Erickson Avenue Area Study

FINAL REPORT

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Prepared for:

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Executive Summary

STUDY PURPOSE AND BACKGROUND

The City of Harrisonburg is completing a small area plan for the Erickson Avenue corridor and adjacent areas between S High Street and S Main Street. The City intends to evaluate future land use conditions that align with the currently anticipated needs of the community in this area of the City. This study provides a conservative estimate of the transportation needs the study area will have if the greatest potential development were to occur. While it is unlikely every single land parcel in the study area will be developed as densely as possible, it is important to consider the transportation needs if that were to occur.

STUDY AREA AND ANALYSIS SCENARIOS

This traffic study was prepared to evaluate the impacts of the proposed land use and development projections on the surrounding transportation network. Therefore, the traffic study analyzed the transportation network under the following land use scenarios:

- **2024 Existing Conditions**
- **2045 No Build Conditions**
- **2045 Build Analysis**
- **2045 Mitigation Analysis**

The existing conditions served as a comparison scenario for all future conditions. 2045 No Build conditions considered forecasted traffic volumes and full development of all parcels within the study area, but it does not add any new street connections. For this study, full development refers to the highest number of dwelling units or commercial square footage for a given parcel that the City and study partners found reasonable. The 2045 Build analysis considered the same volumes and land development as the 2045 No Build analysis but added in several new proposed street connections in an effort to mitigate any issues seen in the 2045 No Build Analysis. The 2045 Mitigation analysis added additional improvements to the 2045 Build analysis to further refine and improve operations. The 2045 Mitigation also included recommendations for multimodal improvements to the study area.

The study area is bound by S High Street to the northwest, Pleasant Hill Road to the northeast, S Main Street to the southeast, W Mosby Road to the southwest, and Pear Street to the west. Erickson Avenue runs through the center of the study area, connecting S High Street and S Main Street. There are four signalized intersections and ten unsignalized intersections in the study area.

The Study Advisory Group (SAG) was formed to provide input throughout the development of the Erickson Avenue Area Study. The SAG is comprised of members from the Virginia Department of Transportation (VDOT) Staunton District, the Central Shenandoah Planning District Commission, and several City of Harrisonburg departments.

KEY FINDINGS AND CONCLUSIONS

2024 Existing Conditions

2024 existing conditions Synchro traffic analyses are generally consistent with observed field conditions. The unsignalized intersection of Pear Street and Erickson Avenue experienced significant delay on the stop-controlled approaches and exceeded capacity on the northbound approach during the PM peak. The funded Restricted Crossing U-Turn (RCUT) project will address safety and operations at this intersection. The other unsignalized intersections operated fairly well, with general approach delays of LOS B or better.

The Synchro traffic analysis matched field observations at Stone Spring Road and S Main Street with significant queuing and a high volume-to-capacity ratio for the westbound left-turn movement. The 95th percentile queues at the westbound, northbound, and southbound left-turn movements all exceeded storage during the PM peak hour. Average daily traffic was higher on S Main Street south of W Mosby Road than north of W Mosby Road, highlighting the significant turning movement volume at this location. The intersection of S High and Erickson operated similarly for all approaches, with all but one movement operating at a LOS C or worse in both the AM and PM peak hours. The intersection of S Main Street and W Mosby Road operated well during both peak hours, at a LOS C. The W Mosby Road approaches experienced significant delay. Likewise, the intersection of S Main Street and Pleasant Hill Road operated at a LOS B during both peak hours. The Pleasant Hill Road approaches experienced significant delay but also had very low volumes.

The most prevalent type of crashes at both intersections and along corridor segments were angle crashes and rear ends. This reflects issues with access management and a failure to yield right-of-way, as well as potential sight distance and roadway curvature issues. Rear ends are also common at signalized intersections. Access management is poor in the study area, with most commercial accesses not in compliance with VDOT minimum spacing requirements. The funded S Main Street median project will address access management along S Main Street between W Mosby Road and Stone Spring Road.

The Bicycle Level of Comfort assessment found that many of the study area corridors are fairly uncomfortable for bicyclists. Bike lanes are present on Erickson Avenue, S High Street, and S Main Street. There is no network of comfortable roadways for bicyclists in the study area. Sidewalks are present in the study area, but do not have high connectivity. They are frequently found on only one side of the street. Most intersections have crosswalks on only three legs. Pedestrians and bicycles were counted in the study area. Both were higher in volume during the PM peak period than the AM peak period.

2045 No Build Conditions

Under 2045 No Build conditions, delay increased greatly at signalized intersections, especially along Erickson Avenue at its intersections with S High Street and S Main Street and at the intersection of S Main Street and W Mosby Road. The RCUT also exhibited poor operation, with high delay for stop-controlled approaches. The 2045 No Build conditions analysis indicates that overall, the existing study area transportation network will struggle to accommodate future development and land uses

based on forecasted growth. Increases in delay are expected due to the projected traffic increase without additional street connections.

2045 Build Analysis

Under 2045 Build conditions, two new connector roads provided relief at the intersections of S High Street and Erickson Avenue and S Main Street and Erickson Avenue. Due to the utilization of the connector roads by development trips and the re-routing of some background trips, the RCUT operates acceptably. The two new streets help improve traffic circulation and spread out future volumes amongst more intersections. However, the intersections of Erickson Avenue with S High Street and S Main Street are crucial for entering and exiting the study area, and so they are constrained. They improve slightly in the Build condition. The intersection of S Main Street and W Mosby Road operates much better under the Build conditions, as many trips are re-routed to the new connector streets.

The 2045 Build conditions analysis indicates that two connector roads between Erickson Avenue, W Mosby Road, and Pear Street are necessary to accommodate future development and land uses based on forecasted growth.

2045 Mitigation Analysis

The mitigation analysis introduced two concepts to improve operation at signalized intersections. These concepts were developed with input from the City and SAG. Alternatives were considered that would be cost-effective and feasible to install within the existing right-of-way where possible, or able to be coordinated with future development. A second southbound left-turn lane was added at the intersection of S High Street and Erickson Avenue. This improvement was made based on the 2045 No Build and 2045 Build Analyses, which indicated a need for increased capacity for the southbound left-turn movement. A partial quadrant roadway intersection (QRI) was selected for the intersection of S Main Street and Erickson Avenue. The QRI re-routes eastbound and westbound left turns to two new intersections to improve operations at the intersection. This improvement was selected for being the most cost-effective of the intersection improvements evaluated. Both of these improvements decreased delay at these intersections.

The 2045 Mitigation analysis indicates that the study area transportation network can accommodate the proposed land use with the addition of new street connections and intersection improvements. The results of this study will be further refined as individual development sites submit site-specific transportation studies. The mitigation analysis also includes recommendations for multimodal improvements within the study area.

The levels of service for the future condition scenarios are visualized in **Figure A**. The overall intersection level of service is shown for the signalized intersections. The level of service for the movement operating the most poorly is shown for the unsignalized intersections.

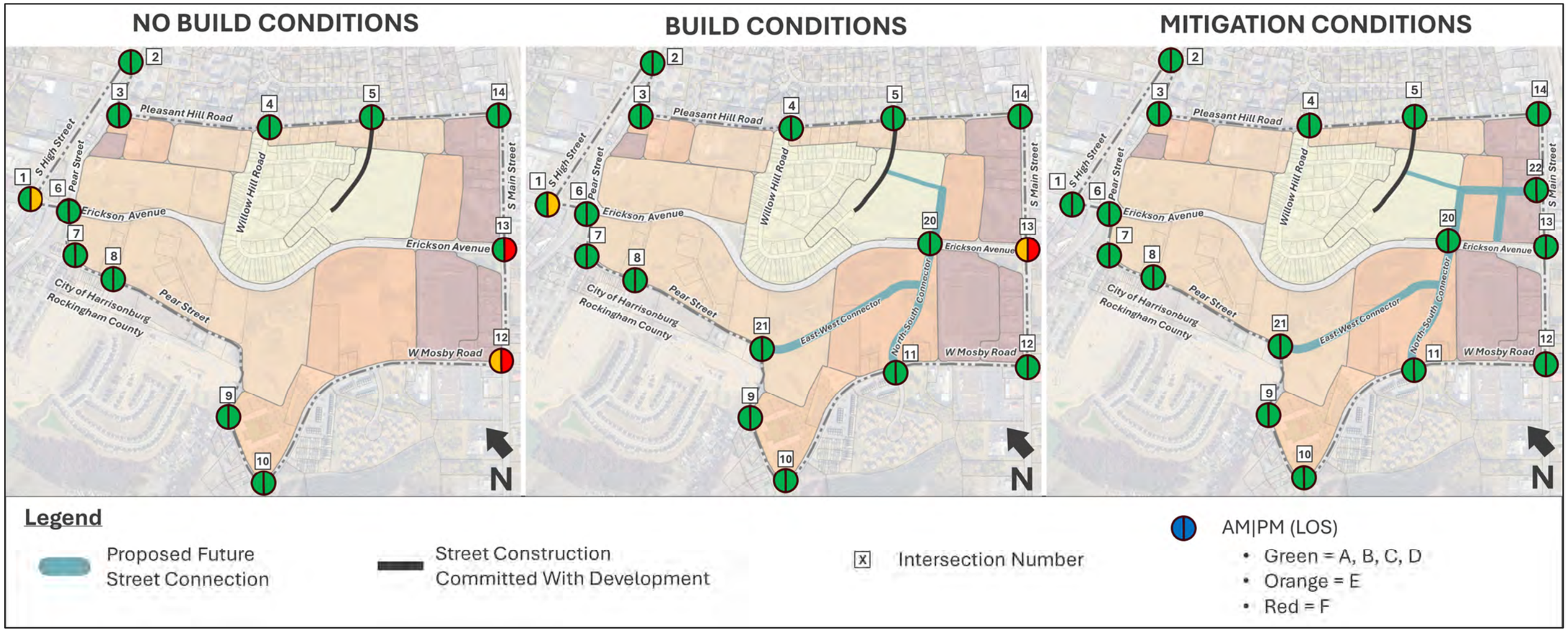

Figure A: Level of Service Comparison for Future Scenarios

1 Introduction

1.1 STUDY PURPOSE AND BACKGROUND

The City of Harrisonburg is completing a small area plan for the Erickson Avenue corridor and adjacent areas between S High Street and S Main Street. The City intends to evaluate future land use conditions that align with the currently anticipated development of the community in this area of the City. This study provides a conservative estimate of the transportation needs the study area will have if relatively dense potential development were to occur. While it is difficult to predict the density to which each land parcel in the study area will develop, it is important to consider the transportation needs for a relatively high density of development.

1.2 STUDY AREA AND ANALYSIS SCENARIOS

This traffic study was prepared to evaluate the impacts of the proposed land use and development projections on the surrounding transportation network. Therefore, the traffic study analyzed the transportation network under the following land use scenarios:

- **2024 Existing Conditions**
- **2045 No Build Conditions**
- **2045 Build Analysis**
- **2045 Mitigation Analysis**

The existing conditions serve as a comparison scenario for all future conditions. The existing conditions assessment used several metrics. A crash analysis evaluated safety, the traffic analysis detailed intersection operations using collected traffic volumes and speed data, and a multimodal evaluation summarized pedestrian, bicycle, and transit access in the study area. An access management evaluation was also performed to document sight distance and access points in the study area. Field observations are also noted to support the technical assessment.

2045 No Build conditions considered forecasted traffic volumes and full development of all parcels within the study area but did not add any new street connections. For this study, full development refers to the highest number of dwelling units or commercial square footage for a given parcel that the City and study partners found reasonable given topography, market conditions, and other factors. The 2045 Build analysis considered the same volumes and land development as the 2045 No Build analysis but added in several new proposed street connections in an effort to mitigate any issues seen in the 2045 No Build Analysis. The 2045 Mitigation analysis added additional improvements to the 2045 Build analysis to further refine and improve operations. The 2045 Mitigation also includes recommendations for multimodal improvements to the study area.

The study area is bound by S High Street to the northwest, Pleasant Hill Road to the northeast, S Main Street to the southeast, W Mosby Road to the southwest, and Pear Street to the west. Erickson Avenue runs through the center of the study area, connecting S High Street and S Main Street. There are four signalized intersections and ten unsignalized intersections in the study area.

1.3 STUDY ADVISORY GROUP

The Study Advisory Group (SAG) was formed to provide input throughout the development of the Erickson Avenue Area Study. The SAG is comprised of 18 members representing the following entities:

- VDOT Staunton District
- Central Shenandoah Planning District Commission
- City of Harrisonburg departments:
    - City Manager's Office
    - Community Development
    - Economic Development
    - Police
    - Public Transportation
    - Public Works

The SAG met 5 times over the duration of the study. The SAG met for a kickoff meeting, for two meetings to determine the best future land uses to use for evaluating future conditions, to review the forecasted future volumes, and to review the mitigation results prior to the public meeting.

2 Existing Conditions

This chapter details the existing conditions for the study area, the extents of which are shown in **Figure 2-1**. The existing conditions assessment used several metrics. A crash analysis evaluated safety, the traffic analysis detailed intersection operations using collected traffic volumes and speed data, and a multimodal evaluation summarized pedestrian, bicycle, and transit access in the study area. An access management evaluation was also performed to document sight distance and access points in the study area. Field observations are also noted to support the technical assessment.

2.1 STUDY AREA

The study area contains four signalized intersections and ten unsignalized intersections, along with the corridors between those intersections. The study area intersections are the following:

1. S High Street and Erickson Avenue (Signalized)
2. S High Street and Pear Street (Unsignalized)
3. Pleasant Hill Road and Pear Street (Unsignalized)
4. Pleasant Hill Road and Willow Hill Drive (Unsignalized)
5. Pleasant Hill Road and Central Avenue (Unsignalized)
6. Pear Street and Erickson Avenue (Unsignalized)
7. Pear Street and Russell Drive (Unsignalized)
8. Pear Street and Cobblers Court (Unsignalized)
9. Pear Street and Ruby Drive (Unsignalized)
10. Pear Street and W Mosby Road (Unsignalized)
11. W Mosby Road and Mosby Court (Unsignalized)
12. S Main Street and W Mosby Road (Signalized)
13. S Main Street and Erickson Avenue/Stone Spring Road (Signalized)
14. S Main Street and Pleasant Hill Road (Signalized)

S Main Street is co-labeled US Route 11, classified by the Virginia Department of Transportation (VDOT) as a minor arterial. Erickson Avenue connects S Main Street to S High Street and currently has no access points between Pear Street and S High Street. Erickson Avenue is classified as a minor arterial for most of the study area, but changes to a major collector north of S High Street. S High Street is co-labeled State Route 42, a principal arterial. Pear Street, west of Erickson Avenue, and W Mosby Road are classified as major collectors, while Pleasant Hill Road and Pear Street, east of Erickson Avenue, are minor collectors.

The railroad that crosses Erickson Avenue between its intersections with S High Street and Pear Street is noted to have low railroad traffic volumes per the City, and it does not impact traffic operations with any regularity at the time of this study. As a result, the railroad crossing was not included in the analysis.

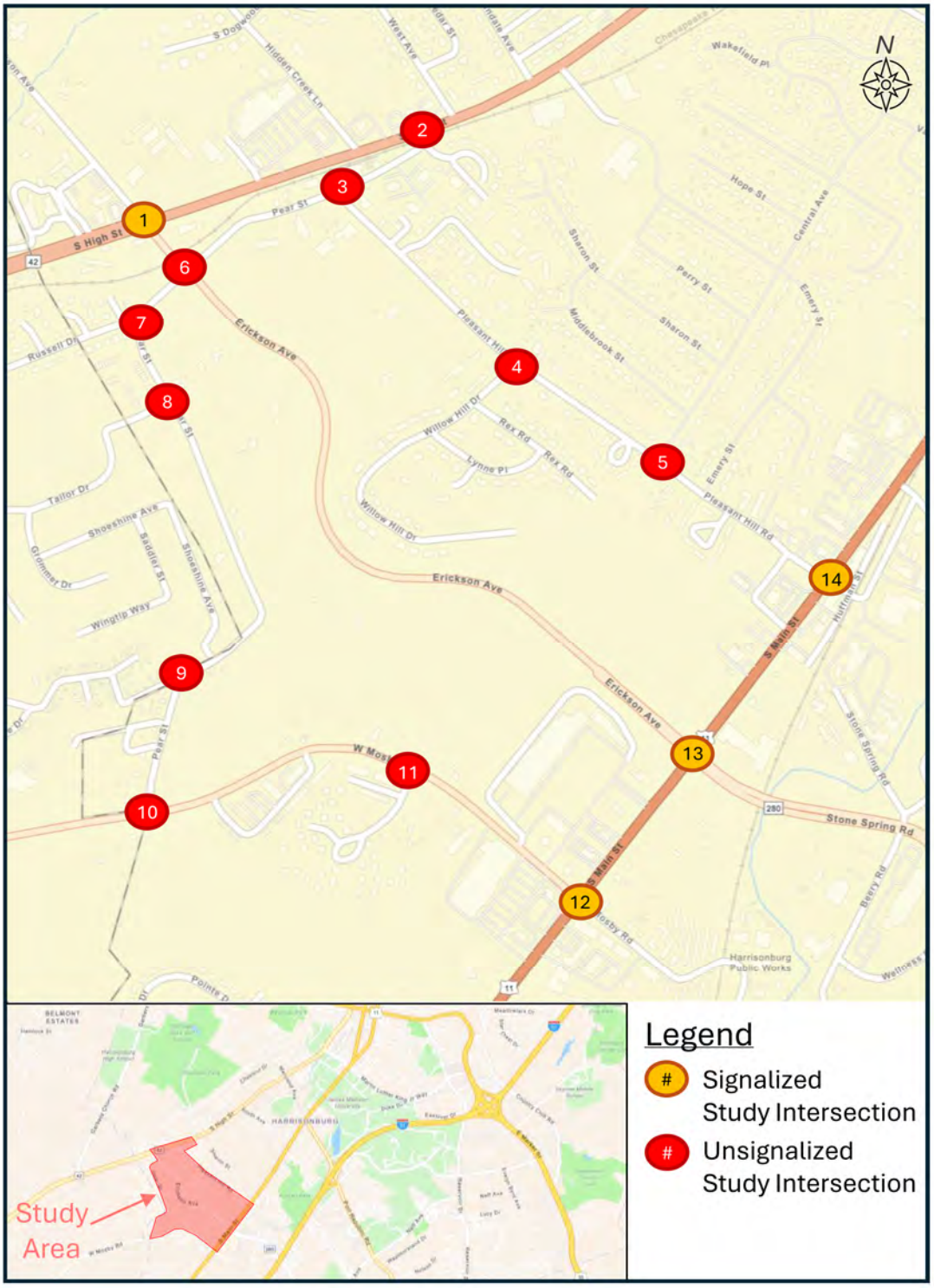

Figure 2-1: Study Area Map (Not to scale)

2.2 FUNDED TRANSPORTATION PROJECTS

Independent of this study, there are two transportation projects programmed for this study area. The following summarizes the scope and anticipated schedule of each project.

South Main Street: Mosby Road to Stone Spring Road

On S Main Street between W Mosby Road and Stone Spring Road, a three-foot-wide concrete median is being installed. Dedicated left-turn lanes for commercial access points will replace the existing two-way-left-turn lane. A five-foot-wide sidewalk will be installed on the east side of the corridor, and existing bike lanes will be removed to accommodate the median. Construction is anticipated in late 2025.

Pear Street & Erickson Avenue Intersection Safety Improvements

At the intersection of Pear Street and Erickson Avenue, a modified Restricted Crossing U-Turn (RCUT) has been identified to improve safety and operations. Three of the four left-turns and both minor street through movements will be redirected to signalized U-turns. Pedestrian crossing enhancements will also be incorporated. This project is projected for preliminary engineering in 2026 and the construction start date is to be determined.

2.3 DATA COLLECTION

2.3.1 Turning Movement Counts

Turning movement count (TMC) data was collected Tuesday, October 29, 2024, from 7:00 AM to 7:00 PM for the study area intersections listed in the prior section. Based upon a review of the collected TMC data, the network AM and PM peak hours for the study area were determined to be 7:30 AM to 8:30 AM and 3:30 PM to 4:30 PM, respectively. However, the PM peak hour was selected to be 4:30 PM to 5:30 PM. Many intersections' peak hour began at 4:30 PM, with volumes that were comparable to the 3:30 PM to 4:30 PM timeframe. The intersection of S High Street and Erickson Avenue tilted the network to a 3:30 PM peak hour with a school that releases at 3:45 PM. It is anticipated that any new trips for future land uses will have a more traditional commuter peak hour. Based on a review of the network peak hour volumes in Synchro, collected traffic volumes were fairly balanced along the corridor, and no adjustments were made to the source volumes. The network peak hours were used to evaluate the existing traffic conditions. Peak hour turning movement count data is summarized in **Figure 2-2**.

Roadways parallel to Interstate 81 are labeled as North-South, which include S High Street, S Main Street, and Pear Street. Erickson Avenue, W Mosby Road, and Pleasant Hill Road are labeled as East-West. The only exception to this rule is that Pear Street is labeled East-West at its intersection with S High Street.

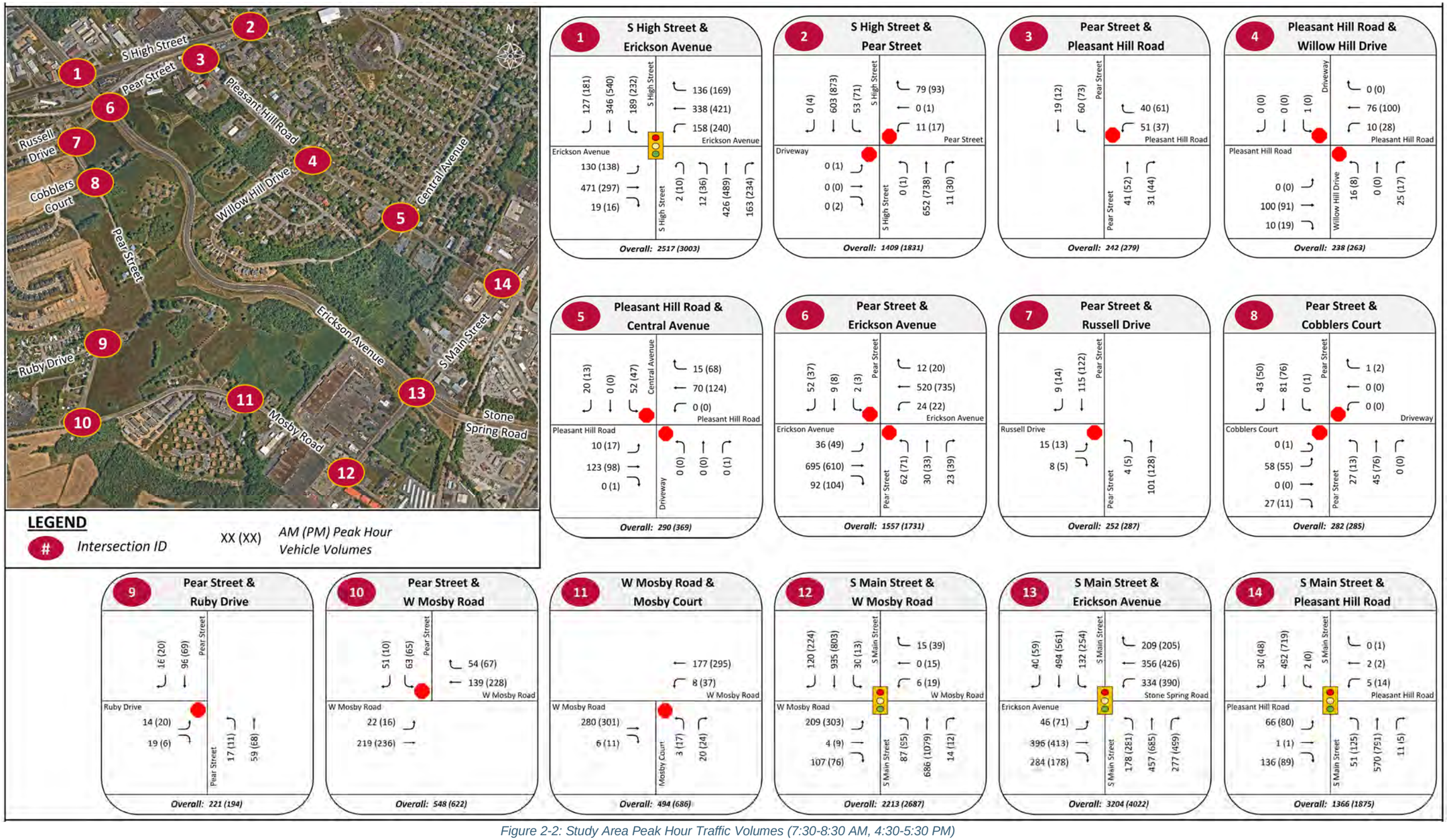

Figure 2-2: Study Area Peak Hour Traffic Volumes (7:30-8:30 AM, 4:30-5:30 PM)

2.3.2 Average Daily Traffic

In addition to TMC data collection, seven-day volume, speed, and vehicle classification data was collected at the following locations from October 29, 2024, to November 4, 2024, in 15-minute intervals:

A. S High Street (east of Erickson Avenue)
B. Pear Street (between Cobblers Court and Saddlers Street)
C. Erickson Avenue (between S High Street and S Main Street)
D. W Mosby Road (just south of Mosby Court)
E. S Main Street (between Erickson Avenue/Stone Spring Road and Pleasant Hill Road)
F. Pleasant Hill Road (in the vicinity of Affordable Suites/Smith Glass)

Figure 2-3 shows the average daily traffic for Tuesday through Thursday from the collected data for each roadway in the study area, with the exception of S Main Street south of W Mosby Road. Monday and Friday data were excluded as travel patterns on those days typically vary from mid-week conditions and are not necessarily representative of typical conditions. Significant outliers were removed from the dataset. The average weekday traffic (AWDT) volume for S Main Street south of W Mosby Road comes from a City speed study completed in September 2023 over two days (Tuesday, September 26, 2023, and Wednesday, September 28, 2023). As this data source is different, the AWDT for S Main Street south of W Mosby Road is shown with a dashed line. The average daily traffic is highest in the study area during the PM peak. Erickson Avenue, S High Street, and S Main Street all experience much greater volumes during the PM peak hours than the AM peak hours. S Main Street experiences a notable midday peak around 12:15 PM. In general, the AWDTs reflect the TMCs collected on October 29, 2024. S Main Street south of W Mosby Road has a consistently higher AWDT than S Main Street north of W Mosby Road, a difference of around 13 percent. This could be attributed to vehicles turning from Stone Spring Road or Erickson Avenue onto southbound S Main Street.

Speed and class were also collected and are summarized in **Table 2-1**. All 85th percentile speeds were within 7 MPH of the posted speed limit except on Pleasant Hill Road. On Pleasant Hill Road, the 85th percentile speed was 11 MPH faster than the posted speed limit. The percentage of heavy vehicles ranges from 1.9% to 5.3% on study area roadways.

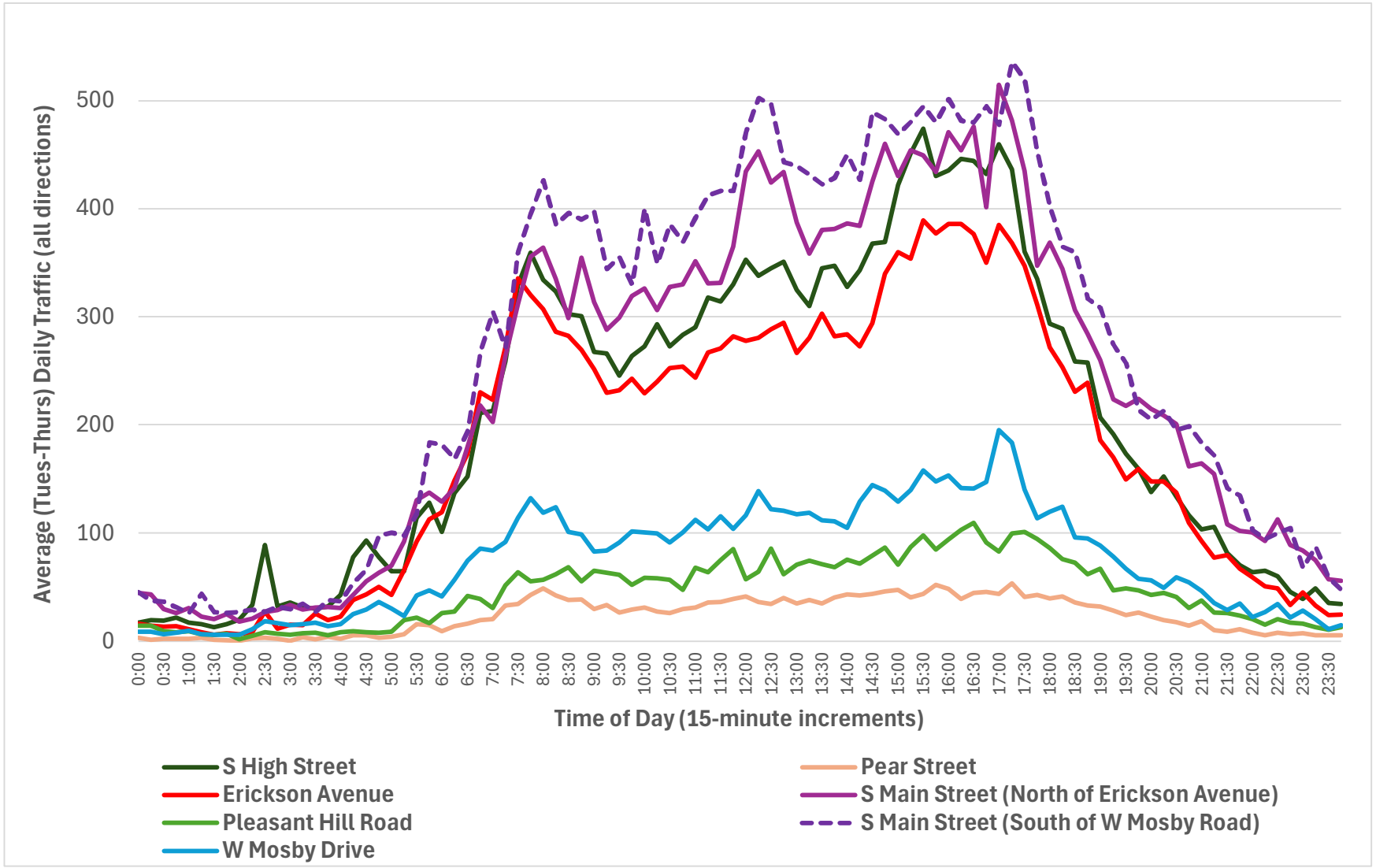

Figure 2-3: Average Weekday Traffic by Roadway (15-minute increments)

Table 2-1: AWDT, 85th Percentile Speed, and Class

Data Collection Point		AWDT (Tues, Wed, Thurs)	Speed Limit	Average Weekday (Tues, Wed, Thurs)	
Roadway	Segment			85th % Speed (Both Directions)	% Heavy Vehicles
S High Street	Erickson Avenue to Pear Street	19,900	35	41	4.7%
Pear Street	Cobblers Court to W Mosby Road	2,250	25	31	4.0%
Erickson Avenue	Pear Street to S Main Street	17,320	35	42	5.3%
W Mosby Road	Mosby Court to S Main Street	7,240	25	30	4.0%
S Main Street	Erickson Avenue to Pleasant Hill Road	22,580	35	40	5.1%
S Main Street	South of W Mosby Road	25,536*	35	38	N/A**
Pleasant Hill Road	Central Avenue to S Main Street	4,420***	25	36	1.9%

*Only two days of available data.
**No available data.
***Only Tuesday and Wednesday data was used, as Thursday was a significant outlier.

2.3.3 Field Observations

On November 6, 2024, during both the AM and PM peak hours, field observations were completed at the study intersections. These observations documented traffic operations, queuing, travel patterns, and geometric deficiencies that may be relevant to identifying future recommendations or understanding existing crash patterns. The study area appeared to be operating at what would be considered typical volume for that time of day. The following points detail field observations:

- Erickson Avenue presents significant vertical and horizontal curve challenges. Pear Street also presents vertical and horizontal curve challenges, especially given that it is only two lanes. An example of such challenges on Pear Street is shown in **Figure 2-4**. The eastbound approach of Pleasant Hill Road and S Main Street also has poor stopping sight distance due to a vertical curve in the road.

Figure 2-4: Pear Street vertical and horizontal curves

- There is poor visibility to the right (looking west) for the southbound left turn movement from Pear Street onto Erickson Avenue due to queued vehicles in the downstream westbound lanes on Erickson Avenue approaching S High Street. Additionally, significant delay was experienced in making a left turn from both Pear Street approaches onto Erickson Avenue. During the PM peak hour, there was a seven-vehicle queue on the northbound Pear Street approach.
- There was consistent traffic on eastbound Erickson Avenue west of S High Street during both the AM and PM peak hour, leaving few gaps for left turns into access points. At the eastbound approach to Erickson Avenue and S High Street, the lane utilization is poor, with most vehicles in the right lane, even if not turning right.
- The left-turn movement at westbound Stone Spring Road and S Main Street queued during the AM peak hour with 10 to 15 unserved vehicles. The queue was consistent and was usually within the storage lane and served within one cycle. However, at times, the queue backed up to the upstream intersection. During the PM peak hour, the westbound left-turn queue exceeds storage lane capacity, extending up over the hill. The northbound and southbound left-turn queues are also lengthy. This queuing is captured in **Figure 2-5**.

Figure 2-5: Stone Spring Road westbound approach during the AM (left) and PM (right) peak hours

- No bicycles were observed in the study area, but there are bike lanes on Erickson Avenue, S Main Street, and S High Street. Examples are shown in **Figure 2-6**. The bike lanes end going west and south at the intersection of Erickson Avenue and S High Street.

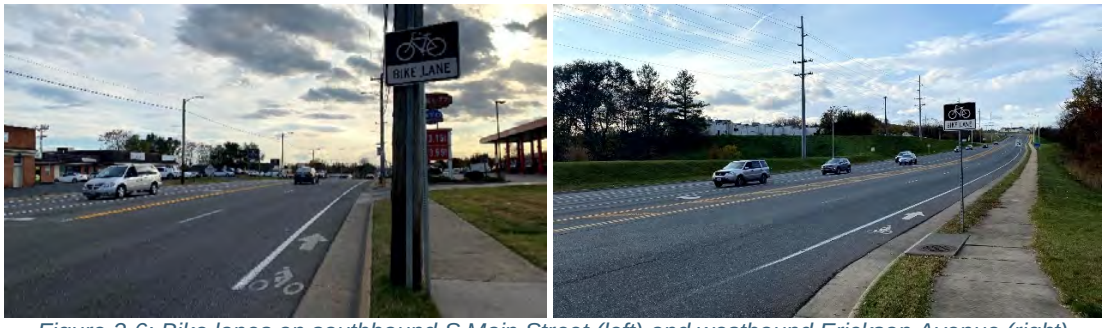

Figure 2-6: Bike lanes on southbound S Main Street (left) and westbound Erickson Avenue (right)

- One pedestrian was observed walking southbound on S Main Street. One pedestrian was observed walking eastbound on Erickson Avenue. There is sidewalk only on the north side of Erickson Avenue. Additionally, most intersections have crosswalks on only three legs.

- The center running two-way left turn lanes (TWLTLs) are heavily used in both directions on both S Main Street and S High Street.
- The speed limit on W Mosby Road changes from 25 MPH west of S Main Street to 35 MPH west of Mosby Court to 45 MPH just west of Pear Street. No issues with compliance with this change in speed limit were observed.
- Willow Hill Drive does not connect to Pleasant Hill Road at Central Avenue but is intended to when the Willow Ridge development is complete.
- Central Avenue has curbside parallel parking pavement markings, but no centerline.

2.4 CRASH ANALYSIS

A crash analysis for the Erickson Avenue study area was conducted using the latest five years of crash data. The crash reports from September 1, 2019, through August 31, 2024, were obtained from the Virginia Department of Transportation database. Each study intersection was isolated to a 250-foot radius around the center of the intersection and analyzed individually. The crash data along the corridor segments, which includes roadway outside of each 250-foot intersection radius, was also collected and analyzed.

There were a total of 274 reported crashes between September 1, 2019, and August 31, 2024, in the study area. The majority of crashes resulted in property damage only, occurred during daylight, and were angle or rear end crashes. 205 of the crashes occurred at intersections while the remaining 69 occurred along corridor segments. Of the 205 intersection crashes, 63 were reported at the intersection of S Main Street and Erickson Avenue, 45 were reported at the intersection of S High Street and Erickson Avenue, 33 were reported at the intersection of S Main Street and W Mosby Road, 27 were reported at the intersection of Pear Street and Erickson Avenue, and 19 were reported at the intersection of S Main Street and Pleasant Hill Road. Six or fewer crashes occurred at the remaining study intersections. The majority of intersection crashes were angle or rear end crashes. Of the 69 corridor crashes, 37 were reported along S Main Street, and 11 each were reported along Erickson Avenue and W Mosby Road. The majority of these corridor crashes were angle or rear end crashes.

The findings from the crash analysis are summarized in **Appendix A**.

2.5 MULTIMODAL AND ACCESS MANAGEMENT EVALUATION

2.5.1 Transit Evaluation

The Harrisonburg Department of Public Transportation (HDPT) runs six City routes. Two routes, Route 3 and Route 4, run within the project study area. These routes operate between 6:30 a.m. and 6:30 p.m. on weekdays. **Figure 2-7** shows the average daily weekday ridership numbers by bus stop for the portions of Route 3 and portions of Route 4 that are within the project study area or within 100 feet of the project study area. The daily ridership data was collected during the month of September 2024. The ridership values shown were determined by taking the average of all weekday data within the data collection period for each bus stop.

