Belmont Bridge Traffic Report

March 2018

PREPARED FOR

PREPARED BY

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CHAPTER 1 INTRODUCTION

1.1 Purpose

The Belmont Bridge in Charlottesville, Virginia is scheduled for replacement as part of VDOT Project 0020-104-101, UPC 75878. The vision for the Belmont Bridge is to provide a community connection for bikes, pedestrians, buses, and cars between the surrounding neighborhoods and the City's downtown/urban core. The purpose of the ***Belmont Bridge Traffic Report*** is to support the preliminary and final design efforts for the replacement of the Belmont Bridge.

1.2 Study Area

The study area for the Belmont Bridge Traffic Report extends along Avon Street/9th Street for approximately 0.25 miles within the City of Charlottesville. The northern study limit is the intersection of 9th Street at E. Market Street and the southern study limit is the intersection of Avon Street at Levy Avenue. **Figure 1** shows the limits of the study. The study area included the following three at-grade intersections:

1. 9th Street at E. Market Street
2. 9th Street at Graves Street
3. Avon Street at Levy Avenue

The project is located in an urban setting adjacent to the historic Downtown Mall and the Sprint Pavilion. Photos showing the general nature of the study area are shown below. Additional study area details are provided in **Chapter 2**.

9TH STREET NORTH OF E. MARKET STREET (FACING SOUTH)

9TH STREET SOUTH OF E. MARKET STREET (FACING NORTH)

AVON STREET SOUTH OF LEVY AVENUE (FACING NORTH)

AVON STREET NORTH OF LEVY AVENUE (FACING SOUTH)

Figure 1: Study Area Intersections

CHAPTER 2 DATA COLLECTION

A preliminary field review of the study area was conducted on February 7, 2017 to observe peak hour traffic conditions, driver behavior, and to verify existing data. In addition to the field review, existing traffic volume data was collected including turning movement counts, tube counts, historical AADTs, and signal timing plans. The following sections summarize the collected data and field review observations.

2.1 Corridor Characteristics

Field reconnaissance of existing (2017) conditions in the study area verified the posted speed limit on 9th Street/Avon Street throughout the study area was 25 MPH. According to VDOT's 2014 Functional Classification Map, 9th Street/Avon Street between the southern county line and E. Market Street is classified as a minor arterial. 9th Street north of E. Market Street is classified as an other principal arterial. Based on the latest (2015) published VDOT traffic data, the approximate annual average daily traffic (AADT) on Avon Street between Monticello Avenue and E. Market Street is 14,000 vehicles per day.

2.2 Land Use

A review of existing zoning and future land use plans was conducted for the areas adjacent to the Belmont Bridge. Along the study corridor the primary zoning classifications are mixed use and residential. Future zoning is expected to remain the same as existing.

2.3 Other Relevant Plans and Studies

The following plans and studies were identified as relevant to the Belmont Bridge Traffic Report. These studies helped to inform future traffic projections and analysis assumptions.

Belmont Bridge Replacement Project Traffic Study (2011)

The ***Belmont Bridge Replacement Project Traffic Study*** was completed in May 2011. The study identified specific intersection improvements and bridge typical sections in support of the previous Belmont Bridge design efforts conducted by MMM Design Group. The study developed future traffic projections, developed potential maintenance of traffic options anticipated during construction, and summarized the traffic analysis findings of the intersection improvements.

City of Charlottesville Strategic Investment Area Plan (2013)

The ***City of Charlottesville Strategic Investment Area (SIA) Plan*** was completed in December 2013. The SIA is an approximately 330-acre area south and east of downtown Charlottesville, which includes the entire limits of this project's study area. The SIA was identified by the City as a potential growth area due to its low density and available land areas. In addition, the SIA serves as a gateway to Downtown Charlottesville, including pedestrian and bicycle connections to the Downtown Mall area. The purpose of the plan was to:

- Provide guidance for future redevelopment and investment in the area
- Provide guidance for improvements to affordable housing, including existing public and assisted housing
- Provide guidance for improved connections throughout the area
- Provide recommended strategies for expanding employment opportunities within the SIA

2.4 Existing Roadway Geometry

The existing (2017) roadway geometry in the Belmont Bridge study area was observed and documented during the field review. **Figure 2** summarizes the existing lane geometry, including effective storage lengths for left- and right-turn storage bays, for the study area intersections.

The cross-section of 9th Street/Avon Street varies throughout the study area. Avon Street, south of Levy Avenue, is a two-lane undivided roadway with varying lane widths. North of Levy Avenue, there are two travel lanes on northbound Avon Street until E. Market Street, where a left-turn lane is created next to the left through lane and the right travel lane becomes a shared through/right-turn lane. 9th Street has two travel lanes in the southbound direction between E. High Street and E. Market Street, but the second travel lane drops as a southbound left-turn lane. Just south of E. Market Street, two 9th Street travel lanes merge to one lane near the Sprint Pavilion. 9th Street continues southbound with one travel lane and dedicated left-turn lanes for Graves Street and Levy Avenue. After the Levy Avenue intersection, 9th Street becomes Avon Street where the two-lane undivided section begins.

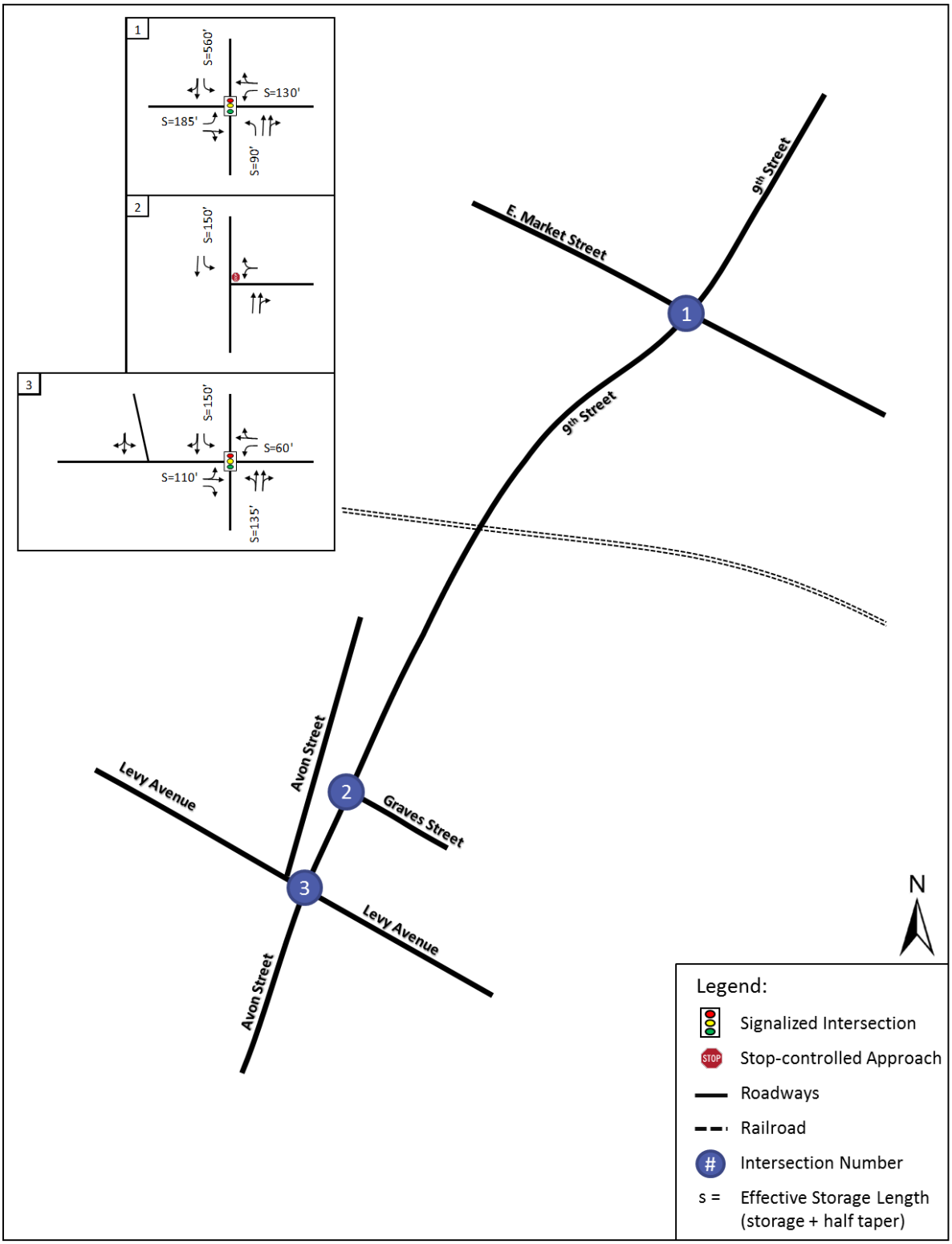
Sidewalks exist on both the east and west sides of 9th Street/Avon Street throughout the study area; however, the eastern sidewalk across the Belmont Bridge (between north of Graves Street and the Sprint Pavilion) has been closed to pedestrian use since April 2011 because of unsafe conditions. Crosswalks exist on all approaches at 9th Street and E. Market Street and at Avon Street and Levy Avenue. In addition, there is a rectangular rapid flashing beacon (RRFB) crossing at Graves Street that allow pedestrians to cross Avon Street. There were no dedicated bicycle lanes within the study area during the field review at the start of this study. However, in March of 2017 the City performed a restriping project in advance of maintenance on the western sidewalk of the Bridge. The restriping provided a five foot wide on-street bike lane traveling south.

2.5 Traffic Data

Study area traffic volumes were collected with tube counts and turning movement counts (TMCs). A 72-hour tube count was conducted on 9th Street between Graves Street and E. Market Street from Tuesday, February 7, 2017 to Thursday, February 9, 2017. TMCs were collected on Tuesday, February 7, 2017 for the three study area intersections. Pedestrians and bicyclist counts were collected along with the vehicle counts. Additional TMCs were collected to supplement this analysis for the intersections of 9th Street at E. High Street and at Avon Street and Monticello Avenue. These two TMCs were collected on Thursday, March 16, 2017, and Thursday, March 23, 2017, respectively. All TMC data was collected between the hours of 7AM – 9AM and 4PM – 6PM. The AM peak hour was determined to be between 8:00AM – 9:00AM, and the PM peak hour was determined to be 4:30PM – 5:30PM. Traffic count data is included in **Appendix A**.

Supplemental traffic data was collected by City of Charlottesville staff in July 2017. An 11-hour TMC was conducted to determine the left-turn traffic volume out of Graves Street on Thursday, July 20, 2017. A 72-hour traffic count was conducted from Tuesday, July 18, 2017 to Thursday, July 20, 2017 to determine the traffic volume using Old Avon Street under the Belmont Bridge. The supplemental traffic count data is included in **Appendix A**.

Figure 2: Existing (2017) Lane Geometry



2.5.1 Field Review Observations

During the field review on February 7, 2017, existing conditions and traffic operations were observed. The following observations were found:

- Heavy pedestrian traffic originating from the Belmont neighborhood, the parking lot below the Belmont Bridge, and street parking south of the railroad tracks, crossed the Belmont Bridge toward the Downtown Mall in the AM peak hour and returned in the PM peak hour.

PARKING LOT BELOW THE BELMONT BRIDGE

PEDESTRIANS WALKING NORTH ALONG 9TH STREET

- Bicyclists were observed traveling in mixed traffic along the 9th Street/Avon Street corridor

BICYCLIST TRAVELING NORTHBOUND ON 9TH STREET

BICYCLIST TRAVELING SOUTHBOUND ON AVON STREET

- Northbound vehicle queues at Avon Street and Levy Avenue extended beyond Belmont Avenue during the AM peak hour
- Southbound vehicle queues at Avon Street and Levy Avenue extended across the bridge to near the railroad tracks during the AM peak hour

NORTHBOUND AM PEAK HOUR QUEUES AT AVON STREET AND LEVY AVENUE

SOUTHBOUND AM PEAK HOUR QUEUES AT AVON STREET AND LEVY AVENUE

- Southbound vehicle queues at Avon Street and Levy Avenue extended back to E. Market Street during the PM peak hour

SOUTHBOUND PM PEAK HOUR QUEUES AT AVON STREET AND LEVY AVENUE

SOUTHBOUND PM PEAK HOUR QUEUES EXTENDING BACK TO E. MARKET STREET

- Eastbound vehicle queues at 9th Street and E. Market Street extended beyond 7th Street during the PM peak hour
- Minimal queuing on other side streets within the study area in both peak hours
- Heavy pedestrian use at the Graves Street mid-block crossing causing northbound and southbound queuing

EASTBOUND PM PEAK HOUR QUEUES ON E. MARKET STREET

GRAVES STREET MID-BLOCK PEDESTRIAN CROSSING

2.5.2 Traffic Volumes

Using the available TMC data, the traffic volumes were balanced through the network for the existing conditions operational analyses. Peak hour traffic volumes were balanced using an iterative process until the volumes were within a reasonable tolerance. The balanced intersection volumes were within ±2% of the original TMCs for all movements in the AM and PM peak hour. The Existing 2017 balanced AM and PM peak hour volumes in the study area are summarized in **Figure 3**.

Pedestrian and bicycle traffic data was also collected in the TMCs within the study area. The City of Charlottesville provided a bicycle seasonal adjustment factor based on bicycle program data to account for higher bicycle traffic that occurs during the spring and fall as compared to winter. The AM and PM peak period pedestrian and bicycle volumes are summarized in **Figure 4** and **Figure 5**, respectively. Approximately 220 pedestrians crossed the Belmont Bridge in the AM peak hour, and approximately 269 pedestrians crossed the Belmont Bridge in the PM peak hour.

2.5.3 Heavy Vehicle Percentages

Heavy vehicle percentages were calculated for each movement at all study area intersections during the overall study area AM and PM peak hours. **Figure 6** contains a summary of the AM and PM peak hour heavy vehicle percentages for each intersection.

