
Traffic Impact Study

7-Eleven Lovettsville

Town of Lovettsville, VA



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Prepared for:

Vertical Construction Management



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INTRODUCTION AND SUMMARY

Purpose and Study Objective

This report presents the findings of an operations traffic impact analysis for the proposed 7-Eleven to be located at the north corner of the North Church Street/East Broad Way intersection in the Town of Lovettsville, Virginia. The project is a reconstruction of an existing, convenience-store-only 7-Eleven that is approximately 2,385 square feet to a building of 3,000 square feet with 8 vehicle fueling positions. Access to the property will be via two full access driveways. The existing driveway which forms the fourth leg of the Broad Way/South Berlin Turnpike intersection will remain and a new driveway is proposed along North Church Street. Construction is planned to be complete in 2017. This report details the traffic operations in the area and the traffic flow to and from the site.

The following tasks were completed as part of this study:

- Field reconnaissance in the vicinity of the site was performed to collect information related to existing traffic controls, roadway geometry, and traffic flow characteristics.
- Traffic counts were conducted at the Church Street/E. Broad Way and S. Berlin Turnpike/ Broad Way intersections on Thursday, November 5, 2015 during the AM and PM peak periods. Spot counts were also conducted at the intersection of N. Berlin Turnpike and W. Broad Way on the same day during the AM and PM system peak hours.
- Future conditions were projected based on inherent traffic growth of one percent (1%) compounded annually and applied to major traffic movements to account for regional growth along the roadway network. Additionally, the Lovettsville Town Square commercial development was assumed to be in place for the future conditions analysis.
- Proposed site traffic volumes were generated based on the methodology outlined in the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 9th Edition and the existing traffic counts at the site driveway.
- Future with development traffic conditions were projected based on existing regional traffic patterns, site traffic patterns, and the proposed development plan.
- Intersection capacity analyses were performed for existing conditions (2015), future conditions without development (2017), and future conditions with development (2017).

Sources of data for this study include VDOT, Vertical Construction Management, Bowman Consultants, and the office files and field reconnaissance efforts by Gorove/Slade Associates, Inc. It should be noted that the proposed development does not meet the threshold to require a VDOT Chapter 527 TIA, but this traffic impact study generally follows the VDOT traffic guidelines.

BACKGROUND INFORMATION: PROPOSED DEVELOPMENT (SITE AND NEARBY)

Site Location and Background Developments

This study is being performed to examine the potential traffic impacts of the proposed reconstruction of the existing 7-Eleven located at the north corner of the North Church Street/East Broad Way intersection. Currently, the property for this proposed reconstruction is occupied by a 2,385 square feet convenience-store-only 7-Eleven. A site location map is provided in Figure 1.

The proposed 7-Eleven will consist of a convenience store of approximately 3,000 square feet and 8 vehicle fueling positions with a build-out year of 2017 as illustrated on the project concept plan on Figure 2.

Scope of Study

The following existing intersections are included in this study:

1. Broad Way and S. Berlin Turnpike/Existing 7-Eleven Driveway, and,
2. E. Broad Way and Church Street.

Access to the 7-Eleven site will be via two full-access driveways. The existing driveway which forms the fourth leg of the Broad Way/S. Berlin Turnpike will remain and the proposed new driveway will be located along N. Church Street. Conditions with and without the proposed convenience store with fuel sales are analyzed in this study to determine the impacts of the proposed development on the surrounding roadways.

A copy of the Scoping Document may be found in Appendix A.



Figure 1: Site Location

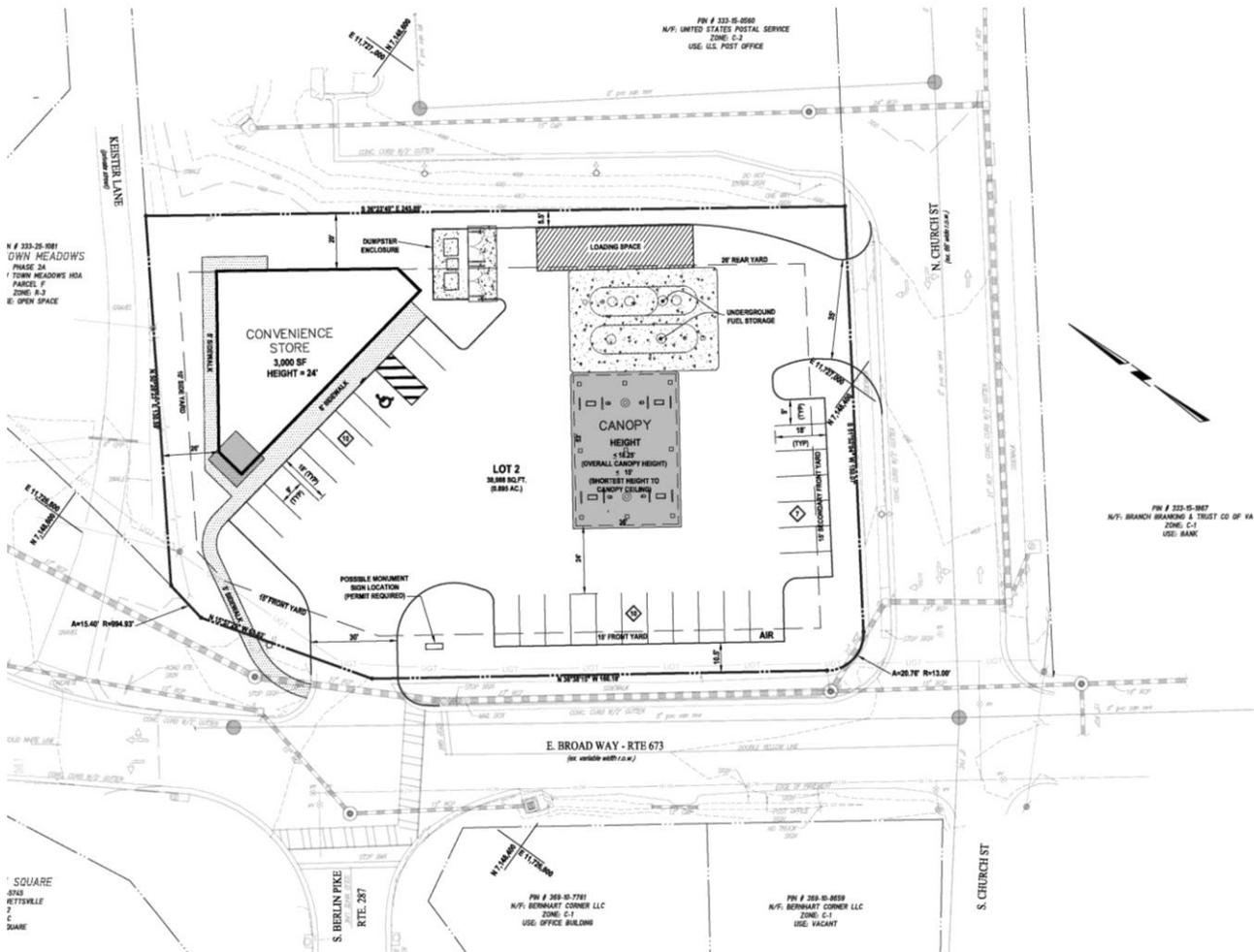


Figure 2: Project Concept Plan (Paciulli, Simmons & Associates)

This report presents the findings of analyses performed for the following conditions:

- **Existing Conditions (2015):** Considers existing traffic volumes and existing roadway configurations.
- **Future Conditions without Development (2017):** Considers future traffic conditions for the year 2017 with background traffic growth and with the trips generated by a nearby development, Lovettsville Town Square, but without the proposed development.
- **Future Conditions with Development (2017):** Considers future traffic conditions for the year 2017 (build-out year) with the proposed redevelopment of the 7-Eleven.

The results of the analysis and the traffic impacts associated with the proposed development plan are presented in the Conclusions section of this report.

Roadway Network

A description of the major roadways within the immediate vicinity of the site is presented below. The existing lane configuration and traffic control in the study are shown in Figure 3. The posted and/or statutory speed limit for each of the study roadways is 25 mph.

South Berlin Turnpike (Rt. 287) is the major north-south route accessing the Town. This roadway is classified by VDOT as a minor arterial and connects north to Brunswick, Maryland and south to Route 9 and Purcellville. Within the center of Town, the northbound and southbound lanes of Berlin Turnpike divide to define the Town Square. The one-way circulation around the square provides two travel lanes along each segment. Published historical traffic count data from VDOT shows that the northbound segment immediately south of the 7-Eleven site carried approximately 3,800 vehicles per day in 2014, with a combined total of approximately 7,800 vehicles per day in both directions along Route 287.

Broad Way (Rt. 673) is a two-lane undivided roadway within the study area. To the east of its intersection with S. Berlin Turnpike, E. Broad Way is a two-way street; between the S. and N. Berlin Turnpike intersections, W. Broad Way is one-way westbound. Route 673 is classified by VDOT as a major collector roadway. Published historical traffic count data from VDOT shows that E. Broad Way carried approximately 3,500 vehicles per day in 2014.

North Church Street was improved to a two-lane curb-and-gutter roadway with an auxiliary right turn lane with the recent construction of the U.S. Post Office building. No speed limit was posted at the time of the traffic counts and the roadway is classified as a local street by VDOT.

Pedestrian Network

The Town's Comprehensive Plan calls for sidewalks with new development projects and anticipates connection of the pedestrian network within the Town to the larger Loudoun County trail system. Sidewalks are currently provided along the site frontage of N. Church Street and E. Broad Way east of S. Berlin Turnpike. Crosswalks and handicap ramps are located on the east and south legs of the Broad Way/S. Berlin Turnpike intersection. Handicap ramps are also provided on the north leg of the N. Church Street/E. Broad Way intersection, but there is no marked crosswalk. Pedestrians may reach the residential areas to the west via sidewalks and crosswalks associated with the Town Square, but pedestrian connectivity is limited to the north of the Square.

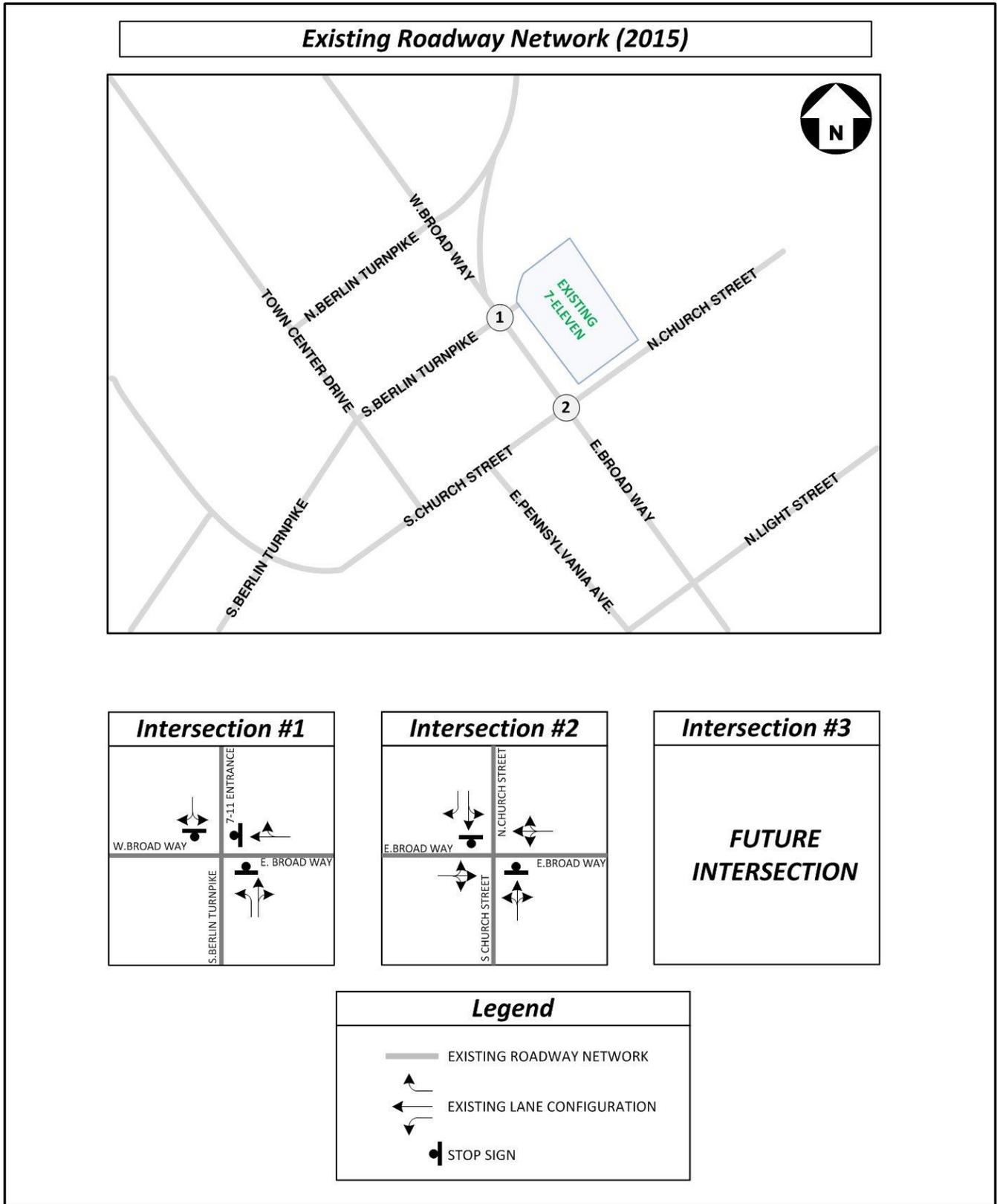


Figure 3: Existing Roadway Network

EXISTING CONDITIONS (2015)

Existing Traffic Volumes

In order to determine the weekday peak hour turning movement traffic volumes, traffic counts were conducted at the study intersections on Thursday, November 5, 2015. Analysis of the traffic data found the following peak hours:

- AM Peak Hour: 7:15 AM to 8:15 AM
- PM Peak Hour: 4:30 PM to 5:30 PM

Spot counts were also conducted at the intersection of W. Broad Way and N. Berlin Turnpike during the system peak hours. All existing turning movement count information is shown in Figure 4. The existing traffic counts are included in Appendix B.

Existing Conditions Capacity Analysis

Intersection capacity analyses were performed for the existing conditions at the study area intersections during the weekday morning and afternoon peak hours. *Synchro, version 8* was used to analyze the study intersections with results based on Highway Capacity Manual (HCM) methodology. The default 2% heavy vehicle percentage was used for all roadways included in this study. The existing peak hour factors in the range of 0.85 to 1.00 were used for all intersections under the existing conditions. A description of the different levels of service is provided in Appendix C.

The results of the intersection capacity analyses are presented in Table 2 and Figure 5, and are expressed in level of service (LOS) and delay (seconds per vehicle) per lane group. The 95th percentile queue results are expressed in feet. The detailed analysis worksheets are contained in Appendix D.

Crash History

Historic data on accidents in the area was obtained from VDOT for the most recent three-year period available (2012-2014). The data is summarized in Table 1 and includes a total of five crashes, one of which occurred at the N. Berlin Turnpike/Town Center Drive intersection. Based on the published daily traffic volumes and road segment lengths, the crash rate for the roadways surrounding the Town Square is 1.17 crashes per 100 million vehicle miles traveled (VMT). This rate is significantly lower than the district average of 128.21 crashes per 100 million VMT for primary roadways such as Berlin Turnpike and far below the average of 235.98 crashes per 100 million VMT for secondary roadways such as Broad Way.

Table 1: Crash Data

| Intersection | Crash Date | Collision Type | Crash Severity |
|----------------|------------|----------------------------|-----------------------|
| Church St | 1/21/2012 | 9. Fixed Object - Off Road | property damage crash |
| Church St | 7/28/2012 | 2. Angle | property damage crash |
| N. Berlin Pike | 12/6/2012 | 2. Angle | injury crash |
| N. Berlin Pike | 5/3/2013 | 2. Angle | injury crash |
| Church St | 7/8/2013 | 2. Angle | property damage crash |

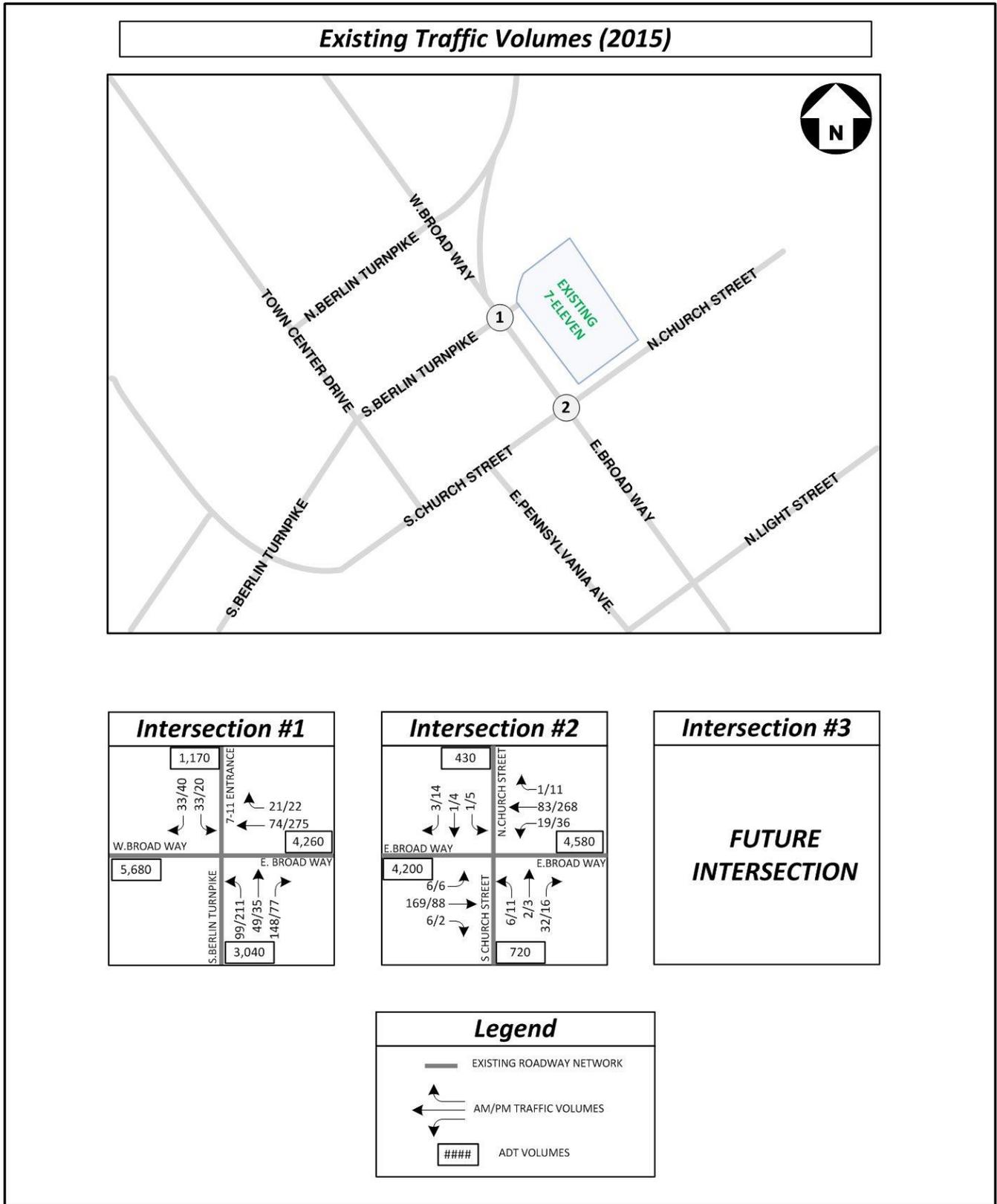


Figure 4: Existing (2015) Traffic Volumes

Table 2: Existing (2015) Intersection Capacity Analysis

| Intersection (Movement) | Storage/Turn Bay Length | Existing 2015 | | | | | |
|---|-------------------------|---------------------|------------------------|----|-----------|------------------------|----|
| | | AM Peak | | | PM Peak | | |
| | | LOS Delay | 95 th Queue | | LOS Delay | 95 th Queue | |
| 1 S Berlin Turnpike / Existing 7-11 Entrance and E/W Broad Way | | | | | | | |
| Overall Intersection (Unsignalized) | | A | 8.6 | -- | B | 11.5 | -- |
| Westbound Approach | 135' | A | 8.5 | 13 | B | 12.5 | 65 |
| Northbound Left | 260' | A | 9.1 | 15 | B | 12.4 | 43 |
| Northbound Thru/Right | 260' | A | 8.7 | 28 | A | 8.8 | 15 |
| Southbound Approach | | A | 7.9 | 8 | A | 8.7 | 8 |
| 2 E Broad Way and N/S Church Street | | | | | | | |
| Overall Intersection (Unsignalized) | | n/a | n/a | -- | n/a | n/a | -- |
| Eastbound Approach | 135' | A | 0.3 | 0 | A | 0.6 | 0 |
| Westbound Approach | 330' | A | 1.6 | 1 | A | 1.1 | 2 |
| Northbound Approach | 155' | A | 10.0 | 5 | B | 11.2 | 5 |
| Southbound Thru/Left | 175' | B | 11.7 | 0 | B | 13.4 | 2 |
| Southbound Right | 175' | A | 8.7 | 0 | B | 10.1 | 2 |
| 3 N Church St and Proposed 7-11 Drive | | FUTURE INTERSECTION | | | | | |
| 4 N Berlin Turnpike and W Broad Way | | | | | | | |
| Westbound Left | 178' | -- | -- | 6 | -- | -- | 4 |
| Westbound Thru/Right | 178' | -- | -- | 18 | -- | -- | 97 |

According to VDOT guidelines on traffic operations performance, it is desirable to achieve a LOS D or better by intersection approach. Under existing conditions, both of the study intersections operate at acceptable levels of service during the weekday AM and PM peak hours. As requested during the scoping process, the westbound queues were analyzed at the intersection of N. Berlin Turnpike and W. Broad Way. The analysis shows that the westbound queues on W. Broad Way at the intersection with N. Berlin Turnpike do not exceed the available storage length under the existing conditions.