The project study area consists of 12 bus stops. Four of the bus stops are along Route 3 and eight bus stops are along Route 4. Seven of the 12 bus stops have an average daily weekday ridership of approximately 2 passengers per day. The bus stops with the highest ridership are Pleasant Hill Road

at Shenk Apartments and West Mosby Road at Sharp Shopper. The average daily weekday ridership for these bus stops is 4.9 and 5.0, respectively. The higher ridership at these bus stops may be due to their proximity to large trip generator developments like high density housing and a large shopping center.

Figure 2-8 shows the total average daily weekday ridership by route for all bus stops within the project study area. The ridership for both routes is similar. Route 3 had a total average ridership of 11.7 passengers per day, and Route 4 had a total average ridership of 17.6 passengers per day. The larger ridership value for Route 4 can be attributed to the greater number of bus stops for this route within the project study area.

Route 3 and Route 4 also operate on Saturdays between 8:30 a.m. and 5:30 p.m. Saturday ridership data was also collected in the month of September, and the reported ridership values were averaged across multiple weekends for this analysis. All bus stops except for West Mosby Road at Sharp Shopper had an average Saturday daily ridership between 1 and 2. Two bus stops, South Main Street at Pleasant Hill Road and South Main Street at Pueblo Grande Mexican Grill, did not have any riders at those bus stops on Saturdays. These two bus stops also have the lowest ridership on weekdays. The remaining bus stop, West Mosby Road at Sharp Shopper, had the highest average Saturday daily ridership at 5. This bus stop had the highest ridership for both the weekday and Saturday averages.

On-time performance data for the entirety of both routes (including areas outside of the study area) was collected for the month of September. On-time performance measures how well a bus adheres to its scheduled arrival and departure times. Route 3 reported an on-time performance of 57.5%. The remaining percentage reported that the buses were no more than 5 minutes late. Route 4 reported an on-time performance of 64.9%. With the exception of 1.5% of early arrivals, it was reported that the buses were no more than 5 minutes late.

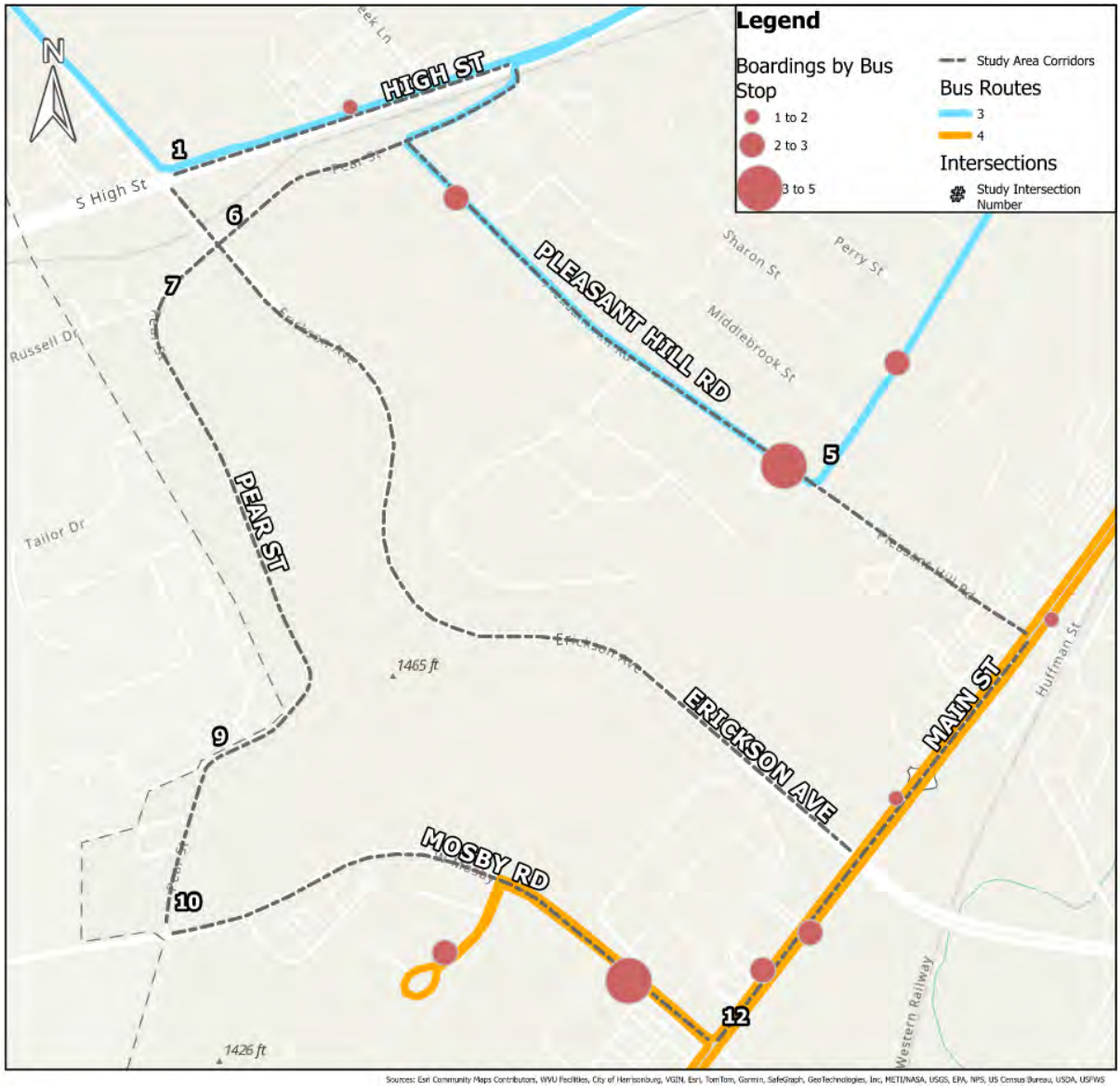

Figure 2-7: Harrisonburg Department of Public Transportation Average Weekday Ridership – Routes 3 and 4

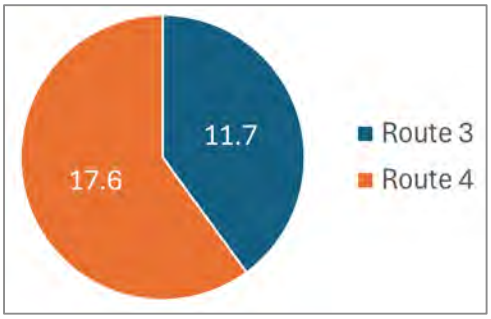

Figure 2-8. Average Total Daily Weekday Ridership by Route (within the study area)

2.5.2 Bicycle and Pedestrian Facilities

There are existing bicycle and pedestrian facilities within the study area. **Figure 2-9** summarizes the presence of bicycle lanes, sidewalks, detectable warning surface (DWS) on sidewalk ramps, and crosswalk locations. Sidewalk connectivity in the study area is limited. Erickson Avenue and S Main Street have sidewalk continuously on one side throughout the study area. W Mosby Road has sidewalk on one side that connects developments to S Main Street. The other corridors have portions of sidewalk that do not connect. There is DWS on most study area sidewalk ramps; however, one ramp at Pleasant Hill Road and S Main Street does not have DWS. Bike lanes are present on Erickson Avenue, S High Street, and S Main Street. There are no bicycle indications, such as share-the-road signs or pavement markings, on other study area corridors. In addition, according to the Harrisonburg Community Bike Map 2022[1], several of the corridors have steep grades: Erickson Avenue, Pear Street, and Pleasant Hill Road.

Pedestrian and bicycle volume at intersections was collected on October 29, 2024, along with the turning movement counts. During the AM peak hour of 7:30 AM to 8:30 AM, there were four pedestrian crossings at the intersection of Pleasant Hill Road and Pear Street, one pedestrian at Pleasant Hill Road and Central Avenue, and two pedestrian crossings at S Main Street and Erickson Avenue. During the PM peak hour of 4:30 PM to 5:30 PM, there were pedestrian crossings at nine of the 14 study intersections. There were 12 pedestrian crossings during the PM peak hour at S Main Street and Pleasant Hill Road. **Table 2-2** summarizes the pedestrian volumes by intersection.

The majority of pedestrian volume occurred between 3:00 PM and 5:30 PM. The highest number of pedestrian crossings seen in the study area during one 15-minute period was 18 pedestrian crossings from 3:30 PM to 3:45 PM. Ten of those pedestrian crossings were at the intersection of Pear Street and Cobblers Court, which could be attributed to a school bus dropping off students at the Cobblers Court development.

The AM peak hour of 7:30 AM to 8:30 AM recorded zero bicycles. The PM peak hour from 4:30 PM to 5:30 PM recorded 18 bicycles. S High Street and Erickson Avenue, S Main Street and Erickson Avenue, and S Main Street and Pleasant Hill Road recorded the highest volume of bicycles compared to the other intersections. They each had between four to six bicycles as the maximum hourly intersection bicycle volume. In general, the study area experiences the most bicycle volume between 2:00 PM and 6:15 PM.

[1] https://www.harrisonburgva.gov/bike-map

Figure 2-9: Existing Pedestrian and Bicycle Facilities

Table 2-2: Pedestrian Volume at Study Area Intersections

Intersection	AM Peak Hour Pedestrian Volume	PM Peak Hour Pedestrian Volume	Maximum # of Pedestrians in any one 15-minute Period	Total Pedestrian Volume (7:00 AM to 7:00 PM)
S High Street and Erickson Avenue	0	0	3	7
S High Street and Pear Street	0	2	5	27
Pleasant Hill Road and Pear Street	4	1	2	11
Pleasant Hill Road and Willow Hill Drive	1	0	1	4
Pleasant Hill Road and Central Avenue	0	2	6	23
Pear Street and Erickson Avenue	0	0	1	5
Pear Street and Russell Drive	0	2	4	22
Pear Street and Cobblers Court	0	0	10	19
Pear Street and Ruby Drive	0	0	2	4
Pear Street and W Mosby Road	0	2	1	10
W Mosby Road and Mosby Court	0	3	3	14
S Main Street and W Mosby Road	0	1	5	27
S Main Street and Erickson Avenue/Stone Spring Road	2	5	4	32
S Main Street and Pleasant Hill Road	0	12	7	37

2.5.3 Bicycle Level of Comfort Assessment

A bicycle level of comfort (BLoC) assessment, also referred to as level of traffic stress (LTS) analysis, was completed regarding bicycle mobility in the study area. The 2022 "Levels of Traffic Stress" created by Dr. Peter Furth guided road segment grading criteria and grading levels. Levels of comfort were determined by quantifying and compiling several attributes: Average Daily Traffic (ADT), speed, number of lanes, parking lane presence and width, and bike facility presence. The four LTS ratings are:

- "LTS 1: Strong separation from all except low speed, low volume traffic. Simple crossings. Suitable for children.
- LTS 2: Except in low speed / low volume traffic situations, cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings. Physical separation from higher speed and multilane traffic. Crossings that are easy for an adult to negotiate. Corresponds to design criteria for Dutch bicycle route facilities. A level of traffic stress that most adults can tolerate, particularly those sometimes classified as 'interested but concerned.'
- LTS 3: Involves interaction with moderate speed or multilane traffic, or close proximity to higher speed traffic. A level of traffic stress acceptable to those classified as 'enthused and confident.'
- LTS 4: Involves interaction with higher speed traffic or close proximity to high-speed traffic. A level of stress acceptable only to those classified as 'strong and fearless.'"[2]

[2] https://peterfurth.sites.northeastern.edu/level-of-traffic-stress/

Road segment attributes were gathered from City GIS shapefiles and VDOT roadway open data. The ADTs collected for this study and the City's S Main Street speed study were used in the LTS calculation for study area corridors; the ADTs from VDOT data were used for the other roadways. The overall level of comfort is shown on the BLoC map, seen in **Figure 2-10**.

Within the study area, S Main Street, S High Street, Pear Street, W Mosby Road, Pleasant Hill Road, and Erickson Avenue exhibit LTS 3. LTS 3 indicates that there are limited separated facilities for bicycles, close proximity with high-speed traffic, and/or proximity to a high volume of traffic. Despite having 25 MPH speed limits, Pear Street, W Mosby Road, and Pleasant Hill Road have no bicycle facilities and are two-lane roadways with no shoulder, so it is understandable that these roadways are less comfortable for bicyclists. S Main Street, S High Street, and Erickson Avenue do have bicycle lanes, while still receiving an LTS rating of 3. This indicates that the bicycle lanes are likely not of sufficient width and/or separation from traffic in the corridor to be comfortable for all users. The speed limit is 35 MPH on these roadways, there are two travel lanes in each direction, and higher speed traffic reduces bicyclist comfort. Overall, there is not an existing network of comfortable bicycle facilities (LTS 1 or 2) in the study area.

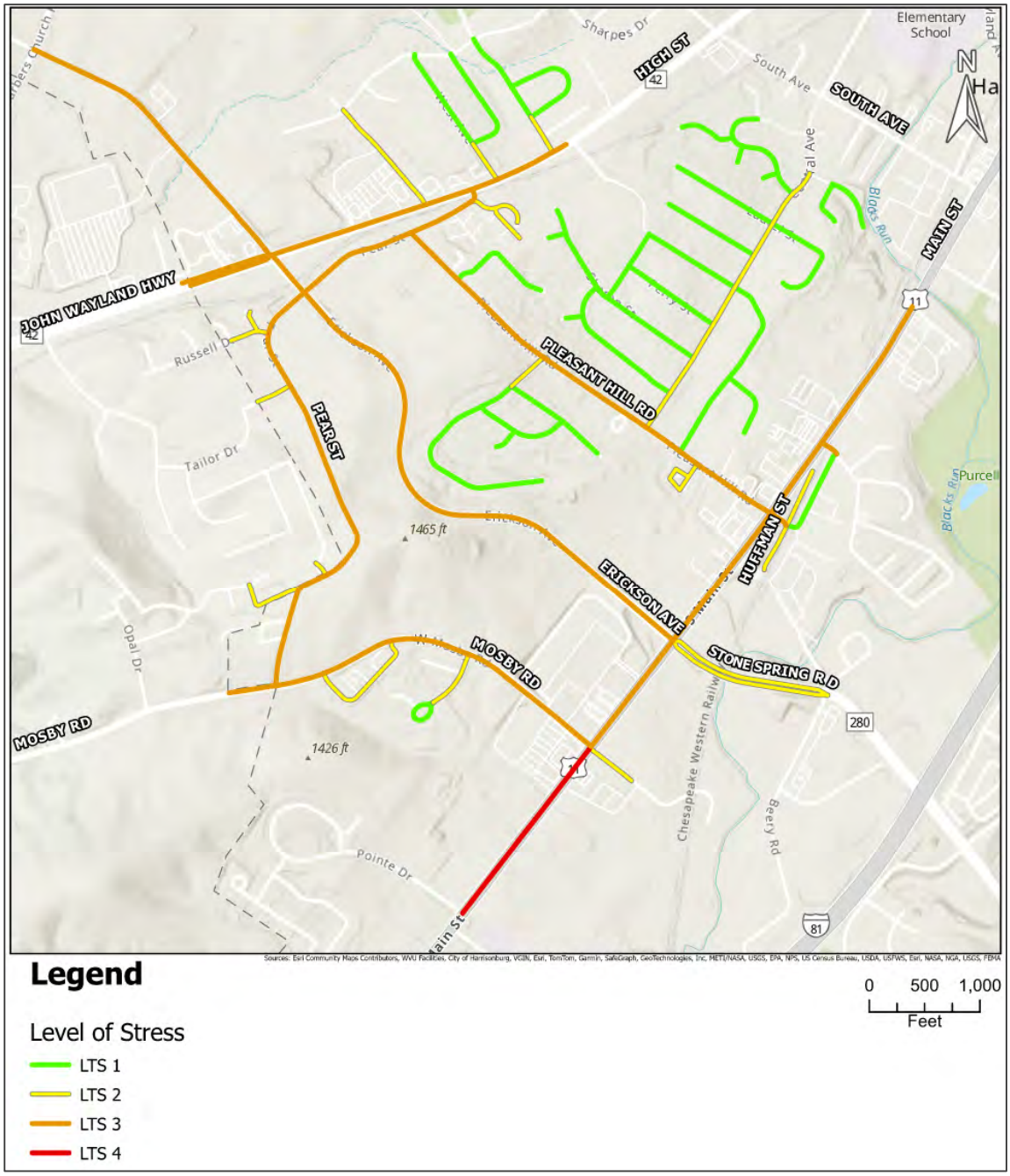

Figure 2-10: Bicycle Level of Comfort (BLoC) map

2.6 ACCESS MANAGEMENT

2.6.1 Access Points

The VDOT *Roadway Design Manual (RDM) Appendix F* identifies intersection spacing standards across various facility types and functional classifications. For areas that are more urbanized with a multimodal facilities focus, VDOT *RDM, Appendix B(2) Multimodal Design Standards For Mixed-Use Urban Centers* may be used in place of Appendix F standards. These standards are chosen based on likely future uses of the study area roadway network. Different spacing standards are provided based on the Virginia Department of Rail and Public Transportation (DRPT) *Multimodal System Design Guidelines*. The study area best fits in the "P4: Large Town/Suburban Center" multimodal center type. VDOT *RDM, Appendix B(2)* Table B(2)-3 is modified from *RDM Appendix F* Table 2-2, and applies to the small corridors' access management, but redirects to the *Appendix F* table for larger corridors. **Table 2-3** indicates which *RDM Appendix* standards are used for which corridors.

Table 2-3: Intersection Minimum Spacing Requirements

Corridor	VDOT RDM Standard Location	Speed Limit	Facility Type	Signalized Intersections	Unsignalized Intersections / Full Crossovers	Full Access / Directional Crossovers	Right-in / Right-Out
S High Street	Appendix F Table 2-2	35 MPH	Other Principal Arterial	1,320	1,050	565	305
Erickson Avenue			Minor Arterial	1,050	660	470	250
S Main Street							
Pear Street	Appendix B(2) Table B(2)-3	25 MPH	Major Avenue	800	400		200
Pleasant Hill Road		25 MPH					
W Mosby Road		25-35 MPH					

Figure 2-11 documents the intersection spacing between study intersections. The intersection spacing on Erickson Avenue between S High Street and Pear Street, for the full access unsignalized intersections, is not compliant. The existing spacing is 440 feet, and the minimum spacing requirement is 660 feet. This is not including the two access points along the segment that also render the segment non-compliant. The spacing between the intersections along Pleasant Hill Road with Central Avenue and with Emery Street is not adequate, at 380 feet, compared to the required 400 feet. **Figure 2-12** visualizes which access points are compliant and non-compliant with these access management requirements in the study area. Note that compliance is not assessed for driveways of single-family homes which must be provided access to the property. All signalized intersections meet separation requirements with other signalized intersections per the VDOT Roadway Design Manual Appendix B(2) Table B(2)-3.

The City will install a three-foot-wide concrete median on S Main Street from just south of W Mosby Road to Erickson Avenue in 2026. This will improve access management compliance and reduce the potential for crashes along this section of S Main Street. Most of the accesses along this section will become Right-In Right-Out and will need only 250 feet of spacing. However, given the density of access on this section, this reduction in spacing requirement will bring only one access point into compliance.

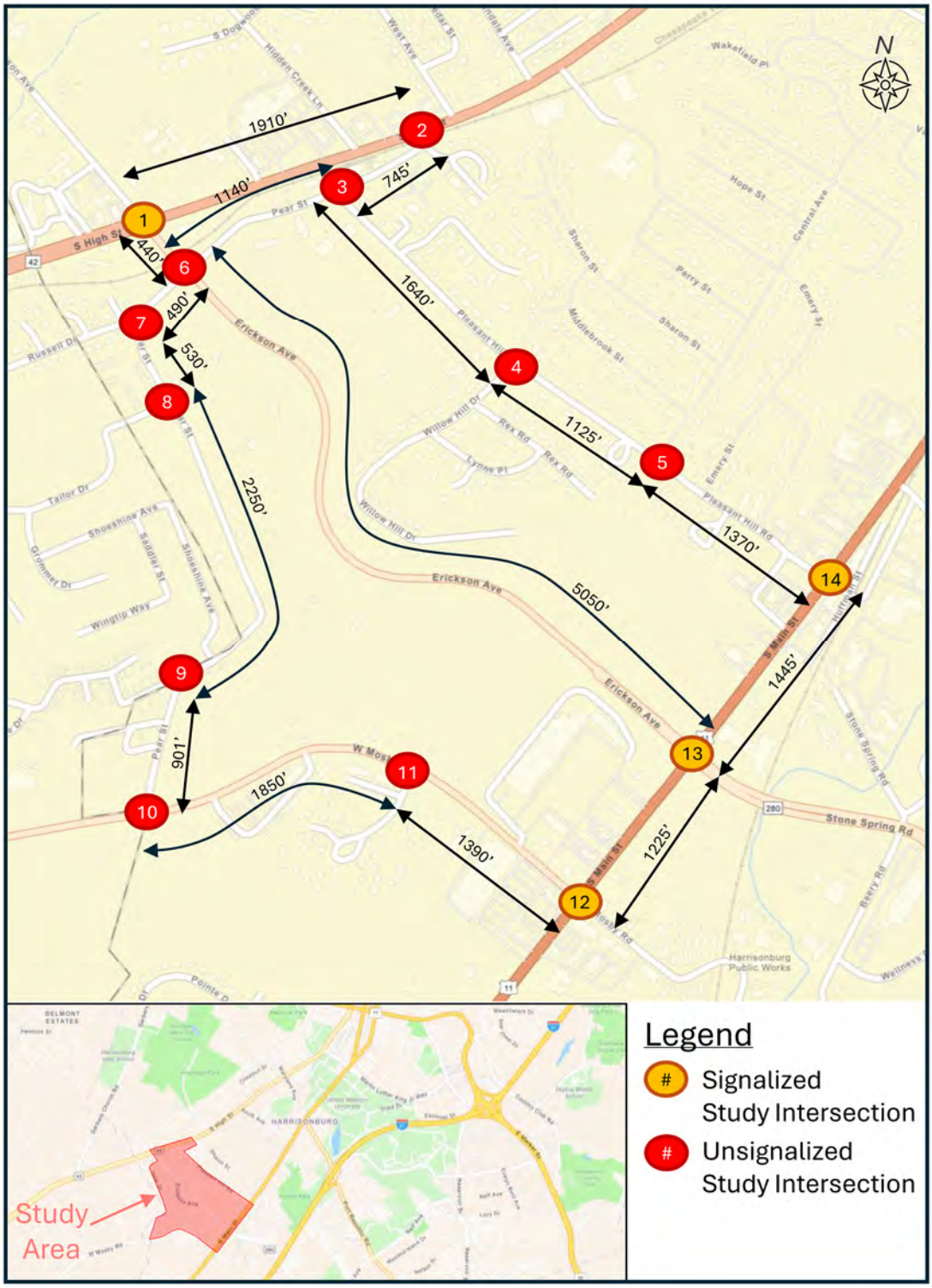

Figure 2-11: Study Intersection Spacing Diagram (Not to scale)

Figure 2-12: Access Point Compliance in Study Area

2.6.2 Intersection Sight Distance

Intersection sight distance is measured according to the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets* (Green Book). The minimum intersection sight distance (ISD) for passenger vehicles turning left or right from a stopped condition are summarized by corridor in **Table 2-4** for grades of three percent (3%) or less, calculated using the posted speed limit.

Table 2-4: Required Intersection Sight Distance from Stop

Corridor	Speed (MPH)	Type	Left-turn ISD	Right-turn ISD
S High St	35 MPH	4-lane with TWLTL	440 ft	335 ft
Pear St	25 MPH	2-lane	280 ft	240 ft
Pleasant Hill Road	25 MPH	2-lane	280 ft	240 ft
Erickson Avenue	35 MPH	4-lane with left-turn lane and bike lane	450 ft	335 ft
W Mosby Road at Pear Street	35 MPH	2-lane	390 ft	335 ft
W Mosby Road at Mosby Court	35 MPH	2-lane with center turn lane	415 ft	335 ft

A desktop review of the unsignalized study intersections was completed to identify potential sight distance issues based on vertical and horizontal curvature, vegetation, and parked vehicles. In addition, ISD exhibits were prepared to illustrate the potential sight distance issues with respect to physical obstructions and right-of-way constraints. All sight distance evaluations are preliminary and should be field verified. A summary of potential sight distance impacts for stop-controlled approaches at unsignalized intersections in the study area is presented below in **Table 2-5**. ISD exhibits can be found in **Appendix B.**

Table 2-5: Potential Sight Distance Impacts (by Intersection) for Minor Street Stop-Controlled Approaches

Intersection	Potential Sight Distance Impacts
Pear Street and S High Street	Queued vehicles, electric pole
Pleasant Hill Road and Pear Street	None identified
Pear Street and Erickson Avenue	Railroad signal poles, queued vehicles, vertical curvature
Russell Drive and Pear Street	None identified
Cobblers Court and Pear Street	None identified
Ruby Drive and Pear Street	Parked vehicles, vertical curvature
Pear Street and W Mosby Road	None identified
Mosby Court and W Mosby Road	Vertical curvature, fence
Willow Hill Drive and Pleasant Hill Road	Vertical curvature
Central Avenue and Pleasant Hill Road	Vegetation

2.7 EXISTING CONDITIONS TRAFFIC ANALYSIS

The existing operating conditions for each study intersection along the corridor were analyzed using Synchro software for the AM and PM peak hours. The key steps in preparing the network for existing conditions traffic analysis were as follows:

- Preparing Synchro files to include all study intersections and geometry
- Incorporating City-provided signal timings into Synchro
- Inputting AM and PM peak hour turning movement count data for all study intersections, including peak hour factors and heavy vehicle percentages
- Network review for volume balancing

2.7.1 Peak Hours

The TMC data indicated that the study intersections had various AM and PM intersection-specific peak hours. For the volumes at each intersection to be properly balanced, the network peak hour was used, which represented the highest total network volume across all study intersections. The network peak hour was found to be 7:30 to 8:30 AM for the morning and 3:30 to 4:30 PM for the evening. However, 4:30 to 5:30 PM was selected for the PM peak hour given that the future developments are likely to generate trips during a more traditional commuter time, and the difference in volumes across the network between the 3:30 to 4:30 PM peak hour compared to the 4:30 to 5:30 PM peak hour were nominal.

2.7.2 Measures of Effectiveness

Several measures of effectiveness (MOE), generated by Synchro 11 analysis software, were used to analyze existing operations at the study area intersections. These MOEs included average vehicular delay, level of service (LOS), and 95th percentile queue length. Highway Capacity Manual (HCM) 6th Edition methodology was used to report MOEs from Synchro at unsignalized intersections. HCM 2000 methodology was used to report MOEs from Synchro at signalized intersections due to limitations of HCM 6 methodology to analyze unique signal operations.

According to the HCM, capacity is defined as the maximum number of vehicles that can pass over a road segment or through an intersection within a fixed time duration. Operational conditions are described by a level of service (LOS), which is a qualitative measure that describes the operational conditions of an intersection or street and is an indicator of motorist perceptions within a traffic stream. The HCM defines six levels of service, LOS A through F, with A as the best and F as the worst. **Table 2-6** shows the level of service and delay per vehicle for signalized and unsignalized intersections.

Queue length is an indicator of congestion at both signalized and unsignalized intersections. The 95th percentile queue length for a given vehicle movement represents the queue length with a five percent probability of being exceeded during the analysis.

Table 2-6: Level of Service and Ranges of Delay

Level of Service (LOS)	Delay Per Vehicle (seconds)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10	≤ 10
B	> 10 – 20	> 10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50
Source, Signalized: Highway Capacity Manual, 6th Edition; Source, Unsignalized: HCM 2000		

Table 2-7 summarizes the findings from the MOEs for all intersections, including average vehicular delay, level of service (LOS), available storage, and 95th percentile queue length. Overall intersection delay is not reported for unsignalized intersections since delay cannot be calculated for uncontrolled through movements. Movements for which delay cannot be calculated are indicated with "(-)" in the table, and movements with zero volume are indicated by "N/A" in the table. LOS E is shown in orange text, and LOS F is shown in red text. Additionally, queues lengths that exceed the storage length are shown in red text.

Table 2-7: Existing AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 1: S High Street and Erickson Avenue (Signalized)						
Overall Intersection		-	C (33.8)	-	D (36.3)	-
Eastbound (Erickson Avenue)	EBL	235	C (28.1)	96	D (35.2)	110
	EBTR	-	D (43.7)	226	D (47.8)	164
	EB Approach	-	D (40.4)	-	D (43.9)	-
Westbound (Erickson Avenue)	WBL	150	C (28.6)	115	D (35.4)	**187**
	WBTR	-	D (39.2)	192	D (50.3)	265
	WB Approach	-	D (36.6)	-	D (46.0)	-
Northbound (S High Street)	NBL	130	C (22.2)	19	C (22.5)	46
	NBT	-	D (38.0)	205	D (37.9)	249
	NBR	240	C (22.7)	47	C (22.1)	98
	NB Approach	-	C (33.5)	-	C (32.2)	-
Southbound (S High Street)	SBL	150	C (27.0)	144	C (26.8)	**183**
	SBT	-	C (27.0)	151	C (30.8)	245
	SBR	390	B (17.4)	26	B (18.9)	34
	SB Approach	-	C (25.2)	-	C (27.5)	-
Intersection 2: S High Street and Pear Street (Unsignalized)						
Eastbound (Driveway)	EBLTR	-	N/A	-	D (27.0)	3
	EB Approach	-	N/A	-	D (27.0)	-
Westbound (Pear Street)	WBLTR	-	B (13.1)	18	C (23.2)	43
	WB Approach	-	B (13.1)	-	C (23.2)	-
Northbound (S High Street)	NBL	-	N/A		A (9.8)	0
	NBTR	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-
Southbound (S High Street)	SBL	90	A (9.5)	5	A (9.8)	8
	SBTR	-	(-)	-	(-)	-
	SB Approach	-	A (0.8)	-	A (0.7)	-
Intersection 3: Pleasant Hill Road and Pear Street (Unsignalized)						
Westbound (Pleasant Hill Road)	WBLR	-	B (10.3)	13	A (10.0)	13
	WB Approach	-	B (10.3)	-	A (10.0)	-
Northbound (Pear Street)	NBTR	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-
Southbound (Pear Street)	SBL	-	A (7.6)	5	A (7.6)	5
	SBT	-	(-)	-	(-)	-
	SB Approach	-	A (5.8)	-	A (6.5)	-
Intersection 4: Pleasant Hill Road and Willow Hill Drive (Unsignalized)						
Eastbound (Pleasant Hill Road)	EBL	-	N/A	0	N/A	0
	EBTR	-	(-)	-	(-)	-
	EB Approach	-	(-)	-	(-)	-
Westbound (Pleasant Hill Road)	WBL	-	A (7.6)	0	A (7.5)	3
	WBTR	-	(-)	-	(-)	-
	WB Approach	-	A (0.9)	-	A (1.6)	-
Northbound (Willow Hill Drive)	NBLTR	-	A (9.8)	5	A (9.5)	3
	NB Approach	-	A (9.8)	-	A (9.5)	-
Southbound (Driveway)	SBLTR	-	B (10.5)	0	N/A	-
	SB Approach	-	B (10.5)	-	N/A	-

(-) = Free movement

N/A = Zero volume; no delay reported

Table 2-7 (continued): Existing AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 5: Pleasant Hill Road and Central Avenue (Unsignalized)						
Eastbound (Pleasant Hill Road)	EBL	-	A (7.6)	0	A (7.7)	0
	EBTR	-	(-)	-	(-)	-
	EB Approach	-	A (0.6)	-	A (1.1)	-
Westbound (Pleasant Hill Road)	WBL	-	N/A	0	N/A	0
	WBTR	-	(-)	-	(-)	-
	WB Approach	-	(-)	-	(-)	-
Northbound (Driveway)	NBLTR	-	N/A	-	A (8.8)	0
	NB Approach	-	N/A	-	A (8.8)	-
Southbound (Central Avenue)	SBLTR	-	B (10.6)	10	B (10.9)	8
	SB Approach	-	B (10.6)	-	B (10.9)	-
Intersection 6: Pear Street and Erickson Avenue (Unsignalized)						
Eastbound (Erickson Avenue)	EBL	50	A (9.0)	3	A (9.7)	5
	EBTR	-	(-)	-	(-)	-
	EB Approach	-	A (0.4)	-	A (0.6)	-
Westbound (Erickson Avenue)	WBL	270	B (10.6)	3	A (9.5)	3
	WBTR	-	(-)	-	(-)	-
	WB Approach	-	A (0.5)	-	A (0.3)	-
Northbound (Pear Street)	NBLTR	-	**F (106.7)**	143	**F (235.1)**	245
	NB Approach	-	**F (106.7)**	-	**F (235.1)**	-
Southbound (Pear Street)	SBLTR	-	C (17.5)	18	D (25.8)	23
	SB Approach	-	C (17.5)	-	D (25.8)	-
Intersection 7: Pear Street and Russell Drive (Unsignalized)						
Eastbound (Russell Drive)	EBLTR	-	B (10.1)	3	B (10.3)	3
	EB Approach	-	B (10.1)	-	B (10.3)	-
Northbound (Pear Street)	NBL	-	A (7.8)	0	A (7.5)	0
	NBT	-	(-)	-	(-)	-
	NB Approach	-	A (0.3)	-	A (0.3)	-
Southbound (Pear Street)	SBTR	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	(-)	-
Intersection 8: Pear Street and Cobblers Court (Unsignalized)						
Eastbound (Cobblers Court)	EBLTR	-	B (10.2)	10	B (10.3)	10
	EB Approach	-	B (10.2)	-	B (10.3)	-
Westbound (Driveway)	WBLTR	-	A (8.5)	0	A (9.3)	0
	WB Approach	-	A (8.5)	-	A (9.3)	-
Northbound (Pear Street)	NBL	-	A (7.6)	3	A (7.5)	0
	NBTR	-	(-)	-	(-)	-
	NB Approach	-	A (2.9)	-	A (1.1)	-
Southbound (Pear Street)	SBL	-	N/A	0	A (8.4)	0
	SBTR	65	(-)	-	(-)	-
	SB Approach	-	(-)	-	A (0.1)	-
Intersection 9: Pear Street and Ruby Drive (Unsignalized)						
Eastbound (Ruby Drive)	EBLTR	-	A (9.5)	3	A (9.5)	3
	EB Approach	-	A (9.5)	-	A (9.5)	-
Northbound (Pear Street)	NBLT	-	A (7.6)	0	A (7.4)	0
	NB Approach	-	A (1.7)	-	A (1.0)	-
Southbound (Pear Street)	SBTR	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	(-)	-

(-) = Free movement
N/A = Zero volume; no delay reported

Table 2-7 (continued): Existing AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 10: Pear Street and W Mosby Road (Unsignalized)						
Eastbound (W Mosby Road)	EBLT	-	A (7.8)	3	A (7.9)	0
	EB Approach	-	A (0.7)	-	A (0.5)	-
Westbound (W Mosby Road)	WBTR	-	(-)	-	(-)	-
	WB Approach	-	(-)	-	(-)	-
Southbound (Pear Street)	SBLR	-	B (11.9)	18	B (13.7)	15
	SB Approach	-	B (11.9)	-	B (13.7)	-
Intersection 11: W Mosby Road and Mosby Court (Unsignalized)						
Eastbound (W Mosby Road)	EBTR	-	(-)	-	(-)	-
	EB Approach	-	(-)	-	(-)	-
Westbound (W Mosby Road)	WBL	170	A (8.2)	0	A (8.1)	3
	WBT	-	(-)	-	(-)	-
	WB Approach	-	A (0.4)	-	A (0.9)	-
Northbound (Mosby Court)	NBLR	-	B (10.6)	3	B (13.0)	8
	NB Approach	-	B (10.6)	-	B (13.0)	-
Intersection 12: S Main Street and W Mosby Road (Signalized)						
Overall Intersection		-	C (22.6)	-	C (31.4)	-
Eastbound (W Mosby Road)	EBL	160	**E (74.5)**	**#298**	**F (88.8)**	**#378**
	EBTR	-	D (42.9)	52	D (39.4)	51
	EB Approach	-	**E (63.5)**	-	**E (77.9)**	-
Westbound (W Mosby Road)	WBLTR	-	D (42.1)	0	**E (67.2)**	99
	WB Approach	-	D (42.1)	-	**E (67.2)**	-
Northbound (S Main Street)	NBL	150	B (14.3)	49	B (17.7)	62
	NBTR	-	B (15.7)	251	C (22.8)	482
	NB Approach	-	B (15.6)	-	C (22.4)	-
Southbound (S Main Street)	SBL	190	A (9.8)	m11	C (26.2)	m7
	SBTR	-	B (15.5)	306	C (21.7)	m411
	SB Approach	-	B (15.3)	-	C (21.7)	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal
(-) = Free movement
N/A = Zero volume; no delay reported

Table 2-7 (continued): Existing AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 13: S Main Street and Erickson Avenue/Stone Spring Road (Signalized)						
Overall Intersection		-	D (35.5)	-	D (42.4)	-
Eastbound (Erickson Avenue)	EBL	350	C (29.4)	50	C (32.2)	77
	EBT	-	E (63.4)	237	E (68.2)	265
	EBR	300	D (41.5)	79	D (37.2)	31
	EB Approach	-	D (52.7)	-	E (56.1)	-
Westbound (Stone Spring Road)	WBL	500	D (53.5)	#338	E (72.8)	**#501**
	WBT	-	D (35.1)	173	D (39.8)	225
	WBR	200	C (25.2)	34	C (23.5)	48
	WB Approach	-	D (39.6)	-	D (49.1)	-
Northbound (S Main Street)	NBL	190	C (21.2)	m79	D (37.4)	**m190**
	NBT	-	C (26.6)	158	D (44.0)	m306
	NBR	330	B (10.7)	m30	C (24.8)	m214
	NB Approach	-	C (20.7)	-	D (36.2)	-
Southbound (S Main Street)	SBL	190	C (24.3)	63	D (37.5)	**240**
	SBT	-	C (33.5)	262	C (33.3)	334
	SBR	160	C (29.8)	0	C (32.8)	18
	SB Approach	-	C (31.5)	-	C (34.5)	-
Intersection 14: S Main Street and Pleasant Hill Road (Signalized)						
Overall Intersection		-	B (14.7)	-	B (15.0)	-
Eastbound (Pleasant Hill Road)	EBLT	-	E (59.8)	105	E (66.2)	m130
	EBR	220	D (48.7)	8	E (59.1)	m0
	EB Approach	-	D (52.3)	-	E (62.5)	-
Westbound (Pleasant Hill Road)	WBLT	-	**F (85.0)**	22	E (75.6)	41
	WBR	-	N/A	-	E (66.7)	-
	WB Approach	-	**F (85.0)**	-	E (75.1)	-
Northbound (S Main Street)	NBL	190	A (3.5)	14	A (5.6)	m22
	NBTR	-	A (3.5)	67	A (1.9)	63
	NB Approach	-	A (3.5)	-	A (2.4)	-
Southbound (S Main Street)	SBL	140	A (6.6)	4	N/A	0
	SBTR	-	B (12.7)	164	B (18.3)	310
	SB Approach	-	B (12.7)	-	B (18.3)	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal
(-) = Free movement
N/A = Zero volume; no delay reported

2.7.3 Existing Conditions Analysis Results

The unsignalized intersection of Pear Street and Erickson Avenue experienced significant delay for the northbound and southbound approaches (the stop-controlled approaches). The northbound approach delay was 106.7 seconds (LOS F) and 235.1 seconds (LOS F) in the AM and PM peak hours, respectively. The southbound approach delay was 17.5 seconds (LOS C) and 25.8 seconds (LOS D) in the AM and PM peak hours, respectively. These delays are due to the limited gaps in both eastbound and westbound traffic on Erickson Avenue in order to cross or turn left. Additionally, the close proximity to the intersection of Erickson Avenue and S High Street to the west contributes to difficulty in finding a gap. Lastly, the Pear Street approaches are one shared lane, meaning that a vehicle waiting for a gap to turn left impedes all vehicles behind. The volume-to-capacity ratio for the northbound approach is 0.87 in the AM peak hour and 1.26 in the PM peak hour, indicating the volume significantly exceeds capacity in the PM peak hour for that approach.

