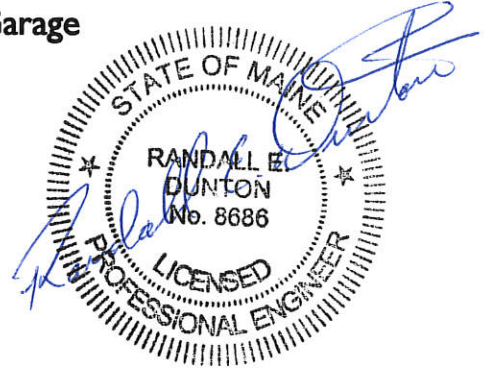


**Traffic Evaluation  
Maine Medical Center – St. John Street Garage  
Portland, Maine  
JN 2866.01**

**Date:** April 9, 2018 *AD*  
**Subject:** Traffic Evaluation – St. John Street Garage  
St. John Street Garage – Portland, Maine  
**To:** Alexander Green (MMC), Dominic Gagnon (Colliers)  
**From:** Randy Dunton / Emily Tynes, Gorrill Palmer



Gorrill Palmer (GP) has prepared this traffic evaluation for the proposed 222 St. John Street garage to be located off St. John Street in Portland, Maine. This project is Phase 2 of 3 phases. Phase 3 will include a Traffic Movement Permit, as well as a more extensive and wide ranging traffic impact study which will incorporate the findings of this evaluation. The garage is proposed to provide 2,477 (13 Shuttle + 2,464 passenger vehicles) parking spaces, with an adjacent surface lot containing approximately 56 parking spaces. GP has forecast trip generation for the proposed garage and evaluated the operation of the proposed garage entrance and exit on St. John Street. The following is a summary of the methodology and results of the evaluation.

### *Trip Generation*

The surface lot directly adjacent to the proposed garage is proposed to accommodate the existing businesses at 222 St. John Street, while the proposed garage itself is anticipated to accommodate the following existing parking areas:

- Gilman Garage: 1,274 spaces
- Sportsman Lot: 60 spaces
- 222 St. John Street Lot: 283 spaces
- Gateway Garage: 100 spaces
- Classic Lot: 97 spaces
- 321 Brackett Street Lot: 9 spaces
- MMC Employee On-Street Parking: 100 spaces (estimated)

Total Parking Spaces = 1,923



The 100 on-street parking spaces are an approximate number of spaces intended to include vehicles that may currently park in areas such as Valley Street or Vaughn Street. As the popularity and efficiency of the garage increases, it is anticipated that up to 100 additional vehicles that are parking on-street will begin to park in the garage (for a total of 200 on-street spaces accommodated in the garage). It should also be noted that 50 parking spaces for the Eagles during special events is proposed to be provided in the MMC garage. Since these are not forecast to occur on a regular and frequent basis, they have not been included in the total parking demand used to calculate trip generation to the site.

The Institutional Development Plan (IDP) identifies a current total of 2,027 employee parking spaces both on and off campus. The existing employee spaces that are not included in the garage spaces identified above are located in the 7 Bramhall Street lot and the 321 Brackett Street lot. These two lots are proposed to remain where they are because they serve specific programs at those two locations.

A parking demand analysis was conducted as part of the Transportation Plan in the IDP to determine parking needs based on supply and demand, and trip reduction efforts outlined in the TDM Plan. The analysis revealed an existing employee parking shortage of 150 to 200 spaces, with the MMC parking system typically operating at or above capacity during weekday daytime hours (IDP page 65). Approximately 500 to 600 additional employee parking spaces are required to meet projected demand based on expected staff growth. The proposed project was identified as a solution to the shortage.

#### *Existing Parking Area Traffic Volumes*

Traffic counts were completed at the existing Gilman Garage access as follows:

- Accurate Counts - November 2, 2017 from 5:00AM to 9:00PM (16 hours) – The counts indicate that the peak hours of traffic entering and exiting the garage occurred from 6:45AM to 7:45AM with 448 trip ends, and 6:00PM to 7:00PM with 326 trip ends.
- GP – January 18, 2018 from 6:30AM to 8:00AM and 5:45PM to 7:15PM - The times were chosen based on the peak hours determined in the November 2, 2017 counts. The counts completed by GP confirmed the original findings from the November 2, 2017 counts.

Traffic counts were also completed at the existing 222 St. John Street surface parking as follows:

- GP - January 18, 2018 from 6:15AM to 7:45AM and from 3:30PM to 5:00PM
- GP - January 23, 2018 from 5:45PM to 7:15PM



The 222 St. John Street parking lot peak hours occurred from 6:15AM to 7:15AM and 3:30PM to 4:30PM. The entering and exiting traffic for each 15 minute period at the 222 St. John Street is shown on the attached “St. John Street Parking Garage Trip Generation” table.

The Gilman Employee Parking Garage and 222 St. John Street surface lot represent approximately 85% of the MMC employee spaces anticipated to be accommodated by the proposed St. John Street garage. As such, it is anticipated that when combined they will represent the majority of the traffic patterns that can be expected at the new garage. To represent the remaining 15% of the satellite lots, the traffic patterns were assumed to be similar to the 222 St. John Street satellite lot, as well as the on-street parking spaces. The trip generation for each 15 minute period for each satellite parking area has been estimated based on the trip generation at the 222 St. John Street parking lot and is shown on the attached “St. John Street Parking Garage Trip Generation” table.

#### *Proposed Parking Garage Trip Generation*

Since the employees that currently park in the Gilman garage will be shifted to the new garage, they will have to take a shuttle in the future rather than have direct access as they do currently. Because of this shift, we would expect those employees to arrive approximately 15 minutes earlier than they typically would and that they would end up leaving the new garage approximately 15 minutes later. Therefore, the counted volumes for the Gilman Garage were adjusted by 15 minutes to estimate the traffic that would be experienced when the spaces are relocated to 222 St. John Street. The adjusted Gilman Garage volumes are shown on the attached “St. John Street Parking Garage Trip Generation” table.

The total trip generation for the proposed St. John Street garage is based on adding the existing or estimated trip generation of each 15 minute period for each parking location to identify the overall AM & PM peak hours.

Based on the combined volumes for the parking areas, the AM peak hour of the proposed garage is estimated to occur from 6:00AM to 7:00AM with 860 trip ends, and the PM peak hour of the garage is estimated to occur 4:15PM to 5:15PM with 448 trip ends. A trip end is a trip into or out of the site, thus a round trip is equal to two trip ends. The peak hours of the garage are estimated to occur outside of the adjacent street (St. John Street) peak hours, which occur from 7:45AM to 8:45AM and 3:15PM to 4:15PM. It should be noted that the Traffic Impact Study for Phase 3 will take a broader look at the overall adjacent roadway network peak hours versus the peak hours of the garage.



### *Trip Distribution and Assignment*

The trip distribution for the proposed St. John Street garage has been based on the counts completed at the existing 222 St. John Street surface lot and the Gilman Garage. Based on the counts, the following trip distribution is anticipated for the proposed 222 St. John Street garage:

- AM Peak Hour: 98% entering, 2% exiting
- PM Peak Hour: 14% entering, 86% exiting

The trip assignment has been based on the VHB travelshed for regional direction on trip distribution and for localized guidance, the trip assignment discussed at the meeting with the City of Portland on October 13, 2017 was used. The trip assignment is shown on the attached Figure 4.

Please note that the trip assignment does assume some traffic will use the existing Union Station access from Congress Street to the site as well as some traffic also using the Margarita's driveway, both of which are used today. The attached Figures 6 and 7 show the estimated MMC traffic at these two locations. MMC share neighborhood concerns about this connect and is exploring options to address the employee traffic through this area.

The attached Figures A-C show the existing Gilman Garage traffic volumes, the reassignment of the existing Gilman Garage to the proposed St. John Street garage, and the net change in traffic due to the relocation of the Gilman Garage.

### *Shuttle Trip Generation / Assignment*

In addition to employee traffic, the parking garage entrance and exit will also be utilized by MMC shuttles to transport employees between the parking garage and the hospital. There are proposed to be 13 shuttles during the peak hours, each with an approximate 15 minute headway. Based on this information, one shuttle can make approximately four trips to and from the proposed garage during a one hour period. With 13 shuttles, approximately 52 shuttle trips are anticipated at the site during the peak hour.

### *2022 Predevelopment Volumes*

GP completed turning movement counts at the intersection of St. John Street with the Margarita's Driveway on May 17, 18, and 19, 2017 from 6:00AM to 8:00AM, 7:45AM to 9:00AM, 5:00PM to 8:00PM, and 3:00PM to 5:00PM. Those volumes were used as the base raw volumes for St. John Street and for Margaritas during the forecast garage peak hours of 6:00AM to 7:00AM and 4:15PM to 5:15PM.



Additionally, GP collected turning movement counts at the intersection of A Street / St. John Street from 7:00AM to 9:00AM and 3:00PM to 6:00PM. Since the St. John Street garage exit is proposed to be located across from D Street, GP compared the Annual Average Daily Traffic (AADT) information between A Street and D Street and proportionally forecast turning movements at the D Street intersection. The traffic volumes collected during the May 2017 counts for the peak hours of the garage and the estimated D Street volumes are shown on the attached Figure 2. These traffic volumes include both existing MMC traffic and the adjacent roadway traffic.

### *Seasonal Adjustment*

Traffic volumes that are not collected during peak summer months are typically seasonally adjusted to estimate traffic volumes that may be experienced during the peak summer months. Since the traffic counts were not collected during the peak summer months, the raw volumes shown on Figure 2 have been seasonally adjusted by 2.3% based on the weekly group mean factors published by MaineDOT.

### *Annual Growth*

In addition to the seasonal adjustment, the adjacent roadway volumes were also increased by an annual growth rate to forecast the traffic that may be experienced during the build out year of the project. An annual growth rate of 0.5% per year (approved by the City and consistent with other studies in the area) has been applied to the seasonally adjusted volumes to yield the 2022 Predevelopment traffic volumes shown on the attached Figure 3. It should be noted that the employee growth rate in the IDP is forecast to be approximately 0.63% per year, which is very similar to the growth rate approved by the City for overall on-street traffic and used on other studies in the area.

### *2022 Postdevelopment Volumes*

The 2022 Predevelopment traffic volumes shown on Figure 3 were combined with the employee and shuttle trip assignments shown on Figures 4 and 5 to yield the 2022 Postdevelopment traffic volumes shown on Figure 8.

### *Capacity Analysis*

A capacity analysis was completed for the proposed St. John Street access using Synchro/SimTraffic computer analysis software. Levels of service are similar to the academic ranking system where an 'A' is good with little control delay and an 'F' represents poor traffic conditions. If the level of service falls below a 'D', an evaluation should be made to determine if mitigation is warranted. It should be noted that a center two way left turn lane is assumed on



St. John Street for the postdevelopment condition as expected mitigation for this project. The following tables summarize the relationship between level of service and control delay per vehicle for unsignalized intersections.

