. Software systems and manual observations of the camera footage are used to count the number and type of vehicles. The vehicle types were categorized: passenger vehicle (non-commercial, including TNCs such as Uber and Lyft), taxi, limo/towncar, shuttle van/bus, charter bus, school bus, small truck, medium truck and large truck. Figure 2 provides a breakdown of each of the vehicle classifications.

Figure 2. Vehicle Classification Breakdown



The tube counts classify vehicles based on the number and spacing of axles; however, the accuracy of the classification counts can be affected by travel speed. A vehicle that travels faster or slower than expected could be registered as a different type of vehicle. The camera counts were used to validate the tube counts and determine if adjustments were needed. Discrepancies between the vehicle classification counts and the pneumatic tube counts were discovered, especially for small and medium trucks. These discrepancies are common for locations with low speeds, and this is likely the cause of the discrepancy for this count due to the tube counts being placed at the gates.

Small and medium trucks were over-counted by pneumatic tube counters for all days by approximately a factor of two. To correct for this, all small and medium truck values were divided by two.

It was also noted that large trucks were undercounted on weekdays, and that automobiles were slightly undercounted on weekends. As a result, large truck counts were multiplied by two on weekdays and the number of automobiles was increased proportionally to the decrease in small and medium trucks on weekends.

2017 Cruise Schedule

Cruise vessels were present at Terminal 91 on eight of the ten days surveyed in 2017. Table 2 provides a summary of the cruise schedule and the number of passengers per cruise ship during the ten-day study period (August 25 through September 3, 2017). Passenger volumes were

highest on the two Fridays, when two ships were present at Terminal 91. Wednesday and Thursday were the only days of the ten-day study period where no cruise ships were present.

Table 2. Cruise Passengers at Terminal 91 During 2017 Monitoring Survey

		Number of Passengers		
Date	**Vessel**	**Disembark**	**Embark**	**Total Passengers**
Fri, 8/25/17	Explorer of the Seas	3,691	3,632	7,323
	Celebrity Solstice	2,919	2,941	5,860
Sat, 8/26/17	Ruby Princess	3,330	3,242	6,572
	Eurodam	2,101	2,112	4,213
Sun, 8/27/17	Emerald Princess	3,360	3,309	6,669
	Oosterdam	2,128	1,877	4,005
Mon, 8/28/17	Amsterdam	1,227	1,246	2,473
Tues, 8/29/17	Carnival Legend	2,341	2,214	4,555
Wed, 8/30/17				
Thur, 8/31/17				
Fri, 9/1/17	Explorer of the Seas	3,653	3,346	6,999
	Celebrity Solstice	2,880	2,820	5,700
Sat, 9/2/17	Ruby Princess	3,232	3,152	6,384
	Eurodam	2,106	2,104	4,210
Sun, 9/3/17	Emerald Princess	3,277	3,197	6,474
	Oosterdam	1,854	1,724	3,578

Source: *Port of Seattle and Cruise Terminals of America*, 2017.

Automobile Traffic

Automobile traffic that entered or exited Terminal 91 was added for both access locations (east and west gate) to determine the total number of automobiles accessing Terminal 91. In addition to passenger cars, vans and small shuttles (i.e. 10-person passenger vans) were also classified as an automobile. Table 3 summarizes the automobile trip ends (a trip to and from T91 counts as two trips) and compares them to the thresholds established in the SFRA. Figure 3 through Figure 5 summarize the AM, PM and daily volumes as compared to their respective thresholds. As shown, the AM peak period exceeded the thresholds on Tuesday when there was one ship call, and both Fridays, Saturdays and Sundays when there were two cruise ships calls. Daily automobile thresholds were exceeded on all the days when a cruise ship was present at T91. The PM peak period threshold was never exceeded.

Table 3. Automobile Traffic to and from Terminal 91

Date	AM Peak (7:15 – 8:30 AM) Threshold = 395	PM Peak (3:45 – 5:30 PM) Threshold = 612	Daily (24-Hour) Threshold = 3,500
Fri, 8/25/17	**1,011**	253	**8,288**
Sat, 8/26/17	**772**	214	**6,758**
Sun, 8/27/17	**723**	156	**6,460**
Mon, 8/28/17	311	281	**3,662**
Tue, 8/29/17	**432**	310	**4,487**
Wed, 8/30/17	111	261	1,990
Thu, 8/31/17	116	202	2,134
Fri, 9/1/17	**831**	309	**7,895**
Sat, 9/2/17	**808**	207	**6,531**
Sun, 9/3/17	**689**	123	**5,965**

Source: *Ten-day tube counts conducted by IDAX, Friday, August 25 to Sunday, September 3, 2017. Combined volumes at both East Gate and West Gate for entry to and from Terminal 91.*
Volumes in bold identify time periods where the SFRA threshold limit is met or exceeded.

Figure 3. Automobile Traffic – AM Peak Period (7:15 – 8:30 AM)

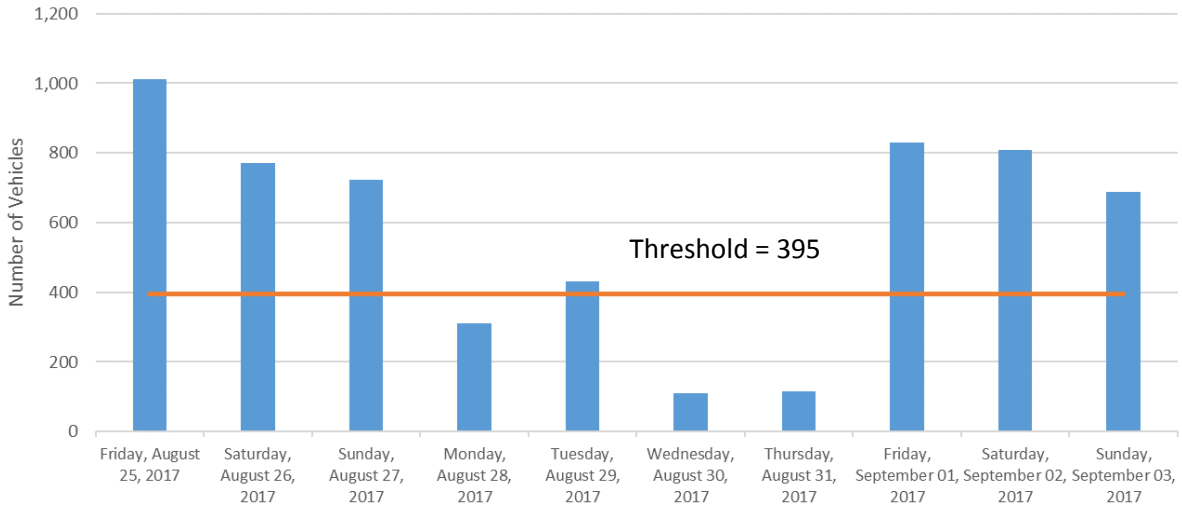


Figure 4. Automobile Traffic – PM Peak Period (3:45 – 5:30 PM)

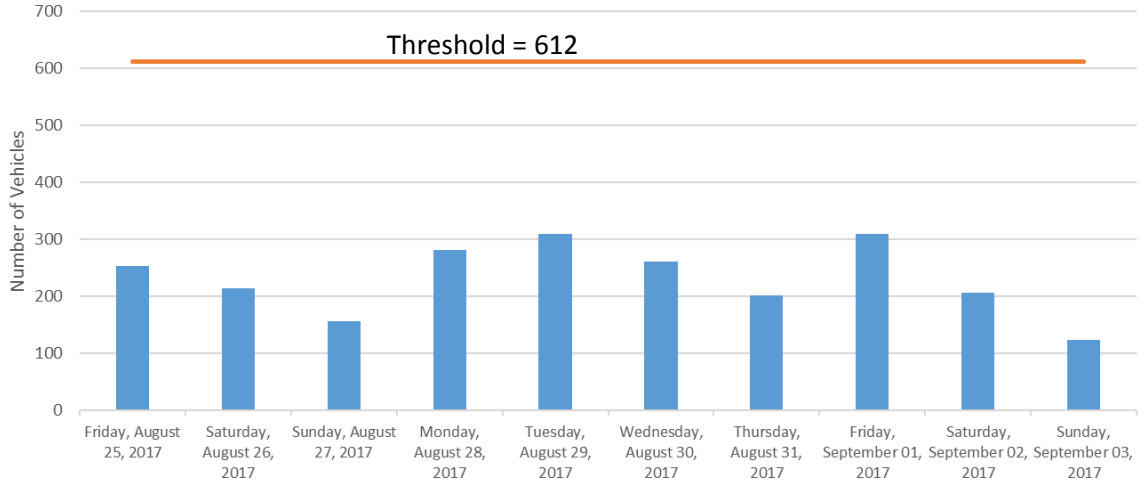
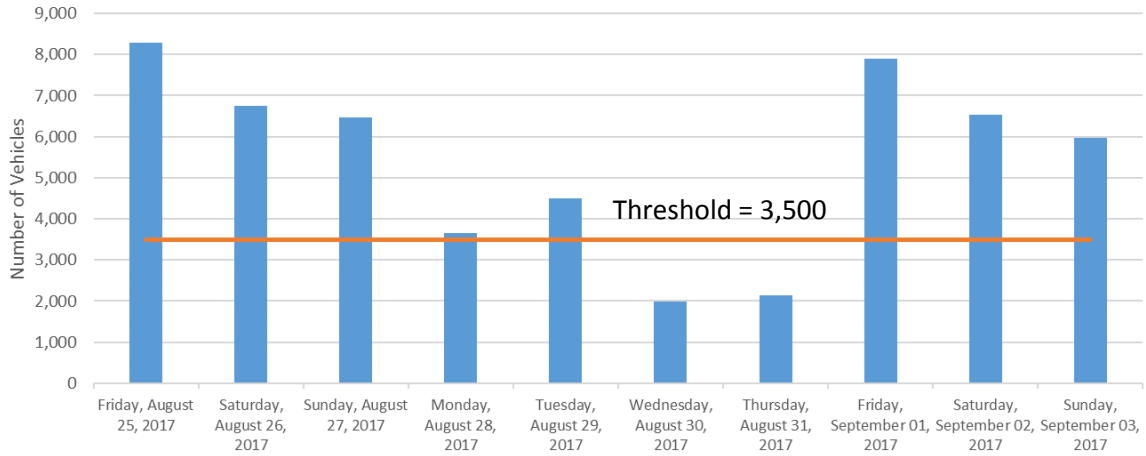
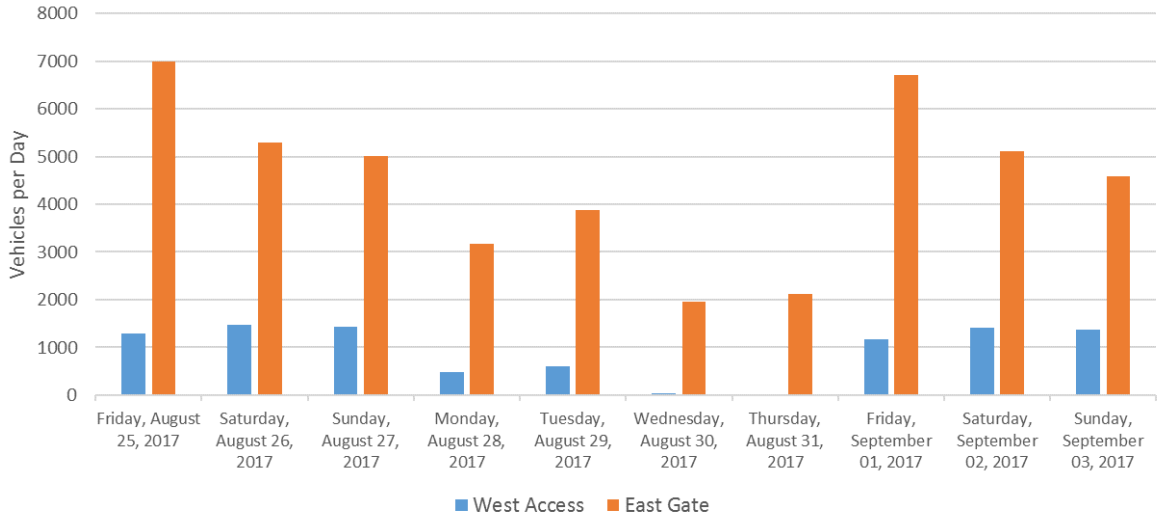


Figure 5. Automobile Traffic – Daily (24-Hour Period)



The daily automobile volume by access location is shown on Figure 6. On days without a cruise ship call, the parking lot at the West Gate is locked, and the small number of trips that entered or exited the terminal at the West Gate are likely related to security or maintenance personnel. Days with the largest number of vehicles accessing Terminal 91 correspond to days with cruise ship activity.

Figure 6. Daily Automobile Trips by Access Location



Truck Traffic

As was done with the automobile traffic, the truck traffic volumes were counted for large vehicles entering at both gates to Terminal 91 and compared to SFRA thresholds. In addition to typical trucks - charter buses and shuttles (greater than 10-person vans) were included in truck counts in Table 4. Almost all large vehicles access Terminal 91 through the East Gate, although some smaller trucks and shuttles may use the West Gate. The total number of truck trip ends for both access locations is summarized in Table 4. As shown, the volume of trucks, shuttles and buses exceeded the AM peak and daily thresholds on all days of the week. The PM peak threshold was exceeded on both Fridays and Thursday, August 31.

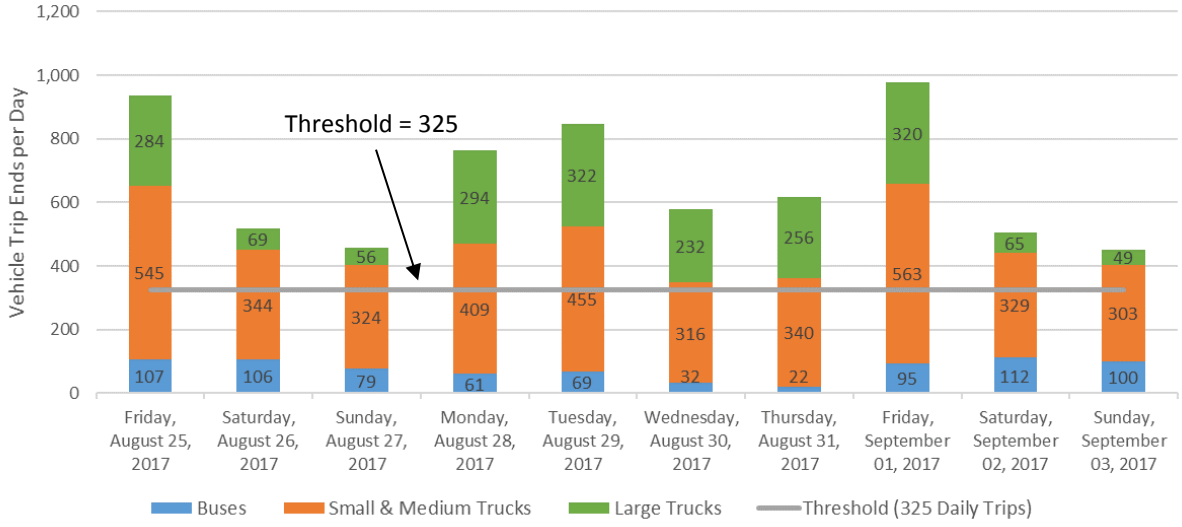
Table 4. Truck, Bus and Shuttle Volumes to and from Terminal 91

Date	AM Peak (7:15 – 8:30 AM) Threshold = 25	PM Peak (3:45 – 5:30 PM) Threshold = 48	Daily (24-Hour) Threshold = 325
Fri, 8/25/17	**86**	**55**	**936**
Sat, 8/26/17	**64**	14	**519**
Sun, 8/27/17	**57**	14	**459**
Mon, 8/28/17	**80**	44	**764**
Tue, 8/29/17	**76**	43	**846**
Wed, 8/30/17	**42**	47	**580**
Thu, 8/31/17	**49**	**63**	**618**
Fri, 9/1/17	**82**	**59**	**978**
Sat, 9/2/17	**60**	8	**506**
Sun, 9/3/17	**60**	3	**452**

Source: *Ten-day tube counts conducted by IDAX, Friday, August 25 to Sunday, September 3, 2017. Combined volumes at both East Gate and West Gate for entry to and from Terminal 91.*
Volumes in bold identify time periods where the Short-Fill Redevelopment Agreement threshold limit is met or exceeded.

The types of vehicles were compiled for each day to show the proportion of each type of large vehicle: buses, small and medium trucks (2 to 4 axles), and large trucks (more than 5 axles). Figure 7 summarizes the daily truck and bus volumes entering Terminal 91.