Figure 3: Existing (2017) Vehicle Volumes

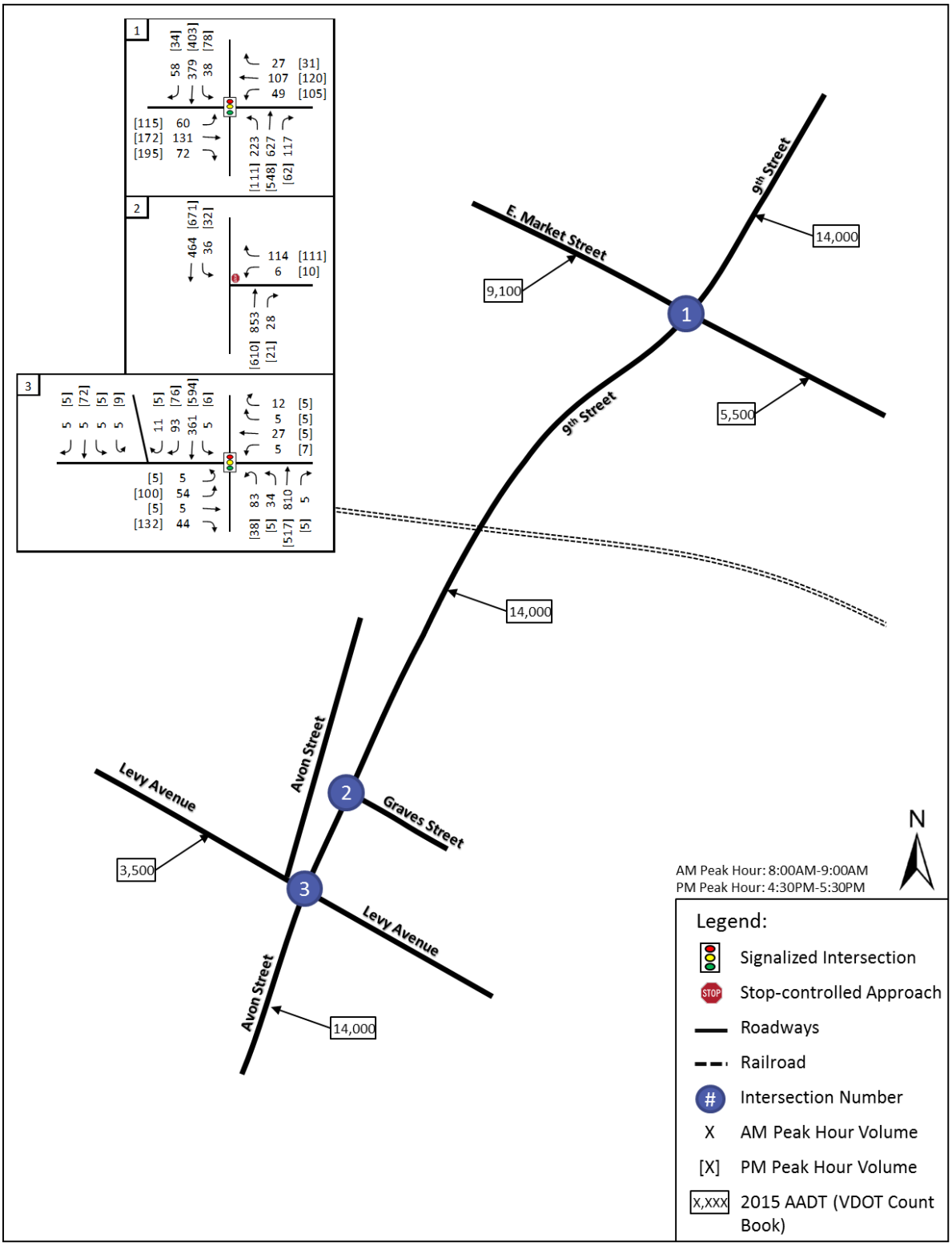


Figure 4: Existing (2017) Pedestrian Volumes

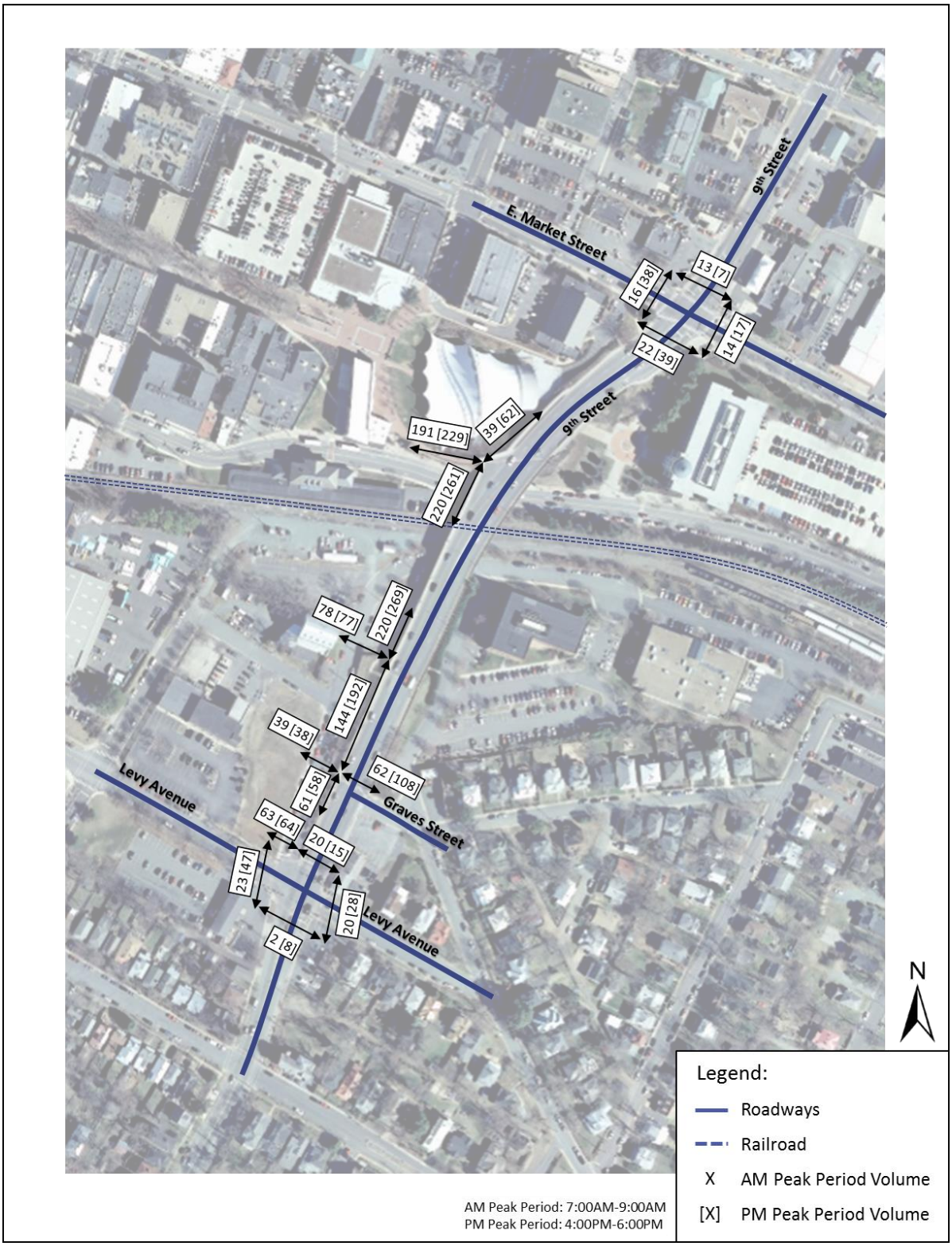


Figure 5: Existing (2017) Bicycle Volumes

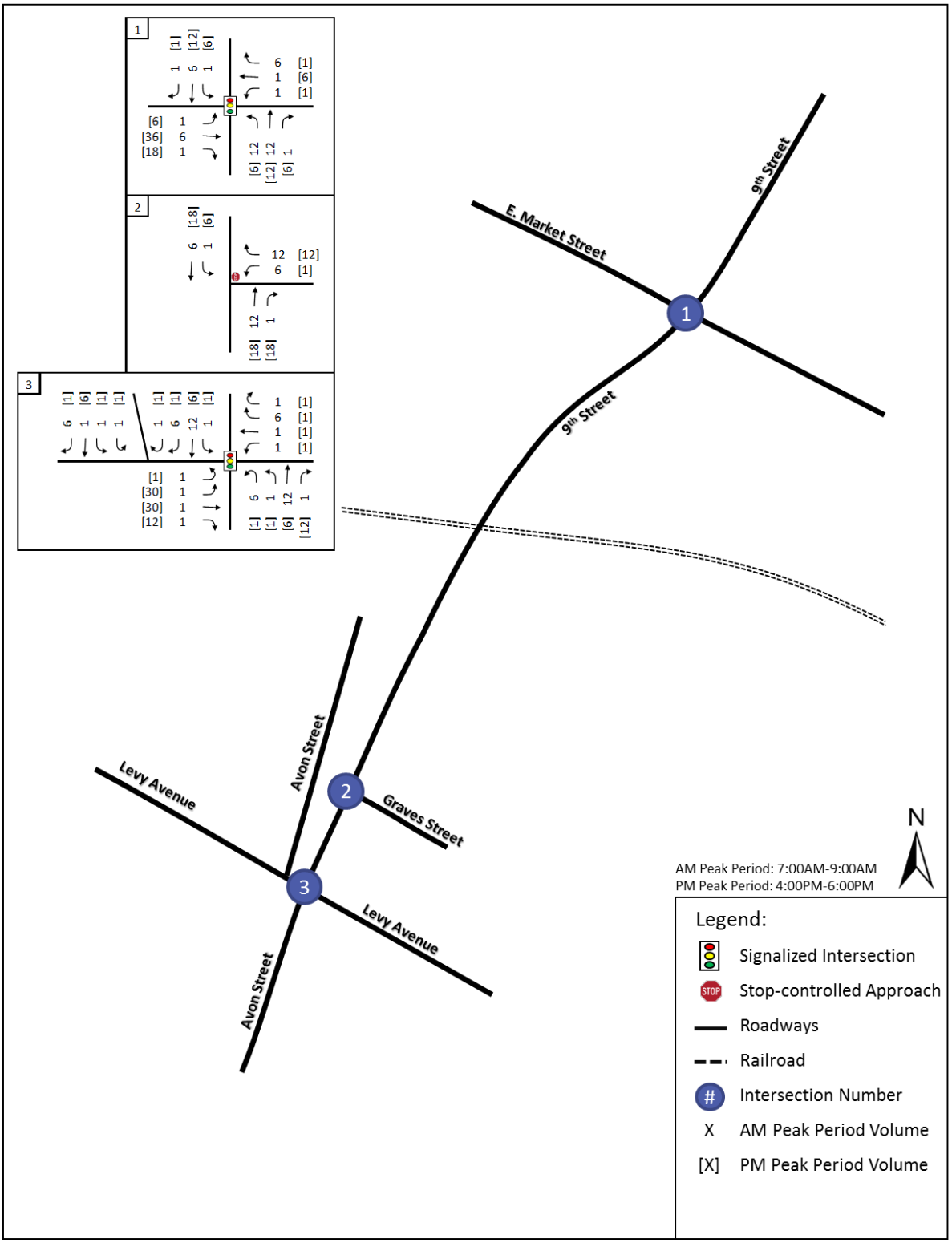
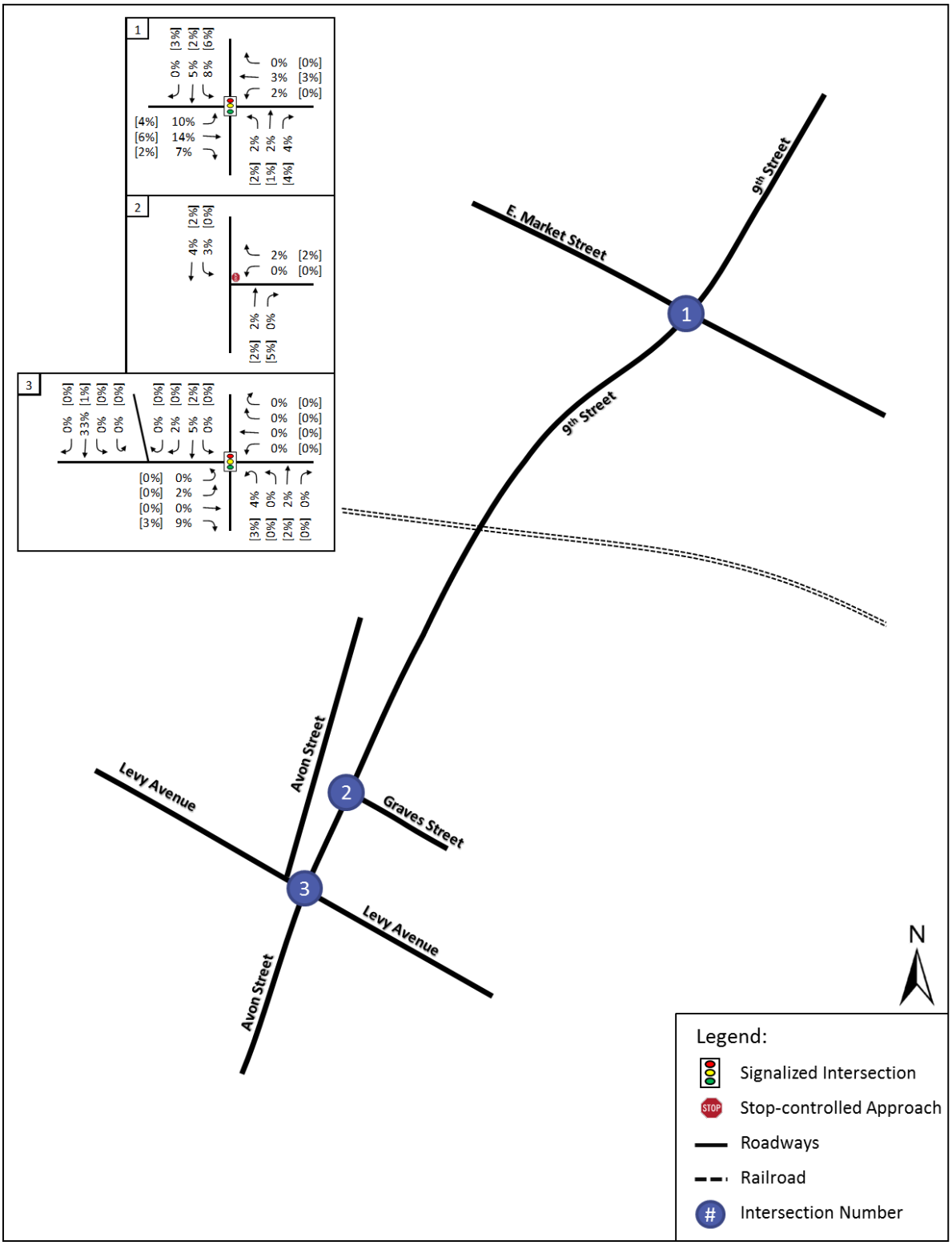


Figure 6: Heavy Vehicle Percentages



CHAPTER 3 EXISTING CONDITIONS

Traffic operational analyses were conducted to evaluate the overall performance of the study area under existing (2017) AM and PM peak hour conditions. Existing (2017) roadway geometry, traffic control, balanced traffic volumes, peak hour factors, and heavy vehicle percentages were used in the analyses. The intent of the existing conditions analysis was to provide a general understanding of the baseline traffic conditions to serve as a starting point for developing future improvement strategies.