**Level of Service Criteria for Unsignalized Intersections**

Level of Service	Control Delay per Vehicle (sec)
A	Less than 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	Greater than 50.0

The capacity analysis was completed for the proposed St. John Street garage access as shown on the concept plan submitted with the overall application. The proposed concept includes entrance and exit lanes that are separated by approximately 160 feet. This separation allows for a shuttle pick-up / drop-off area in between the driveways. The results are based on the average of five SimTraffic runs. The following table summarizes the results of the capacity analysis. Detailed results are attached.

**Level of Service Summary**

Approach	Level of Service	
	2022 AM Garage Peak Hour	2022 PM Garage Peak Hour
<b>Entrance / St. John St</b>		
St. John NB T	A	A
St. John NB L	E	A
St. John SB TR	A	A
<b>Exit / St. John St</b>		
Exit EB LT	A	A
Exit EB R	A	A
D St WB LTR	A	A
St. John NB TR	A	A
St. John SB L	A	A
St. John SB T	A	A
<b>Exit / Shuttle Loop Exit</b>		
Exit EB	A	A
Shuttle Loop Exit SB	A	D

NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound  
 L = Left, T = Through, R = Right





As shown in the table, the proposed St. John Street garage exit is forecast to operate at acceptable levels of service during both the AM and PM peak hours of the garage. The proposed entrance is forecast to operate at acceptable levels of service during the AM and PM peak hours of the garage, with the exception of the northbound left turn lane during the AM peak hour, which is forecast to operate at a level of service ‘E’. This is due to the high volume of right turning traffic into the site providing limited gaps for left turning vehicles. Additionally, during the PM peak hour, the shuttle loop exit southbound is forecast to operate at a level of service ‘D’. This is due to the queue of vehicles exiting onto St. John Street extending past the shuttle exit. The operation of the shuttle loop exit should be monitored to determine if this condition occurs.

Although the levels of service are acceptable, GP reviewed the peak hour signal warrant identified in the Manual on Uniform Traffic Control Devices (MUTCD) to evaluate if the site exit meets the warrant for signalization based on full occupancy of the 1,923 parking spaces identified previously. Based on our evaluation (attached) the intersection of the garage exit with St. John Street does not meet the peak hour warrant for signalization in either the AM or PM peak hours. If the IDP forecast increase in demand of 500 spaces reaches fruition, then a signal may be warranted. A signal cannot be installed until the volumes are met. The garage accesses will be monitored and if the volumes warrant a signal in the future, permission to install a signal will be requested from the City and MaineDOT.

*Queue Analysis*

GP completed a queue analysis for key movements using the same Synchro/SimTraffic computer analysis software as that used to complete the capacity analysis. Queue analysis involves comparing the 95<sup>th</sup> percentile queue lengths, rounded up to the nearest five feet, to the available storage lengths. The results are based on the average of five SimTraffic runs. The following table summarizes the results of the queue analysis for the key movements. Detailed results are attached.

**Queue Analysis Summary**

Approach	Available Storage Length (ft)	95 <sup>th</sup> Percentile Queue Lengths (ft)	
		AM Garage Peak Hour	PM Garage Peak Hour
<b>Entrance / St. John St</b>			
St. John NB L	160	190	25
<b>Exit / St. John St</b>			
Exit EB LT	120 (to garage)	55	65
Exit EB R	120 (to garage)	20	55
D St WB LR		40	45
<b>Exit / Shuttle Loop Exit</b>			
Exit EB T1 (LT lane)	50 (to garage)	--	95
Exit EB T2 (R lane)	50 (to garage)	--	15



Approach	Available Storage Length (ft)	95 <sup>th</sup> Percentile Queue Lengths (ft)	
		AM Garage Peak Hour	PM Garage Peak Hour
Shuttle Loop Exit SB L	150	50	75

NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound  
 L=Left, T=Through, R=Right

As shown in the table, the queue length for the northbound left turn into the site is forecast to extend past D Street during the AM peak hour by one to two vehicles, assuming the length of a vehicle and the associated space between vehicles is 25 feet. This could at times cause a delay in exiting shuttles from traveling straight across the intersection onto D Street; however, this is forecast to be infrequent and only during the AM peak hour. To reduce this potential, we recommend that the section of the proposed center left turn lane that is within this intersection be highlighted or striped in some way as to discourage drivers from queuing in this section and blocking intersection traffic.

During the PM peak hour, the queue length of vehicles exiting the garage at St. John Street is forecast to extend past the shuttle loop exit, occasionally blocking the shuttles from exiting the site until the queue clears. This will be monitored, and if it becomes an issue, options will be explored. Even without implementing any options, the 95<sup>th</sup> percentile queue length of the shuttles is only forecast to be two to three shuttles (assuming a shuttle and the associated space between shuttles is a total of 30 feet). Additionally, the 95<sup>th</sup> percentile queue length of the eastbound inside through lane at the intersection of the proposed garage exit with the shuttle loop is forecast to exceed the available storage length by one to two vehicles. This indicates that there may be one to two vehicles queued inside the garage.

### *Left Turn Lane Warrant*

Since the 95<sup>th</sup> percentile queue for the northbound left into the site in the AM peak hour is forecast to extend back to D Street, GP completed an evaluation to see if D Street would warrant a formal southbound left turn lane. Based on our evaluation (attached), a formal left turn lane is not warranted.

### *On-Street Parking*

Currently St. John Street has no on-street parking allowed along the westerly side of the street but allows on-street parking along the easterly side in the immediate vicinity of the entrance and exit for the proposed garage. Based on our field reviews and the proposed off-site mitigation plan for St. John Street along the site frontage, it is anticipated that some on-street parking spaces will be removed. The number of spaces is dependent on the final St. John Street lane configuration.





### *Pedestrian Accommodations*

Currently the nearest crosswalks across St. John Street are located at the intersection with C Street approximately 600 feet to the north and at the METRO station approximately 600 feet to the south. To better accommodate employees who wish to walk between the garage and work, or for pedestrians in the neighborhood, the proposed off-site mitigation along St. John Street includes a crosswalk across St. John Street on the northerly side of the garage exit, as shown on the attached plan from Woodard & Curran. This crosswalk is proposed to include new ADA ramps and dynamic pedestrian actuated crossing signs, which would have flashing lights to alert traffic when pedestrians are crossing. In addition, MMC is reviewing available crosswalks & sidewalks, as well as street lighting between the garage and the hospital to ensure pedestrians have a designated route. See full site plan application for additional crosswalk & sidewalk locations as well as lighting upgrades.

### *Bicycle Accommodations*

The City has recently restriped St. John Street along the site frontage to include a northbound and southbound bicycle lane. Consistent with the City's desire to provide a bicycle lane through this corridor, MMC is proposing to maintain a bicycle lane as well in each direction on St. John Street as part of their restriping efforts to include a center turn lane. See full Site Plan application submittal for a striping plan along the site frontage.

### *Conclusions*

The following is a summary of the conclusions:

1. The proposed parking garage is the second phase of a three phase process. This evaluation will be incorporated into the larger more extensive traffic impact study to be submitted during phase three of the MMC expansion.
2. The proposed parking garage will accommodate six existing MMC parking areas as well as 100 on-street parking spaces in the general neighborhood around the hospital. This accounts for approximately 1,923 parking spaces. The proposed parking garage is planned to provide approximately 2,464 passenger vehicle parking spaces and 13 shuttle parking spaces. This leaves an occupancy to supply ratio of approximately 78%. Therefore, the proposed parking garage is proposed to not only accommodate the relocated vehicles, but allows for some additional parking increases in the future.
3. This project aligns with the parking demand information in the IDP.



4. The peak hours of the proposed St. John Street garage are forecast to be 6:00AM to 7:00AM and 4:15PM to 5:15PM. The peak hours of the garage are estimated to occur outside of the adjacent street (St. John Street) peak hours, which occur from 7:45AM to 8:45AM and 3:15PM to 4:15PM.
5. The employee trip generation for the proposed garage is forecast to be **860 AM** and **448 PM** peak hour trip ends, based on the parking demand of 1,923 spaces.
6. MMC is expected to expand their existing shuttle service to 13 shuttles during the peak hours, with a reduced level during non-peak hours.
7. Based on the results of the capacity analysis, the proposed garage entrance and exit are forecast to operate at overall acceptable levels of service during both the AM and PM peak hours of the garage.
8. The queue length for the northbound left turn into the site is forecast to extend into the D Street intersection during the AM peak hour by one to two vehicles. To reduce impacts to intersection movements, we recommend that the section of the proposed center left turn lane that is within this intersection be highlighted or striped in some way as to discourage drivers from queuing in this section and blocking intersection. The 95<sup>th</sup> percentile queue length of the garage exit during the PM peak hour is forecast to extend past the shuttle loop, occasionally blocking the shuttles from exiting. However, the 95<sup>th</sup> percentile queue length of the shuttles is not forecast to exceed two to three shuttles.
9. The proposed off-site mitigation includes restriping St. John Street to provide a single travel lane in each direction and a center two way left turn lane. This design will impact on-street parking along one side of St. John Street.
10. A crosswalk across St. John Street is proposed on the northerly side of the St. John Street / D Street intersection. This will include ADA accommodations for the crossing as well as pedestrian actuated dynamic crossing signs.
11. To accommodate bicyclists, the currently proposed off-site mitigation plan is maintaining a bicycle lane in both the northbound and southbound directions.
12. Based on this evaluation, it is our opinion that with the proposed mitigation identified herein, the proposed garage traffic can be accommodated on the adjacent roadway network. As the parking demand increases, the operation of the garage should be monitored to determine if signalization at the entrance and/or exit is warranted.