Figure 7. Large Vehicles by Day of Week



Historic Trends

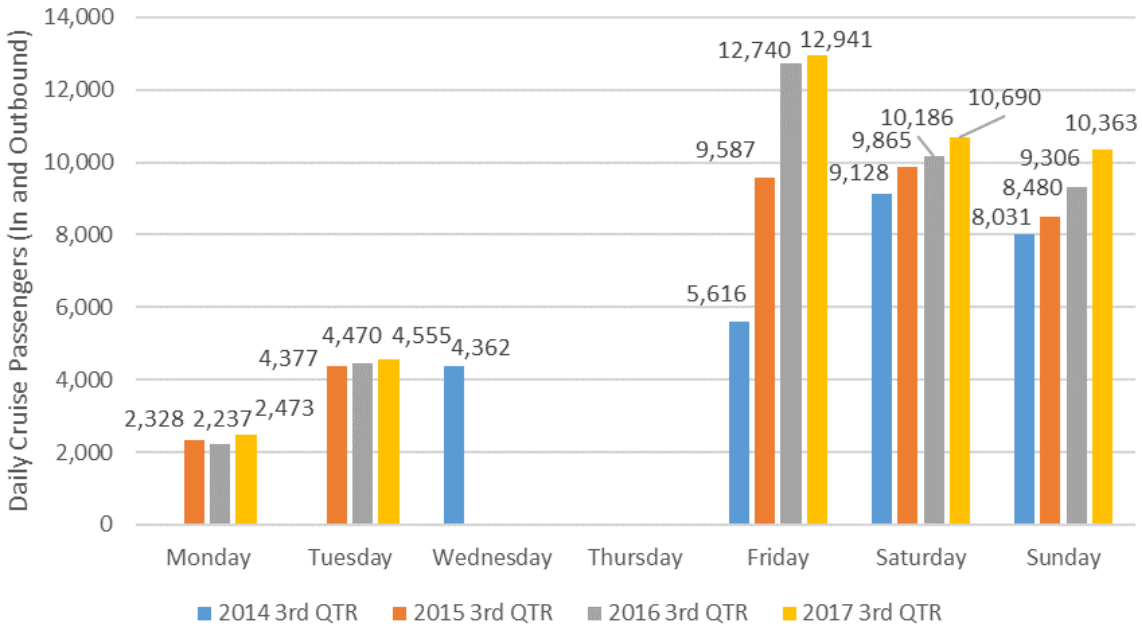
This section compares results from the four most recent traffic monitoring studies—September 2014, 2015, 2016 and 2017[1].

[1] Reports from years 2014, 2015 completed by Heffron Transportation. 2016 and 2017 reports completed by Transpo Group. Previous reports available: https://www.portseattle.org/Supporting-Our-Community/Community-Engagement/Pages/NAC.aspx

Passenger Trends

Traffic volumes at Terminal 91 fluctuate from day to day. The largest changes result from cruise activities. Figure 8 shows the number of passengers that embark and disembark cruise ships at the terminal by day of week for the past three monitoring years. As shown, cruise activity in the mid-week has changed over the years; in 2015, 2016 and 2017 there were no ships on Wednesday or Thursday. Cruise volumes on Monday and Tuesday show little to no growth over the last few years, while weekend activity has increased significantly. The majority of cruise ship passenger volume growth is on Friday, which continues to exceed weekend cruise ship passenger volumes due to larger capacity cruise ships calling on Fridays. The Wednesday 2014 cruise ship call seems to be an anomaly, but was noted as a homeport call of the Tuesday ship, as the cruise happened to finish on a Wednesday instead of the regular Tuesday in 2014.

Figure 8. Cruise Ship Passenger Volume Trends



Automobile Traffic Trends

Figures 9, 10, and 11 compare historic automobile traffic monitoring results for the AM peak, PM peak and 24-hour periods, respectively. Aside from one anomaly in 2015 (Saturday during the AM peak hour), traffic volumes are consistent with cruise ship passenger trends during the last four years of traffic monitoring. The AM peak period automobile traffic volumes continue to exceed the threshold on Friday, Saturday and Sunday and in 2017, the threshold was exceeded on Tuesday. The PM peak period automobile traffic volumes have increased slightly from 2016, back to levels more consistent with 2015 and earlier. Volumes during the PM are well below the established threshold. Daily automobile traffic volumes exceed the threshold on Tuesday, Wednesday, Friday, Saturday and Sunday.

Figure 9. Automobile Trends – AM Peak Period (7:15 – 8:30 AM)

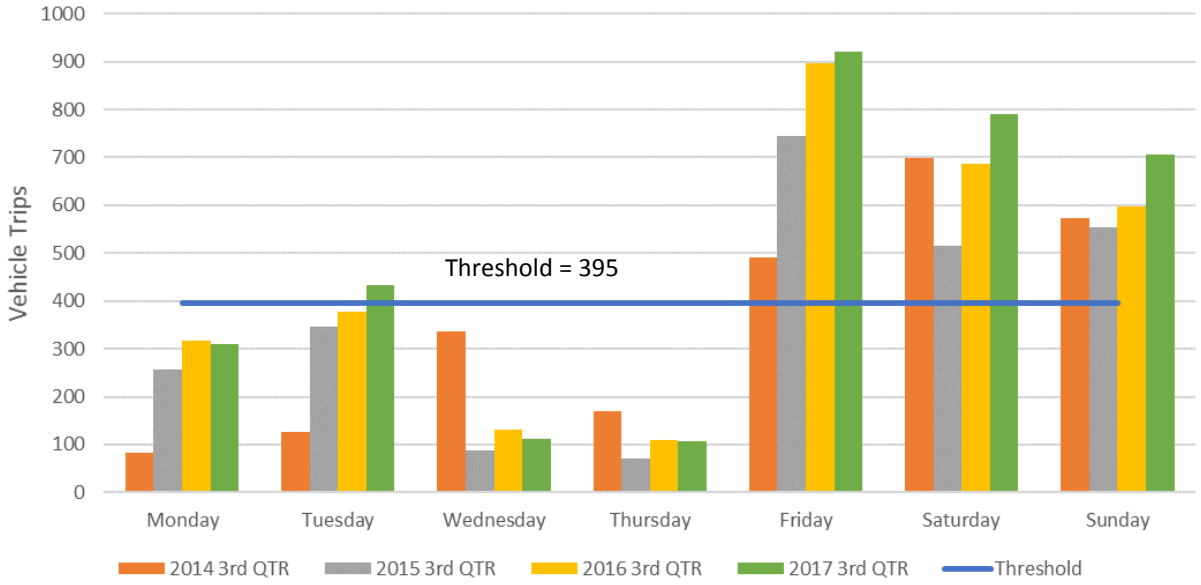


Figure 10. Automobile Trends – PM Peak Period (3:45 – 5:30 PM)

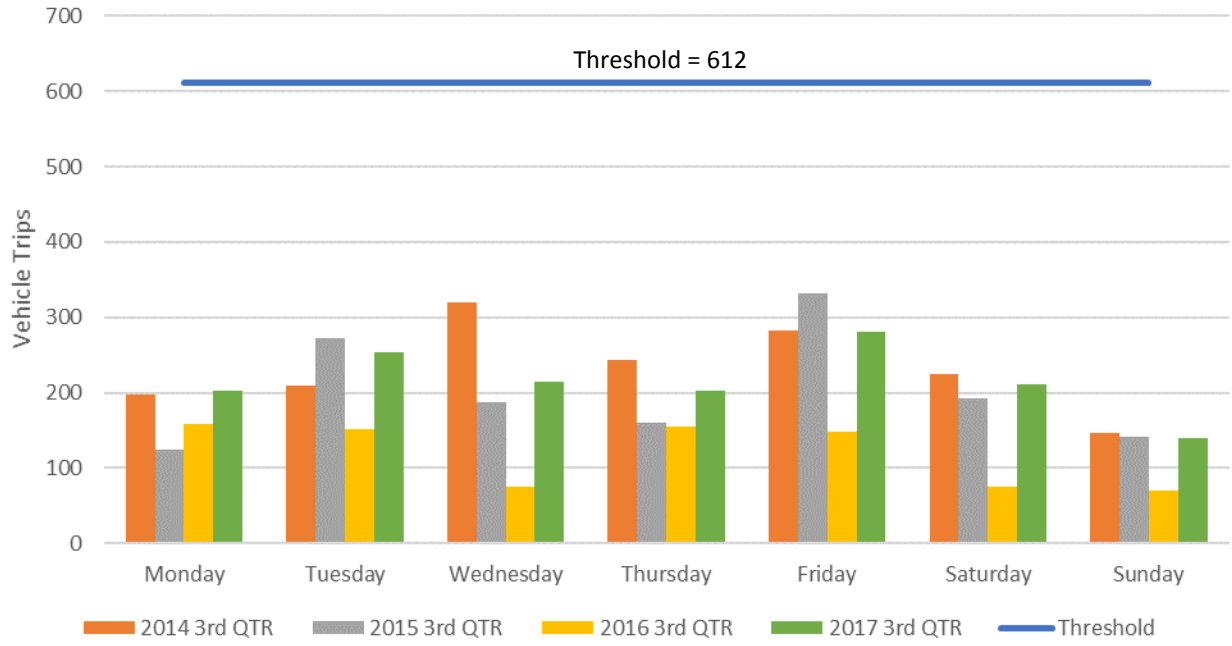
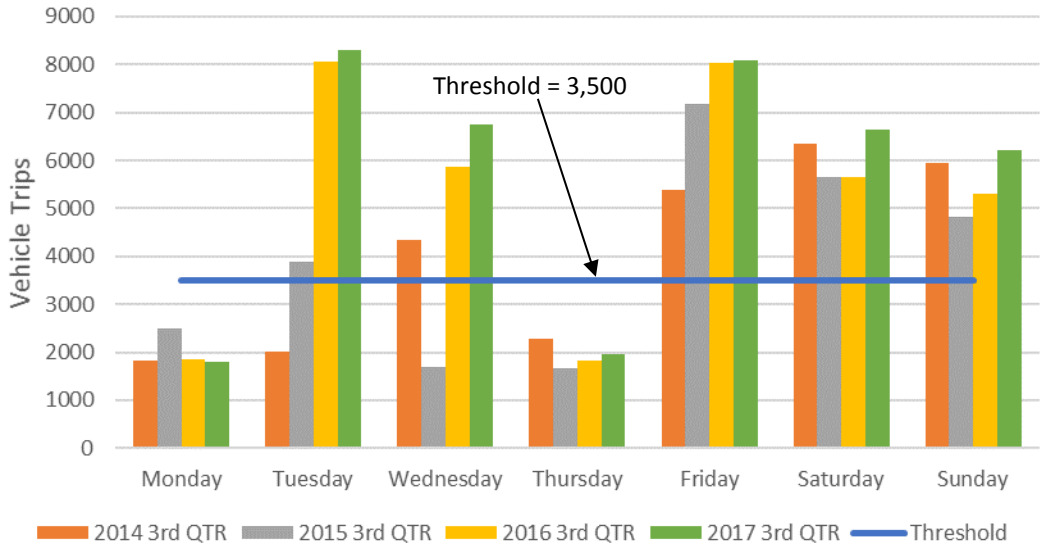


Figure 11. Automobile Trends – Daily (24-Hour Period)



Truck and Bus Traffic Trends

Figures 12, 13, and 14 compare truck volumes to prior monitoring results for the AM peak, PM peak, and 24-hour periods, respectively. These volumes include buses and trucks. The AM peak period, PM peak period and daily volumes of trucks have generally decreased during the weekdays (apart from Monday, where in 2015 the volumes were low due to the holiday) but increased on the weekends (including Friday). Truck volumes thresholds were met or exceeded every day during the AM peak period and the daily (24-hour) period. The PM peak period threshold was met only on Friday.

Figure 12. Truck and Bus Trends – AM Peak Period (7:15 – 8:30 AM)

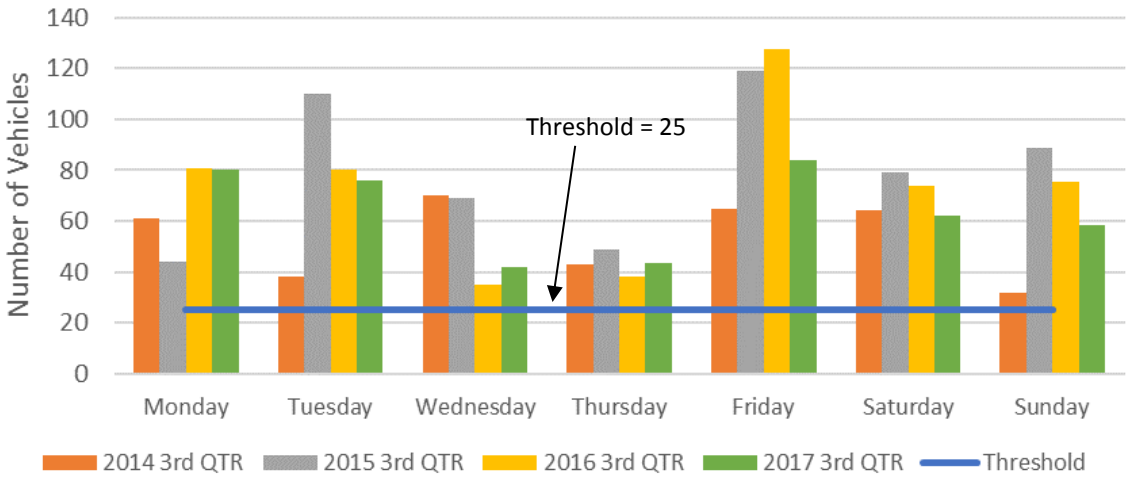


Figure 13. Truck and Bus Trends – PM Peak Period (3:45 – 5:30 PM)

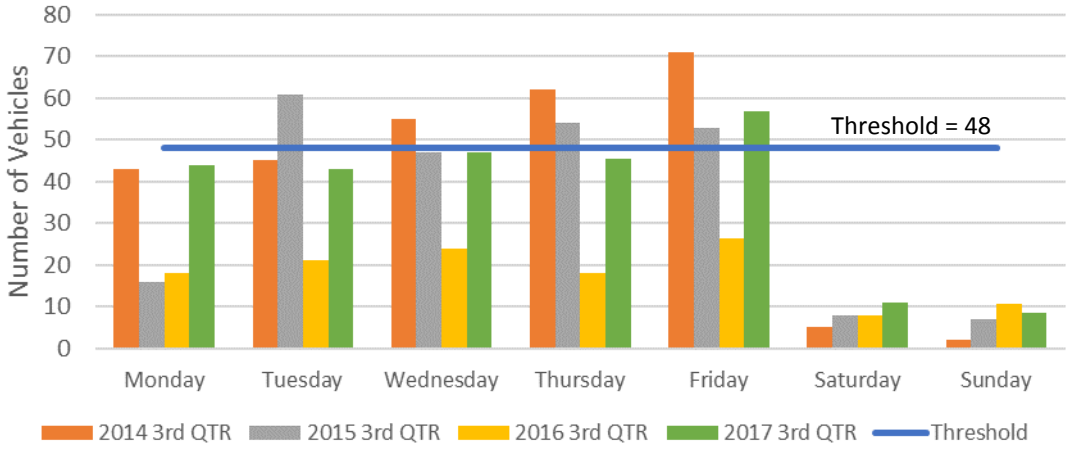
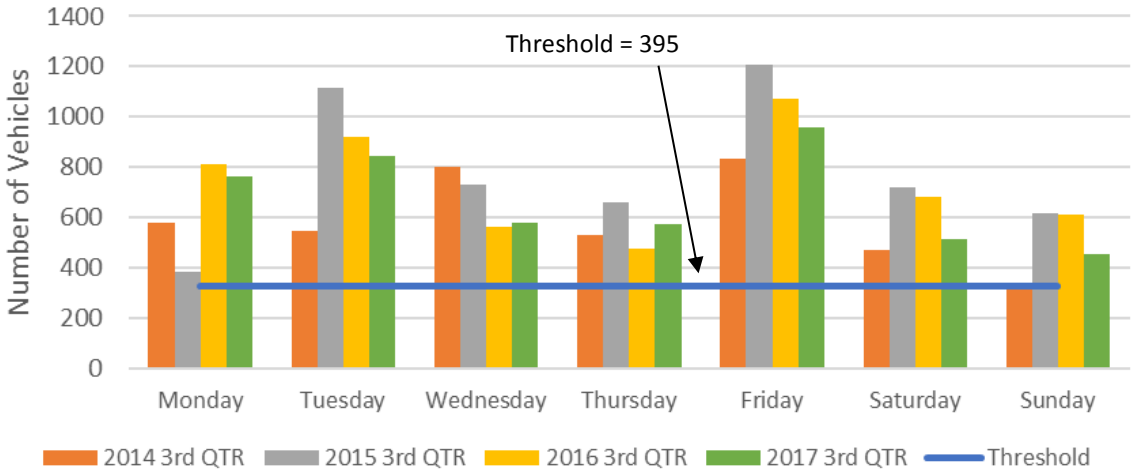


Figure 14. Truck and Bus Trends – Daily (24-Hour Period)



Intersection Level of Service

Trigger Levels

The SFRA established level of service trigger levels for three off-site intersections. Level of service is a qualitative measure used to characterize traffic operating conditions. Six letter designations, "A" through "F," are used to define level of service. LOS A is the best and represents good traffic operations with little or no delay to motorists. LOS F is the worst and indicates poor traffic operations with long delays. The trigger levels are summarized in Table 5. It is noted that the SFRA included the West Galer Street intersection on Elliott Avenue West, which was the primary access to Terminal 91 when the SFRA was created. That access has been replaced with the Galer Street Flyover. Therefore, the trigger level previously established for Galer Street was applied to the Elliott Avenue West/West Galer Street Flyover intersection.

Table 5. Level of Service Trigger Levels from SFRA

Intersection	**Trigger Level**
Elliot Avenue W / Galer Street Flyover	**LOS E**
Elliot Avenue W / W Garfield Street	**LOS C**
Elliot Avenue W / W Mercer Place	**LOS E**

Source: *Short-Fill Redevelopment Agreement, January 2000.*
SFRA included the Elliott Avenue West / West Galer Street Intersection, which was the primary access to Terminal 91. That access has been replaced with the Galer Street Flyover

As previously discussed, the level of service methodology prescribed by the SFRA (Critical Lane Analysis) is outdated. Computers now allow more complex calculations to occur, which have resulted in more accurate analyses of intersection operations. For this study, intersection levels of service were determined using the methodologies in the Highway Capacity Manual (Transportation Research Board, 2000). Levels of service for study area intersections were calculated using Trafficware's Synchro 9 traffic operations analysis software, which is also the latest version of software. Current level of service criteria for signalized intersections can be found in Appendix B.