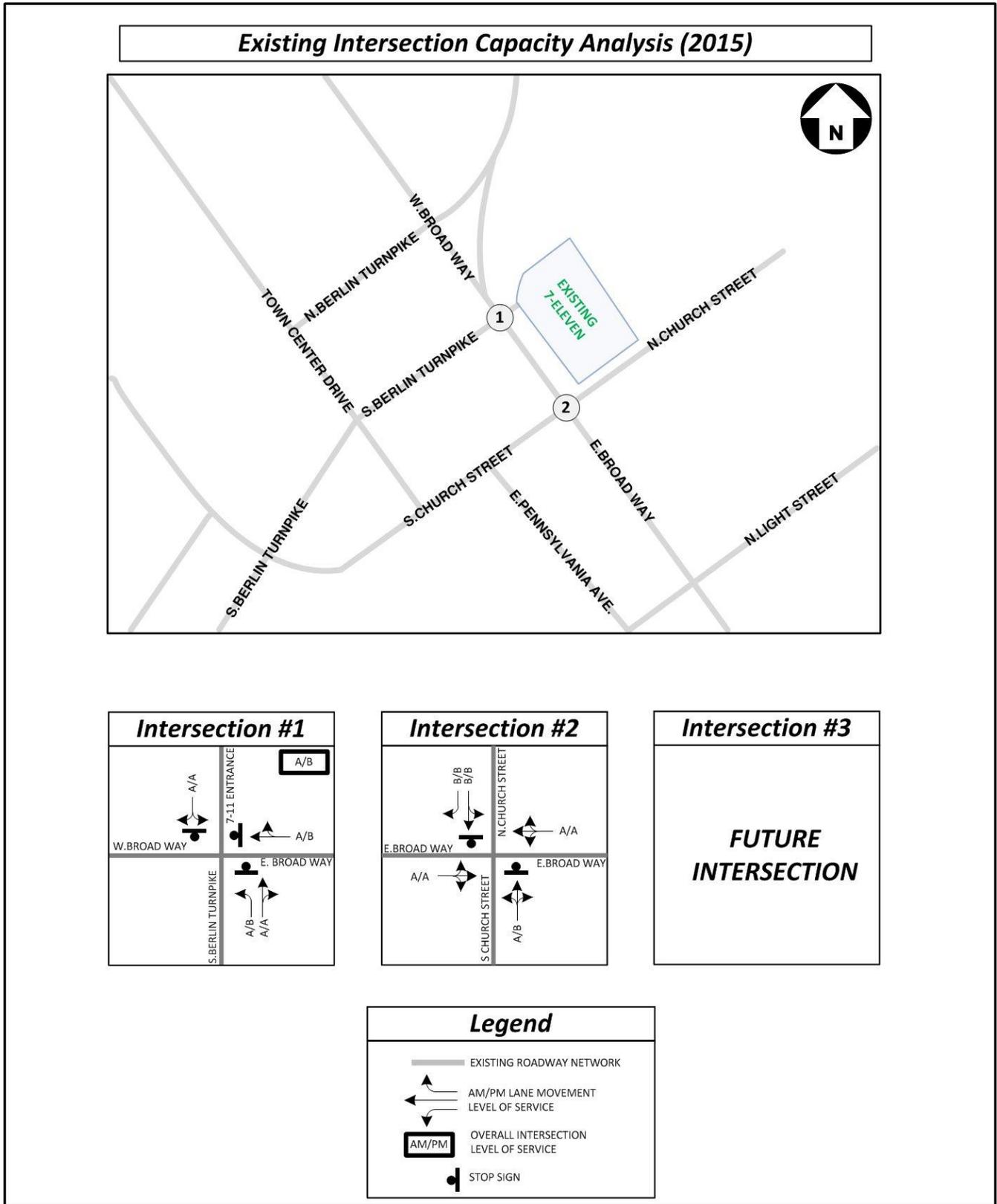


Figure 5: Existing (2015) Intersection Capacity Analysis

FUTURE CONDITIONS WITHOUT DEVELOPMENT (2017)

Future without Development Traffic Volumes

Inherent Growth and Background Development

The proposed development is anticipated to be complete in 2017. A 1.0% growth rate was applied to the existing through volumes along the roadways to obtain future 2017 volumes on the roadway network. In addition, there is one approved by incomplete development project within the vicinity, Lovettsville Town Square. Construction was recently initiated on this project, which will consist of approximately 18,000 square feet of retail development. Sidewalks are anticipated on the block between W. Broad Way and Town Center Drive with the retail development.

The trip generation for this development, which was assumed to be complete in 2017, is presented below in Table 2. To present a conservative analysis, no non-auto or pass-by trip reductions were applied to the standard ITE Trip Generation Manual, 9th Edition equations. The resulting trips were then routed through the roadway network based on the direction of approach (DOA) that would be similar to that of the proposed 7-Eleven development. The resulting Lovettsville Town Square volumes are presented in Figure 6.

The future background conditions traffic volumes were obtained by adding the existing traffic volumes, the regional growth, and the Lovettsville Town Square volumes and are presented in Figure 7.

Table 3: Trip Generation for Lovettsville Town Square at 2017

| Land Use | ITE Code | Size | ----- Weekday ----- | | | | | | |
|---|----------|----------|---------------------|----------|-----------|--------------|-----------|-----------|------------|
| | | | AM Peak Hour | | | PM Peak Hour | | | Daily |
| | | | In | Out | Total | In | Out | Total | Total |
| <u>Lovettsville Town Square Commercial</u> | | | | | | | | | |
| Retail | 820 | 18.0 kSF | 11 | 6 | 17 | 32 | 35 | 67 | 767 |
| <i>Total Trips</i> | | | <i>11</i> | <i>6</i> | <i>17</i> | <i>32</i> | <i>35</i> | <i>67</i> | <i>767</i> |

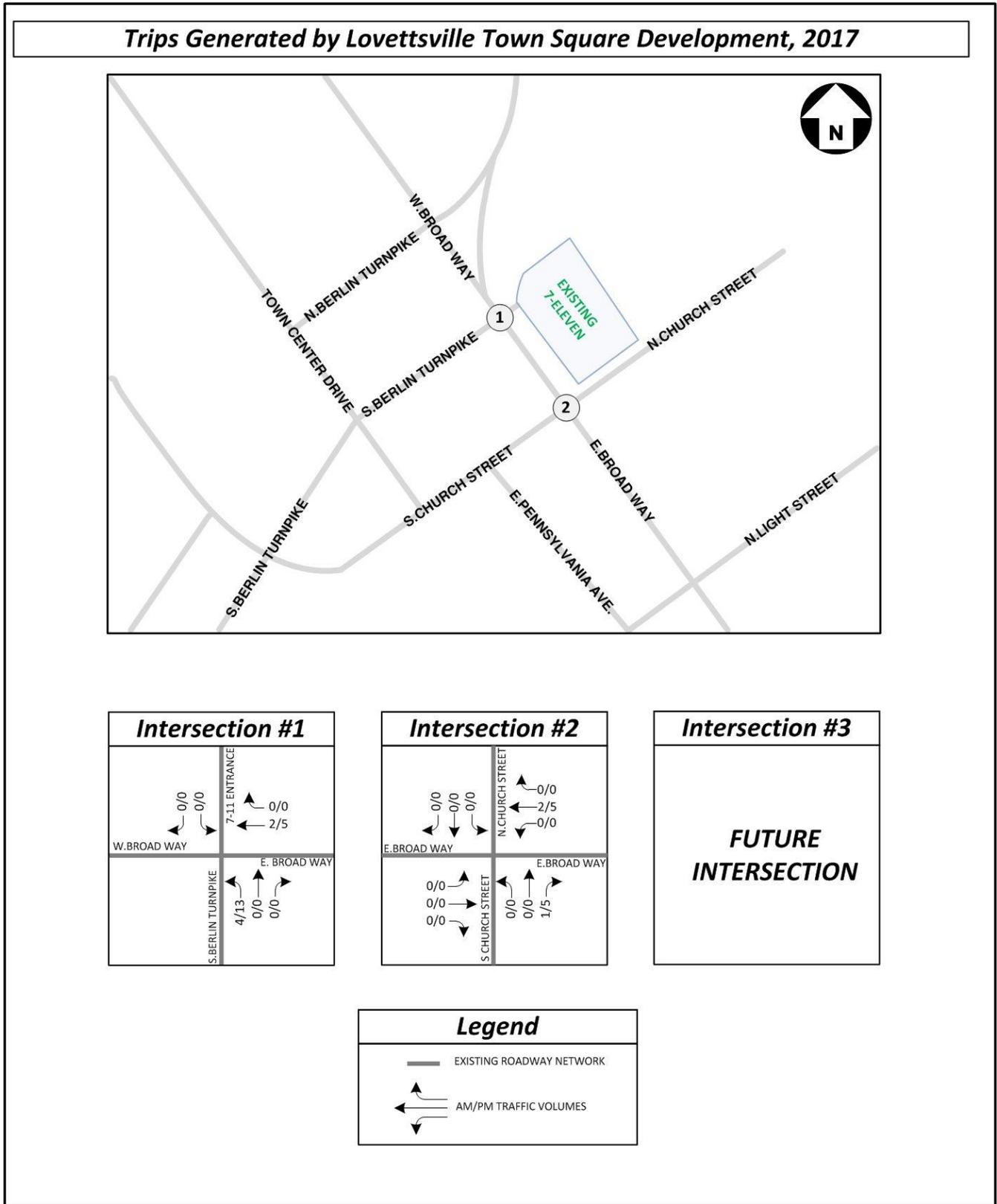


Figure 6: Lovettsville Town Square Trips

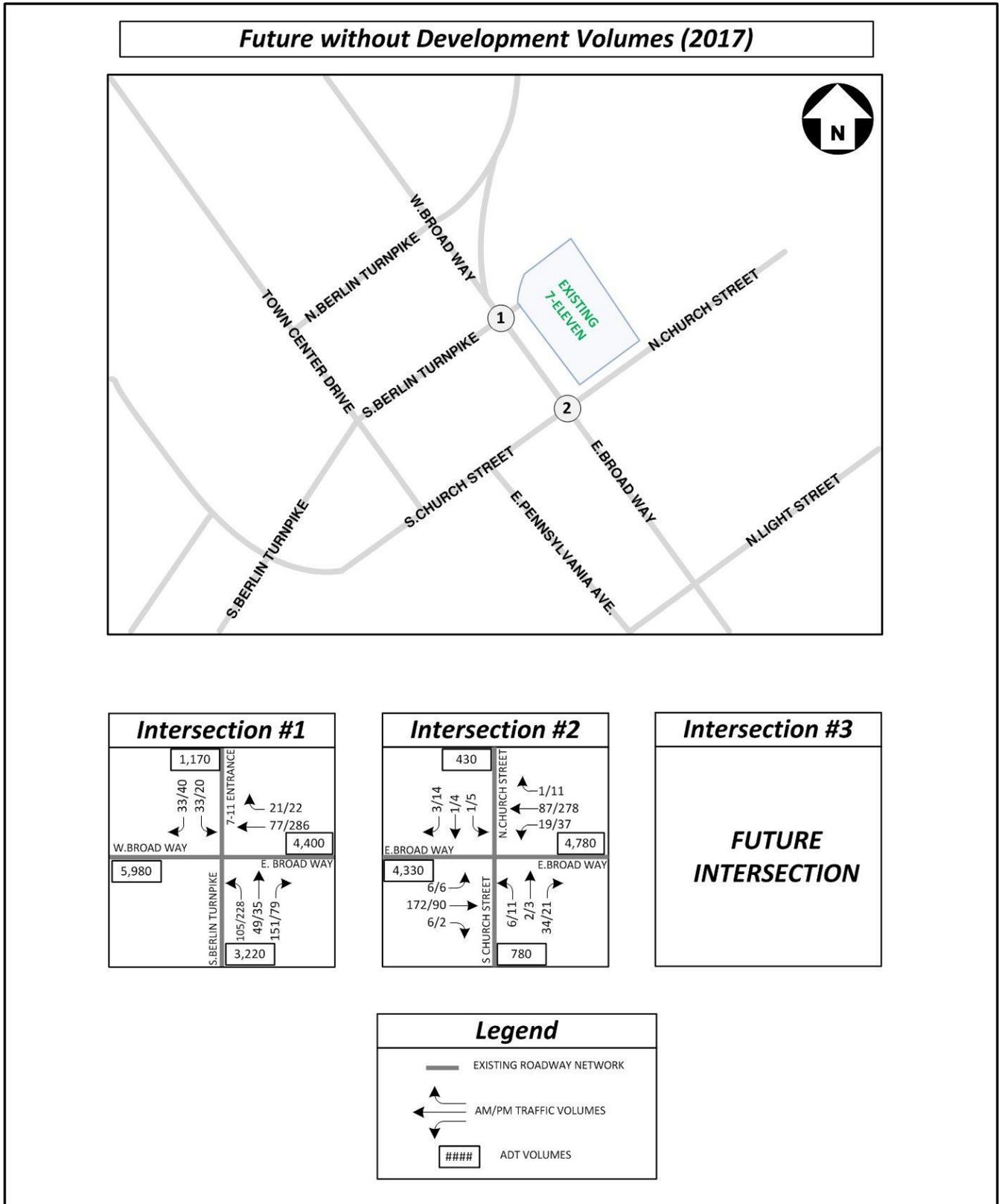


Figure 7: Future (2017) Background Volumes without Development

Future without Development Capacity Analysis

Intersection capacity analyses were performed for the future conditions without the proposed development at the intersections contained within the study area during the weekday morning and afternoon peak hours. *Synchro, version 8* was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. A future peak hour factor of 0.92 was used in the analysis. A default 2% heavy vehicle percentage was used for traffic along the road network.

The results of the intersection capacity analyses are presented in Table 4 and Figure 8, and are expressed in level of service (LOS) and delay (seconds per vehicle) per lane group. The 95th percentile queue results are expressed in feet. The detailed analysis worksheets are contained in Appendix E.

Table 4: Future without Development (2017) Intersection Capacity Analysis

| Intersection (Movement) | Turn Bay/ Storage Length | Future without Development, 2017 | | | | | |
|---|--------------------------------|----------------------------------|------------------------|-----------|------------------------|-------------|-----|
| | | AM Peak | | PM Peak | | | |
| | | LOS Delay | 95 th Queue | LOS Delay | 95 th Queue | | |
| 1 S Berlin Turnpike / Existing 7-11 Entrance and E/W Broad Way | | | | | | | |
| Overall Intersection (Unsignalized) | | A | 8.5 | -- | B | 11.6 | -- |
| Westbound Approach | 135' | A | 8.4 | 13 | B | 12.3 | 63 |
| Northbound Left | 260' | A | 9.1 | 15 | B | 12.9 | 50 |
| Northbound Thru/Right | 260' | A | 8.5 | 25 | A | 8.8 | 15 |
| Southbound Approach | | A | 7.9 | 8 | A | 8.7 | 8 |
| 2 E Broad Way and N/S Church Street | | | | | | | |
| Overall Intersection (Unsignalized) | | n/a | n/a | -- | n/a | n/a | -- |
| Eastbound Approach | 135' | A | 0.3 | 0 | A | 0.5 | 0 |
| Westbound Approach | 330' | A | 1.5 | 1 | A | 1.1 | 2 |
| Northbound Approach | 155' | A | 9.9 | 5 | B | 10.8 | 5 |
| Southbound Thru/Left | 175' | B | 11.5 | 0 | B | 13.2 | 2 |
| Southbound Right | 175' | A | 8.8 | 0 | B | 10.0 | 2 |
| 3 N Church St and Proposed 7-11 Drive | | FUTURE INTERSECTION | | | | | |
| 4 N Berlin Turnpike and W Broad Way | | | | | | | |
| Westbound Left | 178' | -- | -- | 5 | -- | -- | 4 |
| Westbound Thru/Right | 178' | -- | -- | 20 | -- | -- | 105 |

Under future background conditions the study intersections will continue to operate at acceptable levels of service during both the weekday AM and PM peak hours. The westbound queues at the intersection of N. Berlin Turnpike and W. Broad Way do not exceed the available storage length under the future without development conditions.

Given the small increase in traffic volume associated with regional growth and the commercial development, no significant increase in the crash rate would be expected at the study intersections.