**St. John Street Parking Garage Trip Generation**

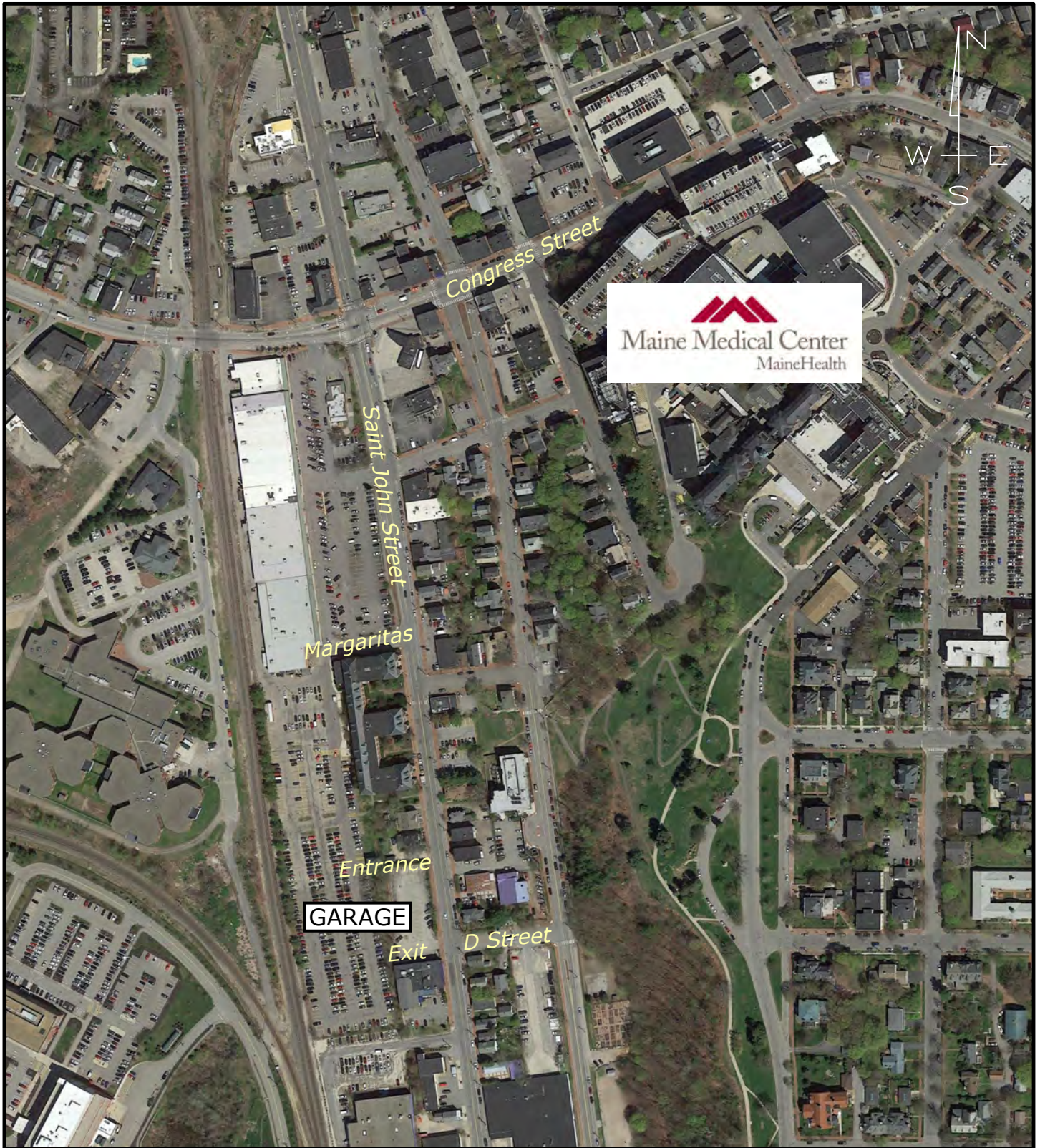
Parking Area Count Date Number of Spaces	St. John St Lot 1/18/2018 283 Spaces		Sportsman Lot Estimated 60 Spaces		Gateway Garage Estimated 100 Spaces		Classic Lot Estimated 97 Spaces		321 Brackett Lot Estimated 9 Spaces		On-Street Spaces Estimated 100 Spaces		Gilman Garage - Shifted 11/2/2017 1274 Spaces		All Parking Areas 1923 Spaces			Existing Parking Hourly Volumes Total Spaces: 1923			Proposed Parking Hourly Volumes Total Spaces: 2423			
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting
6:00 AM	23	0	5	0	8	0	8	0	1	0	8	0	89	1	142	1	143	860	98%	2%	1084	1058	26	
6:15 AM	45	0	10	0	16	0	15	0	1	0	16	0	113	8	216	8	224	838	97%	3%	1056	1023	33	
6:30 AM	85	1	18	0	30	0	29	0	3	0	30	0	118	6	313	7	320	791	95%	5%	997	944	53	
6:45 AM	51	1	11	0	18	0	17	0	2	0	18	0	51	4	168	5	173	637	83%	17%	803	666	137	
7:00 AM	26	0	6	0	9	0	9	0	1	0	9	0	55	6	115	6	121	578	69%	31%	728	504	224	
7:15 AM	41	0	9	0	14	0	14	0	1	0	14	0	60	24	153	24	177	551	59%	41%	694	407	287	
7:30 AM	12	7	3	1	4	2	4	2	0	0	4	2	65	60	92	74	166	436	44%	56%	549	243	306	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	40	74	40	74	114							
8:00 AM	2	2	0	0	1	1	1	1	0	0	1	1	33	51	38	56	94							
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	23	39	23	39	62							
3:15 PM	1	8	0	2	0	3	0	3	0	0	0	3	12	38	13	57	70	357	12%	88%	450	55	395	
3:30 PM	2	27	0	6	1	10	1	9	0	1	10	10	9	36	14	99	113	411	11%	89%	518	59	459	
3:45 PM	1	15	0	3	0	5	0	5	0	0	5	5	6	60	7	93	100	399	13%	87%	503	63	440	
4:00 PM	1	12	0	3	0	4	0	4	0	0	4	4	9	37	10	64	74	407	15%	85%	513	76	437	
4:15 PM	3	22	1	5	1	8	1	8	0	1	8	8	9	56	16	108	124	448	14%	86%	564	81	483	
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6:30 PM	1	7	0	1	0	2	0	2	0	0	2	2	50	25	51	39	90							
6:45 PM	2	4	0	1	1	1	1	1	0	0	1	1	12	30	17	38	55							
7:00 PM	0	2	0	0	0	1	0	1	0	0	0	0	7	24	7	29	36							

Indicates peak hour volumes



# Location Map

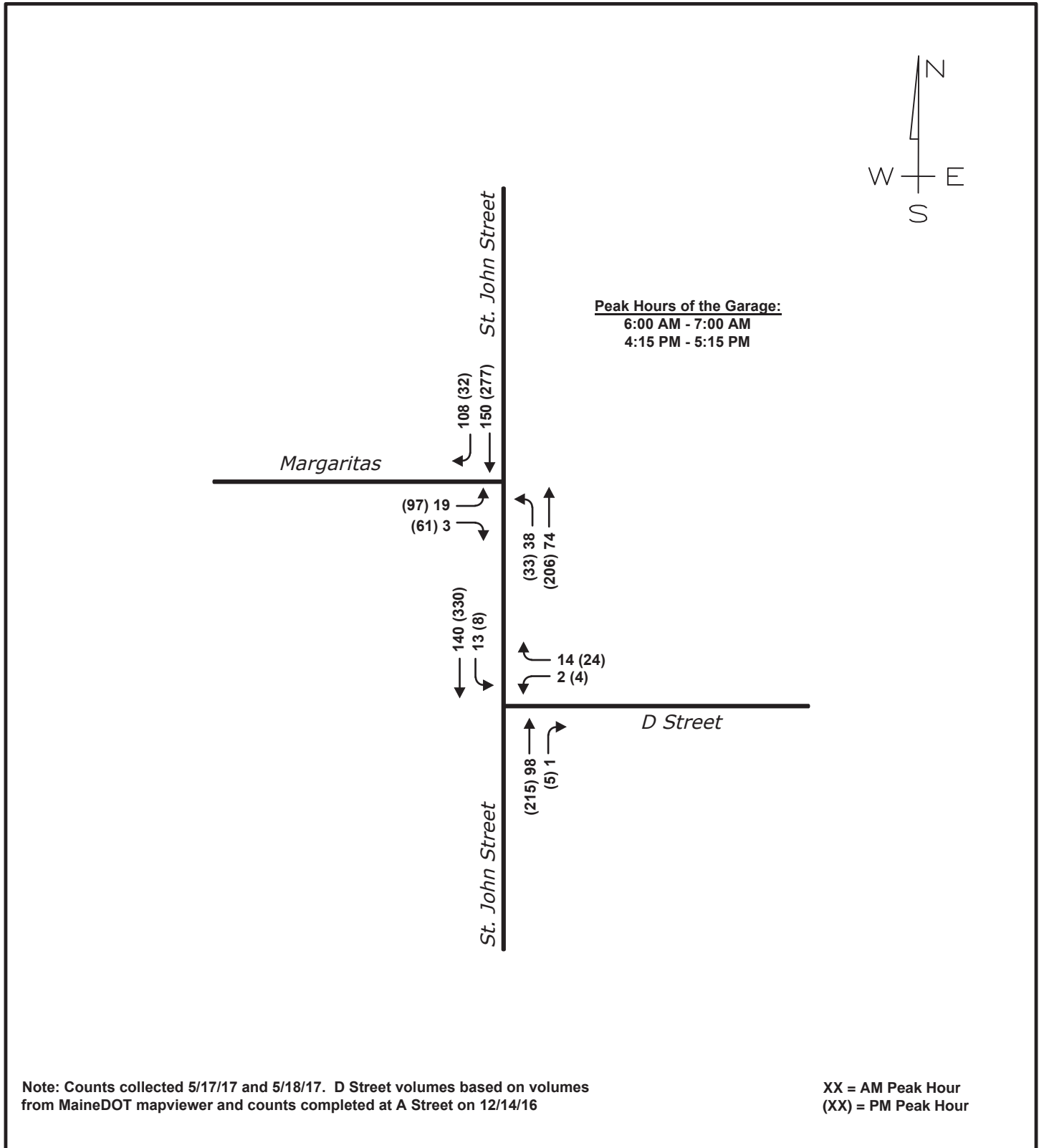
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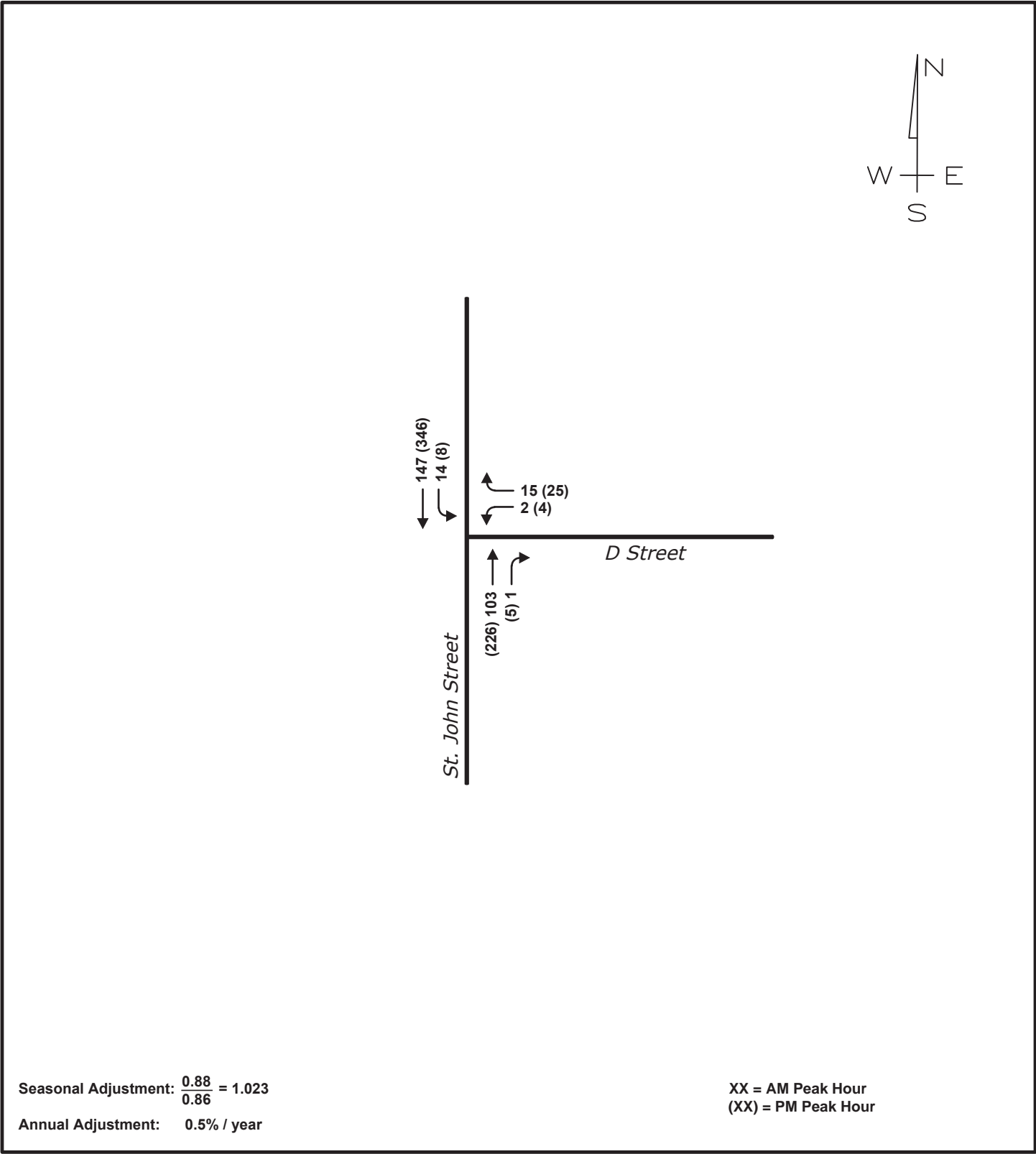
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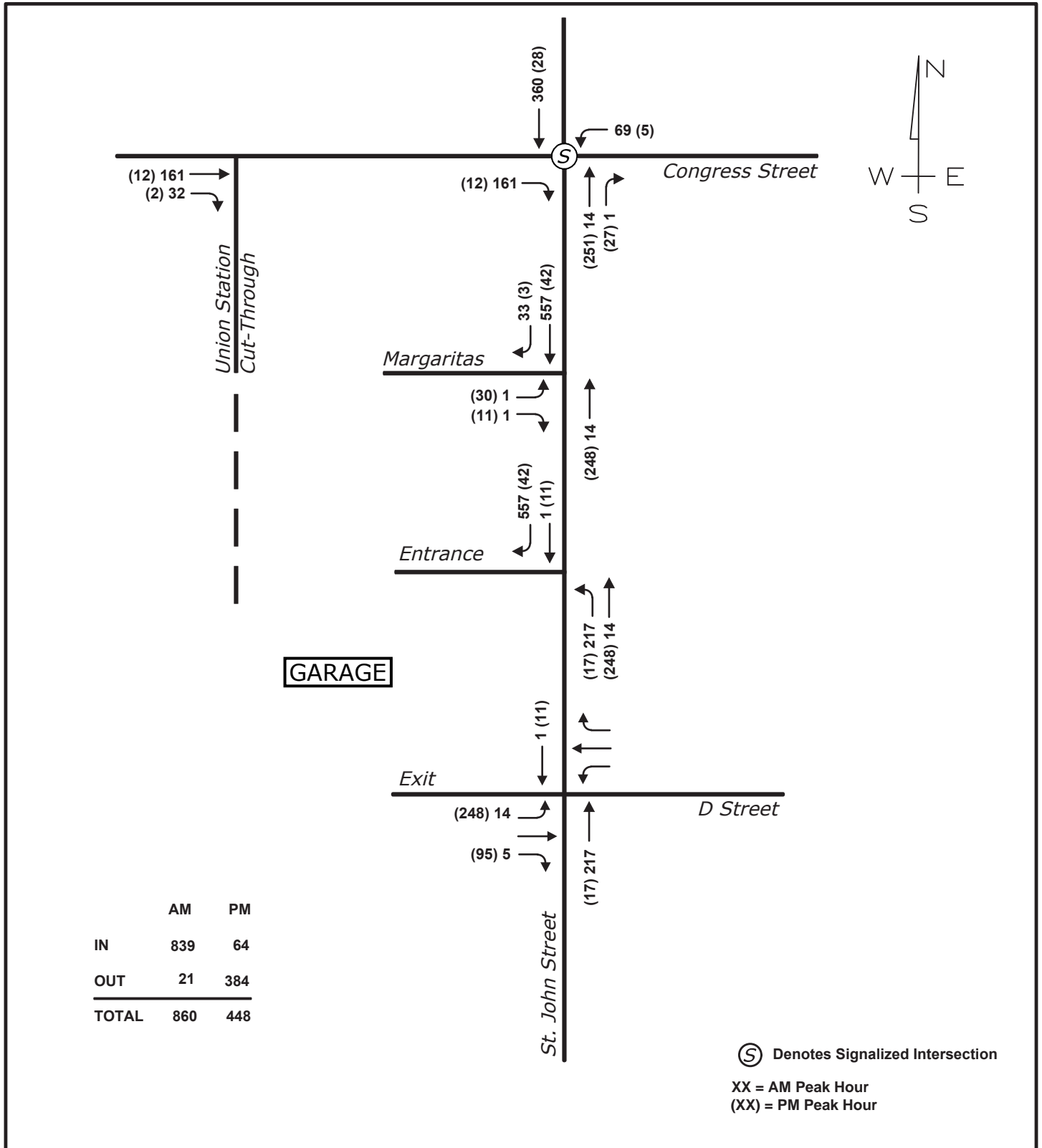
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# Proposed Garage Trip Assignment