In 2013, SDOT installed Traffic Responsive Operations Systems technology along the Elliott Avenue/15th Avenue corridor between West Armour Street and West Harrison Street. The signalized intersections along this corridor section use volume detection technology to change the traffic signal cycles and operation based on traffic volume. The technology allows for 15 different operational programs that are available during the day (five AM peak hour options, five PM peak hour options, and five off-peak options), instead of just one per time period under the former signal system. Each operational program is triggered when a specific traffic demand threshold is met. Since the operations can change as volumes change throughout the day, SDOT staff recommended that the Synchro model's cycle length and signal phase times should be "optimized" for each condition. This analysis uses the recommended approach.

The levels of service models developed by Seattle Department of Transportation (SDOT) for the Elliott Avenue/15th Avenue corridor were used for all analyses; these models reflect the current configuration (with the BAT lanes) and the volume-responsive traffic signal timing. However, these models use phasing plans that are not compatible with the stricter HCM 2010 phasing requirements (such as dedicated pedestrian phases). As a result, HCM 2000 was used to evaluate the intersection level of service in 2016 and 2017. It is noted that HCM methodology was not used to calculate intersection level of service in years prior to 2016. This change, along with slight alterations to the traffic signal timing and phasings implemented by the City of Seattle, result in more variation in average vehicle delay when comparing 2016 and 2017 to previous years, as illustrated in Figures 19 and 20.

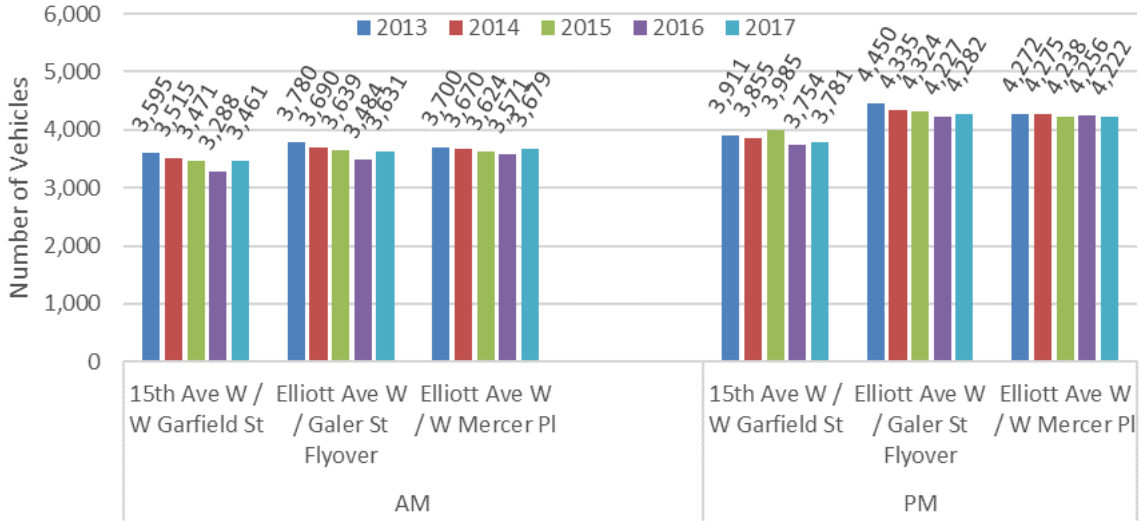
Year 2017 Traffic Volumes

Without Cruise Activity

New intersection counts were performed at all three study intersections on Thursday August 24, 2017 for two hours during the AM (7:00 – 9:00 AM) and PM (4:00 – 6:00 PM) peak periods. These counts were performed when no cruise activity was occurring at the Port. The peak one hour during each of the count periods was identified and used for the intersection analysis. These peak one-hour traffic volumes are reported from 7:45 to 8:45 A.M. and from 4:45 to 5:45 P.M. It is noted that these peak hours differ from the longer-than-60-minute periods prescribed by the SFRA. The peak hours were selected to meet industry standard for traffic analysis and level of service definitions, and are consistent with other traffic studies performed by the City of Seattle. Traffic volumes without cruise activity are shown on Figure 16 for the AM and PM peak hours, respectively. Additionally, the raw intersection turning movement counts are shown in Appendix A.

It is interesting to note that traffic volumes have changed very little since 2012. For each year since 2012, the total number of vehicles entering each of the intersections during the peak hours is compared on Figure 15. All sets of counts reflect late August or September conditions without cruise activity at Terminal 91. Volumes during both the AM and PM peak hours have remained nearly constant from 2012 to 2017, as both intersections are near capacity. This makes processing more vehicles during peak periods difficult, even if roadway volumes are generally increasing.

Figure 15. Total Traffic Entering Intersection – Without Cruise Activity



Source: Intersection turning movement counts performed for the respective Terminal 91 Monitoring Studies. All sets of counts reflect Q3 conditions without cruise activity at Terminal 91.

With Cruise Activity

The gate counts described in the prior sections were used to determine the net change in AM and PM peak hour traffic associated with cruise activity at Terminal 91. Two conditions with cruise activity were evaluated: a typical weekday with one ship call at the terminal (Tuesday) and a peak weekday with two large ship calls (Friday). These were compared to a day with no cruise (Thursday) to determine the traffic associated with cruise activity. The trip generation estimates are summarized in Table 6. As shown, cruise related trips are highest during the AM peak hour with 773 trips generated on the peak Friday. During the PM peak hour, on the same day, there were 35 cruise-related trips. Additionally, the raw intersection turning movement counts are shown in Appendix A.

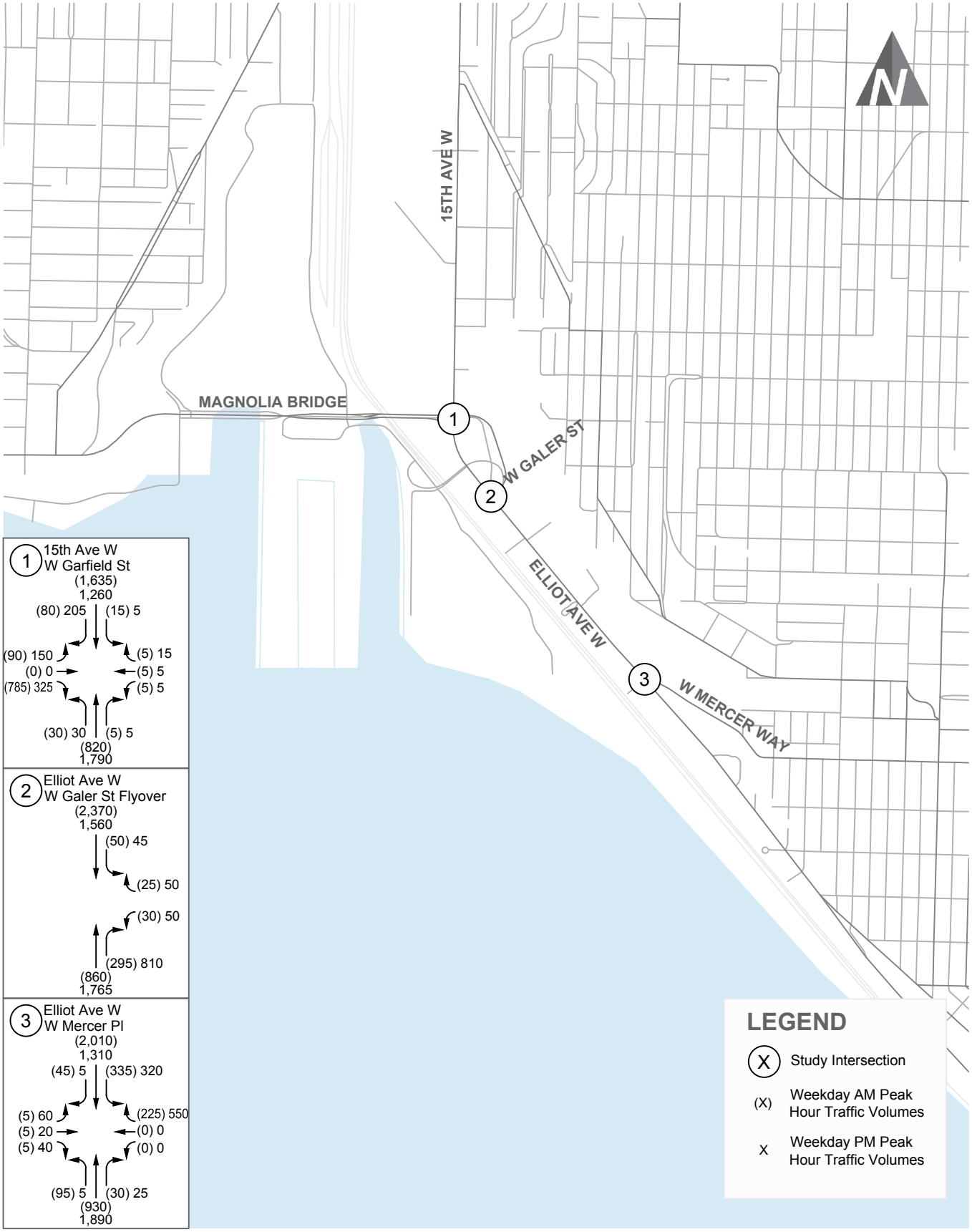
Due to low traffic volumes during the PM peak hour at both gates, in addition to the small number of vehicles generated by one cruise in the PM peak hour, a small change in daily traffic volumes can result in a net negative number of vehicles when comparing a cruise day to a non-cruise day.

Table 6. Weekday Peak Hour Traffic: Cruise Day vs. Non-Cruise Day - 2017

	East Gate		West Gate		Total Terminal 91		
	Enter	Exit	Enter	Exit	Enter	Exit	Total
AM Peak Hour (7:45 to 8:45 AM)							
Non-Cruise Day (Wed 8/30/2017)	75	31	2	4	77	35	112
Typical Weekday Cruise Day (Tues 8/29/2017)	177	187	55	41	232	228	460
Peak Weekday Cruise Day (Fri 9/1/2017)	328	321	119	43	447	364	811
Net Change with Typical Weekday Cruise	**102**	**156**	**53**	**37**	**155**	**193**	**348**
Net Change with Peak Weekday Cruise	**253**	**290**	**117**	**39**	**370**	**329**	**699**
PM Peak Hour (4:45 to 5:45 PM)							
Non-Cruise Day (Wed 8/30/2017)	34	81	0	0	34	81	115
Typical Weekday Cruise Day (Tues 8/29/2017)	22	84	0	1	22	85	107
Peak Weekday Cruise Day (Fri 9/1/2017)	37	68	0	0	37	68	105
Net Change with Typical Weekday Cruise	**-12**	**3**	**0**	**1**	**-12**	**4**	**-8**
Net Change with Peak Weekday Cruise	**3**	**-13**	**0**	**0**	**3**	**-13**	**-10**

Source: *Ten-day tube counts conducted by IDAX, Thursday, August 24 to Sunday, September 3, 2017. Combined volumes at both East Gate and West Gate for entry to and from Terminal 91.*
Volumes in bold identify time periods where the Short-Fill Redevelopment Agreement threshold limit is met or exceeded.

The additional peak hour traffic generated by the cruise terminal on an average weekday (with one ship call) and the peak weekday (two ship calls) was distributed to the roadway network and assigned to the study-area intersections according to travel patterns defined by traffic counts performed for the 2010 Monitoring study. The AM and PM cruise terminal trips are shown on Figure 17.

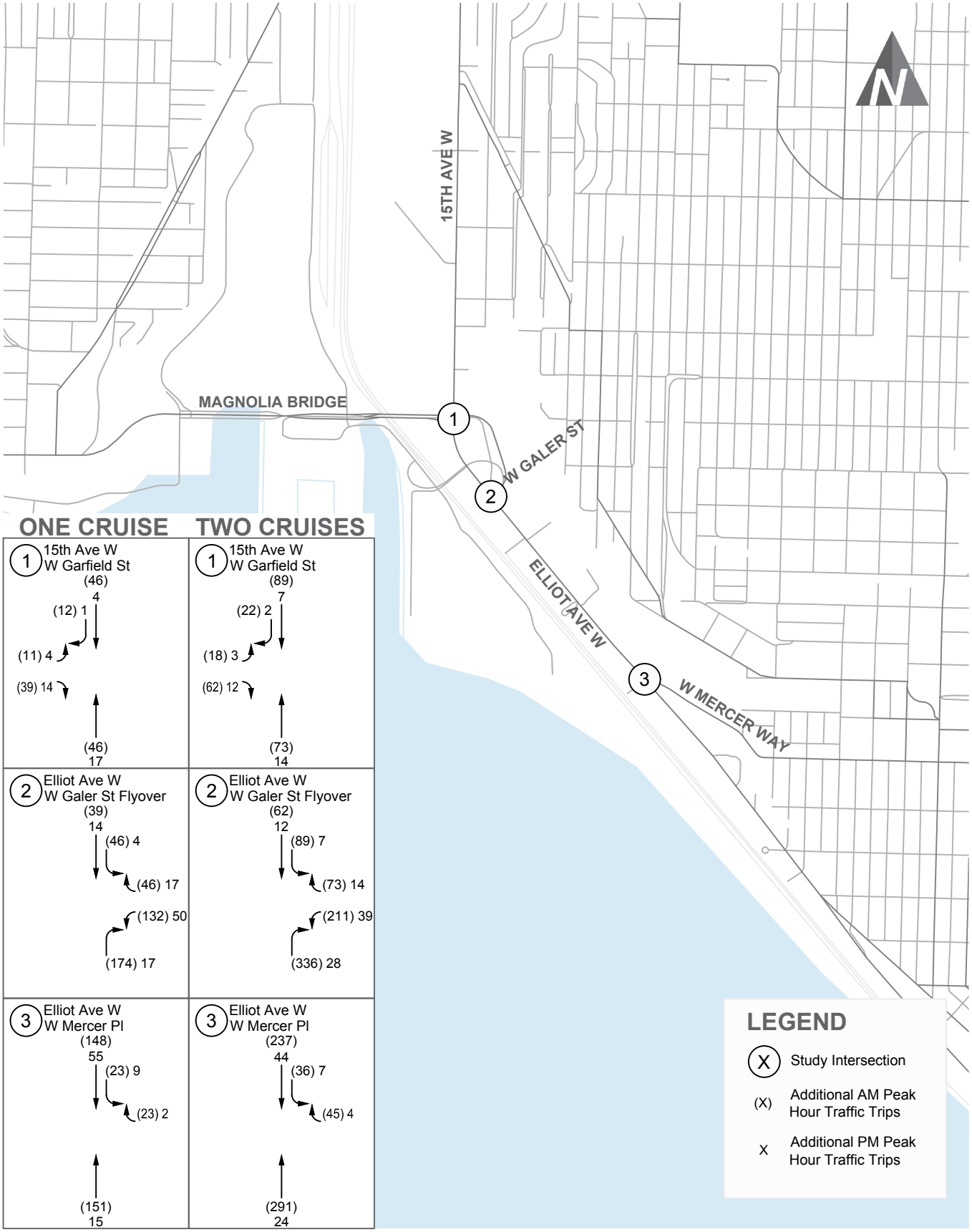


Existing Peak Hour Traffic Volumes - Without Cruises

FIGURE 16

Terminal 91 - Annual Traffic Monitoring - 2017

transpogroup



ONE CRUISE	TWO CRUISES
1 15th Ave W W Garfield St (46) 4 (12) 1 (11) 4 (39) 14 (46) 17	1 15th Ave W W Garfield St (89) 7 (22) 2 (18) 3 (62) 12 (73) 14
2 Elliot Ave W W Galer St Flyover (39) 14 (46) 4 (46) 17 (132) 50 (174) 17	2 Elliot Ave W W Galer St Flyover (62) 12 (89) 7 (73) 14 (211) 39 (336) 28
3 Elliot Ave W W Mercer Pl (148) 55 (23) 9 (23) 2 (151) 15	3 Elliot Ave W W Mercer Pl (237) 44 (36) 7 (45) 4 (291) 24

