FROM				
	NAME & TITLE	Frank J. Murphy, Acting Director	CITY of	
	AGENCY NAME & ADDRESS	Department of Transportation (DOT) 417 East Fayette Street, Room 527	BALTIMORE	
	SUBJECT	City Council Bill 17-0049	MEMO	

TO The Honorable President and Members of the City Council
c/o Natawna Austin
Room 400 City Hall

May 2, 2017

I am herein reporting on City Council Bill 17-0049 for the purpose of the application of Blue Ocean Realty, contract purchaser of certain property located at Ward 27, Section 15, Block 4820E, Lot 021, to have that property designated a Residential Planned Unit Development, and approving the Development Plan submitted by the applicant.

The Department of Transportation was provided documents entitled Perpetual Easement dated December 30, 1986 and Deed dated October 16, 1986. The documents establish that there is an easement for the benefit of Lot 21 (proposed development parcel) over Lot 1 which is the lot that the Belvedere Apartments is constructed on. The ingress and egress provided would cover both vehicular and pedestrian traffic and would allow for passage over Lot 1 to get to both Falls Road and Northern Parkway.

The site plan provided to the Department of Transportation showed proposed improvements to the existing entrance on Falls Road. This entrance is not included in the proposed planned unit development (PUD), and therefore cannot be evaluated by the TIS. DOT recommends that the improvements to this intersection be removed from the PUD.

The Traffic Impact Study (TIS) for 1190 West Northern Parkway is complete. Attached is a copy of the TIS for the Council's legislative file. The Department of Transportation (DOT) has reviewed the TIS and discussed its findings with the development team. The agreed upon improvements are:

A. Install advance warning pedestrian signs on southbound for the intersection of Falls Road and Northern Parkway.
B. Upgrade transit stop at Falls Road and Northern Parkway for pedestrian safety.
C. Refresh the crosswalks with thermoplastic markings on the north leg of Falls Road at Northern parkway.
D. Remove vegetation within the sight triangle between the existing north entrance to Belvedere Tower Apartments and Clifthurst Avenue and removal of vegetation back to the right-of-way.

DOT recommends the amendments for insertion into City Council Bill No. 17-0049. The amendments would formalize the agreed upon proposed improvements and who is responsible for construction and financing.

Thank you for this opportunity to comment.

Respectfully,

Lindsay Wines for

Frank J. Murphy
Acting Director

FJM/PAF
Cc: Karen Stokes, Mayor's Office
Kyron Banks, Mayor's Office

1190 W. Northern Parkway

Traffic Impact Study

June 6, 2017

Prepared For:

DEPARTMENT OF TRANSPORTATION
BALTIMORE CITY

Prepared By:

Sabra, Wang & Associates, Inc.
Engineers • Planners • Analysts

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I. INTRODUCTION

The proposed 1190 Northern Parkway development is a four-story 209,000 SF multi-family building with 148 dwelling units and a 297 space parking garage located on the northeast corner of Northern Parkway and Falls Road. The area is currently improved with multiple gas stations, retail lots, single family houses, and an existing Belvedere Towers multi-family apartment building which will remain unchanged and is not part of the proposed development. The anticipated build-out year of 1190 Northern Parkway is 2019.

The proposed development is a Planned Unit Development (PUD) located behind the existing Belvedere Towers development. With no access to Falls Road or Northern Parkway, the owner is proposing to establish a shared access agreement with the owner of the existing Belvedere Towers. The agreement will allow the proposed development use of the established access points on Falls Road and the right-in/right-out on Northern Parkway. The Department of Transportation has received the access agreement and has conferred with the Law Department that the access agreement provides the new development with access to the existing access points on Northern Parkway and Falls Road. The existing access for ingress and egress are not included in the PUD.

The TIS panel met on February, 4th, 2016 and through continued coordination a scope was developed which identified the following study intersections:

1. Falls Road at Smith Avenue
2. Falls Road at Kelly Avenue
3. Falls Road at Mattfeldt Avenue/ North Entrance - Existing
4. Falls Road at Shell Station/ South Entrance - Existing
5. Northern Parkway at Access Drive - Existing
6. Northern Parkway at Falls Road
7. Northern Parkway at I-83 NB ramps
8. Northern Parkway at I-83 SB ramps

A map of the study area, including the study intersections, is shown in **Figure 1**

The purpose of this study is to assess the impacts on traffic operations in the surrounding transportation network due to the proposed development.

The traffic analysis evaluated the following scenarios based on the submission to the Department of Planning as of May 31, 2017:

1. Existing Conditions
    - Existing Conditions evaluated and documented existing roadway network facilities and traffic volumes under existing year 2017.
2. Year 2019 Background Conditions
    - Background Conditions incorporated regional growth in existing traffic volumes, and traffic from other nearby planned, approved, or current development activity by the build-out year 2019.
3. Year 2019 Build-Out Conditions
    - Build-Out Conditions evaluated the total future traffic volumes, which included the 2019 Background Conditions in addition to the trips generated by the proposed 1190 Northern Parkway Development.

Each of the three scenarios evaluated Measures of Effectiveness (MOE) of Level of Service (LOS), delay, and capacity.

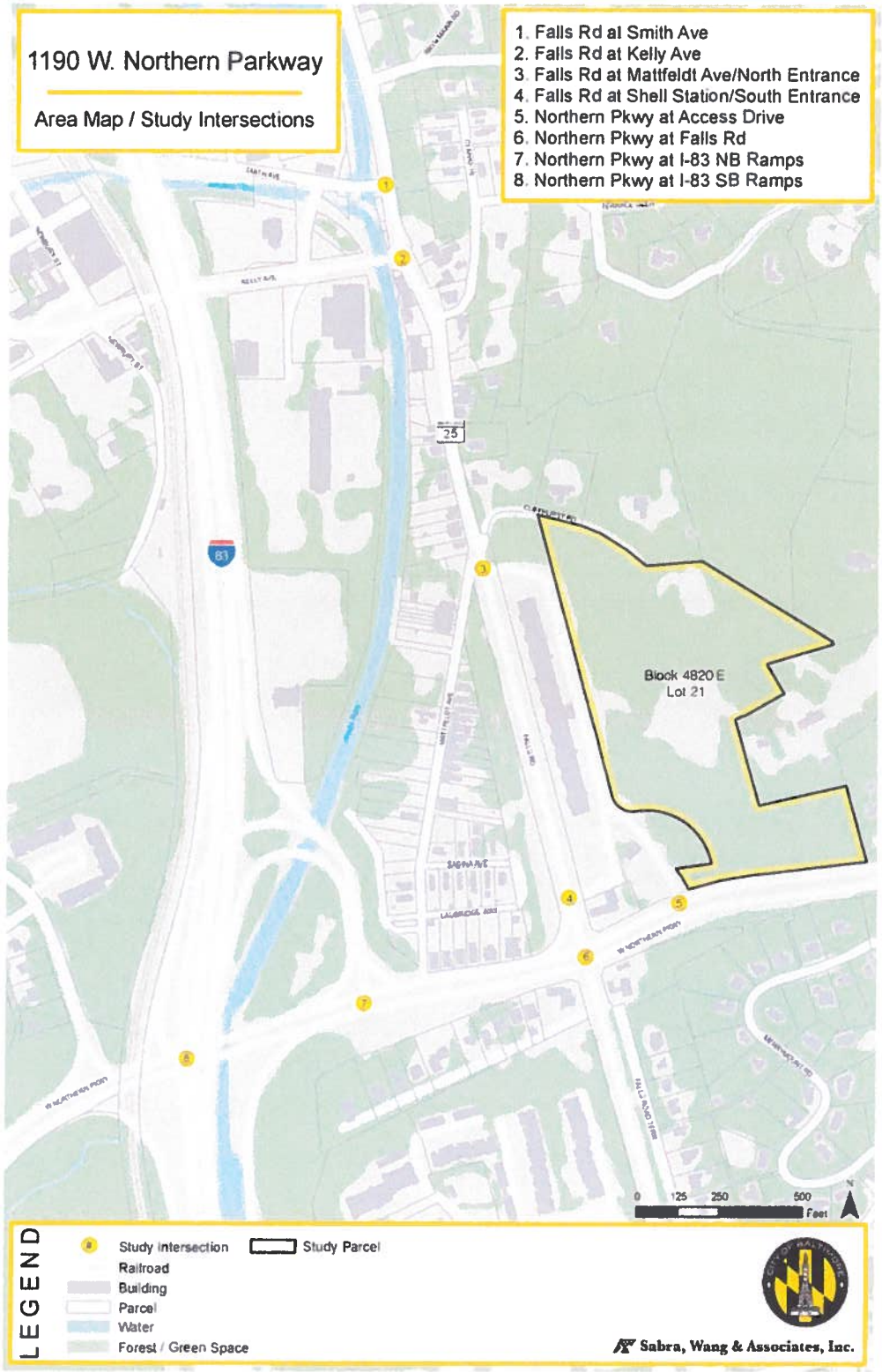


Figure 1: Area Map and Study Area intersections

II. EXISTING CONDITIONS

Roadway Characteristics

The following roadways were included in the analysis:

Falls Road is a four-lane undivided minor arterial roadway that connects Northern Parkway in the south to points northward. The posted speed limit varies between 25 and 30 miles per hour. Intersections evaluated along Falls Road include Smith Avenue, Kelly Avenue, Mattfeldt Avenue/Existing Belvedere Towers North Entrance, Existing Belvedere Towers/ Shell Gas Station South Entrance and Northern Parkway. On-street parking is permitted on Falls Road north of Mattfeldt and south of Kelly Avenue. The existing Average Daily Traffic volume on Falls Road is 14,875 vehicles per day according to the Maryland State Highway Administration 2016 Traffic Volume Map. https://www.roads.maryland.gov/index.aspx?PageId=792

Northern Parkway is a six-lane primary arterial roadway that connects I-83 and Falls Road to points west and east. The posted speed limit is 35 miles per hour. Intersections evaluated along Northern Parkway include Falls Road, Access Drive, I-83 northbound ramps, and I-83 southbound ramps. The existing Average Daily Traffic volume on Northern Parkway is 42,660 vehicles per day according to the Maryland State Highway 2016 Traffic Volume Map.

Smith Avenue is a two-lane local roadway that provides access to Mount Washington Retail Park west of Falls Road. Metered parking is allowed on the northern side of the roadway. The posted speed limit is 25 miles per hour.

Kelly Avenue is a two-way four-lane minor arterial road in the study area that connects Falls Road in the east to Cross Country Blvd to the west. The posted speed limit is 30 miles per hour. Parking is not allowed on the bridge over I-83.

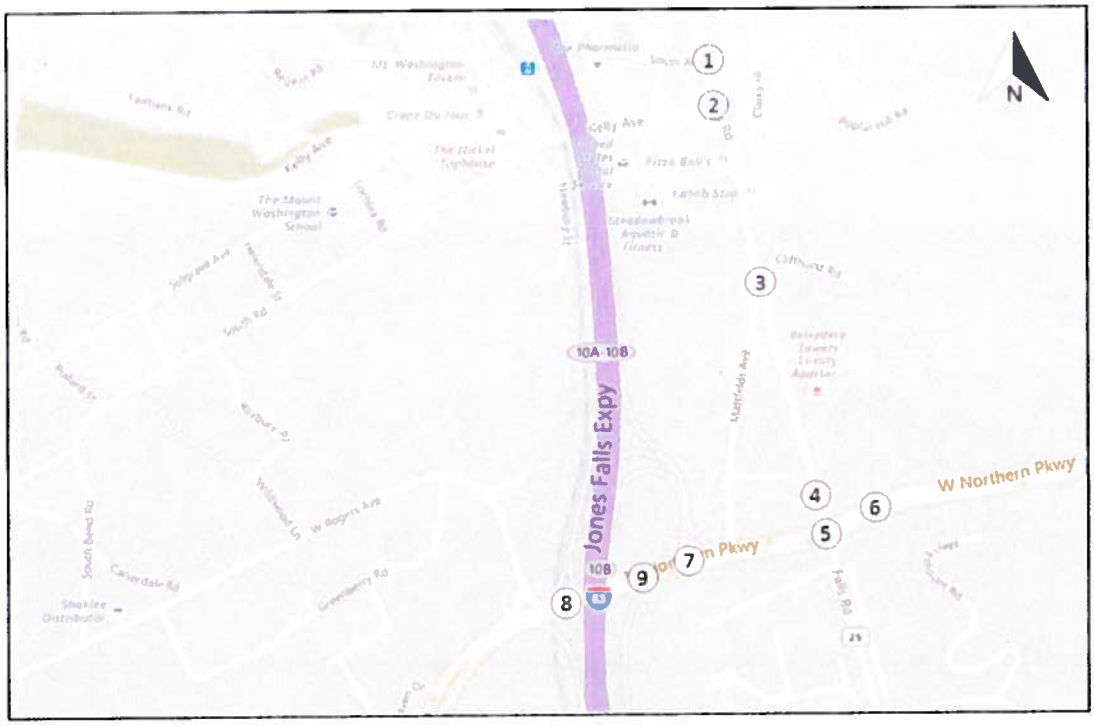
Mattfeldt Ave is a two-way two-lane local road that connects to Falls Road in the north to Northern Parkway to the south. Parking is permitted along the both sides of the road, except on the northbound and southbound approaches to Falls Road and Northern Parkway, respectively. The posted speed limit is 20 miles per hour. Southbound right-turns from Falls Road onto Mattfeldt Avenue are prohibited Monday through Friday from 7AM – 9AM.

The Belvedere Towers **North Entrance** (Falls Road at Mettfeldt Avenue) is a two-way, two-lane access that intersects with Falls Road.

The Belvedere Towers **South Entrance** (Falls Road at the Shell Gas Station) is a wide, two-way, two-lane, shared access with the Shell gas station that intersects with Falls Road. The entrance is located approximately 60-ft north of the Falls Road at Northern Parkway intersection.

The Belvedere Towers **Northern Parkway Entrance** (Access Drive) is a two-way, two-lane, right-in/right-out access that intersects with Northern Parkway.