The nine other unsignalized intersections did not experience significant delay. The highest delay in the AM peak hour for any side street approach at these nine unsignalized intersections was 13.1 seconds for the westbound approach at the intersection of Pear Street and S High Street. Likewise, the highest delay in the PM peak hour for any side street approach was 27.0 seconds for the eastbound approach at the intersection of Pear Street and S High Street. These delays are primarily attributed to the need for a gap in both directions of opposing traffic to cross or turn left at these intersections.

At the signalized intersection of S High Street and Erickson Avenue, overall intersection delay was 33.8 seconds (LOS C) during the AM peak hour and 36.3 seconds (LOS D) during the PM peak hour. The longest delay was 43.7 seconds (LOS D) in the AM peak hour for the eastbound through movement, and 50.3 seconds (LOS D) in the PM peak hour for the westbound through movement. Additionally, the 95th percentile queues exceed capacity in the PM peak hour for the southbound and westbound left-turn movements. Overall, the intersection operates similarly for all approaches, with all but one movement operating at a LOS C or worse in both the AM and PM peak hours.

At the signalized intersection of S Main Street and W Mosby Road, overall intersection delay was 22.6 seconds (LOS C) during the AM peak hour and 31.4 seconds (LOS C) during the PM peak hour. The longest delay was experienced at the eastbound left-turn movement, with 74.5 seconds (LOS E) in the AM peak hour and 88.8 seconds (LOS F) in the PM peak hour. Additionally, the 95th percentile queues exceed capacity in both the AM and PM peak hours for the eastbound left-turn movement. The eastbound left-turn lane becomes a two-way left-turn lane upstream of the intersection, so the queuing would not impede through traffic, but it would impede vehicles attempting to turn left from one of the many access points on this approach. The poor level of service on the eastbound and westbound approaches can be attributed to the prioritization of the northbound and southbound approaches on S Main Street.

At the signalized intersection of S Main Street and Erickson Avenue, overall intersection delay was 35.5 seconds (LOS D) during the AM peak hour, and 42.4 seconds (LOS D) during the PM peak hour. The intersection volume-to-capacity ratio of 0.86 in the PM peak hour is significant. The longest delays were 63.4 seconds (LOS E) in the AM peak hour for the eastbound through movement, and 72.8 seconds (LOS E) in the PM peak hour for the westbound left-turn movement. In the PM peak

hour, the westbound left-turn movement volume-to-capacity ratio in 0.92, indicating it is almost at capacity. Additionally, the 95th percentile queues exceed capacity in the PM peak hour for the westbound, northbound, and southbound left-turn movements. While the intersection has protected-permissive left turns, due to the high volume, there are insufficient gaps for left-turning vehicles to utilize the permissive left-turn phase.

At the signalized intersection of S Main Street and Pleasant Hill Road, overall intersection delay was 14.7 seconds (LOS B) during the AM peak hour and 15.0 seconds (LOS B) during the PM peak hour. The longest delay was experienced at the westbound left-through movement, with 85.0 seconds (LOS F) in the AM peak hour and 75.6 seconds (LOS E) in the PM peak hour. However, this movement experienced very low volume, so a longer delay is less significant. The northbound and southbound approaches of S Main Street operate well, at LOS B or better.

Full Synchro HCM reports, documenting the detailed MOEs for AM and PM peak hour existing conditions for all intersections, can be found in **Appendix C**.

2.8 EXISTING CONDITIONS SUMMARY

This section examined existing conditions throughout the study area through a variety of criteria, including traffic operations, safety, multimodal facilities, transit facilities and ridership, and access management. The following findings can be concluded from these various assessments:

Traffic Operations

- The measured 85th percentile speed is within 7 MPH of the posted speed limit for all but one study area roadway, Pleasant Hill Road. The 85th percentile speed was 36 MPH, 11 MPH over the posted speed limit of 25 MPH.
- The network AM peak hour is 7:30 to 8:30 AM, and the PM network peak hour is 4:30 PM to 5:30 PM.
- The unsignalized intersection of Pear Street and Erickson Avenue experienced significant delay on the stop-controlled approaches and exceeded capacity on the northbound approach during the PM peak. The funded RCUT project will address safety and operations at this intersection.
- The unsignalized intersection of S High Street and Pear Street experienced LOS C and LOS D on the stop-controlled approaches during the PM peak hour.
- The eight other unsignalized intersections operated fairly well, with general approach delays of LOS B or better.
- The Synchro traffic analysis matched field observations at Stone Spring Road and S Main Street with significant queuing and a high volume-to-capacity ratio for the westbound left-turn movement. The 95th percentile queues at the westbound, northbound, and southbound left-turn movements all exceeded storage during the PM peak hour. Average daily traffic was higher on S Main Street south of W Mosby Road than north of W Mosby Road, highlighting the significant turning movement volume at this location.
- The intersection of S High and Erickson operated similarly for all approaches, with all but one movement operating at a LOS C or worse in both the AM and PM peak hours.
- The intersection of S Main Street and W Mosby Road operated well during both peak hours, at a LOS C. The W Mosby Road approaches experienced significant delay. Likewise, the

intersection of S Main Street and Pleasant Hill Road operated at a LOS B during both peak hours. The Pleasant Hill Road approaches experienced significant delay but also had very low volumes.

Transit

- Public bus transit exists within the study area but does not have significant ridership. Average daily weekday ridership on Routes 3 and 4 are 11.6 and 13 riders, respectively.

Safety

- The most prevalent type of crashes at both intersections and along corridor segments were angle crashes and rear ends. This reflects issues with access management and a failure to yield right-of-way, as well as potential sight distance and roadway curvature issues.

Multimodal Facilities

- The Bicycle Level of Comfort assessment found that many of the study area corridors are fairly uncomfortable for bicyclists. Bike lanes are present on Erickson Avenue, S High Street, and S Main Street. There is no network of comfortable roadways for bicyclists (LTS 1 or 2) in the study area.
- Sidewalks are present in the study area, but do not have high connectivity. They are frequently found on only one side of the street. Most intersections have crosswalks on only three legs.
- Pedestrians and bicycles were counted in the study area. Both were higher in volume during the PM peak period than the AM peak.

Access Management

- Access management is poor in the study area, with most commercial accesses not in compliance with VDOT minimum spacing requirements. The funded S Main Street median project will address access management along S Main Street between W Mosby Road and Stone Spring Road.

Infrastructure Geometry

- Field observations noted horizontal and vertical curvature challenges on Pear Street, Erickson Avenue, Pleasant Hill Road, and W Mosby Road.
- The most common potential intersection sight distance issues are vertical curvature of the roadway and queued vehicles.

3 2045 Future Conditions Methodology

This study seeks to develop a transportation network that can address the travel demands of the study area 20 years into the future. This will provide an opportunity for the City to seek contributions to transportation improvements as development occurs gradually over time, rather than waiting for a single or few select developments to trigger the impact thresholds that demonstrate the need for transportation mitigation. These transportation improvements will be conceptual in nature and will continue to be refined further as the area develops.

Land use projections were determined in close consultation with the SAG, and travel forecasting models were used to provide a conservative estimate of future traffic and resulting transportation needs in the study area. Variations from this projection are likely to occur, and the recommended improvements should continue to be evaluated and refined to reflect the actual development conditions.

All future conditions analyses were based on the same land use scenario, with differing transportation networks. Every transportation network will start with existing conditions plus any publicly funded transportation improvement projects.

- The **2045 No Build Condition** represents the studied 2045 land uses without any additional transportation improvements beyond the two previously funded improvements.
- The **2045 Build** scenario represents the studied 2045 land uses with the addition of new street connections for circulation and connectivity.
- The **2045 Mitigation** scenario further refines the 2045 Build scenario with additional intersection improvements to alleviate delay and congestion and enhance multimodal conditions.

3.1 2045 STUDIED LAND USE

Studied future land use and density projections for 2045 were developed in coordination with the Study Advisory Group based on existing zoning, planned development, the Comprehensive Plan's Land Use Guide, land conditions (i.e. topography, geology, utility and infrastructure needs), and market demands. All parcels in the study area were grouped together into 14 total land bays based on existing and projected land use. See **Figure 3-1** for the location of each land bay, the projected land use and density. Every land bay with undeveloped land was assumed to be 85% developable, accounting for typical land constraints encountered during development, such as slopes, unsuitable soils, and other limiting site conditions. The land uses and density projections are for planning purposes, to develop future traffic volumes and identify potential transportation improvements. These are subject to change over the next 20 years as market demands and development needs evolve. These land use projections will serve as the base assumptions for all future conditions analyses. **Table 3-1** summarizes the yield totals for each land bay. All yield totals are based on full redevelopment of the 85% developable area of the land bay unless specified as an existing land use or a combination of new and existing land uses.

The single-family detached/duplex land use represents seven dwelling units per acre. The townhome land use represents 15 dwelling units per acre. The multifamily land use represents 24 dwelling units per acre, with many units in one building. The commercial land use represents any retail parcels and has a 0.3 floor-area-ratio (the ratio of the building square footage to the lot area).

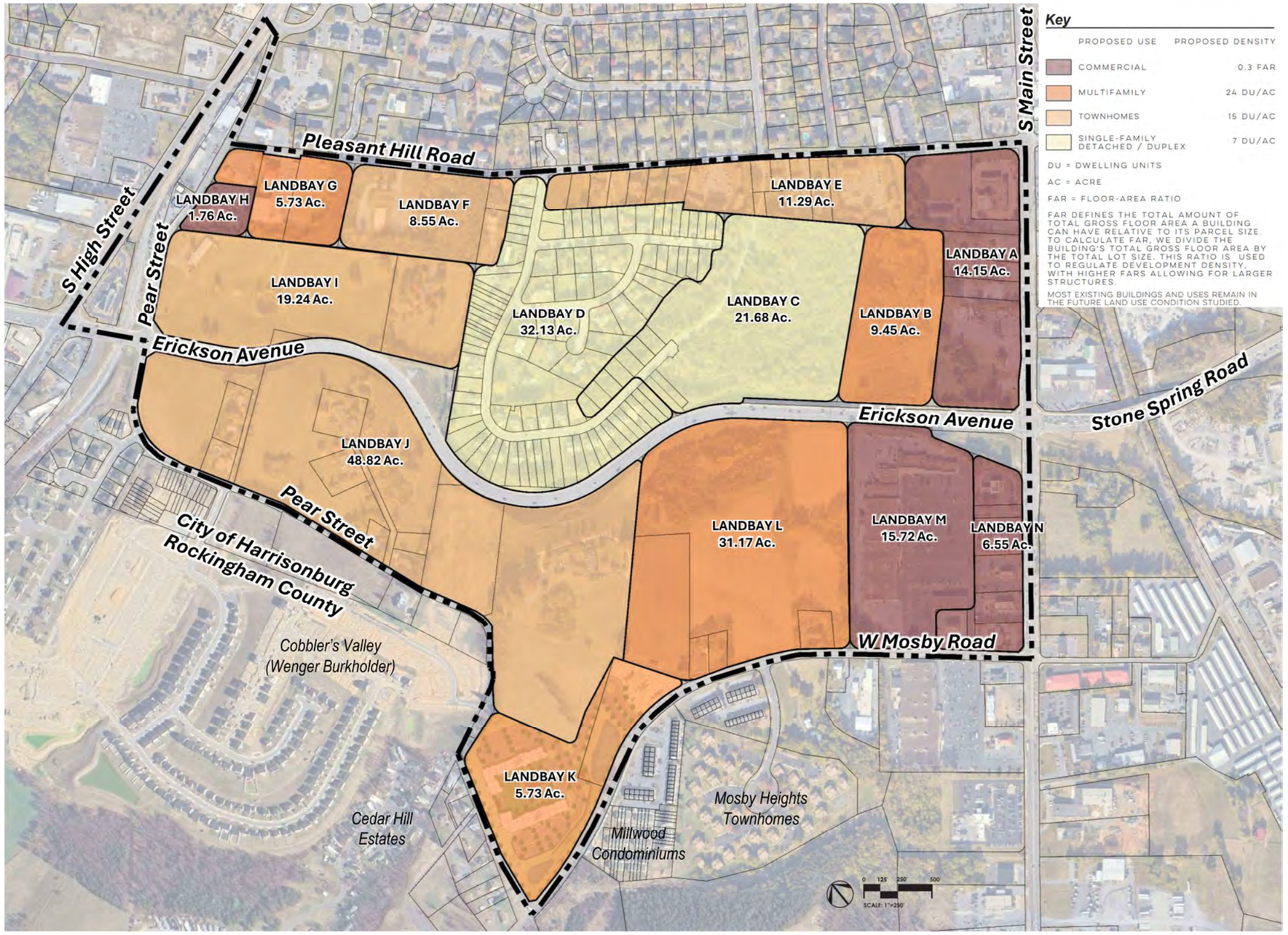

Figure 3-1: 2045 Studied Land Uses

Table 3-1: Studied Future Land Use Yield Summary

Land Bay	Unit Type	Land Bay Acreage	Percentage of Study Area	Net Acreage of Underdeveloped Land (85%)	Proposed Future Commercial Floor-Area-Ratio	Proposed Future Residential Density (DU/AC)	Proposed Future Commercial Yield (Square Feet)	Proposed Future Residential Yield (Dwelling Units)
A	Commercial (new and existing)	14.15	5%	12.03	0.30		157,175	
B	Multifamily (new)	9.45	3%	8.03		24.00		193
C	Single Family (new)	21.68	8%	18.43		7.00		129
D	Single Family (existing)	32.13	12%	27.31				100
E	Townhomes (new and existing)	11.29	4%	9.60		15.00		97
F	Townhomes (new)	8.55	3%	7.27		15.00		109
G	Multifamily (new)	5.73	2%	4.87		20.00		97
H	Commercial (new)	1.76	1%	1.50	0.30		19,550	
I	Townhomes (new)	19.24	7%	16.35		10.00		164
J	Townhomes (new)	48.82	18%	41.50		15.00		622
K	Multifamily (new)	13.02	5%	11.07		24.00		164
L	Multifamily (new)	31.17	11%	26.49		24.00		636
M	Commercial (existing)	15.72	6%	13.36	0.30		174,615	-
N	Commercial (existing)	6.55	2%	5.57	0.07		20,000	
	Total	**239.3**	**88%**				**371,340**	**2,311**

3.2 FUNDED TRANSPORTATION PROJECTS

Independent of this study, there are two transportation projects programmed for this study area, discussed in **Section 2.2.** The addition of a modified RCUT at Pear Street and Erickson Avenue will result in a new travel pattern. Three of the four left-turns and both minor street through movements will be redirected to signalized U-turns. The southbound and northbound through and left movements were added to their respective right turn movement. The westbound and eastbound left movement was added to the respective through movement.

To analyze the RCUT in Synchro, the intersection was split into five nodes to properly represent the flow of traffic. These are intersections 15, 16, 17, 18, and 19 in the MOE reports. Intersections 15, 16, 18, and 19 are unsignalized; intersection 17 is signalized. Signal timings were adjusted based on future traffic volumes. Unsignalized intersections 16 and 18 are free-flowing, and thus were not evaluated in any traffic analyses. Unsignalized intersection 15 comprises the stop-controlled northbound right-turn only approach of Pear Street, the uncontrolled eastbound approach of Erickson Avenue, and the stop-controlled westbound left-turn-to-Pear-Street approach. Intersection 17 is made up of the westbound approach of Erickson Avenue and the left-turn approach made up of any northbound or eastbound traffic wishing to make a left turn onto Erickson Avenue or Pear Street. Intersection 19 is comprised of the uncontrolled westbound Erickson Avenue approach and the stop controlled right-turn only southbound Pear Street approach.

3.3 2045 BACKGROUND TRAFFIC VOLUMES

3.3.1 Regional Growth Forecasting Methodology and Growth Rate Determination

In order to analyze the future 2045 conditions, the future background traffic volumes were forecasted based on the existing traffic volumes and the assumed growth rate in the Harrisonburg Rockingham Metropolitan Planning Organization (MPO) Travel Demand Model (TDM). This model reflects the future land uses in and around the study area and subsequently provides an estimation of the future traffic volumes and patterns within the study area.

A growth rate was selected based upon the Harrisonburg Rockingham MPO TDM. This TDM was developed by VDOT in close cooperation with the local municipality staff to assist in long-range transportation planning. The model's base year is 2015 and the model's future year is 2040. The growth rate from 2015 to 2040 was determined for the following roadway segments: Erickson Avenue, High Street, Pear Street, Pleasant Hill Road, S Main Street, and W Mosby Road. The growth rates for each segment are summarized in **Table 3-2**.

Existing daily volumes from the travel demand model are very imbalanced on W Mosby Road, while the regional growth projected for W Mosby Road is very balanced bi-directionally. In the AM peak, there is some directional nature to the volumes, but in the PM peak, the volumes are fairly balanced. At a daily volume level, the directional split that the model has output is not anticipated. Thus, the growth rate from westbound W Mosby Road was removed as an outlier. Pear Street east of Erickson behaves similarly in the model to W Mosby Road in the directional nature of its daily volumes.

In aggregate, the entire study network grows by about 1.4% annually. Without the inclusion of the W Mosby Road outlier, this is reduced to 1.2%. A growth rate of 1.0% was selected for the entire

street network, Rounding to 1.0% annual growth is proposed because the proposed project trips from future development for this study are quite conservative.

Upon evaluation of the TDM growth rate, the traffic volumes from known development traffic impact studies (TIAs) in the area were captured in the TDM and do not need to be added separately.

Table 3-2: Erickson Avenue Study Area 2040 Regional Growth Summary

Corridor	Direction	Linear Growth per TDM (2015 to 2040)
Erickson Avenue	Eastbound	1.0%
Erickson Avenue	Westbound	1.5%
High Street	Northbound	1.1%
High Street	Southbound	1.0%
Pear Street	Northbound	0.5%
Pear Street	Southbound	1.6%
Pleasant Hill Road	Eastbound	0.5%
Pleasant Hill Road	Westbound	0.0%
S Main Street	Northbound	1.8%
S Main Street	Southbound	1.9%
W Mosby Road	Eastbound	1.9%
W Mosby Road	Westbound	3.6%
Average Regional Growth:		**1.4%**
Average Regional Growth with Outliers Removed:		**1.2%**
Proposed Regional Growth:		**1.0%**

This 1.0% growth rate was then applied to the existing traffic volumes from 2024 to determine the background growth in the study future year of 2045. **Figure 3-2** visualizes how the regional growth rate is calculated and then applied to the collected existing traffic volumes to determine the 2045 background traffic growth.

Figure 3-2: Background Growth Rate Determination Methodology

3.3.2 2045 Background Traffic Volumes

Using the selected 1.0% growth rate and the base year of 2024, existing through traffic volumes were grown by 1.0% annually to 2045. However, no growth is proposed for Pleasant Hill Road, as this road

is not operating as a through-street for regional traffic. Additionally, at S High Street and Erickson Avenue and at S Main Street and Erickson Avenue, all movements were grown by 1.0%.

Figure 3-3 shows to which movements the growth factor was applied. **Figure 3-4** and **Figure 3-5** show the forecasted background growth future volumes.

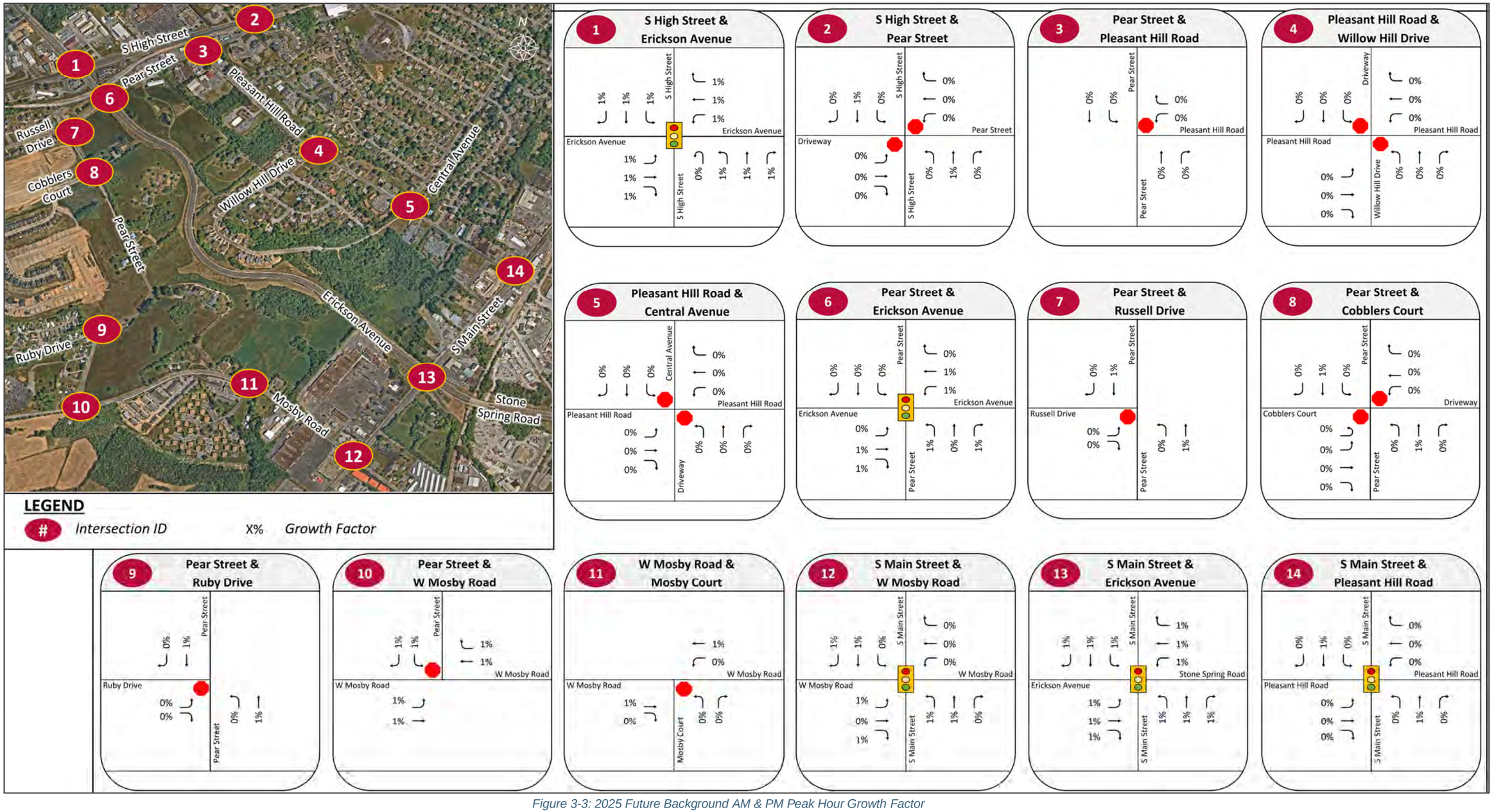

Figure 3-3: 2025 Future Background AM & PM Peak Hour Growth Factor

LEGEND

(#) *Intersection ID*

XX (XX) *AM (PM) Peak Hour Vehicle Volumes*

Note: See additional sheet for more detailed RCUT routing at Intersection 6.

1 S High Street & Erickson Avenue

			S High Street								
156 (223)	426 (665)	233 (286)				168 (208)	416 (519)	195 (296)			
									Erickson Avenue		
Erickson Avenue											
160 (170)	580 (366)	23 (20)									
			S High Street			2 (10)	15 (44)	525 (602)	201 (288)		

Overall: 3100 (3697)

2 S High Street & Pear Street

			S High Street								
0 (4)	743 (1076)	53 (71)				79 (93)	0 (1)	11 (17)			
									Pear Street		
Driveway											
0 (1)	0 (0)	0 (2)									
			S High Street			0 (1)	803 (909)	11 (30)			

Overall: 1700 (2205)

3 Pear Street & Pleasant Hill Road

			Pear Street								
19 (12)	60 (73)					40 (61)	51 (37)				
									Pleasant Hill Road		
			Pear Street			41 (52)	31 (44)				

Overall: 242 (279)

4 Pleasant Hill Road & Willow Hill Drive

			Driveway								
0 (0)	0 (0)	1 (0)				0 (0)	76 (100)	10 (28)			
									Pleasant Hill Road		
Pleasant Hill Road											
0 (0)	100 (91)	10 (19)									
			Willow Hill Drive			16 (8)	0 (0)	25 (17)			

Overall: 238 (263)

5 Pleasant Hill Road & Central Avenue

			Central Avenue								
20 (13)	0 (0)	52 (47)				15 (68)	70 (124)	0 (0)			
									Pleasant Hill Road		
Pleasant Hill Road											
10 (17)	123 (98)	0 (1)									
			Driveway			0 (0)	0 (0)	0 (1)			

Overall: 290 (369)

6 Pear Street & Erickson Avenue

See Intersections 15, 16, 17, 18, and 19 on Page 2.

Overall: 1885 (2098)

7 Pear Street & Russell Drive

			Pear Street								
9 (14)	142 (150)										
Russell Drive											
15 (13)	8 (5)										
									Pear Street		
						4 (5)	124 (158)				

Overall: 302 (345)

8 Pear Street & Cobblers Court

			Pear Street								
43 (50)	100 (94)	0 (1)				1 (2)	0 (0)	0 (0)			
									Driveway		
Cobblers Court											
0 (1)	58 (55)	0 (0)	27 (11)								
						27 (13)	55 (94)	0 (0)			

Overall: 311 (321)

9 Pear Street & Ruby Drive

			Pear Street								
16 (20)	118 (85)										
Ruby Drive											
14 (20)	19 (6)										
			Pear Street			17 (11)	73 (84)				

Overall: 257 (226)

10 Pear Street & W Mosby Road

			Pear Street								
63 (12)	78 (80)					67 (83)	171 (281)				
									W Mosby Road		
W Mosby Road											
27 (20)	270 (291)										

Overall: 676 (767)

11 W Mosby Road & Mosby Court

						218 (363)	8 (37)				
									W Mosby Road		
W Mosby Road											
345 (371)	6 (11)										
			Mosby Court			3 (17)	20 (24)				

Overall: 600 (823)

12 S Main Street & W Mosby Road

			S Main Street								
148 (276)	1152 (989)	30 (13)				15 (39)	0 (15)	6 (19)			
									W Mosby Road		
W Mosby Road											
257 (373)	4 (9)	132 (94)									
			S Main Street			107 (117)	845 (1329)	14 (12)			

Overall: 2710 (3285)

13 S Main Street & Erickson Avenue

			S Main Street								
49 (73)	609 (691)	163 (313)				257 (253)	439 (525)	411 (480)			
									Stone Spring Road		
Erickson Avenue											
57 (87)	488 (509)	350 (219)									
			S Main Street			219 (346)	563 (844)	341 (615)			

Overall: 3947 (4955)

14 S Main Street & Pleasant Hill Road

			S Main Street								
30 (48)	606 (886)	2 (0)				0 (1)	2 (2)	5 (14)			
									Pleasant Hill Road		
Pleasant Hill Road											
66 (80)	1 (1)	136 (89)									
			S Main Street			51 (125)	702 (975)	11 (5)			

Overall: 1612 (2226)

Figure 3-4: 2045 Future Background AM & PM Peak Hour Vehicle Volumes (1 of 2)

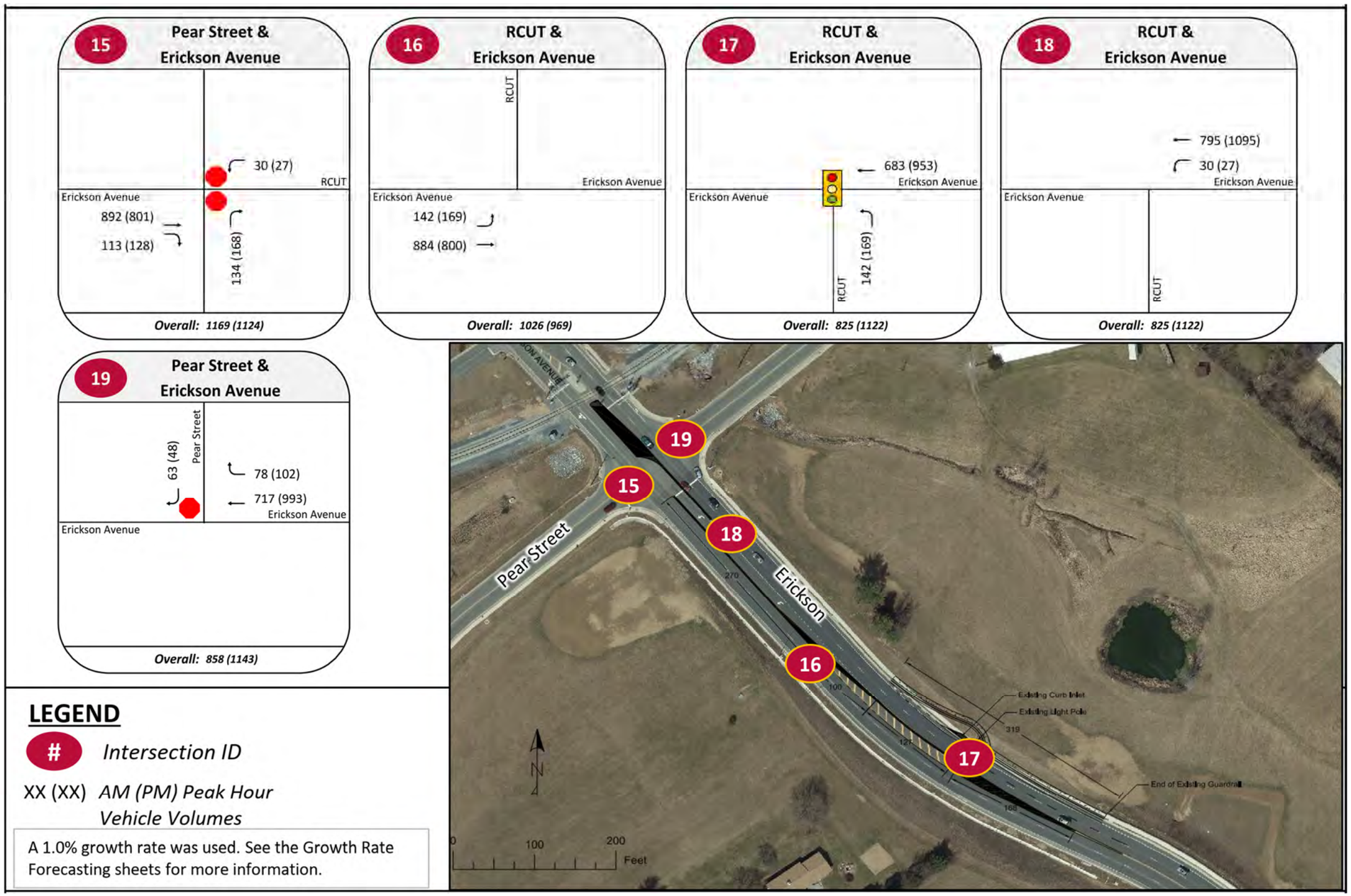

Figure 3-5: 2045 Future Background AM & PM Peak Hour Vehicle Volumes (2 of 2)

3.4 FUTURE DEVELOPMENT TRIP GENERATION

Peak hour traffic volumes generated by the studied land uses detailed above were calculated using the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition*. Land use codes 210 (single-family detached housing, 215 (single-family attached housing), 221 (multifamily housing – mid-rise), 821 (shopping plaza 40-150k), 822 (strip retail plaza <40k), 850 (supermarket), and 890 (furniture store) were used to calculate the site trip generation in the weekday AM and PM peak hours. Trip generation for the residential uses was based on the number of dwelling units while trip generation for the retail uses was based on square footage. The trip generation was calculated using the fitted curve equation unless the R-squared value was less than or equal to 0.75; in that case, the average rate was used.

For Land Bay M, the existing furniture store land use is replaced by a supermarket land use. This provides a conservative estimate for redevelopment of this land bay. A summary of the trip generation is shown in **Table 3-3**.

Table 3-3: 2045 Proposed Future Development Trip Generation

Existing Land Uses to Be Removed													
Land Bay	Land Use Description	ITE Code	Quantity	Unit	Daily			AM			PM		
					Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
M	Furniture Store	890	37500	SF	118	118	236	7	3	10	9	11	20
Total Trips to be Removed:					**118**	**118**	**236**	**7**	**3**	**10**	**9**	**11**	**20**
New Land Uses													
Land Bay	Land Use Description	ITE Code	Quantity	Unit	Daily			AM			PM		
					Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
A	Shopping Plaza (40-150k)	821	132677	SF	6,269	6,268	12,537	290	178	468	575	623	1,198
B	Multifamily Housing (Mid-Rise)	221	193	DU	437	437	874	17	56	73	46	30	76
C	Single-Family Detached Housing	210	64	DU	335	334	669	13	37	50	41	24	65
	Single-Family Attached Housing	215	65	DU	223	222	445	9	19	28	20	15	35
	Land Bay C Subtotal				*558*	*556*	*1,114*	*22*	*56*	*78*	*61*	*39*	*100*
E	Single-Family Attached Housing	215	20	DU	51	51	102	2	3	5	5	3	8
F	Single-Family Attached Housing	215	109	DU	390	390	780	16	35	51	35	26	61
G	Multifamily Housing (Mid-Rise)	221	97	DU	208	208	416	7	24	31	23	15	38
H	Strip Retail Plaza (<40k)	822	19550	SF	532	532	1,064	28	18	46	65	64	129
I	Single-Family Attached Housing	215	164	DU	600	599	1,199	25	55	80	54	40	94
J	Single-Family Attached Housing	215	622	DU	2,345	2,344	4,689	99	219	318	210	159	369
K	Multifamily Housing (Mid-Rise)	221	164	DU	368	368	736	14	47	61	39	25	64
L	Multifamily Housing (Mid-Rise)	221	636	DU	1,494	1,493	2,987	62	206	268	151	97	248
M	Supermarket	850	37500	SF	1,833	1,833	3,666	63	44	107	168	168	336
Total New Trips:					**15,085**	**15,079**	**30,164**	**645**	**941**	**1,586**	**1,432**	**1,289**	**2,721**
Net New Trips:					**14,967**	**14,961**	**29,928**	**638**	**938**	**1,576**	**1,423**	**1,278**	**2,701**

3.5 FUTURE TRAFFIC ANALYSIS METHODOLOGY

The measures of effectiveness are detailed in **Section 2.7.2 Measures of Effectiveness**.

Peak hour factors for future conditions were adjusted to a minimum of 0.92, per guidance in the VDOT Traffic Operations and Safety Analysis Manual (TOSAM), Version 2.0. Heavy vehicle percentages were re-calculated based on the 2024 existing heavy vehicle volumes and an assumed heavy vehicle percentage of 2.0% for all site development trips.

Highway Capacity Manual (HCM) 6th Edition methodology was used to report MOEs from Synchro at unsignalized intersections, except for Intersection 15 at the RCUT. At this intersection, HCM 2000 methodology was used for an unsignalized intersection. Overall intersection delay is not reported for unsignalized intersections since delay cannot be calculated for uncontrolled through movements. At the RCUT, only intersections 15, 17, and 19 were reported from Synchro; the other intersections 16 and 18 are free-flowing and thus do not have measures of effectiveness to report upon. At all signalized intersections, HCM 2000 methodology was used to report MOEs from Synchro due to limitations of HCM 6 methodology to analyze unique signal operations.

4 2045 No Build Conditions

4.1 NO BUILD TRANSPORTATION NETWORK AND LAND USE

The No Build transportation network includes the existing transportation network and the City funded transportation improvements noted previously in **Section 2.2**. The No Build conditions analyzed new developments outlined under **Section 3.1** of this report, but no additional street connections or intersection improvements were introduced beyond those already funded by the City.