LEGEND

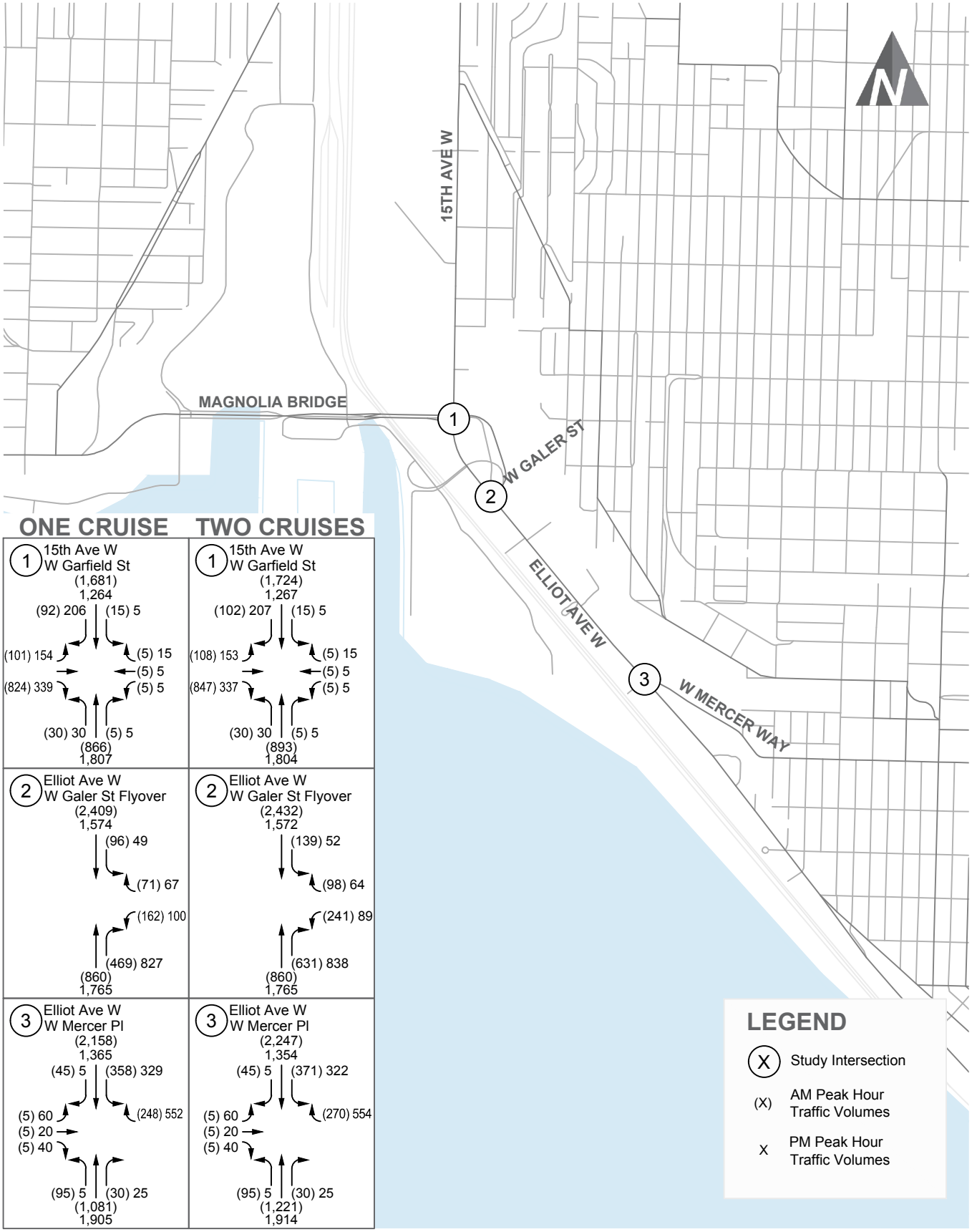
- (X) Study Intersection
- (X) Additional AM Peak Hour Traffic Trips
- X Additional PM Peak Hour Traffic Trips

Additional Peak Hour Traffic due to Cruise Activity

Terminal 91 - Annual Traffic Monitoring - 2017

FIGURE 17

transpogroup



ONE CRUISE	TWO CRUISES
1 15th Ave W W Garfield St (1,681) 1,264 (92) 206 (15) 5 (101) 154 (5) 15 (5) 5 (824) 339 (5) 5 (30) 30 (5) 5 (866) 1,807	1 15th Ave W W Garfield St (1,724) 1,267 (102) 207 (15) 5 (108) 153 (5) 15 (5) 5 (847) 337 (5) 5 (30) 30 (5) 5 (893) 1,804
2 Elliot Ave W W Galer St Flyover (2,409) 1,574 (96) 49 (71) 67 (162) 100 (469) 827 (860) 1,765	2 Elliot Ave W W Galer St Flyover (2,432) 1,572 (139) 52 (98) 64 (241) 89 (631) 838 (860) 1,765
3 Elliot Ave W W Mercer Pl (2,158) 1,365 (45) 5 (358) 329 (5) 60 (5) 20 (5) 40 (248) 552 (95) 5 (30) 25 (1,081) 1,905	3 Elliot Ave W W Mercer Pl (2,247) 1,354 (45) 5 (371) 322 (5) 60 (5) 20 (5) 40 (270) 554 (95) 5 (30) 25 (1,221) 1,914

LEGEND

- (X) Study Intersection
- (X) AM Peak Hour Traffic Volumes
- X PM Peak Hour Traffic Volumes

Peak Hour Traffic Volumes - with Cruise Activity

Terminal 91 - Annual Traffic Monitoring - 2017

FIGURE **18**

transpogroup

Level of Service Analysis

Peak hour traffic volumes shown on Figures 16 through 18 were used to determine the levels of service for study-area intersections. This analysis reflects existing conditions on a normal day (without cruise operations at Terminal 91), on a weekday with one ship call, and on a weekday with two ship calls. The methodology used to determine level of service was previously described in the *Trigger Levels* section. The results are summarized in Table 7, and the detailed level of service reports can be found in Appendix C.

The level of service results for the 'without cruise conditions' at each study intersection all operate well below the SFRA threshold level. The addition of the traffic resulting from a typical one-ship day does not significantly impact operations at any of the three study intersections. On two-cruise ship days, intersection LOS results also fall below the SFRA threshold level. During the periods of heaviest activity in 2017, queuing occasionally occurred along the Galer flyover stretching onto Elliott.

Table 7. 2017 Traffic Operations with and Without Cruise

	SFRA Trigger Level[A]	Average Weekday Without Cruise		Average Weekday With One Ship		Peak Weekday With Two Ships	
		LOS[B]	Delay[C]	LOS	Delay	LOS	Delay
AM Peak Hour							
15th Ave / Garfield Street	LOS C	A	4.9	A	5.4	A	5.7
Elliott Ave / Galer Flyover	LOS E	A	4.8	B	10.6	B	16.3
Elliott Ave / W Mercer Place	LOS E	C	28.2	D	36.5	D	44.8
PM Peak Hour							
15th Ave / Garfield Street	LOS C	A	6.8	A	7.2	A	7.1
Elliott Ave / Galer Flyover	LOS E	B	17.2	B	18.0	C	18.0
Elliott Ave / W Mercer Place	LOS E	C	31.8	C	32.8	C	32.8

Source: Levels of service were calculated using traffic operations models developed by SDOT for the Elliott Avenue corridor. They reflect existing signal timing and lane geometry. All analysis was performed using the Synchro 9.0 model and analysis methodology.

A. Level of service threshold established by Short-Fill Redevelopment Agreement, January 2000. The SFRA included the Elliot Avenue W / W Galer Street intersection which was the primary access to Terminal 91. That access has been replaced with the Galer Street Flyover.

B. Level of Service

C. Average delay per vehicle in seconds.

Level of service results from Terminal 91 Monitoring Reports dating back to 2011 are compared on Figure 19 for the Elliott Avenue West/Galer Street Flyover intersection and on Figure 20 for the Elliott Avenue West / West Mercer Place intersection. The charts compare the average vehicle delay without and with cruise traffic. The condition with one cruise ship is used because that is the only condition that existed in prior years for an accurate comparison. Operations during the PM peak period worsened during 2017, and as a result, the delay during cruise conditions also increased. Figures 19 and 20 show that both intersections operate well within the delay associated with the LOS E threshold established by the SFRA.

Figure 19. Traffic Operations at Elliott Ave West / Galer Street Flyover Intersection

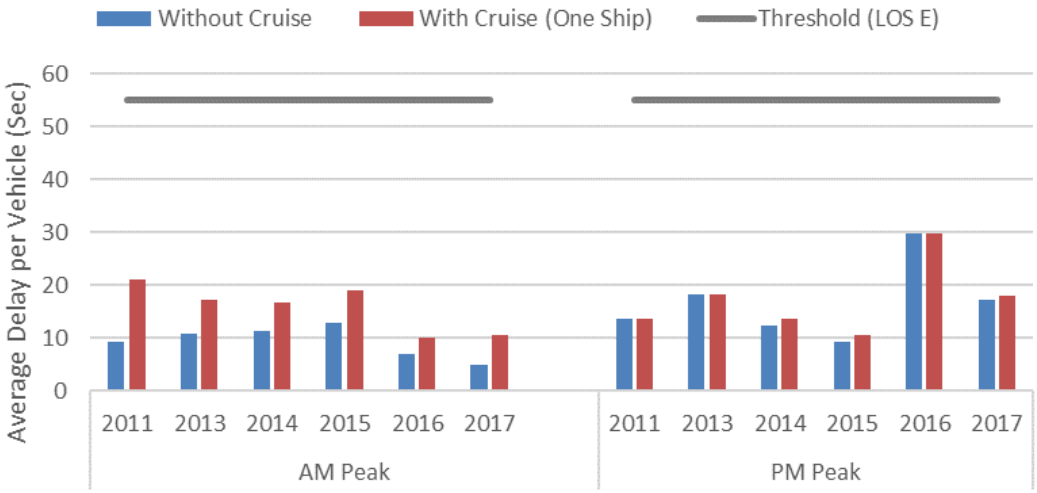
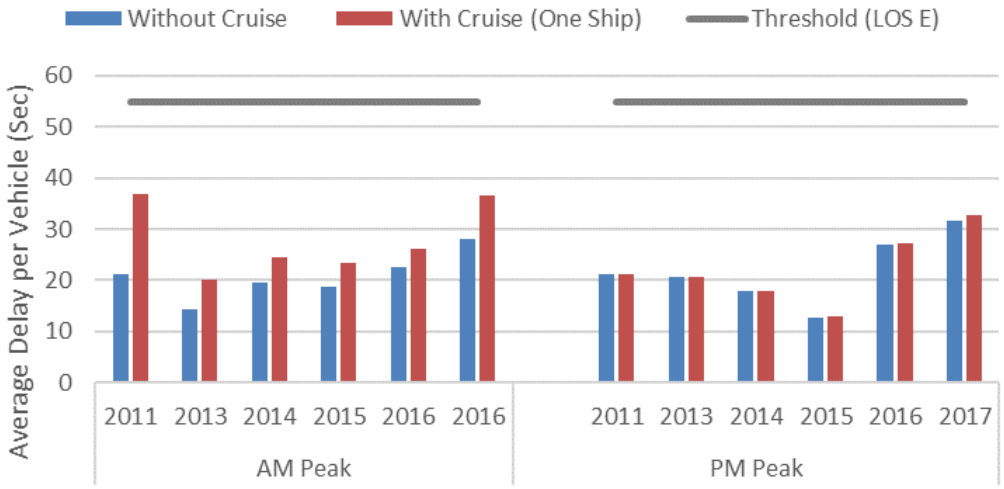


Figure 20. Traffic Operations at Elliott Ave West / West Mercer Place Intersection



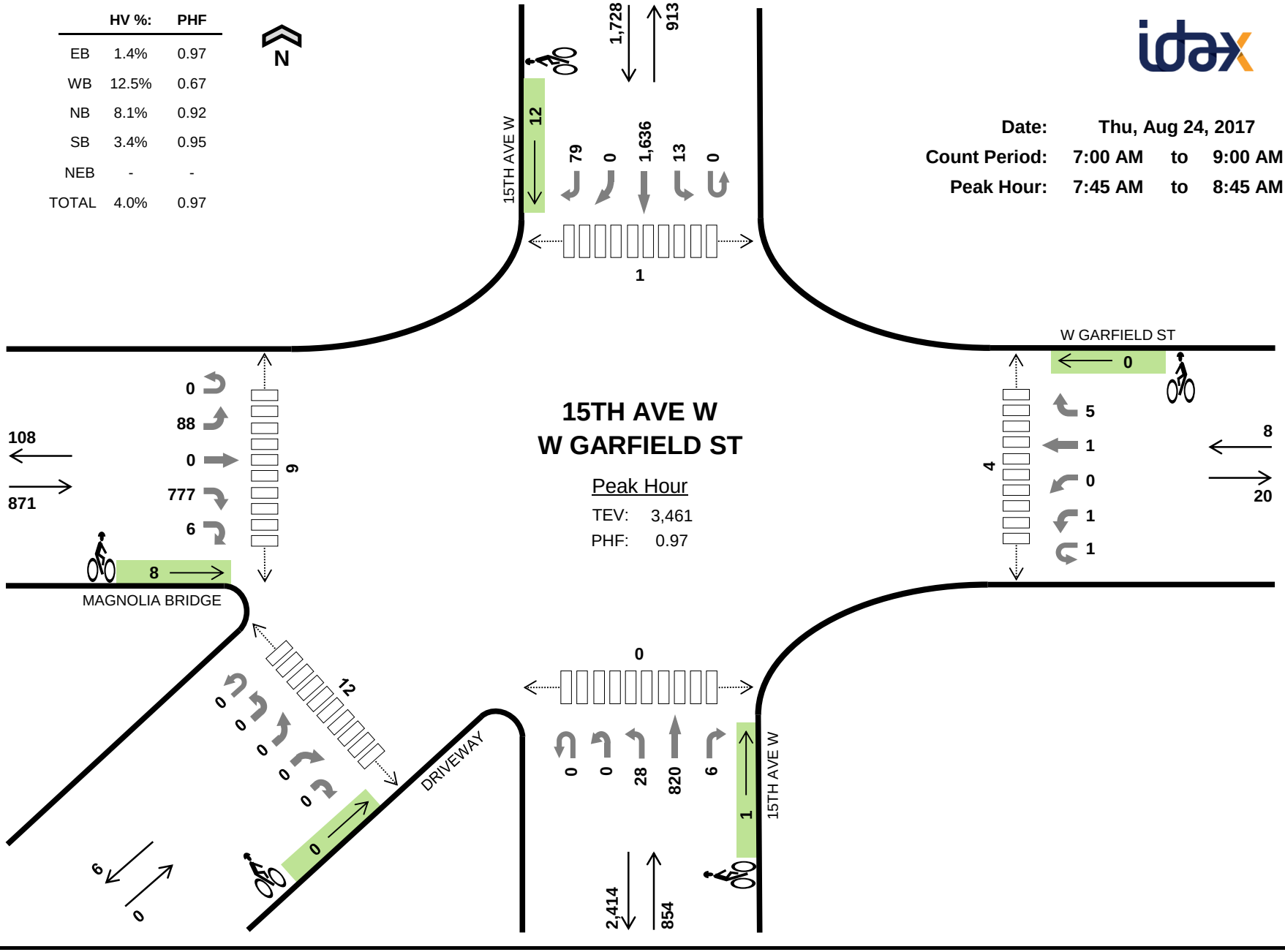
Conclusions

This 2017 Terminal 91 Traffic Monitoring Study shows that truck trips continue to exceed the volume thresholds for AM, PM and daily periods, and have exceeded those thresholds for many years. Automobile trips exceed the thresholds during the AM and daily periods on days with cruise operations. However, despite the fact that the traffic volume thresholds are exceeded, traffic operations along the Elliott Avenue West/15th Avenue West corridor still operate below the trigger levels listed in the short fill agreement at each of the study intersections during both the AM and PM peak hours.

Appendix A:Intersection Traffic Counts

AM Counts

	HV %:	PHF
EB	1.4%	0.97
WB	12.5%	0.67
NB	8.1%	0.92
SB	3.4%	0.95
NEB	-	-
TOTAL	4.0%	0.97



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Two-Hour Count Summaries

Interval Start	MAGNOLIA BRIDGE Eastbound					W GARFIELD ST Westbound					15TH AVE W Northbound					15TH AVE W Southbound					DRIVEWAY Northeastbound					15-min Total	Rolling One Hour
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
7:00 AM	0	11	0	170	1	0	0	0	0	0	0	0	5	167	2	0	2	345	0	7	0	0	0	0	0	710	0
7:15 AM	0	18	1	194	0	0	0	0	0	0	0	0	8	203	0	0	4	389	0	13	0	0	0	0	0	830	0
7:30 AM	0	12	2	204	1	0	0	0	0	0	0	0	5	178	0	0	2	396	0	17	0	0	0	0	0	817	0
7:45 AM	**0**	**17**	**0**	**202**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**8**	**224**	**1**	**0**	**3**	**414**	**0**	**21**	**0**	**0**	**0**	**0**	**0**	**891**	3,248
8:00 AM	**0**	**22**	**0**	**187**	**2**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**10**	**192**	**2**	**0**	**5**	**391**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**830**	3,368
8:15 AM	**0**	**31**	**0**	**191**	**3**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**3**	**208**	**3**	**0**	**3**	**433**	**0**	**19**	**0**	**0**	**0**	**0**	**0**	**895**	3,433
8:30 AM	**0**	**18**	**0**	**197**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**7**	**196**	**0**	**0**	**2**	**398**	**0**	**23**	**0**	**0**	**0**	**0**	**0**	**845**	**3,461**
8:45 AM	0	29	0	152	0	0	2	0	0	0	0	0	10	210	3	0	2	362	0	28	0	0	0	0	0	798	3,368
Count Total	0	158	3	1,497	8	1	3	0	1	5	0	0	56	1,578	11	0	23	3,128	0	144	0	0	0	0	0	6,616	0
Peak Hour	**0**	**88**	**0**	**777**	**6**	**1**	**1**	**0**	**1**	**5**	**0**	**0**	**28**	**820**	**6**	**0**	**13**	**1,636**	**0**	**79**	**0**	**0**	**0**	**0**	**0**	**3,461**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals						Bicycles						Pedestrians (Crossing Leg)					
	EB	WB	NB	SB	NEB	Total	EB	WB	NB	SB	NEB	Total	East	West	North	South	Southwest	Total
7:00 AM	6	0	22	9	0	*37*	3	0	0	3	0	*6*	1	1	2	1	2	*7*
7:15 AM	7	0	17	10	0	*34*	1	0	0	4	0	*5*	0	3	1	0	2	*6*
7:30 AM	6	0	11	12	0	*29*	1	0	4	2	0	*7*	1	2	1	0	3	*7*
7:45 AM	**2**	**0**	**18**	**16**	**0**	***36***	**2**	**0**	**0**	**2**	**0**	***4***	**1**	**4**	**1**	**0**	**4**	***10***
8:00 AM	**3**	**0**	**18**	**16**	**0**	***37***	**2**	**0**	**0**	**1**	**0**	***3***	**0**	**0**	**0**	**0**	**2**	***2***
8:15 AM	**2**	**0**	**16**	**11**	**0**	***29***	**1**	**0**	**1**	**4**	**0**	***6***	**2**	**1**	**0**	**0**	**2**	***5***
8:30 AM	**5**	**1**	**17**	**15**	**0**	***38***	**3**	**0**	**0**	**5**	**0**	***8***	**1**	**4**	**0**	**0**	**4**	***9***
8:45 AM	2	0	18	17	0	*37*	2	0	1	4	0	*7*	1	2	0	0	3	*6*
Count Total	33	1	137	106	0	*277*	15	0	6	25	0	*46*	7	17	5	1	22	*52*
Peak Hr	**12**	**1**	**69**	**58**	**0**	***140***	**8**	**0**	**1**	**12**	**0**	***21***	**4**	**9**	**1**	**0**	**12**	*26*