3.1 Traffic Analysis Assumptions

Existing signal timings and phasing were obtained from the City of Charlottesville. Capacity analyses were performed using *Synchro* (version 9.1) to determine existing intersection delay, measured in seconds per vehicle, and level of service (LOS). LOS illustrates the relative difference in delay and ranges from A to F. LOS A indicates a condition of little or no congestion and LOS F indicates a condition of severe congestion, unstable traffic flow, and stop-and-go conditions. **Table 1** summarizes the delay associated with each LOS for both signalized and unsignalized intersections.

Table 1: Intersection Level of Service (LOS) Analysis Criteria

LOS	Average Stopped Delay (seconds/vehicle) Signalized	Unsignalized	Description of Traffic Conditions
A	≤ 10.0	≤ 10.0	Very low delay, progression is extremely favorable; most vehicles arrive during green phase.
B	> 10.0 to 20.0	> 10.0 to 15.0	Generally good progression, low delays, more vehicles must stop at intersection red phases.
C	> 20.0 to 35.0	> 15.0 to 25.0	Fair progression, increasing number of vehicles must stop; signal cycle fails to process all traffic.
D	> 35.0 to 55.0	> 25.0 to 35.0	Traffic congestion more noticeable, increasing cycle failures, unfavorable progression, and longer delays.
E	> 55.0 to 80.0	> 35.0 to 50.0	Poor progression, generally high v/c ratios, frequent cycle failures, intersection traffic approaching capacity.
F	≥ 80.0	≥ 50.0	Arrival flow exceeds intersection capacity, many cycle failures, poor progression, and high delays.

Source: 2000 Highway Capacity Manual (HCM)

Queuing analyses were performed using *SimTraffic* (version 9.1) to determine maximum queue lengths. A maximum queuing analysis was completed for each of the study area intersections under existing (2017) AM and PM peak hour conditions using *SimTraffic* (version 9.1). Queue length is a performance indicator at both signalized and unsignalized intersections. Maximum queue lengths that exceed the length of turn lane storage bays may indicate capacity or operational issues.

The ***VDOT Traffic Operations and Safety Analysis Manual (version 1.0)*** guidance on determining the appropriate number of simulation runs needed to produce accurate microsimulation results was followed for all *SimTraffic* analyses. For each analysis scenario, ten *SimTraffic* simulation runs were conducted using different random number seeds and averaged together. The *VDOT Sample Size Determination Tool* was then used to confirm that the ten runs were performed at a 95th percentile confidence level with 10% tolerance. Average speed on northbound 9th Street between Graves Street and E. Market Street was the measure of effectiveness evaluated with the *VDOT Sample Size Determination Tool* for all analysis scenarios. The results of the *VDOT Sample Size Determination Tool* are provided in **Appendix B**.

The following measures of effectiveness (MOEs) were selected to measure the quantitative performance of the intersections within the network.

- Average vehicle delay and Highway Capacity Manual (HCM) LOS by movement, approach, and intersection – measured in seconds per vehicle
- Maximum queue length – measured in feet

Avon Street and Levy Avenue was analyzed using the methodologies contained in the ***2000 Highway Capacity Manual (HCM 2000)***, since ***2010 Highway Capacity Manual (HCM 2010)*** methodology does not support more than four intersection approaches. To be consistent between signalized intersections, 9th Street at E. Market Street was also analyzed using HCM 2000 methodologies. 9th Street at Graves Street was analyzed using the methodologies contained in the HCM 2010.

Traffic analysis and modeling assumptions are included in **Appendix B**.

3.2 Existing (2017) Traffic Analysis Results

3.2.1 Delay and Level of Service

The results of the existing (2017) AM and PM peak hour capacity analyses are summarized in **Figure 7**. The corresponding *Synchro* output sheets are provided in **Appendix C** for reference.

3.2.2 Queuing

The existing maximum queue lengths reported by *SimTraffic* were confirmed to accurately reflect the existing maximum queue lengths observed in the field. For movements without conflicting traffic volumes, no queue length was reported by *SimTraffic*. Movements and approaches with queuing that exceeds turn lane storage bay lengths, blocks access to turn lane storage bays, or spills to adjacent intersections were also identified.

The results of the existing (2017) AM and PM peak hour queuing analyses are summarized in **Figure 8**. The corresponding *SimTraffic* output sheets are provided in **Appendix C** for reference.

Figure 7: Existing (2017) Delay and Level of Service

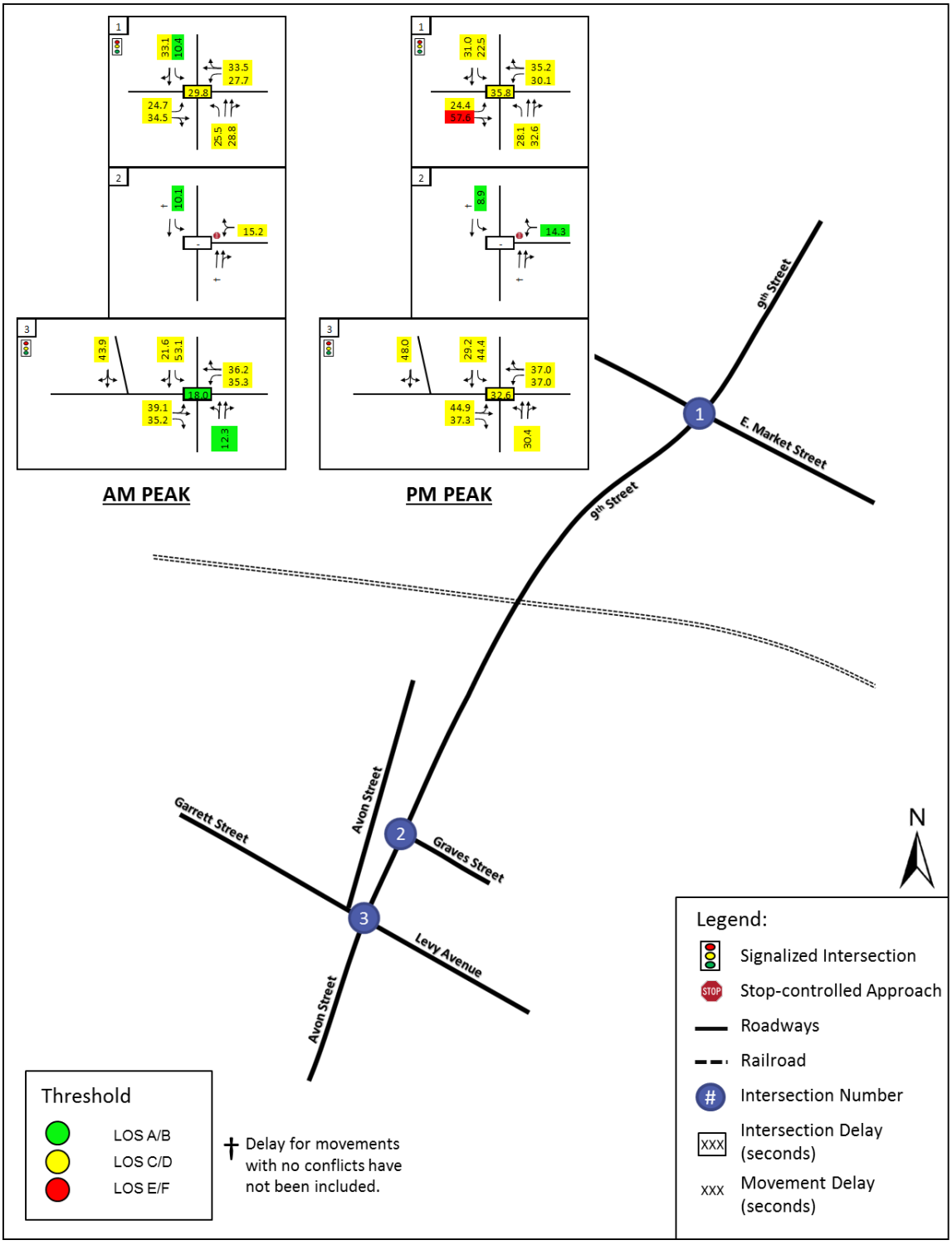
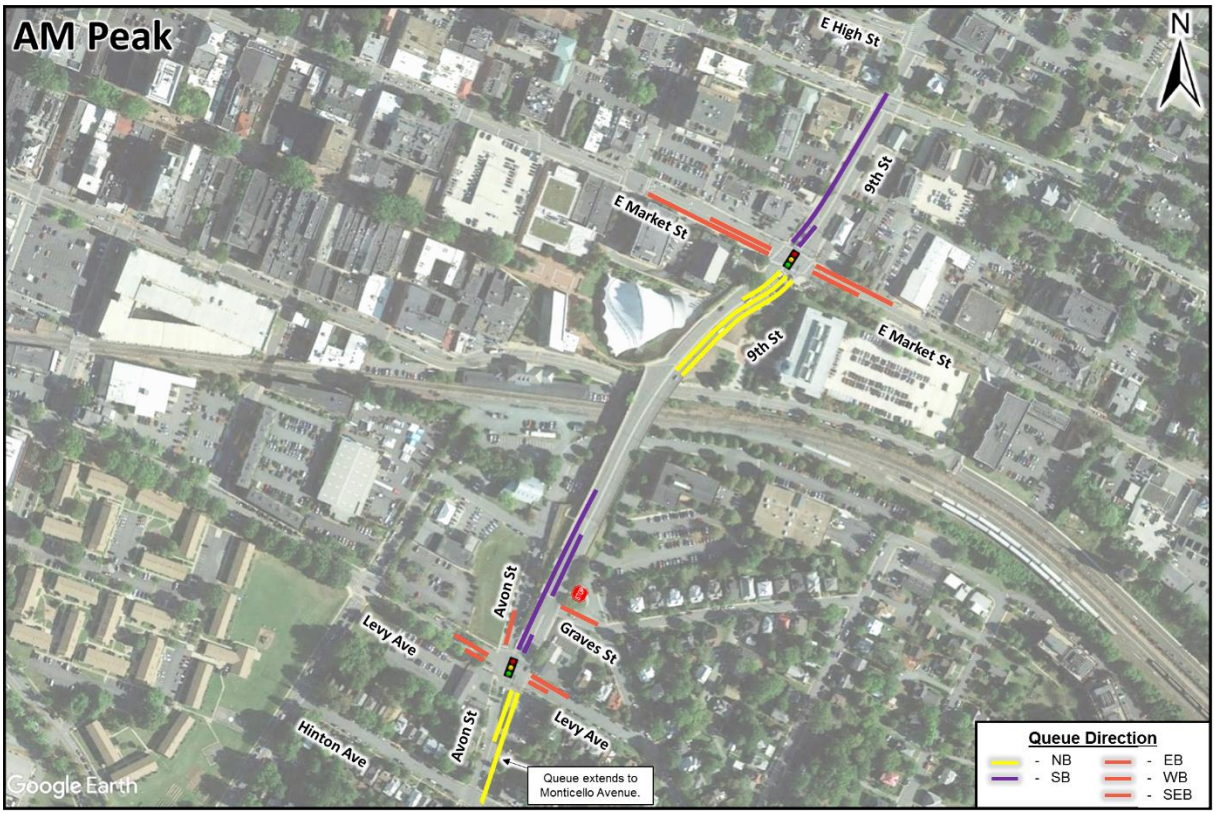


Figure 8: Existing (2017) Queues



CHAPTER 4 TRAFFIC FORECASTING

An opening year of 2019 and a design year of 2041 were identified for future conditions analysis. The following sections describe the methodology for developing growth rates and projecting traffic volumes within the study area.

4.1 Traffic Growth Rate Development

The downtown Charlottesville area is near to fully developed, and there is some redevelopment occurring in pockets. However, given the constrained roadway network surrounding the project area, the vehicular volume is projected to remain relatively constant. It is anticipated, however, that mode choices will shift to raise the volume of bicycles and pedestrians within the already vibrant area. To account for these assumptions, linear growth rates, as shown in **Table 2**, were used to develop the projected opening year (2019) and design year (2041) peak hour traffic volumes.

Table 2: Growth Rates

Mode Type	Growth Rate
Vehicles	0.20%
Pedestrians	3.00%
Bicycles	3.00%

4.2 Projected Traffic Volumes

Standard linear growth rate calculations were applied to the existing (2017) peak hour traffic volumes to generate opening year (2019) and design year (2041) in kind peak hour projected traffic volumes. In Kind conditions (typically referred to as No-Build) represents a scenario where the Belmont Bridge is replaced with identical geometry as existing conditions. The projected traffic volumes were then re-balanced throughout the study area. The balanced projected 2019 and 2041 in kind AM and PM peak hour volumes for vehicles, pedestrians, and bicycles are summarized in **Figure 9**, **Figure 10**, **Figure 11**, and **Figure 12,** respectively.