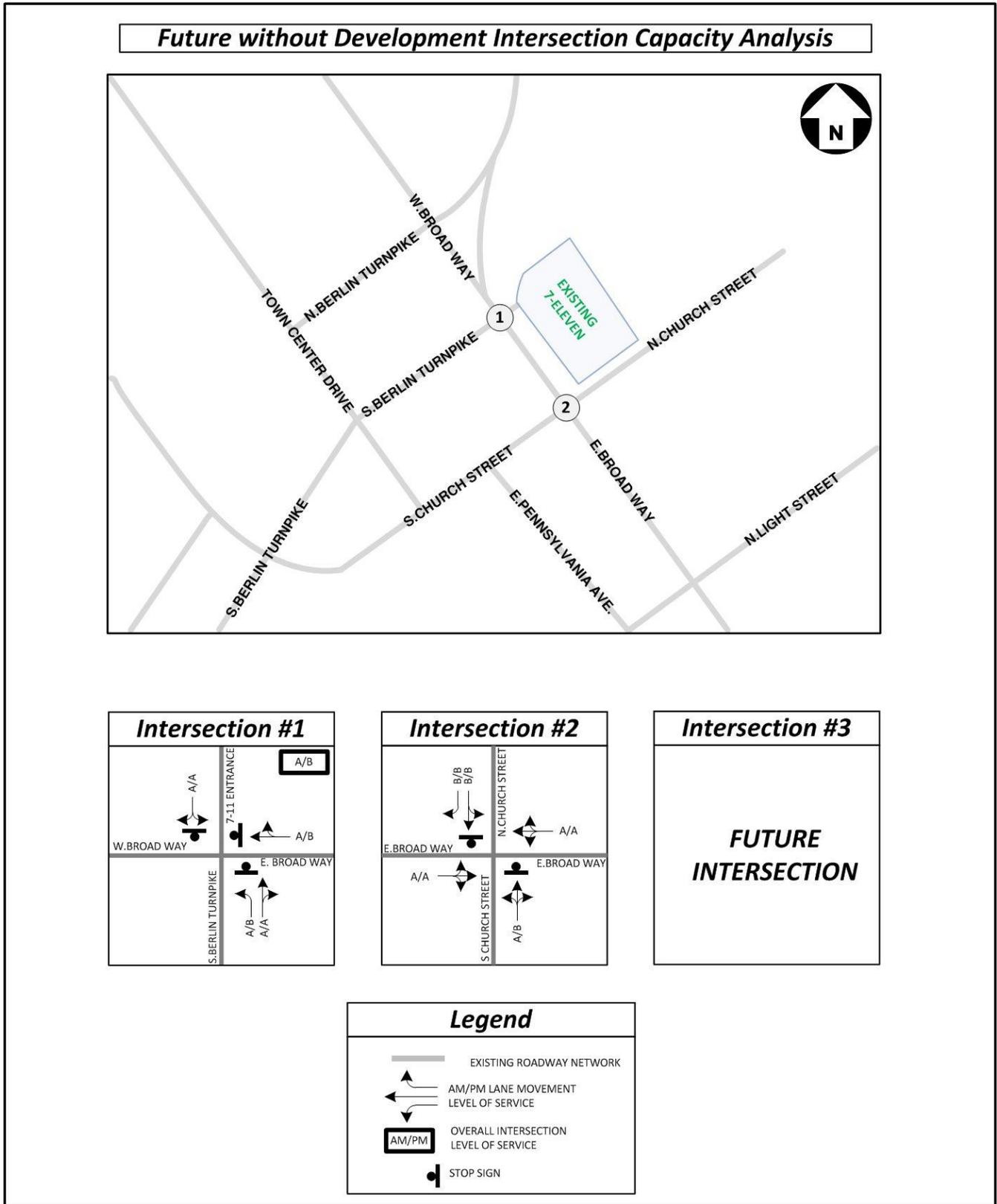


Figure 8: Future (2017) without Development Levels of Service

TRIP GENERATION

As noted earlier, the future development proposal would consist of approximately 3,000 square feet of convenience store with 8 vehicle fueling positions. In order to calculate the trip generation for the proposed 7-Eleven redevelopment, the ITE Trip Generation Manual, 9th Edition was used to determine the trips into and out of the subject site for the weekday morning and afternoon peak hours, as well as the typical weekday daily trips. A convenience store draws a significant proportion of its trips from traffic already on the adjacent roadways. Trips that stop by such a use on the way to another primary destination are termed pass-by trips. Pass-by trips were calculated assuming rates of 63% during the weekday morning peak period and 66% during the weekday afternoon peak period, based on ITE data.

As the current convenience-store-only 7-Eleven will be removed as part of the redevelopment, the existing site-generated peak hour trips from the traffic counts were also taken into account. The daily trip generation for the current store was computed using the ITE trip rate for Convenience Market. Also based on ITE data, a pass-by trip rate of 61% would be expected for the current store and was applied to the existing driveway counts for both the AM and PM peak hours.

Both the ITE data and the existing driveway counts indicate that a Convenience Market generates more trips during the AM peak hour than the PM peak hour. For a Convenience Store with Gasoline Pumps, the PM peak hour is the more intense period. While customer patterns will likely change with the addition of fuel sales, the AM peak hour trip generation for the future use was adjusted upward to present a conservative analysis. The ratio of the proposed total trip generation to the existing total trip generation for the PM peak hour was applied to the AM peak hour ($153 / 117 = 1.31 \times 136 = 178$).

The development's trip generation and pass-by trip adjustments for existing and proposed conditions are shown in Table 5. The existing convenience store generates 136 AM peak hour and 117 PM peak hour trips. The proposed convenience store/gasoline pumps will generate 178 AM peak hour and 153 PM peak hour trips, with the conservative assumptions. Accounting for pass-by trips, the redevelopment would add 13 new AM peak hour and 7 new PM peak hour trips to the surrounding public roadways.

Table 5: Site Trip Generation

| Land Use | ITE Code | Size | ----- Week day ----- | | | | | | | |
|--|----------|---------|----------------------|-----------|-----------|--------------|-----------|-----------|-------|--------------|
| | | | AM Peak Hour | | | PM Peak Hour | | | Daily | |
| | | | In | Out | Total | In | Out | Total | Total | |
| Existing Use | | | | | | | | | | |
| Convenience Market (AM/PM From Counts) | 851 | 2.4 kSF | 70 | 66 | 136 | 57 | 60 | 117 | | 1,760 |
| Pass-by reduction - 61% AM/PM/Daily | | | -43 | -40 | -83 | -35 | -37 | -72 | | -1,074 |
| Total Existing Trips | | | 27 | 26 | 53 | 22 | 23 | 45 | | 686 |
| Proposed Use | | | | | | | | | | |
| Convenience Store with Gasoline Pumps | 853 | 8.0 vfp | 89* | 89* | 178* | 76 | 77 | 153 | | 4,341 |
| Pass-by reduction - 63% AM, 66% PM/Daily | | | -56 | -56 | -112 | -50 | -51 | -101 | | -2,865 |
| Total Proposed Trips | | | 33 | 33 | 66 | 26 | 26 | 52 | | 1,476 |
| Net New Trips (Proposed Minus Existing Trips) | | | | | | | | | | |
| | | | 6 | 7 | 13 | 4 | 3 | 7 | | 790 |

Note: *Proposed AM peak hour trip generation was adjusted upward in proportion to PM peak hour increase.

SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

Site Access

Vehicular access to the proposed 7-Eleven redevelopment will be via two full-access driveways. Access to the property will be provided via the existing driveway which forms the fourth leg of the Broad Way/S. Berlin Turnpike intersection and a new driveway along N. Church Street.

The proposed 7-Eleven store would continue to be served by the sidewalks along E. Broad Way and N. Church Street, and would be located closer to these connections than the current store. The applicant will coordinate with the adjacent homeowners association and park project in the vicinity of Keister Lane to determine if additional pedestrian facilities in that area would be appropriate. As noted previously, pedestrian connectivity is limited north of Keister Lane.

Trip Distribution and Assignment

The distribution of site trips was based on existing traffic patterns, engineering judgment and the nature of the proposed development. The direction of approach was agreed to as part of the scoping documentation. The inbound and outbound trips calculated for the weekday morning and afternoon peak hours were routed through the roadway network to the site. The site direction of approach is illustrated in Figure 9. The trips generated by the site were routed through the roadway network based on the Direction of Approach. The resulting new site trips are illustrated in Figure 10 and the pass-by trips are shown in Figure 11. The trips to and from the existing convenience-store-only 7-Eleven were removed from the road network based on the existing traffic counts and the site's trip distribution. These removed existing site trips are shown in Figure 12.



Figure 9: Direction of Approach

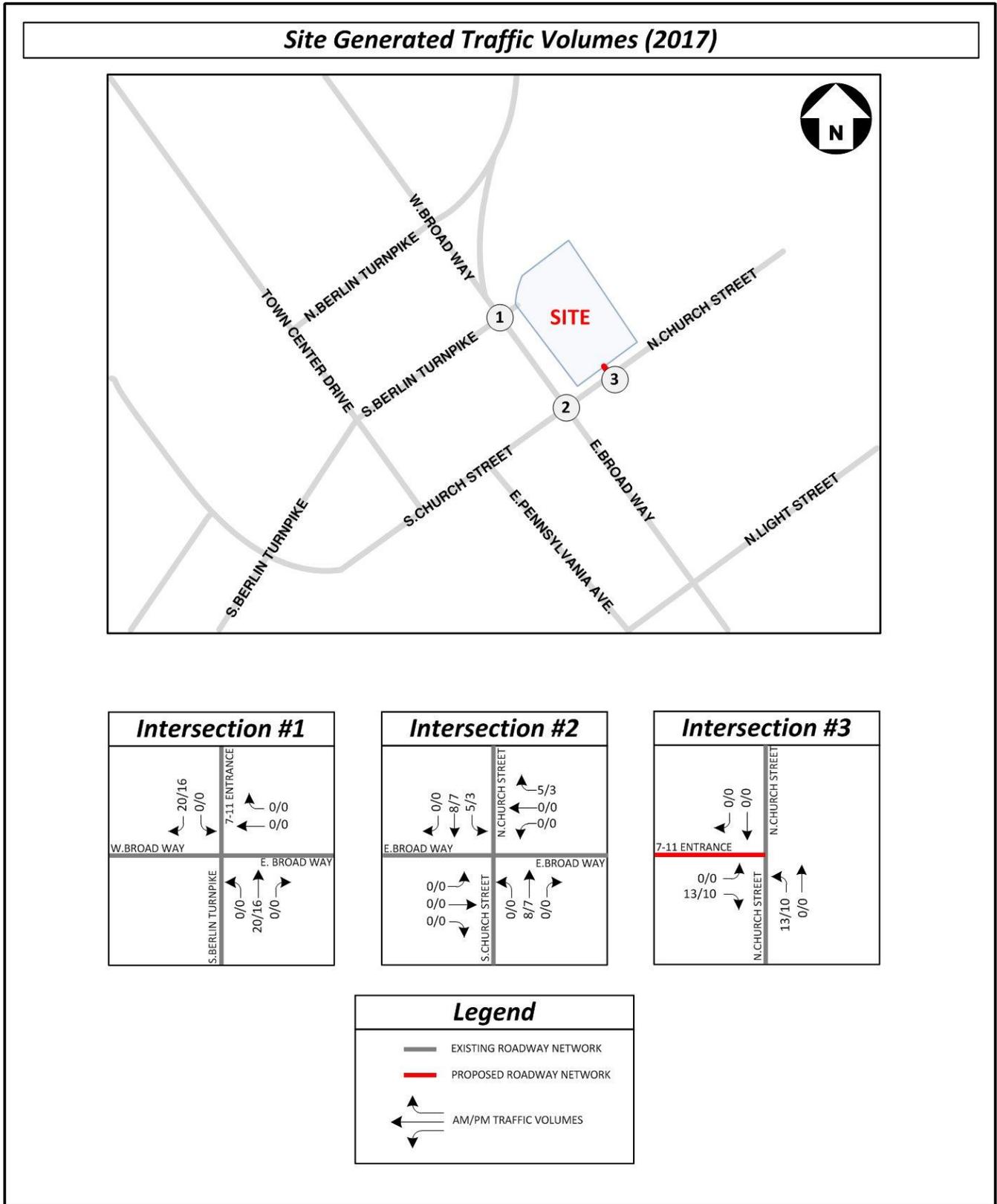


Figure 10: Site Generated Trips

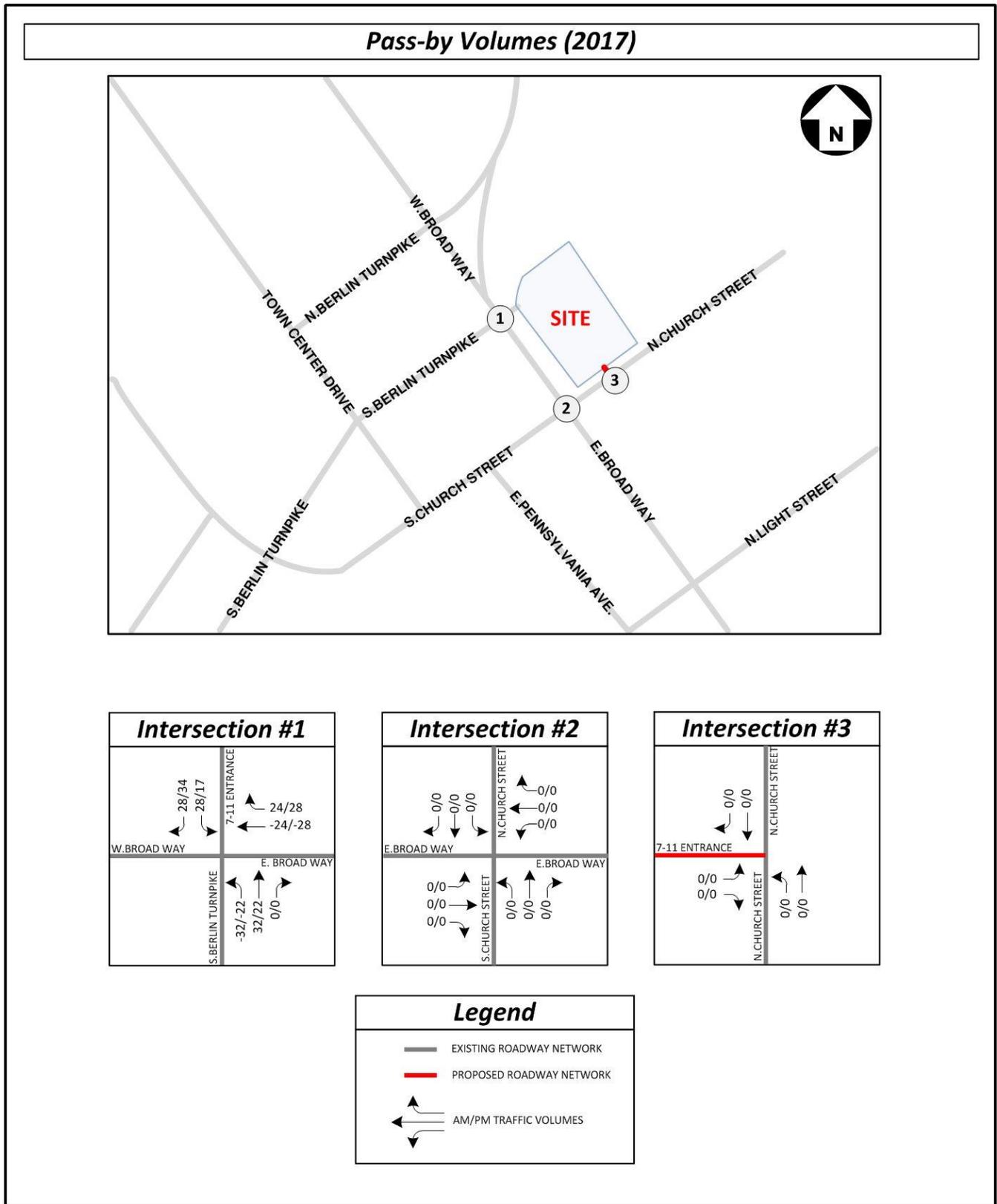


Figure 11: Pass-by Trips

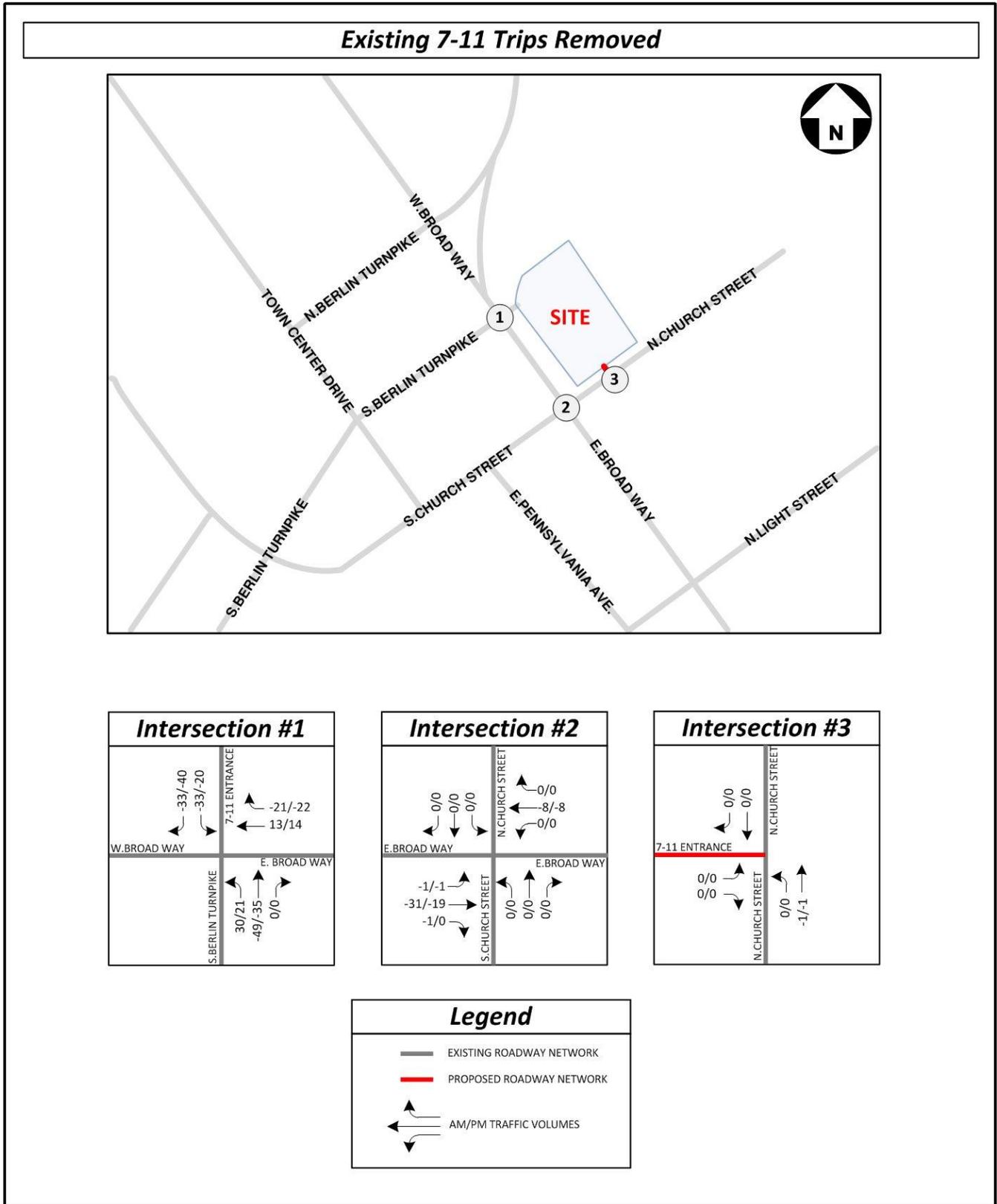


Figure 12: Existing Site Trips Removed

FUTURE (2017) CONDITIONS WITH DEVELOPMENT

Future with Development Traffic Volumes

The trips to and from the existing 7-Eleven development were removed from the network, and the proposed site generated traffic volumes were added to the 2017 future background traffic volumes to project traffic volumes on the roadways in the vicinity of the site under the 2017 future with development conditions. The traffic volumes for the future with development traffic conditions are shown in Figure 13.

Future with Development Capacity Analysis

Synchro, version 8 was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. A future peak hour factor of 0.92 was used in the analysis. The default heavy vehicle percentage of 2% was used for traffic at all study intersections. The capacity and queuing analysis results are shown in Table 6 and Figure 14. The detailed analysis worksheets are contained in Appendix F.