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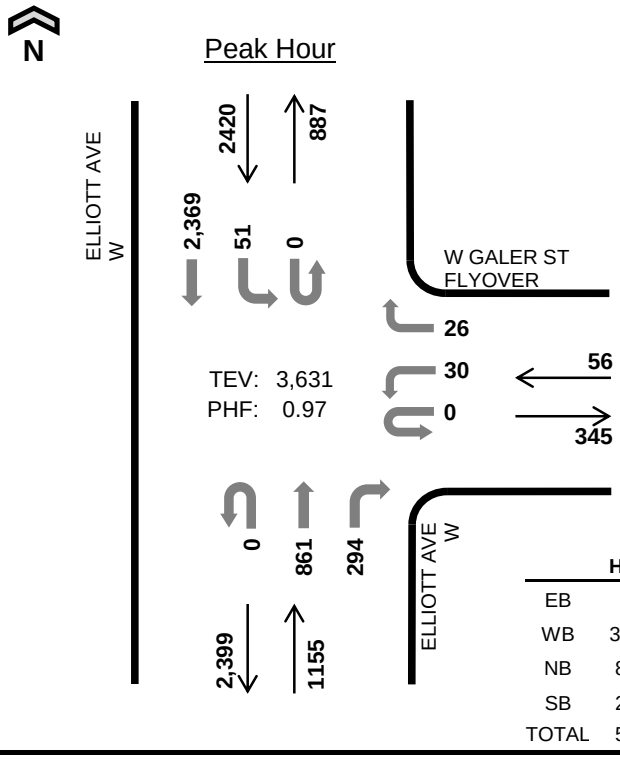
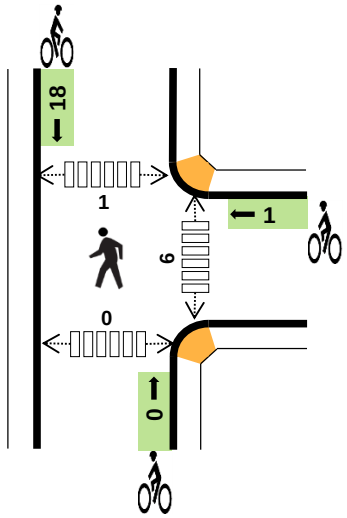
ELLIOTT AVE W
W GALER ST FLYOVER



Date: Thu, Aug 24, 2017
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM

	HV %:	PHF
EB	-	-
WB	32.1%	0.88
NB	8.3%	0.95
SB	2.8%	0.96
TOTAL	5.0%	0.97



Two-Hour Count Summaries

Interval Start	0				W GALER ST FLYOVER				ELLIOTT AVE W				ELLIOTT AVE W				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	12	0	4	0	0	168	61	0	5	503	0	753	0
7:15 AM	0	0	0	0	0	7	0	5	0	0	216	73	0	18	565	0	884	0
7:30 AM	0	0	0	0	0	7	0	1	0	0	187	67	0	8	587	0	857	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	**0**	**0**	**232**	**73**	**0**	**11**	**572**	**0**	**896**	3,390
8:00 AM	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**7**	**0**	**0**	**213**	**78**	**0**	**14**	**614**	**0**	**935**	3,572
8:15 AM	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**6**	**0**	**0**	**219**	**75**	**0**	**8**	**598**	**0**	**916**	3,604
8:30 AM	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**9**	**0**	**0**	**197**	**68**	**0**	**18**	**585**	**0**	**884**	**3,631**
8:45 AM	0	0	0	0	1	8	0	10	1	0	213	68	0	8	523	0	832	3,567
Count Total	0	0	0	0	1	64	0	46	1	0	1,645	563	0	90	4,547	0	6,957	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**30**	**0**	**26**	**0**	**0**	**861**	**294**	**0**	**51**	**2,369**	**0**	**3,631**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	5	27	13	*45*	0	0	0	5	*5*	3	0	0	0	*3*
7:15 AM	0	5	23	16	*44*	0	1	0	3	*4*	2	0	0	0	*2*
7:30 AM	0	5	19	15	*39*	0	0	3	2	*5*	1	0	1	0	*2*
7:45 AM	**0**	**2**	**23**	**17**	***42***	**0**	**0**	**0**	**4**	***4***	**1**	**0**	**0**	**0**	*1*
8:00 AM	**0**	**4**	**25**	**17**	***46***	**0**	**0**	**0**	**2**	***2***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**0**	**5**	**29**	**13**	***47***	**0**	**1**	**0**	**3**	***4***	**2**	**0**	**1**	**0**	*3*
8:30 AM	**0**	**7**	**19**	**20**	***46***	**0**	**0**	**0**	**9**	***9***	**3**	**0**	**0**	**0**	***3***
8:45 AM	0	7	24	17	*48*	0	1	0	3	*4*	4	0	0	0	*4*
Count Total	0	40	189	128	*357*	0	3	3	31	*37*	16	0	2	0	*18*
Peak Hr	**0**	**18**	**96**	**67**	***181***	**0**	**1**	**0**	**18**	***19***	**6**	**0**	**1**	**0**	***7***

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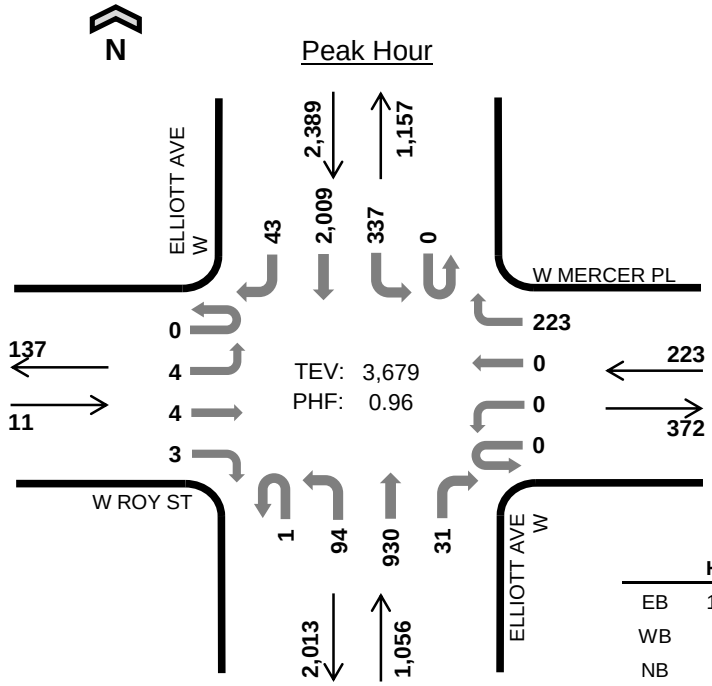
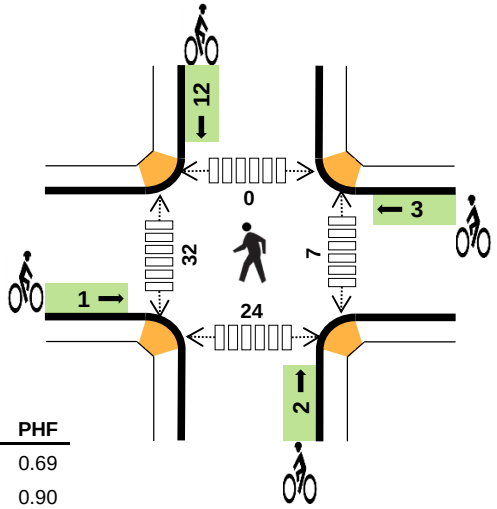
ELLIOTT AVE W
W ROY ST

Peak Hour



Date: Thu, Aug 24, 2017
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM



	HV %:	PHF
EB	18.2%	0.69
WB	8.5%	0.90
NB	7.2%	0.97
SB	3.2%	0.95
TOTAL	4.7%	0.96

Two-Hour Count Summaries

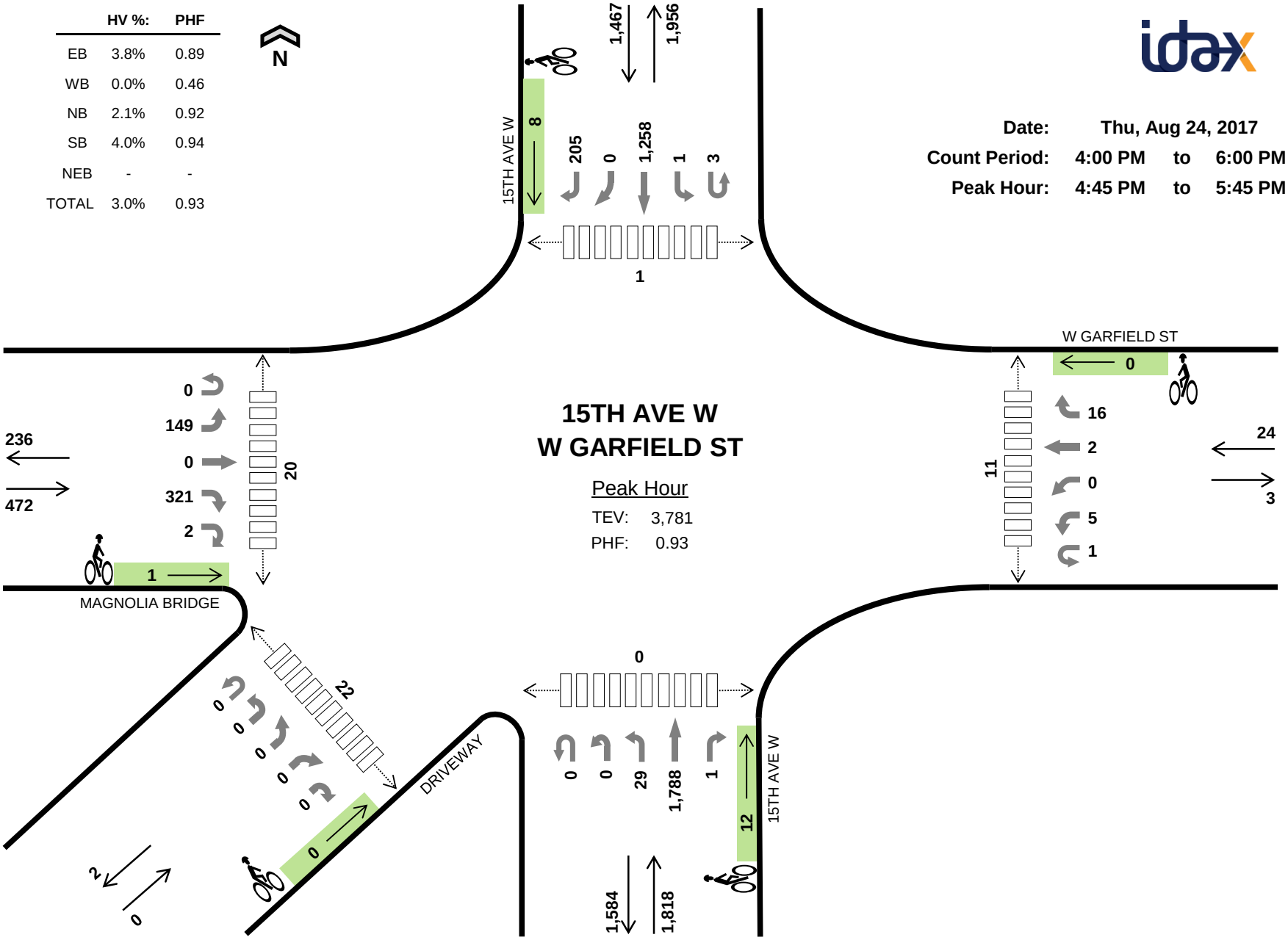
Interval Start	W ROY ST				W MERCER PL				ELLIOTT AVE W				ELLIOTT AVE W				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	1	0	0	0	52	0	15	212	1	0	76	415	15	787	0
7:15 AM	0	0	1	4	0	0	0	50	1	27	211	2	0	80	481	6	863	0
7:30 AM	0	0	0	2	0	0	0	47	0	23	218	8	0	65	493	18	874	0
7:45 AM	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**62**	**0**	**23**	**242**	**7**	**0**	**79**	**479**	**12**	**907**	3,431
8:00 AM	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**54**	**0**	**23**	**242**	**8**	**0**	**90**	**527**	**15**	**963**	3,607
8:15 AM	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**59**	**1**	**23**	**234**	**7**	**0**	**87**	**503**	**7**	**924**	3,668
8:30 AM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**48**	**0**	**25**	**212**	**9**	**0**	**81**	**500**	**9**	**885**	**3,679**
8:45 AM	0	1	0	1	0	0	0	79	0	13	208	7	0	102	449	10	870	3,642
Count Total	0	5	5	11	0	0	0	451	2	172	1,779	49	0	660	3,847	92	7,073	0
Peak Hour	**0**	**4**	**4**	**3**	**0**	**0**	**0**	**223**	**1**	**94**	**930**	**31**	**0**	**337**	**2,009**	**43**	**3,679**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	5	23	19	*47*	0	0	0	6	*6*	2	5	0	2	*9*
7:15 AM	3	2	23	18	*46*	0	0	1	3	*4*	7	7	0	3	*17*
7:30 AM	0	6	16	17	*39*	0	1	2	3	*6*	0	6	0	7	*13*
7:45 AM	**0**	**6**	**19**	**22**	***47***	**0**	**1**	**1**	**3**	***5***	**3**	**7**	**0**	**8**	*18*
8:00 AM	**1**	**3**	**20**	**18**	***42***	**0**	**1**	**1**	**1**	***3***	**2**	**10**	**0**	**7**	*19*
8:15 AM	**1**	**8**	**21**	**16**	***46***	**1**	**0**	**0**	**2**	***3***	**1**	**9**	**0**	**3**	*13*
8:30 AM	**0**	**2**	**16**	**20**	***38***	**0**	**1**	**0**	**6**	***7***	**1**	**6**	**0**	**6**	***13***
8:45 AM	0	8	19	22	*49*	0	0	0	5	*5*	3	18	0	5	*26*
Count Total	5	40	157	152	*354*	1	4	5	29	*39*	19	68	0	41	*128*
Peak Hour	**2**	**19**	**76**	**76**	***173***	**1**	**3**	**2**	**12**	***18***	**7**	**32**	**0**	**24**	***63***

PM Counts

	HV %:	PHF
EB	3.8%	0.89
WB	0.0%	0.46
NB	2.1%	0.92
SB	4.0%	0.94
NEB	-	-
TOTAL	3.0%	0.93



Date: Thu, Aug 24, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM

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Two-Hour Count Summaries

Interval Start	MAGNOLIA BRIDGE Eastbound					W GARFIELD ST Westbound					15TH AVE W Northbound					15TH AVE W Southbound					DRIVEWAY Northeastbound					15-min Total	Rolling One Hour
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
4:00 PM	0	34	1	81	0	0	0	0	1	2	0	0	7	412	0	1	1	350	0	43	0	0	0	0	0	933	0
4:15 PM	0	31	0	80	2	0	2	0	0	0	0	0	8	436	0	0	0	324	0	52	0	0	0	0	0	935	0
4:30 PM	0	33	1	85	0	0	0	0	3	0	0	0	7	439	1	0	1	289	0	33	0	0	0	0	0	892	0
4:45 PM	**0**	**37**	**0**	**74**	**1**	**0**	**3**	**0**	**1**	**1**	**0**	**0**	**6**	**425**	**0**	**0**	**0**	**301**	**0**	**55**	**0**	**0**	**0**	**0**	**0**	**904**	3,664
5:00 PM	**0**	**43**	**0**	**89**	**0**	**1**	**1**	**0**	**0**	**11**	**0**	**0**	**8**	**484**	**0**	**2**	**0**	**330**	**0**	**48**	**0**	**0**	**0**	**0**	**0**	**1,017**	3,748
5:15 PM	**0**	**39**	**0**	**71**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**8**	**415**	**1**	**0**	**1**	**334**	**0**	**55**	**0**	**0**	**0**	**0**	**0**	**928**	3,741
5:30 PM	**0**	**30**	**0**	**87**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**7**	**464**	**0**	**1**	**0**	**293**	**0**	**47**	**0**	**0**	**0**	**0**	**0**	**932**	**3,781**
5:45 PM	0	40	1	61	0	0	0	0	1	0	0	0	10	434	0	0	0	287	0	39	0	0	0	0	0	873	3,750
Count Total	0	287	3	628	4	1	7	0	7	18	0	0	61	3,509	2	4	3	2,508	0	372	0	0	0	0	0	7,414	0
Peak Hour	**0**	**149**	**0**	**321**	**2**	**1**	**5**	**0**	**2**	**16**	**0**	**0**	**29**	**1,788**	**1**	**3**	**1**	**1,258**	**0**	**205**	**0**	**0**	**0**	**0**	**0**	**3,781**	**0**