Figure 2 shows the existing lane configuration and traffic controls at the study intersections.



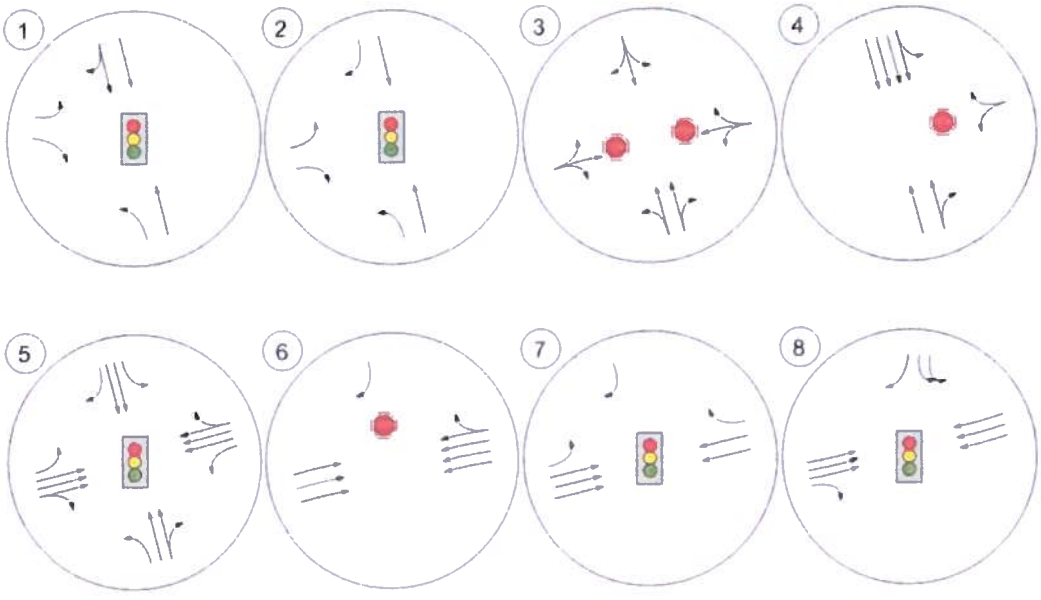


Figure 2: Existing Lane Configurations and Traffic Control
(note intersection #9 Falls Road and the I-83 NB Ramp not shown has yield control)

Pedestrian and Bicycle Facilities

Bicycle facilities in the study area are marked sharrows and "Share the Road" signs along both the northbound and southbound directions of Falls Road. Ultimately, Baltimore's Bike Master Plan calls for bicycle accommodations in the form of new sharrows along Kelly Avenue and dedicated bike lanes along Northern Parkway. Morning and evening bicycle turning movements are shown in
Figure 3 and
Figure 4, respectively.

Pedestrian infrastructure is complete along Falls Road in the study area. Due to right-of-way constraints, portions of Falls Road on the eastside between Mattfeldt and Kelly Avenue have incomplete pedestrian infrastructure. Marked crosswalks, curb ramps, and pedestrian signals are located at most signalized intersections within the study area. All sidewalks widths meet the 5ft required for ADA compliance with the exception of a few segments along the western edge of Falls Road. No pedestrian crossings in the study area are equipped with Accessible Pedestrian Signals (APS). **Table 1** shows the pedestrian volumes at the study intersections during the morning and evening peak hours.

Existing bicycle and pedestrian infrastructure in the study area are shown in **Figure 5** and **Figure 6**, respectively. Pedestrian crossings and bicycle turning movement counts for all study intersections can be found in **Appendix A**.

Table 1: Pedestrian Volumes

	Intersection	North Leg		East Leg		South Leg		West Leg		Total	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	Falls Road at Smith Avenue	2	0	0	0	0	0	3	2	5	2
2	Falls Road at Kelly Avenue	0	0	0	0	9	5	3	2	12	7
3	Falls Road at Mattfeldt Ave/North Ent	0	0	0	0	0	2	3	2	3	4
4	Falls Road at South Ent	0	0	0	4	0	0	0	0	0	4
5	Falls Road at Northern Parkway	10	6	1	7	1	1	3	1	15	15
6	Northern Parkway at Entrance to Belvedere Towers	0	3	0	0	0	0	0	0	0	3
7	Northern Parkway at I-83 SB Ramps	0	2	0	0	0	0	0	1	0	3
8	Northern Parkway at I-83 NB Ramps	0	0	0	0	0	0	0	0	0	0