4.2 2045 NO BUILD TRAFFIC VOLUMES

4.2.1 Travel Patterns and Trip Distributions

The net new development trips resulting from the 2045 studied land use projections were assigned to the study area streets based on surrounding land uses and existing and anticipated future traffic patterns. The resulting directional distribution of site generated traffic is summarized in **Table 4-1**. The directional distributions are the same for residential and commercial, except for trips entering and exiting the study area on S Main Street and for trips entering and existing south on S High Street. The directional distributions are visualized in **Figure 4-1** and **Figure 4-2.**

External development trips were assigned based on the most likely routes travelers would take to the proposed future development. An unsignalized access point is assumed between Land Bay B and Land Bay C on Erickson Avenue. This is the only access point assumed on Erickson Avenue. All other needed access points are assumed to be on Pear Street, W Mosby Road, S Main Street, and Pleasant Hill Road.

Table 4-1: Directional Distribution of Site Generated Traffic

Direction To/From	Residential	Commercial
North on S High Street	25%	25%
South on S High Street	5%	10%
North on S Main Street	25%	15%
South on S Main Street	10%	15%
West on Erickson Avenue	5%	5%
East on Stone Spring Road	20%	20%
North on Central Avenue	5%	5%
West on W Mosby Road	5%	5%
Total	**100%**	**100%**

Figure 4-1: Directional Distribution of Study Area Residential Trips

Figure 4-2: Directional Distribution of Study Area Commercial Trips

4.2.2 Pass-By Trips

Pass-by trips were determined for the commercial land bays using the rates found in the *ITE Trip Generation Manual, 11th Edition* Pass-By Data and Rate Tables. Land Use 822 is not in the ITE pass-by tables, so the pass-by rate for Land Use 821 was used.

4.2.3 Internal Capture

Internal capture was considered between each residential and commercial grouping. Internal capture was determined based on the *ITE Trip Generation Handbook, 3rd Edition*. The internal capture was subtracted from the external trips entering and exiting the study area. However, the internal capture was then added back in to reflect movement within the study area. Each residential and commercial land bay grouping was assigned a gravity based on the percentage of dwelling units or retail square footage it represented amongst the proposed land bays. See **Table 4-2** for a detailed summary of the gravities used. The internal capture trips were then allocated for each possible combination of residential-to-commercial trip and commercial-to-residential trip using the relative gravities and assigned to the study intersections.

Table 4-2: Internal Capture Gravity by Land Bay

Land Bay	ITE Code	Land Use	Density	Unit	Commercial Gravity	Residential Gravity
A	821	Shopping Plaza (40-150k)	132,677	SF	70%	
B	221	Multifamily Housing (Mid-Rise)	193	DU		9%
C	210	Single-Family Detached Housing	64	DU		3%
C	215	Single-Family Attached Housing	65	DU		3%
E	215	Single-Family Attached Housing	20	DU		1%
F	215	Single-Family Attached Housing	109	DU		5%
G	221	Multifamily Housing (Mid-Rise)	97	DU		4%
H	822	Strip Retail Plaza (<40k)	19,550	SF	10%	
I	215	Single-Family Attached Housing	164	DU		8%
J	215	Single-Family Attached Housing	622	DU		29%
K	221	Multifamily Housing (Mid-Rise)	164	DU		8%
L	221	Multifamily Housing (Mid-Rise)	636	DU		30%
M	850	Supermarket	37,500	SF	20%	

4.2.4 Development Trips

The development trips were determined by subtracting internal capture trips and for retail, also subtracting pass-by trips. The internal capture was then added back in given that the study area included intersections that the internal capture passes through. The pass-by trips were not similarly added back into the study network, given that those trips occurred at driveways that were not analyzed.

The No Build development trips are shown in **Figure 4-3** and **Figure 4-4**.

4.2.5 2045 No Build Traffic Volumes

The development trips were added to the 2045 background volumes to obtain the resulting 2045 No Build total future traffic, shown in **Figure 4-5** and **Figure 4-6**.

Figure 4-3: 2045 Future No Build – Development AM & PM Peak Hour Vehicle Trips (1 of 2)

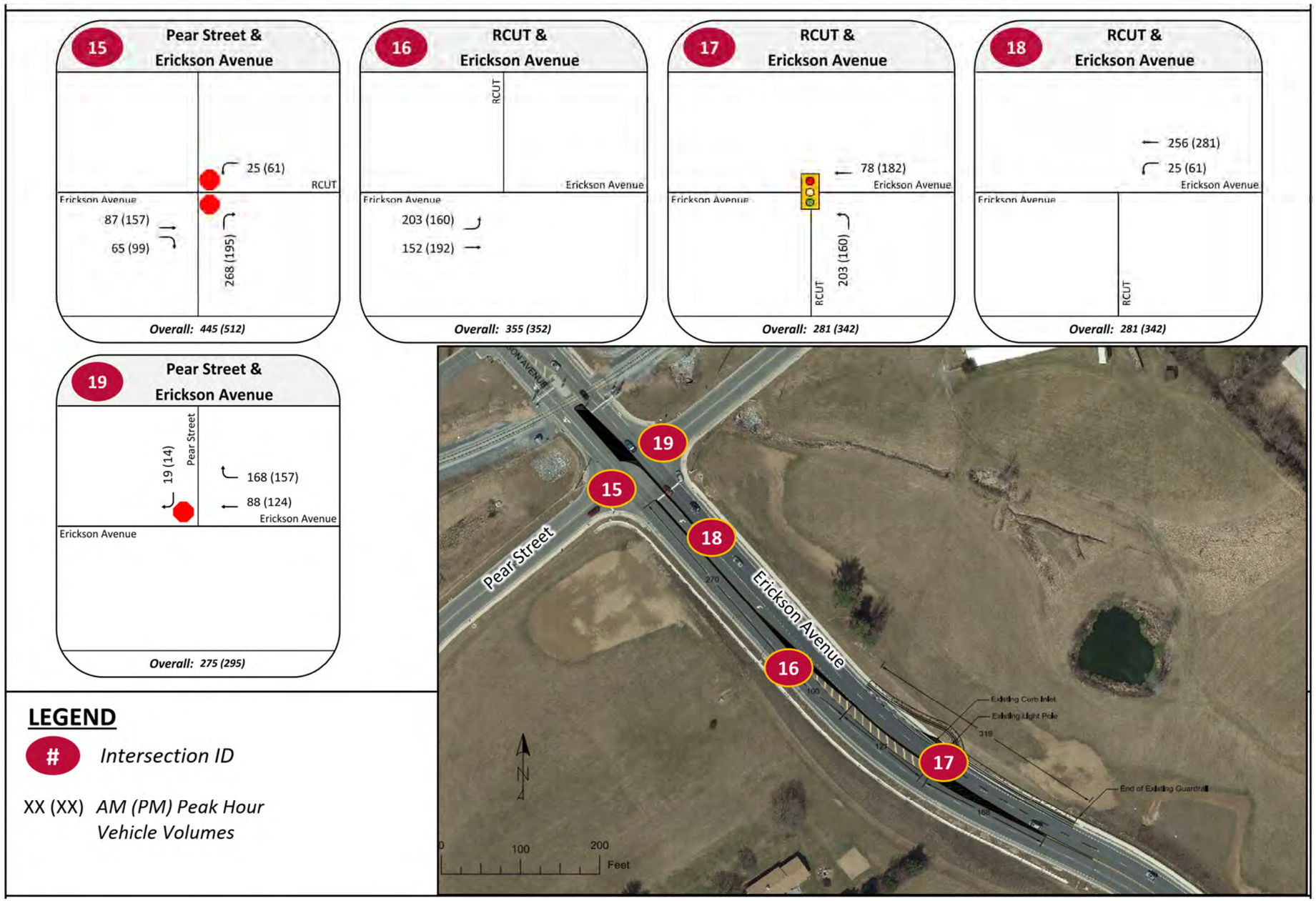

Figure 4-4: 2045 Future No Build – Development AM & PM Peak Hour Vehicle Trips (2 of 2)

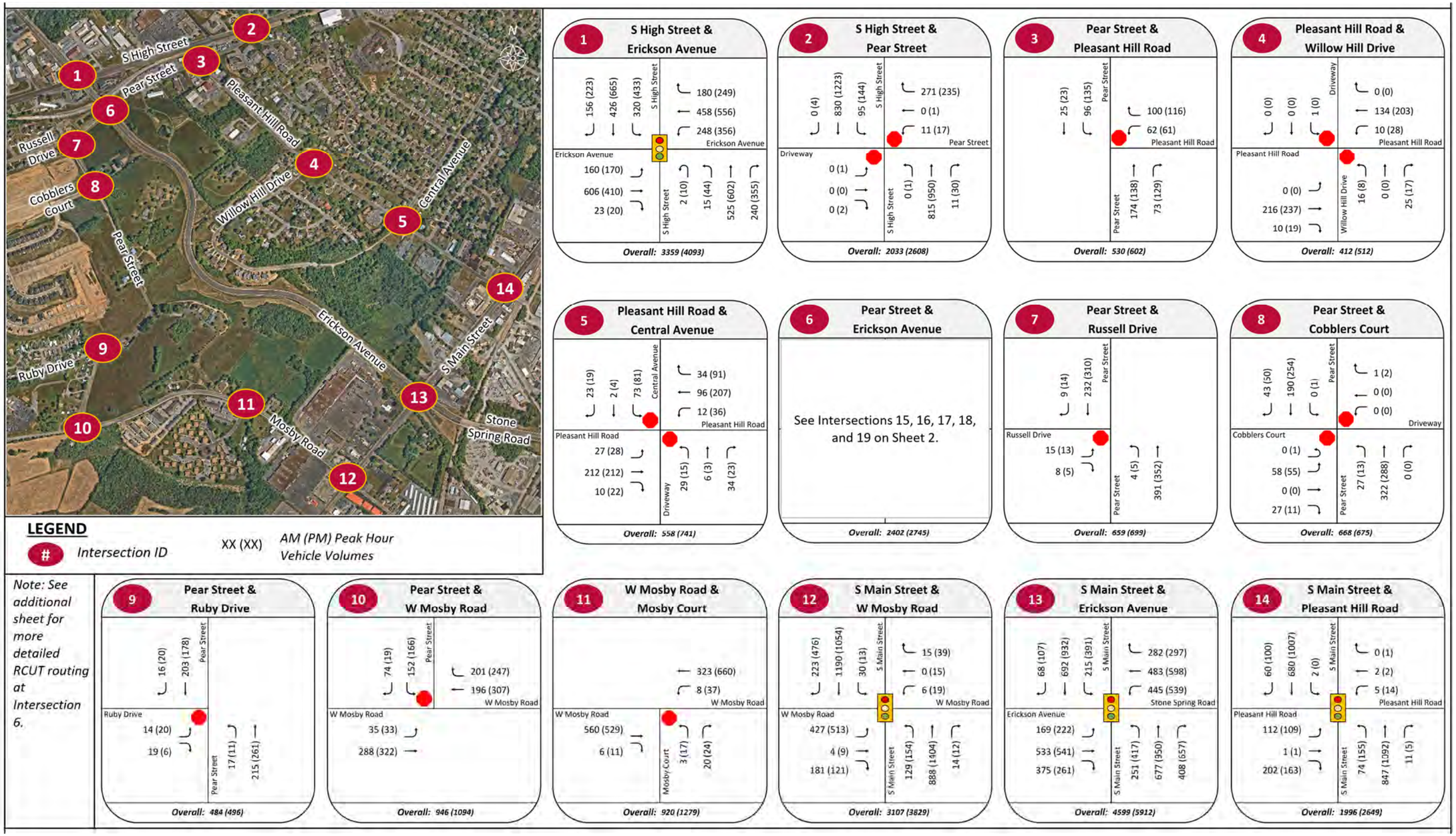

Figure 4-5: 2045 Future No Build AM & PM Peak Hour Vehicle Volumes (1 of 2)

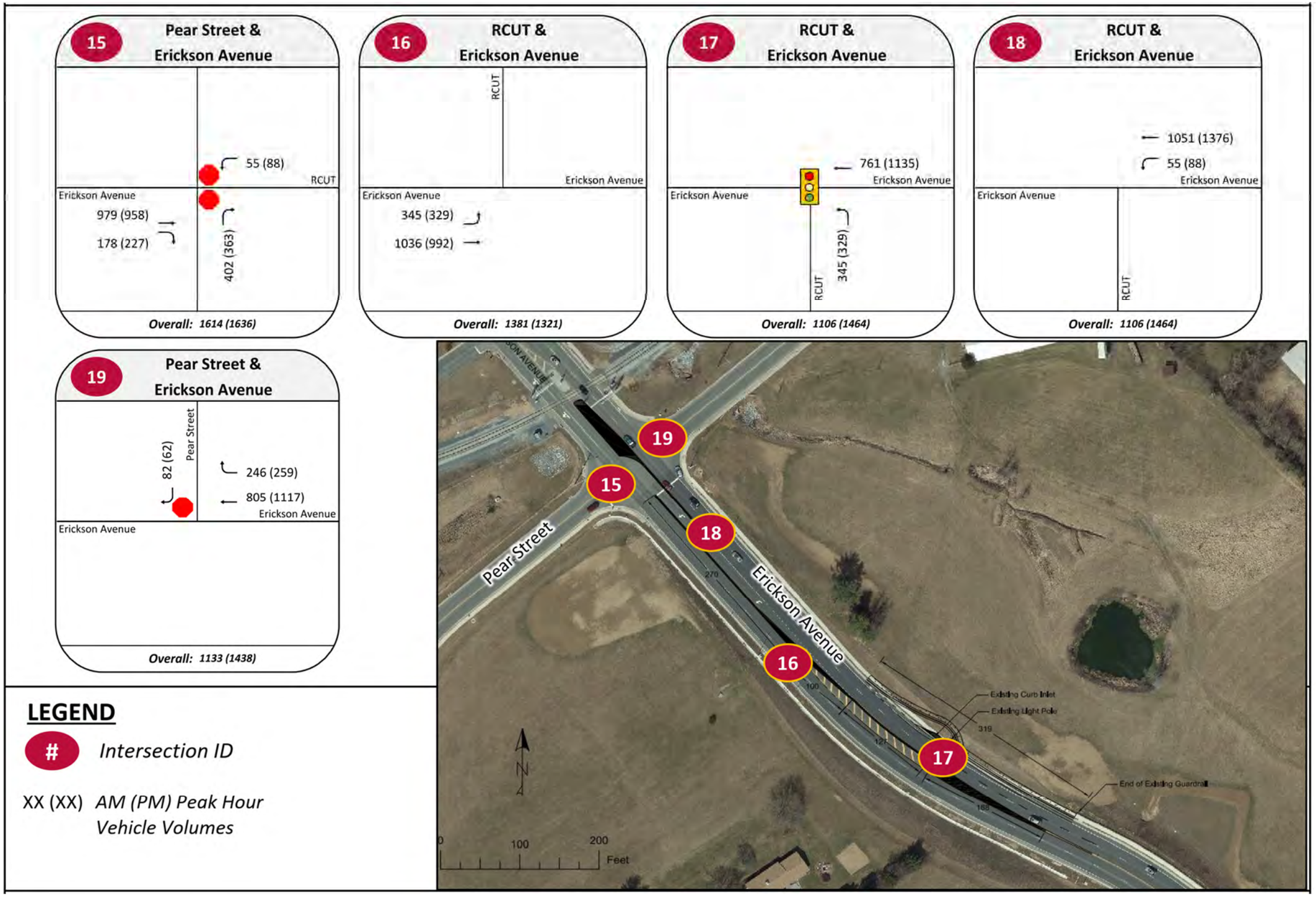

Figure 4-6: 2045 Future No Build AM & PM Peak Hour Vehicle Volumes (2 of 2)

4.3 2045 NO BUILD TRAFFIC ANALYSIS

4.3.1 Measures of Effectiveness

The analysis of the 2045 background conditions was based on the future No Build peak hour turning movement volumes. **Table 4-3** summarizes the MOEs for all intersections, including average vehicular delay, level of service (LOS), available storage, and 95th percentile queue length. Movements for which delay cannot be calculated are indicated with "(-)" in the table, and movements with zero volume are indicated by "N/A" in the table. LOS E is shown in orange text, and LOS F is shown in red text. Additionally, queues lengths that exceed the storage length are shown in red text.

Existing intersection geometry and signal timings were utilized, except at the funded RCUT project. At the RCUT, the signalized intersection timings were revised based on the background traffic volumes.

Full Synchro HCM reports, documenting the detailed MOEs for AM and PM peak hour No Build conditions for all intersections, can be found in **Appendix C**.

Table 4-3: No Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 1: S High Street and Erickson Avenue (Signalized)										
Overall Intersection		-	C (33.8)	-	D (36.3)	-	D (53.6)	-	**E (58.8)**	-
Eastbound (Erickson Avenue)	EBL	235	C (28.1)	96	D (35.2)	110	C (31.6)	#118	D (40.0)	#164
	EBTR	-	D (43.7)	226	D (47.8)	164	**E (59.8)**	#343	D (54.7)	#270
	EB Approach	-	D (40.4)	-	D (43.9)	-	D (54.1)	-	D (50.6)	-
Westbound (Erickson Avenue)	WBL	150	C (28.6)	115	D (35.4)	**187**	D (43.7)	**#250**	D (43.3)	**304**
	WBTR	-	D (39.2)	192	D (50.3)	265	D (43.3)	#294	**E (56.5)**	#409
	WB Approach	-	D (36.6)	-	D (46.0)	-	D (43.4)	-	D (52.5)	-
Northbound (S High Street)	NBL	130	C (22.2)	19	C (22.5)	46	C (24.6)	21	C (26.9)	52
	NBT	-	D (38.0)	205	D (37.9)	249	**E (62.0)**	#292	**E (56.2)**	#326
	NBR	240	C (22.7)	47	C (22.1)	98	C (25.8)	96	C (26.3)	172
	NB Approach	-	C (33.5)	-	C (32.2)	-	D (50.1)	-	D (44.1)	-
Southbound (S High Street)	SBL	150	C (27.0)	144	C (26.8)	**183**	**F (135.4)**	**#378**	**F (172.5)**	**#581**
	SBT	-	C (27.0)	151	C (30.8)	245	C (31.4)	186	D (37.6)	310
	SBR	390	B (17.4)	26	B (18.9)	34	B (19.6)	35	C (22.1)	57
	SB Approach	-	C (25.2)	-	C (27.5)	-	**E (66.2)**	-	**E (79.2)**	-
Intersection 2: S High Street and Pear Street (Unsignalized)										
Eastbound (Driveway)	EBLTR	-	N/A	-	D (27.0)	3	N/A	-	**F (121.5)**	8
	EB Approach	-	N/A	-	D (27.0)	-	N/A	-	**F (121.5)**	-
Westbound (Pear Street)	WBLTR	-	B (13.1)	18	C (23.2)	43	C (21.7)	95	**F (140.0)**	300
	WB Approach	-	B (13.1)	-	C (23.2)	-	C (21.7)	-	**F (140.0)**	-
Northbound (S High Street)	NBL	-	N/A		A (9.8)	0	N/A		B (11.7)	0
	NBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-
Southbound (S High Street)	SBL	90	A (9.5)	5	A (9.8)	8	B (10.6)	13	B (12.0)	23
	SBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	A (0.8)	-	A (0.7)	-	A (1.1)	-	A (1.3)	-
Intersection 3: Pleasant Hill Road and Pear Street (Unsignalized)										
Westbound (Pleasant Hill Road)	WBLR	-	B (10.3)	13	A (10.0)	13	B (12.7)	28	B (13.1)	33
	WB Approach	-	B (10.3)	-	A (10.0)	-	B (12.7)	-	B (13.1)	-
Northbound (Pear Street)	NBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-
Southbound (Pear Street)	SBL	-	A (7.6)	5	A (7.6)	5	A (8.1)	8	A (8.2)	10
	SBT	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	A (5.8)	-	A (6.5)	-	A (6.4)	-	A (7.0)	-
Intersection 4: Pleasant Hill Road and Willow Hill Drive (Unsignalized)										
Eastbound (Pleasant Hill Road)	EBL	-	N/A	0	N/A	0	N/A	0	N/A	0
	EBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	EB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-
Westbound (Pleasant Hill Road)	WBL	-	A (7.6)	0	A (7.5)	3	A (7.8)	0	A (7.8)	3
	WBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach	-	A (0.9)	-	A (1.6)	-	A (0.5)	-	A (1.0)	-
Northbound (Willow Hill Drive)	NBLTR	-	A (9.8)	5	A (9.5)	3	B (10.8)	5	B (11.0)	3
	NB Approach	-	A (9.8)	-	A (9.5)	-	B (10.8)	-	B (11.0)	-
Southbound (Driveway)	SBLTR	-	B (10.5)	0	N/A	-	B (11.9)	0	N/A	-
	SB Approach	-	B (10.5)	-	N/A	-	B (11.9)	-	N/A	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal
(-) = Free movement
N/A = Zero volume; no delay reported

Table 4-3 (continued): No Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 5: Pleasant Hill Road and Central Avenue (Unsignalized)										
Eastbound (Pleasant Hill Road)	EBL	-	A (7.6)	0	A (7.7)	0	A (7.6)	3	A (8.0)	3
	EBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	EB Approach	-	A (0.6)	-	A (1.1)	-	A (0.8)	-	A (0.9)	-
Westbound (Pleasant Hill Road)	WBL	-	N/A	0	N/A	0	A (7.7)	0	A (7.8)	3
	WBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach	-	(-)	-	(-)	-	A (0.7)	-	A (0.8)	-
Northbound (Willow Hill Drive)	NBLTR	-	N/A	-	A (8.8)	0	B (11.8)	10	B (12.8)	8
	NB Approach	-	N/A	-	A (8.8)	-	B (11.8)	-	B (12.8)	-
Southbound (Central Avenue)	SBLTR	-	B (10.6)	10	B (10.9)	8	B (13.5)	18	C (18.3)	30
	SB Approach	-	B (10.6)	-	B (10.9)	-	B (13.5)	-	C (18.3)	-
Intersection 6: Pear Street and Erickson Avenue (Unsignalized)										
Eastbound (Erickson Avenue)	EBL	50	A (9.0)	3	A (9.7)	5	See Intersections 15, 17, and 19.			
	EBTR	-	(-)	-	(-)	-				
	EB Approach	-	A (0.4)	-	A (0.6)	-				
Westbound (Erickson Avenue)	WBL	270	B (10.6)	3	A (9.5)	3				
	WBTR	-	(-)	-	(-)	-				
	WB Approach	-	A (0.5)	-	A (0.3)	-				
Northbound (Pear Street)	NBLTR	-	**F (106.7)**	143	**F (235.1)**	245				
	NB Approach	-	**F (106.7)**	-	**F (235.1)**	-				
Southbound (Pear Street)	SBLTR	-	C (17.5)	18	D (25.8)	23				
	SB Approach	-	C (17.5)	-	D (25.8)	-				
Intersection 7: Pear Street and Russell Drive (Unsignalized)										
Eastbound (Russell Drive)	EBLTR	-	B (10.1)	3	B (10.3)	3	B (13.1)	5	B (13.8)	3
	EB Approach	-	B (10.1)	-	B (10.3)	-	B (13.1)	-	B (13.8)	-
Northbound (Pear Street)	NBL	-	A (7.8)	0	A (7.5)	0	A (8.1)	0	A (8.0)	0
	NBT	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	A (0.3)	-	A (0.3)	-	A (0.1)	-	A (0.1)	-
Southbound (Pear Street)	SBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-
Intersection 8: Pear Street and Cobblers Court (Unsignalized)										
Eastbound (Cobblers Court)	EBLTR	-	B (10.2)	10	B (10.3)	10	B (14.4)	18	C (15.1)	15
	EB Approach	-	B (10.2)	-	B (10.3)	-	B (14.4)	-	C (15.1)	-
Westbound (Driveway)	WBLTR	-	A (8.5)	0	A (9.3)	0	B (10.2)	0	B (10.8)	0
	WB Approach	-	A (8.5)	-	A (9.3)	-	B (10.2)	-	B (10.8)	-
Northbound (Pear Street)	NBL	-	A (7.6)	3	A (7.5)	0	A (7.9)	3	A (7.9)	0
	NBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	A (2.9)	-	A (1.1)	-	A (0.6)	-	A (0.3)	-
Southbound (Pear Street)	SBL	-	N/A	0	A (8.4)	0	N/A	0	A (9.2)	0
	SBTR	65	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	A (0.1)	-	(-)	-	(-)	-
Intersection 9: Pear Street and Ruby Drive (Unsignalized)										
Eastbound (Ruby Drive)	EBLTR	-	A (9.5)	3	A (9.5)	3	B (10.8)	5	B (11.6)	5
	EB Approach	-	A (9.5)	-	A (9.5)	-	B (10.8)	-	B (11.6)	-
Northbound (Pear Street)	NBLT	-	A (7.6)	0	A (7.4)	0	A (7.7)	0	A (7.7)	0
	NB Approach	-	A (1.7)	-	A (1.0)	-	A (0.6)	-	A (0.3)	-
Southbound (Pear Street)	SBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-
Intersection 10: Pear Street and W Mosby Road (Unsignalized)										
Eastbound (W Mosby Road)	EBLT	-	A (7.8)	3	A (7.9)	0	A (8.4)	3	A (8.8)	3
	EB Approach	-	A (0.7)	-	A (0.5)	-	A (0.9)	-	A (0.8)	-
Westbound (W Mosby Road)	WBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-
Southbound (Pear Street)	SBLR	-	B (11.9)	18	B (13.7)	15	C (21.9)	78	D (33.7)	100
	SB Approach	-	B (11.9)	-	B (13.7)	-	C (21.9)	-	D (33.7)	-

Table 4-3 (continued): No Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 11: W Mosby Road and Mosby Court (Unsignalized)										
Eastbound (W Mosby Road)	EBTR	-	(-)	-	(-)	-	(-)	-	(-)	-
	EB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-
Westbound (W Mosby Road)	WBL	170	A (8.2)	0	A (8.1)	3	A (9.1)	0	A (8.8)	3
	WBT	-	(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach	-	A (0.4)	-	A (0.9)	-	A (0.2)	-	A (0.5)	-
Northbound (Mosby Court)	NBLR	-	B (10.6)	3	B (13.0)	8	B (13.7)	5	C (22.2)	15
	NB Approach	-	B (10.6)	-	B (13.0)	-	B (13.7)	-	C (22.2)	-
Intersection 12: S Main Street and W Mosby Road (Signalized)										
Overall Intersection		-	C (22.6)	-	C (31.4)	-	**E (62.3)**	-	**F (81.9)**	-
Eastbound (W Mosby Road)	EBL	160	**E (74.5)**	**#298**	**F (88.8)**	**#378**	**F (292.6)**	**#753**	**F (272.5)**	**#924**
	EBTR	-	D (42.9)	52	D (39.4)	51	D (42.4)	116	D (38.6)	60
	EB Approach	-	**E (63.5)**	-	**E (77.9)**	-	**F (217.0)**	-	**F (225.0)**	-
Westbound (W Mosby Road)	WBLTR	-	D (42.1)	0	**E (67.2)**	99	D (39.6)	0	D (38.8)	70
	WB Approach	-	D (42.1)	-	**E (67.2)**	-	D (39.6)	-	D (38.8)	-
Northbound (S Main Street)	NBL	150	B (14.3)	49	B (17.7)	62	**F (94.1)**	**#198**	**E (79.7)**	**#242**
	NBTR	-	B (15.7)	251	C (22.8)	482	B (19.3)	341	C (30.4)	731
	NB Approach	-	B (15.6)	-	C (22.4)	-	C (28.7)	-	D (35.2)	-
Southbound (S Main Street)	SBL	190	A (9.8)	m11	C (26.2)	m7	B (14.8)	m9	D (43.1)	14
	SBTR	-	B (15.5)	306	C (21.7)	m411	C (21.3)	m449	**E (71.8)**	#984
	SB Approach	-	B (15.3)	-	C (21.7)	-	C (21.1)	-	**E (71.5)**	-
Intersection 13: S Main Street and Erickson Avenue/Stone Spring Road (Signalized)										
Overall Intersection		-	D (35.5)	-	D (42.4)	-	D (54.5)	-	**F (108.6)**	-
Eastbound (Erickson Avenue)	EBL	350	C (29.4)	50	C (32.2)	77	D (37.0)	150	**F (96.6)**	#310
	EBT	-	**E (63.4)**	237	**E (68.2)**	265	**F (100.7)**	#380	**F (104.6)**	#411
	EBR	300	D (41.5)	79	D (37.2)	31	D (42.5)	135	C (34.7)	69
	EB Approach	-	D (52.7)	-	**E (56.1)**	-	**E (70.4)**	-	**F (85.0)**	-
Westbound (Stone Spring Road)	WBL	500	D (53.5)	#338	**E (72.8)**	**#501**	**F (146.3)**	**#632**	**F (251.4)**	**#876**
	WBT	-	D (35.1)	173	D (39.8)	225	D (37.0)	234	D (42.8)	322
	WBR	200	C (25.2)	34	C (23.5)	48	C (27.2)	88	C (25.2)	99
	WB Approach	-	D (39.6)	-	D (49.1)	-	**E (75.0)**	-	**F (117.5)**	-
Northbound (S Main Street)	NBL	190	C (21.2)	m79	D (37.4)	**m190**	D (53.5)	**m192**	**F (139.2)**	**#639**
	NBT	-	C (26.6)	158	D (44.0)	m306	C (31.9)	m235	**F (89.2)**	#651
	NBR	330	B (10.7)	m30	C (24.8)	m214	B (15.0)	m87	C (33.6)	**549**
	NB Approach	-	C (20.7)	-	D (36.2)	-	C (30.8)	-	**F (81.5)**	-
Southbound (S Main Street)	SBL	190	C (24.3)	63	D (37.5)	**240**	D (46.1)	**#188**	**F (188.1)**	**#585**
	SBT	-	C (33.5)	262	C (33.3)	334	D (44.4)	382	**F (139.5)**	#698
	SBR	160	C (29.8)	0	C (32.8)	18	C (31.9)	0	**F (170.0)**	18
	SB Approach	-	C (31.5)	-	C (34.5)	-	D (43.9)	-	**F (155.1)**	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal
(-) = Free movement
N/A = Zero volume; no delay reported

Table 4-3 (continued): No Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 14: S Main Street and Pleasant Hill Road (Signalized)										
Overall Intersection		-	B (14.7)	-	B (15.0)	-	B (17.8)	-	B (18.6)	-
Eastbound (Pleasant Hill Road)	EBLT	-	E (59.8)	105	E (66.2)	m130	E (64.6)	160	E (69.1)	168
	EBR	220	D (48.7)	8	E (59.1)	m0	D (53.1)	74	E (57.8)	49
	EB Approach	-	D (52.3)	-	E (62.5)	-	E (57.2)	-	E (62.4)	-
Westbound (Pleasant Hill Road)	WBLT	-	**F (85.0)**	22	E (75.6)	41	**F (85.0)**	22	E (75.6)	41
	WBR	-	N/A	-	E (66.7)	-	N/A	-	E (66.7)	-
	WB Approach	-	**F (85.0)**	-	E (75.1)	-	**F (85.0)**	-	E (75.1)	-
Northbound (S Main Street)	NBL	190	A (3.5)	14	A (5.6)	m22	A (6.5)	m22	B (14.4)	m44
	NBTR	-	A (3.5)	67	A (1.9)	63	A (5.8)	155	A (2.5)	m103
	NB Approach	-	A (3.5)	-	A (2.4)	-	A (5.8)	-	A (4.0)	-
Southbound (S Main Street)	SBL	140	A (6.6)	4	N/A	0	A (7.8)	4	N/A	0
	SBTR	-	B (12.7)	164	B (18.3)	310	B (15.6)	254	C (23.4)	514
	SB Approach	-	B (12.7)	-	B (18.3)	-	B (15.6)	-	C (23.4)	-
Intersection 15: Pear Street and Erickson Avenue (Unsignalized)										
Eastbound (Erickson Avenue)	EBTR		See Intersection 6.				(-)	0	(-)	0
	EB Approach						(-)	-	(-)	-
Westbound (RCUT)	WBL	275					E (39.2)	38	**F (53.1)**	76
	WB Approach						E (39.2)	-	**F (53.1)**	-
Northbound (Pear Street)	NBR	-					**F (65.7)**	292	**F (59.5)**	259
	NB Approach						**F (65.7)**	-	**F (59.5)**	-
Intersection 17: Erickson Avenue and RCUT (Signalized)										
Overall Intersection		-	See Intersection 6.				A (8.6)	-	B (10.9)	-
Westbound (Erickson Avenue)	WBL						A (7.3)	119	A (9.0)	214
	WB Approach						A (7.3)	-	A (9.0)	-
Northbound (RCUT)	NBL	175					B (11.4)	108	B (17.5)	164
	NB Approach						B (11.4)	-	B (17.5)	-
Intersection 19: Pear Street and Erickson Avenue (Unsignalized)										
Westbound (Erickson Avenue)	WBTR		See Intersection 6.				(-)	-	(-)	-
	WB Approach						(-)	-	(-)	-
Southbound (Pear Street)	SBR	-					B (14.6)	18	C (17.5)	18
	SB Approach						B (14.6)	-	C (17.5)	-

= 95th percentile volume exceeds capacity, queue may be longer

m = Volume for 95th percentile queue is metered by upstream signal

(-) = Free movement

N/A = Zero volume; no delay reported

4.3.2 No Build Traffic Analysis Results

The unsignalized intersection of Pear Street and Erickson Avenue was converted to an RCUT for all future conditions, based on funded transportation projects as described in **Section 2.2**. The RCUT is represented by unsignalized intersections 15 and 19 and signalized intersection 17 in the Synchro reports. At unsignalized intersection 15, the removal of northbound left and through movements improved delay on the northbound approach. The northbound right-turn delay decreased compared to existing conditions, going from 106.7 to 65.7 seconds during the AM peak hour and from 235.1 to 59.5 seconds during the PM peak hour. The stop-controlled westbound approach experienced a delay of 39.2 seconds during the AM peak hour and 53.1 seconds during the PM peak hour. While the northbound and westbound approaches still operated at LOS E or LOS F, the delays are a significant improvement over the existing delays. At the unsignalized intersection 19 (southbound Pear Street and westbound Erickson Avenue), all approaches operated at LOS C or better. At signalized intersection 17, where the U-turn onto westbound Erickson Avenue is made, all approaches operated at LOS B or better.

At the unsignalized intersection of S High Street and Pear Street, the westbound approach experienced significant delay during the PM peak, going from LOS C to LOS F, an increase in delay of approximately 117 seconds. This could be attributed to the increased difficulty of making a left-turn from the westbound approach as the opposing volumes increased. The eastbound approach also experienced significant delay during the PM peak, going from LOS D to LOS F, an increase in delay of 94.5 seconds. However, this approach is a driveway which had minimal volumes relative to other approaches.

The eight other unsignalized intersections did not experience a significant increase in delay from the Existing to No Build conditions. The highest delay in the AM peak hour for any side street approach at these eight unsignalized intersections was 21.9 seconds for the southbound approach at the intersection of Pear Street and W Mosby Road. Likewise, the highest delay in the PM peak hour for any side street approach was 33.7 seconds for the southbound approach at the intersection of Pear Street and W Mosby Road. These delays are primarily attributed to the need for a gap in both directions of opposing traffic to cross or turn left at these intersections. All of these eight unsignalized intersections operated at LOS C or better during both peak hours, except for the southbound approach at the intersection of Pear Street and W Mosby Road, which operates at LOS D during the PM peak hour.

At the signalized intersection of S High Street and Erickson Avenue, overall intersection delay increased by nearly 20 seconds (LOS C to LOS D) during the AM peak hour and increased by approximately 23 seconds (LOS D to LOS E) during the PM peak hour. The southbound left-turn movement experienced a significant increase in delay, going from LOS C to LOS F during both peak hours. During the AM peak hour, the delay increased by approximately 108 seconds, and during the PM peak hour, the delay increased by almost 146 seconds. It is likely this movement would experience cycle failure during both peak hours given a cycle length of 100 seconds during the AM peak hour and 120 seconds during the PM peak hour. The northbound through movement also experienced a large increase in delay, going from LOS D to LOS E during both peak hours. During the AM peak hour, the delay increased by 24 seconds, and during the PM peak hour, the delay increased by 18.3 seconds. During the AM peak hour, the eastbound through-right movement delay increased from LOS D to LOS E, and during the PM peak hour, the westbound through-right movement increased from LOS D to LOS E. Additionally, the 95th percentile queues exceeded

existing capacity during the AM and PM peak hours for the southbound and westbound left-turn movements. The 95th percentile queues for those movements were already exceeding capacity during the PM peak hour under existing conditions.

At the signalized intersection of S Main Street and W Mosby Road, overall intersection delay increased by nearly 40 seconds (LOS C to LOS E) during the AM peak hour and increased by approximately 51 seconds (LOS E to LOS F) during the PM peak hour. During both peak hours, the eastbound left-turn movement operated poorly at LOS F, with delay increasing by approximately 218 seconds during the AM peak hour and almost 184 seconds during the PM peak hour. Additionally, the 95th percentile queues continued to exceed capacity in both the AM and PM peak hours for the eastbound left-turn movement. The eastbound left-turn lane becomes a two-way left-turn lane upstream of the intersection, so the queuing would not impede through traffic, but it would impede vehicles attempting to turn left from one of the many access points on this approach. The northbound left-turn movement experienced a significant increase in delay, going from LOS B to LOS F during the AM peak hour and going from LOS B to LOS E during the PM peak hour. Additionally, the 95th percentile queues for this movement exceeded capacity during both peak hours. During the PM peak hour, the southbound through-right movement delay increased from LOS C to LOS E, an increase of approximately 50 seconds.