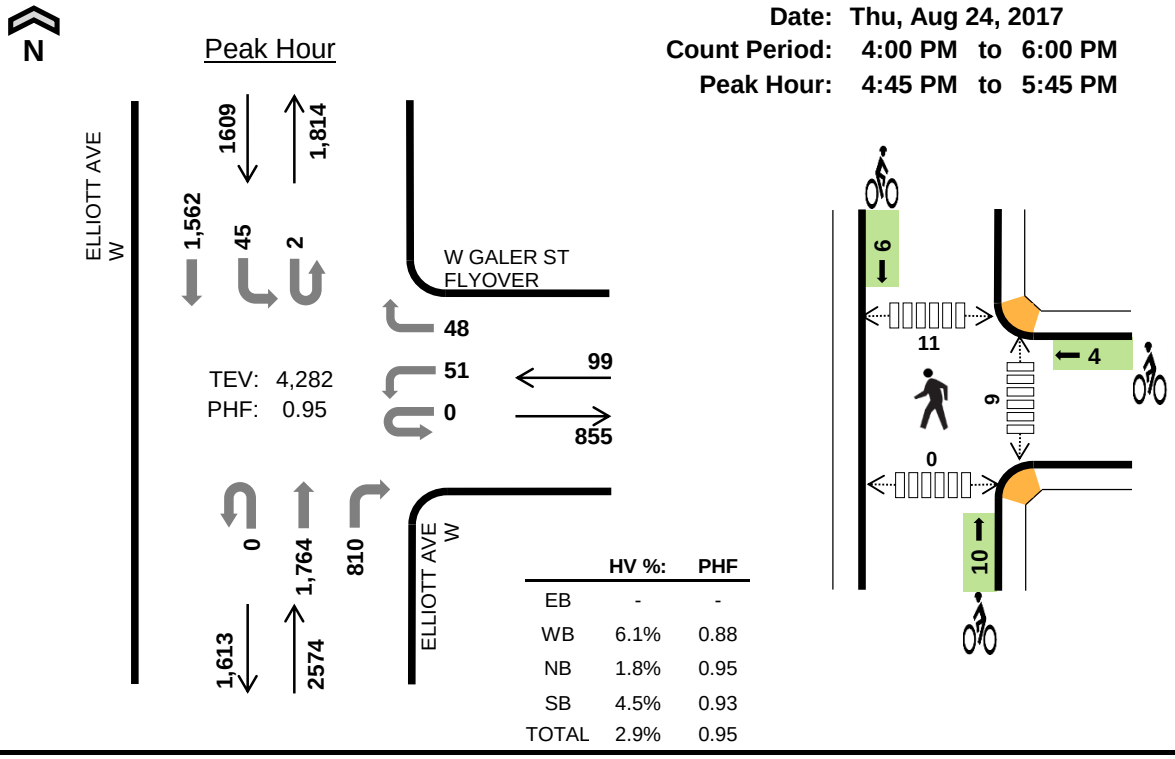
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals						Bicycles						Pedestrians (Crossing Leg)					
	EB	WB	NB	SB	NEB	Total	EB	WB	NB	SB	NEB	Total	East	West	North	South	Southwest	Total
4:00 PM	3	0	12	10	0	*25*	2	0	3	1	0	*6*	5	2	3	2	2	*14*
4:15 PM	3	0	8	15	0	*26*	1	0	2	0	0	*3*	1	6	0	0	3	*10*
4:30 PM	3	0	5	7	0	*15*	0	0	3	0	0	*3*	3	5	0	3	5	*16*
4:45 PM	**4**	**0**	**11**	**15**	**0**	***30***	**0**	**0**	**3**	**2**	**0**	***5***	**2**	**6**	**0**	**0**	**2**	***10***
5:00 PM	**3**	**0**	**6**	**18**	**0**	***27***	**0**	**0**	**2**	**4**	**0**	***6***	**3**	**3**	**1**	**0**	**3**	***10***
5:15 PM	**2**	**0**	**11**	**12**	**0**	***25***	**1**	**0**	**1**	**1**	**0**	***3***	**2**	**6**	**0**	**0**	**9**	***17***
5:30 PM	**9**	**0**	**10**	**14**	**0**	***33***	**0**	**0**	**6**	**1**	**0**	***7***	**4**	**5**	**0**	**0**	**8**	***17***
5:45 PM	4	0	6	11	0	*21*	0	0	0	1	0	*1*	4	4	2	0	8	*18*
Count Total	31	0	69	102	0	*202*	4	0	20	10	0	*34*	24	37	6	5	40	*112*
Peak Hr	**18**	**0**	**38**	**59**	**0**	***115***	**1**	**0**	**12**	**8**	**0**	***21***	**11**	**20**	**1**	**0**	**22**	*54*

Mark Skaggs: (425) 250-0777 mark.skaggs@idaxdata.com

ELLIOTT AVE W
W GALER ST FLYOVER

Date: Thu, Aug 24, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM



	HV %:	PHF
EB	-	-
WB	6.1%	0.88
NB	1.8%	0.95
SB	4.5%	0.93
TOTAL	2.9%	0.95

Two-Hour Count Summaries

Interval Start	0				W GALER ST FLYOVER				ELLIOTT AVE W				ELLIOTT AVE W				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	21	0	26	0	0	377	126	0	10	434	0	994	0
4:15 PM	0	0	0	0	0	30	0	17	0	0	436	181	0	3	395	0	1,062	0
4:30 PM	0	0	0	0	0	20	0	12	0	0	438	149	0	7	375	0	1,001	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**8**	**0**	**0**	**421**	**210**	**1**	**12**	**367**	**0**	**1,034**	4,091
5:00 PM	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**16**	**0**	**0**	**473**	**193**	**1**	**9**	**424**	**0**	**1,125**	4,222
5:15 PM	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**12**	**0**	**0**	**402**	**199**	**0**	**11**	**398**	**0**	**1,033**	4,193
5:30 PM	**0**	**0**	**0**	**0**	**0**	**16**	**0**	**12**	**0**	**0**	**468**	**208**	**0**	**13**	**373**	**0**	**1,090**	**4,282**
5:45 PM	0	0	0	0	0	16	0	14	0	0	436	173	0	3	356	0	998	4,246
Count Total	0	0	0	0	0	138	0	117	0	0	3,451	1,439	2	68	3,122	0	8,337	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**51**	**0**	**48**	**0**	**0**	**1,764**	**810**	**2**	**45**	**1,562**	**0**	**4,282**	**0**

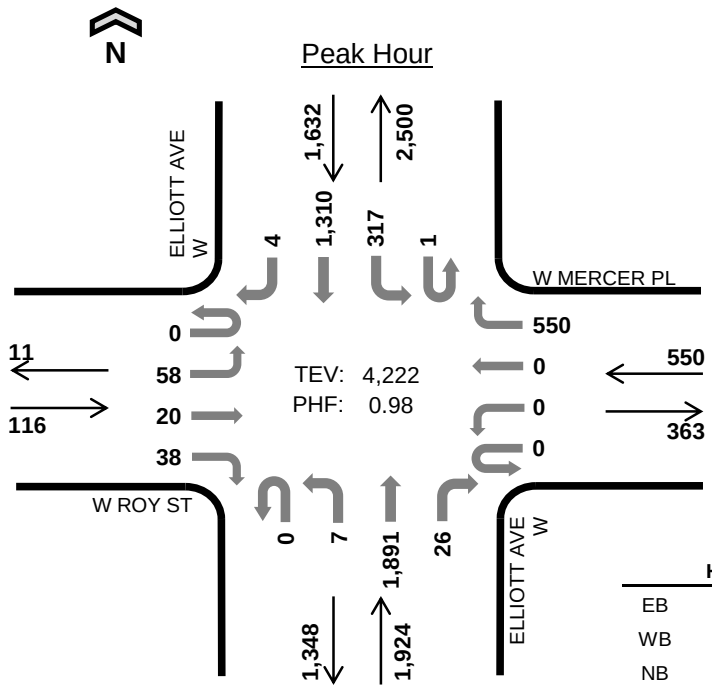
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

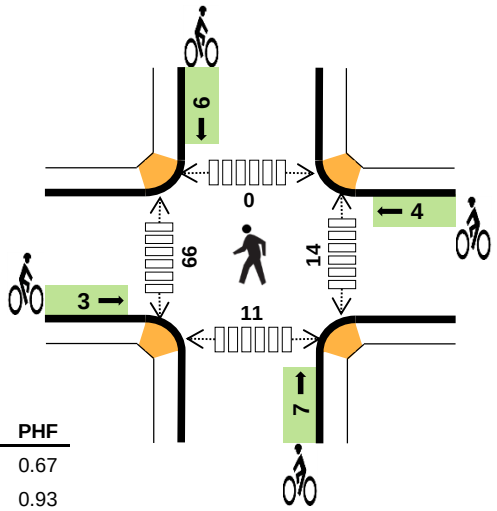
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	6	13	14	*33*	0	0	2	2	*4*	4	0	1	0	*5*
4:15 PM	0	2	12	18	*32*	0	0	2	0	*2*	3	0	1	0	*4*
4:30 PM	0	2	8	9	*19*	0	0	5	0	*5*	2	0	7	0	*9*
4:45 PM	**0**	**2**	**10**	**20**	***32***	**0**	**1**	**2**	**0**	***3***	**1**	**0**	**5**	**0**	*6*
5:00 PM	**0**	**1**	**11**	**17**	***29***	**0**	**0**	**1**	**3**	***4***	**3**	**0**	**3**	**0**	*6*
5:15 PM	**0**	**1**	**14**	**15**	***30***	**0**	**1**	**2**	**2**	***5***	**2**	**0**	**0**	**0**	*2*
5:30 PM	**0**	**2**	**12**	**21**	***35***	**0**	**2**	**5**	**1**	***8***	**3**	**0**	**3**	**0**	***6***
5:45 PM	0	1	10	16	*27*	0	0	0	0	*0*	2	0	8	0	*10*
Count Total	0	17	90	130	*237*	0	4	19	8	*31*	20	0	28	0	*48*
Peak Hr	**0**	**6**	**47**	**73**	***126***	**0**	**4**	**10**	**6**	***20***	**9**	**0**	**11**	**0**	***20***

Mark Skaggs: (425) 250-0777 mark.skaggs@idaxdata.com

ELLIOTT AVE W
W ROY ST

Date: Thu, Aug 24, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM





	HV %:	PHF
EB	0.0%	0.67
WB	2.7%	0.93
NB	1.6%	0.95
SB	4.2%	0.95
TOTAL	2.7%	0.98

Two-Hour Count Summaries

Interval Start	W ROY ST				W MERCER PL				ELLIOTT AVE W				ELLIOTT AVE W				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	13	4	11	0	0	0	121	0	3	396	9	0	59	412	2	1,030	0
4:15 PM	0	14	10	13	0	0	0	122	1	3	419	4	0	71	336	5	998	0
4:30 PM	0	16	5	13	0	0	0	120	0	1	481	8	0	53	331	3	1,031	0
4:45 PM	**0**	**10**	**5**	**7**	**0**	**0**	**0**	**145**	**0**	**3**	**454**	**6**	**0**	**80**	**332**	**1**	**1,043**	4,102
5:00 PM	**0**	**24**	**9**	**10**	**0**	**0**	**0**	**129**	**0**	**1**	**477**	**7**	**0**	**88**	**331**	**2**	**1,078**	4,150
5:15 PM	**0**	**14**	**2**	**10**	**0**	**0**	**0**	**128**	**0**	**1**	**460**	**7**	**1**	**74**	**355**	**1**	**1,053**	4,205
5:30 PM	**0**	**10**	**4**	**11**	**0**	**0**	**0**	**148**	**0**	**2**	**500**	**6**	**0**	**75**	**292**	**0**	**1,048**	**4,222**
5:45 PM	0	5	5	9	0	0	0	160	0	2	441	3	0	56	330	1	1,012	4,191
Count Total	0	106	44	84	0	0	0	1,073	1	16	3,628	50	1	556	2,719	15	8,293	0
Peak Hour	**0**	**58**	**20**	**38**	**0**	**0**	**0**	**550**	**0**	**7**	**1,891**	**26**	**1**	**317**	**1,310**	**4**	**4,222**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	1	6	11	18	*36*	0	0	2	0	*2*	4	14	0	4	*22*
4:15 PM	1	3	6	17	*27*	2	1	3	1	*7*	0	12	0	3	*15*
4:30 PM	0	3	8	13	*24*	2	1	5	0	*8*	5	15	0	4	*24*
4:45 PM	**0**	**5**	**5**	**20**	***30***	**1**	**1**	**1**	**0**	***3***	**4**	**21**	**0**	**3**	*28*
5:00 PM	**0**	**1**	**8**	**15**	***24***	**0**	**0**	**1**	**2**	***3***	**2**	**18**	**0**	**3**	*23*
5:15 PM	**0**	**3**	**11**	**13**	***27***	**2**	**0**	**2**	**3**	***7***	**5**	**17**	**0**	**4**	*26*
5:30 PM	**0**	**6**	**6**	**21**	***33***	**0**	**3**	**3**	**1**	***7***	**3**	**10**	**0**	**1**	***14***
5:45 PM	0	3	8	20	*31*	1	0	0	1	*2*	7	5	0	4	*16*
Count Total	2	30	63	137	*232*	8	6	17	8	*39*	30	112	0	26	*168*
Peak Hour	**0**	**15**	**30**	**69**	***114***	**3**	**4**	**7**	**6**	***20***	**14**	**66**	**0**	**11**	***91***

Appendix B: Level of Service Definitions

Highway Capacity Manual, 2000

Signalized intersection level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. The Table below shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, LOS for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table 2 shows LOS criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Appendix C: Intersection Operations Level of Service Reports

2017 – Existing

HCM Signalized Intersection Capacity Analysis
1: 15th & W Garfield St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	0	785	5	5	5	30	820	5	15	1635	80
Future Volume (vph)	90	0	785	5	5	5	30	820	5	15	1635	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	11	10	12	11	10	12
Grade (%)		-7%			0%			-1%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00	0.96	1.00	1.00	0.92
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	0.99	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1723	1635		1572		1624	3135	1438	1684	3271	1448
Flt Permitted		0.75	1.00		0.92		0.12	1.00	1.00	0.32	1.00	1.00
Satd. Flow (perm)		1356	1635		1469		203	3135	1438	574	3271	1448
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	93	0	809	5	5	5	31	845	5	15	1686	82
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	1	0	0	10
Lane Group Flow (vph)	0	93	809	0	11	0	31	845	4	15	1686	72
Confl. Peds. (#/hr)	1					1	9		4	4		9
Confl. Bikes (#/hr)			8						1			12
Heavy Vehicles (%)	1%	1%	1%	13%	13%	13%	8%	8%	8%	3%	3%	3%
Turn Type	Perm	NA	custom	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4	4		4			2			2	
Permitted Phases	4		2	4			2		2	2		2
Actuated Green, G (s)		15.8	131.0		15.8		115.2	115.2	115.2	115.2	115.2	115.2
Effective Green, g (s)		15.8	131.0		15.8		115.2	115.2	115.2	115.2	115.2	115.2
Actuated g/C Ratio		0.11	0.94		0.11		0.82	0.82	0.82	0.82	0.82	0.82
Clearance Time (s)		4.5	4.5		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		153	1635		165		167	2579	1183	472	2691	1191
v/s Ratio Prot			c0.06					0.27			c0.52	
v/s Ratio Perm		0.07	0.44		0.01		0.15		0.00	0.03		0.05
v/c Ratio		0.61	0.49		0.06		0.19	0.33	0.00	0.03	0.63	0.06
Uniform Delay, d1		59.1	0.5		55.5		2.6	3.0	2.2	2.3	4.5	2.3
Progression Factor		1.00	1.00		1.00		0.11	0.11	0.00	1.00	1.00	1.00
Incremental Delay, d2		4.6	0.1		0.1		2.3	0.3	0.0	0.1	1.1	0.1
Delay (s)		63.8	0.6		55.6		2.6	0.7	0.0	2.4	5.6	2.4
Level of Service		E	A		E		A	A	A	A	A	A
Approach Delay (s)		7.1			55.6			0.7			5.5	
Approach LOS		A			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	4.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	109.7%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	30	25	860	295	50	2370
Future Volume (vph)	30	25	860	295	50	2370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	16	10	13	9	10
Total Lost time (s)	5.0	5.0	5.5	5.0	5.0	5.5
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.91
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	2830	1364	3120	1545	1577	4700
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	2830	1364	3120	1545	1577	4700
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	31	26	887	304	52	2443
RTOR Reduction (vph)	0	24	0	87	0	0
Lane Group Flow (vph)	31	2	887	217	52	2443
Confl. Peds. (#/hr)		1		6	6	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	32%	32%	8%	8%	3%	3%
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		1	4 7	2	1 2
Permitted Phases		4				
Actuated Green, G (s)	11.9	11.9	100.6	84.7	12.0	118.1
Effective Green, g (s)	11.9	11.9	100.6	84.7	12.0	118.1
Actuated g/C Ratio	0.09	0.09	0.72	0.61	0.09	0.84
Clearance Time (s)	5.0	5.0	5.5		5.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	240	115	2241	934	135	3964
v/s Ratio Prot	0.01		0.28	c0.14	0.03	c0.52
v/s Ratio Perm		0.00				
v/c Ratio	0.13	0.02	0.40	0.23	0.39	0.62
Uniform Delay, d1	59.3	58.7	7.7	12.7	60.5	3.6
Progression Factor	1.00	1.00	0.60	0.81	0.94	0.37
Incremental Delay, d2	0.2	0.1	0.5	0.1	1.5	0.2
Delay (s)	59.5	58.8	5.1	10.4	58.3	1.6
Level of Service	E	E	A	B	E	A
Approach Delay (s)	59.2		6.5			2.7
Approach LOS	E		A			A