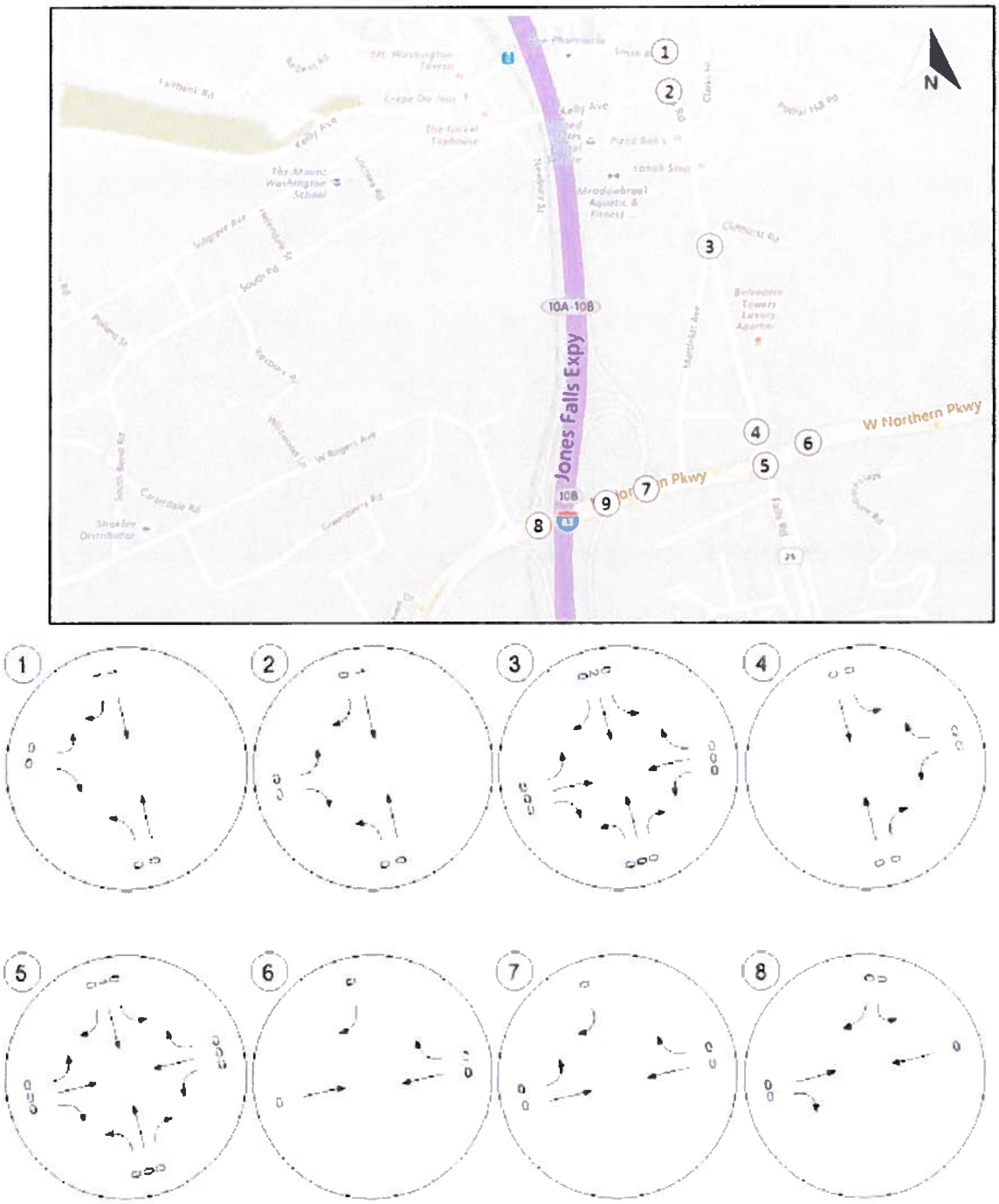


Figure 3: AM Peak Hour Intersection Bicycle Volumes

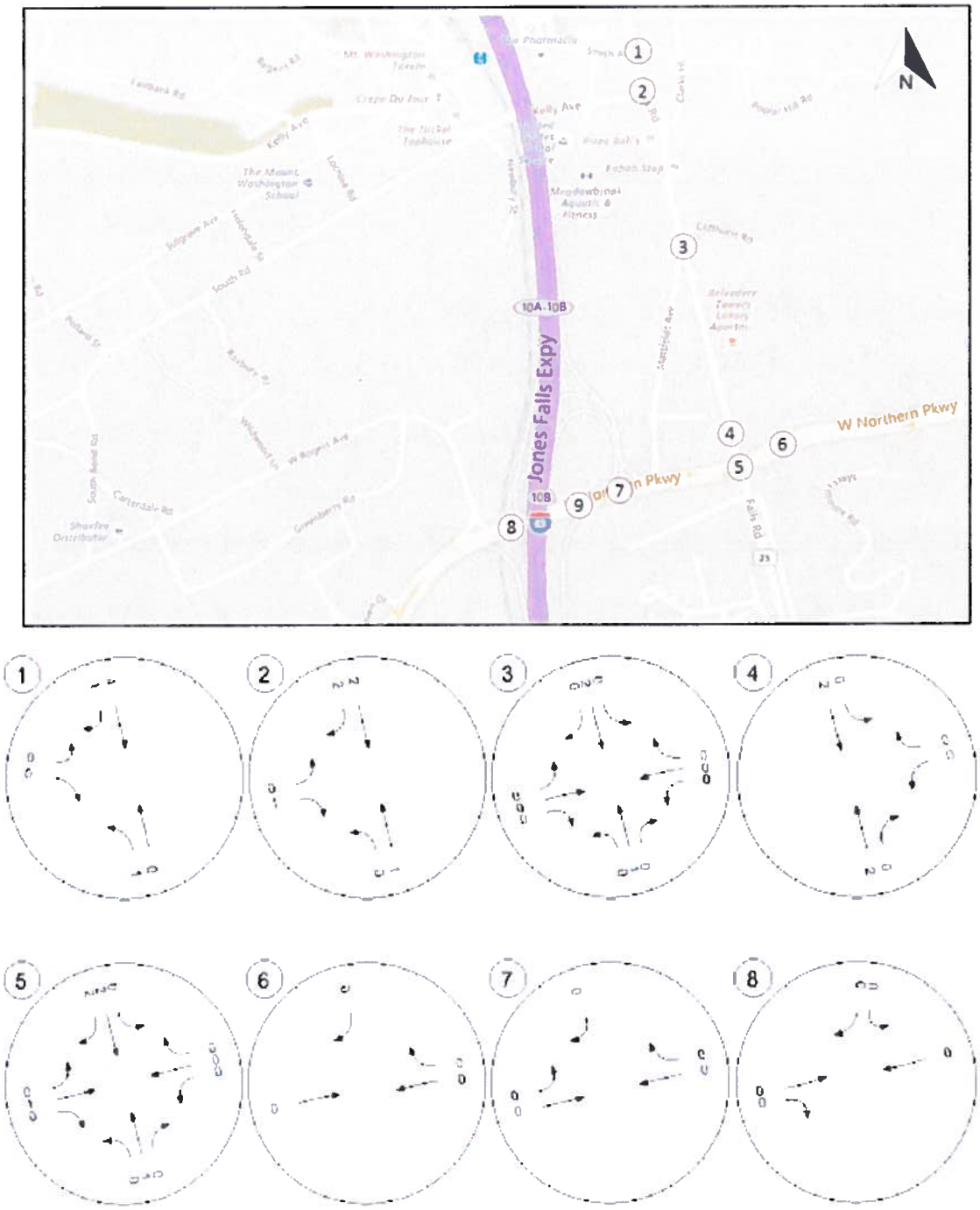


Figure 4: PM Peak Hour Intersection Bicycle Volumes

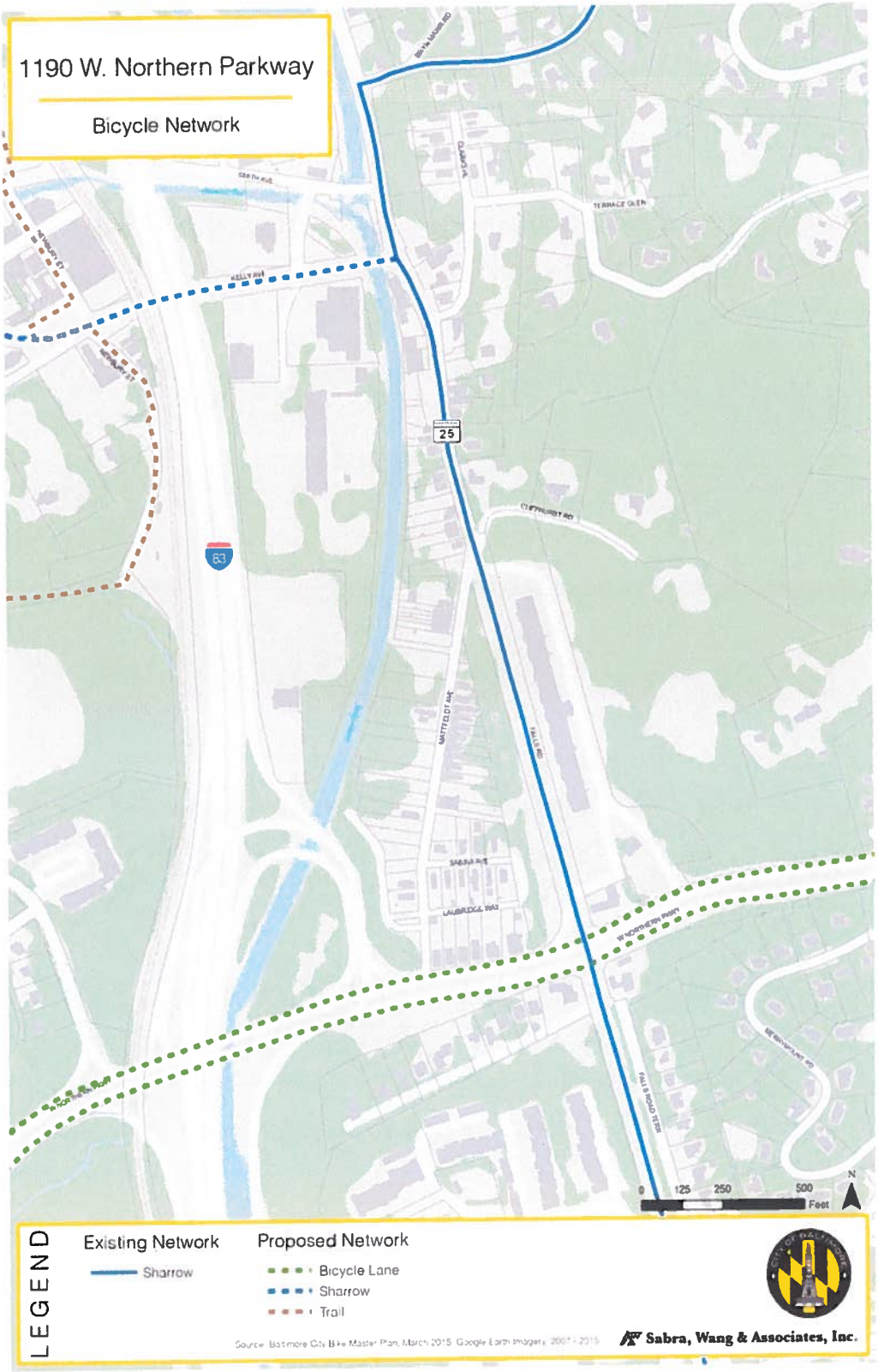


Figure 5: Bicycle Infrastructure

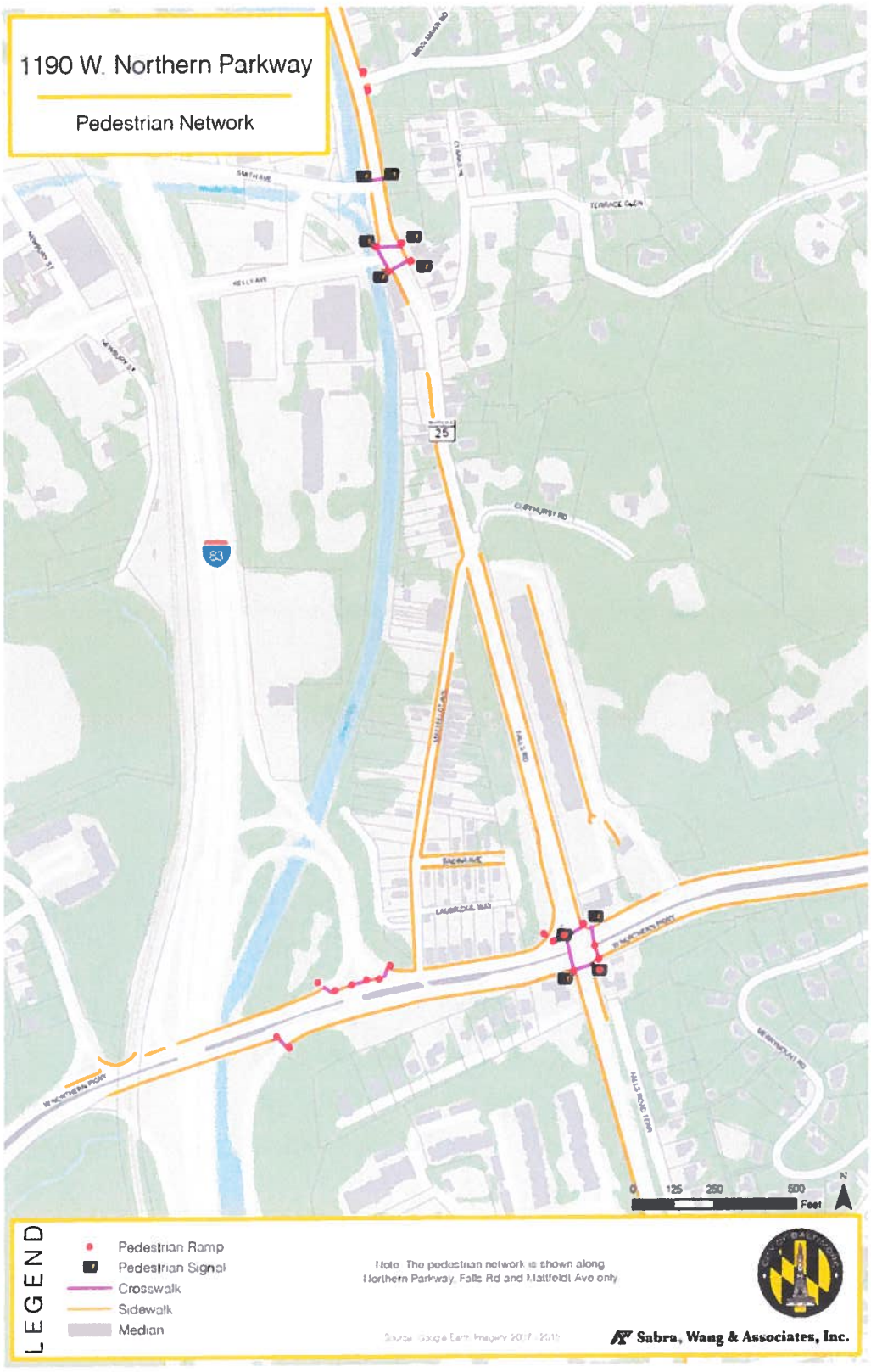


Figure 6: Existing Pedestrian Infrastructure

Existing Transit Conditions

The study area is served by the Maryland Transit Administration's (MTA) bus line number 27 along Falls Road and Northern Parkway west of Falls Rd, the number 44 line along Northern Pkwy, the number 58 line along Falls Road and Northern Parkway west of Falls Rd, and the number 60 line along Kelly Ave and Falls Road north of Kelly Ave. The light rail parallels I-83 and Falls Road in the study area with the Mount Washington station located off of Kelly Ave. **Table 2** represents the ridership for winter 2015 weekdays. The data was provided by MTA staff.

Table 2: Bus Ridership from 2015

Bus Stop Location	Routes	Stop #	Boardings	Alightings
NB Falls Rd at South Entrance	027, 58	5046	**13**	**12**
SB Falls Rd at Northern Pkwy	027, 94	4857	**37**	**8**
WB Northern Pkwy at Falls Rd	30, 44, 58	5990	**25**	**57**
NB Falls Rd at Mattfeldt Ave	027, 33, 58, 94	5047	**1**	**1**
SB Falls Rd at Mattfeldt Ave	027, 33, 58, 94	4856	**2**	**3**

Figure 6 shows the existing transit service in the surrounding area. **Figure 7** includes the transit stop amenities currently in place.

Figure 7: Available Public Transit Services

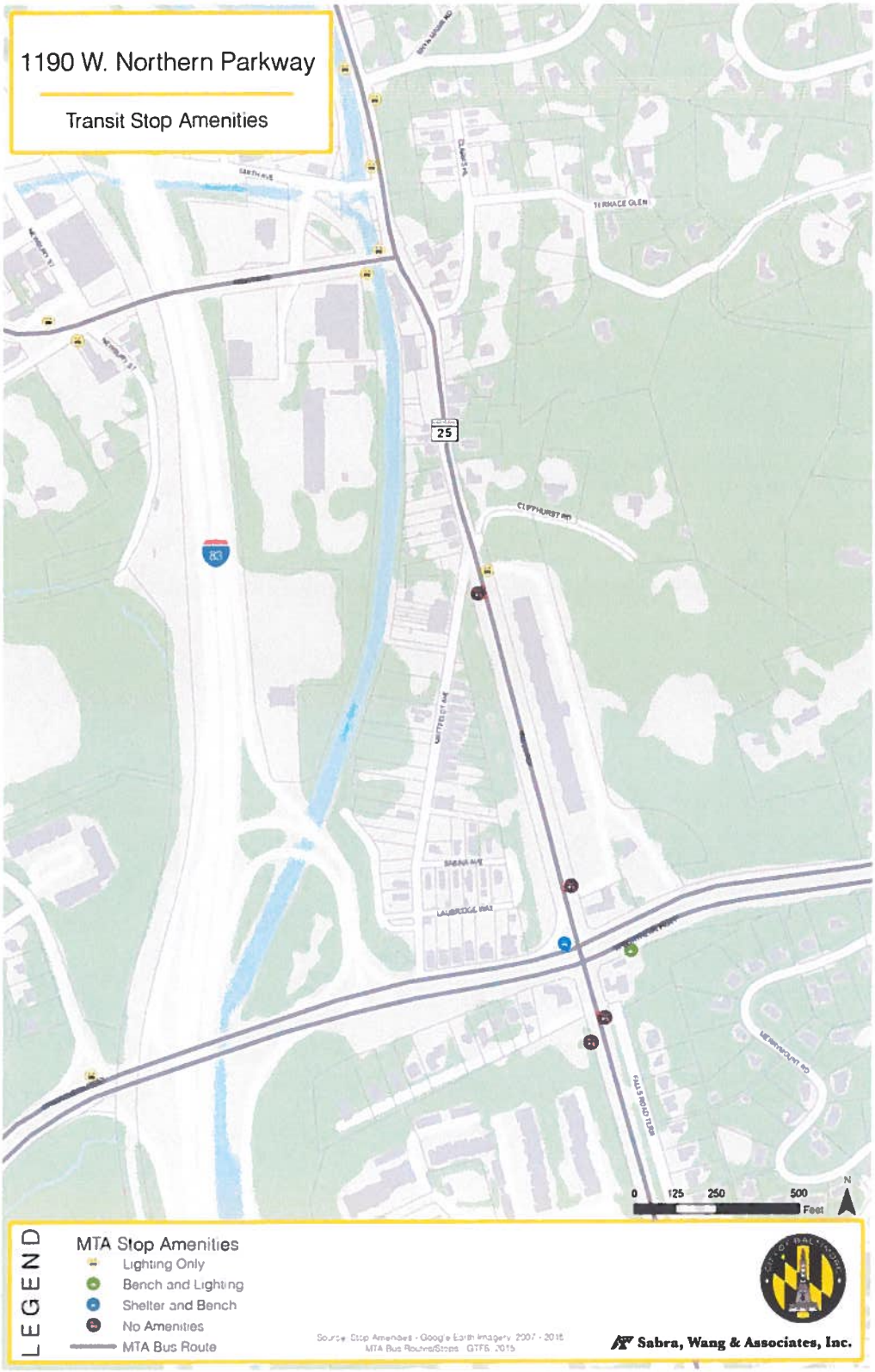


Figure 8: Public Transit Stop Amenities

Observations

Traffic Signal Operations

Five of the eight study intersections are signalized with the remaining three intersections at the site access points stop controlled on the side street approaches only. Signalized intersections along Northern Parkway include the I-83 NB Ramps, I-83 SB Ramps, and Falls Road. These signals operate in coordinated system with 150-second cycle lengths during both the AM and PM peak hours. Signalized intersections along Falls Road include Smith Avenue and Kelly Avenue which operate in coordination with each other but are not part of a larger coordinated signal system. The cycle lengths in the AM and PM peak hours are 205 seconds.

Field Observations

The following is a summary of field observations and approximate queue lengths noted in May 2017 at the study intersections during both the morning and evening peak hours:

1. Falls Road at Smith Avenue
    - During the morning peak period, the northbound, southbound, and eastbound queue lengths reached 125ft (5 vehicles), 375ft (15 vehicles), and 125ft (5 vehicles), respectively.
    - During the evening peak period, the northbound, southbound, and eastbound queue lengths reached 125ft (5 vehicles), 1125ft (45 vehicles), and 250ft (10 vehicles), respectively.
    - Some residual queuing, where all queued vehicles at the beginning of a green interval were not able to clear the intersection during the green interval during each signal cycle, was observed southbound and eastbound during the evening peak hour.
2. Falls Road at Kelly Avenue
    - During the morning peak period, the northbound, southbound, and eastbound queue lengths reached 375ft (15 vehicles), 125ft (5 vehicles), and 375ft (15 vehicles), respectively.
    - During the evening peak period, the northbound, southbound, and eastbound queue lengths reached 500ft (20 vehicles), 125ft (5 vehicles), and 625ft (25 vehicles), respectively.
    - Residual queues were observed eastbound during the evening peak hour.
3. Falls Road at Mattfeldt Avenue / Northern Belvedere Driveway
    - During the morning and evening peak periods, the eastbound and westbound queue lengths were minimal, with maximum queue lengths less than 125ft (5 vehicles) on each approach.
    - The minor street approaches are offset by approximately 30ft which results in some difficulty when conflicting left turns on Falls Road arrive at the same time.
    - A combination of the skewed approach alignment and 24% up-grade on the Mattfeldt Avenue approach make it difficult to make eastbound turning movements.
    - Sight distance is limited on both of the side street approaches.
4. Falls Road at Southern Belvedere Driveway
    - During the morning and evening peak periods, westbound queue lengths reached 125ft (5 vehicles)
    - Southbound queues regularly spilled back past the driveway from the signal at Northern Parkway during both peaks which created additional delays for westbound left turns from the driveway.
5. Falls Road at Northern Parkway
    - During the morning peak period, the northbound, southbound, eastbound, and westbound queue lengths reached 250ft (10 vehicles), 500ft (20 vehicles), 875ft (35 vehicles), and 1000ft (40 vehicles), respectively.