At the signalized intersection of S Main Street and Erickson Avenue, overall intersection delay increased by approximately 19 seconds (remaining at LOS D) during the AM peak hour and increased by approximately 66 seconds (LOS D to LOS F) during the PM peak hour. During the AM peak hour, the eastbound through and westbound left-turn movements experienced significant increases in delay, both going to LOS F from LOS E and LOS D, respectively. The westbound left-turn 95th percentile queue also exceeded capacity during both peak hours. During the PM peak hour, almost all movements and every approach operated at LOS F, indicating the intersection is over-capacity.

At the signalized intersection of S Main Street and Pleasant Hill Road, overall intersection delay increased slightly but remained similar to existing conditions. Most approaches operated similarly to existing conditions as well. During the AM peak hour, the eastbound approach went from LOS D to LOS E, an increase of approximately 5 seconds of delay. During the PM peak hour, the southbound through-right movement went from LOS B to LOS C, an increase in delay of 5 seconds.

4.4 2045 NO BUILD CONDITIONS SUMMARY

The 2045 No Build Conditions comprised the addition of the funded transportation projects detailed in **Section 2.2** as well as future development and background growth trips to the existing transportation network, but it did not include new street connections or intersection improvements. The westbound left-turn movement at S High Street and Pear Street experienced greater delay than during existing conditions. The RCUT at Erickson Avenue and Pear Street operated better than during existing conditions. The eight other unsignalized intersections did not experience a significant increase in delay from the Existing to No Build conditions.

At the signalized intersections of S High Street and Erickson Avenue, S Main Street and W Mosby Road, and S Main Street and Erickson Avenue, the overall intersection delay increased during both peak hours. At S High Street and Erickson Avenue, the southbound left-turn movement in particular experienced a significant increase in delay, going from LOS C to LOS F during both peak hours. At S Main Street and W Mosby Road during both peak hours, the eastbound left-turn continued to operate poorly while the northbound left-turn delay significantly increased from existing conditions. At S Main Street and Erickson Avenue, the eastbound through movement and westbound left-turn movement operated poorly during the AM peak hour, and during the PM peak hour, almost all movements operated at LOS F, indicating the intersection is over-capacity. S Main Street and Pleasant Hill Road operated similarly to existing conditions.

5 2045 Build Conditions

The 2045 Build condition proposes additional street connections in the study area to mitigate issues seen in the No Build conditions. The locations of these access points and general alignment of these streets were determined with input from the SAG. Project trips are redistributed via 3 new intersections that aim to mitigate the effects of the future No Build traffic volumes on the study area transportation network.

5.1 BUILD TRANSPORTATION NETWORK

A North-South Connector road is proposed to connect Erickson Avenue to W Mosby Road, including a new signalized intersection at Erickson Avenue and a new north leg at the existing unsignalized intersection of W Mosby Road and Mosby Court. North of Erickson Avenue, this street will serve as localized access to future development, connecting eventually to Willow Hill Drive. Willow Hill Drive will be connected to Pleasant Hill Road by future development. A new East-West Connector road will tie Pear Street to the new North-South Connector. The approximate locations of these proposed streets are shown in **Figure 5-1**.

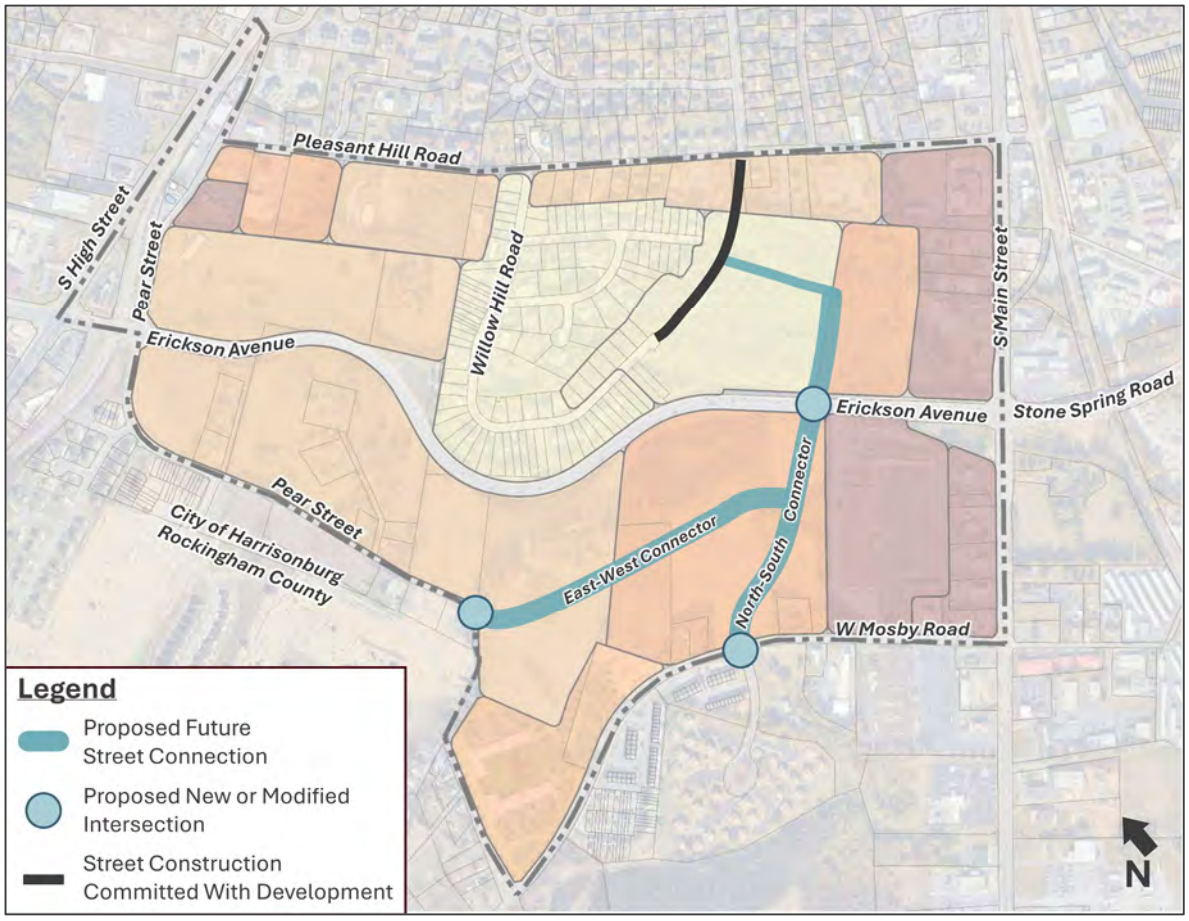

Figure 5-1: 2045 Build Proposed Street Connections

The proposed North-South Connector creates one new intersection and one new approach to an existing intersection. At the new signalized intersection on Erickson Avenue, right- and left-turn lanes

are added for the eastbound and westbound movements. It is assumed that the northbound approach has one left-turn lane, one through lane, and one right-turn lane. The southbound approach is assumed to have one left-turn lane and one through-right-turn lane. The new north leg at the existing intersection of W Mosby Road and Mosby Court will have one left-through-right lane. An eastbound left-turn lane was not introduced given the existing striped area quickly narrows and the intersection was shown to operate well in the Build conditions without one.

At this new T-intersection with Pear Street, the East-West Connector and eastbound Pear Street will be uncontrolled as the new mainline approaches, and the northbound leg of existing Pear Street will be stop-controlled, as the minor street approach.

Figure 5-2, **Figure 5-3**, and **Figure 5-4** show the lane configurations at these new or adjusted intersections. All connections internal to the land bays will be determined in conjunction with future development.

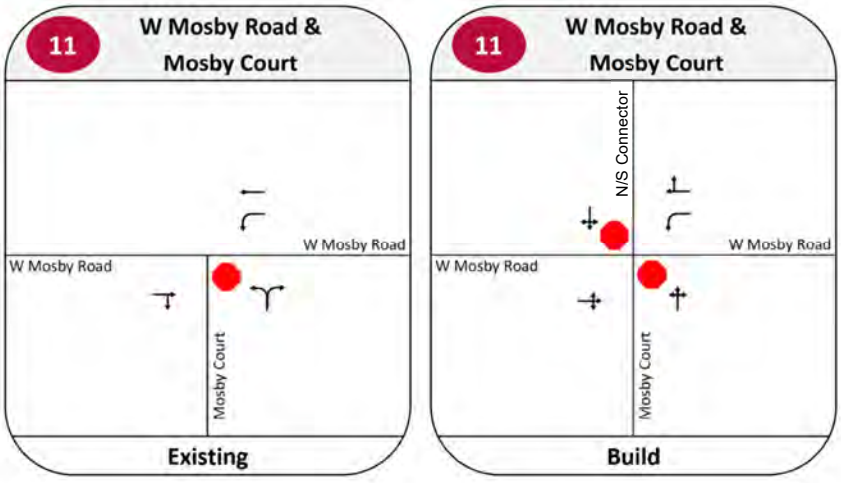

Figure 5-2: Existing and Build Lane Configurations at W Mosby Road and Mosby Court

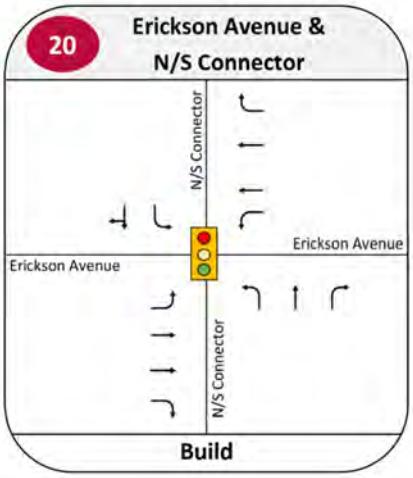

Figure 5-3: Build Lane Configurations at Erickson Avenue and North-South Connector

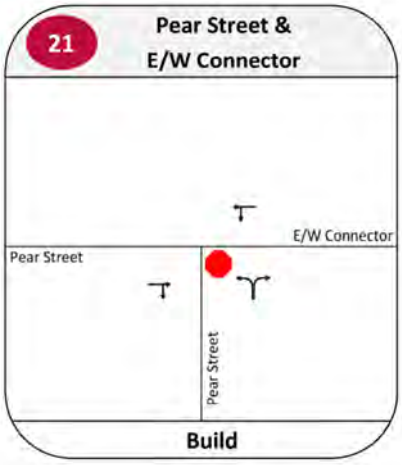

Figure 5-4: Build Lane Configurations at Pear Street and East-West Connector

5.2 BUILD TRAFFIC VOLUMES

5.2.1 Future Background Traffic Volume Adjustments Based on New Street Connections

In general, the future background traffic volumes were assumed to follow their current routing. However, Streetlight origin-destination data was provided by VDOT to understand travel patterns in the study area. Based on this origin-destination data, the future background (existing plus regional growth) traffic volume at the following movements were assumed to be re-routed to utilize the proposed street connections.

Westbound Stone Spring Road to W Mosby Road west of Mosby Court

Trips originating on westbound Stone Spring Road making a left-turn at Erickson Avenue and S Main Street to reach W Mosby Road west of Mosby Court were re-routed to utilize the North-South Connector. These trips were assumed to travel westbound through the Erickson Avenue and S Main Street intersection and turn left at the Erickson Avenue and North-South Connector intersection, turn right at the intersection of W Mosby Road and the North-South Connector, and travel outside the study area on W Mosby Road. Per the Streetlight data, 8% of AM peak hour trips and 11% of PM peak hour trips traveling westbound on Stone Spring Road are destined for W Mosby Road west of Mosby Court under existing conditions. Due to projected and anticipated delay for the left turn movement from Stone Spring Road onto South Main Street, it is assumed that all of these trips are re-routed to the new route.

Eastbound W Mosby Road west of Mosby Court to eastbound Stone Spring Road

Trips originating on eastbound W Mosby Road making a left-turn to reach Stone Spring Road east of S Main Street and exit the study area were assumed to re-route to utilize the North-South Connector. These trips now turn left at W Mosby Road and the North-South Connector, turn right at Erickson Avenue and the North-South Connector, and travel eastbound through the intersection of Erickson Avenue and S Main Street to exit the study area. Per the Streetlight data, 35% of AM peak hour trips and 21% of PM peak hour trips traveling bidirectionally on W Mosby Road are destined for Stone Spring Road under existing conditions. Due to projected and anticipated delay for the left turn

movement from Mosby Road onto South Main Street, it is assumed that 90% of these trips are re-routed, so 32% of AM peak hour trips and 19% of PM peak hours trip traveling bidirectionally on W Mosby Road.

The new routes are visualized in **Figure 5-5**. The Build background traffic volume adjustments based on the assumed re-routing for the new street connections are shown in **Figure 5-6**.

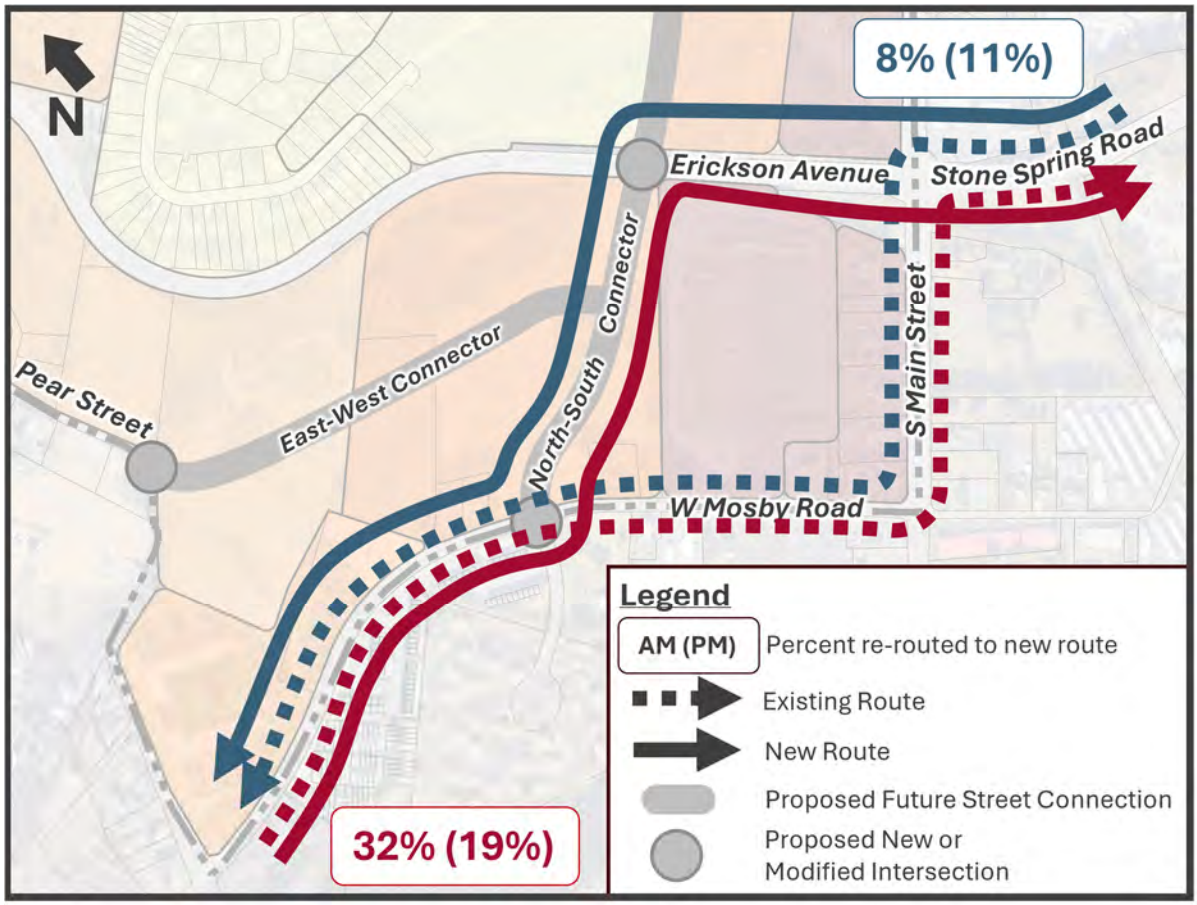

Figure 5-5: Background Traffic Volume Adjustment Routes

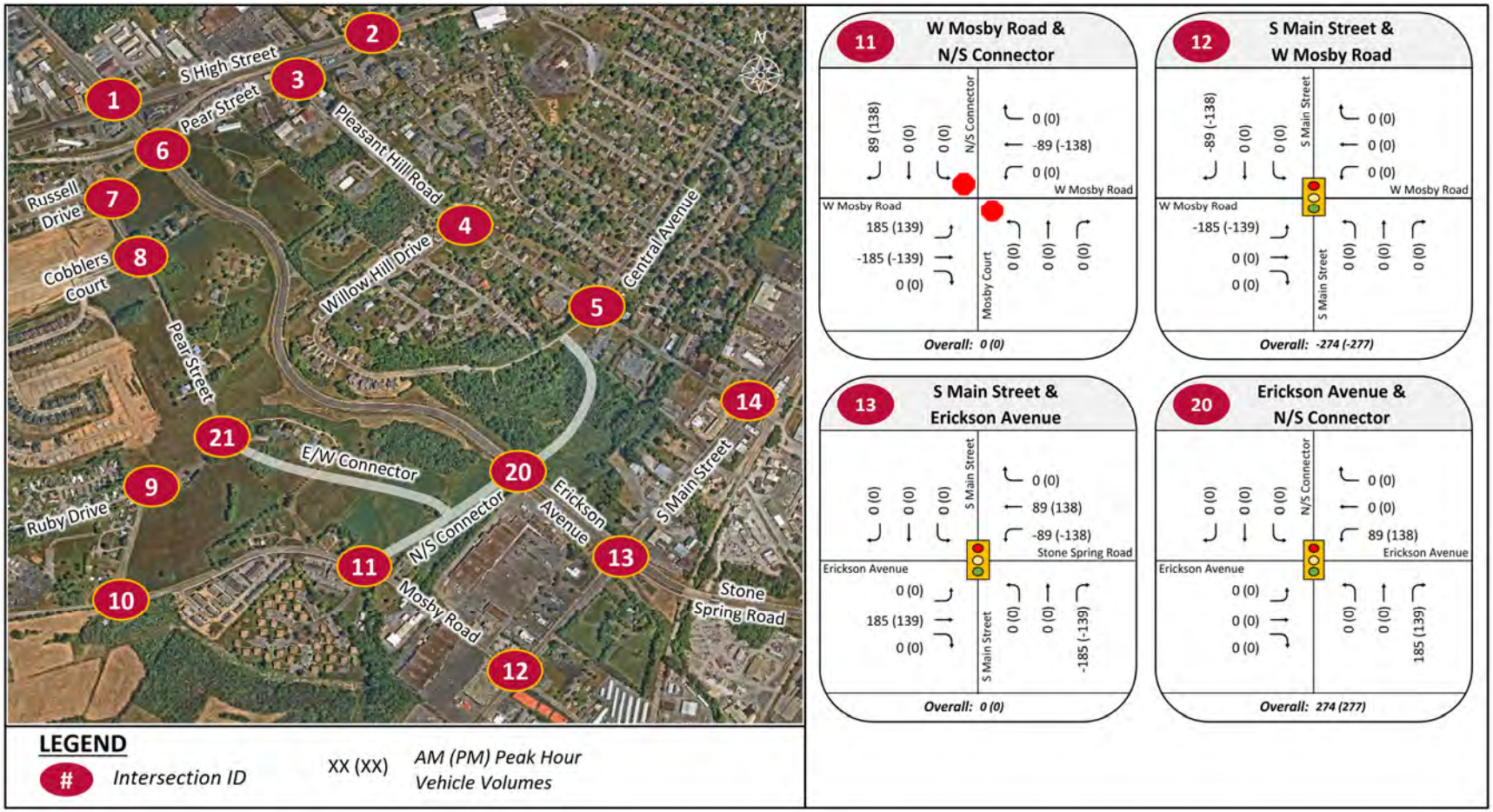

Figure 5-6: 2045 Build Background Trip Adjustments Based on New Street Connections - AM & PM Peak Hour Vehicle Volumes

5.2.2 Future Development Trip Adjustments Based on New Street Connections

The assumed future development trips from the No Build conditions were assumed to be re-routed if it seemed likely that a driver would take one of the new proposed street connections. Examples include if a new signal facilitates making a left-turn that was previously difficult, if a new connection provides a shorter or simpler route, and if a new connection provides better access to the destination land bay.

Most future development trips to the land bays along Pear Street were assumed to use the East-West Connector Road instead of traveling along W Mosby Road and turning onto Pear Street. Trips that would have made a left-turn from northbound Pear Street at Erickson Avenue using the RCUT were routed to the North-South Connector, where a signal will facilitate making a left-turn onto Erickson Avenue with fewer steps than at the RCUT. Trips that would have traveled along W Mosby Road to reach S Main Street are rerouted to utilize the North-South Connector to reach Erickson Avenue and then travel to S Main Street. Trips from Stone Spring Road to Pear Street or W Mosby Road utilize the new street connections if they are not destined for a business along S Main Street. The Build development trip adjustments based on new street connections are shown in **Figure 5-7** and **Figure 5-8**.

5.2.3 2045 Build Traffic Volumes

The 2045 Build traffic volumes, which account for background and future development traffic volume adjustments based on the new street connections, are shown in **Figure 5-9** and **Figure 5-10**.

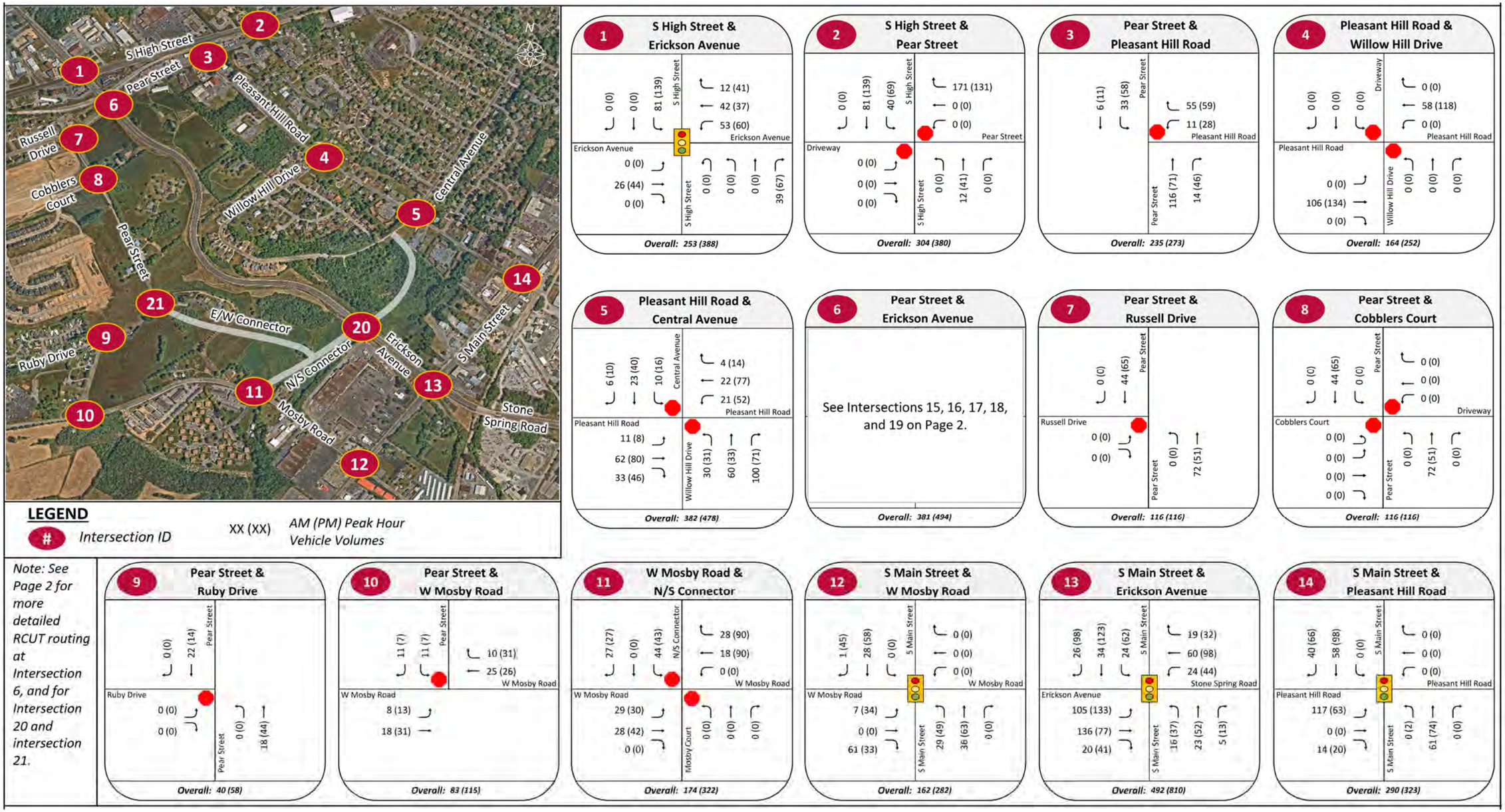

Figure 5-7: 2045 Build – Development Trip Adjustments Based on New Street Connections - AM & PM Peak Hour Vehicle Trips (1 of 2)

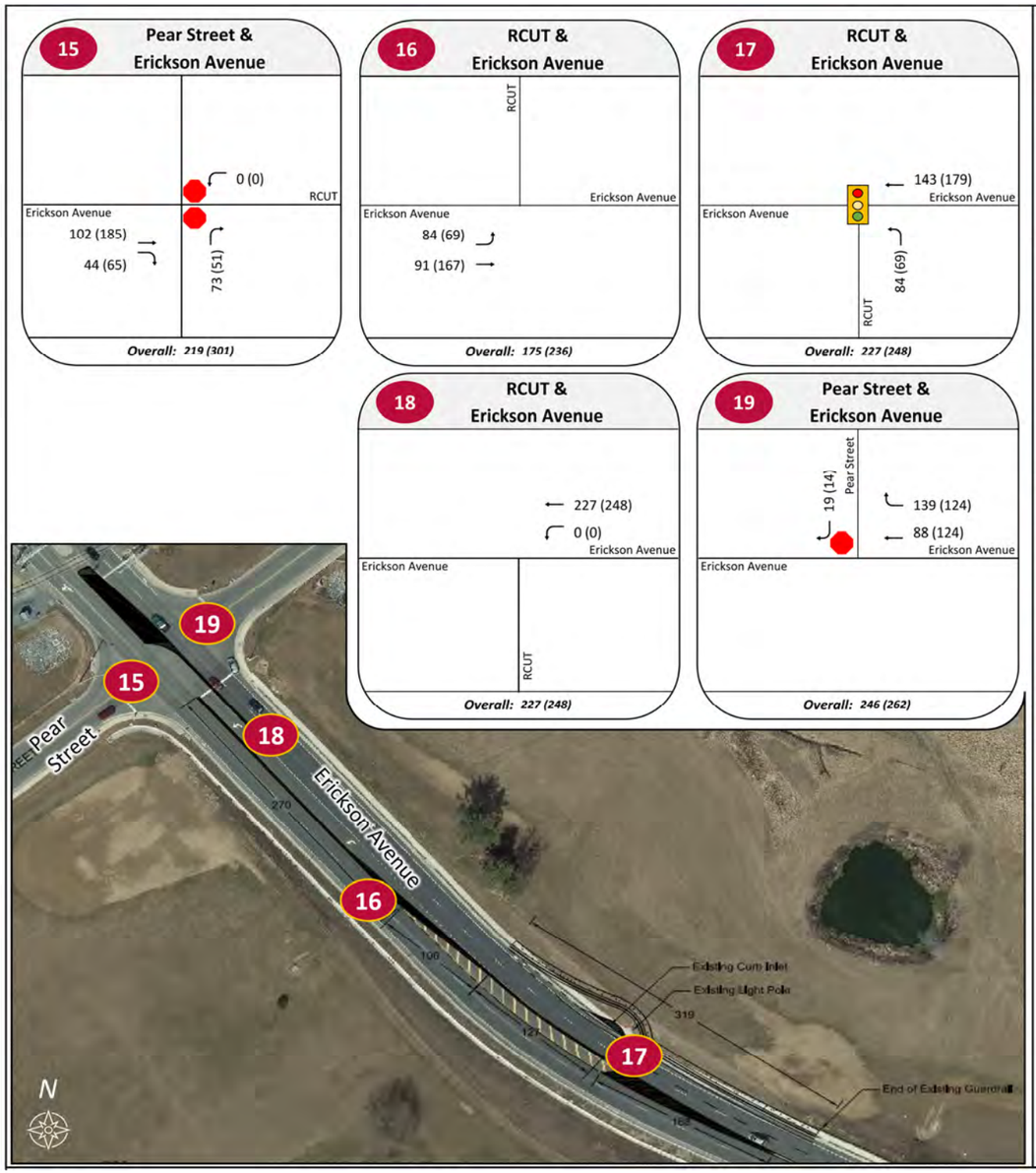

Figure 5-8: 2045 Build – Development Trip Adjustments Based on New Street Connections - AM & PM Peak Hour Vehicle Trips (2 of 2)

LEGEND

Intersection ID

XX (XX) *AM (PM) Peak Hour Vehicle Volumes*

Note: See Page 2 for more detailed RCUT routing at Intersection 6, and for Intersection 20 and intersection 21.

1 S High Street & Erickson Avenue

			S High Street								
156 (223)	426 (665)	314 (425)				180 (249)	458 (556)	248 (356)			
											Erickson Avenue
Erickson Avenue											
160 (170)	606 (410)	23 (20)									
			S High Street			2 (10)	15 (44)	525 (602)	240 (355)		

Overall: 3353 (4085)

2 S High Street & Pear Street

			S High Street								
0 (4)	824 (1215)	93 (140)				250 (224)	0 (1)	11 (17)			
											Pear Street
Driveway											
0 (1)	0 (0)	0 (2)									
			S High Street			0 (1)	815 (950)	11 (30)			

Overall: 2004 (2585)

3 Pear Street & Pleasant Hill Road

			Pear Street								
25 (23)	93 (131)					95 (120)	62 (65)				
											Pleasant Hill Road
			Pear Street			157 (123)	45 (90)				

Overall: 477 (552)

4 Pleasant Hill Road & Willow Hill Drive

			Driveway								
0 (0)	0 (0)	1 (0)				0 (0)	134 (218)	10 (28)			
											Pleasant Hill Road
Pleasant Hill Road											
0 (0)	206 (225)	10 (19)									
			Willow Hill Drive			16 (8)	0 (0)	25 (17)			

Overall: 402 (515)

5 Pleasant Hill Road & Central Avenue

			Central Avenue								
26 (23)	23 (40)	62 (63)				19 (82)	92 (201)	21 (52)			
											Pleasant Hill Road
Pleasant Hill Road											
21 (25)	185 (178)	33 (47)									
			Willow Hill Drive			30 (31)	60 (33)	100 (72)			

Overall: 672 (847)

6 Pear Street & Erickson Avenue

See Intersections 15, 16, 17, 18, and 19 on Page 2.

Overall: 2266 (2592)

7 Pear Street & Russell Drive

			Pear Street								
9 (14)	186 (215)										
											Russell Drive
Russell Drive											
15 (13)	8 (5)										
			Pear Street			4 (5)	196 (209)				

Overall: 418 (461)

8 Pear Street & Cobblers Court

			Pear Street								
43 (50)	144 (159)	0 (1)				1 (2)	0 (0)	0 (0)			
											Driveway
Cobblers Court											
0 (1)	58 (55)	0 (0)	27 (11)								
			Pear Street			27 (13)	127 (145)	0 (0)			

Overall: 427 (437)

9 Pear Street & Ruby Drive

			Pear Street								
16 (20)	140 (99)										
Ruby Drive											
14 (20)	19 (6)										
			Pear Street			17 (11)	91 (128)				

Overall: 297 (284)

10 Pear Street & W Mosby Road

			Pear Street								
74 (19)	89 (87)					77 (114)	196 (307)				
											W Mosby Road
W Mosby Road											
35 (33)	288 (322)										

Overall: 759 (882)

11 W Mosby Road & N/S Connector

			N/S Connector								
116 (165)	0 (0)	44 (43)				28 (90)	147 (315)	8 (37)			
											W Mosby Road
W Mosby Road											
214 (169)	188 (274)	6 (11)									
			Mosby Court			3 (17)	0 (0)	20 (24)			

Overall: 774 (1145)

12 S Main Street & W Mosby Road

			S Main Street								
60 (183)	1180 (1047)	30 (13)				15 (39)	0 (15)	6 (19)			
											W Mosby Road
W Mosby Road											
79 (268)	4 (9)	193 (127)									
			S Main Street			136 (166)	881 (1392)	14 (12)			

Overall: 2598 (3290)

13 S Main Street & Erickson Avenue

			S Main Street								
75 (171)	643 (814)	187 (375)				276 (285)	588 (761)	346 (386)			
											Stone Spring Road
Erickson Avenue											
162 (220)	809 (725)	370 (260)									
			S Main Street			235 (383)	586 (896)	161 (489)			

Overall: 4439 (5765)

14 S Main Street & Pleasant Hill Road

			S Main Street								
70 (114)	664 (984)	2 (0)				0 (1)	2 (2)	5 (14)			
											Pleasant Hill Road
Pleasant Hill Road											
183 (143)	1 (1)	150 (109)									
			S Main Street			51 (127)	763 (1049)	11 (5)			

Overall: 1902 (2549)

Figure 5-9: 2045 Build AM & PM Peak Hour Vehicle Volumes (1 of 2)

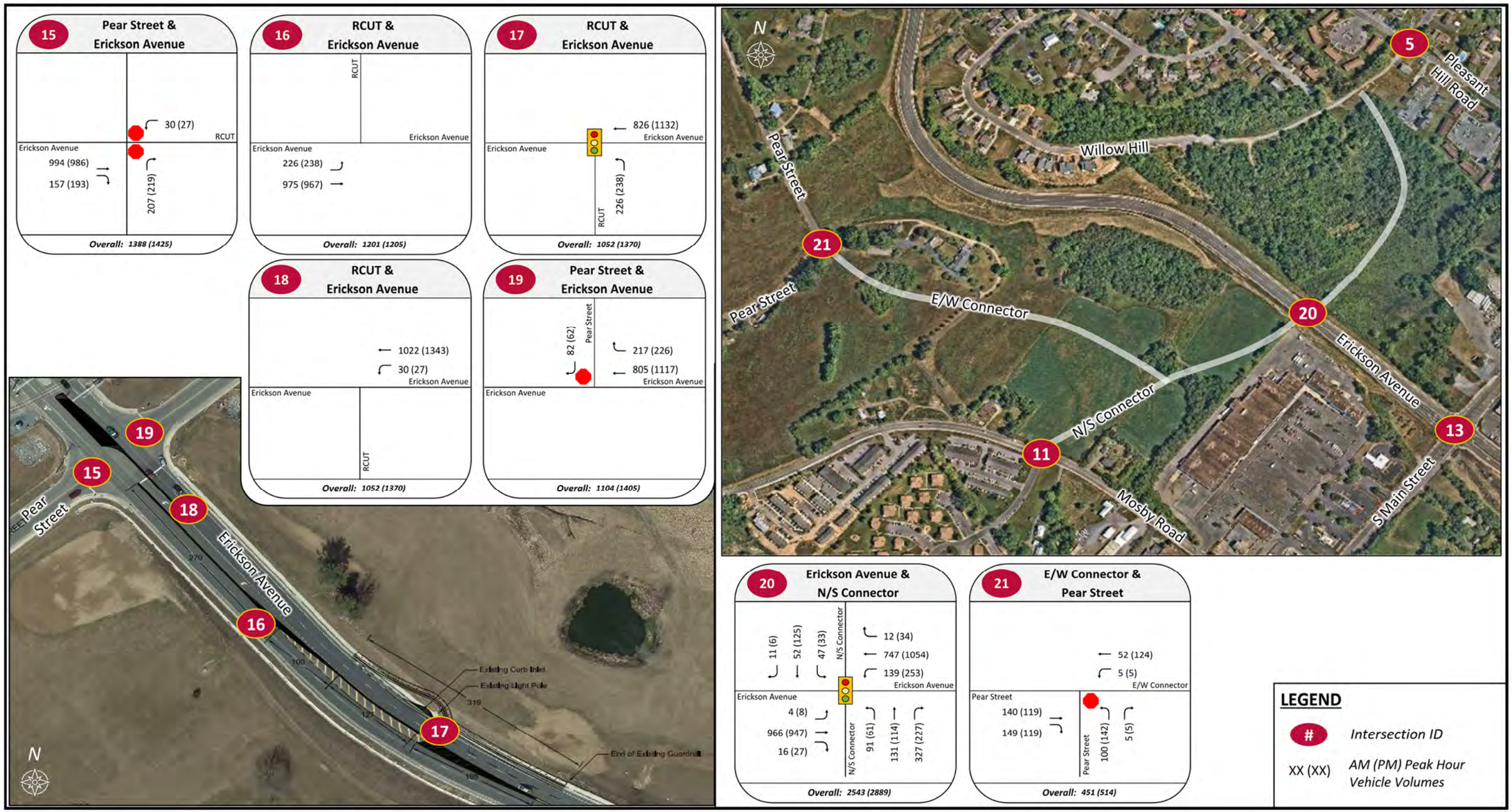

Figure 5-10: 2045 Build AM & PM Peak Hour Vehicle Volumes (2 of 2)

5.3 2045 BUILD TRAFFIC ANALYSIS

5.3.1 Measures of Effectiveness

The analysis of the 2045 build conditions was based on the future Build peak hour turning movement volumes. Signal timings were revised at signalized intersections based on the Build traffic volumes. Cycle lengths were maintained but individual phase splits were adjusted.

Table 5-1 summarizes the findings from the MOEs for all intersections, including average vehicular delay, level of service (LOS), available storage, and 95th percentile queue length. Movements for which delay cannot be calculated are indicated with "(-)" in the table, and movements with zero volume are indicated by "N/A" in the table. LOS E is shown in orange text, and LOS F is shown in red text. Additionally, queues lengths that exceed the storage length are shown in red text.