Figure 9: Opening Year (2019) and Design Year (2041) Vehicle Volumes

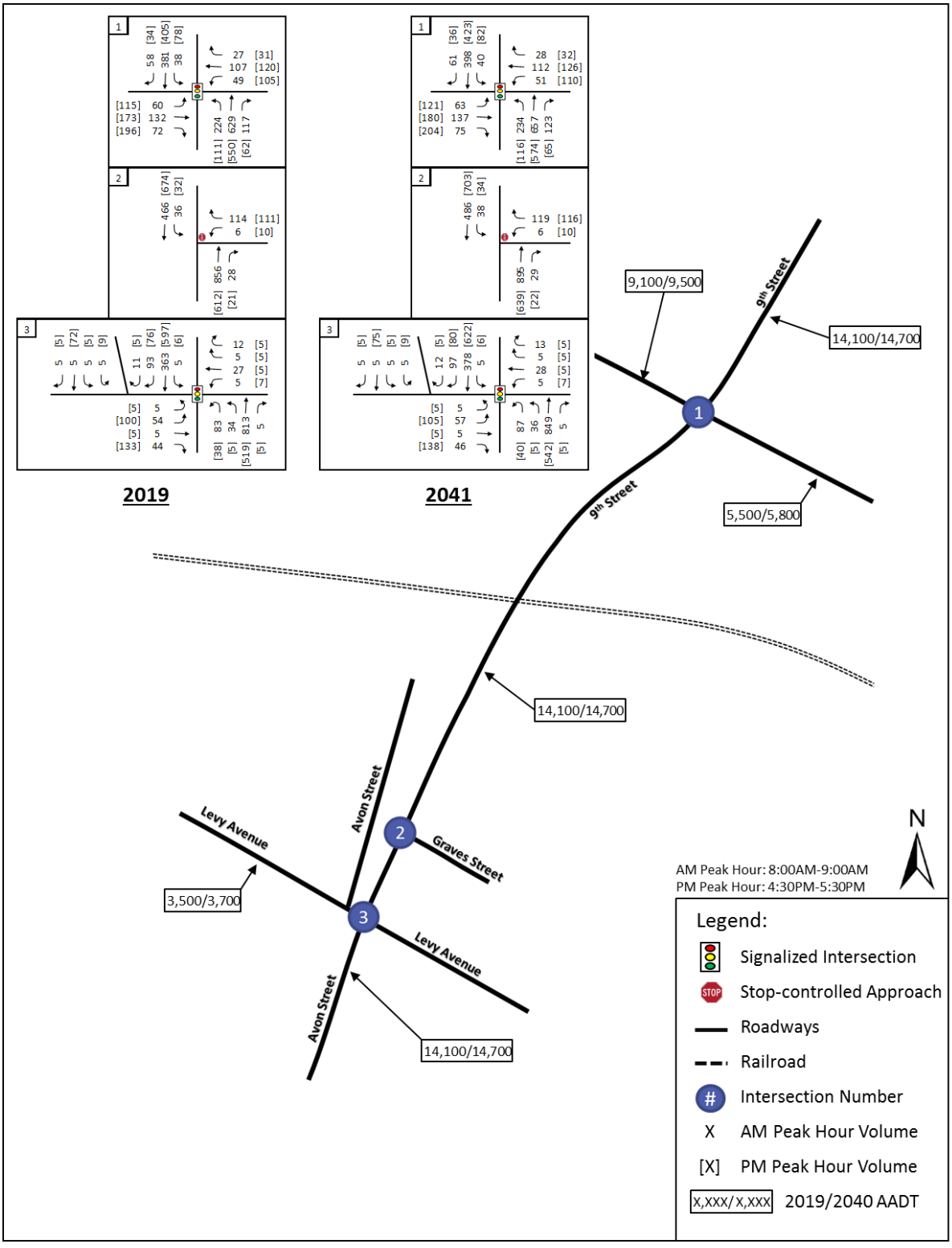


Figure 10: Opening Year (2019) Pedestrian Volumes

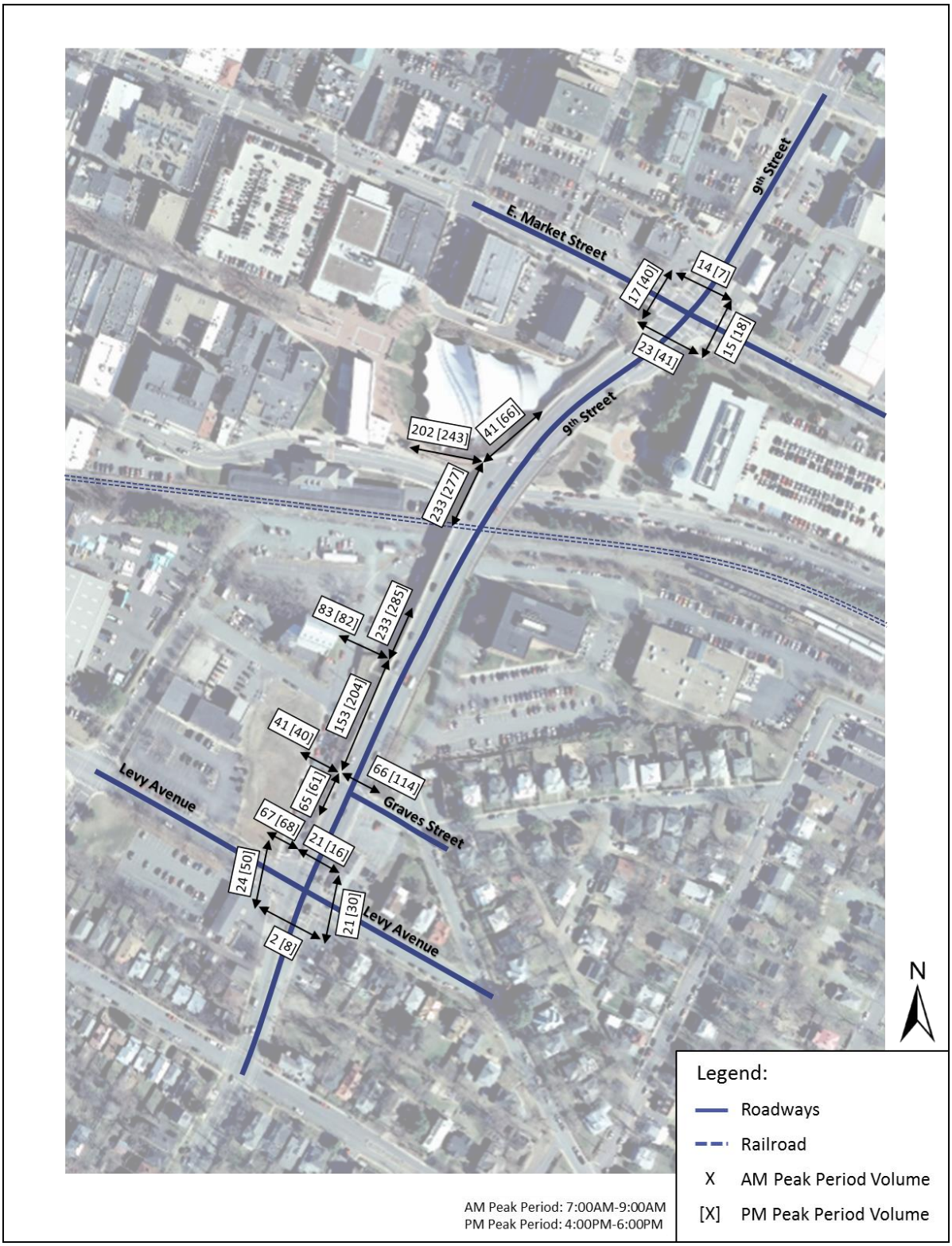


Figure 11: Design Year (2041) Pedestrian Volumes

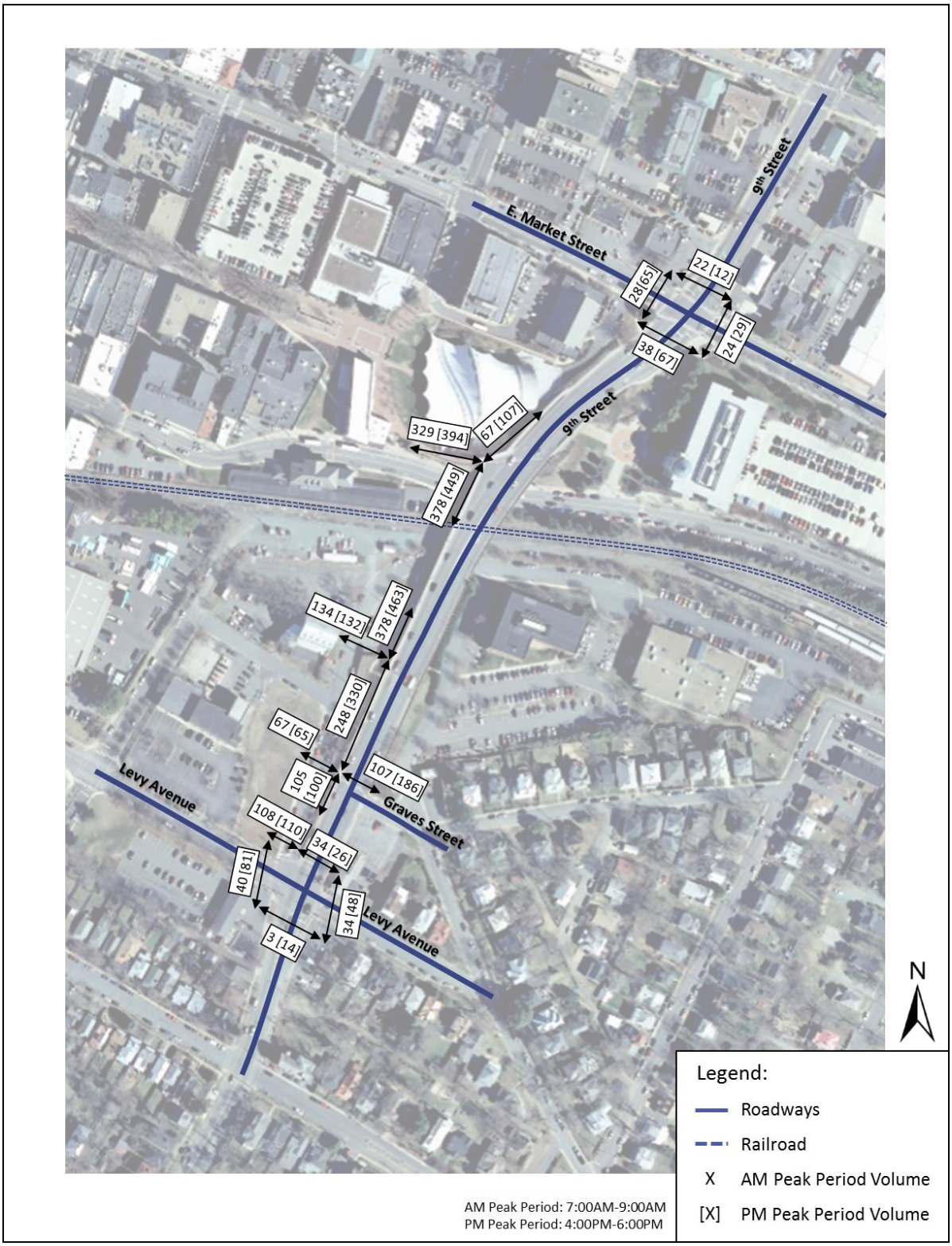
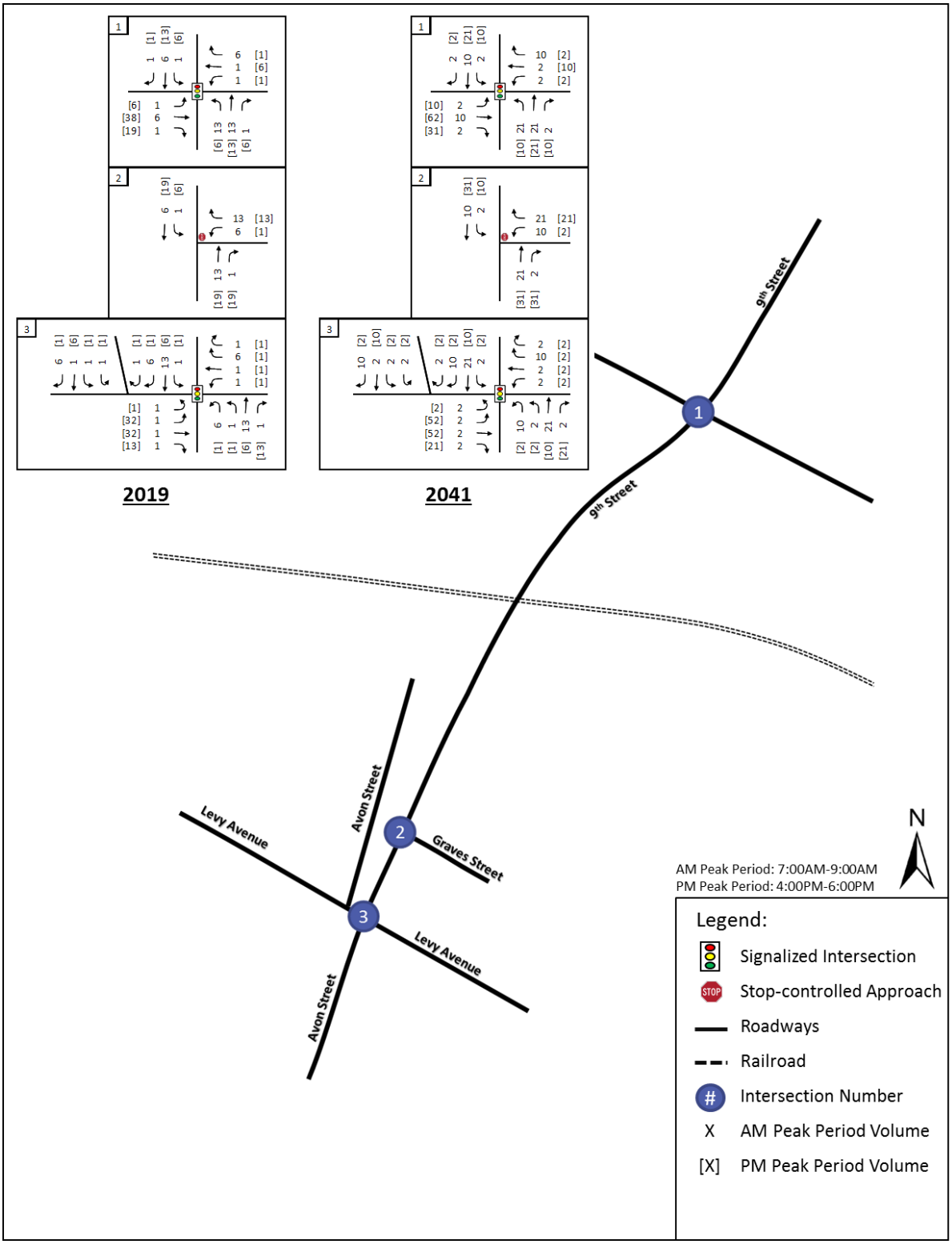


Figure 12: Opening Year (2019) and Design Year (2041) Bicycle Volumes



CHAPTER 5 IN KIND CONDITIONS

Traffic operational analyses were conducted to evaluate the overall performance of the study area under the in kind opening year (2019) and design year (2041) AM and PM peak hour conditions. The intent of the in kind conditions analysis was to provide a baseline traffic conditions for comparing potential bridge reconstruction alternatives to replacing the bridge in kind, or with the existing geometric configuration.