- During the evening peak period, the northbound, southbound, eastbound, and westbound queue lengths reached 250ft (10 vehicles), 375ft (15 vehicles), 875ft,(35 vehicles) and 500ft (20 vehicles), respectively.
- Residual queuing was observed during both peak hours for the southbound left, eastbound left, eastbound through, and westbound through movements.
- Uneven lane utilization was observed throughout both peaks on the westbound approach with heavier use of the right hand (outer) lane, due to downstream demand for the I-83 ramp.
- The southbound left turn queue was observed spilling out of the turnbay during the evening peak hour.
- The eastbound left turn queue was observed spilling out of the turnbay during both the morning and evening peak hours.

6. Northern Parkway at Belvedere Driveway
    - During the morning and evening peak periods, the southbound queues were minimal with a maximum queue length less than 25ft (1 vehicle).
    - Westbound queues regularly spilled back past the Belvedere Driveway from the signal at Falls Road. Stopped westbound traffic was observed leaving gaps for southbound right turns.
7. Northern Parkway at the I-83 Northbound Ramps
    - During the morning and evening peak periods, the northbound, eastbound, and westbound queue lengths reached 250ft (10 vehicles), 500ft (20 vehicles) and 500ft (20 vehicles), respectively.
    - Eastbound and westbound queues occasionally spilled back to the upstream signals at the I-83 southbound ramp and Falls Road during both peaks.
    - As the eastbound though movement is free, eastbound queues are a result of spillbacks from the Falls Road signal.
    - Westbound lane utilization is heaviest in the right turn lane onto the I-83 ramps.
    - The weaving movement from the northbound ramp to the eastbound left turn lane at Falls Road is difficult due to persistent congestion throughout both peaks compounded by the short intersection spacing. The friction from the weaving maneuver reduces throughput at the Falls Road signal, increasing congestion.
8. Northern Parkway at the I-83 Southbound Ramps
    - During the morning peak period, the southbound, eastbound, and westbound queue lengths reached 500ft vehicles on each approach, respectively.
    - During the morning peak period, the southbound, eastbound, and westbound queue lengths reached 500ft (20 vehicles), 250ft (10 vehicles), and 625ft (25 vehicles), respectively.
    - Eastbound queues occasionally spilled back to the intersection from the downstream intersections at the northern ramps and Falls Road.
    - The southbound left turn was occasionally metered by eastbound congestion, particularly during the evening peak, resulting in occasional residual queuing.

In general, congestion was present along both directions of Northern Parkway throughout the morning and evening peak hours. Congestion was heaviest on Falls Road northbound during the evening peak and southbound during the morning peak. Pedestrian and bicycle traffic was light throughout the study area during both the AM and PM peaks.

Sight Distance

Sight distance was evaluated at the unsignalized Mattfeldt Avenue/Northern Site Driveway intersection with Falls Road. The proposed site plan for 1190 Northern Parkway is shown in **Figure 9**. Stopping Sight Distance (SSD) along Falls Road approaching the intersection is more than adequate as horizontal curvature approaching the intersection is minimal both northbound and southbound. Furthermore, the intersection is located near the top of a hill, so the vertical curvature of the roadway does not impede sight distance either.

Intersection Site Distance (ISD) was also evaluated for the stop controlled Mattfeldt Avenue and Northern Site Driveway approaches. ISD is provided at intersections to allow drivers entering or crossing a roadway sufficient site distance to anticipate and avoid collisions. ISD was measured from the location where vehicles were observed stopping, as sight distance was severely limited at the American Association of State Highway and Transportation Officials (AASHTO) recommended 14.5ft from the edge of the major roadway. **Table 3** shows the measured ISD compared to the AASHTO recommended minimums. Results from the ISD analysis indicate the available ISD for left turn movements from the side streets are not adequate as they do not meet the AASHTO minimum on both the Mattfeldt Avenue and Northern Driveway approaches. Less than adequate ISD may increase the likelihood of drivers from the minor street approaches accepting less than adequate gaps in traffic along Falls Road.

Table 3: Intersection Sight Distance Calculations

Intersection Sight Distance - Mattfeldt Approach						
Movement	**t_g (sec)**	**Design Speed (mph)**	**Minimum ISD (ft)**	**Measured ISD (ft)**		**Results**
Left Turn	12.2	30	540	ISD_{Left}	705	Met
				ISD_{Right}	405	Unmet
Right Turn	8.6	30	380	ISD_{Left}	705	Met

Intersection Sight Distance - Northern Site Ent Approach						
Movement	**t_g (sec)**	**Design Speed (mph)**	**Minimum ISD (ft)**	**Measured ISD (ft)**		**Results**
Left Turn	8	30	355	ISD_{Left}	750	Met
				ISD_{Right}	310	Unmet
Right Turn	6.5	30	290	ISD_{Left}	310	Met

The available sight distance on Mattfeldt Avenue looking right is 405ft, 135ft less than the AASHTO minimum, due to the vertical curvature on Falls Road. Sight distance looking right from the Northern Site Driveway is restricted by foliage on the northeast corner of the intersection. The westbound left turn is only 45ft less than the AASHTO minimum of 355ft, foliage should be cut 8-10 feet from the face of curb. A detailed breakdown of the time gap calculations utilized in the ISD calculations is provided in **Appendix C**.

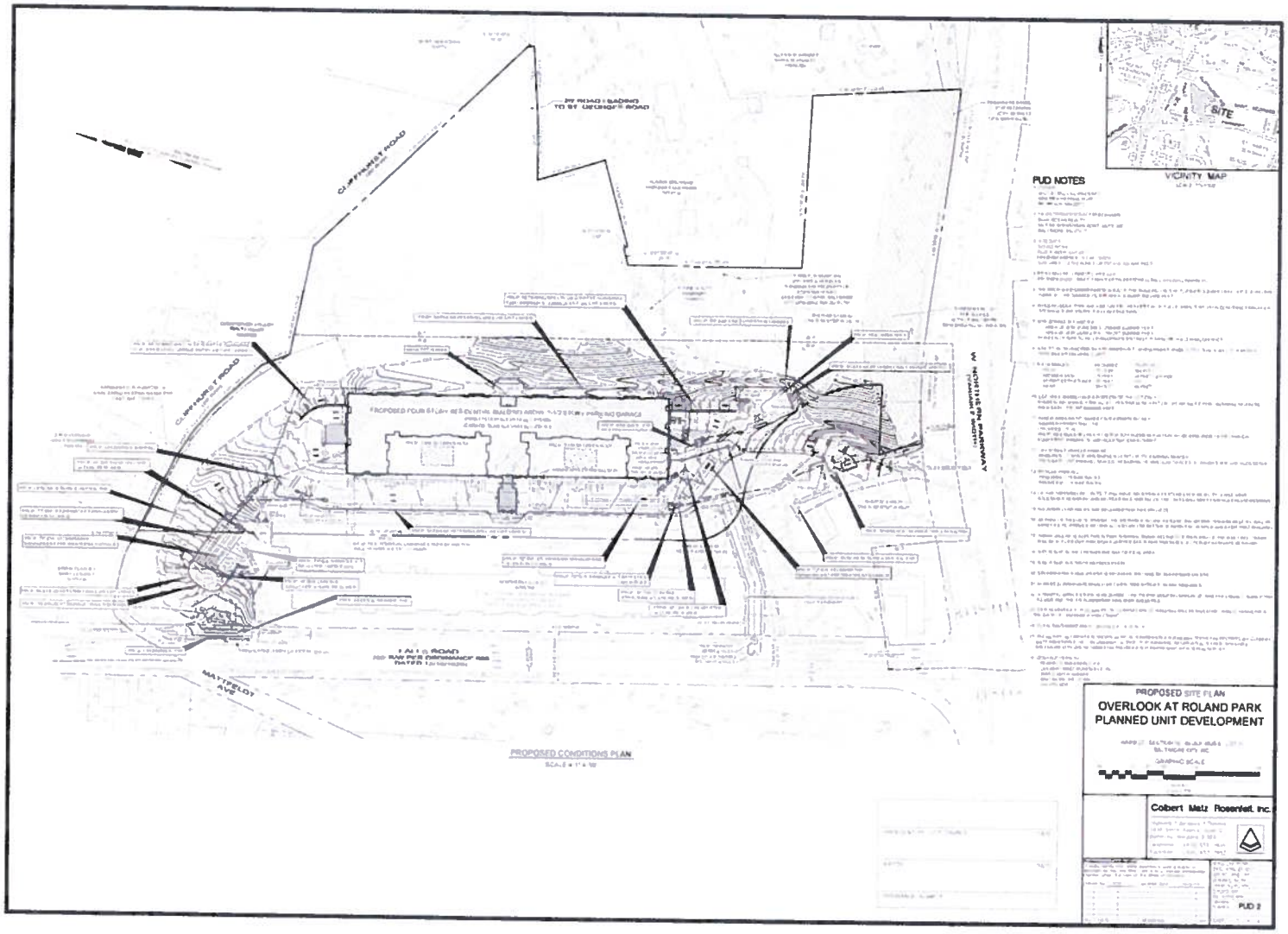


Figure 9: 1190 Northern Parkway Proposed Site Plan

Existing Traffic Volumes Analysis

Data collection was performed on Wednesday April 19, 2017 when public schools and local colleges were in session. Data collected included morning and evening weekday peak hour turning volumes, pedestrian volumes, and bicycle counts. Vehicle turning movement volumes were conservatively balanced and rounded up to the nearest 5.

Figure 10 and Error! Reference source not found. show the existing AM and PM peak hour traffic volumes. Traffic counts at each of the study intersections can be found in **Appendix A.**

Highway Capacity Manual (HCM) methodology was used to evaluate capacity at all study intersections during the AM and PM peak hours. A Synchro traffic model was developed for each peak period with the existing conditions data including roadway geometry, traffic volumes, and signal timing and phasing data as inventoried and documented in the field.

Performance measures of effectiveness included level of service, delay and volume-to-capacity ratio. The level of service (LOS) is a letter designation that corresponds to a certain range of roadway operating conditions. The levels of service range from A to F, with A indicating the best operating conditions and F indicating the worst, or a failing, operating condition. The volume-to-capacity ratio (v/c ratio) is the ratio of current flow rate to the capacity of the intersection. This ratio is often used to determine how sufficient capacity is on a given roadway. Generally speaking, a ratio of 1.00 indicates that the roadway is operating at capacity. A ratio of greater than 1.00 indicates that the facility is operating above capacity as the number of vehicles exceeds the roadway capacity. The results of the existing conditions intersection capacity analysis, including average delay per vehicle, are summarized in **Table 4**. HCM reports are provided in **Appendix B.**

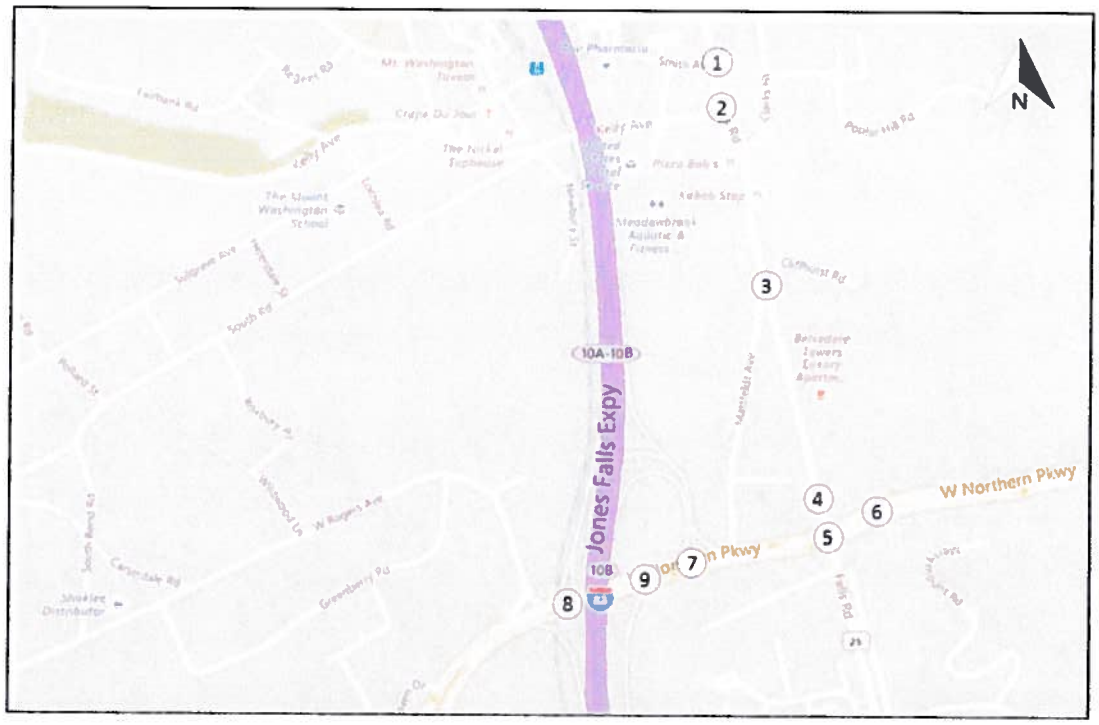
Table 4: Summary of Intersection Capacity Analysis- Existing Conditions - AM (PM)

Intersection			2017 (Existing)		
			V/C	Delay	LOS
1	Falls Road at Smith Avenue	Overall	0.55 (0.56)	34.0 (32.0)	C (C)
2	Falls Road at Kelly Avenue	Overall	1.00 (1.02)	42.2 (54.8)	D (D)
3*	Falls Road at Mattfeldt Ave/North Ent	Overall	- (-)	- (-)	- (-)
		EB	0.27 (0.13)	132.1 (59.1)	F (F)
		WB	>2.00 (1.28)	>300 (>300)	F (F)
		NB	0.23 (0.31)	0.0 (0.2)	A (A)
		SB	0.01 (0.02)	0.4 (0.7)	A (A)
4*	Falls Road at South Ent	Overall	- (-)	- (-)	- (-)
		WB	0.10 (0.16)	14.1 (16.8)	B (C)
		NB	0.29 (0.39)	0.0 (0.0)	A (A)
		SB	0.24 (0.22)	0.0 (0.1)	A (A)
5	Falls Road at Northern Parkway	Overall	1.14 (1.14)	124.4 (119.5)	F (F)
6*	Northern Parkway at Access Drive (Stop Controlled Approach)	Overall	- (-)	- (-)	- (-)
		EB	0.37 (0.46)	0.0 (0.0)	A (A)
		WB	0.35 (0.30)	0.0 (0.0)	A (A)
		SB	0.02 (0.02)	12.7 (11.8)	B (B)
7	Northern Parkway at I-83 NB Ramps	Overall	0.83 (0.84)	6.6 (6.8)	A (A)
8	Northern Parkway at I-83 SB Ramps	Overall	0.89 (0.70)	14.5 (16.3)	B (B)

*Intersection is unsignalized.