Full Synchro HCM reports, documenting the detailed MOEs for AM and PM peak hour Build conditions for all intersections, can be found in **Appendix C**.

Table 5-1: Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM		Future Build AM		Future Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 1: S High Street and Erickson Avenue (Signalized)														
Overall Intersection		-	C (33.8)	-	D (36.3)	-	D (53.6)	-	**E (58.8)**	-	D (52.6)	-	**E (57.6)**	-
Eastbound (Erickson Avenue)	EBL	235	C (28.1)	96	D (35.2)	110	C (31.6)	#118	D (40.0)	#164	C (31.6)	#118	D (40.0)	#164
	EBTR	-	D (43.7)	226	D (47.8)	164	**E (59.8)**	#343	D (54.7)	#270	**E (59.8)**	#343	D (54.7)	#270
	EB Approach	-	D (40.4)	-	D (43.9)	-	D (54.1)	-	D (50.6)	-	D (54.1)	-	D (50.6)	-
Westbound (Erickson Avenue)	WBL	150	C (28.6)	115	D (35.4)	**187**	D (43.7)	**#250**	D (43.3)	**304**	D (43.7)	**#250**	D (43.3)	**304**
	WBTR	-	D (39.2)	192	D (50.3)	265	D (43.3)	#294	**E (56.5)**	#409	D (43.3)	#294	**E (56.5)**	#409
	WB Approach	-	D (36.6)	-	D (46.0)	-	D (43.4)	-	D (52.5)	-	D (43.4)	-	D (52.5)	-
Northbound (S High Street)	NBL	130	C (22.2)	19	C (22.5)	46	C (24.6)	21	C (26.9)	52	C (24.6)	21	C (26.9)	52
	NBT	-	D (38.0)	205	D (37.9)	249	**E (62.0)**	#292	**E (56.2)**	#326	**E (62.0)**	#292	**E (56.2)**	#326
	NBR	240	C (22.7)	47	C (22.1)	98	C (25.8)	96	C (26.3)	172	C (25.8)	96	C (26.3)	172
	NB Approach	-	C (33.5)	-	C (32.2)	-	D (50.1)	-	D (44.1)	-	D (50.1)	-	D (44.1)	-
Southbound (S High Street)	SBL	150	C (27.0)	144	C (26.8)	**183**	**F (135.4)**	**#378**	**F (172.5)**	**#581**	**F (126.9)**	**#368**	**F (163.3)**	**#568**
	SBT	-	C (27.0)	151	C (30.8)	245	C (31.4)	186	D (37.6)	310	C (31.4)	186	D (37.6)	310
	SBR	390	B (17.4)	26	B (18.9)	34	B (19.6)	35	C (22.1)	57	B (19.6)	35	C (22.1)	57
	SB Approach	-	C (25.2)	-	C (27.5)	-	**E (66.2)**	-	**E (79.2)**	-	**E (62.7)**	-	**E (75.7)**	-
Intersection 2: S High Street and Pear Street (Unsignalized)														
Eastbound (Driveway)	EBLTR	-	N/A	-	D (27.0)	3	N/A	-	**F (121.5)**	8	N/A	-	**F (111.2)**	8
	EB Approach	-	N/A	-	D (27.0)	-	N/A	-	**F (121.5)**	-	N/A	-	**F (111.2)**	-
Westbound (Pear Street)	WBLTR	-	B (13.1)	18	C (23.2)	43	C (21.7)	95	**F (140.0)**	300	C (20.3)	83	**F (127.7)**	278
	WB Approach	-	B (13.1)	-	C (23.2)	-	C (21.7)	-	**F (140.0)**	-	C (20.3)	-	**F (127.7)**	-
Northbound (S High Street)	NBL	-	N/A		A (9.8)	0	N/A		B (11.7)	0	N/A		B (11.6)	0
	NBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
Southbound (S High Street)	SBL	90	A (9.5)	5	A (9.8)	8	B (10.6)	13	B (12.0)	23	B (10.6)	13	B (11.9)	20
	SBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	A (0.8)	-	A (0.7)	-	A (1.1)	-	A (1.3)	-	A (1.1)	-	A (1.2)	-
Intersection 3: Pleasant Hill Road and Pear Street (Unsignalized)														
Westbound (Pleasant Hill	WBLR	-	B (10.3)	13	A (10.0)	13	B (12.7)	28	B (13.1)	33	B (12.1)	25	B (12.6)	32.5
	WB Approach	-	B (10.3)	-	A (10.0)	-	B (12.7)	-	B (13.1)	-	B (12.1)	-	B (12.6)	-
Northbound (Pear Street)	NBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
Southbound (Pear Street)	SBL	-	A (7.6)	5	A (7.6)	5	A (8.1)	8	A (8.2)	10	A (8.0)	5	A (8.0)	10
	SBT	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	A (5.8)	-	A (6.5)	-	A (6.4)	-	A (7.0)	-	A (6.3)	-	A (6.8)	-

Table 5-1 (continued): Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM		Future Build AM		Future Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 4: Pleasant Hill Road and Willow Hill Drive (Unsignalized)														
Eastbound (Pleasant Hill Road)	EBL	-	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0
	EBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	EB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
Westbound (Pleasant Hill Road)	WBL	-	A (7.6)	0	A (7.5)	3	A (7.8)	0	A (7.8)	3	A (7.8)	0	A (7.8)	3
	WBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach	-	A (0.9)	-	A (1.6)	-	A (0.5)	-	A (1.0)	-	A (0.5)	-	A (0.9)	-
Northbound (Willow Hill Drive)	NBLTR	-	A (9.8)	5	A (9.5)	3	B (10.8)	5	B (11.0)	3	B (10.7)	5	B (11.0)	3
	NB Approach	-	A (9.8)	-	A (9.5)	-	B (10.8)	-	B (11.0)	-	B (10.7)	-	B (11.0)	-
Southbound (Driveway)	SBLTR	-	B (10.5)	0	N/A	-	B (11.9)	0	N/A	-	B (11.8)	0	N/A	-
	SB Approach	-	B (10.5)	-	N/A	-	B (11.9)	-	N/A	-	B (11.8)	-	N/A	-
Intersection 5: Pleasant Hill Road and Central Avenue (Unsignalized)														
Eastbound (Pleasant Hill Road)	EBL	-	A (7.6)	0	A (7.7)	0	A (7.6)	3	A (8.0)	3	A (7.6)	0	A (8.0)	3
	EBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	EB Approach	-	A (0.6)	-	A (1.1)	-	A (0.8)	-	A (0.9)	-	A (0.7)	-	A (0.8)	-
Westbound (Pleasant Hill Road)	WBL	-	N/A	0	N/A	0	A (7.7)	0	A (7.8)	3	A (7.8)	3	A (7.8)	3
	WBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach	-	(-)	-	(-)	-	A (0.7)	-	A (0.8)	-	A (1.2)	-	A (1.2)	-
Northbound (Willow Hill Drive)	NBLTR	-	N/A	-	A (8.8)	0	B (11.8)	10	B (12.8)	8	B (13.7)	37.5	C (15.9)	33
	NB Approach	-	N/A	-	A (8.8)	-	B (11.8)	-	B (12.8)	-	B (13.7)	-	C (15.9)	-
Southbound (Central Avenue)	SBLTR	-	B (10.6)	10	B (10.9)	8	B (13.5)	18	C (18.3)	30	C (15.9)	28	C (22.4)	48
	SB Approach	-	B (10.6)	-	B (10.9)	-	B (13.5)	-	C (18.3)	-	C (15.9)	-	C (22.4)	-
Intersection 6: Pear Street and Erickson Avenue (Unsignalized)														
Eastbound (Erickson Avenue)	EBL	50	A (9.0)	3	A (9.7)	5	See Intersections 15, 17, and 19.							
	EBTR	-	(-)	-	(-)	-								
	EB Approach	-	A (0.4)	-	A (0.6)	-								
Westbound (Erickson Avenue)	WBL	270	B (10.6)	3	A (9.5)	3								
	WBTR	-	(-)	-	(-)	-								
	WB Approach	-	A (0.5)	-	A (0.3)	-								
Northbound (Pear Street)	NBLTR	-	**F (106.7)**	143	**F (235.1)**	245								
	NB Approach	-	**F (106.7)**	-	**F (235.1)**	-								
Southbound (Pear Street)	SBLTR	-	C (17.5)	18	D (25.8)	23								
	SB Approach	-	C (17.5)	-	D (25.8)	-								
Intersection 7: Pear Street and Russell Drive (Unsignalized)														
Eastbound (Russell Drive)	EBLTR	-	B (10.1)	3	B (10.3)	3	B (13.1)	5	B (13.8)	3	B (11.0)	3	B (11.4)	3
	EB Approach	-	B (10.1)	-	B (10.3)	-	B (13.1)	-	B (13.8)	-	B (11.0)	-	B (11.4)	-
Northbound (Pear Street)	NBL	-	A (7.8)	0	A (7.5)	0	A (8.1)	0	A (8.0)	0	A (7.9)	0	A (7.7)	0
	NBT	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	A (0.3)	-	A (0.3)	-	A (0.1)	-	A (0.1)	-	A (0.2)	-	A (0.2)	-
Southbound (Pear Street)	SBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-

Table 5-1 (continued): Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM		Future Build AM		Future Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 8: Pear Street and Cobblers Court (Unsignalized)														
Eastbound (Cobblers Court)	EBLTR	-	B (10.2)	10	B (10.3)	10	B (14.4)	18	C (15.1)	15	B (11.3)	13	B (11.6)	10
	EB Approach	-	B (10.2)	-	B (10.3)	-	B (14.4)	-	C (15.1)	-	B (11.3)	-	B (11.6)	-
Westbound (Driveway)	WBLTR	-	A (8.5)	0	A (9.3)	0	B (10.2)	0	B (10.8)	0	A (8.9)	0	A (9.7)	0
	WB Approach	-	A (8.5)	-	A (9.3)	-	B (10.2)	-	B (10.8)	-	A (8.9)	-	A (9.7)	-
Northbound (Pear Street)	NBL	-	A (7.6)	3	A (7.5)	0	A (7.9)	3	A (7.9)	0	A (7.8)	3	A (7.7)	0
	NBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	NB Approach	-	A (2.9)	-	A (1.1)	-	A (0.6)	-	A (0.3)	-	A (1.4)	-	A (0.6)	-
Southbound (Pear Street)	SBL	-	N/A	0	A (8.4)	0	N/A	0	A (9.2)	0	N/A	0	A (8.6)	0
	SBTR	65	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	A (0.1)	-	(-)	-	(-)	-	(-)	-	(-)	-
Intersection 9: Pear Street and Ruby Drive (Unsignalized)														
Eastbound (Ruby Drive)	EBLTR	-	A (9.5)	3	A (9.5)	3	B (10.8)	5	B (11.6)	5	A (9.8)	3	A (10.0)	3
	EB Approach	-	A (9.5)	-	A (9.5)	-	B (10.8)	-	B (11.6)	-	A (9.8)	-	A (10.0)	-
Northbound (Pear Street)	NBLT	-	A (7.6)	0	A (7.4)	0	A (7.7)	0	A (7.7)	0	A (7.6)	0	A (7.5)	0
	NB Approach	-	A (1.7)	-	A (1.0)	-	A (0.6)	-	A (0.3)	-	A (1.2)	-	A (0.6)	-
Southbound (Pear Street)	SBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	SB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
Intersection 10: Pear Street and W Mosby Road (Unsignalized)														
Eastbound (W Mosby Road)	EBLT	-	A (7.8)	3	A (7.9)	0	A (8.4)	3	A (8.8)	3	A (8.0)	3	A (8.3)	3
	EB Approach	-	A (0.7)	-	A (0.5)	-	A (0.9)	-	A (0.8)	-	A (0.9)	-	A (0.8)	-
Westbound (W Mosby Road)	WBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
Southbound (Pear Street)	SBLR	-	B (11.9)	18	B (13.7)	15	C (21.9)	78	D (33.7)	100	C (15.2)	38	C (19.4)	33
	SB Approach	-	B (11.9)	-	B (13.7)	-	C (21.9)	-	D (33.7)	-	C (15.2)	-	C (19.4)	-
Intersection 11: W Mosby Road and Mosby Court/North-South Connector (Unsignalized)														
Eastbound (W Mosby Road)	EBL	-	Does not exist in Existing or No Build Conditions.								A (8.1)	15	A (8.8)	15
	EBTR	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-
	EB Approach	-	(-)	-	(-)	-	(-)	-	(-)	-	A (4.3)	-	A (3.3)	-
Westbound (W Mosby Road)	WBL	170	A (8.2)	0	A (8.1)	3	A (9.1)	0	A (8.8)	3	A (7.9)	0	A (8.0)	3
	WBT	-	(-)	-	(-)	-	(-)	-	(-)	-	Geometry changes in Build Condition.			
	WBTR	-	Geometry changes in Build Condition.								(-)	-	(-)	-
	WB Approach	-	A (0.4)	-	A (0.9)	-	A (0.2)	-	A (0.5)	-	A (0.3)	-	A (0.7)	-
Northbound (Mosby Court)	NBLR	-	B (10.6)	3	B (13.0)	8	B (13.7)	5	C (22.2)	15	Geometry changes in Build Condition.			
	NBLTR	-	Geometry changes in Build Condition.								B (11.7)	3	D (30.5)	23
	NB Approach	-	B (10.6)	-	B (13.0)	-	B (13.7)	-	C (22.2)	-	B (11.7)	-	D (30.5)	-
Southbound (N/S Connector)	SBLTR	-	Does not exist in Existing or No Build Conditions.								C (15.7)	35	D (28.7)	97.5
	SB Approach	-									C (15.7)	-	D (28.7)	-

Table 5-1 (continued): Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM		Future Build AM		Future Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 12: S Main Street and W Mosby Road (Signalized)														
Overall Intersection		-	C (22.6)	-	C (31.4)	-	**E (62.3)**	-	**F (81.9)**	-	B (18.8)	-	C (31.3)	-
Eastbound (W Mosby Road)	EBL	160	**E (74.5)**	**#298**	**F (88.8)**	**#378**	**F (292.6)**	**#753**	**F (272.5)**	**#924**	D (54.3)	107	**E (65.1)**	**325**
	EBTR	-	D (42.9)	52	D (39.4)	51	D (42.4)	116	D (38.6)	60	D (49.1)	119	D (40.4)	61
	EB Approach	-	**E (63.5)**	-	**E (77.9)**	-	**F (217.0)**	-	**F (225.0)**	-	D (50.6)	-	**E (56.7)**	-
Westbound (W Mosby Road)	WBLTR	-	D (42.1)	0	**E (67.2)**	99	D (39.6)	0	D (38.8)	70	**E (61.1)**	0	**E (67.9)**	99
	WB Approach	-	D (42.1)	-	**E (67.2)**	-	D (39.6)	-	D (38.8)	-	**E (61.1)**	-	**E (67.9)**	-
Northbound (S Main Street)	NBL	150	B (14.3)	49	B (17.7)	62	**F (94.1)**	**#198**	**E (79.7)**	**#242**	B (19.8)	#79	D (42.8)	**#203**
	NBTR	-	B (15.7)	251	C (22.8)	482	B (19.3)	341	C (30.4)	731	B (15.8)	354	C (27.7)	721
	NB Approach	-	B (15.6)	-	C (22.4)	-	C (28.7)	-	D (35.2)	-	B (16.3)	-	C (29.3)	-
Southbound (S Main Street)	SBL	190	A (9.8)	m11	C (26.2)	m7	B (14.8)	m9	D (43.1)	14	B (11.7)	m10	C (31.9)	m3
	SBTR	-	B (15.5)	306	C (21.7)	m411	C (21.3)	m449	**E (71.8)**	#984	B (13.2)	m372	C (23.4)	m323
	SB Approach	-	B (15.3)	-	C (21.7)	-	C (21.1)	-	**E (71.5)**	-	B (13.2)	-	C (23.5)	-
Intersection 13: S Main Street and Erickson Avenue/Stone Spring Road (Signalized)														
Overall Intersection		-	D (35.5)	-	D (42.4)	-	D (54.5)	-	**F (108.6)**	-	**E (64.7)**	-	**F (92.4)**	-
Eastbound (Erickson Avenue)	EBL	350	C (29.4)	50	C (32.2)	77	D (37.0)	150	**F (96.6)**	#310	C (34.8)	141	**F (129.6)**	**#352**
	EBT	-	**E (63.4)**	237	**E (68.2)**	265	**F (100.7)**	#380	**F (104.6)**	#411	**F (151.8)**	#581	**F (165.4)**	#574
	EBR	300	D (41.5)	79	D (37.2)	31	D (42.5)	135	C (34.7)	69	D (36.7)	125	C (32.5)	69
	EB Approach	-	D (52.7)	-	**E (56.1)**	-	**E (70.4)**	-	**F (85.0)**	-	**F (105.9)**	-	**F (130.2)**	-
Westbound (Stone Spring Road)	WBL	500	D (53.5)	#338	**E (72.8)**	**#501**	**F (146.3)**	**#632**	**F (251.4)**	**#876**	**F (111.1)**	#476	**F (139.3)**	**#584**
	WBT	-	D (35.1)	173	D (39.8)	225	D (37.0)	234	D (42.8)	322	D (38.7)	290	**E (56.2)**	447
	WBR	200	C (25.2)	34	C (23.5)	48	C (27.2)	88	C (25.2)	99	C (28.4)	85	C (27.5)	89
	WB Approach	-	D (39.6)	-	D (49.1)	-	**E (75.0)**	-	**F (117.5)**	-	**E (57.0)**	-	**E (72.9)**	-
Northbound (S Main Street)	NBL	190	C (21.2)	m79	D (37.4)	**m190**	D (53.5)	**m192**	**F (139.2)**	**#639**	**E (62.3)**	**#237**	**F (117.5)**	**#564**
	NBT	-	C (26.6)	158	D (44.0)	m306	C (31.9)	m235	**F (89.2)**	#651	C (32.9)	176	**F (84.1)**	#597
	NBR	330	B (10.7)	m30	C (24.8)	m214	B (15.0)	m87	C (33.6)	**549**	D (36.3)	40	D (47.8)	**348**
	NB Approach	-	C (20.7)	-	D (36.2)	-	C (30.8)	-	**F (81.5)**	-	D (40.5)	-	**F (81.3)**	-
Southbound (S Main Street)	SBL	190	C (24.3)	63	D (37.5)	**240**	D (46.1)	**#188**	**F (188.1)**	**#585**	C (34.4)	91	**F (146.9)**	**#578**
	SBT	-	C (33.5)	262	C (33.3)	334	D (44.4)	382	**F (139.5)**	#698	D (42.7)	348	**F (86.1)**	#570
	SBR	160	C (29.8)	0	C (32.8)	18	C (31.9)	0	**F (170.0)**	18	C (31.6)	0	B (16.1)	10
	SB Approach	-	C (31.5)	-	C (34.5)	-	D (43.9)	-	**F (155.1)**	-	D (40.1)	-	**F (94.1)**	-

Table 5-1 (continued): Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM		Future Build AM		Future Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 14: S Main Street and Pleasant Hill Road (Signalized)														
Overall Intersection		-	B (14.7)	-	B (15.0)	-	B (17.8)	-	B (18.6)	-	C (21.5)	-	C (20.4)	-
Eastbound (Pleasant Hill Road)	EBLT	-	E (59.8)	105	E (66.2)	m130	E (64.6)	160	E (69.1)	168	E (67.5)	240	E (76.7)	#225
	EBR	220	D (48.7)	8	E (59.1)	m0	D (53.1)	74	E (57.8)	49	D (48.5)	20	E (56.0)	0
	EB Approach	-	D (52.3)	-	E (62.5)	-	E (57.2)	-	E (62.4)	-	E (59.0)	-	E (67.8)	-
Westbound (Pleasant Hill Road)	WBLT	-	F (85.0)	22	E (75.6)	41	F (85.0)	22	E (75.6)	41	F (85.0)	22	E (75.6)	41
	WBR	-	N/A	-	E (66.7)	-	N/A	-	E (66.7)	-	N/A	-	E (66.7)	-
	WB Approach	-	F (85.0)	-	E (75.1)	-	F (85.0)	-	E (75.1)	-	F (85.0)	-	E (75.1)	-
Northbound (S Main Street)	NBL	190	A (3.5)	14	A (5.6)	m22	A (6.5)	m22	B (14.4)	m44	B (10.2)	m21	B (17.7)	m27
	NBTR	-	A (3.5)	67	A (1.9)	63	A (5.8)	155	A (2.5)	m103	A (8.4)	166	A (4.2)	m120
	NB Approach	-	A (3.5)	-	A (2.4)	-	A (5.8)	-	A (4.0)	-	A (8.5)	-	A (5.6)	-
Southbound (S Main Street)	SBL	140	A (6.6)	4	N/A	0	A (7.8)	4	N/A	0	A (9.6)	4	N/A	0
	SBTR	-	B (12.7)	164	B (18.3)	310	B (15.6)	254	C (23.4)	514	B (18.6)	274	C (24.6)	508
	SB Approach	-	B (12.7)	-	B (18.3)	-	B (15.6)	-	C (23.4)	-	B (18.6)	-	C (24.6)	-
Intersection 15: Pear Street and Erickson Avenue (Unsignalized)														
Eastbound (Erickson Avenue)	EBTR		See Intersection 6.				(-)	0	(-)	0	(-)	0	(-)	0
	EB Approach						(-)	-	(-)	-	(-)	-	(-)	-
Westbound (RCUT)	WBL	275					E (39.2)	38	F (53.1)	76	E (35.1)	19	D (31.8)	16
	WB Approach						E (39.2)	-	F (53.1)	-	E (35.1)	-	D (31.8)	-
Northbound (Pear Street)	NBR	-					F (65.7)	292	F (59.5)	259	C (20.9)	67	C (23.7)	83
	NB Approach						F (65.7)	-	F (59.5)	-	C (20.9)	-	C (23.7)	-
Intersection 17: Erickson Avenue and RCUT (Signalized)														
Overall Intersection		-	See Intersection 6.				A (8.6)	-	B (10.9)	-	A (9.4)	-	B (11.7)	-
Westbound (Erickson Avenue)	WBL						A (7.3)	119	A (9.0)	214	A (6.1)	98	A (7.7)	153
	WB Approach						A (7.3)	-	A (9.0)	-	A (6.1)	-	A (7.7)	-
Northbound (RCUT)	NBL	175					B (11.4)	108	B (17.5)	164	C (21.7)	76	C (30.4)	#147
	NB Approach						B (11.4)	-	B (17.5)	-	C (21.7)	-	C (30.4)	-
Intersection 19: Pear Street and Erickson Avenue (Unsignalized)														
Westbound (Erickson Avenue)	WBTR		See Intersection 6.				(-)	-	(-)	-	(-)	-	(-)	-
	WB Approach						(-)	-	(-)	-	(-)	-	(-)	-
Southbound (Pear Street)	SBR	-					B (14.6)	18	C (17.5)	18	B (14.3)	12	C (17.1)	12
	SB Approach						B (14.6)	-	C (17.5)	-	B (14.3)	-	C (17.1)	-

Table 5-1 (continued): Build AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM		Future No Build AM		Future No Build PM		Future Build AM		Future Build PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 20: Erickson Avenue and North-South Connector (Signalized)														
Overall Intersection		-	Does not exist in Existing Conditions.								C (20.1)	-	C (20.1)	-
Eastbound (Erickson Avenue)	EBL	150									A (8.5)	6	A (9.3)	7
	EBT	-									B (18.2)	317	C (21.4)	326
	EBR	150									B (12.0)	0	B (14.2)	0
	EB Approach	-									B (18.0)	-	C (21.1)	-
Westbound (Erickson Avenue)	WBL	150									B (11.5)	67	B (17.7)	137
	WBT	-									B (12.0)	226	B (13.5)	306
	WBR	150									A (8.7)	0	A (8.7)	0
	WB Approach	-									B (11.9)	-	B (14.2)	-
Northbound (N/S Connector)	NBL	150									C (31.8)	72	C (32.7)	60
	NBT	-									D (38.2)	121	D (37.1)	118
	NBR	-									C (34.0)	153	C (26.1)	93
	NB Approach	-									C (34.6)	-	C (30.2)	-
Southbound (N/S Connector)	SBL	150									C (30.5)	43	C (31.8)	39
	SBTR	-									D (35.8)	61	D (40.4)	132
	SB Approach	-									C (33.5)	-	D (38.6)	-
Intersection 21: Pear Street and East-West Connector (Unsignalized)														
Eastbound (Pear Street)	EBTR	-	Does not exist in Existing Conditions.								(-)	-	(-)	-
	EB Approach	-									(-)	-	(-)	-
Westbound (E/W Connector)	WBLT	-									A (7.9)	0	A (7.8)	0
	WB Approach	-									A (0.7)	-	A (0.3)	-
Northbound (Pear Street)	NBLR	-									B (11.3)	15	B (12.2)	22.5
	NB Approach	-									B (11.3)	-	B (12.2)	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal
(-) = Free movement
N/A = Zero volume; no delay reported

5.3.2 Build Traffic Analysis Results

The unsignalized intersection of Pear Street and Erickson Avenue was converted to an RCUT for all future conditions, based on funded transportation projects as described in **Section 2.2**. The RCUT is represented by unsignalized intersections 15 and 19 and signalized intersection 17 in the Synchro reports. Unsignalized intersection 15 (free-flowing eastbound Erickson Avenue, stop-controlled westbound Erickson Avenue, and stop-controlled northbound Pear Street) experienced a decrease in delay due to the addition of the new street connections in the Build conditions that resulted in different project trip paths. The westbound approach remained at LOS E during the AM peak hour and improved from LOS F to LOS D during the PM peak hour. The northbound approach improved from LOS F to LOS C during both peak hours. At unsignalized intersection 19 (free-flowing westbound Erickson Avenue and stop-controlled southbound Pear Street), all approaches continued to operate at LOS C or better. At signalized intersection 17 where the U-turn onto westbound Erickson Avenue is made, delay increased on the northbound approach during both peak hours, going from LOS B to LOS C. All approaches operated at LOS C or better.

The following unsignalized intersections experienced a slight decrease in delay from No Build to Build during both peak hours, but on the whole, operated similarly during both conditions:

- S High Street and Pear Street
- Pleasant Hill Road and Pear Street
- Pleasant Hill Road and Willow Hill Drive
- Pear Street and Russell Drive
- Pear Street and Cobblers Court
- Pear Street and Ruby Drive

At the unsignalized intersection of Pear Street and W Mosby Road, the delay experienced by the southbound approach decreased significantly, going from LOS D to LOS C during the PM peak hour. This can be attributed to the new connector road re-routing trips from this intersection. The unsignalized intersection of Pleasant Hill Road and Central Avenue experienced an increase in delay on the northbound and southbound approaches during both peak hours.

The unsignalized intersection of W Mosby Road and Mosby Court has a new southbound approach under the Build condition. The eastbound and westbound approaches operated similarly. During the PM peak hour, the northbound approach experienced an increase in delay, going from LOS C to LOS D.

The Build condition included the introduction of a new unsignalized intersection at Pear Street and the East-West Connector. The intersection operated at LOS B or better on all approaches during both peak hours.

At the signalized intersection of S High Street and Erickson Avenue, the overall intersection delay decreased by approximately one second from the No Build condition during both peak hours. The delay and 95th percentile queues for the southbound left-turn movement decreased very slightly. There was little change from No Build to Build given that this intersection is one of the key intersections for entering or exiting the study area. Even with Build improvements elsewhere in the

study area, all traffic desiring to exit the study area west on Erickson Avenue or south on S High Street must go through this intersection.

At the signalized intersection of S Main Street and W Mosby Road, overall intersection delay decreased so that the Build condition delay is nearly the same or better than as existing conditions, operating at LOS B during the AM peak hour and LOS C during the PM peak hour. The eastbound left-turn movement operation improved, with delay decreasing from LOS F to LOS D during the AM peak hour and from LOS F to LOS E during the PM peak hour. Additionally, the 95th percentile queue was within capacity during the AM peak hour but exceeded capacity in PM peak hour for the eastbound left-turn movement. The northbound left-turn movement experienced a significant decrease in delay, going from LOS F to LOS B during the AM peak hour and going from LOS E to LOS D during the PM peak hour. Additionally, the 95th percentile queues for this movement were within capacity during the AM peak hour but exceeded capacity in PM peak hour. During the PM peak hour, the southbound through-right movement delay decreased from LOS E to LOS C. These changes could be attributed to the re-routing of turning volumes to the new connector roads. The westbound approach experienced increased delay, going from LOS D to LOS E during both peak hours.

At the signalized intersection of S Main Street and Erickson Avenue, overall intersection delay increased by approximately 10 seconds (LOS D to LOS E) during the AM peak hour and decreased by approximately 16 seconds (LOS D to LOS F) during the PM peak hour. During the AM peak hour, the eastbound through movement experienced a significant increase in delay of approximately 51 seconds, remaining at LOS F. The westbound left-turn movements experienced a decrease in delay of approximately 35 seconds, remaining at LOS F. The westbound left-turn 95th percentile queue no longer exceeded capacity in the Build condition. The northbound approach experienced an increase in delay, going from LOS C to LOS D. During the PM peak hour, almost all movements and every approach still operated at LOS F, indicating the intersection is over-capacity. The eastbound approach delay increased, while the northbound approach delay stayed the same. The eastbound left-turn movement 95th percentile queue exceeded capacity. The westbound and southbound approaches both experienced decreased delay of approximately 45 seconds and 61 seconds, respectively. The westbound approach improved from LOS F to LOS E. Like the intersection of S High Street and Erickson Avenue, this is a primary intersection one for entering and exiting the study area and so the connector roads do not greatly help relieve this over-capacity intersection as most volumes still travel through it.

At the signalized intersection of S Main Street and Pleasant Hill Road, overall intersection delay increased slightly but remained similar to No Build conditions, going from LOS B to LOS C during both peak hours. This was an increase in overall intersection delay of 3.7 seconds during the AM peak hours and 1.8 seconds during the PM peak hour.

The Build condition included the introduction of a new signalized intersection at Erickson Avenue and the North-South Connector road. The overall intersection operated at LOS C during both the AM and PM peak hours. The northbound through and southbound through-right movements operated at LOS D during both peak hours. All other movements operated at LOS C or better during both peak hours. No queues exceeded capacity.

5.4 2045 BUILD CONDITIONS SUMMARY

The 2045 Build Conditions comprised the addition of new street connections to the No Build network. The RCUT experienced less delay than during the No Build conditions due to the re-routing of some study area trips to utilize the new street connections. At the unsignalized intersection of Pear Street and W Mosby Road, the delay decreased significantly as trips utilize the new street connections. The unsignalized intersection of W Mosby Road and Mosby Court continued to operate well, even with the addition of the new southbound approach of the North-South Connector. The new unsignalized intersection of Pear Street and East-West Connector operated well.

There is little change between the No Build and Build conditions at S Main Street and Erickson Avenue. S Main Street and W Mosby Road operations improved, as more trips utilized the new street connections instead of this intersection. The new signalized intersection at Erickson Avenue and North-South Connector operated well.

6 2045 Mitigation Conditions

The 2045 Mitigation scenario was developed to explore additional improvements needed to address the operations issues seen in the 2045 Build scenario. These issues include the movements operating at LOS F or experiencing significant queuing at the four signalized intersections, as well as unsignalized intersection movements that were operating at LOS F. The four key intersections that were found to have operational issues in the 2045 Build scenario were examined utilizing VDOT Junction Screening Tool (VJuST) to evaluate potential intersection improvements. A 2045 Mitigation street network was developed to incorporate these improvements and screened in Synchro to enable further refinement of signal timings, number of lanes per movement, and the need for turn lanes. These improvements were also refined with input from the City and the SAG, especially regarding how future development would contribute to and incorporate the improvements. Once refined, 2045 Mitigation concepts and cross-sections were developed to visualize the proposed network. Additional alternative mitigation concepts were tested for some locations. In addition, the mitigation scenario includes recommendations for pedestrian, bike, and transit improvements in the **2045 Multimodal Improvements** section. The following sections describe the process used to develop the mitigation network and recommendations.

6.1 VJuST SCREENING

The following intersections were screened using the VDOT Junction Screening Tool (VJuST) to evaluate innovative intersection configurations that could mitigate capacity issues and provide safety and pedestrian benefits:

- S High Street and Erickson Avenue
- S Main Street and W Mosby Road
- S Main Street and Erickson Avenue
- S Main Street and Pleasant Hill Road

VJuST provides a comparison of the volume-over-capacity (V/C) ratios, pedestrian benefit, and safety benefit of an innovative intersection when compared to a conventional intersection.

Existing land uses adjacent to S High Street and S Main Street present challenges to acquiring the additional right-of-way required for many of the innovative intersection alternatives. The following sections discuss the different alternatives considered for each of the four intersections.

6.1.1 S High Street and Erickson Avenue

The intersection of S High Street and Erickson Avenue faced operational challenges in the 2045 Build condition. The conventional signalized intersection was compared to the center-turn overpass, echelon, median U-turn, and partial median U-turn intersection geometries. All other innovative intersections were excluded due to lack of existing right-of-way or in the case of the Thru-Cut, the inability to accommodate the magnitude of the traffic volumes. The Thru-Cut was indicated by the VJuST tool to be unable to accommodate such high volumes on both the major and minor approaches. For an intersection with the need to process through volumes on all approaches, the Thru-Cut was not the right fit. **Table 6-1** summarizes the results of the VJuST analysis.

Table 6-1: VJuST Results at S High Street and Erickson Avenue

Type	Maximum V/C AM Peak Hour	Maximum V/C PM Peak Hour	Pedestrian Accommodation Compared to Conventional	Safety: Weighted Total Conflict Points
Conventional	0.77	0.87	N/A	48
Center-Turn Overpass	0.41	0.54	Better	32
Echelon	0.43	0.46	Better	28
Median U-Turn	0.67	0.84	Better	20
Partial Median U-Turn	0.77	0.89	Better	28

The center-turn overpass and echelon provide improved capacity as well as better pedestrian and vehicle safety. However, they are both very costly alternatives (based on the cost to add grade separation) and therefore were not explored further. The median U-turn or partial median U-turn would eliminate the two-way left-turn lane on S High Street for some distance, impacting access to businesses along S High Street. Additionally, it would add another restricted turning movement at an intersection adjacent to the funded RCUT planned for Erickson Avenue and Pear Street.

Considering these results, no new innovative intersection is recommended. Other improvements at this intersection are detailed in the **Mitigation Network** section.

6.1.2 S Main Street and W Mosby Road

At the intersection of S Main Street and W Mosby Road, the eastbound left-turn movement faces significant delay in the 2045 Build condition. The conventional signalized intersection was compared to the echelon, median U-turn, partial median U-turn, thru-cut, and roundabout intersection geometries. All other innovative intersections were excluded due to lack of existing right-of-way. **Table 6-2** summarizes the results of the VJuST analysis.

Table 6-2: VJuST Results at S Main Street and W Mosby Road

Type	Maximum V/C AM Peak Hour	Maximum V/C PM Peak Hour	Pedestrian Accommodation Compared to Conventional	Safety: Weighted Total Conflict Points
Conventional	0.77	0.88	N/A	48
Echelon	0.65	0.72	+	28
Median U-Turn	0.89	1.02	+	20
Partial Median U-Turn	0.74	0.84	+	28
Thru-Cut	0.75	0.86		28
Roundabout	0.71	0.92		8

The echelon provides the best operational improvement as well as pedestrian and safety benefits, but the cost is prohibitive. The partial median U-turn is the next best option, but the right-of-way is too narrow to add a median with sufficient width to store a vehicle and facilitate a U-turn. Adding a median would also block off access to many driveways that are currently utilizing the two-way left-turn

lane. The thru-cut does not provide significant operational improvements from the conventional intersection and would add new movement restrictions.

Considering these results, it was determined with the City that no mitigation intersection improvements are recommended. Signal timings are updated in the Mitigation analysis, and an alternative recommendation was evaluated in **Section 6.5.4**.

6.1.3 S Main Street and Erickson Avenue

The intersection of S Main Street and Erickson Avenue faces significant operational challenges in the 2045 Build condition. Most movements are operating close to capacity, leading to significant delay for some movements. The conventional intersection was compared to the center-turn overpass, echelon, partial median U-turn, quadrant roadway (QRI), and single loop intersection geometries. All other innovative intersections were excluded due to concerns with expanding the S Main Street width affecting existing business and the bridge on Stone Spring Road limiting options. The QRI includes new street connections that can be incorporated into future development, without requiring large expansion of the existing S Main Street pavement footprint. The improvements that involve U-turns require a much greater expansion of S Main Street's width to be able to accommodate storage and adequate turning radius for the U-turning vehicles. Any improvements requiring increased width on the minor streets are difficult given that Stone Spring Road is a bridge which constrains inexpensive widening. **Table 6-3** summarizes the results.

Table 6-3: VJuST Results at S Main Street and Erickson Avenue

Type	Maximum V/C AM Peak Hour	Maximum V/C PM Peak Hour	Pedestrian Accommodation Compared to Conventional	Safety: Weighted Total Conflict Points
Conventional	0.89	1.07	N/A	48
Center-Turn Overpass	0.57	0.69	Better	32
Echelon	0.50	0.63	Better	28
Partial Median U-Turn	0.87	0.95	Better	28
Quadrant Roadway	0.86	1.05	Similar	40
Single Loop	0.81	1.04	Worse	28

The grade-separated alternatives of a center-turn overpass and echelon operate within capacity but are very costly. A partial median U-turn has a high volume-to-capacity ratio during the PM peak hour and only provides minimal relief; there are also potential right-of-way constraints. The single loop is over-capacity during the PM peak hour and is worse for pedestrian mobility.

The QRI provides some operational benefit and improves safety. A 2020 VDOT Strategically Targeted Affordable Roadway Solutions (STARS) Program study had also recommended a QRI at this intersection. Further exploration of a QRI improvement at this intersection is detailed in the **Mitigation Network** section.