5.1 Traffic Analysis Assumptions

The calibrated existing conditions Synchro/SimTraffic models were used as a basis to develop the in kind models. No geometric changes were made, but the models were updated with projected 2019 and 2041 traffic volumes. Traffic signal timing splits and offsets were optimized for 2041 conditions only. A summary of Synchro/SimTraffic modeling inputs and assumptions for the in kind traffic models is provided in **Appendix B**.

5.2 In Kind Opening Year (2019) Traffic Analysis Results

5.2.1 Delay and Level of Service

The results of the in kind opening year (2019) AM and PM peak hour capacity analyses are summarized in **Figure 13.** The corresponding *Synchro* output sheets are provided in **Appendix D** for reference.

5.2.2 Queuing

The results of the in kind opening year (2019) AM and PM peak hour queuing analyses are summarized in **Figure 14**. The corresponding *SimTraffic* output sheets are provided in **Appendix D** for reference.

5.3 In Kind Design Year (2041) Traffic Analysis Results

5.3.1 Delay and Level of Service

The results of the in kind design year (2041) AM and PM peak hour capacity analyses are summarized in **Figure 15**. The corresponding *Synchro* output sheets are provided in **Appendix D** for reference.

5.3.2 Queuing

The results of the in kind design year (2041) AM and PM peak hour queuing analyses are summarized in **Figure 16**. The corresponding *SimTraffic* output sheets are provided in **Appendix D** for reference.

5.4 Summary

Delay, LOS, and maximum queues under the in-kind opening year (2019) AM and PM peak hour are comparable to existing (2017) conditions. Design year (2041) analysis results are comparable to existing (2017) and in-kind opening year (2019) conditions—some delay and queue improvements are projected in the design year resulting from optimizing traffic signal timing splits and offsets.

Figure 13: In Kind Opening Year (2019) Delay and Level of Service

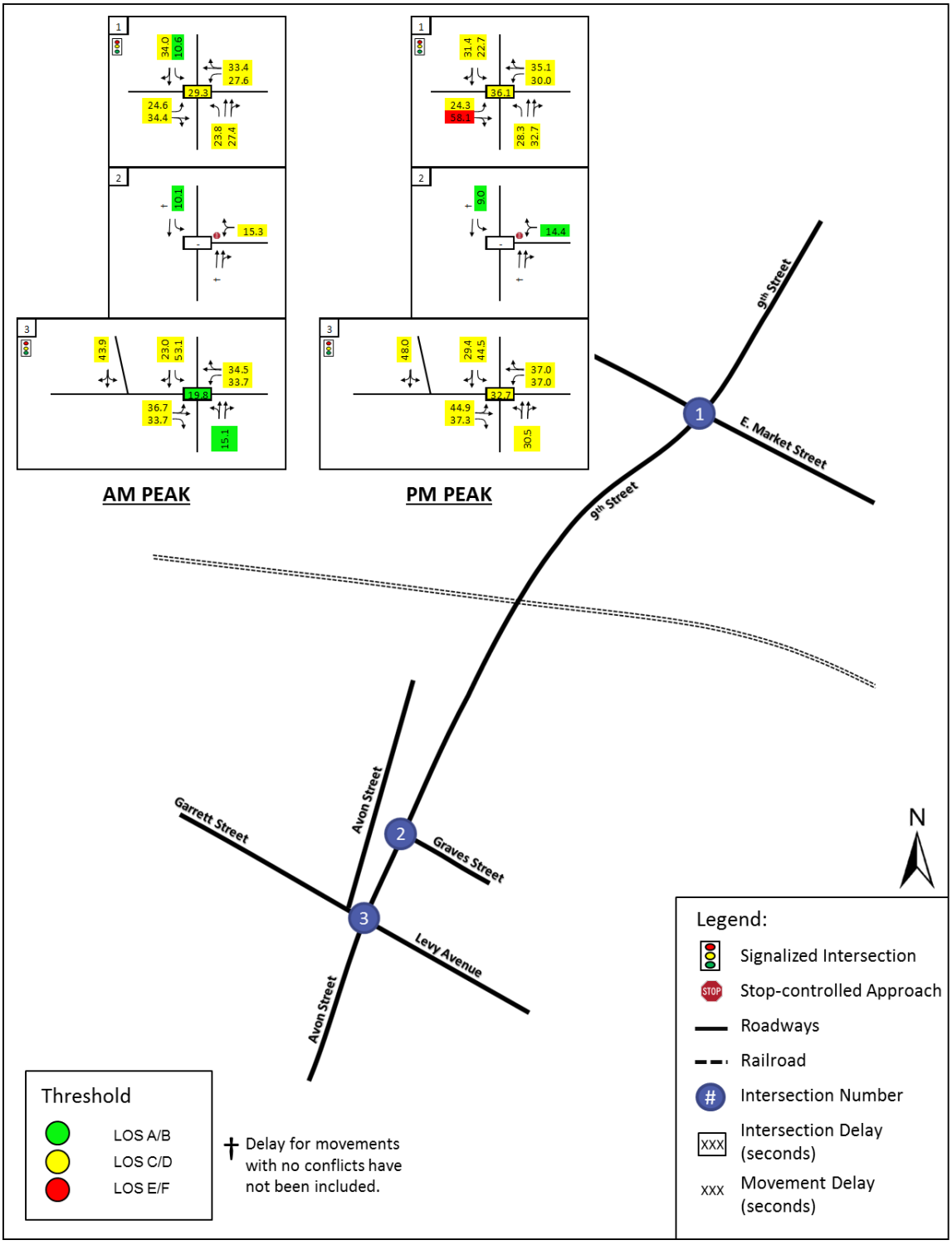
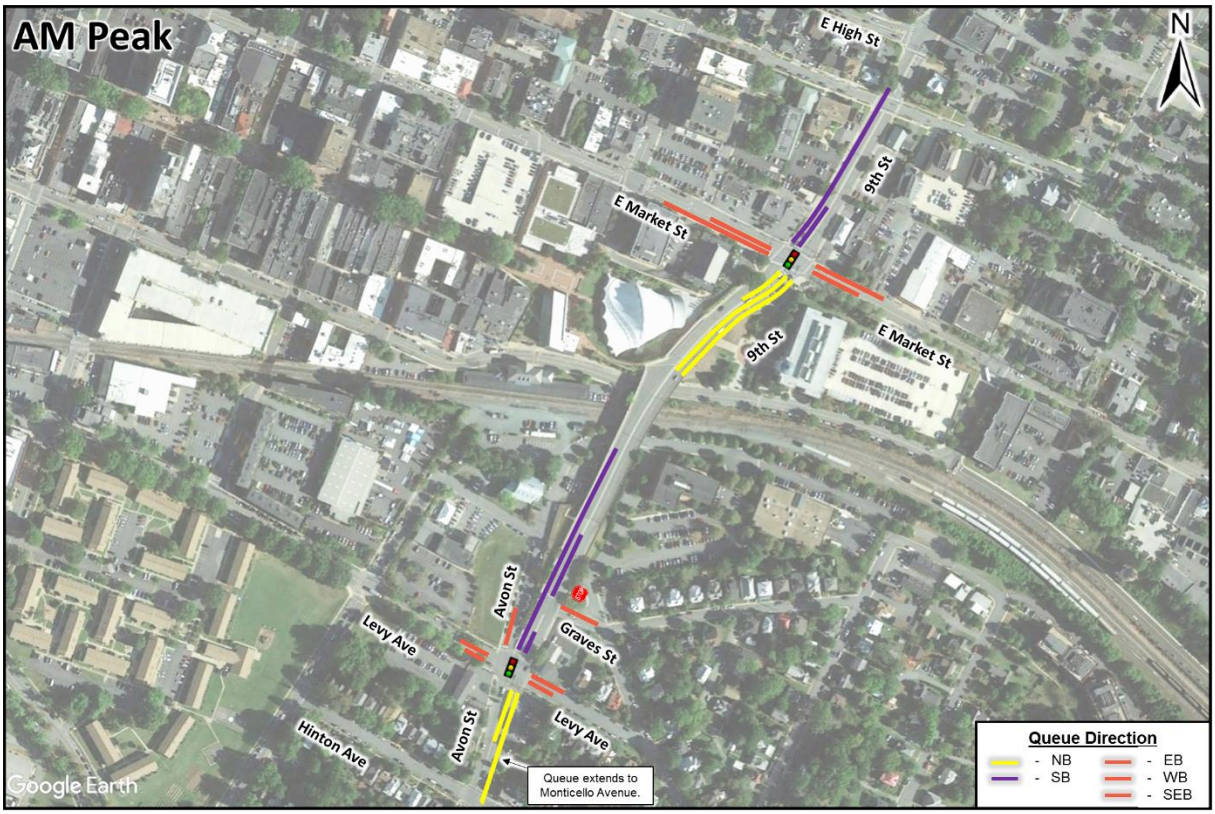