The results of the Existing Conditions capacity analysis indicate that most intersections are currently operating at a level of service D or better in the AM and PM peak hours, with the exception of:

- Falls Road at Northern Parkway
- Falls Road at Mattfeldt Ave/North Entrance
    - The stop controlled eastbound and westbound approaches



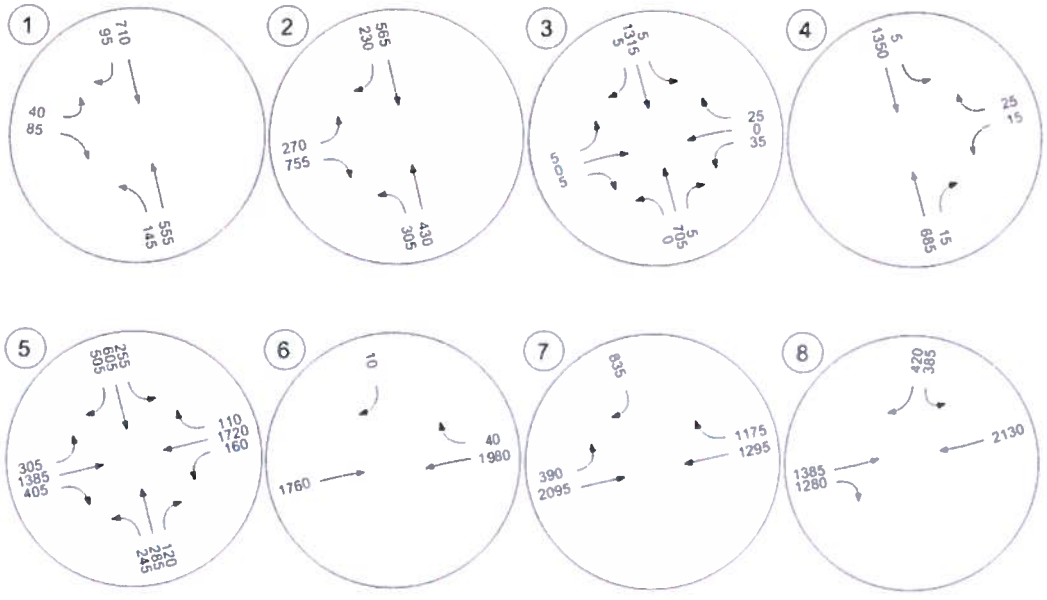
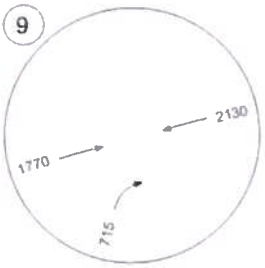
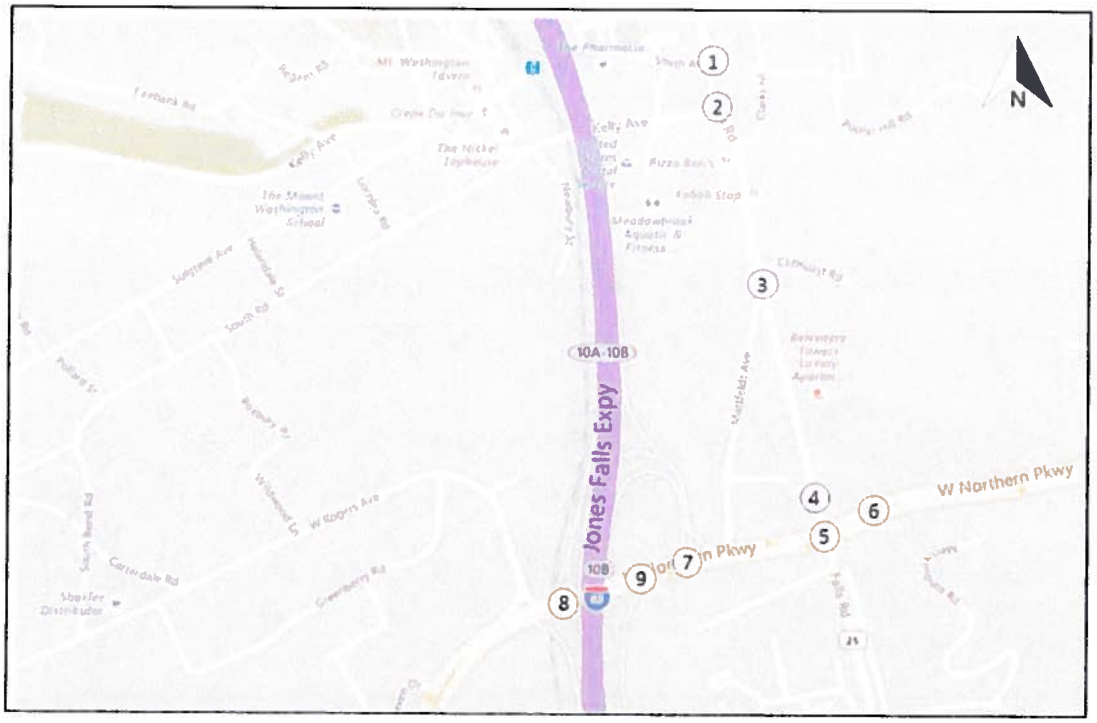


Figure 10: Existing AM Peak Hour Intersection Traffic Volumes





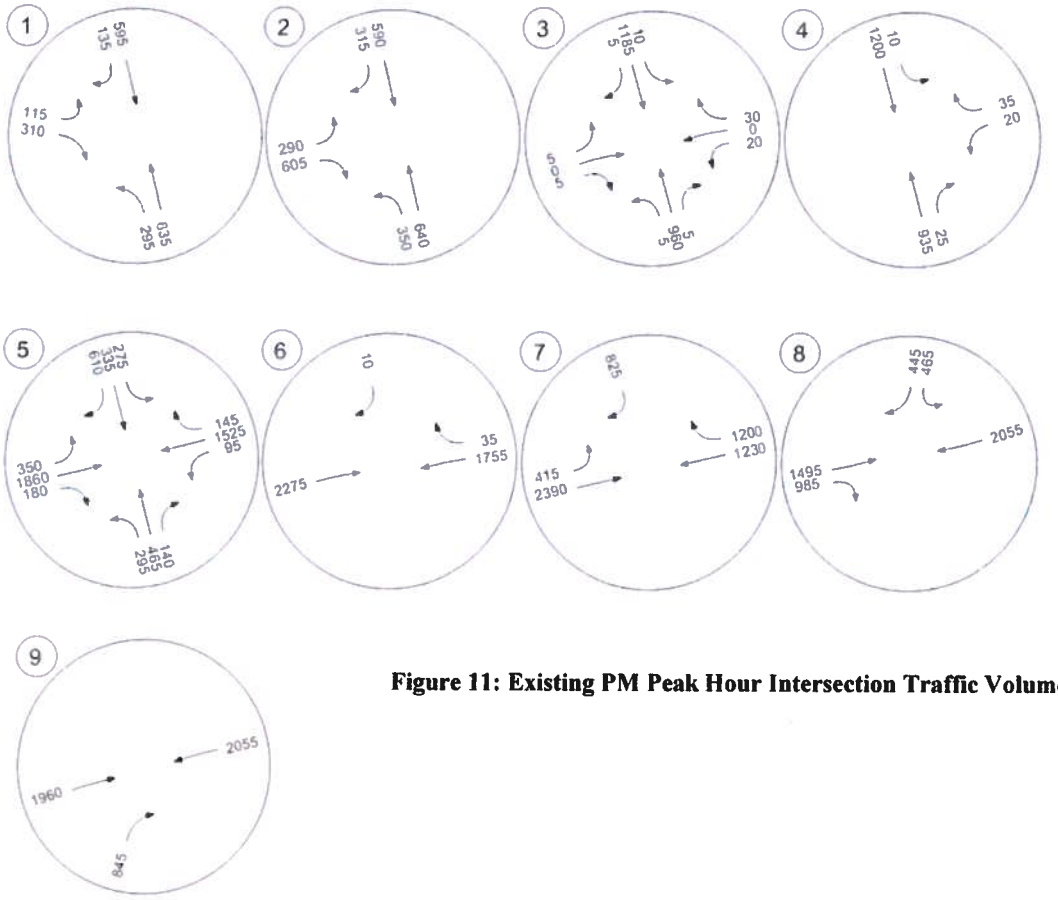


Figure 11: Existing PM Peak Hour Intersection Traffic Volumes

II. BACKGROUND CONDITIONS

Growth Projections and Background Traffic

Background conditions refer to factors that will affect the performance of the transportation network but are not directly related to the proposed development, including:

- Planned improvements to the transportation network by the City in the study area
- Growth in regional traffic volumes through the study area during the study period
- Other planned, approved but un-built developments in the study area

Planned Transportation Network Improvements

No known planned transportation improvements are expected between now and the build-out year 2019.

Regional Growth

Annual growth in regional traffic through the study area was estimated using the Baltimore Metropolitan Council (BMC) regional travel forecasting model. As growth along Northern Parkway and Falls Road was generally 0.5%, the annual increase in regional through-traffic was assumed to be a conservative rate of 1.0% per year from now until the build-out year 2019.

Background Developments

Based on conversations with the City's Department of Planning, the only known planned development affecting the study area that is expected to be completed prior to full build out of 1190 Northern Parkway is the Sinai Hospital Expansion project.

The Sinai Hospital is planning to expand the emergency room and construct the Rymland Ambulatory Services Building (ASB).

The Institute of Transportation Engineer (ITE) Trip Generation Manual, 9th Edition, was utilized to estimate the vehicle trips generated by the development, using code 610 for "hospital" land use. Based on the existing transportation infrastructure serving the area a 7% reduction in vehicle trips was applied to account for pedestrian/bus/shuttle bus trips. The approved project is anticipated to generate 224 AM peak hour trips and 264 PM peak hour trips, as detailed in the following table.

Table 5: Trip generation estimation for Sinai Hospital expansion

Land Use	Size	Traffic Impact AM		Traffic Impact PM	
		Entry	Exit	Entry	Exit
610 - Hospital	125,000 Sq. Feet	142	99	119	165
Transit/Walk Reduction		10	7	8	12
Non-pass-by		132	92	111	153
Total New Non-pass-by Trips		**132**	**92**	**111**	**153**

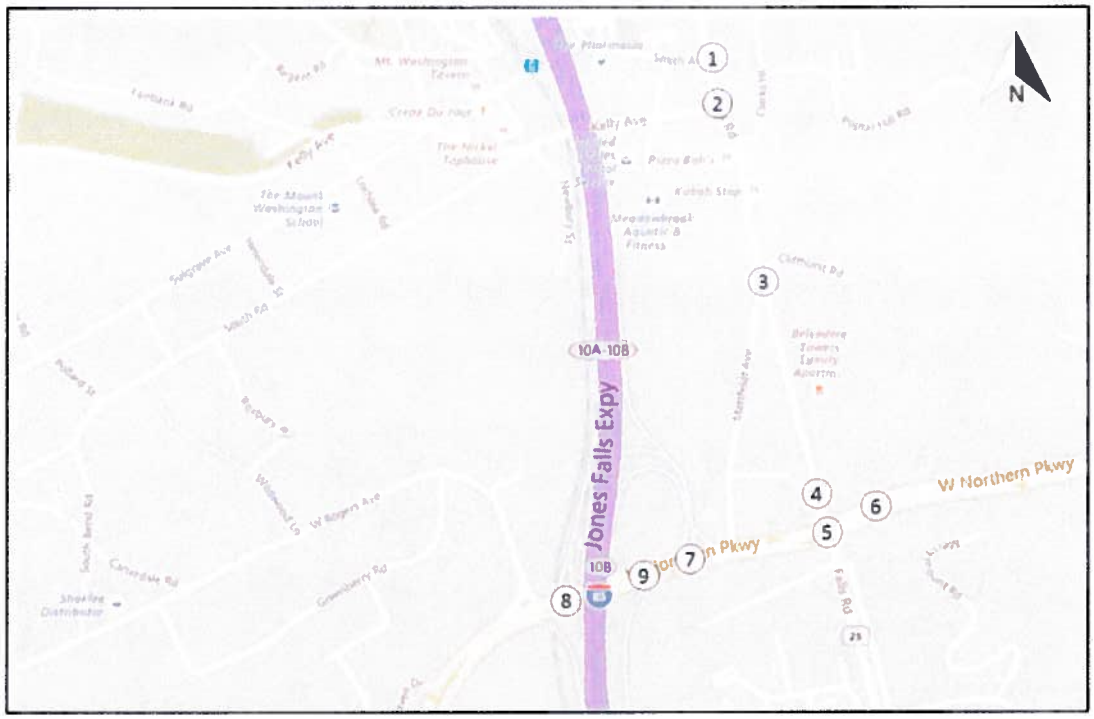
Trip distribution for the trips generated by the Sinai Hospital Expansion were distributed based on the directional distribution assumptions from the prior 2008 PUD, where distribution of site trips was based on existing employee home zip code information provided by Sinai Hospital, existing traffic patterns, land uses within the site, and future parking locations, and summarized below[1]. The fifty zip codes with the highest number of employees were mapped and analyzed to determine where employees travel to and from.