6.1.4 S Main Street and Pleasant Hill Road

The intersection of S Main Street and Pleasant Hill Road faces some operational challenges in the 2045 Build condition. The conventional intersection was compared to the echelon, median U-turn,

partial median U-turn, thru-cut, and roundabout intersection geometries. All other innovative intersections were excluded due to concerns that expanding the width of S Main Street would affect existing businesses. **Table 6-4** summarizes the results.

Table 6-4: VJuST Results at S Main Street and Pleasant Hill Road

Type	Maximum V/C AM Peak Hour	Maximum V/C PM Peak Hour	Pedestrian Accommodation Compared to Conventional	Safety: Weighted Total Conflict Points
Conventional	0.77	0.88	N/A	48
Echelon	0.65	0.72	Better	28
Thru-Cut	0.75	0.86	Same	28
Roundabout	0.71	0.92	Same	8

The echelon operates well but is expensive. A thru-cut would work well here given low minor-street through movement volumes but would not operate well with pedestrian phases are added. The roundabout operates worse than the conventional intersection during the PM peak hour and thus is not recommended.

As the intersection is operating within capacity with the conventional layout, it was determined with the City that no new innovative intersection is recommended at this intersection.

6.2 MITIGATION NETWORK

Incorporating the VJuST results, a mitigation network was developed based on the Build network to improve operation and safety. The mitigation network is comprised of several larger new street connections, as well as smaller lane geometry changes at several intersections.

6.2.1 Quadrant Roadway Intersection (QRI)

To improve operations at the intersection of S Main Street and Erickson Avenue, a partial QRI is proposed. The eastbound and westbound left-turns will be prohibited at the intersection and rerouted using the QRI to complete their turns. This rerouting utilizes the North-South Connector; a new right-in-right-out access point between the North-South Connector and S Main Street on Erickson Avenue; and a new signalized intersection on S Main Street between Erickson Avenue and Pleasant Hill Road. These new streets are visualized in **Figure 6-1**. A partial QRI was chosen instead of a full QRI (in which all left turns are prohibited at the main intersection) so that not all left-turning movements must reroute.

The cross-sections and lanes of the QRI Road are to be determined in conjunction with future development. Additionally, a shared-use path is proposed along the north side of Erickson Avenue as well as additional sidewalk on the south side. A detailed configuration of the QRI is visualized in the concept plan shown in **Figure 6-2**.

Figure 6-1: 2045 Mitigation Proposed Street Connections

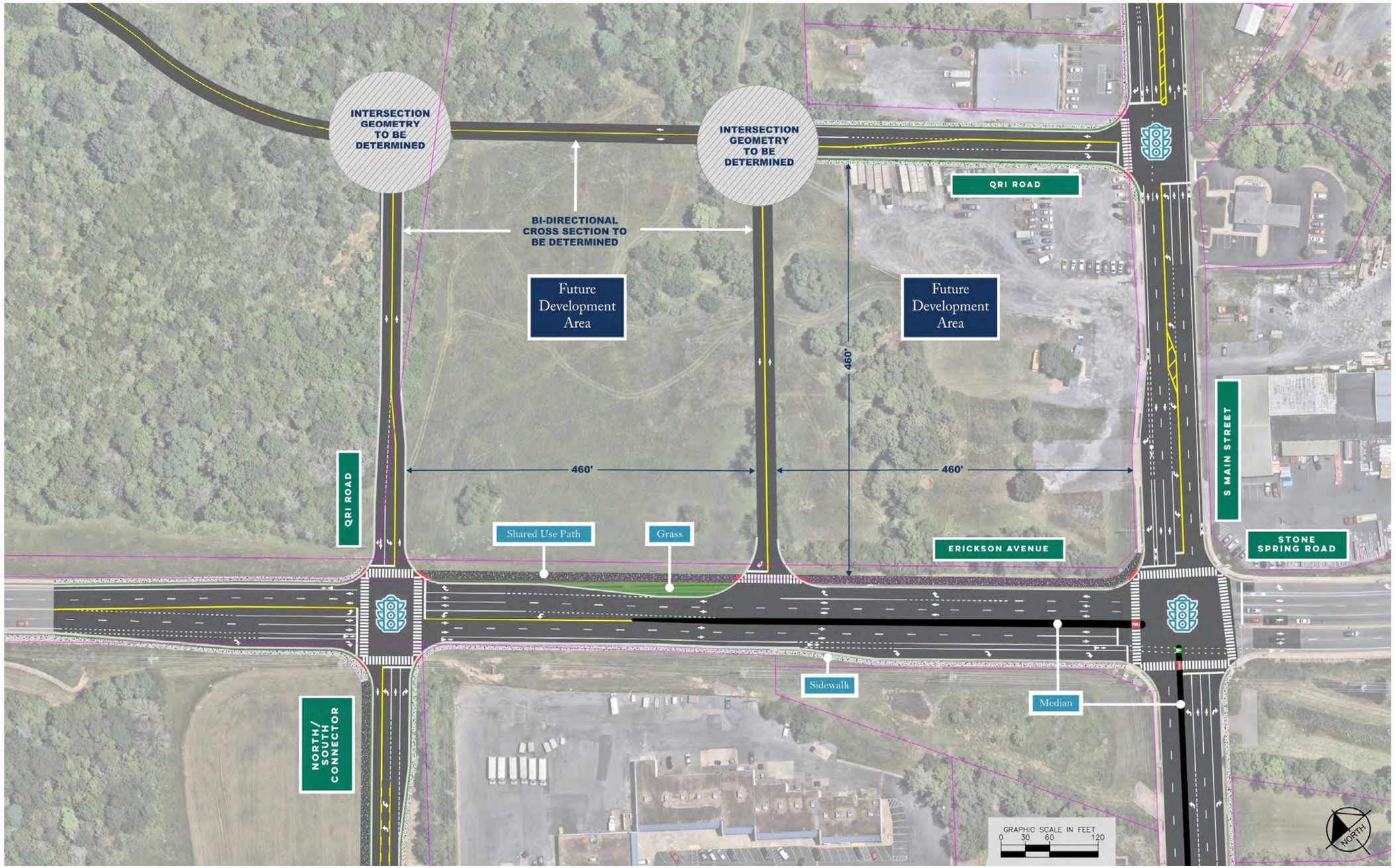

Figure 6-2: QRI Concept

6.2.2 S High Street and Erickson Avenue

At S High Street and Erickson Avenue, the bike lanes were removed on the north leg of S High Street, and the extra width was used to add a second southbound left-turn lane. This will help the southbound left-turn movement operate more efficiently by providing additional capacity. **Figure 6-3** visualizes how the lanes shift in cross-section. In Synchro, the southbound left-turn phasing was changed from Protected/Permissive for the single left-turn lane to Protected Only for the dual left-turn lanes. Signal timings were then optimized.

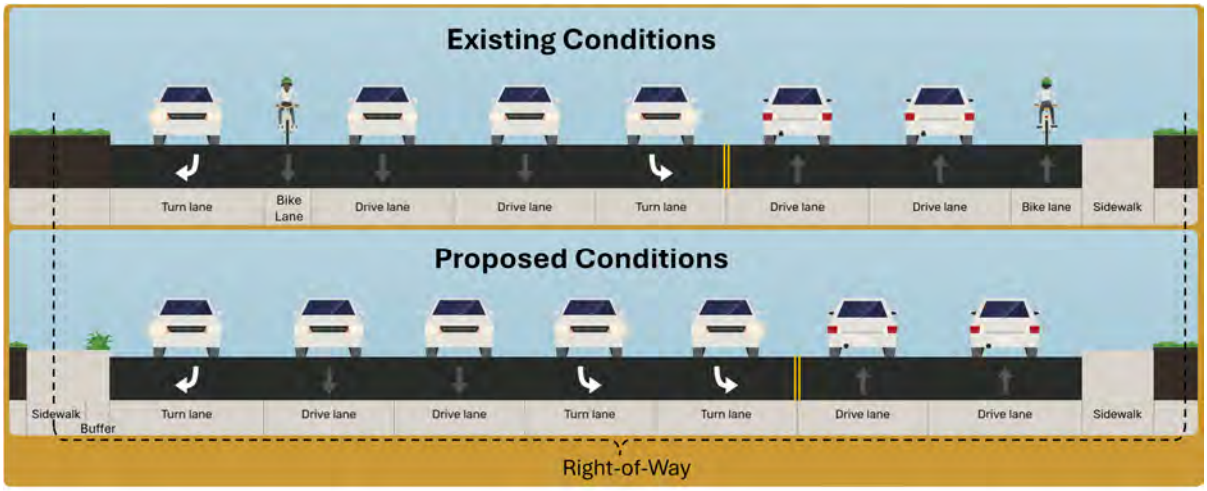

Figure 6-3: Cross-section looking north on S High Street at intersection with Erickson Avenue

6.3 MITIGATION TRAFFIC VOLUMES

The 2045 Build volumes were adjusted based on the changes in the Mitigation Network. The 2045 Background traffic was assumed to remain the same as in the Build conditions, except for the re-routing of eastbound and westbound left-turns at the QRI. Eastbound left turns now turn left at the intersection of the North-South Connector and Erickson Avenue, and then turn left at the QRI Road and S Main Street intersection. Westbound left turns travel through the Erickson Avenue and S Main Street intersection, turn right at the right-in-right-out access point on Erickson Avenue between the North-South Connector and S Main Street, turn right at the QRI Road and S Main Street, and travel southbound through the intersection of Erickson Avenue and S Main Street. The new route these left-turns take is visualized in **Figure 6-4**. The re-routed background trip eastbound and westbound left-turn volumes are visualized in **Figure 6-5**. The mitigation background trips are the sum of the 2045 Build background trips and the re-routed eastbound and westbound left-turn volumes from the QRI.

Future development trips were re-routed based on the new QRI Road. As a result, trips were re-routed through the QRI Road and S Main Street intersection to avoid the intersection of Erickson Avenue and S Main Street. Additionally, eastbound and westbound development trip left turns at the intersection of Erickson Avenue and S Main Street were re-routed to utilize the QRI. Future development trips for the 2045 Mitigation Conditions are visualized in **Figure 6-6** and **Figure 6-7**.

The 2045 Mitigation volumes are the sum of the 2045 Build background trips, the background trip re-routes at the QRI, and the mitigation development trips. The 2045 Mitigation volumes are visualized in **Figure 6-8** and **Figure 6-9.**

Figure 6-4: QRI routing for eastbound and westbound left turns at Erickson Avenue and S Main Street

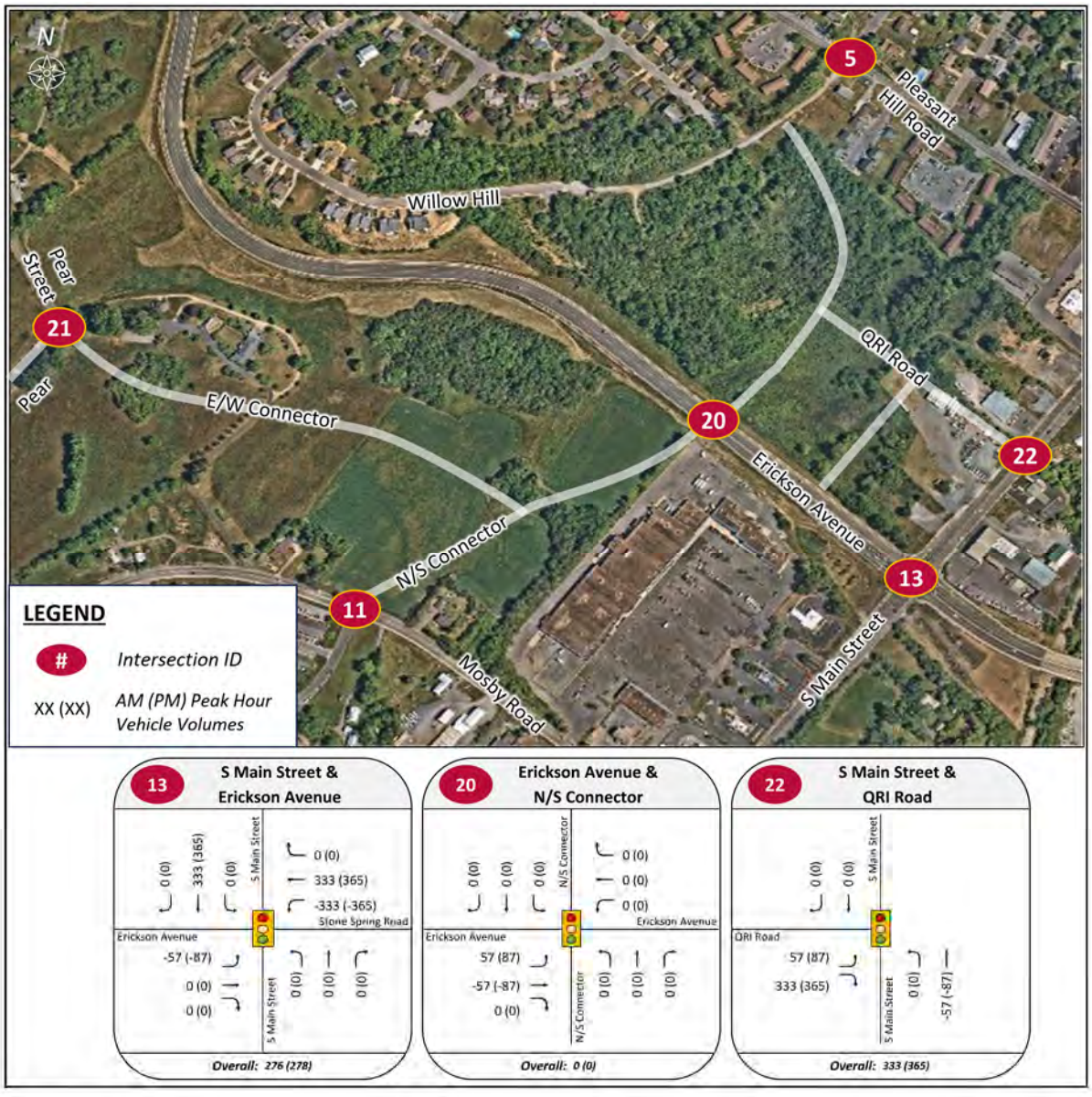

Figure 6-5: 2045 Mitigation Background Trips Re-Routing due to QRI

Figure 6-6: 2045 Mitigation – Development AM & PM Peak Hour Vehicle Trips (1 of 2)

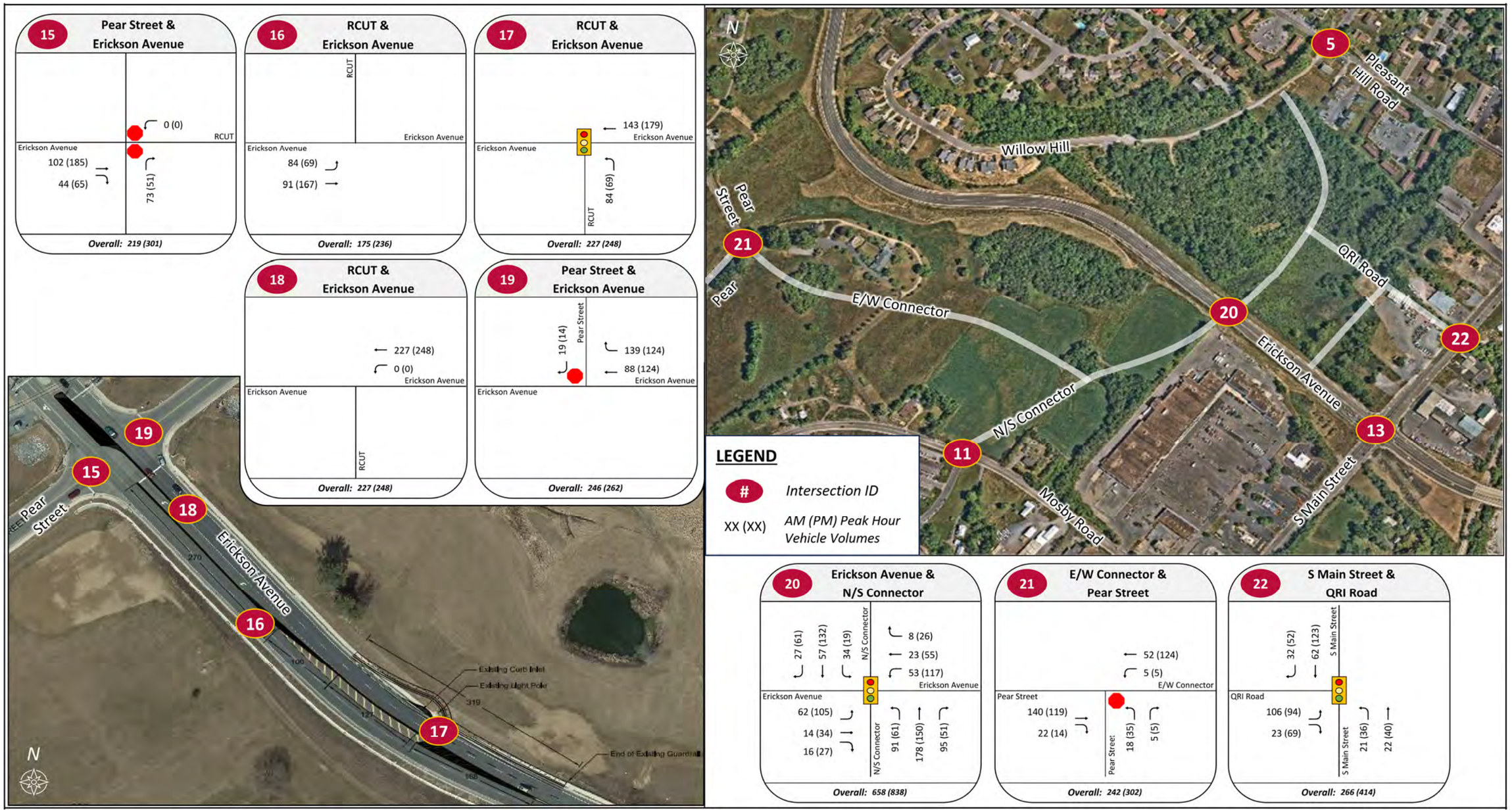

Figure 6-7: 2045 Mitigation – Development AM & PM Peak Hour Vehicle Trips (2 of 2)

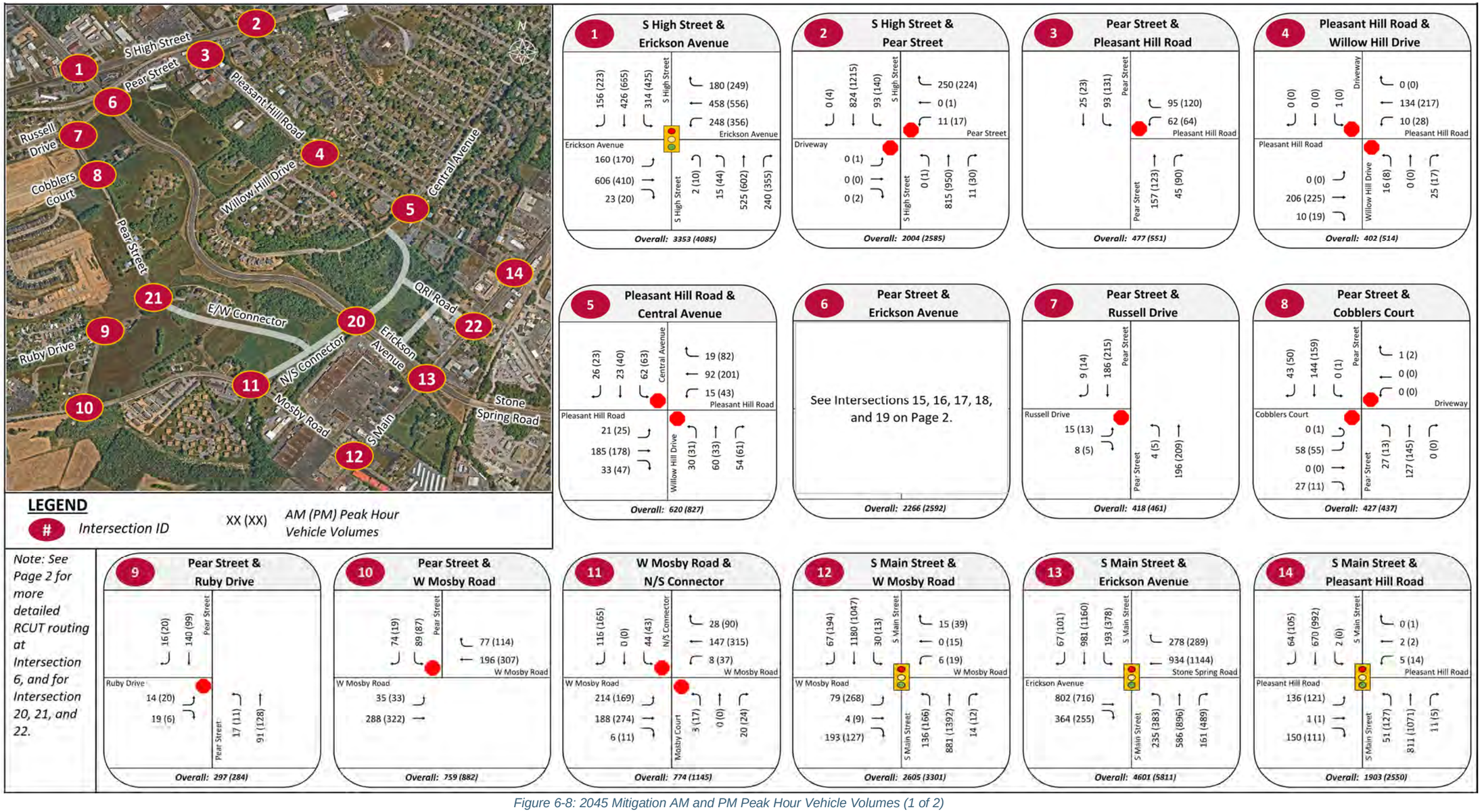

Figure 6-8: 2045 Mitigation AM and PM Peak Hour Vehicle Volumes (1 of 2)

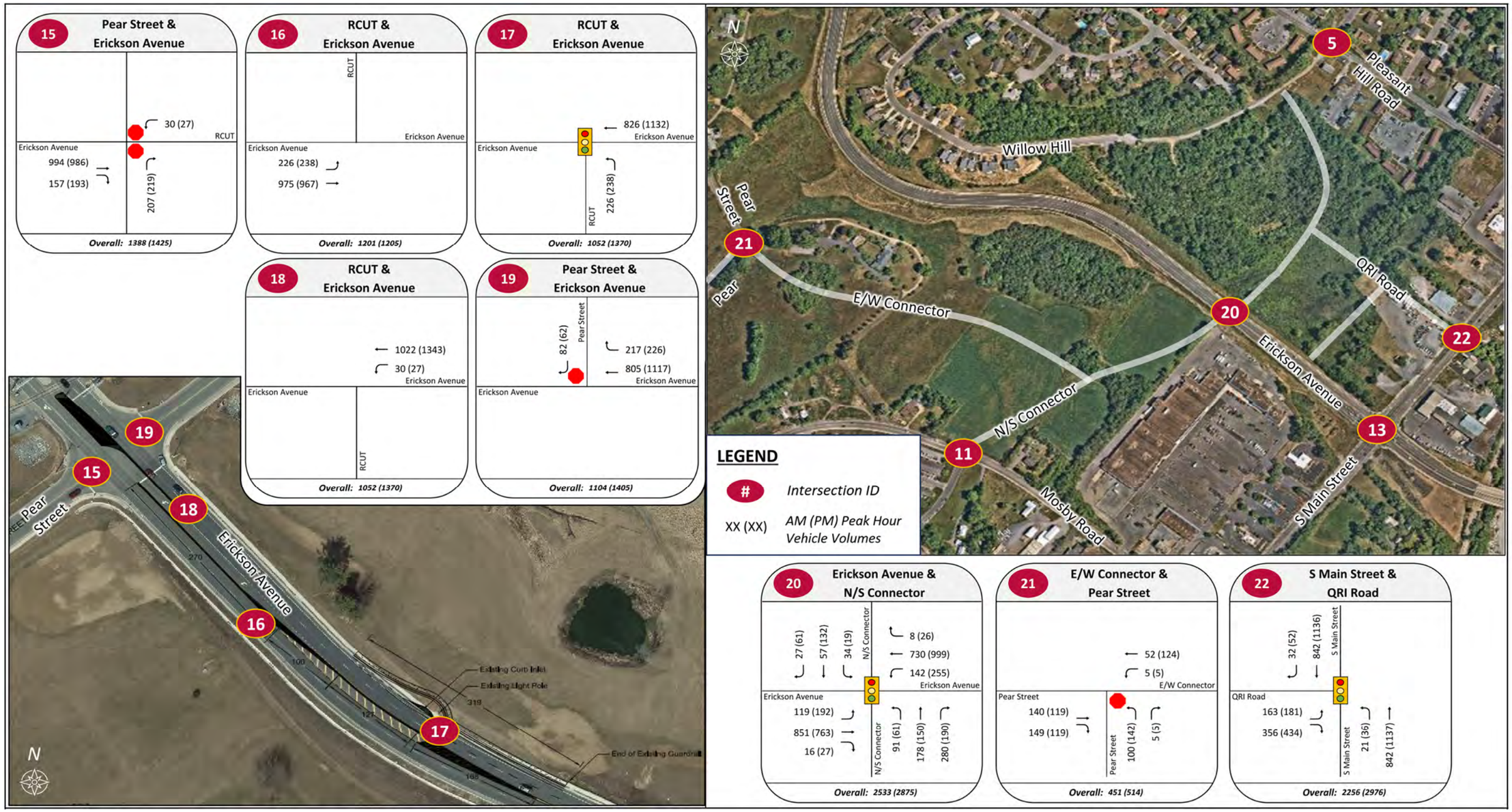

Figure 6-9: 2045 Mitigation AM and PM Peak Hour Vehicle Volumes (2 of 2)

6.4 2045 MITIGATION ANALYSIS

6.4.1 Measures of Effectiveness

The analysis of the 2045 Mitigation condition was based on the future Mitigation peak hour turning movement volumes. Signal timings were revised at signalized intersections to support the Mitigation volumes and revised intersection configurations. Cycle lengths were maintained but individual phase timings were adjusted.

Table 6-5 summarizes the findings from the MOEs only at intersections where changes were made from the Build condition or where trip route adjustments occurred. The MOEs include average vehicular delay, level of service (LOS), available storage, and 95th percentile queue length. Movements for which delay cannot be calculated are indicated with "(-)" in the table, and movements with zero volume are indicated by "N/A" in the table. LOS E is shown in orange text, and LOS F is shown in red text. Additionally, queues lengths that exceed the storage length are shown in red text.

Figure 6-10 compares the levels of service for all future scenarios. The overall intersection level of service is shown for the signalized intersections. The level of service for the movement operating the most poorly is shown for the unsignalized intersections.

Full Synchro HCM reports, documenting the detailed MOEs for AM and PM peak hour Mitigation conditions for all intersections, can be found in **Appendix C**.

Table 6-5: Mitigation AM and PM Peak Hour Results

Approach	Movement	Storage Length	Future No Build AM		Future No Build PM		Future Build AM		Future Build PM		Future Mitigation AM		Future Mitigation PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 1: S High Street and Erickson Avenue (Signalized)														
Overall Intersection		-	D (53.6)	-	E (58.8)	-	D (52.6)	-	E (57.6)	-	D (44.3)	-	D (44.6)	-
Eastbound (Erickson Avenue)	EBL	235	C (31.6)	#118	D (40.0)	#164	C (31.6)	#118	D (40.0)	#164	D (36.8)	#135	E (64.6)	#200
	EBTR	-	E (59.8)	#343	D (54.7)	#270	E (59.8)	#343	D (54.7)	#270	D (49.9)	#317	E (59.9)	#257
	EB Approach	-	D (54.1)	-	D (50.6)	-	D (54.1)	-	D (50.6)	-	D (47.2)	-	E (61.2)	-
Westbound (Erickson Avenue)	WBL	150	D (43.7)	#250	D (43.3)	304	D (43.7)	#250	D (43.3)	304	D (48.4)	#259	D (47.4)	#318
	WBTR	-	D (43.3)	#294	E (56.5)	#409	D (43.3)	#294	E (56.5)	#409	C (34.1)	254	D (48.2)	364
	WB Approach	-	D (43.4)	-	D (52.5)	-	D (43.4)	-	D (52.5)	-	D (38.1)	-	D (48.0)	-
Northbound (S High Street)	NBL	130	C (24.6)	21	C (26.9)	52	C (24.6)	21	C (26.9)	52	C (25.0)	21	C (25.9)	52
	NBT	-	E (62.0)	#292	E (56.2)	#326	E (62.0)	#292	E (56.2)	#326	E (55.7)	#292	D (47.4)	#351
	NBR	240	C (25.8)	96	C (26.3)	172	C (25.8)	96	C (26.3)	172	C (25.8)	98	C (23.2)	152
	NB Approach	-	D (50.1)	-	D (44.1)	-	D (50.1)	-	D (44.1)	-	D (45.9)	-	D (37.8)	-
Southbound (S High Street)	SBL	150 (390)[1]	F (135.4)	#378	F (172.5)	#581	F (126.9)	#368	F (163.3)	#568	E (77.8)	#200	D (54.4)	219
	SBT	-	C (31.4)	186	D (37.6)	310	C (31.4)	186	D (37.6)	310	C (32.0)	189	D (35.3)	306
	SBR	390	B (19.6)	35	C (22.1)	57	B (19.6)	35	C (22.1)	57	C (22.4)	39	C (23.1)	60
	SB Approach	-	E (66.2)	-	E (79.2)	-	E (62.7)	-	E (75.7)	-	D (46.4)	-	D (39.4)	-
Intersection 12: S Main Street and W Mosby Road (Signalized)														
Overall Intersection		-	E (62.3)	-	F (81.9)	-	B (18.8)	-	C (31.3)	-	B (17.8)	-	C (28.3)	-
Eastbound (W Mosby Road)	EBL	160	F (292.6)	#753	F (272.5)	#924	D (54.3)	107	E (65.1)	325	D (54.6)	107	E (64.5)	#343
	EBTR	-	D (42.4)	116	D (38.6)	60	D (49.1)	119	D (40.4)	61	D (47.7)	116	D (39.0)	60
	EB Approach	-	F (217.0)	-	F (225.0)	-	D (50.6)	-	E (56.7)	-	D (49.7)	-	E (55.9)	-
Westbound (W Mosby Road)	WBLTR	-	D (39.6)	0	D (38.8)	70	E (61.1)	0	E (67.9)	99	E (61.1)	0	E (73.3)	#120
	WB Approach	-	D (39.6)	-	D (38.8)	-	E (61.1)	-	E (67.9)	-	E (61.1)	-	E (73.3)	-
Northbound (S Main Street)	NBL	150	F (94.1)	#198	E (79.7)	#242	B (19.8)	#79	D (42.8)	#203	C (22.5)	#90	D (50.9)	#216
	NBTR	-	B (19.3)	341	C (30.4)	731	B (15.8)	354	C (27.7)	721	B (17.5)	378	C (30.4)	755
	NB Approach	-	C (28.7)	-	D (35.2)	-	B (16.3)	-	C (29.3)	-	B (18.2)	-	C (32.6)	-
Southbound (S Main Street)	SBL	190	B (14.8)	m9	D (43.1)	14	B (11.7)	m10	C (31.9)	m3	A (8.7)	m8	B (16.8)	m3
	SBTR	-	C (21.3)	m449	E (71.8)	#984	B (13.2)	m372	C (23.4)	m323	A (10.0)	164	B (11.3)	m126
	SB Approach	-	C (21.1)	-	E (71.5)	-	B (13.2)	-	C (23.5)	-	A (10.0)	-	B (11.4)	-

Table 6-5 (continued): Mitigation AM and PM Peak Hour Results

Approach	Movement	Storage Length	Future No Build AM		Future No Build PM		Future Build AM		Future Build PM		Future Mitigation AM		Future Mitigation PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 13: S Main Street and Erickson Avenue/Stone Spring Road (Signalized)														
Overall Intersection		-	D (54.5)	-	**F (108.6)**	-	**E (64.7)**	-	**F (92.4)**	-	C (30.9)	-	D (45.9)	-
Eastbound (Erickson Avenue)	EBL	350	D (37.0)	150	**F (96.6)**	#310	C (34.8)	141	**F (129.6)**	**#352**	Movement removed for QRI.			
	EBT	-	**F (100.7)**	#380	**F (104.6)**	#411	**F (151.8)**	#581	**F (165.4)**	#574	D (48.4)	394	**E (69.6)**	#475
	EBR	300	D (42.5)	135	C (34.7)	69	D (36.7)	125	C (32.5)	69	C (28.2)	209	C (25.2)	145
	EB Approach	-	**E (70.4)**	-	**F (85.0)**	-	**F (105.9)**	-	**F (130.2)**	-	D (42.1)	-	**E (58.0)**	-
Westbound (Stone Spring Road)	WBL	500	**F (146.3)**	**#632**	**F (251.4)**	**#876**	**F (111.1)**	#476	**F (139.3)**	**#584**	Movement removed for QRI.			
	WBT	-	D (37.0)	234	D (42.8)	322	D (38.7)	290	**E (56.2)**	447	D (41.2)	289	**E (78.0)**	#510
	WBR	200	C (27.2)	88	C (25.2)	99	C (28.4)	85	C (27.5)	89	C (30.0)	130	C (27.8)	165
	WB Approach	-	**E (75.0)**	-	**F (117.5)**	-	**E (57.0)**	-	**E (72.9)**	-	D (38.6)	-	**E (67.9)**	-
Northbound (S Main Street)	NBL	190	D (53.5)	**m192**	**F (139.2)**	**#639**	**E (62.3)**	**#237**	**F (117.5)**	**#564**	D (39.9)	**#269**	D (54.2)	**#522**
	NBT	-	C (31.9)	m235	**F (89.2)**	#651	C (32.9)	176	**F (84.1)**	#597	B (12.1)	83	C (22.6)	397
	NBR	330	B (15.0)	m87	C (33.6)	**549**	D (36.3)	40	D (47.8)	**348**	A (4.1)	3	C (24.2)	480
	NB Approach	-	C (30.8)	-	**F (81.5)**	-	D (40.5)	-	**F (81.3)**	-	B (17.5)	-	C (29.9)	-
Southbound (S Main Street)	SBL	190	D (46.1)	**#188**	**F (188.1)**	**#585**	C (34.4)	91	**F (146.9)**	**#578**	B (12.7)	m79	D (37.0)	279
	SBT	-	D (44.4)	382	**F (139.5)**	#698	D (42.7)	348	**F (86.1)**	#570	C (26.9)	272	D (37.8)	#590
	SBR	160	C (31.9)	0	**F (170.0)**	18	C (31.6)	0	B (16.1)	10	A (4.9)	m0	C (21.2)	m17
	SB Approach	-	D (43.9)	-	**F (155.1)**	-	D (40.1)	-	**F (94.1)**	-	C (23.5)	-	D (36.6)	-
Intersection 20: Erickson Avenue and North-South Connector (Signalized)														
Overall Intersection		-	Does not exist in No Build Condition.				C (20.1)	-	C (20.1)	-	C (21.4)	-	C (22.9)	-
Eastbound (Erickson Avenue)	EBL	150					A (8.5)	6	A (9.3)	7	B (11.1)	54	B (16.5)	99
	EBT	-					B (18.2)	317	C (21.4)	326	C (20.6)	273	C (21.1)	258
	EBR	150					B (12.0)	0	B (14.2)	0	B (14.3)	0	B (15.4)	0
	EB Approach	-					B (18.0)	-	C (21.1)	-	B (19.4)	-	B (20.0)	-
Westbound (Erickson Avenue)	WBL	150					B (11.5)	67	B (17.7)	137	B (12.3)	62	B (14.5)	98
	WBT	-					B (12.0)	226	B (13.5)	306	B (17.7)	225	C (21.7)	315
	WBR	150					A (8.7)	0	A (8.7)	0	B (12.8)	0	B (13.8)	0
	WB Approach	-					B (11.9)	-	B (14.2)	-	B (16.8)	-	C (20.1)	-
Northbound (N/S Connector)	NBL	150					C (31.8)	72	C (32.7)	60	C (28.5)	76	C (30.8)	61
	NBT	-					D (38.2)	121	D (37.1)	118	D (37.4)	#189	C (34.6)	#171
	NBR	-					C (34.0)	153	C (26.1)	93	C (25.8)	101	C (22.6)	50
	NB Approach	-					C (34.6)	-	C (30.2)	-	C (30.0)	-	C (28.3)	-
Southbound (N/S Connector)	SBL	150					C (30.5)	43	C (31.8)	39	C (27.3)	36	C (29.3)	27
	SBTR	-					D (35.8)	61	D (40.4)	132	C (34.4)	79	D (44.3)	#223
	SB Approach	-					C (33.5)	-	D (38.6)	-	C (32.4)	-	D (42.9)	-

Table 6-5 (continued): Mitigation AM and PM Peak Hour Results

Approach	Movement	Storage Length	Future No Build AM		Future No Build PM		Future Build AM		Future Build PM		Future Mitigation AM		Future Mitigation PM	
			LOS	95th %	LOS	95th %	LOS	95th %	LOS	95th %	LOS	95th %	LOS	95th %
Intersection 22: S Main Street and QRI Road (Signalized)														
Overall Intersection		-	Does not exist in No Build Condition.				Does not exist in Build Condition.				B (18.3)	-	B (19.0)	-
Eastbound (QRI Road)	EBL	270									**E (61.8)**	212	**E (62.6)**	235
	EBR	-									D (54.7)	317	D (49.6)	414
	EB Approach	-									**E (57.0)**	-	D (53.5)	-
Northbound (S Main Street)	NBL	250									A (5.7)	m10	B (12.1)	m10
	NBT	-									A (4.7)	134	A (4.4)	120
	NB Approach	-									A (4.7)	-	A (4.6)	-
Southbound (S Main Street)	SBT	-									A (9.1)	84	B (16.1)	548
	SBR	300									A (1.7)	1	A (1.1)	m1
	SB Approach	-									A (8.9)	-	B (15.4)	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal
(-) = Free movement
N/A = Zero volume; no delay reported
[1] = Storage length increased during Future Build Mitigation

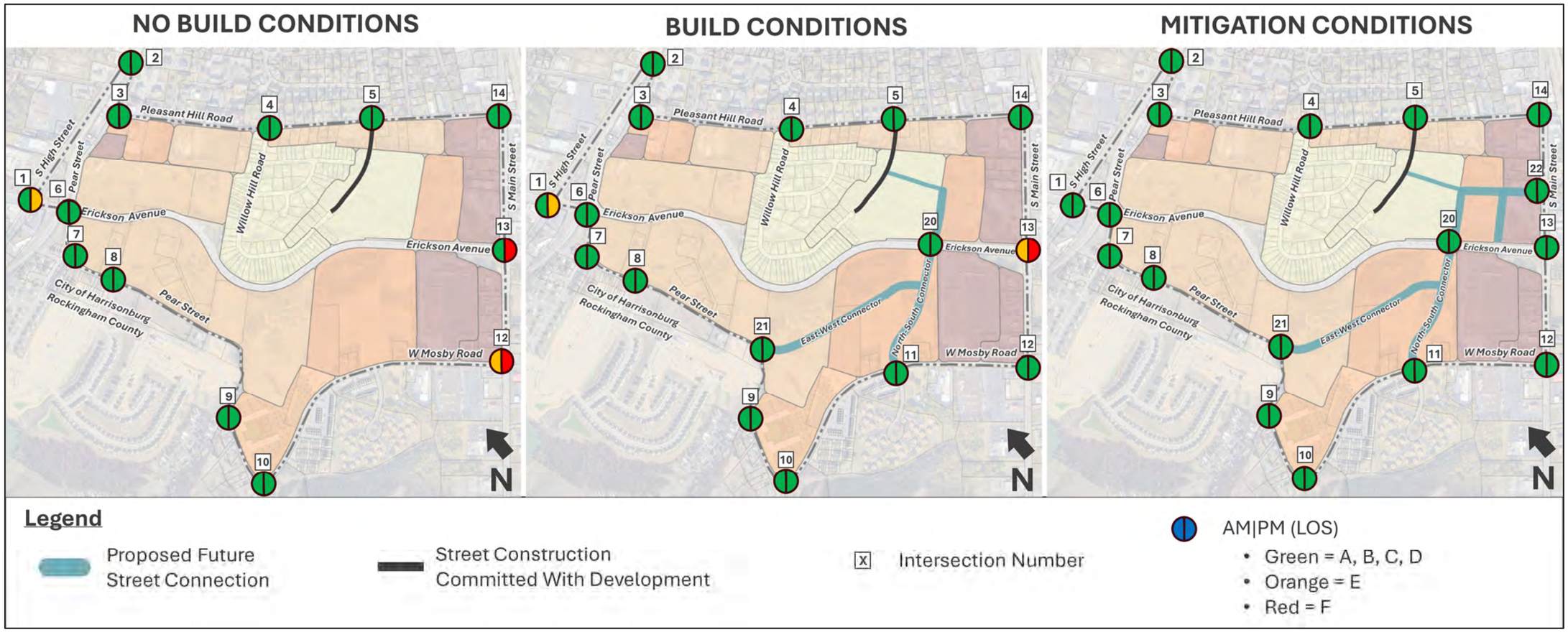

Figure 6-10: Level of Service Comparison for Future Scenarios

6.4.2 Mitigation Traffic Analysis Results

At the signalized intersection of S High Street and Erickson Avenue, a second southbound left-turn lane was added, and the southbound left-turn phasing was changed from Protected/Permissive to Protected Only. The overall intersection delay improved by approximately 8 seconds during the AM peak hour and by approximately 13 seconds during the PM peak hour. The delay and 95th percentile queues for the southbound left-turn movement both improved with the addition of the second southbound left-turn lane. During the AM peak hour, the delay improved from LOS F to LOS E and during the PM peak hour went from LOS F to LOS D. The 95th queues were within capacity. Other movements also improved with almost all operating at LOS D or better during both peak hours. The northbound through movement operated at LOS E during the AM peak hour, which was still a decrease in delay of approximately 6 seconds from the Build condition. The eastbound approach operated at LOS E during the PM peak hour, an increase in delay of approximately 11 seconds.