Figure 14: In Kind Opening Year (2019) Queues



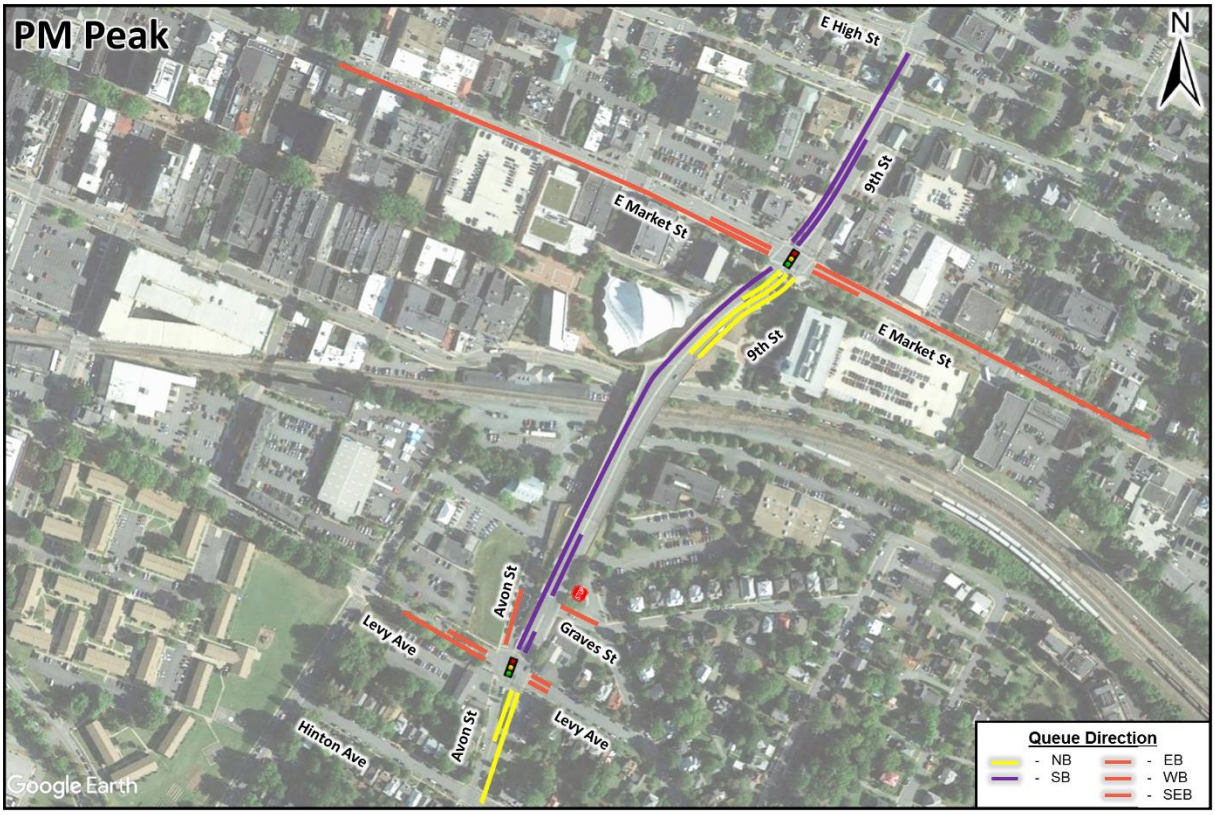


Figure 15: In Kind Design Year (2041) Delay and Level of Service

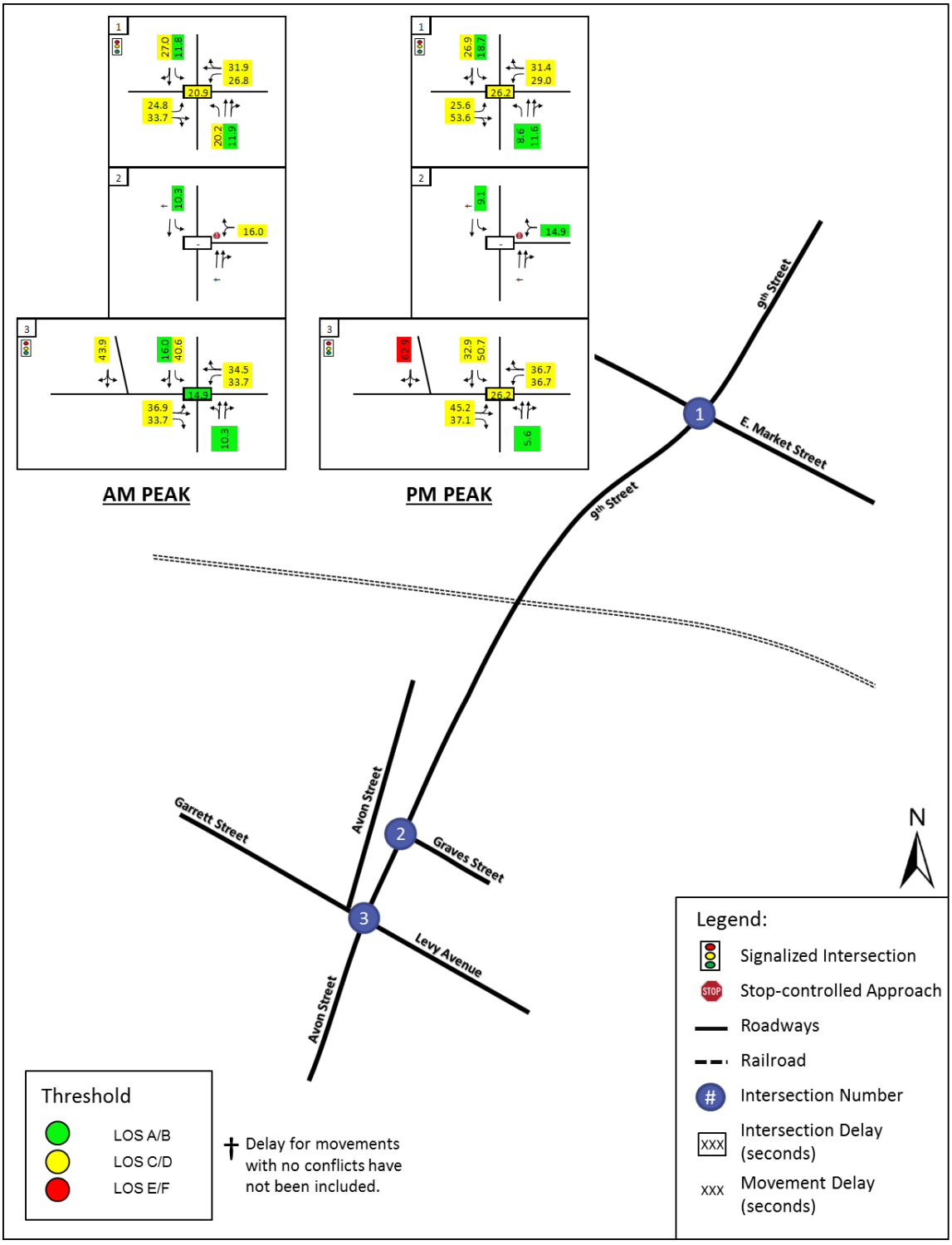
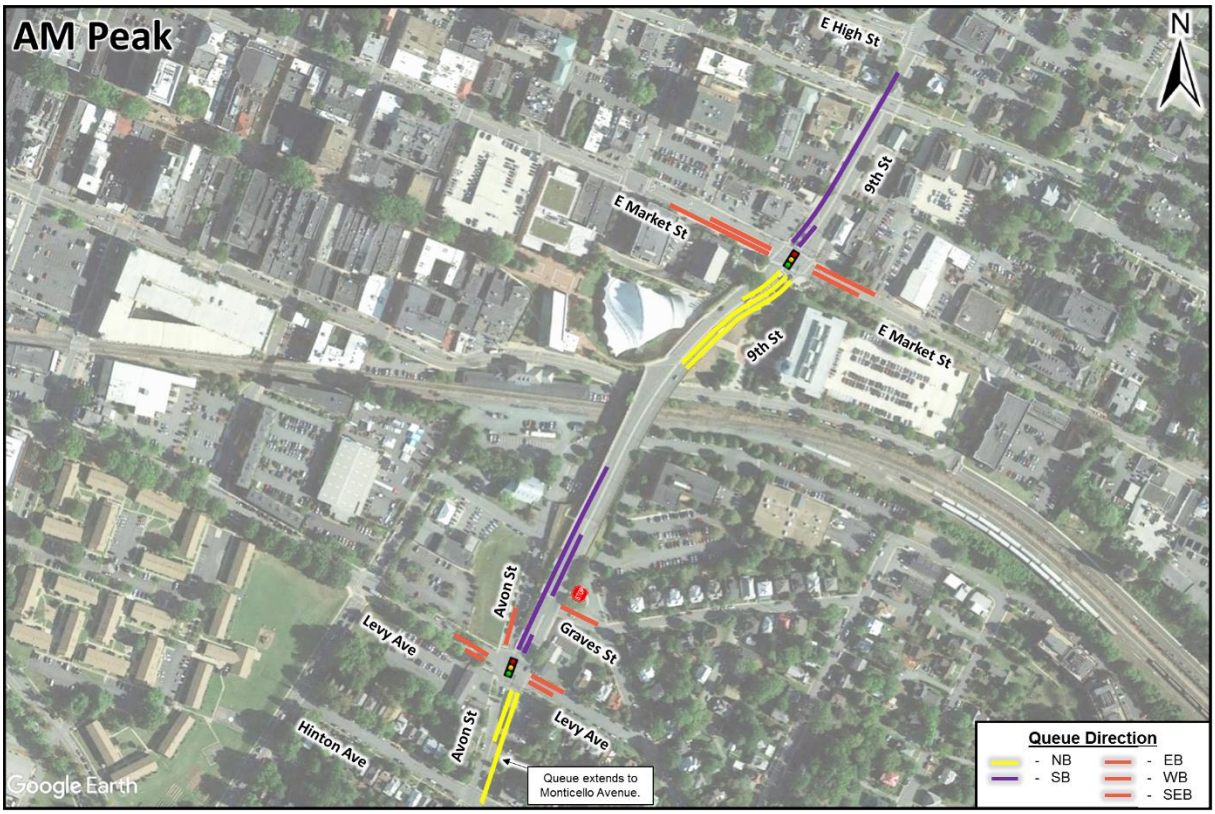
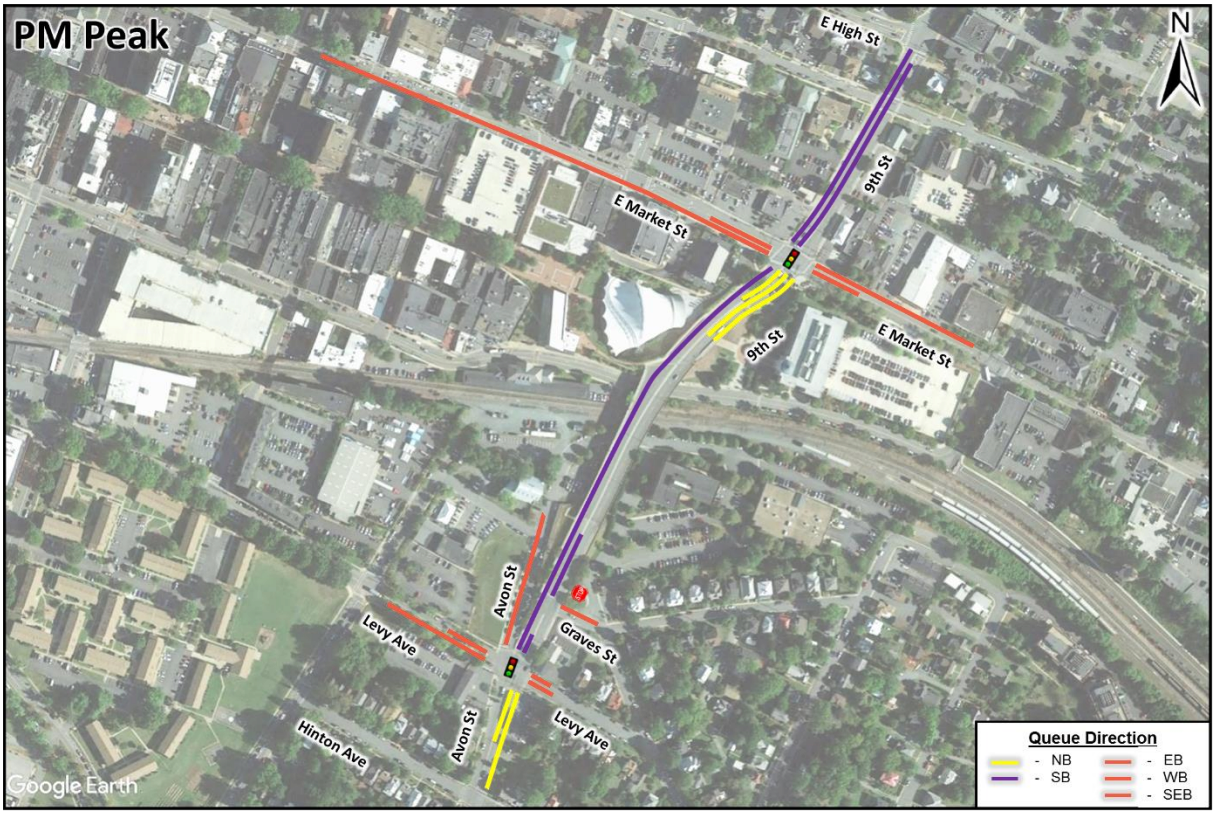


Figure 16: In Kind Design Year (2041) Queues





CHAPTER 6 CONCEPT DEVELOPMENT

Potential geometric concepts for the study area intersections were developed in junction with bridge replacement scenarios developed by the City and the Belmont Bridge project team during the April 17, 2017 design charrette. In addition to the 4-lane bridge cross-section, previously discussed in **Chapter 5** as the In Kind bridge replacement scenario, two additional cross-sections were considered:

- 3-lane bridge cross-section (one travel lane in both directions, left turn lanes extend onto bridge)
- 2-lane bridge cross-section (one travel lane in both directions)

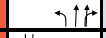
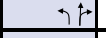
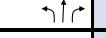
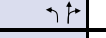
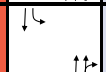
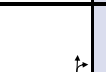
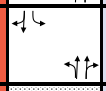
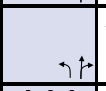
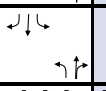
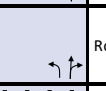
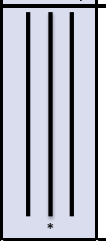
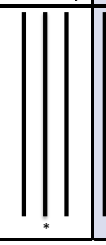
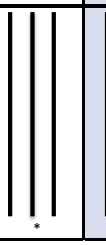
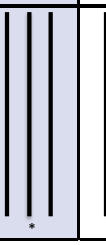
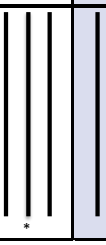
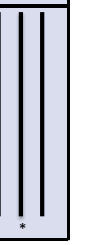
Providing one travel lane in each direction balances vehicular, pedestrian, and bicycle function and operations. Based on traffic analysis discussed in **Section 6.1**, it was determined that providing additional left turn lane storage across the bridge did not provide sufficient benefits to outweigh the cost of widening the bridge to three lanes. In addition, a two-lane bridge matches the character and operations of Avon Street to the south and East High Street to the north, as both sections currently operate with one lane in each direction. The proposed two-lane bridge cross-section is also consistent with the proposed East High Streetscape project that is currently under design just north of the Belmont Bridge study area.

6.1 Study Intersection Concepts

Based on the two additional bridge replacement cross-section scenarios, four intersection concepts were developed, analyzed, and presented during the culmination of the design charrette. A concept matrix that illustrates potential modified lane configurations at the three study intersections and the corresponding bridge cross-section is shown in **Figure 17**. Southbound lane configurations that are not shown in the matrix are assumed to be unchanged. The full concept matrix and preliminary results are provided in **Appendix E**. Based on the traffic analysis, the following lane configurations were selected as the preferred intersection concepts:

- 9th Street at E. Market Street: Concept 2A (dedicated northbound left, through, and right lanes)
- Avon Street at Levy Avenue: Concept 1A (dedicated northbound and southbound left and shared through/right lanes)

Figure 17: Concept Matrix

Intersection Number and Description		Existing	Concept						
			1A	2A	3A	4A	1B	1C	1D
1	9th Street at E. Market Street					Roundabout	Same as 1A + Old Avon Street One-way NB†	Same as 1A + Old Avon Street One-way NB and Graves Street RIRO†	Same as 1A + adjacent intersection improve-ments
2	9th Street at Graves Street								
3	Avon Street at Garrett Street/ Levy Avenue					Roundabout			
Bridge			 *	 *	 **	 *	 *	 *	 *

* Turn lanes don't impact the cross-section of the bridge
** Turn lanes impact the cross-section of the bridge
† Requires re-routing of volumes

6.2 Additional Concept Considerations

Additional concepts to improve traffic operations and safety were also considered at three locations within the study area.

- At 9th Street and Graves Street, several concepts were considered to restrict left turns entering and exiting Graves Street to reduce conflict points and improve safety.
- At Avon Street and Levy Avenue, two concepts were considered to convert Old Avon Street to one-way northbound or to remove the approach altogether.
- The mid-block at-grade 9th Street pedestrian crosswalk was evaluated to determine the suitability for design and construction of maintaining the existing at-grade crossing just north of Graves Street.

6.2.1 9th Street at Graves Street Access

The existing configuration at 9th Street and Graves Street allows full movements entering and exiting Graves Street. The existing southbound queues on 9th Street extend from Levy Avenue beyond E. Market Street in the PM peak hour, which often blocks the 9th Street median opening at Graves Street. Westbound left turning vehicles were observed making a left turn and blocking the northbound 9th Street travel lane. Three concepts were considered at Graves Street:

- Convert Graves Street to right-in/right-out
- Convert Graves Street to left-in/right-in/right-out
- Allow left turns out of Graves Street with time-of-day restrictions

It was determined that restricting left turns out of Graves Street improved safety by reducing the number of conflict points and improved traffic operations by shifting left turns to the Avon Street/Levy Avenue intersection or to the Levy Avenue/6th Street SE intersection. The preferred build concept proposes converting Graves Street to left-in/right-in/right-out. In conjunction with this recommendation, the City is independently studying converting Monticello Avenue to one-way southbound between Graves Street and Levy Avenue to better accommodate the shift in left turns. In 2041, it is projected that approximately 6 left-turning vehicles in the AM peak hour and 10 left-turning vehicles in the PM peak hour will use the Avon Street at Levy Avenue intersection to reach their destination.