- 35% to/from the north via I-83;
- 15% to/from the south via I-83;
- 10% to/from the north via Greenspring Avenue/ Pimlico Road;
- 7% to/from the south via Greenspring Avenue;

[1] 2008 TIS in support of Sinai Hospital PUD

- 5% to/from the north via Falls Road;
- 15% to from the east via Northern Parkway;
- 10% to/from the west via Northern Parkway;
- 3% to/ from the west via Belvedere Avenue.

Figures 12 and 13 show the future year 2019 AM and PM peak hour intersection traffic volumes.



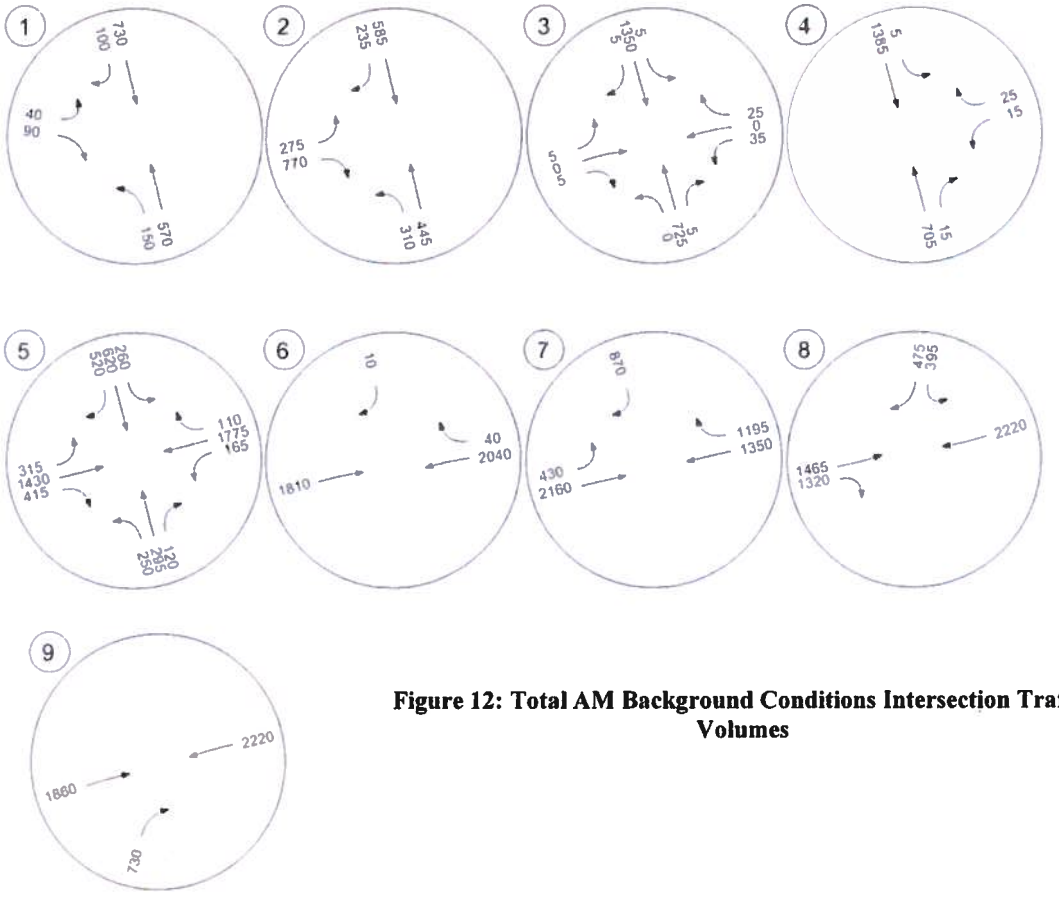
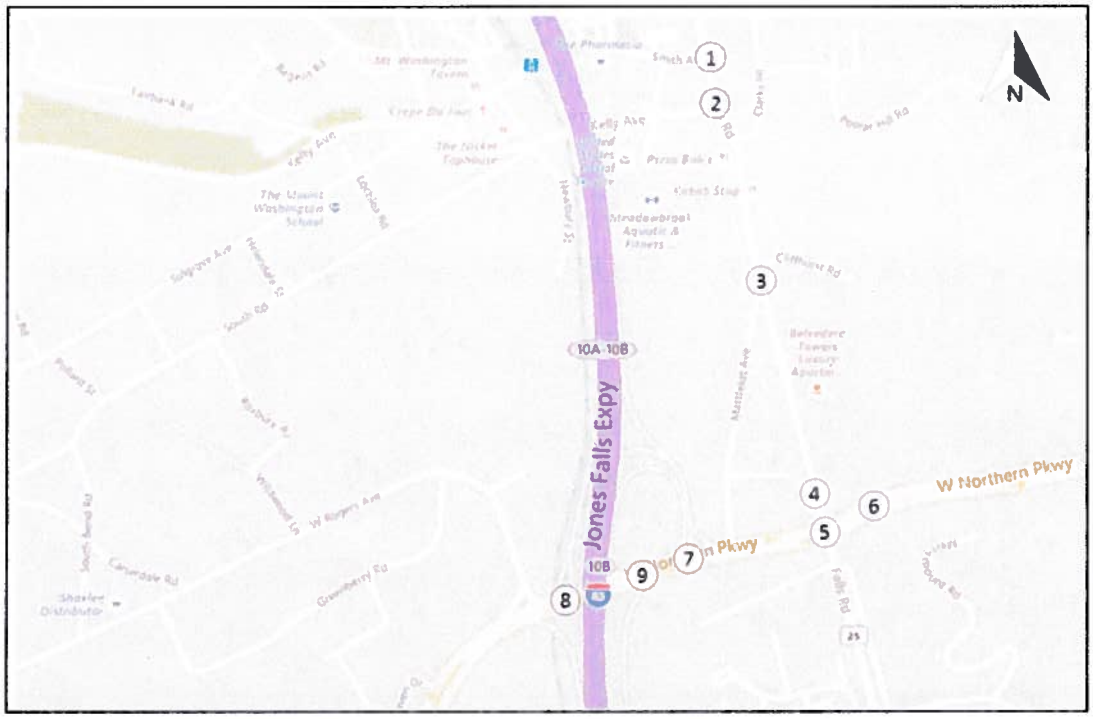


Figure 12: Total AM Background Conditions Intersection Traffic Volumes



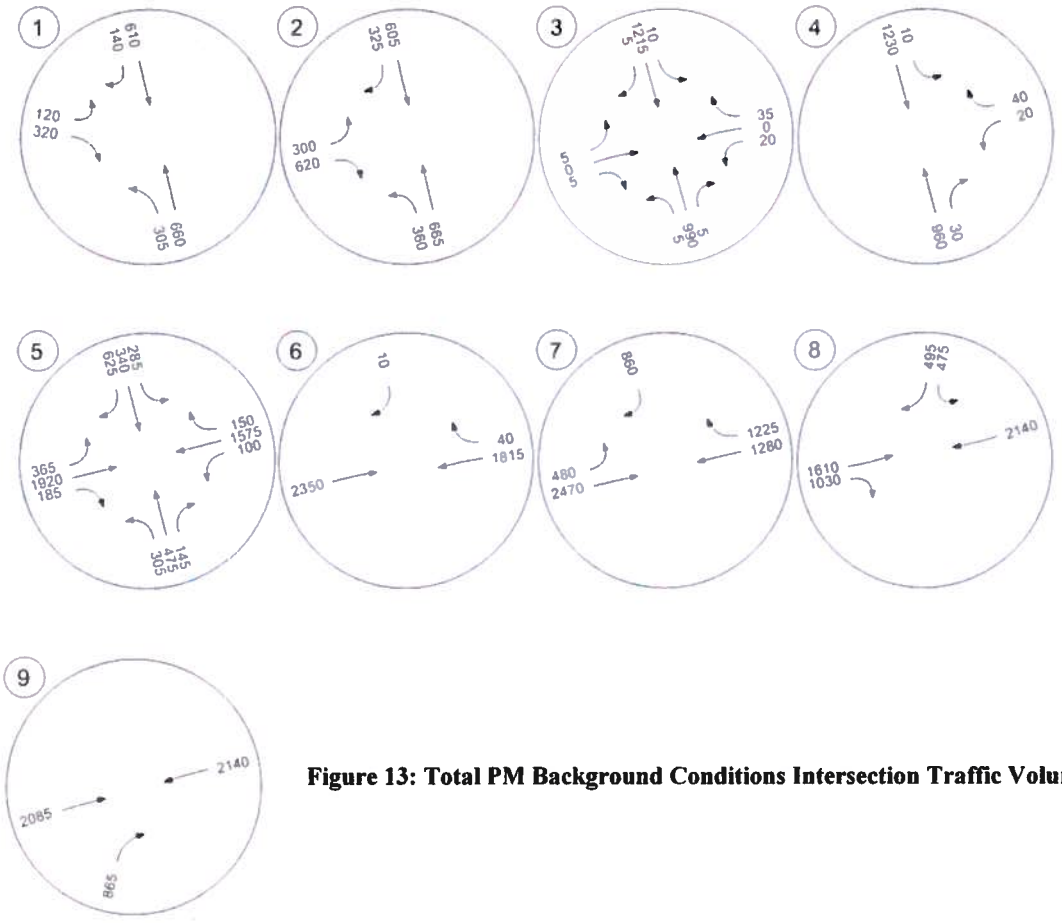


Figure 13: Total PM Background Conditions Intersection Traffic Volumes

Background Traffic Analysis

A capacity analysis was performed for the background condition, where regional growth and Sinai hospital background trips were added to existing trips to determine the future background congestion levels. The results of this background conditions capacity analysis are summarized in **Table 6** with the Existing Conditions results for comparison. HCM reports are provided in **Appendix B**.

Table 6: Summary of Intersection Capacity Analysis – Background Conditions

Intersection			2017 (Existing)			2019 (No_Build)		
			V/C	Delay	LOS	V/C	Delay	LOS
1	Falls Road at Smith Avenue	Overall	0.55 (0.56)	34.0 (32.0)	C (C)	0.57 (0.58)	35.2 (33.0)	D (C)
2	Falls Road at Kelly Avenue	Overall	1.00 (1.02)	42.2 (54.8)	D (D)	1.05 (1.07)	47.1 (60.6)	D (E)
3*	Falls Road at Mattfeldt Ave/North Ent	Overall	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
		EB	0.27 (0.13)	132.1 (59.1)	F (F)	0.31 (0.15)	158.7 (66.7)	F (F)
		WB	>2.00 (1.28)	>300 (>300)	F (F)	>2.00 (1.51)	>300 (>300)	F (F)
		NB	0.23 (0.31)	0.0 (0.2)	A (A)	0.23 (0.32)	0.0 (0.2)	A (A)
		SB	0.01 (0.02)	0.4 (0.7)	A (A)	0.01 (0.02)	0.0 (0.8)	A (A)
4*	Falls Road at South Ent	Overall	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
		WB	0.10 (0.16)	14.1 (16.8)	B (C)	0.10 (0.18)	14.4 (17.0)	B (C)
		NB	0.29 (0.39)	0.0 (0.0)	A (A)	0.30 (0.40)	0.0 (0.0)	A (A)
		SB	0.24 (0.22)	0.0 (0.1)	A (A)	0.25 (0.22)	0.0 (0.1)	A (A)
5	Falls Road at Northern Parkway	Overall	1.14 (1.14)	124.4 (119.5)	F (F)	1.18 (1.18)	131.7 (131.4)	F (F)
6*	Northern Parkway at Access Drive (Stop Controlled Approach)	Overall	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
		EB	0.37 (0.46)	0.0 (0.0)	A (A)	0.38 (0.47)	0.0 (0.0)	A (A)
		WB	0.35 (0.30)	0.0 (0.0)	A (A)	0.36 (0.31)	0.0 (0.0)	A (A)
		SB	0.02 (0.02)	12.7 (11.8)	B (B)	0.02 (0.02)	12.9 (12.0)	B (B)
7	Northern Parkway at I-83 NB Ramps	Overall	0.83 (0.84)	6.6 (6.8)	A (A)	0.85 (0.86)	7.0 (7.4)	A (A)
8	Northern Parkway at I-83 SB Ramps	Overall	0.89 (0.70)	14.5 (16.3)	B (B)	0.92 (0.75)	16.1 (17.5)	B (B)

*Intersection is unsignalized.

The results of the Background Conditions capacity analysis indicates that the only degradations in overall intersection LOS at any study intersections were the intersections of Falls Road at Smith Avenue and Falls Road at Kelly Avenue in the AM and PM peak hours, respectively. A 1 second increase in average vehicle delay at Smith Avenue resulted in an LOS degradation from C to D and a 6 second increase at Kelly Avenue resulted in an LOS degradation from D to E.

IV. FUTURE CONDITIONS

Trip Generation

The objective of a trip generation analysis is to forecast the number of new trips that will begin or end at a proposed development. A primary source for data on vehicular trip generation is the *Trip Generation Handbook* published by the Institute of Transportation Engineers. The *Handbook* compiles data from numerous studies of trip rates at hundreds of specific types of land uses such as recreational, residential, commercial, office, institutional, and industrial throughout the country. The data is sorted by various time periods such as morning and evening peak hour, and plotted against independent variables for specific land uses such as square feet of commercial space, number of hotel rooms, number of dwelling units, etc. The data is presented in chart format with mean averages, standard deviations, and fitted curve linear regression equations, where enough data is available.

Several site-specific factors can reduce the number of new personal vehicular trips generated by a new development or land use. These include 1) the availability of non-vehicular modes of transportation such as sidewalks, bicycle facilities, and public transportation; 2) the effect of pass-by traffic which includes vehicles already on the roadway network making an intermediate stop on the way from an origin to a primary trip destination without a route diversion, and 3) the effect of internally captured trips composed of traffic originating and destined for differing land uses *within* the same development that do not travel on the external public roadway network. An example of an internal trip would be a trip from an office building to a restaurant or from a hotel to an office building within the same development.

Using the ITE Trip Generation Manual, 9th Edition (2012), baseline peak hour trip generation rates were determined based on the future land use of a multi-family development with 148 dwelling units. The average number of vehicle trip ends and percentage of entering and exiting volumes were calculated. Land use category 220 (apartments) was selected.