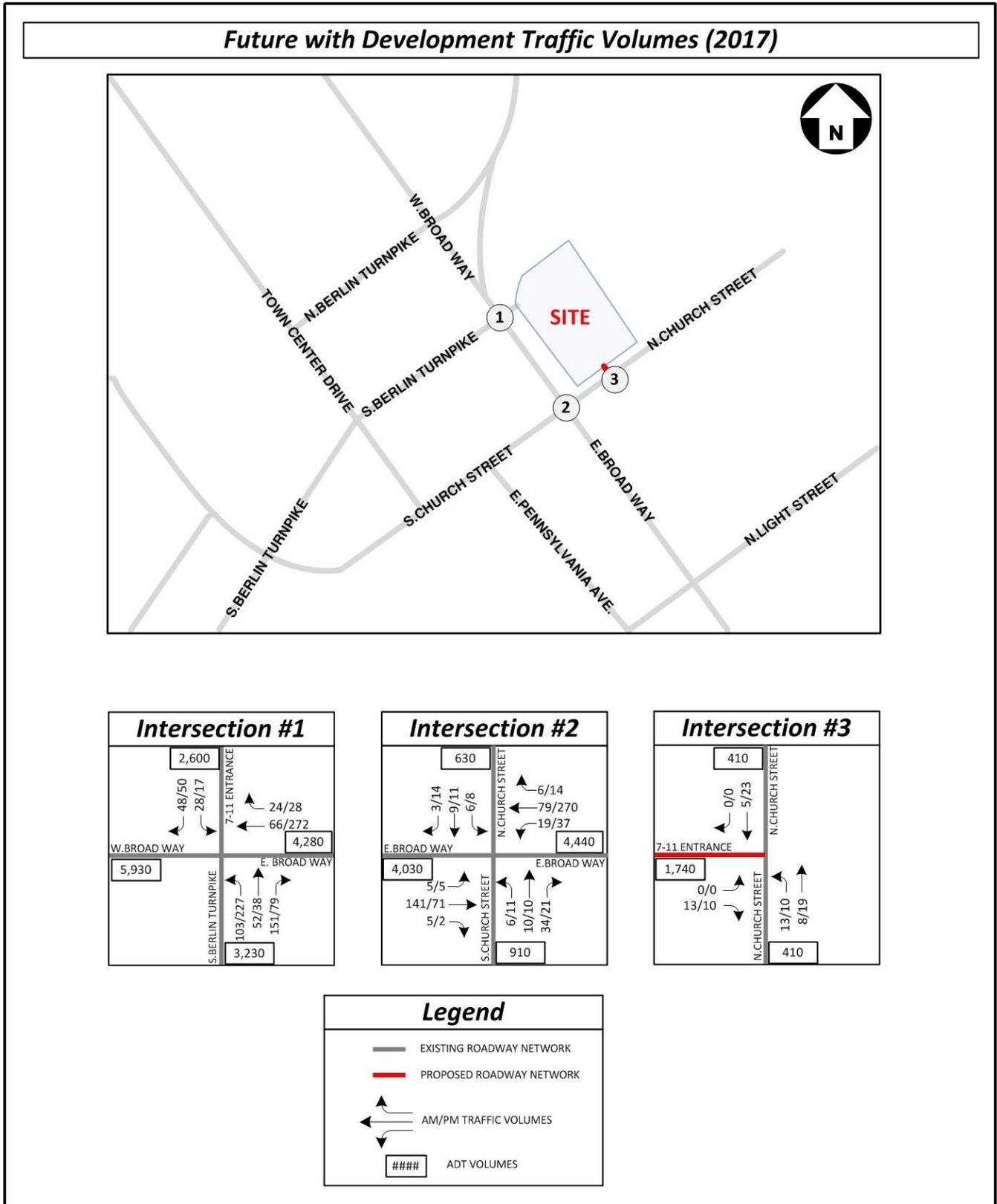


Figure 13: Future with Development (2017) Volumes

Table 6: Total Future (2017) with Development Intersection Capacity Analysis

| Intersection (Movement) | Turn Bay/ Storage Length | Future with Development, 2017 | | | | | |
|---|-----------------------------|-------------------------------|------------------------|----|-----------|------------------------|-----|
| | | AM Peak | | | PM Peak | | |
| | | LOS Delay | 95 th Queue | | LOS Delay | 95 th Queue | |
| 1 S Berlin Turnpike / Existing 7-11 Entrance and E/W Broad Way | | | | | | | |
| Overall Intersection (Unsignalized) | | A | 8.5 | -- | B | 11.4 | -- |
| Westbound Approach | 135' | A | 8.4 | 10 | B | 12.1 | 58 |
| Northbound Left | 260' | A | 9.1 | 15 | B | 12.8 | 50 |
| Northbound Thru/Right | 260' | A | 8.5 | 25 | A | 8.8 | 15 |
| Southbound Approach | | A | 7.8 | 8 | A | 8.6 | 8 |
| 2 E Broad Way and N/S Church Street | | | | | | | |
| Overall Intersection (Unsignalized) | | n/a | n/a | -- | n/a | n/a | -- |
| Eastbound Approach | 135' | A | 0.3 | 0 | A | 0.5 | 0 |
| Westbound Approach | 330' | A | 1.5 | 1 | A | 1.1 | 2 |
| Northbound Approach | 155' | A | 10.0 | 6 | B | 11.2 | 6 |
| Southbound Thru/Left | 175' | B | 11.3 | 2 | B | 13.1 | 3 |
| Southbound Right | 175' | A | 8.7 | 0 | A | 10.0 | 2 |
| 3 N Church St and Proposed 7-11 Drive | | | | | | | |
| Overall Intersection (Unsignalized) | | n/a | n/a | -- | n/a | n/a | -- |
| Eastbound Approach | | A | 8.4 | 1 | A | 8.4 | 1 |
| Northbound Approach | 175' | A | 4.5 | 1 | A | 2.5 | 1 |
| 4 N Berlin Turnpike and W Broad Way | | | | | | | |
| Westbound Left | 178' | -- | -- | 7 | -- | -- | 5 |
| Westbound Thru/Right | 178' | -- | -- | 24 | -- | -- | 108 |

Under future conditions with the redevelopment of the 7-Eleven, the study intersections will continue to operate at acceptable levels of service during both the weekday AM and PM peak hours. The westbound queues at the intersection of N. Berlin Turnpike and W. Broad Way do not exceed the available storage length under the future with development conditions.

Given the small increase in peak hour trips projected with the 7-Eleven redevelopment, no significant increase in the crash rate would be expected at the study intersections.

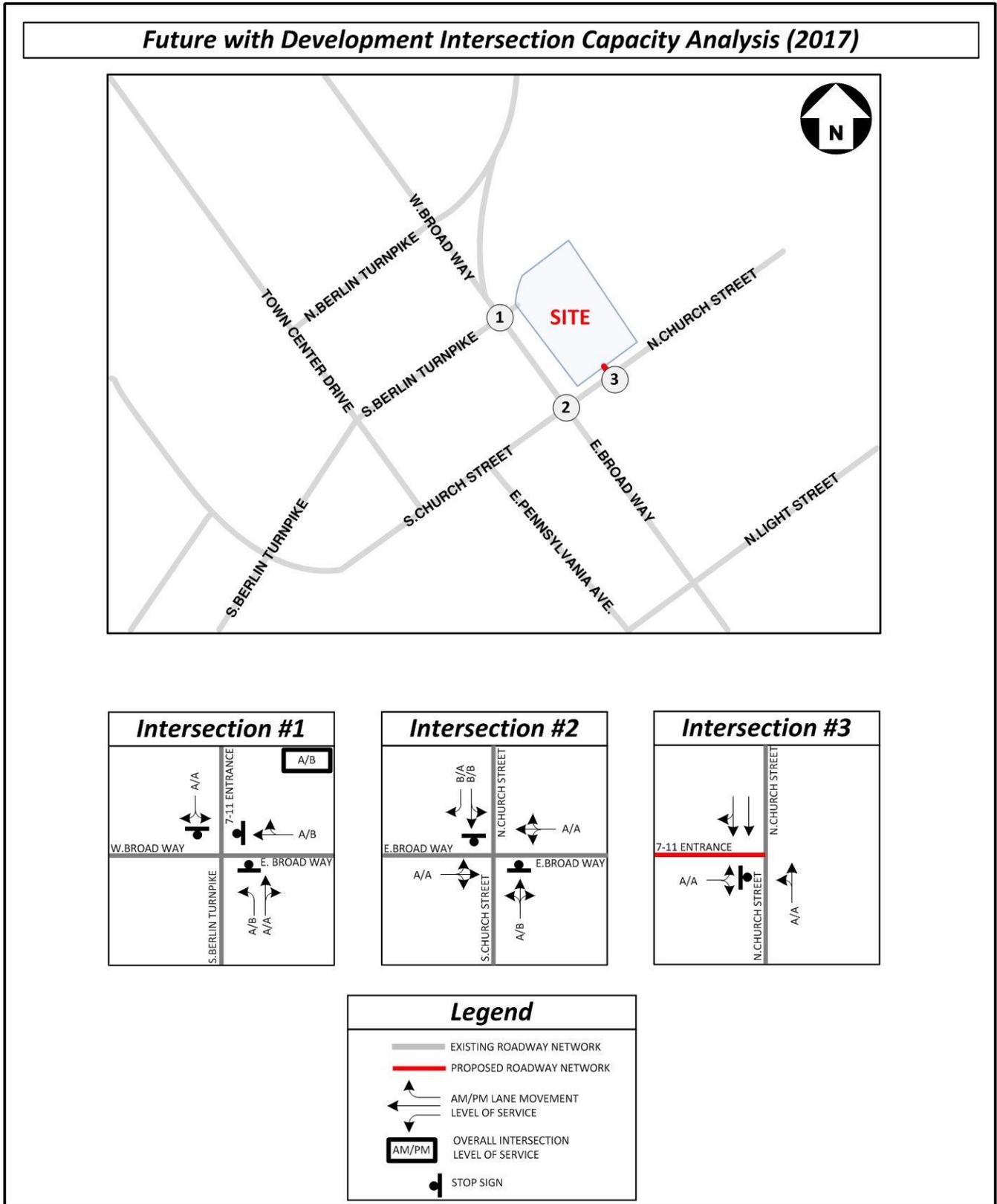


Figure 14: Total Future (2017) with Development Levels of Service

CONCLUSIONS

This report presents the findings of an operations traffic impact analysis for the proposed 7-Eleven to be located at the north corner of the North Church Street/East Broad Way intersection in the Town of Lovettsville, Virginia. The project is a reconstruction of an existing, convenience-store-only 7-Eleven that is approximately 2,385 square feet to a building of 3,000 square feet with 8 vehicle fueling positions. Access to the property will be via two full access driveways. The existing driveway which forms the fourth leg of the Broad Way/South Berlin Turnpike intersection will remain and a new driveway is proposed along North Church Street. Construction is planned to be complete in 2017.

The analysis presents the existing conditions (2015), future conditions without the proposed 7-Eleven redevelopment (2017), and future conditions with the proposed 7-Eleven redevelopment (2017) and supports the following major conclusions:

Existing Conditions (2015)

Under existing conditions, all of the study intersections operate at acceptable levels of service (LOS D or better) during the weekday AM and PM peak hours. The westbound queues on W. Broad Way at the intersection with N. Berlin Turnpike do not extend beyond the available storage.

Future Conditions without Development (2017)

Regional traffic growth and trips generated by the Lovettsville Town Square commercial development were added to the existing traffic counts to determine conservative traffic volumes in 2017 without the proposed redevelopment. Under future without development conditions, all of the study intersections continue to operate at acceptable levels of service during the weekday peak hours. The westbound queues at the intersection of N. Berlin Turnpike and W. Broad Way do not extend beyond the available storage.

Future Conditions with Development (2017)

Trip generation calculations for the proposed 7-Eleven with fuel sales were adjusted upward to present conservative traffic forecasts with the redevelopment. Under future with development conditions, all of the study intersections continue to operate at acceptable levels of service during the weekday AM and PM peak hours. The westbound queues at the intersection of N. Berlin Turnpike and W. Broad Way do not extend beyond the available storage. Thus, the levels of service with the proposed 7-Eleven would be consistent with existing conditions and no traffic mitigation measures would be required to accommodate development of the proposed convenience store and fuel sales.

TECHNICAL APPENDIX

TECHNICAL APPENDIX TABLE OF CONTENTS

Appendix A: Scoping Document

Appendix B: Existing (2015) Traffic Volumes & Count Sheets

Appendix C: Level of Service Definitions

Appendix D: Intersection Capacity Analysis - Existing Conditions (2015)

Appendix E: Intersection Capacity Analysis - Future without Development Condition (2017)

Appendix F: Intersection Capacity Analysis - Future with Development Condition (2017)

APPENDIX A

SCOPING DOCUMENT

PRE-SCOPE OF WORK MEETING FORM

Information on the Project Traffic Impact Analysis Base Assumptions

The applicant is responsible for entering the relevant information and submitting the form to VDOT and the locality no less than three (3) business days prior to the meeting. If a form is not received by this deadline, the scope of work meeting may be postponed.

| Contact Information | | | | |
|---|---|--|---|--|
| Consultant Name: Tele: E-mail: | Chad Baird, Gorove/Slade Associates, Inc. 571-248-0992 chad.baird@goroveslade.com | | | |
| Developer/Owner Name: Tele: E-mail: | Ashley Ballard, Vertical Construction Management 817-328-0507 Aballard@Verticalcm.com | | | |
| Project Information | | | | |
| Project Name: | Lovettsville 7-Eleven | Locality/County: | Town of Lovettsville | |
| Project Location: (See Figure 1) | The proposed development is located at the north corner of the North Church Street/East Broad Way intersection in the Town of Lovettsville, Virginia. | | | |
| Submission Type | Comp Plan <input type="checkbox"/> | Rezoning <input type="checkbox"/> | Site Plan <input checked="" type="checkbox"/> | Subd Plat <input type="checkbox"/> |
| Project Description: (Including details on the land use, acreage, phasing, access location, etc. Attach additional sheet if necessary) | The project is a reconstruction of an existing, convenience store only 7-Eleven that is approximately 2,385 square feet and currently sits near the center of the property along the eastern side of the property to a building of 2,940 square feet with 8 vehicle fueling positions. Access to the property will be via two full access driveways. One existing driveway will remain and forms the fourth leg of the Broad Way/S. Berlin Pike intersection and the proposed new driveway will be located off North Church Street. | | | |
| Proposed Use(s): (Check all that apply; attach additional pages as necessary) | Residential <input type="checkbox"/> | Commercial <input checked="" type="checkbox"/> | Mixed Use <input type="checkbox"/> | Other <input type="checkbox"/> |
| | Residential Uses(s) Number of Units: _____ ITE LU Code(s): _____ _____ _____ Commercial Use(s) ITE LU Code(s): <u>853</u> Square Ft or Other Variable: <u>VFP</u> | | Other Use(s) ITE LU Code(s): _____ _____ Independent Variable(s): _____ _____ _____ | |
| Total Peak Hour Trip Projection: | Less than 100 <input checked="" type="checkbox"/> | 100 – 499 <input type="checkbox"/> | 500 – 999 <input type="checkbox"/> | 1,000 or more <input type="checkbox"/> |

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

Traffic Impact Analysis Assumptions

| | | | |
|--|---|---|--|
| Study Period | Existing Year: 2015 | Build-out Year: 2017 | Design Year: N/A |
| Study Area Boundaries (See Figure 1) | North: N Berlin Pike (Route 287) | South: North Church Street | |
| | East: U.S. Post Office Driveway | West: East Broad Way | |
| External Factors That Could Affect Project (Planned road improvements, other nearby developments) | Will include Lovettsville Town Square development. | | |
| Consistency With Comprehensive Plan (Land use, transportation plan) | Consistent with proposed Text Amendment. | | |
| Available Traffic Data (Historical, forecasts) | VDOT Historical AADT Data | | |
| Trip Distribution (Please refer to attached Figure 2) | Road Name: N Berlin Pike (from North) – 35% | Road Name: E Broad Way (from East) – 15% | |
| | Road Name: S Berlin Pike (from South) – 40% | Road Name: Town Center Drive – 5% | |
| | Road Name: W Broad Way (from West) – 5% | Road Name: | |
| Annual Vehicle Trip Growth Rate: | 1.0% (See Table 1) | Peak Period for Study (check all that apply) | <input checked="" type="checkbox"/> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/> SAT |
| | | Peak Hour of the Generator (Table 2) | 133 AM 153 PM 4,341 Daily Trips 49 AM, 52 PM, and 1,476 Daily Trips after pass-by |
| Study Intersections and/or Road Segments (Attach additional sheets as necessary) Please refer to attached Figure 2 | 1. N/S Church Street and E Broad Way | 6. | |
| | 2. S Berlin Pike and E/W Broad Way | 7. | |
| | 3. N. Church Street/Site Driveway (TF only) | 8. | |
| | 4. | 9. | |
| | 5. | 10. | |
| Trip Adjustment Factors | Internal allowance: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Reduction: | Pass-by allowance: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Reduction: 63% AM, 66% PM & Daily | |
| Software Methodology | <input checked="" type="checkbox"/> Synchro <input type="checkbox"/> HCS (v.2000/+) <input type="checkbox"/> aaSIDRA <input type="checkbox"/> CORSIM <input type="checkbox"/> Other _____ | | |
| Traffic Signal Proposed or Affected (Analysis software to be used, progression speed, cycle length) | No traffic signals within the study area. | | |
| | Analysis Software: Synchro version 8 | | Results: HCM methodology |
| Improvement(s) Assumed or to be Considered | Improvements required to mitigate site or background trips will be identified. | | |

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

| | |
|---------------------------------------|--|
| Background Traffic Studies Considered | Lovettsville Town Square, if available. |
| Plan Submission | <input type="checkbox"/> Master Development Plan (MDP) <input checked="" type="checkbox"/> Generalized Development Plan (GDP) <input type="checkbox"/> Preliminary/Sketch Plan <input type="checkbox"/> Other Plan type (Final Site, Subd. Plan) |
| Additional Issues to be Addressed | <input checked="" type="checkbox"/> Queuing analysis <input type="checkbox"/> Actuation/Coordination <input type="checkbox"/> Weaving analysis <input type="checkbox"/> Merge analysis <input checked="" type="checkbox"/> Bike/Ped Accommodations <input type="checkbox"/> Intersection(s) <input type="checkbox"/> TDM Measures <input type="checkbox"/> Other _____ |

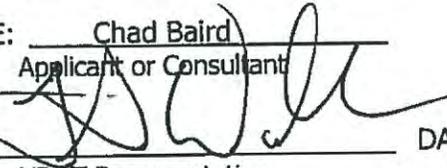
NOTES on ASSUMPTIONS:

1. The scenarios to be included in the study are Existing (2015), Future without Development (2017), and Future with Development (2017).
2. Existing peak hour factors in the range of 0.85 to 1.00 will be used for existing scenarios. The default peak hour factor of 0.92 will be used for all future scenarios unless the existing peak hour factor is greater. The greater value will be used.
3. Default heavy vehicle percentage of 2% will be used for all movements.
4. For any approach LOS D or better would be considered as acceptable/desirable traffic operation condition. For all approaches, the projected future conditions without development LOS and delay will be maintained in the future with development condition. Will show intersection, approach, and movement LOS.
5. Will provide both 95th percentile queues.
6. Trips generated by the existing store to be removed will be based on the actual traffic counts, rather than the ITE estimate shown in Table 2.
7. For the future with redevelopment scenario, the additional site driveway on North Church Street will also be analyzed.
8. Crash data and expected safety impacts from the site will be included in the TIA.
9. Discussion of existing and future pedestrian and bicycle accommodations will be included.
10. Interaction of S. Berlin Pike/Broad Way and N. Berlin Pike/W. Broad Way intersections will be addressed in the TIA. Queuing on westbound W. Broad Way will be analyzed and included. As S. Berlin Pike/Broad Way is an all-way stop intersection, no weaving or merging conditions would exist on the downstream road segment.