Intersection Summary			
HCM 2000 Control Delay	4.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	5	5	0	0	225	95	930	30	335	2010	45
Future Volume (vph)	5	5	5	0	0	225	95	930	30	335	2010	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	10	10	12
Grade (%)		5%			0%			1%			0%	
Total Lost time (s)		4.5				4.0	5.5	4.5	4.5	5.5	4.5	4.5
Lane Util. Factor		1.00				1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		0.89				0.99	1.00	1.00	0.97	1.00	1.00	0.88
Flpb, ped/bikes		1.00				1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.95				0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1306				1489	1678	3133	1464	3173	3067	1378
Flt Permitted		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1306				1489	1678	3133	1464	3173	3067	1378
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	5	5	5	0	0	234	99	969	31	349	2094	47
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	14	0	0	13
Lane Group Flow (vph)	0	10	0	0	0	234	99	969	17	349	2094	34
Confl. Peds. (#/hr)			24	24			32		7	7		32
Confl. Bikes (#/hr)			1			3			2			12
Heavy Vehicles (%)	18%	18%	18%	9%	9%	9%	7%	7%	7%	3%	3%	3%
Parking (#/hr)											5	
Turn Type	Split	NA				Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3					5	2		1 4	6	
Permitted Phases						Free			2			6
Actuated Green, G (s)		2.2				140.0	14.0	76.5	76.5	46.8	99.8	99.8
Effective Green, g (s)		2.2				140.0	14.0	76.5	76.5	43.3	99.8	99.8
Actuated g/C Ratio		0.02				1.00	0.10	0.55	0.55	0.31	0.71	0.71
Clearance Time (s)		4.5					5.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)		3.0					0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		20				1489	167	1711	799	981	2186	982
v/s Ratio Prot		c0.01					c0.06	0.31		c0.11	c0.68	
v/s Ratio Perm						0.16			0.01			0.02
v/c Ratio		0.50				0.16	0.59	0.57	0.02	0.36	0.96	0.03
Uniform Delay, d1		68.4				0.0	60.3	20.9	14.6	37.5	18.2	5.9
Progression Factor		1.00				1.00	1.00	1.00	1.00	0.99	1.16	2.86
Incremental Delay, d2		18.6				0.2	3.7	1.4	0.0	0.2	9.8	0.1
Delay (s)		86.9				0.2	64.0	22.2	14.6	37.2	30.9	17.0
Level of Service		F				A	E	C	B	D	C	B
Approach Delay (s)		86.9			0.2			25.8			31.6	
Approach LOS		F			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D

HCM Signalized Intersection Capacity Analysis
1: 15th & W Garfield St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	0	325	5	5	15	30	1790	5	5	1260	205
Future Volume (vph)	150	0	325	5	5	15	30	1790	5	5	1260	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	11	10	12	11	10	12
Grade (%)		-7%			0%			-1%			0%	
Total Lost time (s)		4.5	4.0		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00	0.91	1.00	1.00	0.86
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1673	1574		1711		1719	3320	1451	1678	3240	1339
Flt Permitted		0.74	1.00		0.95		0.17	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)		1304	1574		1638		312	3320	1451	136	3240	1339
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	161	0	349	5	5	16	32	1925	5	5	1355	220
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	1	0	0	45
Lane Group Flow (vph)	0	161	349	0	12	0	32	1925	4	5	1355	175
Confl. Peds. (#/hr)	1					1	20		11	11		20
Confl. Bikes (#/hr)			1						12			8
Heavy Vehicles (%)	4%	4%	4%	0%	0%	0%	2%	2%	2%	4%	4%	4%
Turn Type	Perm	NA	Free	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			4			2			2	
Permitted Phases	4		Free	4			2		2	2		2
Actuated Green, G (s)		21.3	140.0		21.3		109.7	109.7	109.7	109.7	109.7	109.7
Effective Green, g (s)		21.3	140.0		21.3		109.7	109.7	109.7	109.7	109.7	109.7
Actuated g/C Ratio		0.15	1.00		0.15		0.78	0.78	0.78	0.78	0.78	0.78
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		2.0			2.0		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		198	1574		249		244	2601	1136	106	2538	1049
v/s Ratio Prot								c0.58			0.42	
v/s Ratio Perm		c0.12	0.22		0.01		0.10		0.00	0.04		0.13
v/c Ratio		0.81	0.22		0.05		0.13	0.74	0.00	0.05	0.53	0.17
Uniform Delay, d1		57.4	0.0		50.7		3.7	7.8	3.3	3.4	5.6	3.8
Progression Factor		1.00	1.00		1.00		0.07	0.18	0.00	1.00	1.00	1.00
Incremental Delay, d2		20.9	0.3		0.0		0.4	0.7	0.0	0.8	0.8	0.3
Delay (s)		78.3	0.3		50.7		0.7	2.1	0.0	4.2	6.4	4.1
Level of Service		E	A		D		A	A	A	A	A	A
Approach Delay (s)		24.9			50.7			2.1			6.1	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	50	50	1765	810	45	1560
Future Volume (vph)	50	50	1765	810	45	1560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	16	10	13	9	10
Total Lost time (s)	5.0	5.0	5.5	5.0	5.0	5.5
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3524	1666	3303	1632	1547	3209
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3524	1666	3303	1632	1547	3209
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	53	53	1858	853	47	1642
RTOR Reduction (vph)	0	40	0	26	0	0
Lane Group Flow (vph)	53	13	1858	827	47	1642
Confl. Peds. (#/hr)		11		9	9	
Confl. Bikes (#/hr)		4		10		
Heavy Vehicles (%)	6%	6%	2%	2%	5%	5%
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		1	4 7	2	1 2
Permitted Phases		4		2		
Actuated Green, G (s)	33.6	33.6	80.9	129.5	10.0	96.4
Effective Green, g (s)	33.6	33.6	80.9	129.5	10.0	96.4
Actuated g/C Ratio	0.24	0.24	0.58	0.92	0.07	0.69
Clearance Time (s)	5.0	5.0	5.5		5.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	845	399	1908	1567	110	2209
v/s Ratio Prot	0.02		c0.56	c0.45	0.03	c0.51
v/s Ratio Perm		0.01		0.06		
v/c Ratio	0.06	0.03	0.97	0.53	0.43	0.74
Uniform Delay, d1	41.0	40.7	28.5	0.8	62.3	13.9
Progression Factor	1.00	1.00	0.55	1.59	0.92	0.67
Incremental Delay, d2	0.0	0.0	11.2	0.2	10.5	2.1
Delay (s)	41.1	40.8	26.9	1.4	67.6	11.5
Level of Service	D	D	C	A	E	B
Approach Delay (s)	40.9		18.9			13.0
Approach LOS	D		B			B

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	20	40	0	0	550	5	1890	25	320	1310	5
Future Volume (vph)	60	20	40	0	0	550	5	1890	25	320	1310	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	10	10	12
Grade (%)		5%			0%			1%			0%	
Total Lost time (s)		4.5				4.0	5.5	4.5	4.5	5.5	4.5	4.5
Lane Util. Factor		1.00				1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		0.98				0.98	1.00	1.00	0.96	1.00	1.00	0.78
Flpb, ped/bikes		1.00				1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.95				0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1683				1561	1761	3287	1513	3143	3037	1212
Flt Permitted		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1683				1561	1761	3287	1513	3143	3037	1212
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	61	20	41	0	0	561	5	1929	26	327	1337	5
RTOR Reduction (vph)	0	13	0	0	0	0	0	0	10	0	0	2
Lane Group Flow (vph)	0	109	0	0	0	561	5	1929	16	327	1337	3
Confl. Peds. (#/hr)			11	11			66		14	14		66
Confl. Bikes (#/hr)			3			4			7			6
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	4%	4%	4%
Parking (#/hr)											5	
Turn Type	custom	NA				Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3					5	2		1 4	6	
Permitted Phases	3					Free			2			6
Actuated Green, G (s)		8.8				140.0	1.0	88.2	88.2	28.5	92.2	92.2
Effective Green, g (s)		8.8				140.0	1.0	88.2	88.2	25.0	92.2	92.2
Actuated g/C Ratio		0.06				1.00	0.01	0.63	0.63	0.18	0.66	0.66
Clearance Time (s)		4.5					5.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)		3.0					0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		105				1561	12	2070	953	561	2000	798
v/s Ratio Prot		c0.06					0.00	c0.59		c0.10	0.44	
v/s Ratio Perm						c0.36			0.01			0.00
v/c Ratio		1.04				0.36	0.42	0.93	0.02	0.58	0.67	0.00
Uniform Delay, d1		65.6				0.0	69.2	23.2	9.7	52.7	14.6	8.2
Progression Factor		1.00				1.00	1.00	1.00	1.00	0.73	2.02	1.00
Incremental Delay, d2		98.1				0.6	8.3	9.2	0.0	0.7	1.2	0.0
Delay (s)		163.7				0.6	77.5	32.4	9.7	39.0	30.7	8.2
Level of Service		F				A	E	C	A	D	C	A
Approach Delay (s)		163.7			0.6			32.2			32.3	
Approach LOS		F			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

2017 – One Ship Day

HCM Signalized Intersection Capacity Analysis
1: 15th & W Garfield St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	0	824	5	5	5	30	866	5	15	1681	92
Future Volume (vph)	101	0	824	5	5	5	30	866	5	15	1681	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	11	10	12	11	10	12
Grade (%)		-7%			0%			-1%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00	0.96	1.00	1.00	0.92
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	0.99	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1723	1635		1572		1624	3135	1438	1685	3271	1448
Flt Permitted		0.75	1.00		0.92		0.11	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)		1356	1635		1469		189	3135	1438	543	3271	1448
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	104	0	849	5	5	5	31	893	5	15	1733	95
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	1	0	0	11
Lane Group Flow (vph)	0	104	849	0	11	0	31	893	4	15	1733	84
Confl. Peds. (#/hr)	1					1	9		4	4		9
Confl. Bikes (#/hr)			8						1			12
Heavy Vehicles (%)	1%	1%	1%	13%	13%	13%	8%	8%	8%	3%	3%	3%
Turn Type	Perm	NA	custom	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4	4		4			2			2	
Permitted Phases	4		2	4			2		2	2		2
Actuated Green, G (s)		16.7	131.0		16.7		114.3	114.3	114.3	114.3	114.3	114.3
Effective Green, g (s)		16.7	131.0		16.7		114.3	114.3	114.3	114.3	114.3	114.3
Actuated g/C Ratio		0.12	0.94		0.12		0.82	0.82	0.82	0.82	0.82	0.82
Clearance Time (s)		4.5	4.5		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		161	1635		175		154	2559	1174	443	2670	1182
v/s Ratio Prot			c0.06					0.28			c0.53	
v/s Ratio Perm		0.08	0.46		0.01		0.16		0.00	0.03		0.06
v/c Ratio		0.65	0.52		0.06		0.20	0.35	0.00	0.03	0.65	0.07
Uniform Delay, d1		58.8	0.6		54.7		2.8	3.3	2.4	2.4	5.0	2.5
Progression Factor		1.00	1.00		1.00		0.12	0.13	0.00	1.00	1.00	1.00
Incremental Delay, d2		6.5	0.1		0.1		2.7	0.3	0.0	0.1	1.2	0.1
Delay (s)		65.3	0.7		54.7		3.1	0.8	0.0	2.6	6.3	2.6
Level of Service		E	A		D		A	A	A	A	A	A
Approach Delay (s)		7.7			54.7			0.8			6.0	
Approach LOS		A			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	113.4%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	162	71	860	469	96	2409
Future Volume (vph)	162	71	860	469	96	2409
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	16	10	13	9	10
Total Lost time (s)	5.0	5.0	5.5	5.0	5.0	5.5
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.91
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	2830	1365	3120	1545	1577	4700
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	2830	1365	3120	1545	1577	4700
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	167	73	887	484	99	2484
RTOR Reduction (vph)	0	63	0	139	0	0
Lane Group Flow (vph)	167	10	887	345	99	2484
Confl. Peds. (#/hr)		1		6	6	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	32%	32%	8%	8%	3%	3%
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		1	4 7	2	1 2
Permitted Phases		4				
Actuated Green, G (s)	19.9	19.9	92.6	84.7	12.0	110.1
Effective Green, g (s)	19.9	19.9	92.6	84.7	12.0	110.1
Actuated g/C Ratio	0.14	0.14	0.66	0.61	0.09	0.79
Clearance Time (s)	5.0	5.0	5.5		5.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	402	194	2063	934	135	3696
v/s Ratio Prot	0.06		0.28	c0.22	0.06	c0.53
v/s Ratio Perm		0.01				
v/c Ratio	0.42	0.05	0.43	0.37	0.73	0.67
Uniform Delay, d1	54.7	51.9	11.2	14.1	62.4	6.8
Progression Factor	1.00	1.00	0.71	1.04	0.94	0.50
Incremental Delay, d2	0.7	0.1	0.5	0.2	15.0	0.4
Delay (s)	55.4	52.0	8.5	14.9	73.5	3.8
Level of Service	E	D	A	B	E	A
Approach Delay (s)	54.4		10.7			6.5
Approach LOS	D		B			A

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	5	5	0	0	248	95	1081	30	358	2158	45
Future Volume (vph)	5	5	5	0	0	248	95	1081	30	358	2158	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	10	10	12
Grade (%)		5%			0%			1%			0%	
Total Lost time (s)		4.5				4.0	5.5	4.5	4.5	5.5	4.5	4.5
Lane Util. Factor		1.00				1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		0.89				0.99	1.00	1.00	0.97	1.00	1.00	0.88
Flpb, ped/bikes		1.00				1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.95				0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1306				1489	1678	3133	1464	3173	3067	1378
Flt Permitted		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1306				1489	1678	3133	1464	3173	3067	1378
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	5	5	5	0	0	258	99	1126	31	373	2248	47
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	14	0	0	13
Lane Group Flow (vph)	0	10	0	0	0	258	99	1126	17	373	2248	34
Confl. Peds. (#/hr)			24	24			32		7	7		32
Confl. Bikes (#/hr)			1			3			2			12
Heavy Vehicles (%)	18%	18%	18%	9%	9%	9%	7%	7%	7%	3%	3%	3%
Parking (#/hr)											5	
Turn Type	Split	NA				Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3					5	2		1 4	6	
Permitted Phases						Free			2			6
Actuated Green, G (s)		2.2				140.0	14.0	76.5	76.5	46.8	99.8	99.8
Effective Green, g (s)		2.2				140.0	14.0	76.5	76.5	43.3	99.8	99.8
Actuated g/C Ratio		0.02				1.00	0.10	0.55	0.55	0.31	0.71	0.71
Clearance Time (s)		4.5					5.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)		3.0					0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		20				1489	167	1711	799	981	2186	982
v/s Ratio Prot		0.01					c0.06	0.36		c0.12	c0.73	
v/s Ratio Perm						c0.17			0.01			0.02
v/c Ratio		0.50				0.17	0.59	0.66	0.02	0.38	1.03	0.03
Uniform Delay, d1		68.4				0.0	60.3	22.5	14.6	37.8	20.1	5.9
Progression Factor		1.00				1.00	1.00	1.00	1.00	1.03	1.04	1.86
Incremental Delay, d2		18.6				0.3	3.7	2.0	0.0	0.2	24.5	0.0
Delay (s)		86.9				0.3	64.0	24.5	14.6	39.2	45.5	11.0
Level of Service		F				A	E	C	B	D	D	B
Approach Delay (s)		86.9			0.3			27.4			44.0	
Approach LOS		F			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	36.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D

HCM Signalized Intersection Capacity Analysis
1: 15th & W Garfield St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	0	339	5	5	15	30	1807	5	5	1264	206
Future Volume (vph)	154	0	339	5	5	15	30	1807	5	5	1264	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	11	10	12	11	10	12
Grade (%)		-7%			0%			-1%			0%	
Total Lost time (s)		4.5	4.0		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00	0.91	1.00	1.00	0.86
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1673	1574		1711		1719	3320	1451	1678	3240	1339
Flt Permitted		0.74	1.00		0.95		0.17	1.00	1.00	0.07	1.00	1.00
Satd. Flow (perm)		1304	1574		1638		310	3320	1451	131	3240	1339
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	166	0	365	5	5	16	32	1943	5	5	1359	222
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	1	0	0	46
Lane Group Flow (vph)	0	166	365	0	12	0	32	1943	4	5	1359	176
Confl. Peds. (#/hr)	1					1	20		11	11		20
Confl. Bikes (#/hr)			1						12			8
Heavy Vehicles (%)	4%	4%	4%	0%	0%	0%	2%	2%	2%	4%	4%	4%
Turn Type	Perm	NA	Free	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			4			2			2	
Permitted Phases	4		Free	4			2		2	2		2
Actuated Green, G (s)		21.7	140.0		21.7		109.3	109.3	109.3	109.3	109.3	109.3
Effective Green, g (s)		21.7	140.0		21.7		109.3	109.3	109.3	109.3	109.3	109.3
Actuated g/C Ratio		0.15	1.00		0.15		0.78	0.78	0.78	0.78	0.78	0.78
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		2.0			2.0		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		202	1574		253		242	2591	1132	102	2529	1045
v/s Ratio Prot								c0.59			0.42	
v/s Ratio Perm		c0.13	0.23		0.01		0.10		0.00	0.04		0.13
v/c Ratio		0.82	0.23		0.05		0.13	0.75	0.00	0.05	0.54	0.17
Uniform Delay, d1		57.3	0.0		50.4		3.8	8.1	3.4	3.5	5.8	3.9
Progression Factor		1.00	1.00		1.00		0.08	0.22	0.00	1.00	1.00	1.00
Incremental Delay, d2		21.8	0.3		0.0		0.4	0.8	0.0	0.9	0.8	0.3
Delay (s)		79.1	0.3		50.4		0.7	2.5	0.0	4.4	6.6	4.2
Level of Service		E	A		D		A	A	A	A	A	A
Approach Delay (s)		25.0			50.4			2.5			6.3	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	100	67	1765	827	49	1574
Future Volume (vph)	100	67	1765	827	49	1574
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	16	10	13	9	10
Total Lost time (s)	5.0	5.0	5.5	5.0	5.0	5.5
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3524	1666	3303	1632	1547	3209
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3524	1666	3303	1632	1547	3209
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	71	1858	871	52	1657
RTOR Reduction (vph)	0	54	0	26	0	0
Lane Group Flow (vph)	105	17	1858	845	52	1657
Confl. Peds. (#/hr)		11		9	9	
Confl. Bikes (#/hr)		4		10		
Heavy Vehicles (%)	6%	6%	2%	2%	5%	5%
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		1	4 7	2	1 2
Permitted Phases		4		2		
Actuated Green, G (s)	34.0	34.0	80.5	129.5	10.0	96.0
Effective Green, g (s)	34.0	34.0	80.5	129.5	10.0	96.0
Actuated g/C Ratio	0.24	0.24	0.58	0.92	0.07	0.69
Clearance Time (s)	5.0	5.0	5.5		5.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	855	404	1899	1567	110	2200
v/s Ratio Prot	0.03		c0.56	c0.46	0.03	c0.52
v/s Ratio Perm		0.01		0.06		
v/c Ratio	0.12	0.04	0.98	0.54	0.47	0.75
Uniform Delay, d1	41.4	40.5	28.9	0.8	62.5	14.3
Progression Factor	1.00	1.00	0.55	1.82	0.92	0.67
Incremental Delay, d2	0.1	0.0	11.9	0.2	12.5	2.2
Delay (s)	41.4	40.6	27.7	1.7	69.8	11.7
Level of Service	D	D	C	A	E	B
Approach Delay (s)	41.1		19.4			13.5
Approach LOS	D		B			B