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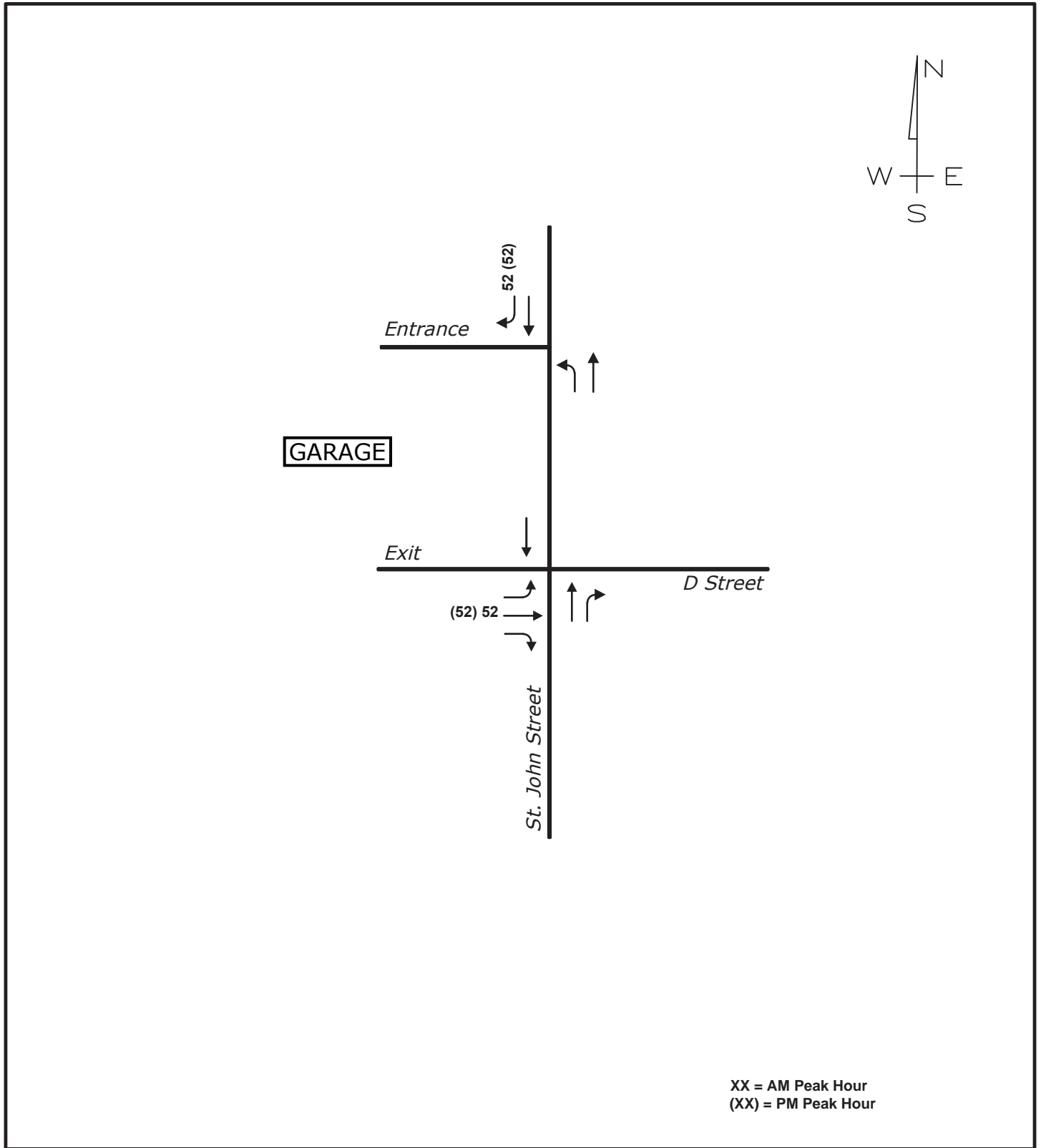
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# Shuttle Trip Assignment



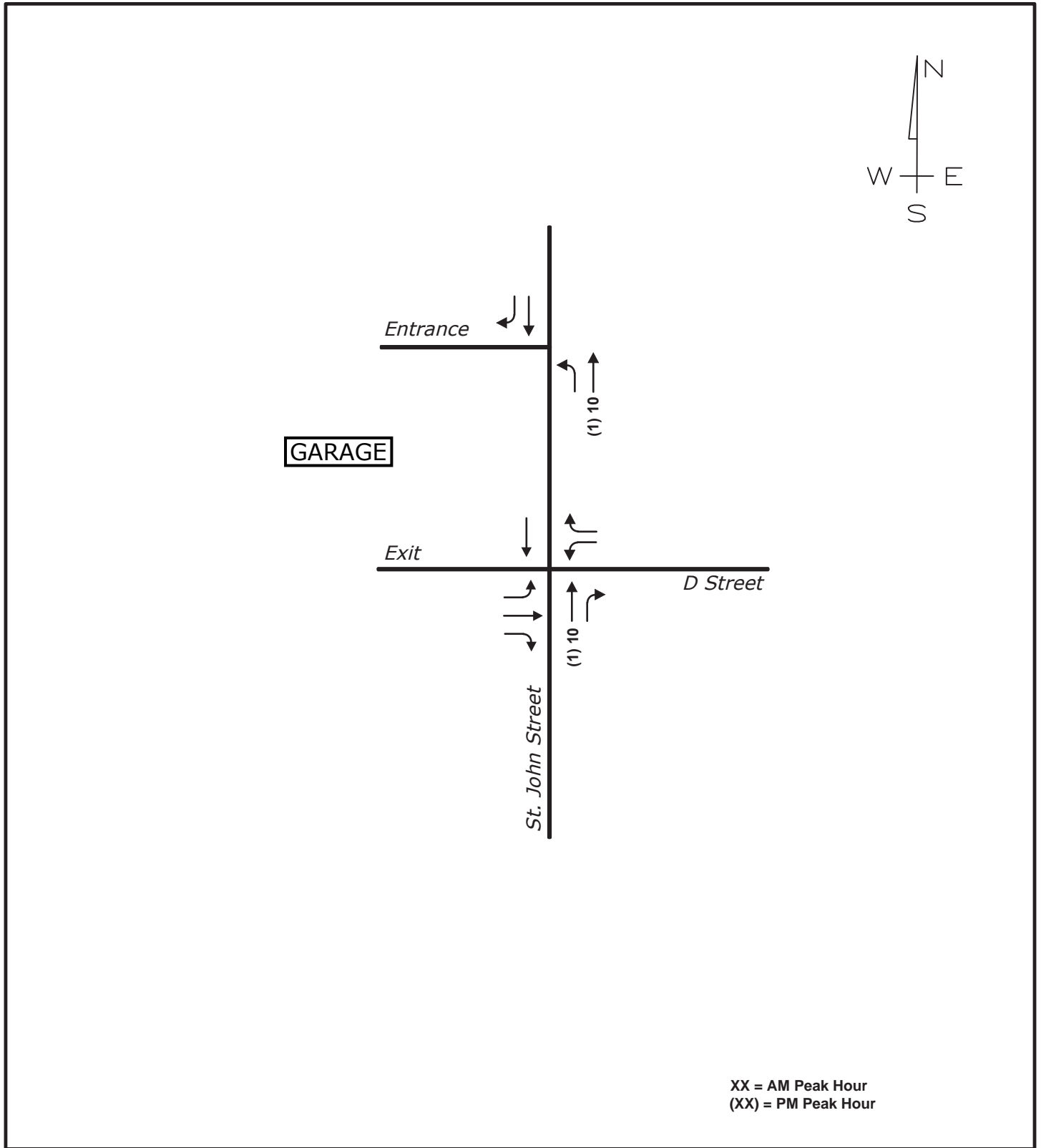
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# Existing Gilman Garage Trip Assignment