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

SIGNED:  DATE: 11/5/2015
Applicant or Consultant

PRINT NAME: Chad Baird
Applicant or Consultant


SIGNED: _____ DATE: 11/12/2015
VDOT Representative

PRINT NAME: THOMAS B. WALKER
VDOT Representative


SIGNED: _____ DATE: 11/12/2015
Local Government Representative

PRINT NAME: JOCINA A. BATEMAN
Local Government Representative

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

Table 1: Historic Growth

| Road Segment | From | To | VDOT AADT | | | | | Growth Rate | | | |
|--------------|------------------|----------------|-----------|-------|-------|-------|-------|-------------|-----------|-----------|-----------|
| | | | 2010 | 2011 | 2012 | 2013 | 2014 | 2010-2014 | 2011-2014 | 2012-2014 | 2013-2014 |
| W Broad Way | WCL Lovettsville | Berlin Tpke | 1,300 | 1,200 | 1,200 | 1,200 | 1,500 | 0.03% | 0.13% | 0.08% | 0.08% |
| E Broad Way | Berlin Tpke | Loudoun Street | 3,000 | 3,300 | 3,200 | 3,200 | 3,500 | 0.03% | 0.03% | 0.03% | 0.03% |

1.0% growth assumed

Table 2: Trip Generation

| Land Use | ITE Code | Size | ----- Weekday ----- | | | | | | | | |
|--|----------|---------|---------------------|-----------|------------|--------------|-----------|-----------|--------------|--|--|
| | | | AM Peak Hour | | | PM Peak Hour | | | Daily | | |
| | | | In | Out | Total | In | Out | Total | Total | | |
| Existing Use | | | | | | | | | | | |
| Convenience Market | 851 | 2.4 kSF | 80 | 80 | 160 | 64 | 61 | 125 | 1,760 | | |
| Pass-by reduction - 63% AM, 66% PM/Daily | | | 50 | -50 | -101 | -42 | -40 | -82 | -1,162 | | |
| Total Existing Trips | | | 30 | 30 | 59 | 22 | 21 | 42 | 598 | | |
| Proposed Use | | | | | | | | | | | |
| Convenience Store with Gasoline Pumps | 853 | 8.0 vfp | 66 | 67 | 133 | 76 | 77 | 153 | 4,341 | | |
| Pass-by reduction - 63% AM, 66% PM/Daily | | | 42 | -42 | -84 | -50 | -51 | -101 | -2,865 | | |
| Total Proposed Trips | | | 24 | 25 | 49 | 26 | 26 | 52 | 1,476 | | |
| Net New Trips (Proposed Minus Existing Trips) | | | -5 | -5 | -10 | 4 | 5 | 9 | 877 | | |

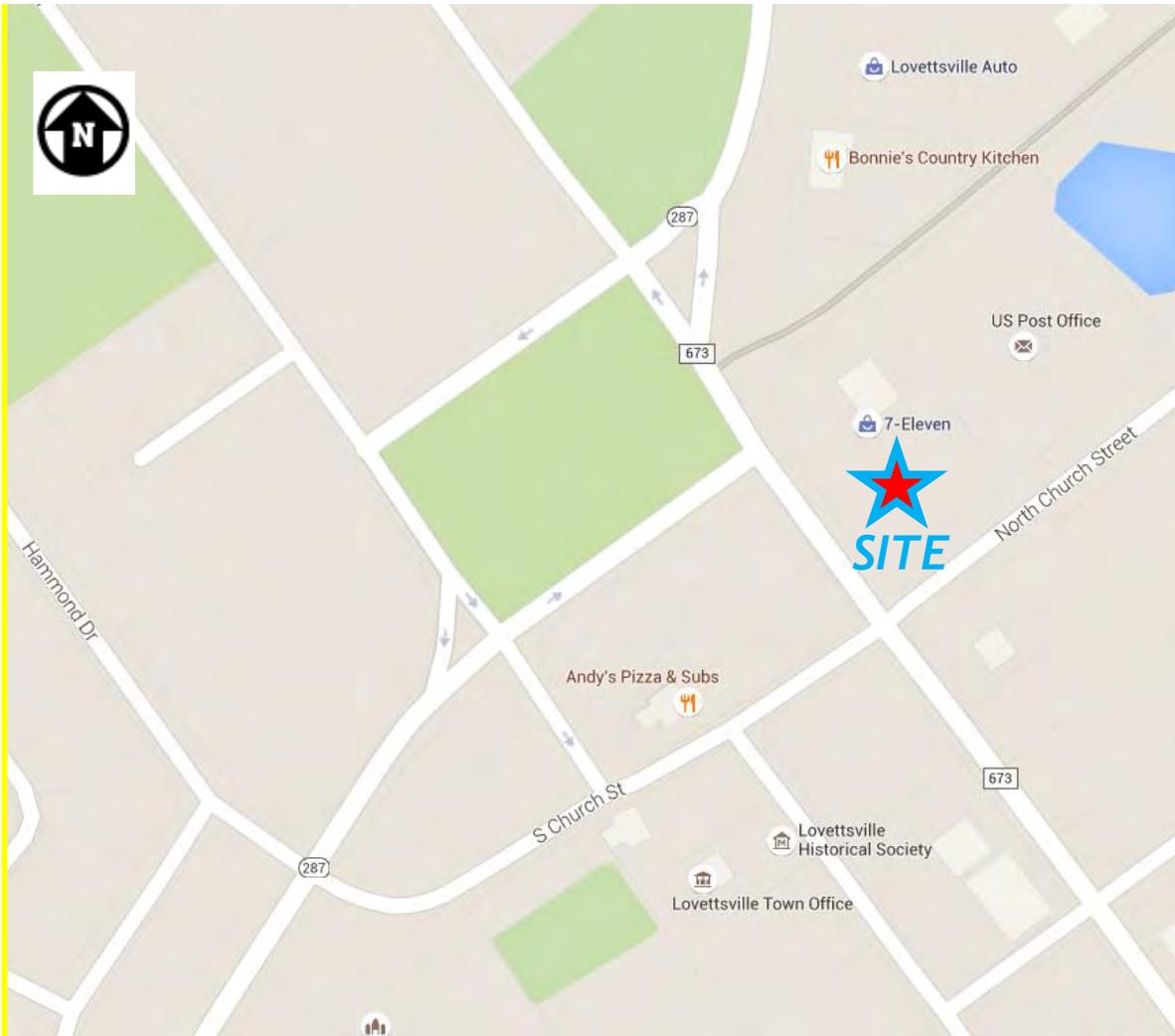


Figure 1: Area Map



Figure 2: Study Intersections and Direction of Approach



Figure 3: Concept Plan

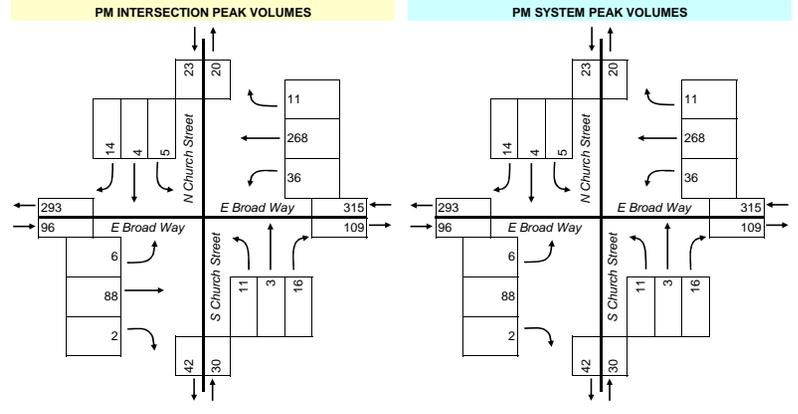
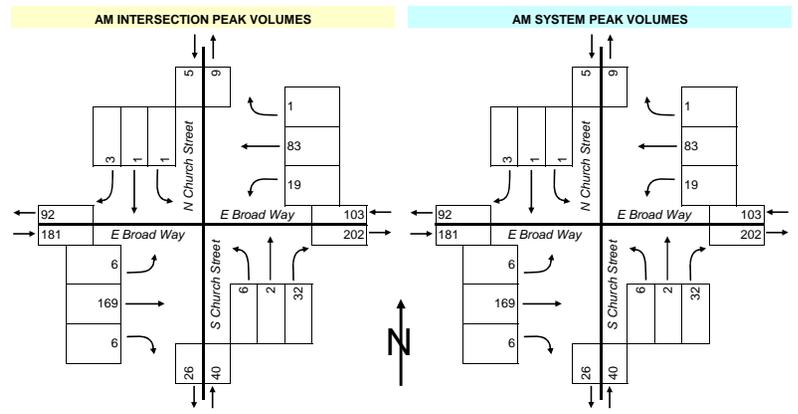
APPENDIX B

EXISTING (2015) TRAFFIC VOLUMES & COUNT SHEETS

Project Name : Lovettsville, 7-11
 Project # : 2581-003
 Location : Lovettsville
 Data Source: Gorove/Slade Associates, Inc.

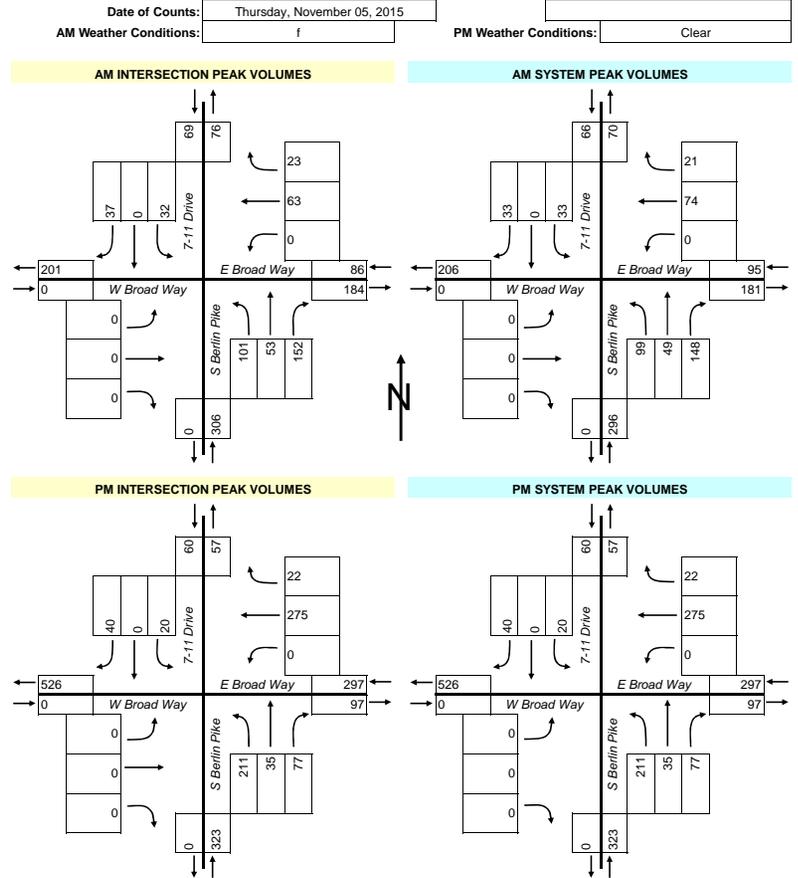
| Intersection: | | E Broad Way and N/S Church Street | | | | | | | | | | | | | | | |
|----------------------------------|-------------------------------|-----------------------------------|------|-------------|-------------|-------------|------|-------------|--------------------------------|-----------------|------|-------------|-------------|-------------|------|-------------|------|
| AM PEAK | Direction: | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | |
| | Roadway: | N Church Street | | | | E Broad Way | | | | S Church Street | | | | E Broad Way | | | |
| | Movement: | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds |
| 6:00 AM to 6:15 AM | | 1 | 0 | 0 | 0 | 0 | 7 | 2 | 0 | 3 | 0 | 0 | 0 | 2 | 29 | 0 | 1 |
| 6:15 AM to 6:30 AM | | 1 | 0 | 0 | 0 | 0 | 6 | 1 | 0 | 6 | 0 | 0 | 0 | 1 | 25 | 2 | 0 |
| 6:30 AM to 6:45 AM | | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 0 | 7 | 0 | 0 | 0 | 1 | 30 | 0 | 0 |
| 6:45 AM to 7:00 AM | | 0 | 0 | 0 | 0 | 0 | 16 | 2 | 0 | 6 | 0 | 0 | 0 | 1 | 44 | 3 | 0 |
| 7:00 AM to 7:15 AM | | 1 | 0 | 1 | 0 | 1 | 16 | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 37 | 1 | 0 |
| 7:15 AM to 7:30 AM | | 0 | 0 | 0 | 2 | 0 | 16 | 3 | 0 | 6 | 0 | 0 | 0 | 0 | 52 | 1 | 0 |
| 7:30 AM to 7:45 AM | | 1 | 0 | 0 | 0 | 0 | 22 | 2 | 0 | 15 | 1 | 2 | 0 | 3 | 44 | 2 | 0 |
| 7:45 AM to 8:00 AM | | 1 | 0 | 1 | 0 | 0 | 23 | 12 | 0 | 6 | 1 | 1 | 0 | 2 | 40 | 2 | 0 |
| 8:00 AM to 8:15 AM | | 1 | 1 | 0 | 0 | 1 | 22 | 2 | 0 | 5 | 0 | 3 | 0 | 1 | 33 | 1 | 0 |
| 8:15 AM to 8:30 AM | | 0 | 0 | 1 | 0 | 0 | 18 | 2 | 0 | 8 | 0 | 1 | 2 | 0 | 41 | 0 | 0 |
| 8:30 AM to 8:45 AM | | 2 | 0 | 0 | 0 | 1 | 32 | 8 | 0 | 13 | 0 | 1 | 0 | 0 | 31 | 2 | 0 |
| 8:45 AM to 9:00 AM | | 0 | 0 | 2 | 0 | 1 | 22 | 1 | 0 | 3 | 1 | 1 | 2 | 0 | 12 | 2 | 1 |
| PM PEAK | Direction: | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | |
| | Roadway: | N Church Street | | | | E Broad Way | | | | S Church Street | | | | E Broad Way | | | |
| | Movement: | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds |
| 4:00 PM to 4:15 PM | | 3 | 1 | 2 | 0 | 5 | 50 | 2 | 0 | 10 | 2 | 2 | 0 | 1 | 26 | 3 | 0 |
| 4:15 PM to 4:30 PM | | 11 | 0 | 1 | 0 | 3 | 58 | 6 | 0 | 4 | 1 | 5 | 0 | 0 | 17 | 4 | 0 |
| 4:30 PM to 4:45 PM | | 4 | 1 | 2 | 0 | 1 | 61 | 7 | 0 | 4 | 1 | 6 | 5 | 0 | 24 | 4 | 0 |
| 4:45 PM to 5:00 PM | | 4 | 0 | 1 | 1 | 2 | 78 | 10 | 0 | 3 | 1 | 1 | 3 | 0 | 18 | 0 | 3 |
| 5:00 PM to 5:15 PM | | 4 | 1 | 0 | 0 | 4 | 63 | 12 | 0 | 6 | 1 | 2 | 0 | 0 | 23 | 1 | 0 |
| 5:15 PM to 5:30 PM | | 2 | 2 | 2 | 1 | 4 | 66 | 7 | 0 | 3 | 0 | 2 | 0 | 2 | 23 | 1 | 0 |
| 5:30 PM to 5:45 PM | | 2 | 1 | 1 | 0 | 3 | 74 | 3 | 0 | 6 | 1 | 3 | 2 | 0 | 17 | 2 | 0 |
| 5:45 PM to 6:00 PM | | 3 | 1 | 1 | 0 | 1 | 55 | 15 | 0 | 6 | 0 | 3 | 0 | 1 | 18 | 2 | 0 |
| 6:00 PM to 6:15 PM | | 2 | 0 | 0 | 2 | 1 | 61 | 11 | 0 | 10 | 0 | 3 | 0 | 2 | 15 | 0 | 0 |
| 6:15 PM to 6:30 PM | | 0 | 0 | 0 | 0 | 0 | 47 | 9 | 0 | 3 | 1 | 2 | 1 | 1 | 16 | 0 | 0 |
| 6:30 PM to 6:45 PM | | 2 | 1 | 0 | 0 | 0 | 33 | 6 | 0 | 5 | 1 | 1 | 5 | 0 | 13 | 0 | 0 |
| 6:45 PM to 7:00 PM | | 0 | 1 | 0 | 0 | 1 | 29 | 3 | 0 | 1 | 1 | 3 | 1 | 0 | 13 | 0 | 0 |
| PEAK HOURS | Direction: | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | |
| Roadway: | N Church Street | | | | E Broad Way | | | | S Church Street | | | | E Broad Way | | | | |
| Movement: | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | |
| AM INTERSECTION PEAK HOUR | | | | | | | | | | | | | | | | | |
| 7:15 AM to 8:15 AM | | 3 | 1 | 1 | 2 | 1 | 83 | 19 | 0 | 32 | 2 | 6 | 0 | 6 | 169 | 6 | 0 |
| PM INTERSECTION PEAK HOUR | | | | | | | | | | | | | | | | | |
| 4:30 PM to 5:30 PM | | 14 | 4 | 5 | 2 | 11 | 268 | 36 | 0 | 16 | 3 | 11 | 8 | 2 | 88 | 6 | 3 |
| AM SYSTEM PEAK HOUR | | | | | | | | | | | | | | | | | |
| 7:15 AM to 8:15 AM | | 3 | 1 | 1 | 2 | 1 | 83 | 19 | 0 | 32 | 2 | 6 | 0 | 6 | 169 | 6 | 0 |
| PM SYSTEM PEAK HOUR | | | | | | | | | | | | | | | | | |
| 4:30 PM to 5:30 PM | | 14 | 4 | 5 | 2 | 11 | 268 | 36 | 0 | 16 | 3 | 11 | 8 | 2 | 88 | 6 | 3 |
| PEAK HOUR FACTORS | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | | |
| | N Church Street | | | | E Broad Way | | | | S Church Street | | | | E Broad Way | | | | |
| AM Peak Hour | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach | |
| AM PEAK HOUR | 0.75 | 0.25 | 0.25 | 0.63 | 0.25 | 0.90 | 0.40 | 0.74 | 0.53 | 0.50 | 0.50 | 0.56 | 0.50 | 0.50 | 0.81 | 0.85 | |
| PM Peak Hour | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach | |
| PM PEAK HOUR | 0.88 | 0.50 | 0.63 | 0.82 | 0.69 | 0.86 | 0.75 | 0.88 | 0.67 | 0.75 | 0.46 | 0.68 | 0.25 | 0.92 | 0.38 | 0.86 | |
| | Overall AM PEAK HOUR FACTOR = | | | | 0.89 | | | | Overall PM PEAK HOUR FACTOR = | | | | 0.98 | | | | |
| AM Period Intersection Volume: | 800 | | | | | | | | PM Period Intersection Volume: | | | | 1198 | | | | |

Date of Counts: Thursday, November 05, 2015
 AM Weather Conditions: Clear
 PM Weather Conditions: Clear