As the proposed land use is singular and residential, no internal trips or pass-by trips were assumed. However, a minor reduction of approximately 5% was used to account for the proximity to transit facilities, which resulted in a decrease of 4 – 5 trips in the morning and evening peak hour, respectively. **Table 7** below shows the site generated trips for the proposed development at full build-out.

Table 7: Site Generated Trips

Land Use	Size	Weekday, Peak Hour of Adjacent Street Traffic			Weekday, Peak Hour of Adjacent Street Traffic		
		Entry	Exit	Total AM	Entry	Exit	Total PM
220 - Apartment	148 Dwelling Units	15	61		64	35	
Reduction		1	3		3	2	
Total New Site Trips		14	58	72	61	33	94

The total daily trips generated by the site would be 935 vehicles, increasing the daily traffic volumes along Falls Road to 15,625 vehicles per day and increasing the daily traffic volumes along Northern Parkway to 43,400.

Trip Distribution and Assignment

The Distribution of site trips to and from the subject development was based on existing traffic patterns and access points to the proposed development. Trip distribution rates and rates at the site access points are shown in below in **Figure 14**.

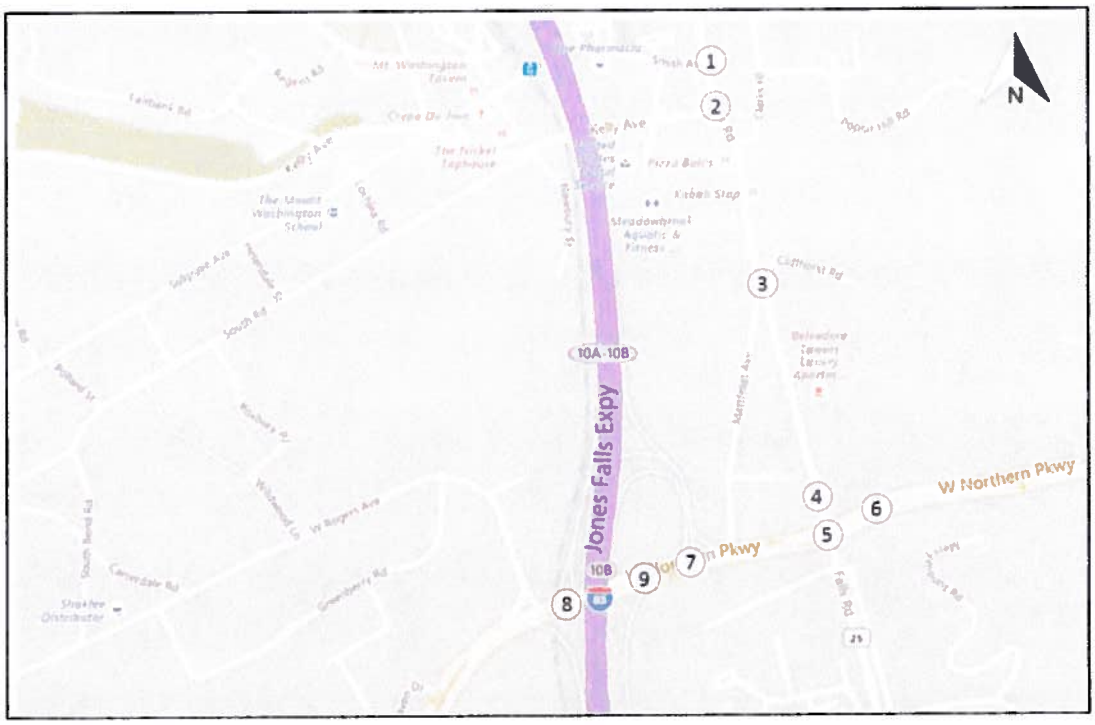
The following trip distribution rates were used for the trip assignment:

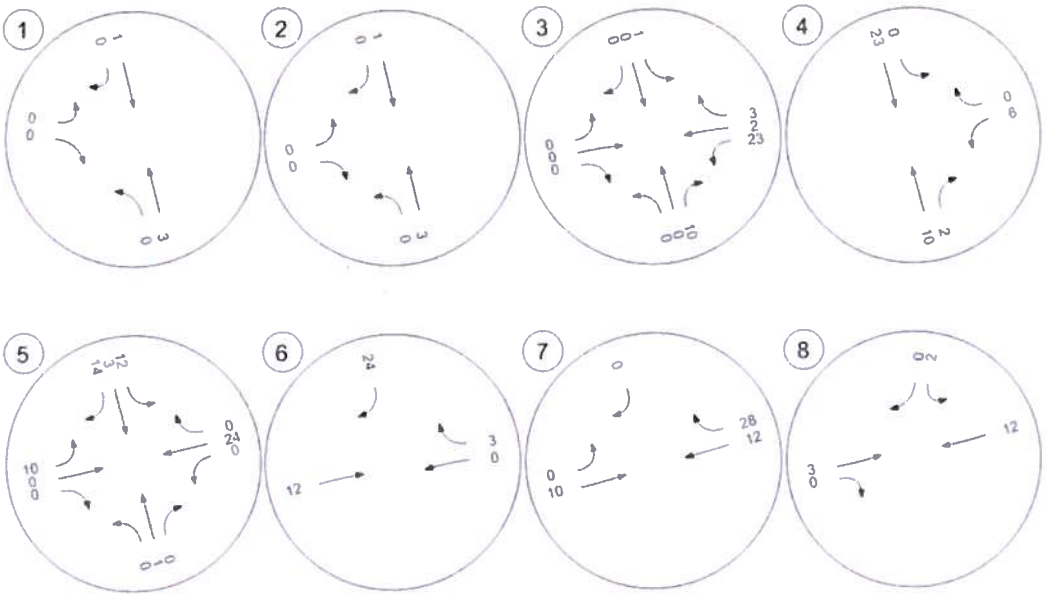
- 35% to/from the south via I-83;
- 15% to/from the north via I-83;
- 20% to/from the east via Northern Parkway;
- 20% to/from the west via Northern Parkway;
- 5% to/from the north via Falls Road;
- 5% to/from the north via Falls Road;

Figure 14: Trip Distribution Rates

The trip assignment was applied to the site generated trips and distributed to the roadway network based on the above rates to determine the net new trips added to the study area by the proposed 1190 Northern Parkway development. The net new site trips during the morning and evening peak hour are shown in **Figure 15 and Figure 16,** respectively.

The AM and PM net new site generated trips were added to the background conditions to determine the 2019 full build-out traffic conditions in the study area. The intersection volumes under *total future* conditions are shown for the AM and PM peak hours in **Figure 17 and Figure 18**, respectively.





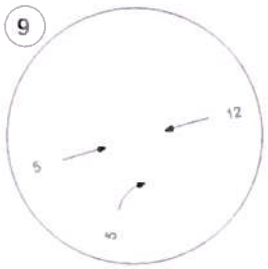
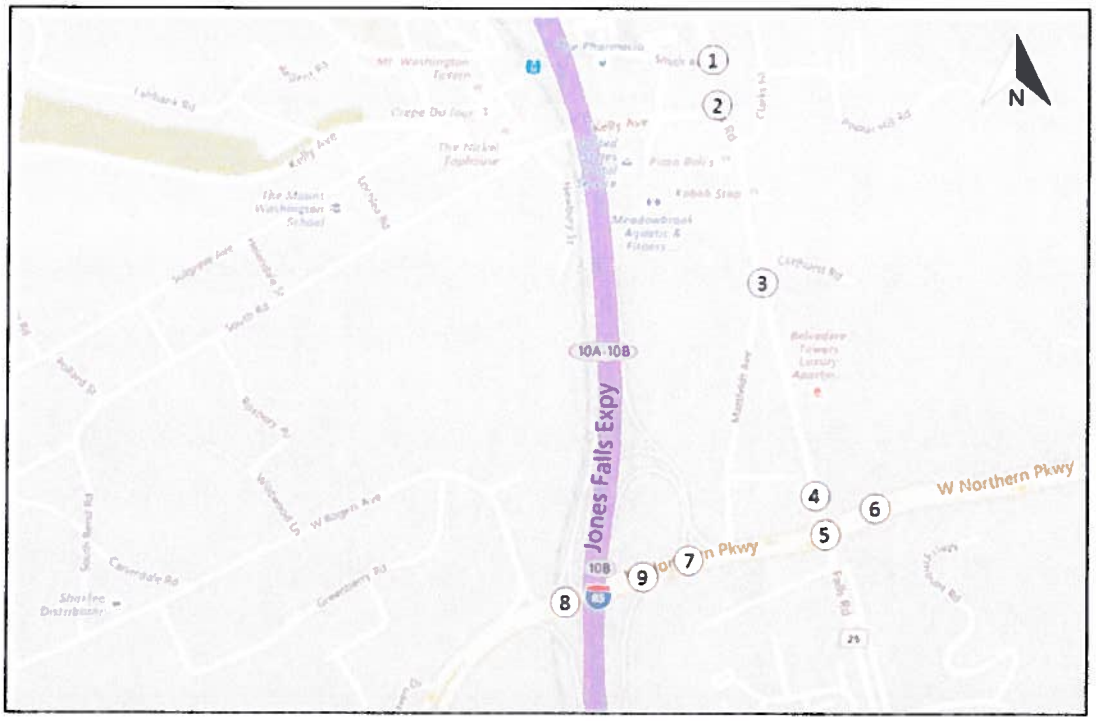
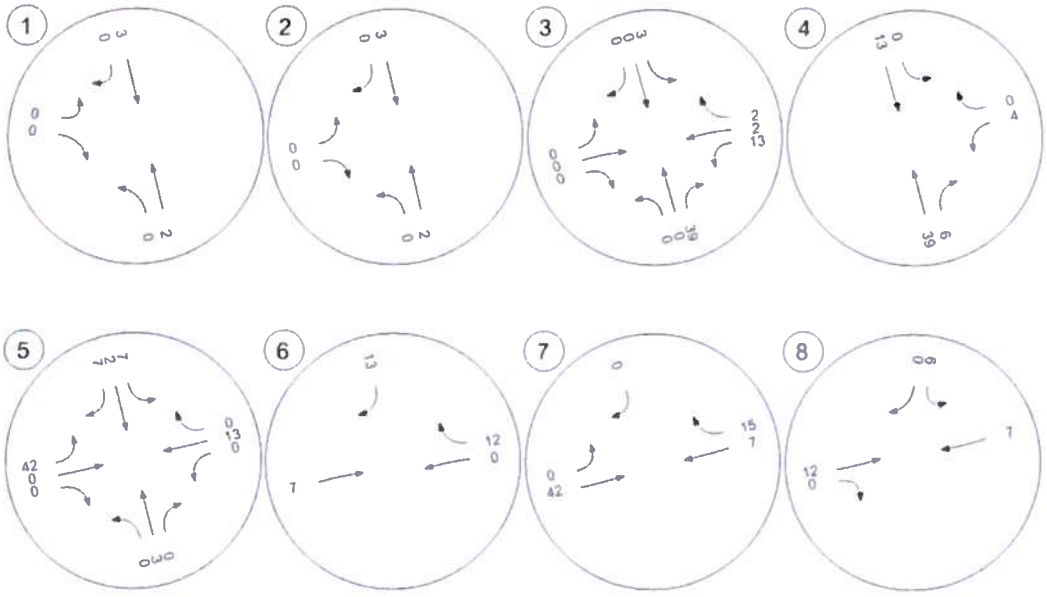


Figure 15: AM Site Vehicle Trip generation from 1190 Northern Pkwy





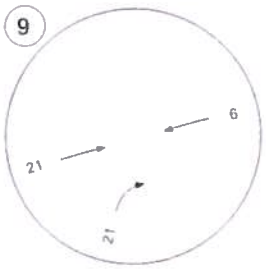
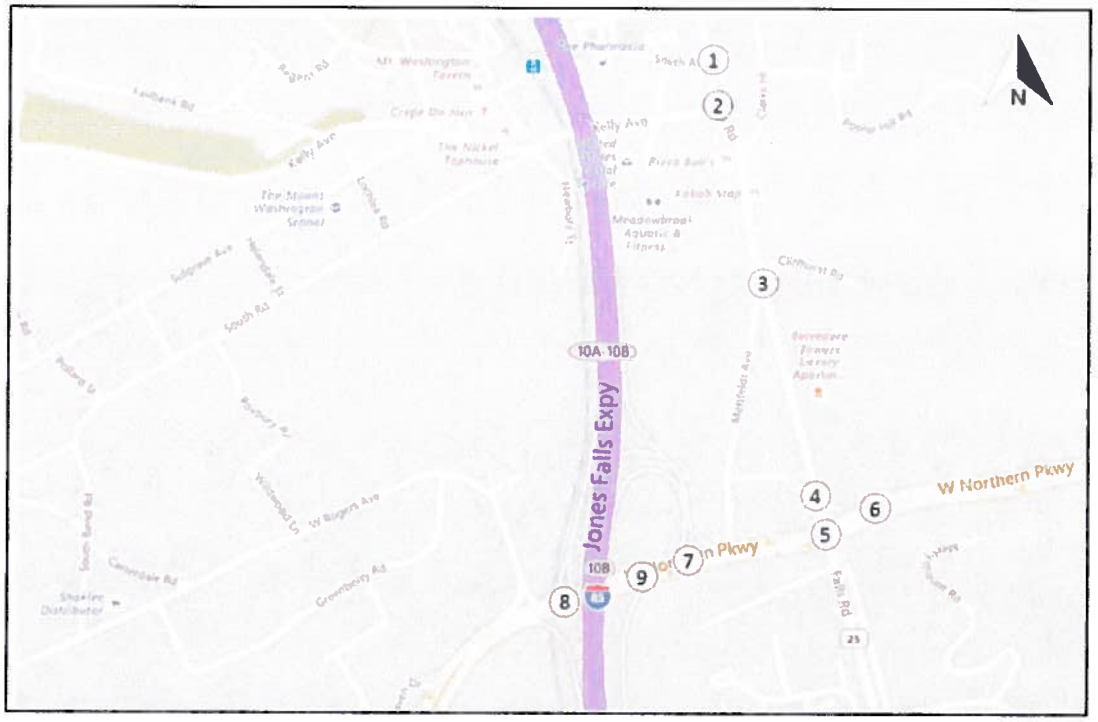