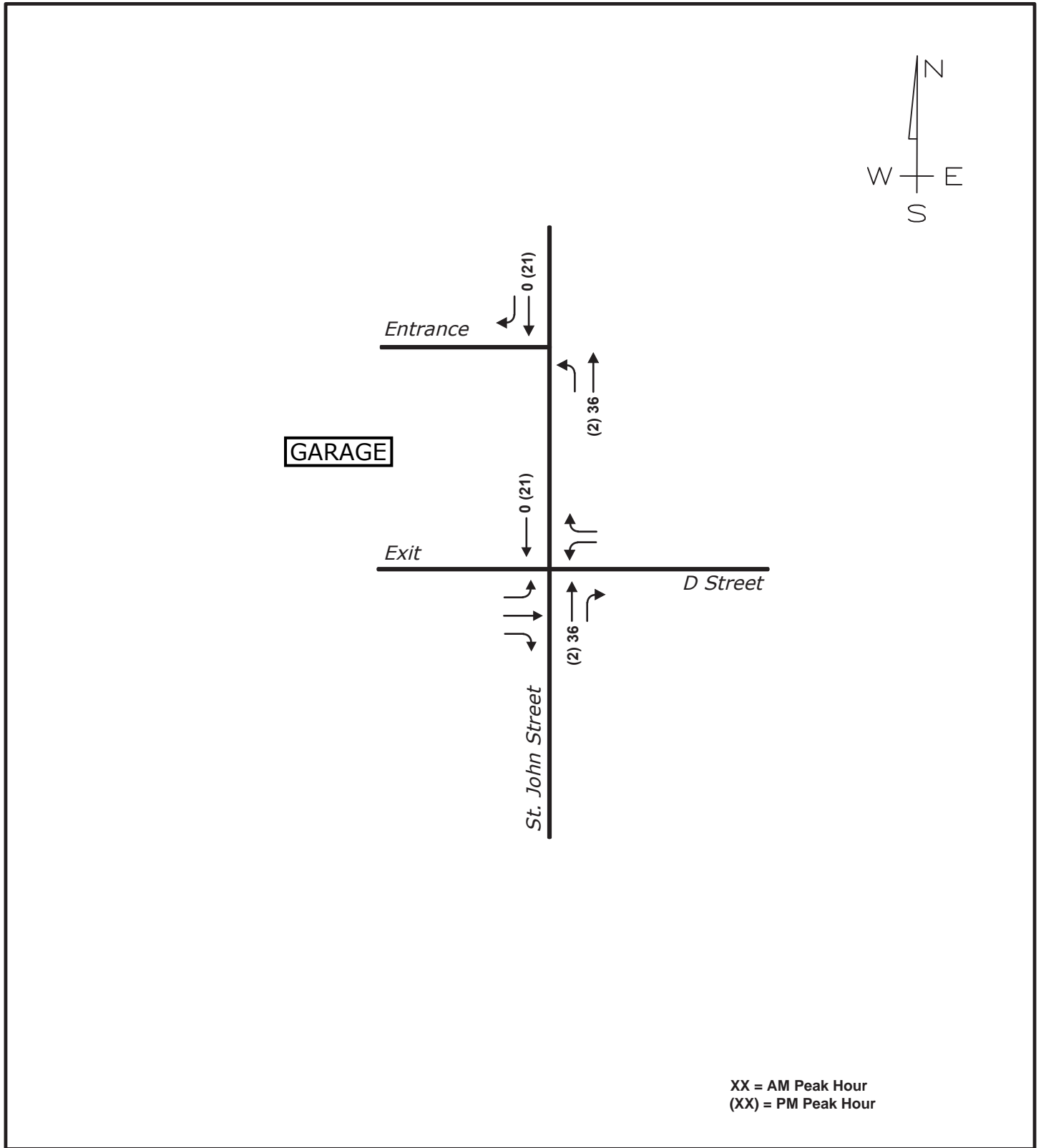
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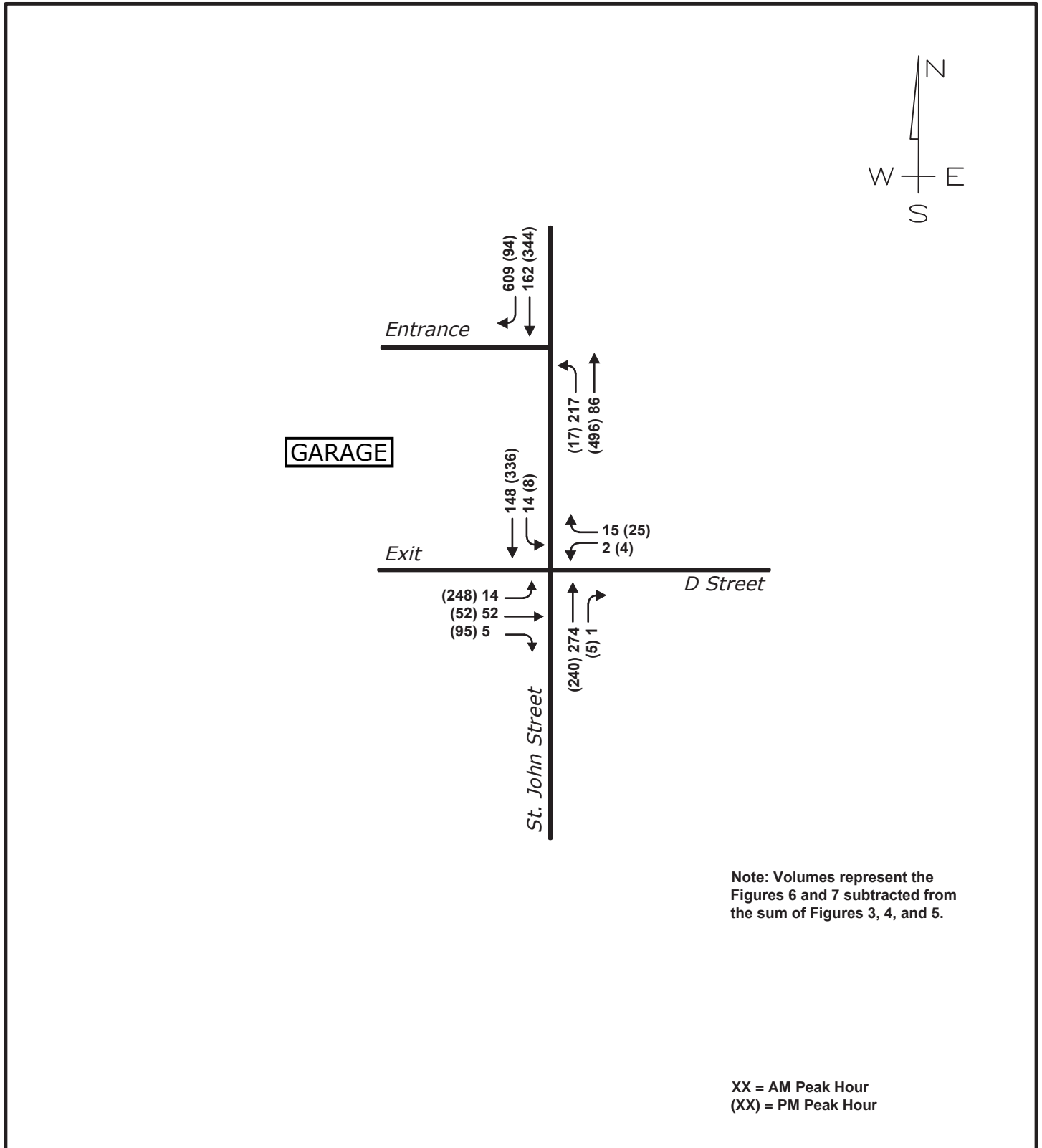
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Draft:      Date: FEB 2018  
Checked: RED      File Name: 2866.01-TRAFF.dwg



## MAINE MEDICAL CENTER EXPANSION PORTLAND, MAINE

Design: ET      Scale: NONE  
Draft:      Date: FEB 2018  
Checked: RD      File Name: 2866.01-TRAFF.dwg