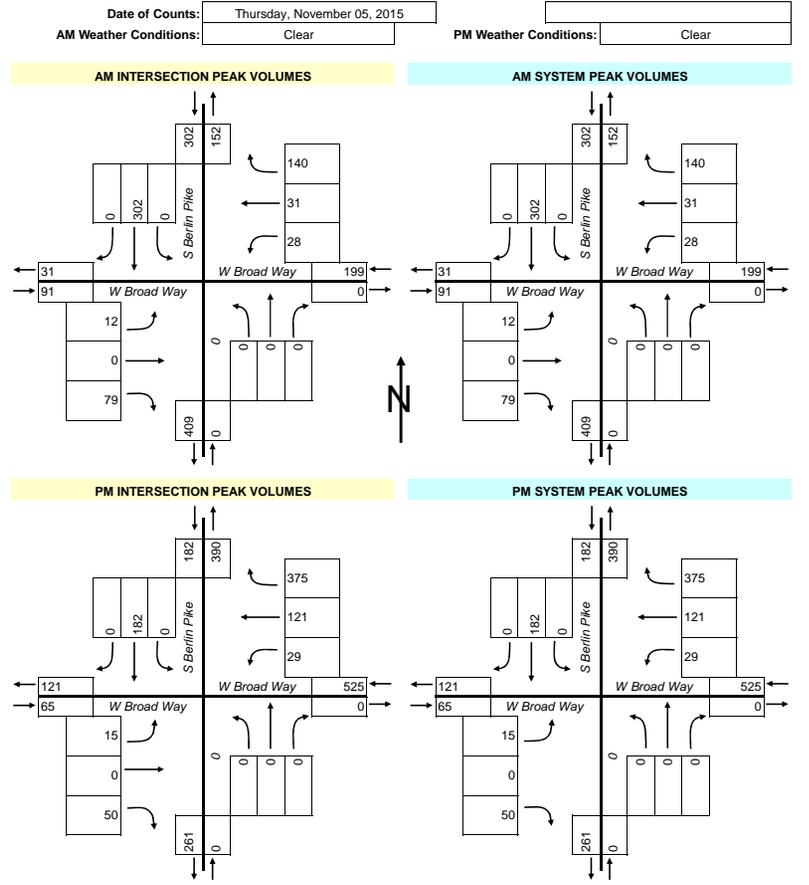
Project Name : Lovettsville, 7-11
 Project # : 2581-003
 Location : Lovettsville
 Data Source: Gorove/Slade Associates, Inc.

| Intersection: | | E/W Broad Way and S Berlin Pike/7-11 Drive | | | | | | | | | | | | | | | | | | | |
|--------------------------------|--|--|------|------|-------------|--------------------------------|------|------|-------------|-----------------------------|------|------|-------------|-------------|------|------|----------------|------|--|--|--|
| AM PEAK | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | | | | | |
| Direction: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Roadway: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Movement: | | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | | | | |
| 6:00 AM to 6:15 AM | | 2 | 0 | 9 | 0 | 3 | 4 | 0 | 0 | 21 | 9 | 13 | 0 | 0 | 0 | 0 | 0 | | | | |
| 6:15 AM to 6:30 AM | | 3 | 0 | 7 | 0 | 2 | 5 | 0 | 0 | 22 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | | | | |
| 6:30 AM to 6:45 AM | | 2 | 0 | 8 | 0 | 1 | 3 | 0 | 0 | 22 | 7 | 19 | 0 | 0 | 0 | 0 | 0 | | | | |
| 6:45 AM to 7:00 AM | | 7 | 0 | 5 | 0 | 4 | 12 | 0 | 0 | 43 | 11 | 19 | 0 | 0 | 0 | 0 | 0 | | | | |
| 7:00 AM to 7:15 AM | | 12 | 0 | 6 | 0 | 8 | 9 | 0 | 0 | 33 | 14 | 26 | 1 | 0 | 0 | 0 | 0 | | | | |
| 7:15 AM to 7:30 AM | | 3 | 0 | 8 | 0 | 1 | 15 | 0 | 0 | 44 | 15 | 28 | 0 | 0 | 0 | 0 | 1 | | | | |
| 7:30 AM to 7:45 AM | | 9 | 0 | 12 | 0 | 8 | 17 | 0 | 0 | 37 | 11 | 23 | 0 | 0 | 0 | 0 | 1 | | | | |
| 7:45 AM to 8:00 AM | | 13 | 0 | 6 | 0 | 6 | 22 | 0 | 0 | 38 | 13 | 24 | 0 | 0 | 0 | 0 | 0 | | | | |
| 8:00 AM to 8:15 AM | | 8 | 0 | 7 | 0 | 6 | 20 | 0 | 0 | 29 | 10 | 24 | 0 | 0 | 0 | 0 | 0 | | | | |
| 8:15 AM to 8:30 AM | | 5 | 0 | 1 | 1 | 1 | 18 | 0 | 0 | 40 | 4 | 16 | 1 | 0 | 0 | 0 | 1 | | | | |
| 8:30 AM to 8:45 AM | | 8 | 0 | 4 | 0 | 6 | 29 | 0 | 0 | 29 | 9 | 26 | 0 | 0 | 0 | 0 | 0 | | | | |
| 8:45 AM to 9:00 AM | | 7 | 0 | 3 | 0 | 5 | 19 | 0 | 0 | 11 | 6 | 31 | 0 | 0 | 0 | 0 | 0 | | | | |
| PM PEAK | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | | | | | |
| Direction: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Roadway: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Movement: | | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | | | | |
| 4:00 PM to 4:15 PM | | 4 | 0 | 6 | 0 | 1 | 53 | 0 | 0 | 23 | 1 | 33 | 0 | 0 | 0 | 0 | 0 | | | | |
| 4:15 PM to 4:30 PM | | 10 | 0 | 2 | 0 | 9 | 60 | 0 | 0 | 18 | 9 | 39 | 0 | 0 | 0 | 0 | 0 | | | | |
| 4:30 PM to 4:45 PM | | 9 | 0 | 8 | 3 | 7 | 66 | 0 | 0 | 21 | 8 | 54 | 0 | 0 | 0 | 0 | 3 | | | | |
| 4:45 PM to 5:00 PM | | 9 | 0 | 1 | 0 | 3 | 83 | 0 | 0 | 18 | 9 | 51 | 0 | 0 | 0 | 0 | 0 | | | | |
| 5:00 PM to 5:15 PM | | 9 | 0 | 4 | 0 | 6 | 60 | 0 | 0 | 19 | 10 | 50 | 0 | 0 | 0 | 0 | 0 | | | | |
| 5:15 PM to 5:30 PM | | 13 | 0 | 7 | 1 | 6 | 66 | 0 | 0 | 19 | 8 | 56 | 1 | 0 | 0 | 0 | 1 | | | | |
| 5:30 PM to 5:45 PM | | 10 | 0 | 1 | 0 | 5 | 72 | 0 | 0 | 20 | 6 | 51 | 1 | 0 | 0 | 0 | 0 | | | | |
| 5:45 PM to 6:00 PM | | 11 | 0 | 2 | 0 | 9 | 53 | 0 | 0 | 18 | 10 | 57 | 0 | 0 | 0 | 0 | 0 | | | | |
| 6:00 PM to 6:15 PM | | 12 | 0 | 3 | 0 | 4 | 62 | 0 | 0 | 14 | 4 | 58 | 0 | 0 | 0 | 0 | 0 | | | | |
| 6:15 PM to 6:30 PM | | 5 | 0 | 4 | 0 | 5 | 41 | 0 | 0 | 12 | 4 | 46 | 0 | 0 | 0 | 0 | 0 | | | | |
| 6:30 PM to 6:45 PM | | 3 | 0 | 4 | 0 | 3 | 36 | 0 | 0 | 9 | 2 | 56 | 0 | 0 | 0 | 0 | 0 | | | | |
| 6:45 PM to 7:00 PM | | 7 | 0 | 0 | 0 | 4 | 27 | 0 | 0 | 13 | 8 | 38 | 0 | 0 | 0 | 0 | 1 | | | | |
| PEAK HOURS | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | | | | | |
| Direction: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Roadway: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Movement: | | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | | | | |
| AM INTERSECTION PEAK HOUR | | | | | | | | | | | | | | | | | | | | | |
| 7:00 AM to 8:00 AM | | 37 | 0 | 32 | 0 | 23 | 63 | 0 | 0 | 152 | 53 | 101 | 1 | 0 | 0 | 0 | 2 | | | | |
| PM INTERSECTION PEAK HOUR | | | | | | | | | | | | | | | | | | | | | |
| 4:30 PM to 5:30 PM | | 40 | 0 | 20 | 4 | 22 | 275 | 0 | 0 | 77 | 35 | 211 | 1 | 0 | 0 | 0 | 4 | | | | |
| AM SYSTEM PEAK HOUR | | | | | | | | | | | | | | | | | | | | | |
| 7:15 AM to 8:15 AM | | 33 | 0 | 33 | 0 | 21 | 74 | 0 | 0 | 148 | 49 | 99 | 0 | 0 | 0 | 0 | 2 | | | | |
| PM SYSTEM PEAK HOUR | | | | | | | | | | | | | | | | | | | | | |
| 4:30 PM to 5:30 PM | | 40 | 0 | 20 | 4 | 22 | 275 | 0 | 0 | 77 | 35 | 211 | 1 | 0 | 0 | 0 | 4 | | | | |
| PEAK HOUR FACTORS | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | | | | | |
| Direction: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Roadway: | | 7-11 Drive | | | | E Broad Way | | | | S Berlin Pike | | | | W Broad Way | | | | | | | |
| Movement: | | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach | | | | |
| AM PEAK HOUR | | 0.63 | 0.00 | 0.69 | 0.79 | 0.66 | 0.84 | 0.00 | 0.85 | 0.84 | 0.82 | 0.88 | 0.85 | 0.00 | 0.00 | 0.00 | #DIV/0! | | | | |
| PM PEAK HOUR | | 0.77 | 0.00 | 0.63 | 0.75 | 0.79 | 0.83 | 0.00 | 0.86 | 0.92 | 0.88 | 0.94 | 0.97 | 0.00 | 0.00 | 0.00 | #DIV/0! | | | | |
| Overall AM PEAK HOUR FACTOR | | = | | | | 0.94 | | | | Overall PM PEAK HOUR FACTOR | | | | = | | | | 0.97 | | | |
| AM Period Intersection Volume: | | 1126 | | | | PM Period Intersection Volume: | | | | 1757 | | | | | | | | | | | |



Project Name : Lovettsville, 7-11
 Project # : 2581-003
 Location : Lovettsville
 Data Source: Gorove/Slade Associates, Inc.

| Intersection: | | S Berlin Pike and W Broad Way | | | | | | | | | | | | | | | |
|---------------------------------------|--|-------------------------------|------|------|-------------|---------------|------|------|-------------|----------------|------|------|----------------|---------------|------|------|-------------|
| AM PEAK | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | |
| Direction: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Roadway: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Movement: | | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds |
| 6:00 AM to 6:15 AM | | | | | | | | | | | | | | | | | |
| 6:15 AM to 6:30 AM | | | | | | | | | | | | | | | | | |
| 6:30 AM to 6:45 AM | | | | | | | | | | | | | | | | | |
| 6:45 AM to 7:00 AM | | | | | | | | | | | | | | | | | |
| 7:00 AM to 7:15 AM | | | | | | | | | | | | | | | | | |
| 7:15 AM to 7:30 AM | | 81 | | | | 35 | 5 | 4 | | | | | 25 | | 3 | | |
| 7:30 AM to 7:45 AM | | 89 | | | | 33 | 4 | 8 | | | | | 23 | | 4 | | |
| 7:45 AM to 8:00 AM | | 65 | | | | 36 | 12 | 10 | | | | | 11 | | 4 | | |
| 8:00 AM to 8:15 AM | | 67 | | | | 36 | 10 | 6 | | | | | 20 | | 1 | | |
| 8:15 AM to 8:30 AM | | | | | | | | | | | | | | | | | |
| 8:30 AM to 8:45 AM | | | | | | | | | | | | | | | | | |
| 8:45 AM to 9:00 AM | | | | | | | | | | | | | | | | | |
| PM PEAK | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | |
| Direction: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Roadway: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Movement: | | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds |
| 4:00 PM to 4:15 PM | | | | | | | | | | | | | | | | | |
| 4:15 PM to 4:30 PM | | | | | | | | | | | | | | | | | |
| 4:30 PM to 4:45 PM | | 46 | | | | 102 | 22 | 7 | | | | | 7 | | 4 | | |
| 4:45 PM to 5:00 PM | | 49 | | | | 101 | 35 | 6 | | | | | 13 | | 4 | | |
| 5:00 PM to 5:15 PM | | 52 | | | | 87 | 27 | 5 | | | | | 11 | | 5 | | |
| 5:15 PM to 5:30 PM | | 35 | | | | 85 | 37 | 11 | | | | | 19 | | 2 | | |
| 5:30 PM to 5:45 PM | | | | | | | | | | | | | | | | | |
| 5:45 PM to 6:00 PM | | | | | | | | | | | | | | | | | |
| 6:00 PM to 6:15 PM | | | | | | | | | | | | | | | | | |
| 6:15 PM to 6:30 PM | | | | | | | | | | | | | | | | | |
| 6:30 PM to 6:45 PM | | | | | | | | | | | | | | | | | |
| 6:45 PM to 7:00 PM | | | | | | | | | | | | | | | | | |
| PEAK HOURS | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | |
| Direction: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Roadway: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Movement: | | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds |
| AM INTERSECTION PEAK HOUR | | | | | | | | | | | | | | | | | |
| 7:15 AM to 8:15 AM | | 0 | 302 | 0 | 0 | 140 | 31 | 28 | 0 | 0 | 0 | 0 | 79 | 0 | 12 | 0 | 0 |
| PM INTERSECTION PEAK HOUR | | | | | | | | | | | | | | | | | |
| 4:30 PM to 5:30 PM | | 0 | 182 | 0 | 0 | 375 | 121 | 29 | 0 | 0 | 0 | 0 | 50 | 0 | 15 | 0 | 0 |
| AM SYSTEM PEAK HOUR | | | | | | | | | | | | | | | | | |
| 7:15 AM to 8:15 AM | | 0 | 302 | 0 | 0 | 140 | 31 | 28 | 0 | 0 | 0 | 0 | 79 | 0 | 12 | 0 | 0 |
| PM SYSTEM PEAK HOUR | | | | | | | | | | | | | | | | | |
| 4:30 PM to 5:30 PM | | 0 | 182 | 0 | 0 | 375 | 121 | 29 | 0 | 0 | 0 | 0 | 50 | 0 | 15 | 0 | 0 |
| PEAK HOUR FACTORS | | Southbound | | | | Westbound | | | | Northbound | | | | Eastbound | | | |
| Direction: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Roadway: | | S Berlin Pike | | | | W Broad Way | | | | W Broad Way | | | | S Berlin Pike | | | |
| Movement: | | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach | Right | Thru | Left | Approach |
| AM PEAK HOUR | | 0.00 | 0.85 | 0.00 | 0.85 | 0.97 | 0.65 | 0.70 | 0.86 | 0.00 | 0.00 | 0.00 | #DIV/0! | 0.79 | 0.00 | 0.75 | 0.81 |
| PM PEAK HOUR | | 0.00 | 0.88 | 0.00 | 0.88 | 0.92 | 0.82 | 0.66 | 0.92 | 0.00 | 0.00 | 0.00 | #DIV/0! | 0.66 | 0.00 | 0.75 | 0.77 |
| Overall AM PEAK HOUR FACTOR | | = 0.92 | | | | = 0.92 | | | | #DIV/0! | | | | = 0.93 | | | |
| AM Period Intersection Volume: | | 592 | | | | 772 | | | | 772 | | | | 592 | | | |
| PM Period Intersection Volume: | | 772 | | | | 592 | | | | 592 | | | | 772 | | | |



APPENDIX C

LEVEL OF SERVICE DEFINITIONS

APPENDIX C: LEVEL OF SERVICE DEFINITIONS

All capacity analyses are based on the procedures specified by the Transportation Research Board, Special Report 209: *Highway Capacity Manual (HCM)*, 2000. Levels of service (LOS) range from A to F. A brief description of each level of service for signalized and unsignalized intersections is provided below.

Signalized Intersections: Level of service is based upon the traffic volume present in each lane on the roadway, the capacity of each lane at the intersection and the delay associated with each directional movement. The levels of service for signalized intersections are defined below:

- Level of Service A describes operations with very low average delay per vehicle, i.e., less than 10.0 seconds. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop. Short signal cycle lengths may also contribute to low delay.
- Level of Service B describes operations with average delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
- Level of Service C describes operations with delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level although many still pass through the intersection without stopping. This is generally considered the lower end of the range of the acceptable level of service in rural areas.
- Level of Service D describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and/or high traffic volumes as compared to the roadway capacity. Many vehicles are required to stop and the number of vehicles that do not have to stop declines. Individual signal cycle failures, where all waiting vehicles do not clear the intersection during a single green time, are noticeable. This is generally considered the lower end of the range of the acceptable level of service in urban areas.
- Level of Service E describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These higher delay values generally indicate poor progression, long cycle lengths, and high traffic volumes. Individual cycle failures are frequent occurrences. LOS E has been set as the limit of acceptable conditions.
- Level of Service F describes operations with average delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over-saturation, i.e., when traffic arrives at a flow rate that exceeds the capacity of the intersection. It may also occur at high volumes with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such delays.

Unsignalized Intersections: At an unsignalized intersection, the major street through traffic and right turns are assumed to operate unimpeded and therefore receive no level of service rating. The level of service for the minor street and the major street left turn traffic is dependent on the volume and capacity of the available lanes, and, the number and frequency of acceptable gaps in the major street traffic to make a conflicting turn. The level of service grade is provided for each conflicting movement at an unsignalized intersection and is based on the total average delay experienced by each vehicle. The delay includes the time it takes a vehicle to move from the back of a queue through the intersection.

The unsignalized intersection level of service analysis does not account for variations in driver behavior or the effects of nearby traffic signals. Therefore, the results from this analysis usually indicate worse levels of service than may be experienced in the field. The unsignalized intersection level of service descriptions are provided below:

- Level of Service A. Describes operations where there is very little to no conflicting traffic for a minor side street movement, i.e., an average total delay of less than 10.0 seconds per vehicle.
- Level of Service B. Describes operations with average total delay in the range of 10.1 to 15.0 seconds per vehicle.
- Level of Service C. Describes operations with average total delay in the range of 15.1 to 25.0 second per vehicle.
- Level of Service D. Describes operations with average total delay in the range of 25.1 to 35.0 seconds per vehicle.
- Level of Service E. Describes operations with average total delay in the range of 35.1 to 50.0 seconds per vehicle.
- Level of Service F. Describes operations with average total delay of 50 seconds per vehicle. LOS F exists when there are insufficient gaps of suitable size to allow a side street demand to cross safely through or enter a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queuing on the minor approaches. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal driver behavior.