6.2.2 Old Avon Street

The Old Avon Street approach at 9th Street and Levy Avenue creates safety and operational issues in the AM and PM peak hours. Two concepts were considered: close Old Avon Street entirely or restrict it to northbound only. The preferred build concept proposes to close Old Avon Street at the 9th Street and Levy Avenue intersection to create a pedestrian zone. This concept allows for additional time to be added to other intersection movements thus refining signal operations, improving safety, and allowing for improved pedestrian connectivity.

Vehicles that currently use Old Avon Street to access businesses and parking west of the Belmont Bridge and south of the railroad tracks will need to utilize the Levy Avenue and 6th Street intersection under the preferred build concept. In 2041, it is projected that the approximately 58 vehicles entering Old Avon Street in the morning peak hour and the 94 vehicles exiting Old Avon Street in the evening peak hour will use the Levy Avenue and 6th Street or 9th Street at Graves Street intersections, depending on destination.

6.2.3 9th Street At-Grade Mid-Block Pedestrian Crosswalk

A memorandum was written to support the conceptual design efforts for the replacement of the Belmont Bridge concerning the suitability for the design and construction of mid-block crosswalks on 9th Street within

the project limits. The memorandum is provided in **Appendix F**. Kimley-Horn recommended removing the mid-block pedestrian crossing because of existing crash patterns, the approach grade at the crossing, and non-compliance with the City's Streets That Work Plan. City of Charlottesville Administration issued an opinion that due to safety and liability concerns, the at-grade pedestrian crossing at Graves Street should be removed from the project.

To accommodate pedestrian access across 9th Street, the signalized intersection of 9th Street and Levy Avenue will be reconstructed as a 4-legged intersection. The 9th Street at Levy Avenue and 9th Street at E. Market Street signalized intersections will be constructed to meet current ADA requirements for an accessible route. A new staircase connection north of the bridge is proposed that will allow pedestrians to walk underneath the bridge along a mezzanine and access the Downtown Mall at the Sprint Pavilion. A pedestrian underpass is also proposed beneath 9th Street just north of Graves Street.

6.3 Preferred Concept

The preferred build concept was approved by the Charlottesville City Council on October 16, 2017. The preferred concept lane geometry is shown in **Figure 18** and the conceptual design is provided in **Appendix G**. Typical sections of the preferred build concept are shown in **Figure 19**, **Figure 20**, and **Figure 21**. The preferred build concept consists of:

- Constructing a 2-lane bridge cross-section (one travel lane in both directions)
- Constructing a dedicated left turn lane, through, and right turn lane on the northbound 9th Street approach at E. Market Street
- Maintaining the existing lane configurations on the southbound 9th Street approach at Levy Avenue
- Closing Old Avon Street at the 9th Street and Levy Avenue intersection to create a pedestrian zone
- Converting Graves Street to left-in/right-in/right-out
- Removing the existing at-grade pedestrian crossing at Graves Street and constructing a pedestrian underpass beneath 9th Street just north of Graves Street
- Reconstructing the signalized intersection of 9th Street and Levy Avenue as a 4-legged intersection and constructing the 9th Street at Levy Avenue and 9th Street at E. Market Street signalized intersections to meet current ADA requirements for an accessible route
- Constructing a new staircase connection north of the bridge to allow pedestrians to walk underneath the bridge along a mezzanine and access the Downtown Mall at the Sprint Pavilion

Figure 18: Preferred Build Concept Lane Geometry

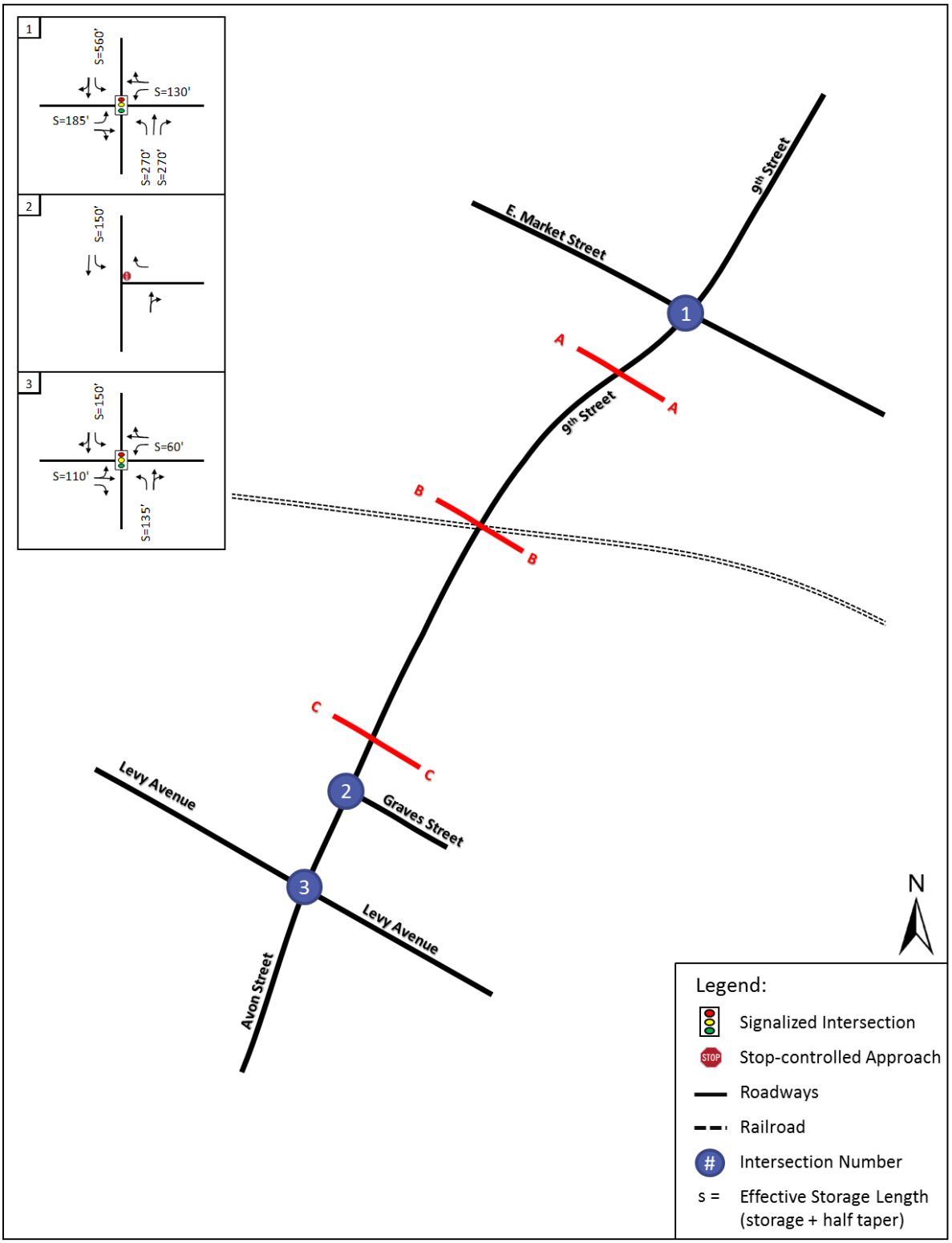


Figure 19: Section A Preferred Concept: Looking North on 9th Street from North of Bridge

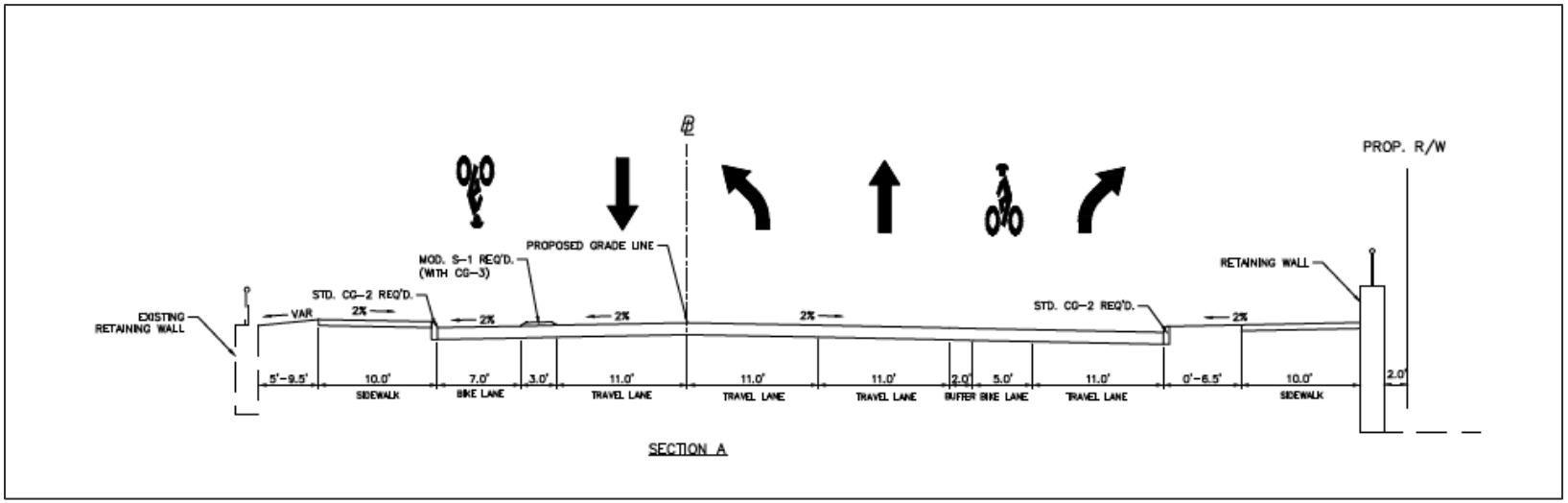


Figure 20: Section B Preferred Concept: Looking North on 9th Street on Belmont Bridge

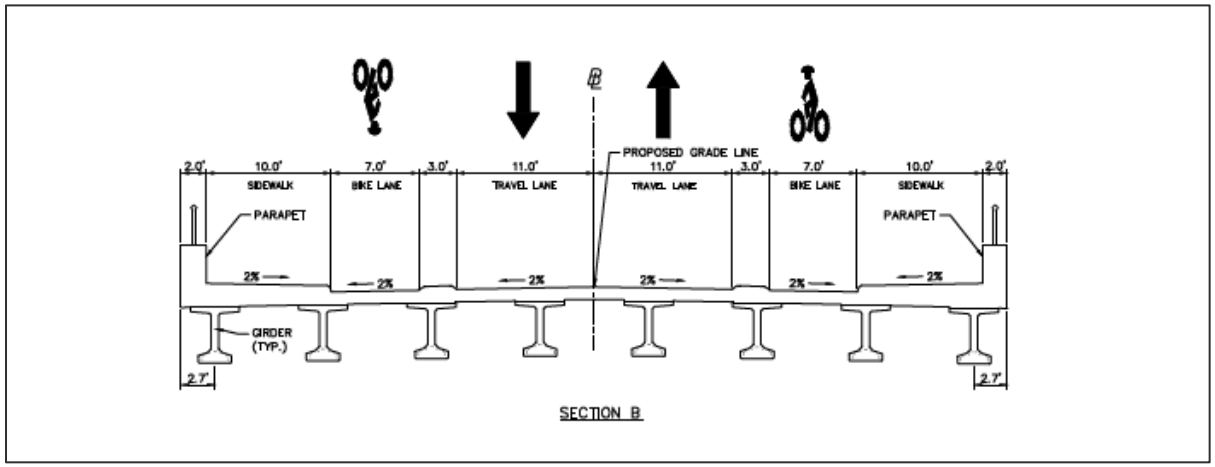
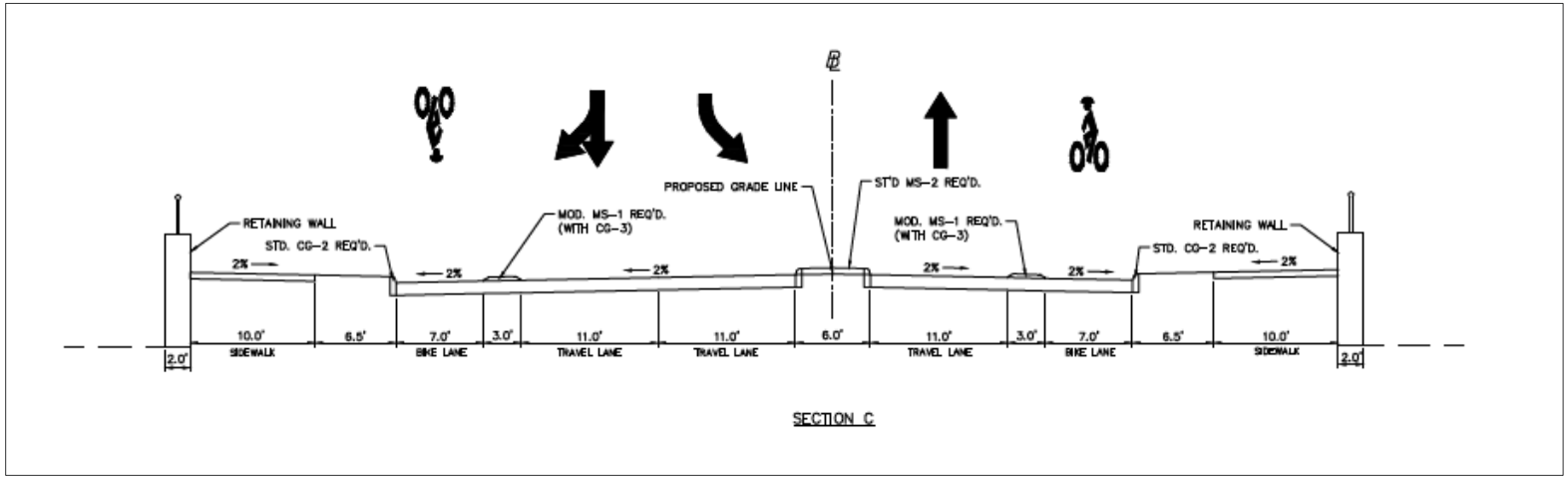


Figure 21: Section C Preferred Concept: Looking North on 9th Street from Graves Street



CHAPTER 7 PREFERRED BUILD CONDITIONS

Traffic operational analyses were conducted to evaluate the overall performance of the study area under the preferred build opening year (2019) and design year (2041) AM and PM peak hour conditions. The intent of the preferred build conditions analysis is to compare the proposed preferred concept to compare the replacing the bridge in kind, or with the existing geometric configuration.