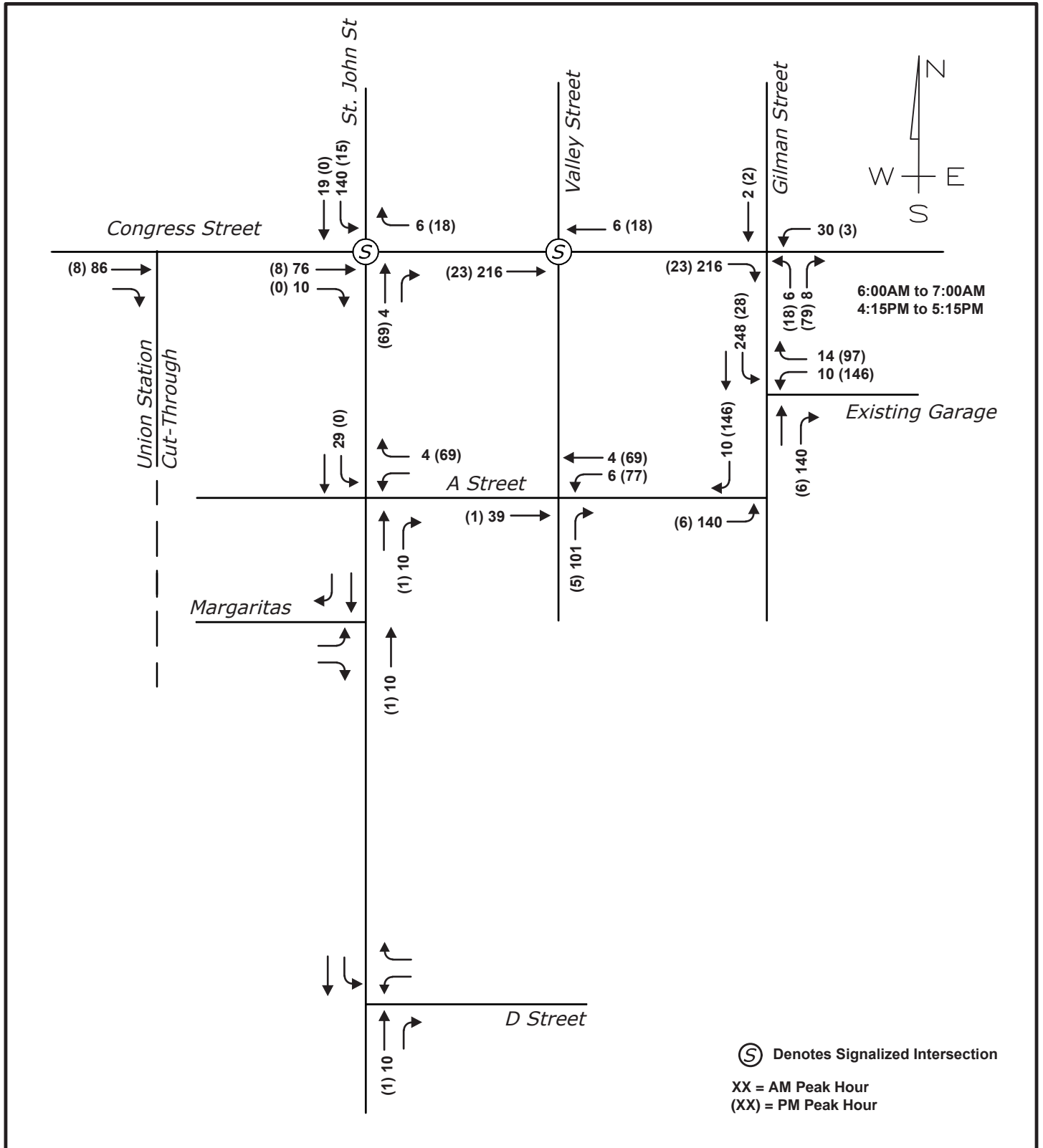


## MAINE MEDICAL CENTER EXPANSION PORTLAND, MAINE

# Existing Garage Employee Trip Assignment

Figure No.

# A



## MAINE MEDICAL CENTER EXPANSION PORTLAND, MAINE

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**GORRILL  
PALMER**

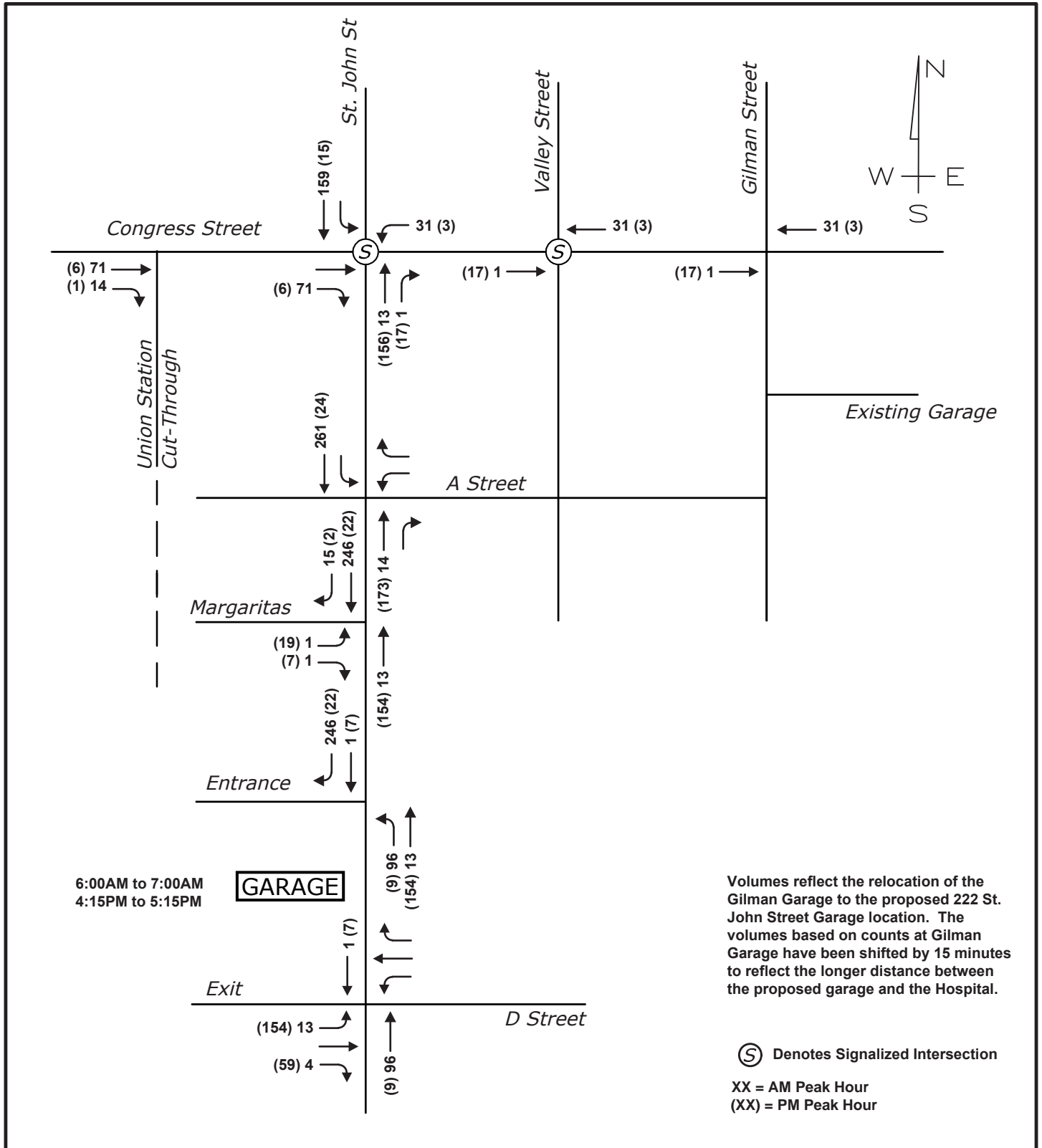
Relationships. Responsiveness. Results.  
www.gorrillpalmer.com  
207.772.2515



# Existing Garage Employee Trip Reassignment

Figure No.

# B



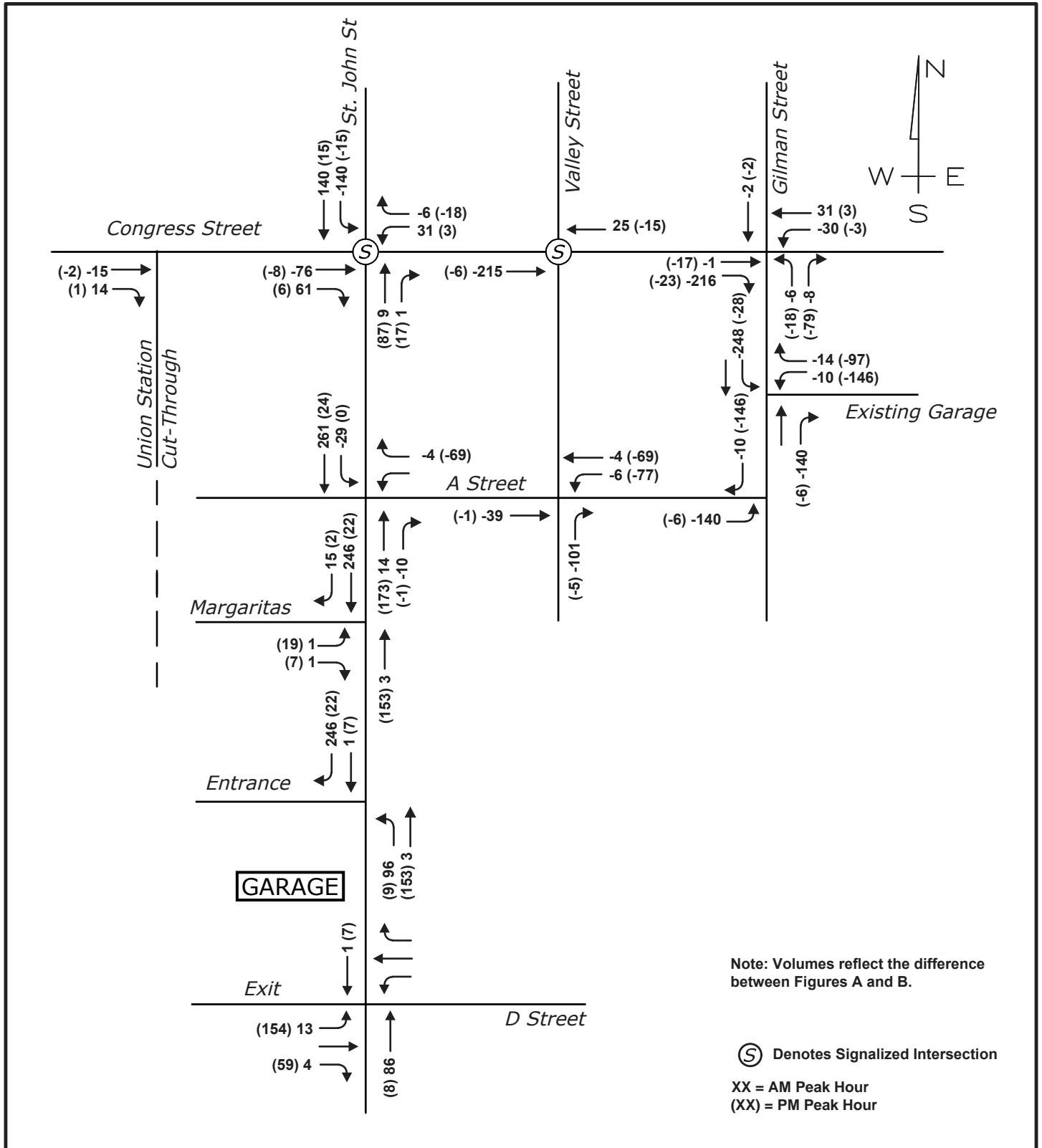
## MAINE MEDICAL CENTER EXPANSION PORTLAND, MAINE

Design: ET Scale: NONE  
 Draft: Date: FEB 2018  
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# Net Change

Figure No.