APPENDIX D

INTERSECTION CAPACITY ANALYSIS – EXISTING CONDITIONS (2015)

| Intersection | | | | | | | | | | | | |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Intersection Delay, s/veh | 8.6 | | | | | | | | | | | |
| Intersection LOS | A | | | | | | | | | | | |
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBU | NBL | NBT | NBR |
| Vol, veh/h | 0 | 0 | 0 | 0 | 0 | 0 | 74 | 21 | 0 | 99 | 49 | 148 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.85 | 0.85 | 0.92 | 0.88 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 0 | 0 | 0 | 0 | 87 | 25 | 0 | 112 | 58 | 174 |
| Number of Lanes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | WB | NB |
|----------------------------|-----|-----|
| Opposing Approach | | SB |
| Opposing Lanes | 0 | 1 |
| Conflicting Approach Left | NB | |
| Conflicting Lanes Left | 2 | 0 |
| Conflicting Approach Right | SB | WB |
| Conflicting Lanes Right | 1 | 1 |
| HCM Control Delay | 8.5 | 8.8 |
| HCM LOS | A | A |

| Lane | NBLn1 | NBLn2 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, % | 100% | 0% | 0% | 50% |
| Vol Thru, % | 0% | 25% | 78% | 0% |
| Vol Right, % | 0% | 75% | 22% | 50% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 99 | 197 | 95 | 66 |
| LT Vol | 99 | 0 | 0 | 33 |
| Through Vol | 0 | 49 | 74 | 0 |
| RT Vol | 0 | 148 | 21 | 33 |
| Lane Flow Rate | 112 | 232 | 112 | 78 |
| Geometry Grp | 7 | 7 | 2 | 5 |
| Degree of Util (X) | 0.165 | 0.273 | 0.146 | 0.096 |
| Departure Headway (Hd) | 5.387 | 4.358 | 4.713 | 4.456 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 671 | 830 | 764 | 806 |
| Service Time | 3.087 | 2.058 | 2.72 | 2.471 |
| HCM Lane V/C Ratio | 0.167 | 0.28 | 0.147 | 0.097 |
| HCM Control Delay | 9.1 | 8.7 | 8.5 | 7.9 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.6 | 1.1 | 0.5 | 0.3 |

Intersection

Intersection Delay, s/veh
 Intersection LOS

| Movement | SBU | SBL | SBT | SBR |
|-------------------|------|------|------|------|
| Vol, veh/h | 0 | 33 | 0 | 33 |
| Peak Hour Factor | 0.92 | 0.85 | 0.92 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 39 | 0 | 39 |
| Number of Lanes | 0 | 0 | 1 | 0 |

Approach SB

| | |
|----------------------------|-----|
| Opposing Approach | NB |
| Opposing Lanes | 2 |
| Conflicting Approach Left | WB |
| Conflicting Lanes Left | 1 |
| Conflicting Approach Right | |
| Conflicting Lanes Right | 0 |
| HCM Control Delay | 7.9 |
| HCM LOS | A |

Lane

HCM Unsignalized Intersection Capacity Analysis

2: S Church Street/North Church Street & East Broadway

Lovetsville 7-11
Existing

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  |  |
| Volume (veh/h) | 6 | 169 | 6 | 19 | 83 | 1 | 6 | 2 | 32 | 1 | 1 | 3 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.90 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Hourly flow rate (vph) | 7 | 199 | 7 | 22 | 92 | 1 | 7 | 2 | 38 | 1 | 1 | 4 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | None | | | | | None | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 93 | | | 206 | | | 358 | 355 | 202 | 393 | 358 | 93 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 93 | | | 206 | | | 358 | 355 | 202 | 393 | 358 | 93 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 100 | | | 98 | | | 99 | 100 | 96 | 100 | 100 | 100 |
| cM capacity (veh/h) | 1501 | | | 1365 | | | 585 | 559 | 838 | 531 | 557 | 964 |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 213 | 116 | 47 | 2 | 4 | | | | | | | |
| Volume Left | 7 | 22 | 7 | 1 | 0 | | | | | | | |
| Volume Right | 7 | 1 | 38 | 0 | 4 | | | | | | | |
| cSH | 1501 | 1365 | 769 | 543 | 964 | | | | | | | |
| Volume to Capacity | 0.00 | 0.02 | 0.06 | 0.00 | 0.00 | | | | | | | |
| Queue Length 95th (ft) | 0 | 1 | 5 | 0 | 0 | | | | | | | |
| Control Delay (s) | 0.3 | 1.6 | 10.0 | 11.7 | 8.7 | | | | | | | |
| Lane LOS | A | A | A | B | A | | | | | | | |
| Approach Delay (s) | 0.3 | 1.6 | 10.0 | 9.9 | | | | | | | | |
| Approach LOS | | | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 2.0 | | | | | | | | | |
| Intersection Capacity Utilization | | | 27.8% | ICU Level of Service | | A | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

4: N Berlin Turnpike & West Broadway

Lovetsville 7-11
Existing

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | |  |  | | | | | |  |  |
| Volume (veh/h) | 12 | 0 | 79 | 28 | 31 | 140 | 0 | 0 | 0 | 0 | 302 | 0 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.85 | 0.92 | 0.85 | 0.85 | 0.85 | 0.97 | 0.92 | 0.92 | 0.92 | 0.92 | 0.85 | 0.85 |
| Hourly flow rate (vph) | 14 | 0 | 93 | 33 | 36 | 144 | 0 | 0 | 0 | 0 | 355 | 0 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 374 | 355 | 355 | 448 | 355 | 0 | 355 | | | 0 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 374 | 355 | 355 | 448 | 355 | 0 | 355 | | | 0 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 97 | 100 | 87 | 93 | 94 | 87 | 100 | | | 100 | | |
| cM capacity (veh/h) | 481 | 570 | 689 | 450 | 570 | 1085 | 1203 | | | 1623 | | |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 107 | 33 | 181 | 355 | 0 | | | | | | | |
| Volume Left | 14 | 33 | 0 | 0 | 0 | | | | | | | |
| Volume Right | 93 | 0 | 144 | 0 | 0 | | | | | | | |
| cSH | 652 | 450 | 918 | 1700 | 1700 | | | | | | | |
| Volume to Capacity | 0.16 | 0.07 | 0.20 | 0.21 | 0.00 | | | | | | | |
| Queue Length 95th (ft) | 15 | 6 | 18 | 0 | 0 | | | | | | | |
| Control Delay (s) | 11.6 | 13.6 | 9.9 | 0.0 | 0.0 | | | | | | | |
| Lane LOS | B | B | A | | | | | | | | | |
| Approach Delay (s) | 11.6 | 10.5 | | 0.0 | | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 5.1 | | | | | | | | | |
| Intersection Capacity Utilization | | | 39.0% | | ICU Level of Service | | | | | A | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

| Intersection | | | | | | | | | | | | |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Intersection Delay, s/veh | 11.5 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBU | NBL | NBT | NBR |
| Vol, veh/h | 0 | 0 | 0 | 0 | 0 | 0 | 275 | 22 | 0 | 211 | 35 | 77 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.85 | 0.85 | 0.92 | 0.94 | 0.88 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 0 | 0 | 0 | 0 | 324 | 26 | 0 | 224 | 40 | 84 |
| Number of Lanes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | WB | NB |
|----------------------------|------|------|
| Opposing Approach | | SB |
| Opposing Lanes | 0 | 1 |
| Conflicting Approach Left | NB | |
| Conflicting Lanes Left | 2 | 0 |
| Conflicting Approach Right | SB | WB |
| Conflicting Lanes Right | 1 | 1 |
| HCM Control Delay | 12.5 | 11.1 |
| HCM LOS | B | B |

| Lane | NBLn1 | NBLn2 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, % | 100% | 0% | 0% | 33% |
| Vol Thru, % | 0% | 31% | 93% | 0% |
| Vol Right, % | 0% | 69% | 7% | 67% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 211 | 112 | 297 | 60 |
| LT Vol | 211 | 0 | 0 | 20 |
| Through Vol | 0 | 35 | 275 | 0 |
| RT Vol | 0 | 77 | 22 | 40 |
| Lane Flow Rate | 224 | 123 | 349 | 71 |
| Geometry Grp | 7 | 7 | 2 | 5 |
| Degree of Util (X) | 0.374 | 0.172 | 0.478 | 0.099 |
| Departure Headway (Hd) | 5.993 | 5.003 | 4.925 | 5.044 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 595 | 710 | 727 | 701 |
| Service Time | 3.775 | 2.784 | 2.979 | 3.144 |
| HCM Lane V/C Ratio | 0.376 | 0.173 | 0.48 | 0.101 |
| HCM Control Delay | 12.4 | 8.8 | 12.5 | 8.7 |
| HCM Lane LOS | B | A | B | A |
| HCM 95th-tile Q | 1.7 | 0.6 | 2.6 | 0.3 |

Intersection

Intersection Delay, s/veh
 Intersection LOS

| Movement | SBU | SBL | SBT | SBR |
|-------------------|------|------|------|------|
| Vol, veh/h | 0 | 20 | 0 | 40 |
| Peak Hour Factor | 0.92 | 0.85 | 0.92 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 24 | 0 | 47 |
| Number of Lanes | 0 | 0 | 1 | 0 |

Approach SB

| | |
|----------------------------|-----|
| Opposing Approach | NB |
| Opposing Lanes | 2 |
| Conflicting Approach Left | WB |
| Conflicting Lanes Left | 1 |
| Conflicting Approach Right | |
| Conflicting Lanes Right | 0 |
| HCM Control Delay | 8.7 |
| HCM LOS | A |

Lane

HCM Unsignalized Intersection Capacity Analysis

2: S Church Street/North Church Street & East Broadway

Lovetsville 7-11
Existing

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  |  |
| Volume (veh/h) | 6 | 88 | 2 | 36 | 268 | 11 | 11 | 3 | 16 | 5 | 4 | 14 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.85 | 0.92 | 0.85 | 0.85 | 0.86 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.88 |
| Hourly flow rate (vph) | 7 | 96 | 2 | 42 | 312 | 13 | 13 | 4 | 19 | 6 | 5 | 16 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 325 | | | 98 | | | 532 | 520 | 97 | 534 | 515 | 318 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 325 | | | 98 | | | 532 | 520 | 97 | 534 | 515 | 318 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 99 | | | 97 | | | 97 | 99 | 98 | 99 | 99 | 98 |
| cM capacity (veh/h) | 1235 | | | 1495 | | | 433 | 445 | 959 | 433 | 448 | 723 |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 105 | 367 | 35 | 11 | 16 | | | | | | | |
| Volume Left | 7 | 42 | 13 | 6 | 0 | | | | | | | |
| Volume Right | 2 | 13 | 19 | 0 | 16 | | | | | | | |
| cSH | 1235 | 1495 | 614 | 440 | 723 | | | | | | | |
| Volume to Capacity | 0.01 | 0.03 | 0.06 | 0.02 | 0.02 | | | | | | | |
| Queue Length 95th (ft) | 0 | 2 | 5 | 2 | 2 | | | | | | | |
| Control Delay (s) | 0.6 | 1.1 | 11.2 | 13.4 | 10.1 | | | | | | | |
| Lane LOS | A | A | B | B | B | | | | | | | |
| Approach Delay (s) | 0.6 | 1.1 | 11.2 | 11.4 | | | | | | | | |
| Approach LOS | | | B | B | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 2.2 | | | | | | | | | |
| Intersection Capacity Utilization | | | 38.5% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 4: N Berlin Turnpike & West Broadway

Lovetsville 7-11
 Existing

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | |  |  | | | | | |  |  |
| Volume (veh/h) | 15 | 0 | 50 | 29 | 121 | 375 | 0 | 0 | 0 | 0 | 182 | 0 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.85 | 0.92 | 0.85 | 0.85 | 0.85 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.88 | 0.85 |
| Hourly flow rate (vph) | 18 | 0 | 59 | 34 | 142 | 408 | 0 | 0 | 0 | 0 | 207 | 0 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 278 | 207 | 207 | 266 | 207 | 0 | 207 | | | 0 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 278 | 207 | 207 | 266 | 207 | 0 | 207 | | | 0 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 95 | 100 | 93 | 95 | 79 | 62 | 100 | | | 100 | | |
| cM capacity (veh/h) | 354 | 690 | 834 | 639 | 690 | 1085 | 1364 | | | 1623 | | |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 76 | 34 | 550 | 207 | 0 | | | | | | | |
| Volume Left | 18 | 34 | 0 | 0 | 0 | | | | | | | |
| Volume Right | 59 | 0 | 408 | 0 | 0 | | | | | | | |
| cSH | 635 | 639 | 945 | 1700 | 1700 | | | | | | | |
| Volume to Capacity | 0.12 | 0.05 | 0.58 | 0.12 | 0.00 | | | | | | | |
| Queue Length 95th (ft) | 10 | 4 | 97 | 0 | 0 | | | | | | | |
| Control Delay (s) | 11.4 | 11.0 | 14.0 | 0.0 | 0.0 | | | | | | | |
| Lane LOS | B | B | B | | | | | | | | | |
| Approach Delay (s) | 11.4 | 13.8 | | 0.0 | | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 10.3 | | | | | | | | | |
| Intersection Capacity Utilization | | | 45.7% | | ICU Level of Service | | | | | A | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

APPENDIX E

INTERSECTION CAPACITY ANALYSIS – FUTURE WITHOUT DEVELOPMENT CONDITIONS (2017)

| Intersection | | | | | | | | | | | | |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Intersection Delay, s/veh | 8.5 | | | | | | | | | | | |
| Intersection LOS | A | | | | | | | | | | | |
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBU | NBL | NBT | NBR |
| Vol, veh/h | 0 | 0 | 0 | 0 | 0 | 0 | 77 | 21 | 0 | 105 | 49 | 151 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 0 | 0 | 0 | 0 | 84 | 23 | 0 | 114 | 53 | 164 |
| Number of Lanes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | WB | NB |
|----------------------------|-----|-----|
| Opposing Approach | | SB |
| Opposing Lanes | 0 | 1 |
| Conflicting Approach Left | NB | |
| Conflicting Lanes Left | 2 | 0 |
| Conflicting Approach Right | SB | WB |
| Conflicting Lanes Right | 1 | 1 |
| HCM Control Delay | 8.4 | 8.7 |
| HCM LOS | A | A |

| Lane | NBLn1 | NBLn2 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, % | 100% | 0% | 0% | 50% |
| Vol Thru, % | 0% | 24% | 79% | 0% |
| Vol Right, % | 0% | 76% | 21% | 50% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 105 | 200 | 98 | 66 |
| LT Vol | 105 | 0 | 0 | 33 |
| Through Vol | 0 | 49 | 77 | 0 |
| RT Vol | 0 | 151 | 21 | 33 |
| Lane Flow Rate | 114 | 217 | 107 | 72 |
| Geometry Grp | 7 | 7 | 2 | 5 |
| Degree of Util (X) | 0.167 | 0.256 | 0.139 | 0.088 |
| Departure Headway (Hd) | 5.368 | 4.336 | 4.682 | 4.43 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 672 | 833 | 770 | 811 |
| Service Time | 3.068 | 2.036 | 2.687 | 2.445 |
| HCM Lane V/C Ratio | 0.17 | 0.261 | 0.139 | 0.089 |
| HCM Control Delay | 9.1 | 8.5 | 8.4 | 7.9 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.6 | 1 | 0.5 | 0.3 |

Intersection

Intersection Delay, s/veh
 Intersection LOS

| Movement | SBU | SBL | SBT | SBR |
|-------------------|------|------|------|------|
| Vol, veh/h | 0 | 33 | 0 | 33 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 36 | 0 | 36 |
| Number of Lanes | 0 | 0 | 1 | 0 |

Approach SB

| | |
|----------------------------|-----|
| Opposing Approach | NB |
| Opposing Lanes | 2 |
| Conflicting Approach Left | WB |
| Conflicting Lanes Left | 1 |
| Conflicting Approach Right | |
| Conflicting Lanes Right | 0 |
| HCM Control Delay | 7.9 |
| HCM LOS | A |

Lane

HCM Unsignalized Intersection Capacity Analysis
 2: S Church Street/North Church Street & East Broadway

Lovetsville 7-11
 Future wo Development

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  |  |
| Volume (veh/h) | 6 | 172 | 6 | 19 | 87 | 1 | 6 | 2 | 34 | 1 | 1 | 3 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 7 | 187 | 7 | 21 | 95 | 1 | 7 | 2 | 37 | 1 | 1 | 3 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 96 | | | 193 | | | 343 | 340 | 190 | 378 | 343 | 95 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 96 | | | 193 | | | 343 | 340 | 190 | 378 | 343 | 95 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 100 | | | 99 | | | 99 | 100 | 96 | 100 | 100 | 100 |
| cM capacity (veh/h) | 1498 | | | 1380 | | | 599 | 570 | 852 | 545 | 568 | 962 |
| Direction, Lane # | | | | | | | | | | | | |
| | EB 1 | WB 1 | NB 1 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 200 | 116 | 46 | 2 | 3 | | | | | | | |
| Volume Left | 7 | 21 | 7 | 1 | 0 | | | | | | | |
| Volume Right | 7 | 1 | 37 | 0 | 3 | | | | | | | |
| cSH | 1498 | 1380 | 786 | 556 | 962 | | | | | | | |
| Volume to Capacity | 0.00 | 0.01 | 0.06 | 0.00 | 0.00 | | | | | | | |
| Queue Length 95th (ft) | 0 | 1 | 5 | 0 | 0 | | | | | | | |
| Control Delay (s) | 0.3 | 1.5 | 9.9 | 11.5 | 8.8 | | | | | | | |
| Lane LOS | A | A | A | B | A | | | | | | | |
| Approach Delay (s) | 0.3 | 1.5 | 9.9 | 9.9 | | | | | | | | |
| Approach LOS | | | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 2.0 | | | | | | | | | |
| Intersection Capacity Utilization | | | 28.2% | ICU Level of Service | | A | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

4: N Berlin Turnpike & West Broadway

Lovetsville 7-11
Future wo Development

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | |  |  | | | | | |  |  |
| Volume (veh/h) | 14 | 0 | 81 | 29 | 38 | 143 | 0 | 0 | 0 | 0 | 308 | 4 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 15 | 0 | 88 | 32 | 41 | 155 | 0 | 0 | 0 | 0 | 335 | 4 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 355 | 335 | 335 | 423 | 335 | 0 | 335 | | | 0 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 355 | 335 | 335 | 423 | 335 | 0 | 335 | | | 0 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 97 | 100 | 88 | 93 | 93 | 86 | 100 | | | 100 | | |
| cM capacity (veh/h) | 486 | 586 | 707 | 474 | 586 | 1085 | 1225 | | | 1623 | | |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 103 | 32 | 197 | 335 | 4 | | | | | | | |
| Volume Left | 15 | 32 | 0 | 0 | 0 | | | | | | | |
| Volume Right | 88 | 0 | 155 | 0 | 4 | | | | | | | |
| cSH | 663 | 474 | 920 | 1700 | 1700 | | | | | | | |
| Volume to Capacity | 0.16 | 0.07 | 0.21 | 0.20 | 0.00 | | | | | | | |
| Queue Length 95th (ft) | 14 | 5 | 20 | 0 | 0 | | | | | | | |
| Control Delay (s) | 11.4 | 13.1 | 10.0 | 0.0 | 0.0 | | | | | | | |
| Lane LOS | B | B | A | | | | | | | | | |
| Approach Delay (s) | 11.4 | 10.4 | | 0.0 | | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 5.3 | | | | | | | | | |
| Intersection Capacity Utilization | | | 41.4% | | ICU Level of Service | | | | | A | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

| Intersection | | | | | | | | | | | | |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Intersection Delay, s/veh | 11.6 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBU | NBL | NBT | NBR |
| Vol, veh/h | 0 | 0 | 0 | 0 | 0 | 0 | 286 | 22 | 0 | 228 | 35 | 79 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 0 | 0 | 0 | 0 | 311 | 24 | 0 | 248 | 38 | 86 |
| Number of Lanes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | WB | NB |
|----------------------------|------|------|
| Opposing Approach | | SB |
| Opposing Lanes | 0 | 1 |
| Conflicting Approach Left | NB | |
| Conflicting Lanes Left | 2 | 0 |
| Conflicting Approach Right | SB | WB |
| Conflicting Lanes Right | 1 | 1 |
| HCM Control Delay | 12.3 | 11.5 |
| HCM LOS | B | B |

| Lane | NBLn1 | NBLn2 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, % | 100% | 0% | 0% | 33% |
| Vol Thru, % | 0% | 31% | 93% | 0% |
| Vol Right, % | 0% | 69% | 7% | 67% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 228 | 114 | 308 | 60 |
| LT Vol | 228 | 0 | 0 | 20 |
| Through Vol | 0 | 35 | 286 | 0 |
| RT Vol | 0 | 79 | 22 | 40 |
| Lane Flow Rate | 248 | 124 | 335 | 65 |
| Geometry Grp | 7 | 7 | 2 | 5 |
| Degree of Util (X) | 0.41 | 0.171 | 0.462 | 0.093 |
| Departure Headway (Hd) | 5.954 | 4.96 | 4.967 | 5.139 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 600 | 716 | 720 | 702 |
| Service Time | 3.737 | 2.742 | 3.026 | 3.139 |
| HCM Lane V/C Ratio | 0.413 | 0.173 | 0.465 | 0.093 |
| HCM Control Delay | 12.9 | 8.8 | 12.3 | 8.7 |
| HCM Lane LOS | B | A | B | A |
| HCM 95th-tile Q | 2 | 0.6 | 2.5 | 0.3 |