At the signalized intersection of S Main Street and W Mosby Road, no mitigation improvement was implemented but volumes did shift with the mitigation trip adjustment. The overall intersection delay decreased slightly but was similar to the Build condition. The southbound approach went from LOS C to LOS B during the PM peak hour, a decrease in delay of approximately 12 seconds. The other movements operated similarly to the Build condition during both peak hours, except for the westbound approach, which experienced an increase in delay of approximately 5 seconds during the PM peak hour.

At the signalized intersection of S Main Street and Erickson Avenue, the QRI was implemented. Overall intersection delay decreased by approximately 34 seconds (LOS E to LOS C) during the AM peak hour and decreased by approximately 47 seconds (LOS F to LOS D) during the PM peak hour. The eastbound and westbound left-turn movements were re-routed to the QRI under Mitigation conditions. The eastbound and westbound approaches went from LOS F during both peak hours to LOS D during the AM peak hour and LOS E during the PM peak hour. During the PM peak hour, the westbound through movement experienced increased delay of approximately 22 seconds. The northbound and southbound movements operated at LOS D or better during both peak hours. During the PM peak hour, the southbound left-turn movement 95th percentile queue exceeded existing capacity.

The mitigation condition introduced a new signalized intersection as part of the QRI, at S Main Street and the QRI Road. The northbound and southbound approaches operated at LOS B or better during both peak hours. The eastbound approach operated at LOS E during the AM peak hour and at LOS D during the PM peak hour.

At the signalized intersection at Erickson Avenue and the North-South Connector road, the overall intersection operated similarly to the Build condition. All movements operated at LOS D or better during both peak hours.

6.5 2045 MITIGATION ADDITIONAL ALTERNATIVE RECOMMENDATIONS

Several additional alternatives were examined in addition to the 2045 Mitigation scenario and can be implemented as needed. These improvements are not included in the Mitigation recommendations as they are not essential for operation of the 2045 Mitigation condition. Instead, they can be implemented as the City has funding and if a need is shown, such as safety concerns at the W Mosby Road and North-South Connector intersection or significant delay at S High Street and Pear Street. A roundabout is a potential intersection safety improvement at the intersection of W Mosby Road and the North-South Connector. Additionally, westbound left turns could be restricted at Pear Street and S High Street to improve delay. Finally, a second southbound left-turn lane could be added at the intersection of Erickson Avenue and S Main Street and the southbound right-turn lane converted to a shared through-right lane.

6.5.1 Roundabout at W Mosby Road and North-South Connector

The 2045 Mitigation results do not dictate the need for a mitigation improvement at the intersection of W Mosby Road and North-South Connector given it operates well with stop-control. However, the installation of a roundabout could provide safety benefits by reducing conflicts at this intersection where horizontal curvature of the roadway may present site distance challenges. A conventional intersection has 32 conflict points, while a roundabout has 8 conflict points.

The feasibility of installing a roundabout at the intersection of W Mosby Road and the North-South Connector was evaluated using Sidra. Sidra-based roundabout analysis results are summarized in **Table 6-6** and **Table 6-7**. The roundabout was assumed to permit the passage of a WB-62 vehicle between the east, west, and north legs and a WB-40 to and from the south leg. It was assumed to be a single-lane roundabout with single lane approaches, an 18-foot circulating width, 120-foot inscribed diameter, 84-foot island diameter, 65-foot entry radius, 30-degree entry angle, and a 1.1 Environmental factor per TOSAM. The detailed Synchro HCM report and Sidra report can be found in **Appendix C**.

Table 6-6: Mitigation versus Roundabout AM Peak Hour Results

Approach	Movement	Storage Length	Future Mitigation AM		Roundabout AM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 11: W Mosby Road and Mosby Court (Unsignalized)						
Eastbound (W Mosby Road)	EBL	-	A (8.1)	15	-	-
	EBTR	-	(-)	-	-	-
	EB Approach	-	A (4.2)	-	A (6.7)	66
Westbound (W Mosby Road)	WBL	170	A (7.9)	0	-	-
	WBTR	-	(-)	0	-	-
	WB Approach	-	A (0.3)	0	A (5.8)	29.5
Northbound (Mosby Court)	NBLTR	-	B (11.6)	3	-	-
	NB Approach	-	B (11.6)	-	A (6.1)	5.5
Southbound (N/S Connector)	SBLTR	-	C (15.6)	35	-	-
	SB Approach	-	C (15.6)	-	A (4.9)	22.9

Table 6-7: Mitigation versus Roundabout PM Peak Hour Results

Approach	Movement	Storage Length	Future Mitigation PM		Roundabout PM	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 11: W Mosby Road and Mosby Court (Unsignalized)						
Eastbound (W Mosby Road)	EBL	-	A (8.8)	15	-	-
	EBTR	-	(-)	-	-	-
	EB Approach	-	A (3.3)	-	A (7.8)	83.9
Westbound (W Mosby Road)	WBL	170	A (8.0)	0	-	-
	WBTR	-	(-)	0	-	-
	WB Approach	-	A (0.7)	0	A (9.1)	88.3
Northbound (Mosby Court)	NBLTR	-	D (30.5)	23	-	-
	NB Approach	-	D (30.5)	-	A (5.6)	8.6
Southbound (N/S Connector)	SBLTR	-	D (28.7)	98	-	-
	SB Approach	-	D (28.7)	-	A (7.3)	42.4

During both peak hours, the roundabout would slightly increase delay on the eastbound and westbound approaches but would decrease delay on the northbound and southbound approaches when compared to the Mitigation scenario. The roundabout operated at LOS A on all approaches during both peak hours. Due to the safety benefits, a roundabout is the City's preferred alternative for the intersection of W Mosby Road and the North-South Connector.

A concept plan was prepared and is attached in **Appendix D**. A cost estimate is provided in **Section 6.7** that includes the roundabout as an alternative.

6.5.2 Restrict Westbound Left-Turns at S High Street and Pear Street

The westbound left-turn movement contributed greatly to the delay experienced on the westbound approach of Pear Street and S High Street. While operation during the mitigation was sufficient for a stop-controlled approach and did not dictate an improvement, the restriction of westbound left turns was evaluated as a potential solution should issues arise in the future. The restriction of westbound left turns at the intersection of S High Street and Pear Street was evaluated using Synchro 11. These left-turns were not re-distributed within the study network, given the very low volume (zero vehicles during the AM peak hour and one vehicle during the PM peak hour). The results are shown in **Table 6-8** and **Table 6-9**. The detailed Synchro HCM report can be found in **Appendix C**.

The westbound approach operated slightly better during the AM hour, experiencing a decrease in delay of approximately 3 seconds. During the PM peak hour, the westbound approach operated much better, going from LOS F to LOS C. Additionally, the 95th percentile queue decreases from 278 feet to 75 feet.

Based upon this analysis, restricting the westbound left-turn movement would be a viable solution to improve the operation of the westbound approach, should the need arise.

Table 6-8: Mitigation versus Westbound Left Turn Restriction AM Peak Hour Results

Approach	Movement	Storage Length	Future Mitigation AM		Future Mitigation PM No WBL	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 2: S High Street and Pear Street (Unsignalized)						
Eastbound (Driveway)	EBLTR	-	N/A	-	N/A	-
	EB Approach	-	N/A	-	N/A	-
Westbound (Pear Street)	WBLTR	-	C (20.3)	83		
	WBTR	s			C (17.5)	68
	WB Approach	-	C (20.3)	-	C (17.5)	-
Northbound (S High Street)	NBL	-	N/A	-	N/A	-
	NBTR	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-
Southbound (S High Street)	SBL	90	B (10.6)	12.5	B (10.6)	12.5
	SBTR	-	(-)	-	(-)	-
	SB Approach	-	A (1.1)	-	A (1.1)	-

Table 6-9: Mitigation versus Westbound Left Turn Restriction PM Peak Hour Results

Approach	Movement	Storage Length	Future Mitigation PM		Future Mitigation PM No WBL	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 2: S High Street and Pear Street (Unsignalized)						
Eastbound (Driveway)	EBLTR	-	**F (111.2)**	8	**F (111.2)**	8
	EB Approach	-	**F (111.2)**	-	**F (111.2)**	-
Westbound (Pear Street)	WBLTR	-	**F (127.7)**	278		
	WBTR	150			C (21.5)	75
	WB Approach	-	**F (127.7)**	-	C (21.5)	-
Northbound (S High Street)	NBL	-	B (11.6)	0	B (11.6)	0
	NBTR	-	(-)	-	(-)	-
	NB Approach	-	(-)	-	(-)	-
Southbound (S High Street)	SBL	90	B (11.9)	20	B (11.9)	20
	SBTR		(-)	-	(-)	-
	SB Approach	-	A (1.2)	-	A (1.2)	-

6.5.3 Dual Southbound Left-Turn Lanes at S Main Street and Erickson Avenue

The addition of a second southbound left-turn lane was evaluated at the intersection of S Main Street and Erickson Avenue. This addition was tested to see if it would improve the operation of the southbound left-turn movement, southbound approach overall, and the northbound approach.

The addition of a second southbound left-turn lane was evaluated in Synchro 11. To facilitate this addition without requiring more right-of-way, the southbound right-turn lane was converted to a shared through-right lane. The southbound left-turn phasing was changed from Protected/Permissive for the single left-turn lane to Protected Only for the dual left-turn lanes. Signal timings were then optimized. The results of the Synchro analysis are shown in **Table 6-10** and **Table 6-11**.

The overall intersection delay increased during both peak hours. During the AM peak hour, the westbound and eastbound approaches operated similarly to with one southbound left-turn lane. The northbound approach went from LOS B to LOS C, while the southbound approach went from LOS C to LOS D. The southbound left-turn movement went from LOS B to LOS E. During the PM peak hour, the eastbound, westbound, and northbound approaches operated similarly to with one southbound left-turn lane. However, the southbound left-turn movement experienced an increased delay of approximately 41 seconds. The southbound left movement 95th percentile queue decreased slightly, while the southbound through movement 95th percentile queue increased.

On the whole, the intersection operated better with one southbound left-turn lane. While the dual southbound left-turns provide additional capacity, the need to change from Protected/Permissive to Protected Only phasing for that movement constrains the benefit. The single southbound left-turn lane provides a better balance in delay across all movements, especially during the PM peak hour. Additionally, the single southbound left-turn lane is existing and thus does not cost anything to implement.

Table 6-10: Single versus Dual Southbound Left-Turn Lane AM Peak Hour Results

Approach	Movement	Storage Length	Future Mitigation AM One SBL turn lane		Future Mitigation AM Dual SBL turn lanes	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 13: S Main Street and Erickson Avenue/Stone Spring Road (Signalized)						
Overall Intersection		-	C (30.9)	-	D (35.8)	-
Eastbound (Erickson Avenue)	EBT	-	D (48.4)	394	D (52.1)	418
	EBR	300	C (28.2)	209	C (28.6)	225
	EB Approach	-	D (42.1)	-	D (44.7)	-
Westbound (Stone Spring Road)	WBT	-	D (41.2)	289	D (42.9)	307
	WBR	200	C (30.0)	130	C (29.4)	148
	WB Approach	-	D (38.6)	-	D (39.8)	-
Northbound (S Main Street)	NBL	190	D (39.9)	**#269**	D (44.1)	**#275**
	NBT	-	B (12.1)	83	B (14.6)	224
	NBR	330	A (4.1)	3	A (9.1)	53
	NB Approach	-	B (17.5)	-	C (20.8)	-
Southbound (S Main Street)	SBL	190	B (12.7)	m79	**E (71.5)**	m131
	SBTR	-			C (28.7)	247
	SBT	-	C (26.9)	272	Shared SBTR lane for this scenario.	
	SBR	160	A (4.9)	m0		
	SB Approach	-	C (23.5)	-	D (35.4)	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal

Table 6-11: Single versus Dual Southbound Left-Turn Lane AM Peak Hour Results

Approach	Movement	Storage Length	Future Mitigation PM One SBL turn lane		Future Mitigation PM Dual SBL turn lanes	
			LOS (Delay)	95th % Queue (ft)	LOS (Delay)	95th % Queue (ft)
Intersection 13: S Main Street and Erickson Avenue/Stone Spring Road (Signalized)						
Overall Intersection		-	D (45.9)	-	D (49.4)	-
Eastbound (Erickson Avenue)	EBT	-	**E (69.6)**	#475	**E (69.6)**	#475
	EBR	300	C (25.2)	145	C (27.2)	152
	EB Approach	-	**E (58.0)**	-	**E (58.5)**	-
Westbound (Stone Spring Road)	WBT	-	**E (78.0)**	#510	**E (78.0)**	#510
	WBR	200	C (27.8)	165	C (32.6)	192
	WB Approach	-	**E (67.9)**	-	**E (68.9)**	-
Northbound (S Main Street)	NBL	190	D (54.2)	**#522**	**E (77.9)**	**#541**
	NBT	-	C (22.6)	397	B (16.0)	233
	NBR	330	C (24.2)	480	B (15.5)	242
	NB Approach	-	C (29.9)	-	C (29.3)	-
Southbound (S Main Street)	SBL	190	D (37.0)	**279**	**E (78.0)**	**250**
	SBTR	-			D (39.9)	#746
	SBT		D (37.8)	#590	Shared SBTR lane for this scenario.	
	SBR	160	C (21.2)	m17		
	SB Approach	-	D (36.6)	-	D (48.7)	-

# = 95th percentile volume exceeds capacity, queue may be longer
m = Volume for 95th percentile queue is metered by upstream signal

6.5.4 S Main Street and W Mosby Road

In order to improve the eastbound left-turn movement operation at the intersection of S Main Street and W Mosby Road, the 2020 VDOT STARS study had recommended dual eastbound left-turn lanes. However, a new development approved after 2020 on the northwest corner of the intersection has limited the available space for this improvement and made it infeasible. As an alternative, re-striping of the eastbound approach was explored. This re-striping changed the eastbound approach from a left-turn only to a left-through lane, changed the outside lane from a through-right to right-turn only lane, and updated the signal timings to split phase. These changes did not result in any improvement in operation at this intersection. Additionally, the re-routing of trips during the Mitigation conditions to utilize the new North-South Connector improved operation of the eastbound left-turn movement without any improvement being made at the intersection.

6.5.5 S Main Street and Pleasant Hill Road

As determined with the City and SAG, capacity challenges were deemed not significant at this intersection and thus no mitigations were considered.

6.6 2045 MULTIMODAL IMPROVEMENTS

There are many multimodal improvements recommended as part of the Mitigation conditions as developed with the City and SAG. Improvements are listed below by intersection or corridor. A visualization of all mitigation Bike and Pedestrian improvements can be found in **Figure 6-12.** Regarding transit, future routes and stops will be evaluated with Harrisonburg Department of Public Transportation as development occurs and transit demands evolve.

The future improvements include:

- S High Street and Erickson Avenue
  - Sidewalk is proposed on the northwest side of S High Street. See **Figure 6-3**.
- Erickson Avenue
  - Addition of sidewalk on south side of Erickson Avenue. See **Figure 6-2**.
  - Addition of shared use path on north side of Erickson Avenue between S Main Street and North-South Connector. See **Figure 6-2**.
- Pleasant Hill Road
  - Addition of sidewalk on both sides of road and shared bike lane pavement markings. See **Figure 6-11**.

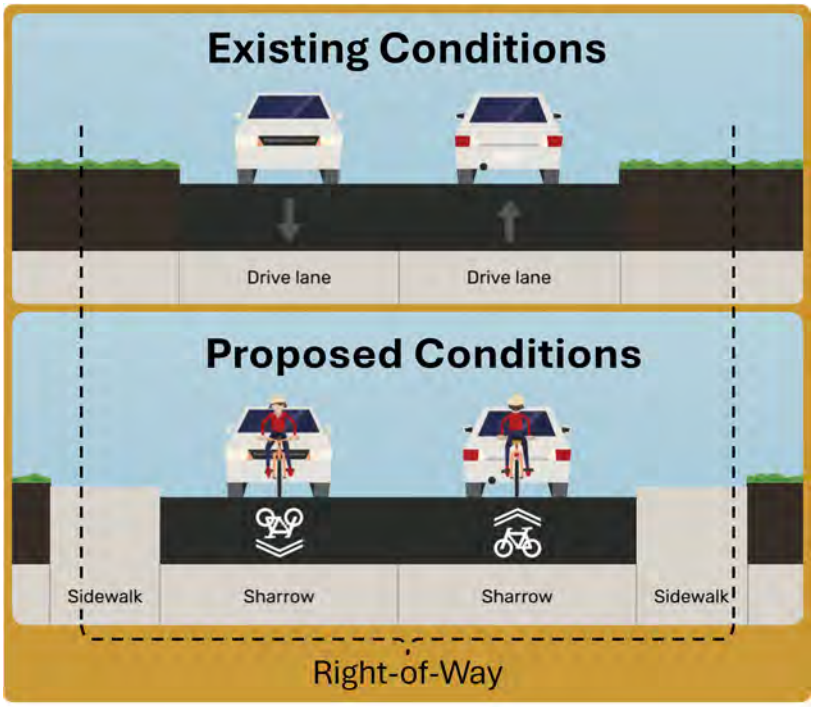

Figure 6-11: Cross-section on Pleasant Hill Road

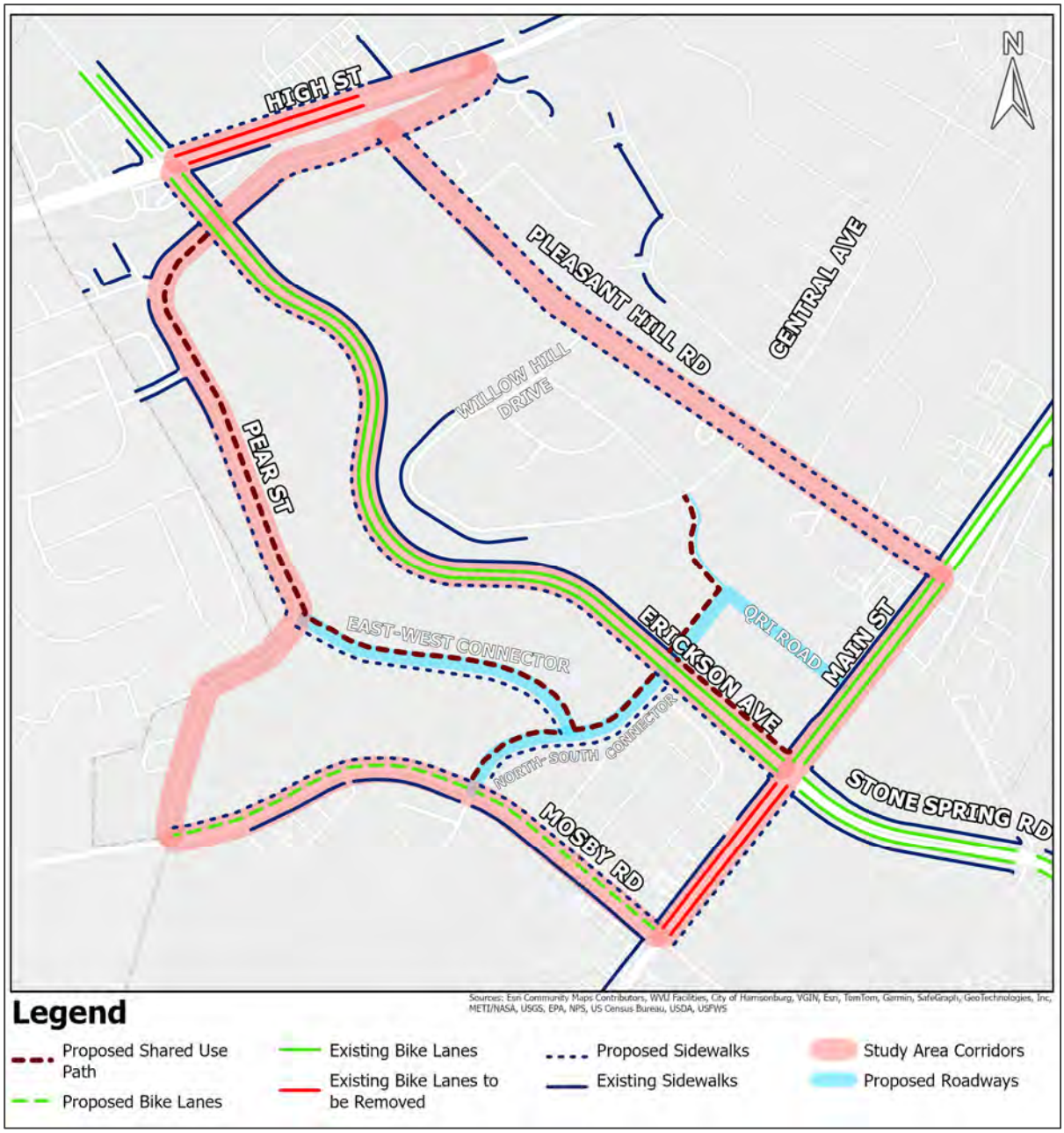

Figure 6-12: 2045 Future Bike and Pedestrian Network

- East-West Connector & North-South Connector
    - Shared use path on one side, sidewalk on the other. See **Figure 6-13**.

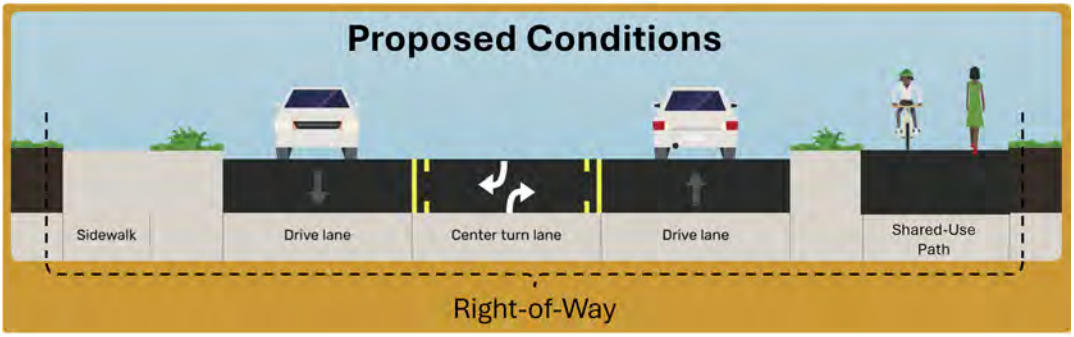

Figure 6-13: Cross-section of Connector streets

- W Mosby Road
    - Sidewalk on the north side of and addition of a bike lane on the uphill portion (westbound) of W Mosby Road. See **Figure 6-14**.

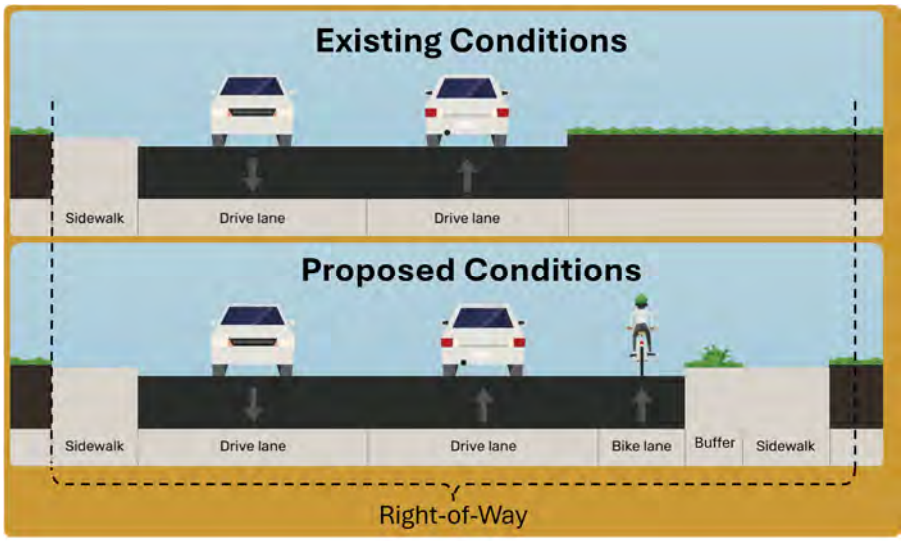

Figure 6-14: Cross-section of W Mosby Road, looking west

- Pear Street between Erickson and the East-West Connector
    - Shared use path on the north side and sidewalk on the south side of Pear Street. See **Figure 6-15**.

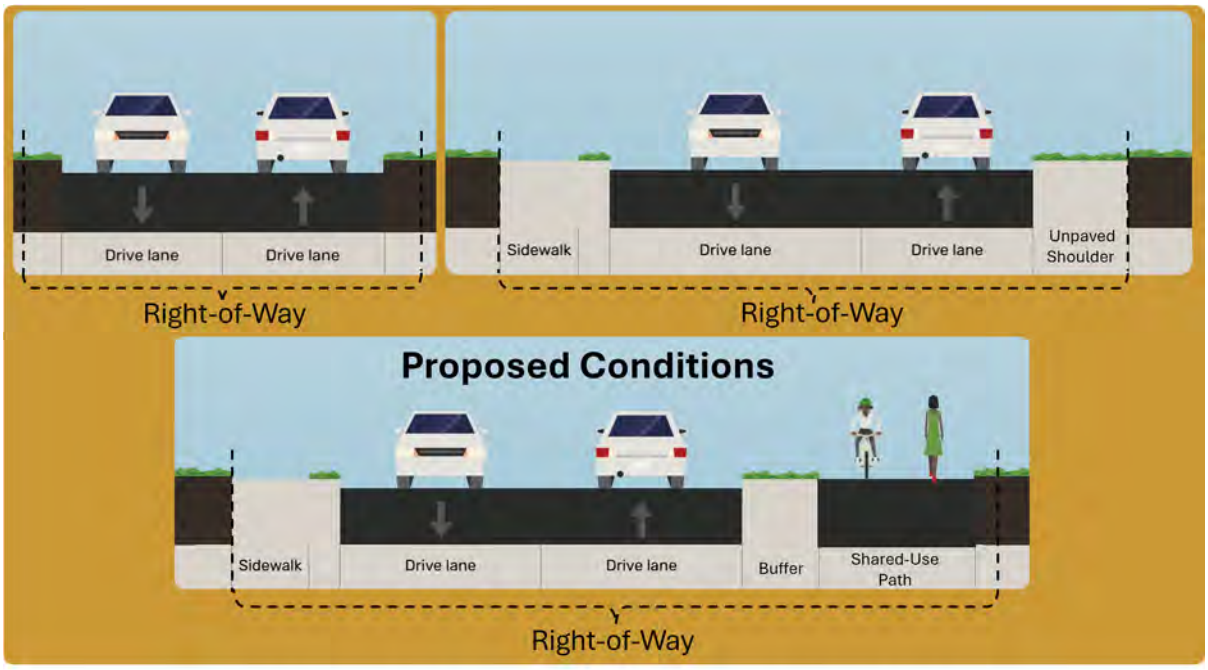

Figure 6-15: Cross-section of Pear Street, looking west

- QRI Road:
  - Multimodal improvements are to be determined in conjunction with future development. A shared use path could be added to connect Erickson Avenue to the extension of Willow Hill Drive.
- Other Streets within Study Area
  - Other existing streets within the study area would benefit from having sidewalk added on at least one side of the street.
  - All new public streets in the study area would be required to construct sidewalk on both sides of the street.

6.7 HIGH-LEVEL COST ESTIMATES

A high-level cost estimate was prepared for the North-South Connector road. It includes the cost of the street between W Mosby Road and Erickson Avenue, and a new signal and turn lane widening at Erickson Avenue. There are two alternatives for the intersection of the proposed connection with W Mosby Road:

- A stop-controlled southbound approach to the existing unsignalized intersection
- A roundabout at W Mosby Road and Mosby Court

The high-level cost estimate tables and concepts for the new street connection can be found in **Appendix D**.

The roundabout was assumed to permit the passage of a WB-62 vehicle between the east, west, and north legs and a WB-40 vehicle to and from the south leg. The roundabout is assumed to be a single-lane roundabout with single lane approaches, an 18-foot circulating width, 120-foot inscribed diameter, 84-foot island diameter, 65-foot entry radius, and 30-degree entry angle. The roundabout concept is preliminary and for the purposes of cost estimation. Further engineering design is necessary to determine actual right-of-way impacts, stormwater, grading, and other elements of the roundabout.

The stop-controlled southbound approach alternative includes the asphalt and pavement markings to add one approach to the unsignalized intersection.

The alignment was estimated based on topographic lines and used to estimate cut and fill. The alignment is not definitive and was generated solely for cost estimation purposes. Further engineering evaluation must be completed to determine the exact alignment. The intersection with Erickson Avenue is assumed to be signalized.

The high-level cost of the new street with a stop-controlled intersection with W Mosby Road is $11,200,000 (in 2025 dollars). The high-level cost of the new street with a roundabout at W Mosby Road is $18,610,000 (in 2025 dollars).

Assumptions for the high-level costs are as follows:

- Costs are given in 2025 dollars. The total construction cost was inflated 3% year over year to 2033.
- 15% contingency was added for erosion and sediment control and stormwater management.
- One-half acre of ROW purchase was assumed for a stormwater management pond.
- 50% contingency was added for unidentified risk.
- 20% contingency was added for construction engineering and inspection.
- 15% contingency was added for preliminary engineering.
- No VDOT oversight or administration costs are included.
- Full depth pavement includes the length of the new alignment, turn lanes at the new signalized intersection, and the roundabout pavement. Mill and overlay is assumed at the new signalized intersection for areas of existing pavement.
- The new signalized intersection was designed as part of the larger QRI concept, thus the area included in these cost estimates is marked on the concept plans.

6.8 2045 MITIGATION CONDITIONS SUMMARY

The 2045 Mitigation Conditions built on the 2045 Build conditions, with improvements implemented at key locations operating at LOS F in the 2045 Build conditions. The southbound left-turn movement at the intersection of S High Street and Erickson improved operation with the addition of a second left-turn lane. The introduction of a QRI at S Main Street and Erickson Avenue improved operations at that intersection.

Several additional alternatives were provided should the need arise in the future for additional safety improvements or delay reduction. A roundabout at W Mosby Road and North-South Connector would reduce conflict points compared to a conventional unsignalized intersection. The westbound left-turn movement at S High Street and Pear Street could be restricted to reduce delay on the westbound approach. A second southbound left-turn lane could be added at S Main Street and Erickson Avenue should the need arise. Changes at S Main Street and W Mosby Road were tested but did not offer any benefit; instead, the re-routing of volumes to utilize the new street connections helped improve this intersection. Lastly, S Main Street and Pleasant Hill Road operated well and so no improvement was recommended at that intersection.

Multimodal improvement recommendations were provided for future sidewalk and bike lanes. High-level cost estimates were prepared for the North-South Connector and the intersections at each end of the new street.

7 Conclusion

This study provides a conservative estimate of the transportation needs the Erickson Avenue study area will have if relatively dense potential development were to occur. The study began with an evaluation of existing conditions, which examined traffic volumes, multimodal facilities, access management, a crash analysis, intersection sight distance, and traffic operations. Next, relatively dense potential development was determined for each developable parcel, and future development trips were generated. Regional background growth was also determined and applied to existing traffic volumes.

The future conditions examined No Build, Build, and Mitigation scenarios to understand peak hour traffic operations. All scenarios included future development trips which were generated based on the studied land uses and accounted for background regional growth in traffic volumes. The No Build scenario included future development but uses the existing street network. The Build scenario incorporated new North-South and East-West Connector streets to relieve the network intersections. The Mitigation scenario sought to address any operational issues identified in the Build scenario. Intersection improvements were evaluated using VJuST, which resulted in the addition of a QRI at S Main Street and Erickson Avenue and the addition of a second southbound left-turn lane at S High Street and Erickson Avenue. The Mitigation scenario also included alternative recommendations should additional improvements become necessary and multimodal improvement recommendations for the future study area network.

While the entire Mitigation scenario represents the preferred alternative for this area study, there are multiple potential standalone projects that would have specific benefits and address unique needs in the study area. The following descriptions summarize the benefits and challenges of the most impactful potential projects.

North-South Connector Road

In addition to serving potential development in this section of the study area, the North-South Connector was shown to provide notable improvement to operations at the intersection of S Main Street and W Mosby Road. The alternative improvements at this intersection, described in **Section 6.5.4**, were determined to be either very impactful to property/business or of limited benefit. The North-South Connector is the preferred alternative to address operational concerns, including delay and queuing, at the S Main Street and W Mosby Road intersection.

East-West Connector Road

In addition to serving adjacent potential development, the East-West Connector was shown to significantly decrease delay at the intersection of Pear Street and W Mosby Road. This decrease in delay can be attributed to residential trips originating along Pear Street using the East-West Connector to reach the North-South Connector instead of passing through the intersection of Pear Street and W Mosby Road. While alternative improvements to reduce delay at the intersection could be considered, creation of a connected network of streets is recommended by this study.

S Main Street and Erickson Avenue QRI

This study evaluated multiple alternatives and identified the QRI as the preferred alternative to address capacity and operational challenges at the intersection of S Main Street and Erickson

Avenue. The 2020 VDOT STARS study also identified a QRI as the preferred alternative at this intersection. Should the QRI be pursued, additional evaluation of anticipated trip growth would be valuable to ensure that the QRI continues to operate effectively. In this study, the QRI is only evaluated during the Mitigation Scenario, in which there are new roadways present (notably, the North-South Connector) with the associated diversion of certain trips. If trip growth meets or exceeds the relatively high volume studied, the QRI may not operate effectively in the absence of the North-South Connector.