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	20	40	0	0	552	5	1905	25	329	1365	5
Future Volume (vph)	60	20	40	0	0	552	5	1905	25	329	1365	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	10	10	12
Grade (%)		5%			0%			1%			0%	
Total Lost time (s)		4.5				4.0	5.5	4.5	4.5	5.5	4.5	4.5
Lane Util. Factor		1.00				1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		0.98				0.98	1.00	1.00	0.96	1.00	1.00	0.78
Flpb, ped/bikes		1.00				1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.95				0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1683				1561	1761	3287	1513	3143	3037	1212
Flt Permitted		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1683				1561	1761	3287	1513	3143	3037	1212
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	61	20	41	0	0	563	5	1944	26	336	1393	5
RTOR Reduction (vph)	0	13	0	0	0	0	0	0	10	0	0	2
Lane Group Flow (vph)	0	109	0	0	0	563	5	1944	16	336	1393	3
Confl. Peds. (#/hr)			11	11			66		14	14		66
Confl. Bikes (#/hr)			3			4			7			6
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	4%	4%	4%
Parking (#/hr)											5	
Turn Type	custom	NA				Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3					5	2		1 4	6	
Permitted Phases	3					Free			2			6
Actuated Green, G (s)		8.8				140.0	1.0	87.9	87.9	28.8	91.9	91.9
Effective Green, g (s)		8.8				140.0	1.0	87.9	87.9	25.3	91.9	91.9
Actuated g/C Ratio		0.06				1.00	0.01	0.63	0.63	0.18	0.66	0.66
Clearance Time (s)		4.5					5.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)		3.0					0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		105				1561	12	2063	949	567	1993	795
v/s Ratio Prot		c0.06					0.00	c0.59		c0.11	0.46	
v/s Ratio Perm						c0.36			0.01			0.00
v/c Ratio		1.04				0.36	0.42	0.94	0.02	0.59	0.70	0.00
Uniform Delay, d1		65.6				0.0	69.2	23.7	9.8	52.6	15.3	8.3
Progression Factor		1.00				1.00	1.00	1.00	1.00	0.74	1.96	1.00
Incremental Delay, d2		98.1				0.6	8.3	10.2	0.0	0.8	1.4	0.0
Delay (s)		163.7				0.6	77.5	34.0	9.8	39.8	31.4	8.3
Level of Service		F				A	E	C	A	D	C	A
Approach Delay (s)		163.7			0.6			33.8			33.0	
Approach LOS		F			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		

2017 – Two Ship Day

HCM Signalized Intersection Capacity Analysis
1: 15th & W Garfield St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	0	847	5	5	5	30	893	5	15	1724	102
Future Volume (vph)	108	0	847	5	5	5	30	893	5	15	1724	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	11	10	12	11	10	12
Grade (%)		-7%			0%			-1%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00	0.96	1.00	1.00	0.92
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	0.99	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1723	1635		1572		1624	3135	1438	1685	3271	1448
Flt Permitted		0.75	1.00		0.92		0.10	1.00	1.00	0.30	1.00	1.00
Satd. Flow (perm)		1356	1635		1469		176	3135	1438	525	3271	1448
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	111	0	873	5	5	5	31	921	5	15	1777	105
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	1	0	0	13
Lane Group Flow (vph)	0	111	873	0	11	0	31	921	4	15	1777	92
Confl. Peds. (#/hr)	1					1	9		4	4		9
Confl. Bikes (#/hr)			8						1			12
Heavy Vehicles (%)	1%	1%	1%	13%	13%	13%	8%	8%	8%	3%	3%	3%
Turn Type	Perm	NA	custom	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4	4		4			2			2	
Permitted Phases	4		2	4			2		2	2		2
Actuated Green, G (s)		17.3	131.0		17.3		113.7	113.7	113.7	113.7	113.7	113.7
Effective Green, g (s)		17.3	131.0		17.3		113.7	113.7	113.7	113.7	113.7	113.7
Actuated g/C Ratio		0.12	0.94		0.12		0.81	0.81	0.81	0.81	0.81	0.81
Clearance Time (s)		4.5	4.5		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		167	1635		181		142	2546	1167	426	2656	1175
v/s Ratio Prot			c0.07					0.29			c0.54	
v/s Ratio Perm		0.08	0.47		0.01		0.18		0.00	0.03		0.06
v/c Ratio		0.66	0.53		0.06		0.22	0.36	0.00	0.04	0.67	0.08
Uniform Delay, d1		58.6	0.6		54.2		3.0	3.5	2.5	2.5	5.4	2.6
Progression Factor		1.00	1.00		1.00		0.15	0.14	0.00	1.00	1.00	1.00
Incremental Delay, d2		7.5	0.2		0.0		3.2	0.4	0.0	0.2	1.4	0.1
Delay (s)		66.1	0.7		54.2		3.7	0.8	0.0	2.7	6.8	2.8
Level of Service		E	A		D		A	A	A	A	A	A
Approach Delay (s)		8.1			54.2			0.9			6.5	
Approach LOS		A			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	116.0%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	241	98	860	631	139	2432
Future Volume (vph)	241	98	860	631	139	2432
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	16	10	13	9	10
Total Lost time (s)	5.0	5.0	5.5	5.0	5.0	5.5
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.91
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	2830	1366	3120	1545	1577	4700
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	2830	1366	3120	1545	1577	4700
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	248	101	887	651	143	2507
RTOR Reduction (vph)	0	83	0	187	0	0
Lane Group Flow (vph)	248	18	887	464	143	2507
Confl. Peds. (#/hr)		1		6	6	
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	32%	32%	8%	8%	3%	3%
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		1	4 7	2	1 2
Permitted Phases		4				
Actuated Green, G (s)	24.3	24.3	88.2	84.7	12.0	105.7
Effective Green, g (s)	24.3	24.3	88.2	84.7	12.0	105.7
Actuated g/C Ratio	0.17	0.17	0.63	0.61	0.09	0.76
Clearance Time (s)	5.0	5.0	5.5		5.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	491	237	1965	934	135	3548
v/s Ratio Prot	0.09		0.28	c0.30	c0.09	c0.53
v/s Ratio Perm		0.01				
v/c Ratio	0.51	0.07	0.45	0.50	1.06	0.71
Uniform Delay, d1	52.4	48.4	13.4	15.6	64.0	9.0
Progression Factor	1.00	1.00	0.70	1.18	0.94	0.57
Incremental Delay, d2	0.8	0.1	0.6	0.3	84.8	0.5
Delay (s)	53.2	48.6	9.9	18.7	144.7	5.6
Level of Service	D	D	A	B	F	A
Approach Delay (s)	51.9		13.6			13.1
Approach LOS	D		B			B

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	5	5	0	0	270	95	1221	30	371	2247	45
Future Volume (vph)	5	5	5	0	0	270	95	1221	30	371	2247	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	10	10	12
Grade (%)		5%			0%			1%			0%	
Total Lost time (s)		4.5				4.0	5.5	4.5	4.5	5.5	4.5	4.5
Lane Util. Factor		1.00				1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		0.89				0.99	1.00	1.00	0.97	1.00	1.00	0.88
Flpb, ped/bikes		1.00				1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.95				0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1306				1489	1678	3133	1464	3173	3067	1378
Flt Permitted		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1306				1489	1678	3133	1464	3173	3067	1378
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	5	5	5	0	0	281	99	1272	31	386	2341	47
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	14	0	0	13
Lane Group Flow (vph)	0	10	0	0	0	281	99	1272	17	386	2341	34
Confl. Peds. (#/hr)			24	24			32		7	7		32
Confl. Bikes (#/hr)			1			3			2			12
Heavy Vehicles (%)	18%	18%	18%	9%	9%	9%	7%	7%	7%	3%	3%	3%
Parking (#/hr)											5	
Turn Type	Split	NA				Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3					5	2		1 4	6	
Permitted Phases						Free			2			6
Actuated Green, G (s)		2.2				140.0	14.0	76.5	76.5	46.8	99.8	99.8
Effective Green, g (s)		2.2				140.0	14.0	76.5	76.5	43.3	99.8	99.8
Actuated g/C Ratio		0.02				1.00	0.10	0.55	0.55	0.31	0.71	0.71
Clearance Time (s)		4.5					5.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)		3.0					0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		20				1489	167	1711	799	981	2186	982
v/s Ratio Prot		0.01					c0.06	0.41		c0.12	c0.76	
v/s Ratio Perm						c0.19			0.01			0.02
v/c Ratio		0.50				0.19	0.59	0.74	0.02	0.39	1.07	0.03
Uniform Delay, d1		68.4				0.0	60.3	24.3	14.6	38.0	20.1	5.9
Progression Factor		1.00				1.00	1.00	1.00	1.00	1.05	1.05	1.70
Incremental Delay, d2		18.6				0.3	3.7	3.0	0.0	0.2	39.2	0.0
Delay (s)		86.9				0.3	64.0	27.2	14.6	40.1	60.4	10.1
Level of Service		F				A	E	C	B	D	E	B
Approach Delay (s)		86.9			0.3			29.5			56.7	
Approach LOS		F			A			C			E	

Intersection Summary			
HCM 2000 Control Delay	44.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E

HCM Signalized Intersection Capacity Analysis
1: Elliott & W Garfield St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	0	337	5	5	15	30	1804	5	5	1267	207
Future Volume (vph)	153	0	337	5	5	15	30	1804	5	5	1267	207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	12	12	11	10	12	11	10	12
Grade (%)		-7%			0%			-1%			0%	
Total Lost time (s)		4.5	4.0		4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00	0.91	1.00	1.00	0.86
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1673	1574		1711		1719	3320	1451	1678	3240	1339
Flt Permitted		0.74	1.00		0.95		0.17	1.00	1.00	0.07	1.00	1.00
Satd. Flow (perm)		1304	1574		1638		309	3320	1451	132	3240	1339
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	165	0	362	5	5	16	32	1940	5	5	1362	223
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	1	0	0	45
Lane Group Flow (vph)	0	165	362	0	12	0	32	1940	4	5	1362	178
Confl. Peds. (#/hr)	1					1	20		11	11		20
Confl. Bikes (#/hr)			1						12			8
Heavy Vehicles (%)	4%	4%	4%	0%	0%	0%	2%	2%	2%	4%	4%	4%
Turn Type	Perm	NA	Free	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			4			2			2	
Permitted Phases	4		Free	4			2		2	2		2
Actuated Green, G (s)		21.6	140.0		21.6		109.4	109.4	109.4	109.4	109.4	109.4
Effective Green, g (s)		21.6	140.0		21.6		109.4	109.4	109.4	109.4	109.4	109.4
Actuated g/C Ratio		0.15	1.00		0.15		0.78	0.78	0.78	0.78	0.78	0.78
Clearance Time (s)		4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		2.0			2.0		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		201	1574		252		241	2594	1133	103	2531	1046
v/s Ratio Prot								c0.58			0.42	
v/s Ratio Perm		c0.13	0.23		0.01		0.10		0.00	0.04		0.13
v/c Ratio		0.82	0.23		0.05		0.13	0.75	0.00	0.05	0.54	0.17
Uniform Delay, d1		57.3	0.0		50.5		3.7	8.0	3.4	3.5	5.8	3.9
Progression Factor		1.00	1.00		1.00		0.08	0.22	0.00	1.00	1.00	1.00
Incremental Delay, d2		21.8	0.3		0.0		0.4	0.8	0.0	0.9	0.8	0.4
Delay (s)		79.2	0.3		50.5		0.7	2.5	0.0	4.4	6.6	4.2
Level of Service		E	A		D		A	A	A	A	A	A
Approach Delay (s)		25.0			50.5			2.5			6.3	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	89	64	1765	838	52	1572
Future Volume (vph)	89	64	1765	838	52	1572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	14	16	10	13	9	10
Total Lost time (s)	5.0	5.0	5.5	5.0	5.0	5.5
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3524	1666	3303	1632	1547	3209
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3524	1666	3303	1632	1547	3209
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	94	67	1858	882	55	1655
RTOR Reduction (vph)	0	51	0	27	0	0
Lane Group Flow (vph)	94	16	1858	855	55	1655
Confl. Peds. (#/hr)		11		9	9	
Confl. Bikes (#/hr)		4		10		
Heavy Vehicles (%)	6%	6%	2%	2%	5%	5%
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		1	4 7	2	1 2
Permitted Phases		4		2		
Actuated Green, G (s)	34.0	34.0	80.5	129.5	10.0	96.0
Effective Green, g (s)	34.0	34.0	80.5	129.5	10.0	96.0
Actuated g/C Ratio	0.24	0.24	0.58	0.92	0.07	0.69
Clearance Time (s)	5.0	5.0	5.5		5.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	855	404	1899	1567	110	2200
v/s Ratio Prot	0.03		c0.56	c0.47	0.04	c0.52
v/s Ratio Perm		0.01		0.06		
v/c Ratio	0.11	0.04	0.98	0.55	0.50	0.75
Uniform Delay, d1	41.2	40.5	28.9	0.8	62.6	14.3
Progression Factor	1.00	1.00	0.55	2.43	0.91	0.67
Incremental Delay, d2	0.1	0.0	11.9	0.2	13.8	2.2
Delay (s)	41.3	40.6	27.7	2.2	71.0	11.7
Level of Service	D	D	C	A	E	B
Approach Delay (s)	41.0		19.5			13.6
Approach LOS	D		B			B

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	20	40	0	0	554	5	1914	25	322	1354	5
Future Volume (vph)	60	20	40	0	0	554	5	1914	25	322	1354	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	10	12	10	10	12
Grade (%)		5%			0%			1%			0%	
Total Lost time (s)		4.5				4.0	5.5	4.5	4.5	5.5	4.5	4.5
Lane Util. Factor		1.00				1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes		0.98				0.98	1.00	1.00	0.96	1.00	1.00	0.78
Flpb, ped/bikes		1.00				1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.95				0.86	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1683				1561	1761	3287	1513	3143	3037	1212
Flt Permitted		0.98				1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1683				1561	1761	3287	1513	3143	3037	1212
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	61	20	41	0	0	565	5	1953	26	329	1382	5
RTOR Reduction (vph)	0	13	0	0	0	0	0	0	10	0	0	2
Lane Group Flow (vph)	0	109	0	0	0	565	5	1953	16	329	1382	3
Confl. Peds. (#/hr)			11	11			66		14	14		66
Confl. Bikes (#/hr)			3			4			7			6
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	4%	4%	4%
Parking (#/hr)											5	
Turn Type	custom	NA				Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3					5	2		1 4	6	
Permitted Phases	3					Free			2			6
Actuated Green, G (s)		8.8				140.0	1.0	88.1	88.1	28.6	92.1	92.1
Effective Green, g (s)		8.8				140.0	1.0	88.1	88.1	25.1	92.1	92.1
Actuated g/C Ratio		0.06				1.00	0.01	0.63	0.63	0.18	0.66	0.66
Clearance Time (s)		4.5					5.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)		3.0					0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)		105				1561	12	2068	952	563	1997	797
v/s Ratio Prot		c0.06					0.00	c0.59		c0.10	0.46	
v/s Ratio Perm						c0.36			0.01			0.00
v/c Ratio		1.04				0.36	0.42	0.94	0.02	0.58	0.69	0.00
Uniform Delay, d1		65.6				0.0	69.2	23.7	9.7	52.7	15.0	8.2
Progression Factor		1.00				1.00	1.00	1.00	1.00	0.74	1.99	1.00
Incremental Delay, d2		98.1				0.7	8.3	10.4	0.0	0.7	1.4	0.0
Delay (s)		163.7				0.7	77.5	34.1	9.8	39.6	31.3	8.2
Level of Service		F				A	E	C	A	D	C	A
Approach Delay (s)		163.7			0.7			33.9			32.8	
Approach LOS		F			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		