7.1 Traffic Analysis Assumptions

The in kind conditions Synchro/SimTraffic models were used as a basis to develop the preferred build models. The models were updated to reflect the preferred build concept geometry shown in **Section 6.3**. Traffic signal timing splits and offsets were optimized for 2019 and 2041 conditions. A summary of Synchro/SimTraffic modeling inputs and assumptions for the preferred build traffic models is provided in **Appendix H**.

7.2 Preferred Build Opening Year (2019) Traffic Analysis Results

7.2.1 Delay and Level of Service

The results of the preferred build opening year (2019) AM and PM peak hour capacity analyses are summarized in **Figure 22**. The corresponding *Synchro* output sheets are provided in **Appendix H** for reference.

7.2.2 Queuing

The results of the preferred build opening year (2019) AM and PM peak hour queuing analyses are summarized in **Figure 23**. The corresponding *SimTraffic* output sheets are provided in **Appendix H** for reference.

7.3 Preferred Build Design Year (2041) Traffic Analysis Results

7.3.1 Delay and Level of Service

The results of the preferred build design year (2041) AM and PM peak hour capacity analyses are summarized in **Figure 24**. The corresponding *Synchro* output sheets are provided in **Appendix H** for reference.

7.3.2 Queuing

The results of the preferred build design year (2041) AM and PM peak hour queuing analyses are summarized in **Figure 25**. The corresponding *SimTraffic* output sheets are provided in **Appendix H** for reference.

7.4 Summary

Delay, LOS, and maximum queues at 9th Street and E. Market Street under the preferred build opening year (2019) and design year (2041) AM and PM peak hour are comparable to existing (2017) conditions and in-kind (2019 and 2041) conditions. Improvements are projected under the preferred build conditions at Avon Street and Levy Avenue resulting from removing the fifth Old Avon Street intersection approach. Overall, traffic operations are maintained on the study corridor while reallocating space to accommodate potential bicyclist and pedestrian growth.

Figure 22: Preferred Build Opening Year (2019) Delay and Level of Service

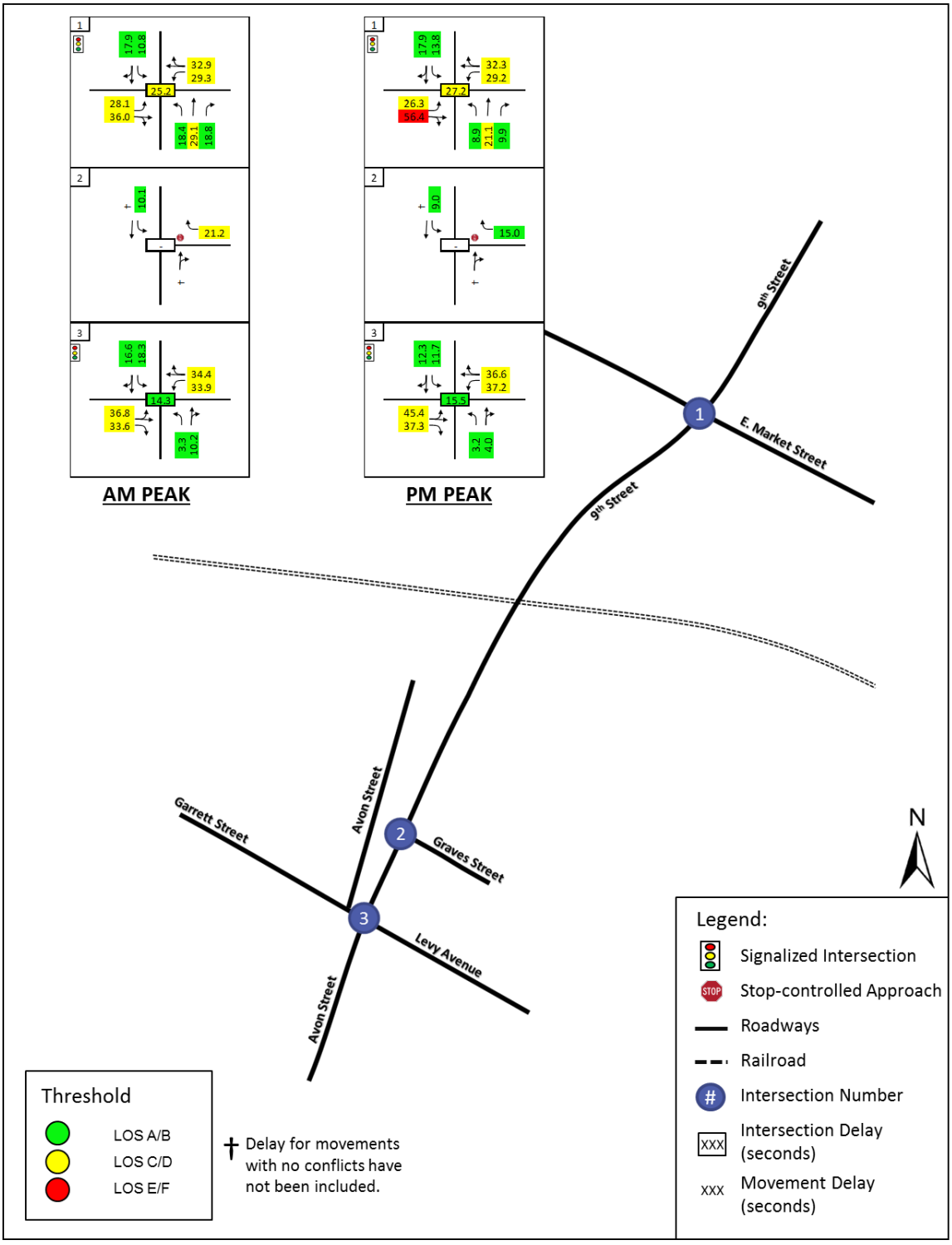


Figure 23: Preferred Build Opening Year (2019) Queues

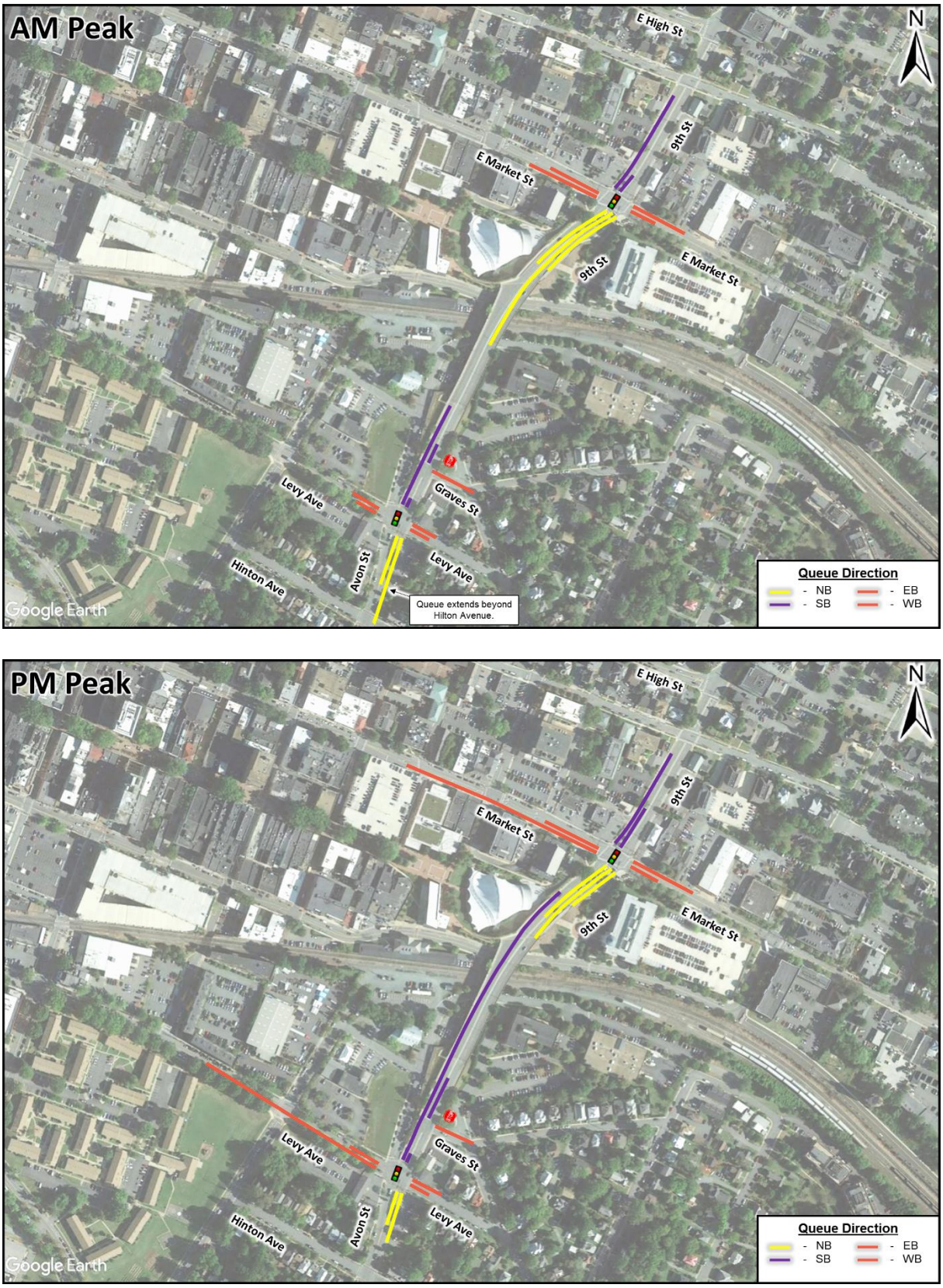


Figure 24: Preferred Build Design Year (2041) Delay and Level of Service

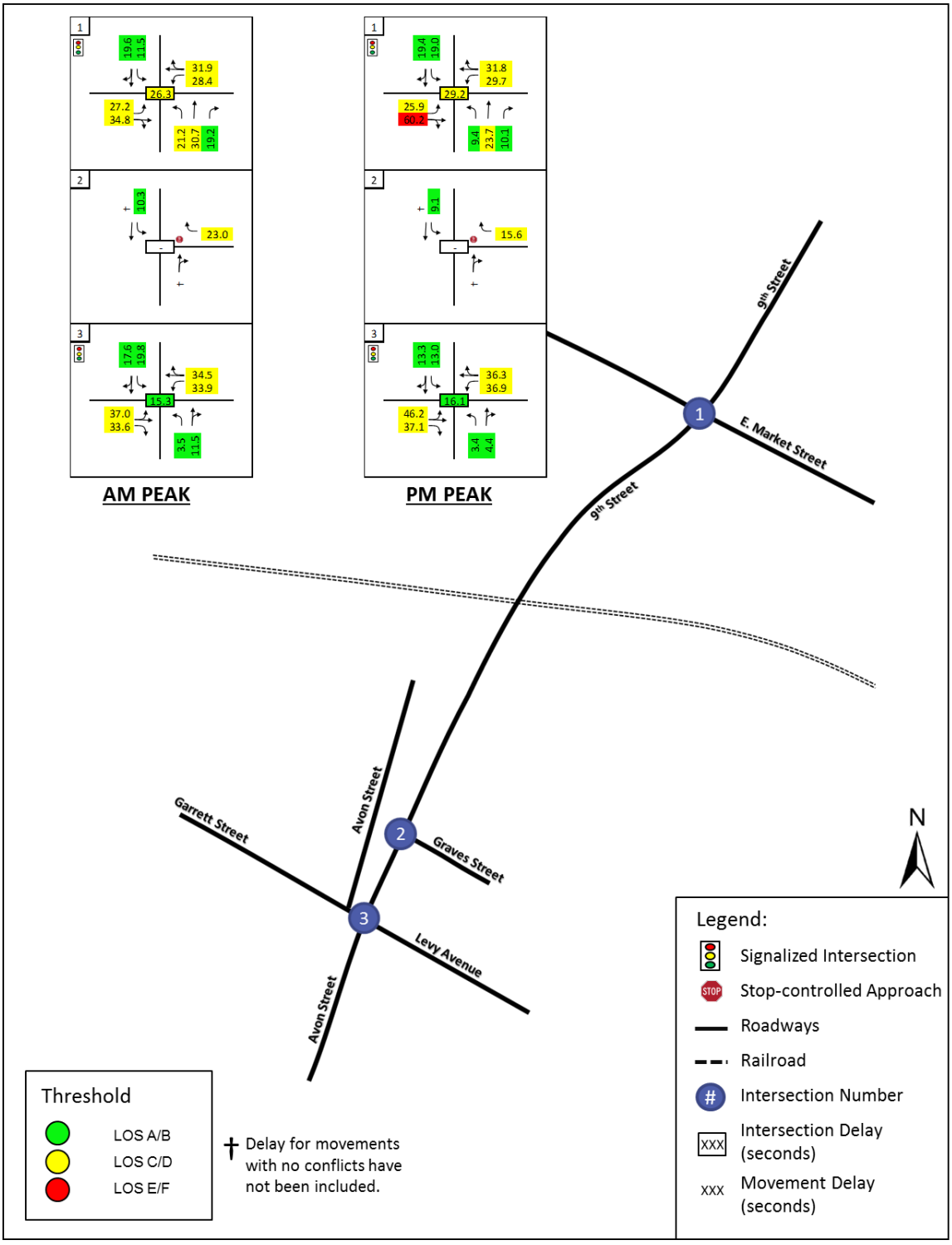


Figure 25: Preferred Build Design Year (2041) Queues