Figure 16: PM Vehicle Site Trip generation from 1190 Northern Pkwy



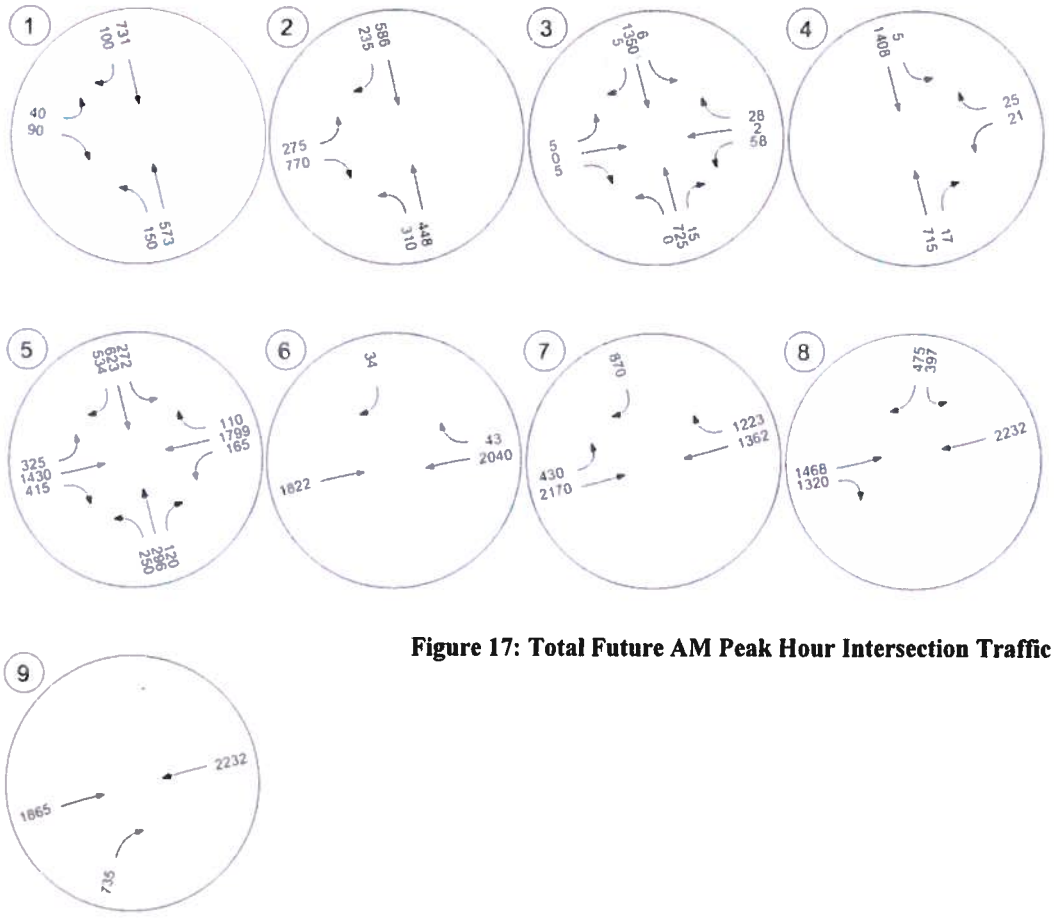
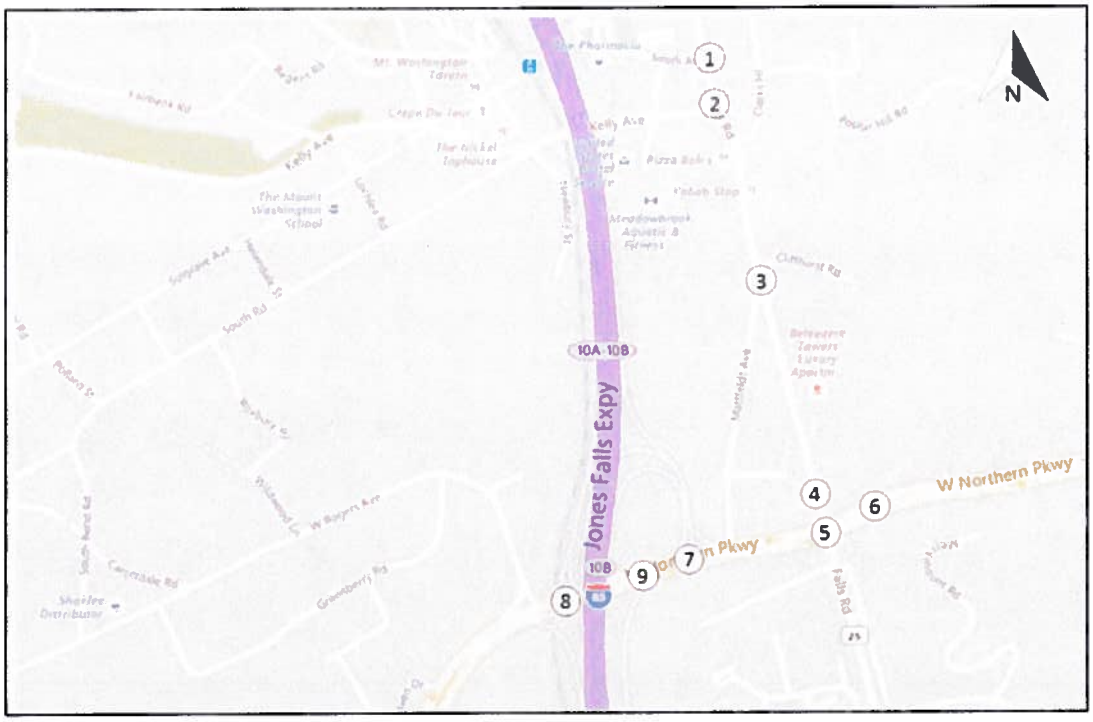


Figure 17: Total Future AM Peak Hour Intersection Traffic Volumes



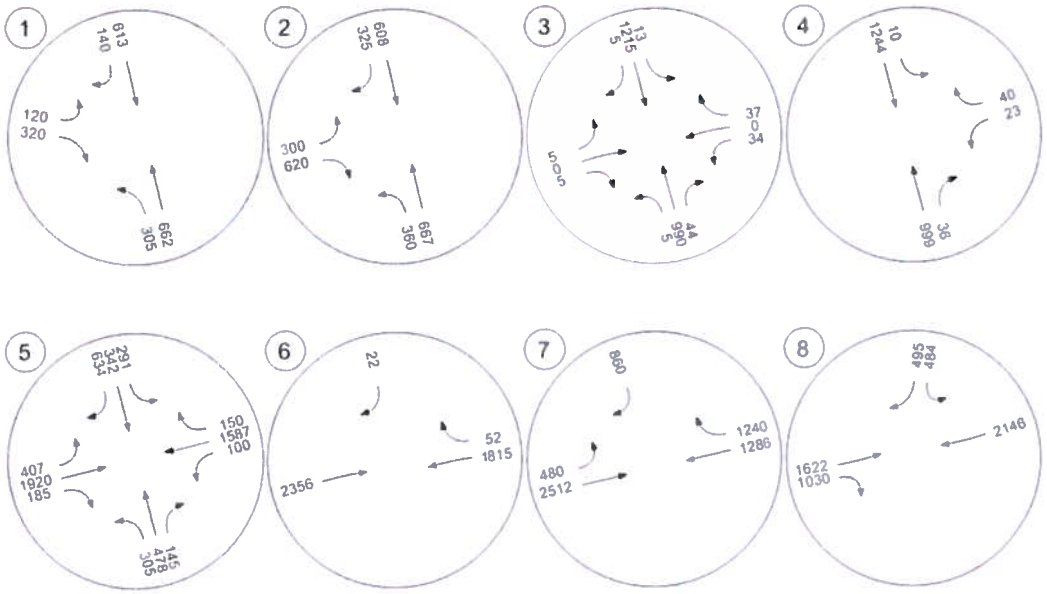
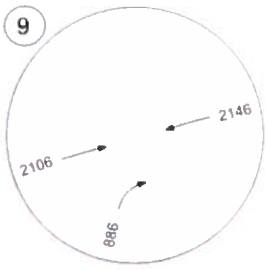


Figure 18: Total Future PM Peak Hour Intersection Traffic Volumes



Future Build Traffic Volumes and Analysis

A capacity analysis was performed for the total future 2019 conditions. Results for the intersections, in their existing configuration, are summarized in **Table 8** with the Existing Conditions and Background Conditions for comparison. HCM reports are provided in **Appendix B**.

Table 8: Summary of Intersection Capacity Analysis – Future Conditions

Intersection			2017 (Existing)			2019 (No_Build)			2019 (Build)		
			V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
1	Falls Road at Smith Avenue	Overall	0.55 (0.56)	34.0 (32.0)	C (C)	0.57 (0.58)	35.2 (33.0)	D (C)	0.57 (0.58)	35.2 (33.1)	D (C)
2	Falls Road at Kelly Avenue	Overall	1.00 (1.02)	42.2 (54.8)	D (D)	1.05 (1.07)	47.1 (60.6)	D (E)	1.05 (1.07)	47.3 (60.7)	D (E)
3*	Falls Road at Mattfeldt Ave/North Ent	Overall	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
		EB	0.27 (0.13)	132.1 (59.1)	F (F)	0.31 (0.15)	158.7 (66.7)	F (F)	0.33 (0.15)	171.8 (70.0)	F (F)
		WB	>2.00 (1.28)	>300 (>300)	F (F)	>2.00 (1.51)	>300 (>300)	F (F)	>2.00 (>2.00)	>300 (>300)	F (F)
		NB	0.23 (0.31)	0.0 (0.2)	A (A)	0.23 (0.32)	0.0 (0.2)	A (A)	0.24 (0.34)	0.0 (0.2)	A (A)
		SB	0.01 (0.02)	0.4 (0.7)	A (A)	0.01 (0.02)	0.0 (0.8)	A (A)	0.01 (0.02)	0.6 (1.1)	A (A)
4*	Falls Road at South Ent	Overall	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
		WB	0.10 (0.16)	14.1 (16.8)	B (C)	0.10 (0.18)	14.4 (17.0)	B (C)	0.13 (0.22)	16.1 (19.5)	C (C)
		NB	0.29 (0.39)	0.0 (0.0)	A (A)	0.30 (0.40)	0.0 (0.0)	A (A)	0.30 (0.42)	0.0 (0.0)	A (A)
		SB	0.24 (0.22)	0.0 (0.1)	A (A)	0.25 (0.22)	0.0 (0.1)	A (A)	0.25 (0.22)	0.0 (0.1)	A (A)
5	Falls Road at Northern Parkway	Overall	1.14 (1.14)	124.4 (119.5)	F (F)	1.18 (1.18)	131.7 (131.4)	F (F)	1.20 (1.21)	135.6 (134.2)	F (F)
6*	Northern Parkway at Access Drive (Stop Controlled Approach)	Overall	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
		EB	0.37 (0.46)	0.0 (0.0)	A (A)	0.38 (0.47)	0.0 (0.0)	A (A)	0.38 (0.47)	0.0 (0.0)	A (A)
		WB	0.35 (0.30)	0.0 (0.0)	A (A)	0.36 (0.31)	0.0 (0.0)	A (A)	0.36 (0.31)	0.0 (0.0)	A (A)
		SB	0.02 (0.02)	12.7 (11.8)	B (B)	0.02 (0.02)	12.9 (12.0)	B (B)	0.08 (0.04)	13.3 (12.3)	B (B)
7	Northern Parkway at I-83 NB Ramps	Overall	0.83 (0.84)	6.6 (6.8)	A (A)	0.85 (0.86)	7.0 (7.4)	A (A)	0.87 (0.87)	6.7 (7.2)	A (A)
8	Northern Parkway at I-83 SB Ramps	Overall	0.89 (0.70)	14.5 (16.3)	B (B)	0.92 (0.75)	16.1 (17.5)	B (B)	0.92 (0.75)	16.1 (17.6)	B (B)

*Intersection is unsignalized.

The results of the future conditions capacity analysis indicate that no degradations in overall intersection LOS are anticipated due to the proposed 1190 Northern Parkway development.

V. SUMMARY

The following summary of findings is based on the analysis and observations presented in the report:

- The proposed 1190 Northern Parkway development is a four-story 209,000 SF multi-family building with 148 dwelling units and a 297 space parking garage located on the northeast corner of Northern Parkway and Falls Road.
- The proposed development has an anticipated build-out year of 2019.
- The results of the Existing Conditions capacity analysis indicate that most intersections are currently operating at a level of service D or better in the AM and PM peak hours, except for the following intersections that operate at or below a level of service E:
    - Falls Road at Kelly Avenue – PM peak hour only
    - Falls Road at Mattfeldt Ave/North Entrance
    - Falls Road at Northern Parkway
- The results from the Background Conditions analysis indicate that the only degradation in overall intersection LOS, due to regional traffic growth of 1% and background trips from the Sinai Hospital expansion project, is the intersection of Falls Road at Smith Avenue where a 3 second increase in average intersection delay resulted in a change in LOS from D to E during the PM peak hour.
- The proposed 1190 Northern Parkway development will generate 72 AM peak hour trips and 94 PM peak hour trips.
- The total Future Traffic Conditions analysis indicates that the new trips generated by the proposed development will not result in any degradation of LOS from the 2019 Background Conditions.
- Additional analyses were performed at the Northern Site Driveway intersection with Falls Road:
    - A sight distance evaluation of the minor street approaches indicated that left turning movements from both Mattfeldt Avenue and the Northern Site Driveway onto Falls Road do not meet AASHTO minimums for left turning movements. The inadequate sight distance for the westbound left turn from the Northern Site Entrance may be improved to an acceptable level by trimming back foliage on the northeast corner of the intersection.