C

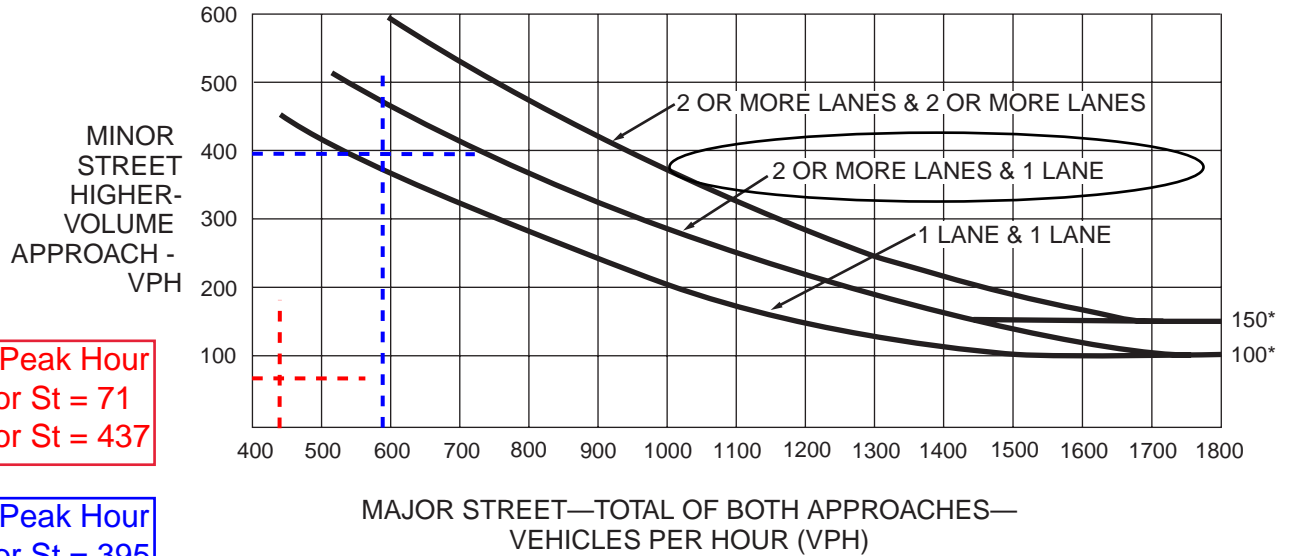


## MAINE MEDICAL CENTER EXPANSION PORTLAND, MAINE

Design: ET      Scale: NONE  
 Draft:            Date: FEB 2018  
 Checked: RED    File Name: 2866.01-TRAFF.dwg

## Proposed St. John Street Garage Access Signal Warrant

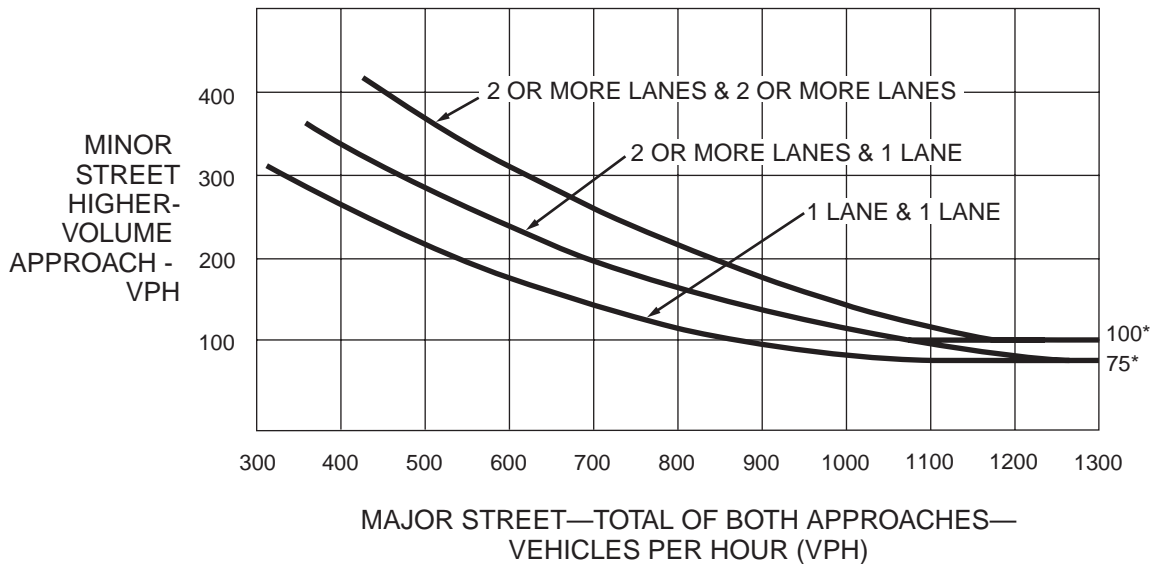
**Figure 4C-3. Warrant 3, Peak Hour**



\*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**

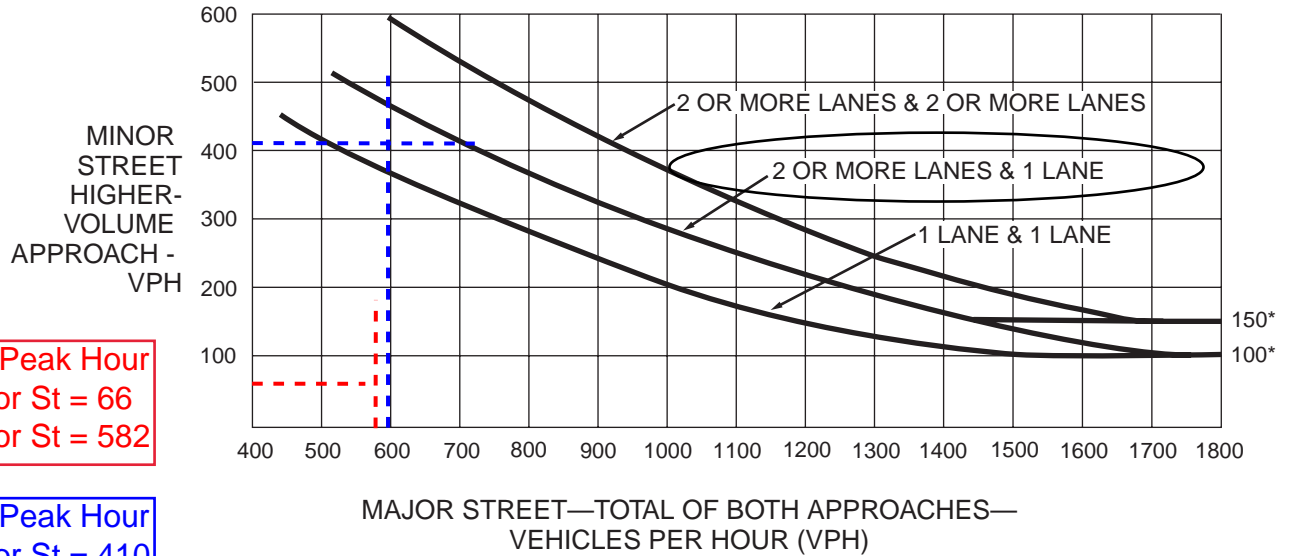
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



\*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

## Margaritas Access Signal Warrant

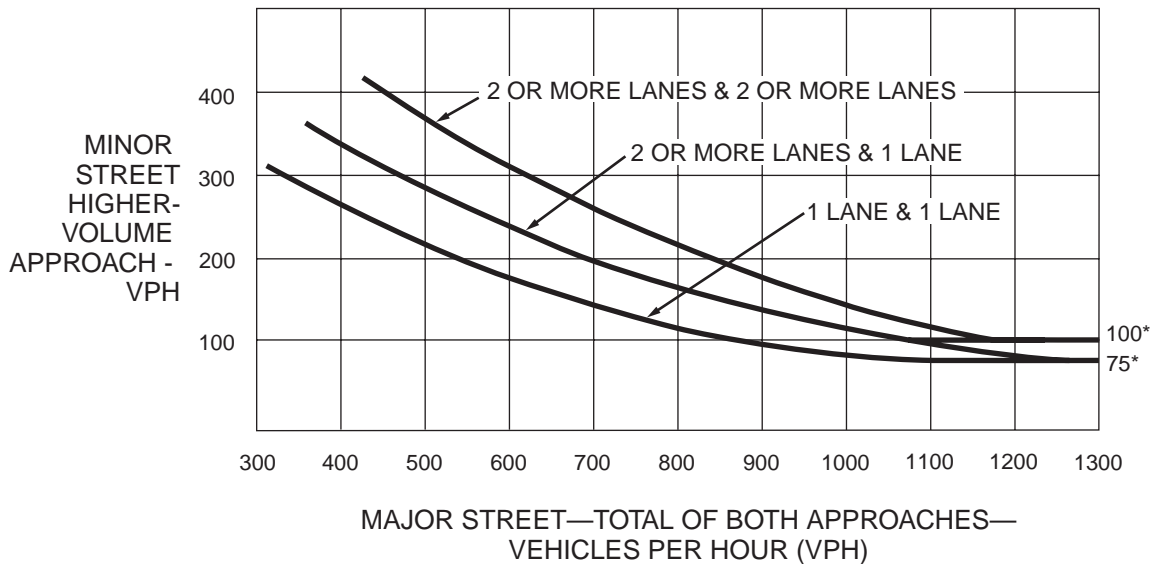
**Figure 4C-3. Warrant 3, Peak Hour**



\*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



\*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

### Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	63	63	63	63	63	63
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1399	1350	1354	1400	1419	1385
Vehs Exited	1400	1341	1349	1382	1412	1375
Starting Vehs	26	26	26	20	30	27
Ending Vehs	25	35	31	38	37	33
Travel Distance (mi)	685	658	664	679	696	676
Travel Time (hr)	30.3	28.2	28.8	29.9	31.2	29.7
Total Delay (hr)	5.8	4.8	5.2	5.5	6.2	5.5
Total Stops	361	365	327	375	393	365
Fuel Used (gal)	23.0	22.1	22.3	23.0	23.4	22.7

### Interval #0 Information Seeding

Start Time	6:57
End Time	7:00
Total Time (min)	3
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

### Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1399	1350	1354	1400	1419	1385
Vehs Exited	1400	1341	1349	1382	1412	1375
Starting Vehs	26	26	26	20	30	27
Ending Vehs	25	35	31	38	37	33
Travel Distance (mi)	685	658	664	679	696	676
Travel Time (hr)	30.3	28.2	28.8	29.9	31.2	29.7
Total Delay (hr)	5.8	4.8	5.2	5.5	6.2	5.5
Total Stops	361	365	327	375	393	365
Fuel Used (gal)	23.0	22.1	22.3	23.0	23.4	22.7

### 3: St. John Street & Garage Exit/D Street Performance by lane

Lane	EB	EB	WB	NB	SB	SB	All
Movements Served	LT	R	LTR	TR	L	T	
Denied Del/Veh (s)							0.1
Total Del/Veh (s)	7.6	3.8	4.5	2.6	1.2	1.6	2.9

### 5: Garage Exit & Shuttle Stop Performance by lane

Lane	EB	EB	SB	All
Movements Served	T	T	L	
Denied Del/Veh (s)				0.0
Total Del/Veh (s)	0.3	0.3	3.8	2.8

### 6: Shuttle Stop & Garage Entrance Performance by lane

Lane	WB	WB	WB	All
Movements Served	L	LT	T	
Denied Del/Veh (s)				0.0
Total Del/Veh (s)	0.1	0.2		0.2

### 7: Garage Entrance & St. John Street Performance by lane

Lane	NB	NB	SB	All
Movements Served	L	T	TR	
Denied Del/Veh (s)				0.2
Total Del/Veh (s)	39.4	7.2	4.0	10.2

### 9: St. John Street & Margarita's Entrance Performance by lane

Lane	EB	EB	NB	SB	All
Movements Served	L	R	LT	TR	
Denied Del/Veh (s)					0.9
Total Del/Veh (s)	38.6	16.5	0.3	2.8	2.5

### Total Network Performance

Denied Del/Veh (s)			1.0	
Total Del/Veh (s)			13.1	



**Intersection: 3: St. John Street & Garage Exit/D Street**

Movement	EB	EB	WB	NB	SB
Directions Served	LT	R	LTR	TR	L
Maximum Queue (ft)	70	28	30	163	27
Average Queue (ft)	28	3	14	9	4
95th Queue (ft)	52	17	38	69	19
Link Distance (ft)	116	116	243	1223	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					25
Storage Blk Time (%)					0
Queuing Penalty (veh)					1

**Intersection: 5: Garage Exit & Shuttle Stop**

Movement	SB
Directions Served	L
Maximum Queue (ft)	51
Average Queue (ft)	24
95th Queue (ft)	48
Link Distance (ft)	68
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 6: Shuttle Stop & Garage Entrance**

Movement	WB
Directions Served	LT
Maximum Queue (ft)	59
Average Queue (ft)	3
95th Queue (ft)	23
Link Distance (ft)	54
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Baseline**

**Intersection: 7: Garage Entrance & St. John Street**

Movement	NB	NB	SB
Directions Served	L	T	TR
Maximum Queue (ft)	184	250	48
Average Queue (ft)	111	34	12
95th Queue (ft)	187	165	35
Link Distance (ft)		212	868
Upstream Blk Time (%)		4	
Queuing Penalty (veh)		11	
Storage Bay Dist (ft)	160		
Storage Blk Time (%)	10	2	
Queuing Penalty (veh)	9	4	

**Intersection: 9: St. John Street & Margarita's Entrance**

Movement	EB	EB	NB
Directions Served	L	R	LT
Maximum Queue (ft)	18	23	27
Average Queue (ft)	2	2	1
95th Queue (ft)	12	14	14
Link Distance (ft)	310	310	868
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 24
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### Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	63	63	63	63	63	63
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1625	1696	1598	1635	1534	1618
Vehs Exited	1636	1688	1607	1620	1532	1616
Starting Vehs	37	24	35	17	23	27
Ending Vehs	26	32	26	32	25	25
Travel Distance (mi)	706	735	681	708	661	698
Travel Time (hr)	28.5	29.2	27.1	28.7	25.9	27.9
Total Delay (hr)	4.1	3.7	3.5	4.0	3.0	3.7
Total Stops	544	571	564	582	488	549
Fuel Used (gal)	22.8	23.6	22.1	23.1	21.1	22.5

### Interval #0 Information Seeding

Start Time	6:57
End Time	7:00
Total Time (min)	3
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

### Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1625	1696	1598	1635	1534	1618
Vehs Exited	1636	1688	1607	1620	1532	1616
Starting Vehs	37	24	35	17	23	27
Ending Vehs	26	32	26	32	25	25
Travel Distance (mi)	706	735	681	708	661	698
Travel Time (hr)	28.5	29.2	27.1	28.7	25.9	27.9
Total Delay (hr)	4.1	3.7	3.5	4.0	3.0	3.7
Total Stops	544	571	564	582	488	549
Fuel Used (gal)	22.8	23.6	22.1	23.1	21.1	22.5

### 3: St. John Street & Garage Exit/D Street Performance by lane

Lane	EB	EB	WB	NB	SB	SB	All
Movements Served	LT	R	LTR	TR	L	T	
Denied Del/Veh (s)							0.1
Total Del/Veh (s)	9.0	4.2	5.2	0.8	1.5	0.6	3.6

### 5: Garage Exit & Shuttle Stop Performance by lane

Lane	EB	EB	SE	All
Movements Served	T	T	L	
Denied Del/Veh (s)				0.2
Total Del/Veh (s)	5.5	1.2	27.2	7.3

### 6: Shuttle Stop & Garage Entrance Performance by lane

Lane	WB	WB	All
Movements Served	L	LT	
Denied Del/Veh (s)			0.0
Total Del/Veh (s)	0.1	0.1	0.1

### 7: Garage Entrance & St. John Street Performance by lane

Lane	NB	NB	SB	All
Movements Served	L	T	TR	
Denied Del/Veh (s)				0.0
Total Del/Veh (s)	3.9	0.6	1.6	1.3

### 9: St. John Street & Margarita's Entrance Performance by lane

Lane	EB	EB	NB	SB	All
Movements Served	L	R	LT	TR	
Denied Del/Veh (s)					0.7
Total Del/Veh (s)	13.2	20.7	0.3	2.8	1.9

### Total Network Performance

Denied Del/Veh (s)			0.7
Total Del/Veh (s)			7.3

**Intersection: 3: St. John Street & Garage Exit/D Street**

Movement	EB	EB	WB	SB	SB
Directions Served	LT	R	LTR	L	T
Maximum Queue (ft)	59	54	44	16	10
Average Queue (ft)	52	33	20	2	0
95th Queue (ft)	65	51	44	13	7
Link Distance (ft)	53	53	243		211
Upstream Blk Time (%)	16	1			
Queuing Penalty (veh)	31	1			
Storage Bay Dist (ft)				25	
Storage Blk Time (%)				0	
Queuing Penalty (veh)				1	

**Intersection: 5: Garage Exit & Shuttle Stop**

Movement	EB	EB	SE
Directions Served	T	T	L
Maximum Queue (ft)	114	17	96
Average Queue (ft)	34	1	32
95th Queue (ft)	92	11	74
Link Distance (ft)	299	299	106
Upstream Blk Time (%)			1
Queuing Penalty (veh)			1
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 6: Shuttle Stop & Garage Entrance**

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

**Baseline**

**Intersection: 7: Garage Entrance & St. John Street**

Movement	NB
Directions Served	L
Maximum Queue (ft)	36
Average Queue (ft)	5
95th Queue (ft)	25
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	160
Storage Blk Time (%)	
Queuing Penalty (veh)	

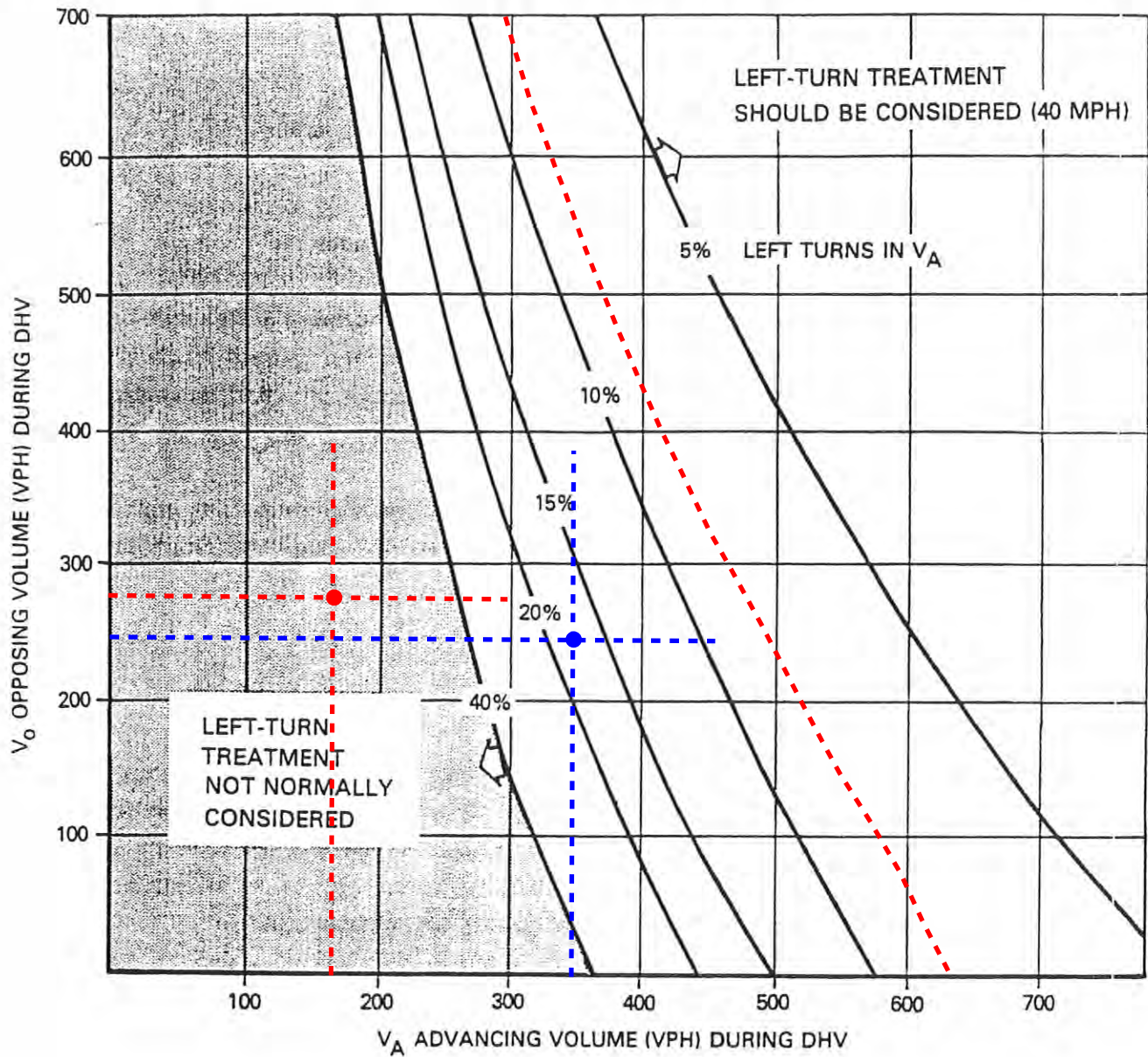
**Intersection: 9: St. John Street & Margarita's Entrance**

Movement	EB	EB	NB
Directions Served	L	R	LT
Maximum Queue (ft)	18	23	10
Average Queue (ft)	1	1	0
95th Queue (ft)	9	10	7
Link Distance (ft)	310	310	867
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 34
----------------------------------





**Instructions:**

1. The family of curves represent the percent of left turns in the advancing volume ( $V_A$ ). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.
4. Read  $V_A$  and  $V_O$  into the chart and locate the intersection of the two volumes.
5. Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is warranted. If the point is to the left of the line, then a left-turn lane is not warranted based on traffic volumes.

AM Peak Hour  
 $V_A = 162$   
 $V_O = 245$   
 $\%L = 8.6\%$

PM Peak Hour  
 $V_A = 344$   
 $V_O = 245$   
 $\%L = 2.3\%$

**VOLUME WARRANTS FOR LEFT-TURN LANES  
 AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS  
 (40 mph) Posted Speed: 25 mph**

**Figure 8-19**