Intersection

Intersection Delay, s/veh

Intersection LOS

| Movement | SBU | SBL | SBT | SBR |
|-------------------|------|------|------|------|
| Vol, veh/h | 0 | 20 | 0 | 40 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 22 | 0 | 43 |
| Number of Lanes | 0 | 0 | 1 | 0 |

Approach SB

Opposing Approach NB

Opposing Lanes 2

Conflicting Approach Left WB

Conflicting Lanes Left 1

Conflicting Approach Right

Conflicting Lanes Right 0

HCM Control Delay 8.7

HCM LOS A

Lane

HCM Unsignalized Intersection Capacity Analysis

2: S Church Street/North Church Street & East Broadway

Lovetsville 7-11
Future wo Development

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  |  |
| Volume (veh/h) | 6 | 90 | 2 | 37 | 278 | 11 | 11 | 3 | 21 | 5 | 4 | 14 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 7 | 98 | 2 | 40 | 302 | 12 | 12 | 3 | 23 | 5 | 4 | 15 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | None | | | | | None | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 314 | | | 100 | | | 518 | 507 | 99 | 525 | 502 | 308 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 314 | | | 100 | | | 518 | 507 | 99 | 525 | 502 | 308 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 99 | | | 97 | | | 97 | 99 | 98 | 99 | 99 | 98 |
| cM capacity (veh/h) | 1246 | | | 1493 | | | 444 | 454 | 957 | 439 | 457 | 732 |
| Direction, Lane # | | | | | | | | | | | | |
| | EB 1 | WB 1 | NB 1 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 107 | 354 | 38 | 10 | 15 | | | | | | | |
| Volume Left | 7 | 40 | 12 | 5 | 0 | | | | | | | |
| Volume Right | 2 | 12 | 23 | 0 | 15 | | | | | | | |
| cSH | 1246 | 1493 | 656 | 446 | 732 | | | | | | | |
| Volume to Capacity | 0.01 | 0.03 | 0.06 | 0.02 | 0.02 | | | | | | | |
| Queue Length 95th (ft) | 0 | 2 | 5 | 2 | 2 | | | | | | | |
| Control Delay (s) | 0.5 | 1.1 | 10.8 | 13.2 | 10.0 | | | | | | | |
| Lane LOS | A | A | B | B | B | | | | | | | |
| Approach Delay (s) | 0.5 | 1.1 | 10.8 | 11.3 | | | | | | | | |
| Approach LOS | | | B | B | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 2.2 | | | | | | | | | |
| Intersection Capacity Utilization | | | 39.4% | ICU Level of Service | A | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

4: N Berlin Turnpike & West Broadway

Lovetsville 7-11
Future wo Development

| |  |  |  |  |  |  |  |  |  |  |  |  | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|------|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | |
| Lane Configurations | |  | |  |  | | | | | |  |  | |
| Volume (veh/h) | 27 | 0 | 51 | 30 | 141 | 383 | 0 | 0 | 0 | 0 | 186 | 11 | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | |
| Hourly flow rate (vph) | 29 | 0 | 55 | 33 | 153 | 416 | 0 | 0 | 0 | 0 | 202 | 12 | |
| Pedestrians | | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | | |
| Median type | | | | | | | None | | | None | | | |
| Median storage (veh) | | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | | |
| vC, conflicting volume | 279 | 202 | 202 | 258 | 202 | 0 | 202 | | | | | | 0 |
| vC1, stage 1 conf vol | | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | | |
| vCu, unblocked vol | 279 | 202 | 202 | 258 | 202 | 0 | 202 | | | | | | 0 |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | | | | 4.1 |
| tC, 2 stage (s) | | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | | | | 2.2 |
| p0 queue free % | 91 | 100 | 93 | 95 | 78 | 62 | 100 | | | | | | 100 |
| cM capacity (veh/h) | 344 | 694 | 839 | 649 | 694 | 1085 | 1370 | | | | | | 1623 |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | SB 1 | SB 2 | | | | | | | | |
| Volume Total | 85 | 33 | 570 | 202 | 12 | | | | | | | | |
| Volume Left | 29 | 33 | 0 | 0 | 0 | | | | | | | | |
| Volume Right | 55 | 0 | 416 | 0 | 12 | | | | | | | | |
| cSH | 560 | 649 | 942 | 1700 | 1700 | | | | | | | | |
| Volume to Capacity | 0.15 | 0.05 | 0.60 | 0.12 | 0.01 | | | | | | | | |
| Queue Length 95th (ft) | 13 | 4 | 105 | 0 | 0 | | | | | | | | |
| Control Delay (s) | 12.6 | 10.8 | 14.5 | 0.0 | 0.0 | | | | | | | | |
| Lane LOS | B | B | B | | | | | | | | | | |
| Approach Delay (s) | 12.6 | 14.3 | 0.0 | | | | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | | |
| Average Delay | 10.7 | | | | | | | | | | | | |
| Intersection Capacity Utilization | 47.4% | | | ICU Level of Service | | | | | A | | | | |
| Analysis Period (min) | 15 | | | | | | | | | | | | |

APPENDIX F

INTERSECTION CAPACITY ANALYSIS – FUTURE WITH DEVELOPMENT CONDITIONS (2017)

| Intersection | | | | | | | | | | | | |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Intersection Delay, s/veh | 8.5 | | | | | | | | | | | |
| Intersection LOS | A | | | | | | | | | | | |
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBU | NBL | NBT | NBR |
| Vol, veh/h | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 24 | 0 | 103 | 52 | 151 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 0 | 0 | 0 | 0 | 72 | 26 | 0 | 112 | 57 | 164 |
| Number of Lanes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | WB | NB |
|----------------------------|-----|-----|
| Opposing Approach | | SB |
| Opposing Lanes | 0 | 1 |
| Conflicting Approach Left | NB | |
| Conflicting Lanes Left | 2 | 0 |
| Conflicting Approach Right | SB | WB |
| Conflicting Lanes Right | 1 | 1 |
| HCM Control Delay | 8.4 | 8.7 |
| HCM LOS | A | A |

| Lane | NBLn1 | NBLn2 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, % | 100% | 0% | 0% | 37% |
| Vol Thru, % | 0% | 26% | 73% | 0% |
| Vol Right, % | 0% | 74% | 27% | 63% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 103 | 203 | 90 | 76 |
| LT Vol | 103 | 0 | 0 | 28 |
| Through Vol | 0 | 52 | 66 | 0 |
| RT Vol | 0 | 151 | 24 | 48 |
| Lane Flow Rate | 112 | 221 | 98 | 83 |
| Geometry Grp | 7 | 7 | 2 | 5 |
| Degree of Util (X) | 0.163 | 0.259 | 0.127 | 0.099 |
| Departure Headway (Hd) | 5.252 | 4.229 | 4.666 | 4.298 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 675 | 836 | 772 | 836 |
| Service Time | 3.05 | 2.026 | 2.673 | 2.313 |
| HCM Lane V/C Ratio | 0.166 | 0.264 | 0.127 | 0.099 |
| HCM Control Delay | 9.1 | 8.5 | 8.4 | 7.8 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.6 | 1 | 0.4 | 0.3 |

Intersection

Intersection Delay, s/veh

Intersection LOS

| Movement | SBU | SBL | SBT | SBR |
|-------------------|------|------|------|------|
| Vol, veh/h | 0 | 28 | 0 | 48 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 30 | 0 | 52 |
| Number of Lanes | 0 | 0 | 1 | 0 |

Approach SB

Opposing Approach NB

Opposing Lanes 2

Conflicting Approach Left WB

Conflicting Lanes Left 1

Conflicting Approach Right

Conflicting Lanes Right 0

HCM Control Delay 7.8

HCM LOS A

Lane

HCM Unsignalized Intersection Capacity Analysis

2: S Church Street/North Church Street & East Broadway

Lovetsville 7-11
Future w Development

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  |  |
| Volume (veh/h) | 5 | 141 | 5 | 19 | 79 | 6 | 6 | 10 | 34 | 6 | 9 | 3 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 5 | 153 | 5 | 21 | 86 | 7 | 7 | 11 | 37 | 7 | 10 | 3 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 92 | | | 159 | | | 305 | 301 | 156 | 340 | 300 | 89 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 92 | | | 159 | | | 305 | 301 | 156 | 340 | 300 | 89 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 100 | | | 99 | | | 99 | 98 | 96 | 99 | 98 | 100 |
| cM capacity (veh/h) | 1502 | | | 1421 | | | 628 | 601 | 890 | 573 | 601 | 969 |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 164 | 113 | 54 | 16 | 3 | | | | | | | |
| Volume Left | 5 | 21 | 7 | 7 | 0 | | | | | | | |
| Volume Right | 5 | 7 | 37 | 0 | 3 | | | | | | | |
| cSH | 1502 | 1421 | 776 | 589 | 969 | | | | | | | |
| Volume to Capacity | 0.00 | 0.01 | 0.07 | 0.03 | 0.00 | | | | | | | |
| Queue Length 95th (ft) | 0 | 1 | 6 | 2 | 0 | | | | | | | |
| Control Delay (s) | 0.3 | 1.5 | 10.0 | 11.3 | 8.7 | | | | | | | |
| Lane LOS | A | A | A | B | A | | | | | | | |
| Approach Delay (s) | 0.3 | 1.5 | 10.0 | 10.9 | | | | | | | | |
| Approach LOS | | | A | B | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 2.8 | | | | | | | | | |
| Intersection Capacity Utilization | | | 28.4% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: North Church Street & 7-11 Drive

Lovetsville 7-11
Future w Development

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
| Lane Configurations |  | | |  |  | |
| Volume (veh/h) | 0 | 10 | 13 | 8 | 5 | 0 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 11 | 14 | 9 | 5 | 0 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 42 | 3 | 5 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 42 | 3 | 5 | | | |
| tC, single (s) | 6.8 | 6.9 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 100 | 99 | 99 | | | |
| cM capacity (veh/h) | 955 | 1080 | 1614 | | | |
| Direction, Lane # | EB 1 | NB 1 | SB 1 | SB 2 | | |
| Volume Total | 11 | 23 | 4 | 2 | | |
| Volume Left | 0 | 14 | 0 | 0 | | |
| Volume Right | 11 | 0 | 0 | 0 | | |
| cSH | 1080 | 1614 | 1700 | 1700 | | |
| Volume to Capacity | 0.01 | 0.01 | 0.00 | 0.00 | | |
| Queue Length 95th (ft) | 1 | 1 | 0 | 0 | | |
| Control Delay (s) | 8.4 | 4.5 | 0.0 | 0.0 | | |
| Lane LOS | A | A | | | | |
| Approach Delay (s) | 8.4 | 4.5 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 5.0 | | | |
| Intersection Capacity Utilization | | | 17.8% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

4: N Berlin Turnpike & West Broadway

Lovetsville 7-11
Future w Development

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | |  |  | | | | | |  |  |
| Volume (veh/h) | 14 | 0 | 83 | 37 | 42 | 162 | 0 | 0 | 0 | 0 | 320 | 4 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 15 | 0 | 90 | 40 | 46 | 176 | 0 | 0 | 0 | 0 | 348 | 4 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 371 | 348 | 348 | 438 | 348 | 0 | 348 | | | 0 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 371 | 348 | 348 | 438 | 348 | 0 | 348 | | | 0 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 97 | 100 | 87 | 91 | 92 | 84 | 100 | | | 100 | | |
| cM capacity (veh/h) | 461 | 576 | 695 | 460 | 576 | 1085 | 1211 | | | 1623 | | |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 105 | 40 | 222 | 348 | 4 | | | | | | | |
| Volume Left | 15 | 40 | 0 | 0 | 0 | | | | | | | |
| Volume Right | 90 | 0 | 176 | 0 | 4 | | | | | | | |
| cSH | 648 | 460 | 918 | 1700 | 1700 | | | | | | | |
| Volume to Capacity | 0.16 | 0.09 | 0.24 | 0.20 | 0.00 | | | | | | | |
| Queue Length 95th (ft) | 14 | 7 | 24 | 0 | 0 | | | | | | | |
| Control Delay (s) | 11.6 | 13.6 | 10.2 | 0.0 | 0.0 | | | | | | | |
| Lane LOS | B | B | B | | | | | | | | | |
| Approach Delay (s) | 11.6 | 10.7 | | 0.0 | | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 5.6 | | | | | | | | | |
| Intersection Capacity Utilization | | | 42.2% | | ICU Level of Service | | | | | A | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

| Intersection | | | | | | | | | | | | |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Intersection Delay, s/veh | 11.4 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBU | NBL | NBT | NBR |
| Vol, veh/h | 0 | 0 | 0 | 0 | 0 | 0 | 272 | 28 | 0 | 227 | 38 | 79 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 0 | 0 | 0 | 0 | 296 | 30 | 0 | 247 | 41 | 86 |
| Number of Lanes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | WB | NB |
|----------------------------|------|------|
| Opposing Approach | | SB |
| Opposing Lanes | 0 | 1 |
| Conflicting Approach Left | NB | |
| Conflicting Lanes Left | 2 | 0 |
| Conflicting Approach Right | SB | WB |
| Conflicting Lanes Right | 1 | 1 |
| HCM Control Delay | 12.1 | 11.4 |
| HCM LOS | B | B |

| Lane | NBLn1 | NBLn2 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, % | 100% | 0% | 0% | 25% |
| Vol Thru, % | 0% | 32% | 91% | 0% |
| Vol Right, % | 0% | 68% | 9% | 75% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 227 | 117 | 300 | 67 |
| LT Vol | 227 | 0 | 0 | 17 |
| Through Vol | 0 | 38 | 272 | 0 |
| RT Vol | 0 | 79 | 28 | 50 |
| Lane Flow Rate | 247 | 127 | 326 | 73 |
| Geometry Grp | 7 | 7 | 2 | 5 |
| Degree of Util (X) | 0.407 | 0.175 | 0.45 | 0.1 |
| Departure Headway (Hd) | 5.938 | 4.957 | 4.968 | 4.949 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 602 | 717 | 721 | 714 |
| Service Time | 3.718 | 2.736 | 3.023 | 3.048 |
| HCM Lane V/C Ratio | 0.41 | 0.177 | 0.452 | 0.102 |
| HCM Control Delay | 12.8 | 8.8 | 12.1 | 8.6 |
| HCM Lane LOS | B | A | B | A |
| HCM 95th-tile Q | 2 | 0.6 | 2.3 | 0.3 |

Intersection

Intersection Delay, s/veh
 Intersection LOS

| Movement | SBU | SBL | SBT | SBR |
|-------------------|------|------|------|------|
| Vol, veh/h | 0 | 17 | 0 | 50 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 18 | 0 | 54 |
| Number of Lanes | 0 | 0 | 1 | 0 |

Approach SB

| | |
|----------------------------|-----|
| Opposing Approach | NB |
| Opposing Lanes | 2 |
| Conflicting Approach Left | WB |
| Conflicting Lanes Left | 1 |
| Conflicting Approach Right | |
| Conflicting Lanes Right | 0 |
| HCM Control Delay | 8.6 |
| HCM LOS | A |

Lane

HCM Unsignalized Intersection Capacity Analysis
 2: S Church Street/North Church Street & East Broadway

Lovetsville 7-11
 Future w Development

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  |  |
| Volume (veh/h) | 5 | 71 | 2 | 37 | 270 | 14 | 11 | 10 | 21 | 8 | 11 | 14 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 5 | 77 | 2 | 40 | 293 | 15 | 12 | 11 | 23 | 9 | 12 | 15 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | None | | | | | None | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 309 | | | 79 | | | 492 | 478 | 78 | 499 | 472 | 301 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 309 | | | 79 | | | 492 | 478 | 78 | 499 | 472 | 301 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 100 | | | 97 | | | 97 | 98 | 98 | 98 | 97 | 98 |
| cM capacity (veh/h) | 1252 | | | 1519 | | | 457 | 471 | 982 | 452 | 475 | 739 |
| Direction, Lane # | | | | | | | | | | | | |
| | EB 1 | WB 1 | NB 1 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 85 | 349 | 46 | 21 | 15 | | | | | | | |
| Volume Left | 5 | 40 | 12 | 9 | 0 | | | | | | | |
| Volume Right | 2 | 15 | 23 | 0 | 15 | | | | | | | |
| cSH | 1252 | 1519 | 630 | 465 | 739 | | | | | | | |
| Volume to Capacity | 0.00 | 0.03 | 0.07 | 0.04 | 0.02 | | | | | | | |
| Queue Length 95th (ft) | 0 | 2 | 6 | 3 | 2 | | | | | | | |
| Control Delay (s) | 0.5 | 1.1 | 11.2 | 13.1 | 10.0 | | | | | | | |
| Lane LOS | A | A | B | B | A | | | | | | | |
| Approach Delay (s) | 0.5 | 1.1 | 11.2 | 11.8 | | | | | | | | |
| Approach LOS | | | | B | B | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | | 2.6 | | | | | | | | |
| Intersection Capacity Utilization | | | | 39.5% | ICU Level of Service | A | | | | | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: North Church Street & 7-11 Drive

Lovetsville 7-11
Future w Development

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
| Lane Configurations |  | | |  |  | |
| Volume (veh/h) | 0 | 10 | 10 | 19 | 23 | 0 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 11 | 11 | 21 | 25 | 0 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 67 | 12 | 25 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 67 | 12 | 25 | | | |
| tC, single (s) | 6.8 | 6.9 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 100 | 99 | 99 | | | |
| cM capacity (veh/h) | 923 | 1065 | 1588 | | | |
| Direction, Lane # | EB 1 | NB 1 | SB 1 | SB 2 | | |
| Volume Total | 11 | 32 | 17 | 8 | | |
| Volume Left | 0 | 11 | 0 | 0 | | |
| Volume Right | 11 | 0 | 0 | 0 | | |
| cSH | 1065 | 1588 | 1700 | 1700 | | |
| Volume to Capacity | 0.01 | 0.01 | 0.01 | 0.00 | | |
| Queue Length 95th (ft) | 1 | 1 | 0 | 0 | | |
| Control Delay (s) | 8.4 | 2.5 | 0.0 | 0.0 | | |
| Lane LOS | A | A | | | | |
| Approach Delay (s) | 8.4 | 2.5 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 2.5 | | | |
| Intersection Capacity Utilization | | | 18.2% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

4: N Berlin Turnpike & West Broadway

Lovetsville 7-11
Future w Development

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | |  |  | | | | | |  |  |
| Volume (veh/h) | 27 | 0 | 52 | 35 | 141 | 388 | 0 | 0 | 0 | 0 | 195 | 11 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 29 | 0 | 57 | 38 | 153 | 422 | 0 | 0 | 0 | 0 | 212 | 12 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 289 | 212 | 212 | 268 | 212 | 0 | 212 | | | 0 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 289 | 212 | 212 | 268 | 212 | 0 | 212 | | | 0 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 91 | 100 | 93 | 94 | 78 | 61 | 100 | | | 100 | | |
| cM capacity (veh/h) | 336 | 685 | 828 | 637 | 685 | 1085 | 1358 | | | 1623 | | |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | SB 1 | SB 2 | | | | | | | |
| Volume Total | 86 | 38 | 575 | 212 | 12 | | | | | | | |
| Volume Left | 29 | 38 | 0 | 0 | 0 | | | | | | | |
| Volume Right | 57 | 0 | 422 | 0 | 12 | | | | | | | |
| cSH | 552 | 637 | 939 | 1700 | 1700 | | | | | | | |
| Volume to Capacity | 0.16 | 0.06 | 0.61 | 0.12 | 0.01 | | | | | | | |
| Queue Length 95th (ft) | 14 | 5 | 108 | 0 | 0 | | | | | | | |
| Control Delay (s) | 12.7 | 11.0 | 14.7 | 0.0 | 0.0 | | | | | | | |
| Lane LOS | B | B | B | | | | | | | | | |
| Approach Delay (s) | 12.7 | 14.5 | | 0.0 | | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 10.8 | | | | | | | | | |
| Intersection Capacity Utilization | | | 48.2% | | ICU Level of Service | | | | | A | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |