



Roadway Reconfiguration Study City of Harrisonburg

Harrisonburg Roadway Reconfiguration Study: Burgess Road, Neff Avenue, and University Boulevard

Final Report

June 2025

Prepared for



Prepared by



Table of Contents

| | |
|---|----|
| Study Context..... | 1 |
| Introduction..... | 1 |
| Study Area..... | 1 |
| Data Collection..... | 5 |
| Field Review..... | 5 |
| Corridor Characteristics..... | 5 |
| Traffic Data..... | 6 |
| Future Traffic Forecasting..... | 6 |
| Crash Summary..... | 13 |
| Potential for Safety Improvement (PSI) and Pedestrian Bicycle Safety Action Plan (PBSAP)..... | 16 |
| Roadway Reconfiguration Alternatives..... | 17 |
| Roadway Reconfiguration Feasibility..... | 17 |
| Relevant Guidelines, Standards and Assumptions..... | 17 |
| Traffic Operations Analysis..... | 18 |
| Existing 2024 Traffic Operations Analysis Results..... | 18 |
| 2040 No Build Traffic Operations Analysis..... | 21 |
| Alternatives Analysis..... | 27 |
| Preferred Alternative..... | 32 |
| Burgess Road..... | 32 |
| University Boulevard..... | 35 |
| Neff Avenue..... | 39 |
| Cost Estimates..... | 44 |

List of Figures

| | |
|--|----|
| Figure 1: Study Corridors..... | 1 |
| Figure 2: Burgess Road Corridor..... | 2 |
| Figure 3: University Boulevard Corridor..... | 3 |
| Figure 4: Neff Avenue Corridor..... | 4 |
| Figure 5: Burgess Road Existing 2024 Peak Hour Traffic Volumes..... | 7 |
| Figure 6: University Boulevard Existing 2024 Peak Hour Traffic Volumes..... | 8 |
| Figure 7: Neff Avenue Existing 2024 Peak Hour Traffic Volumes..... | 9 |
| Figure 8: Burgess Road 2040 Peak Hour Traffic Volumes..... | 10 |
| Figure 9: University Boulevard 2040 Peak Hour Traffic Volumes..... | 11 |
| Figure 10: Neff Avenue 2040 Peak Hour Traffic Volumes..... | 12 |
| Figure 11: Burgess Road Crashes..... | 13 |
| Figure 12: Burgess Road Crashes by Type..... | 13 |
| Figure 13: University Boulevard Crashes..... | 14 |
| Figure 14: University Boulevard Crashes by Type..... | 14 |
| Figure 15: Neff Avenue Crashes..... | 15 |
| Figure 16: Neff Avenue Crashes by Type..... | 15 |
| Figure 17: Potential for Safety Improvement (PSI) Locations (2019-2023)..... | 16 |
| Figure 18: PBSAP 4.0 Locations..... | 16 |
| Figure 19: Evelyn Byrd Avenue Roadway Reconfiguration 60% Plans..... | 22 |
| Figure 20: University Boulevard Roadway Reconfiguration Plans Reservoir Street to Medical Ave..... | 23 |
| Figure 21: University Boulevard Roadway Reconfiguration Plans east of Medical Avenue..... | 25 |
| Figure 22: Burgess Road Roadway Reconfiguration Concept..... | 33 |
| Figure 23: Burgess Road Roadway Reconfiguration Concept with Left Turn Lane..... | 34 |
| Figure 24: University Boulevard Roadway Reconfiguration Concept..... | 36 |
| Figure 25: Neff Avenue Roadway Reconfiguration Concept..... | 40 |

List of Tables

| | |
|---|----|
| Table 1: Burgess Road Corridor Characteristics | 5 |
| Table 2: University Boulevard Corridor Characteristics | 5 |
| Table 3: Neff Avenue Corridor Characteristics..... | 5 |
| Table 4: Corridor Peak Hours..... | 6 |
| Table 5: Burgess Road Crashes by Severity..... | 13 |
| Table 6: Burgess Road Crashes by Type..... | 13 |
| Table 7: University Boulevard Crashes by Severity..... | 14 |
| Table 8: University Boulevard Crashes by Type..... | 14 |
| Table 9: Neff Avenue Crashes by Severity..... | 15 |
| Table 10: Neff Avenue Crashes by Type | 15 |
| Table 11: ADT Road Diet Feasibility Guidelines | 17 |
| Table 12: Study Corridor 2024 and 2040 ADT..... | 17 |
| Table 13: Burgess Road 2024 Existing Traffic Operations Analysis Results..... | 18 |
| Table 14: University Boulevard 2024 Existing Traffic Operations Analysis Results | 19 |
| Table 15: Neff Avenue 2024 Existing Traffic Operations Analysis Results..... | 20 |
| Table 16: Burgess Road 2040 No Build Traffic Operations Analysis Results..... | 21 |
| Table 17: University Boulevard 2040 No Build Traffic Operations Analysis Results | 24 |
| Table 18: Neff Avenue 2040 No Build Traffic Operations Analysis Results..... | 26 |
| Table 19: Burgess Road 2040 Single Southbound Through Lane Traffic Operations Analysis Results | 27 |
| Table 20: University Boulevard and Carrier Drive 2040 Modified Lane Configuration Traffic Operations Analysis Results | 28 |
| Table 21: University Blvd 2040 Modified Lane Configuration Traffic Operations Analysis Results..... | 29 |
| Table 22: Neff Avenue 2040 Modified Lane Configuration Traffic Operations Analysis Results..... | 31 |
| Table 23: Roadway Reconfiguration Cost Estimates..... | 44 |

Appendices

| | |
|------------|---|
| Appendix A | Traffic Counts |
| Appendix B | Reservoir Street Median Project Details |
| Appendix C | 2024 Existing Synchro and SimTraffic Analysis Results |
| Appendix D | 2040 No Build Synchro and SimTraffic Analysis Results |
| Appendix E | 2040 Build Synchro and Sim Traffic Analysis Results |
| Appendix F | Cost Estimates |

Figure 2: Burgess Road Corridor

While the study's purpose is to identify potential bicycle and pedestrian improvements along the corridors, due to the significant traffic volumes on these corridors, the focus of the analysis was on the improvements' impact on vehicular traffic operations.

Within each corridor select intersections were analyzed in detail and are shown in Figures 2-4.

The study intersections for Burgess Road between Evelyn Byrd Avenue and the Harrisonburg Crossing entrance include:

1. Burgess Road and Evelyn Byrd Avenue
2. Burgess Road and Harrisonburg Crossing Entrance
3. Burgess Road and Clover Leaf Plaza Entrance



Figure 3: University Boulevard Corridor

The study intersections for University Boulevard between Carrier Drive and Medical Avenue include:

- 1. University Boulevard and Carrier Drive
- 2. University Boulevard and E Campus Drive
- 3. University Boulevard and Reservoir Street
- 4. University Boulevard and Medical Avenue



Figure 4: Neff Avenue Corridor

The study intersections for Neff Avenue between Reservoir Street and Turner Ashby Lane include:

1. Neff Avenue and Reservoir Street
2. Neff Avenue and Warwick Drive (Costco entrance)
3. Neff Avenue and Sunchase Drive
4. Neff Avenue and Putter Court
5. Neff Avenue and Turner Ashby Lane/Thomas Bowers Circle



Data Collection

All three corridors consist of two travel lanes in each direction with turn lanes at many intersections. (Westbound on University Boulevard between Carrier Drive and Campus Drive one of the travel lanes is designated as a right turn lane.) Given multiple through lanes, there is an opportunity to repurpose the space to provide bicycle lanes.

Neff Avenue currently provides bicycle lanes in both directions. For this corridor, the possibility of providing wider or buffered bike lanes was considered, along with improving the existing pedestrian crossing.

Field Review

Field visits were conducted on Tuesday February 20th, 2024, for all three corridors. While on site the study team observed traffic operations, bicycle and pedestrian activity, and gathered roadway measurements.

Corridor Characteristics

Tables 1-3 summarize the characteristics of each of the study corridors.

Table 1: Burgess Road Corridor Characteristics

| | |
|---|---|
| Functional Classification | Major Collector |
| Length | 1,050 feet |
| Width | Varies 44 feet to 55 feet (exclusive of curb and gutter) |
| Typical Section | 2 lanes northbound and 2 lanes southbound |
| Posted Speed Limit | 25 mph |
| Sidewalks | Both sides: Harrisonburg Crossing to Clover Leaf Plaza East side only: Evelyn Byrd Avenue to Harrisonburg Crossing |
| Curb and Gutter | Yes |
| 2024 ADT | 7,270 vpd |
| 85 th Percentile Travel Speeds | NB: 30.7 mph SB: 31.9 mph |
| Lane Utilization | SB: outside lane favored 61% |

Table 2: University Boulevard Corridor Characteristics

| | | | |
|---|---|---|--|
| Segment | Carrier Dr to ~330' west of Campus Dr | ~330' west of Campus Dr to Reservoir St | Reservoir St to Medical Ave |
| Functional Classification | Major Collector | | |
| Length | 1,680 feet | | |
| Width | Varies 43 feet to 65 feet (exclusive of curb and gutter) | | |
| Typical Section | 2 EB through lanes 1 WB through lane 1 WB right turn lane | 2 EB through lanes 2 WB through lanes Turn lanes at intersections | 2 EB through lanes 1 WB through lane Turn lanes at intersections |
| Sidewalks | North side only | Both sides | Both sides – end west of Medical Ave |
| Posted Speed Limit | 25 mph | | |
| Curb and Gutter | Yes | | |
| 2024 ADT | 9,540 vpd | | |
| 85 th Percentile Travel Speeds | EB: 32.1 WB: 34.0 | | |
| Lane Utilization | EB: outside lane favored 71% WB: inside lane favored 73% | | |

Table 3: Neff Avenue Corridor Characteristics

| | |
|---|---|
| Functional Classification | Major Collector |
| Length | 2,010 feet |
| Width | Varies 52 feet to 64 feet (exclusive of curb and gutter) |
| Typical Section | 2 EB through lanes and 2 WB through lanes, turn lanes at Reservoir St |
| Posted Speed Limit | 35 mph |
| Curb and Gutter | Yes |
| 2024 ADT | 19,000 vpd |
| 85 th Percentile Travel Speeds | EB: 42.8 WB: 43.5 |
| Lane Utilization | WB: outside lane favored 71% |

Traffic Data

12-hour turning movement counts (7 AM to 7 PM) were collected at the study intersections on Tuesday, February 13, 2024. The peak hours varied by corridor and are shown in **Table 4** below. For each corridor two peak periods were approved by City staff for operational analyses and are listed in **Table 4**. The peak hour traffic volumes are available in **Appendix A** and shown in **Figures 5 - 7**.

For all three corridors, the greatest traffic volumes occurred during the PM peak hour. On Burgess Road and University Boulevard the midday peak hour traffic volumes were greater than the AM traffic volumes reflecting the commercial land use and student travel patterns.

Table 4: Corridor Peak Hours

| Corridor | AM Peak | Midday Peak | PM Peak | Peaks for Analysis |
|----------------------|------------------|-----------------|----------------|--------------------|
| Burgess Road | 10:00 – 11:00 AM | 12:00 – 1:00 PM | 5:00 – 6:00 PM | Midday and PM |
| University Boulevard | 8:30 – 9:30 AM | 12:00 – 1:00 PM | 4:45 – 5:45 PM | Midday and PM |
| Neff Avenue | 8:30 – 9:30 AM | 12:00 – 1:00 PM | 4:45 – 5:45 PM | AM and PM |

Future Traffic Forecasting

To estimate future 2040 traffic volumes, a growth rate of 1%, provided by the City, was applied to the 2024 traffic volumes. No proposed developments were assumed along the study corridor. However, traffic volumes were adjusted at the intersections of University Boulevard at Reservoir Street and Neff Avenue at Reservoir Street to reflect the funded median project along Reservoir Street. The trip re-routing details and a sketch of the project are included in **Appendix B**.

The resulting 2040 turning movement volumes for the study area intersections are presented in **Figures 8-10**.

Figure 5: Burgess Road Existing 2024 Peak Hour Traffic Volumes

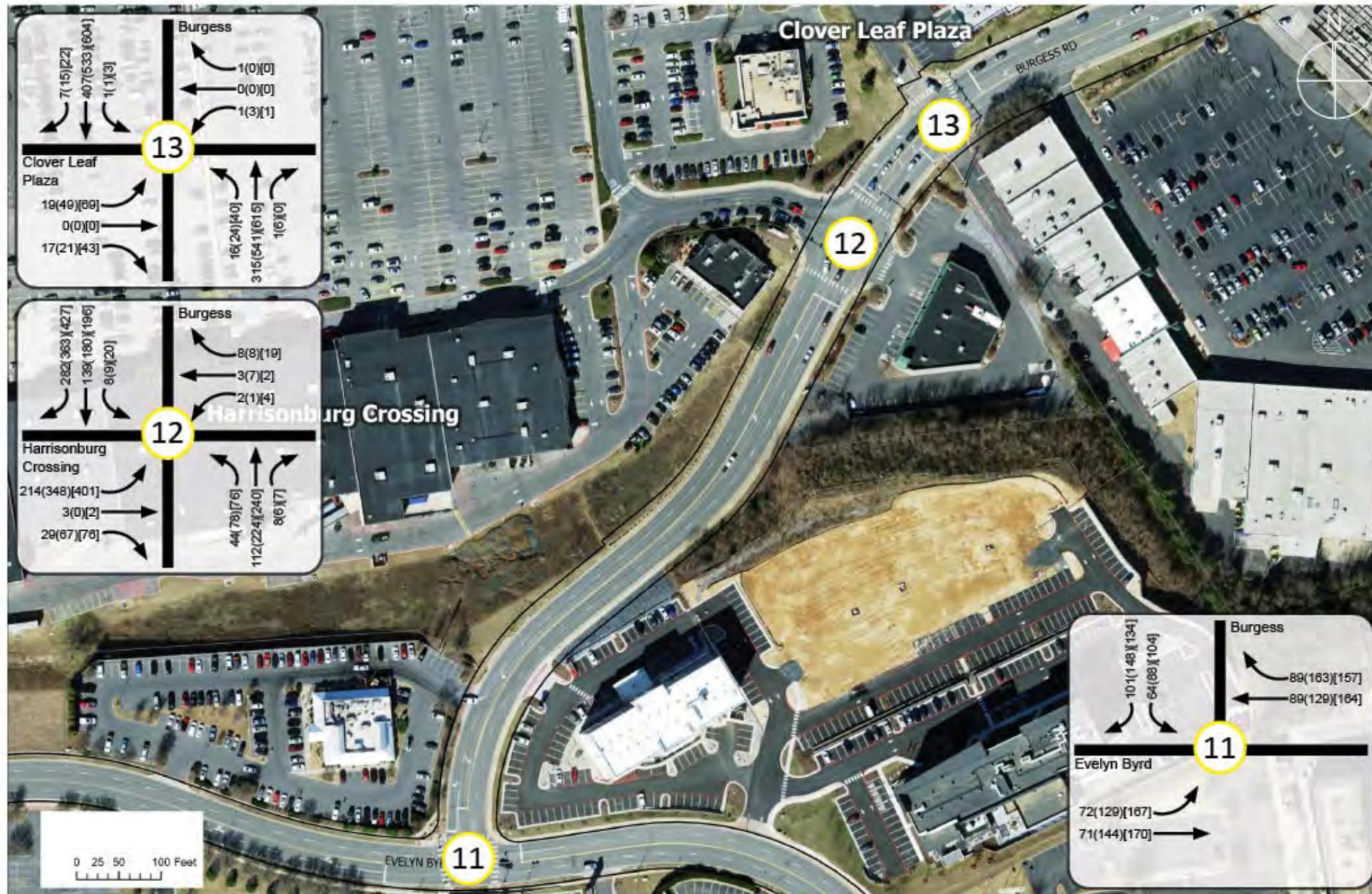


Figure 6: University Boulevard Existing 2024 Peak Hour Traffic Volumes

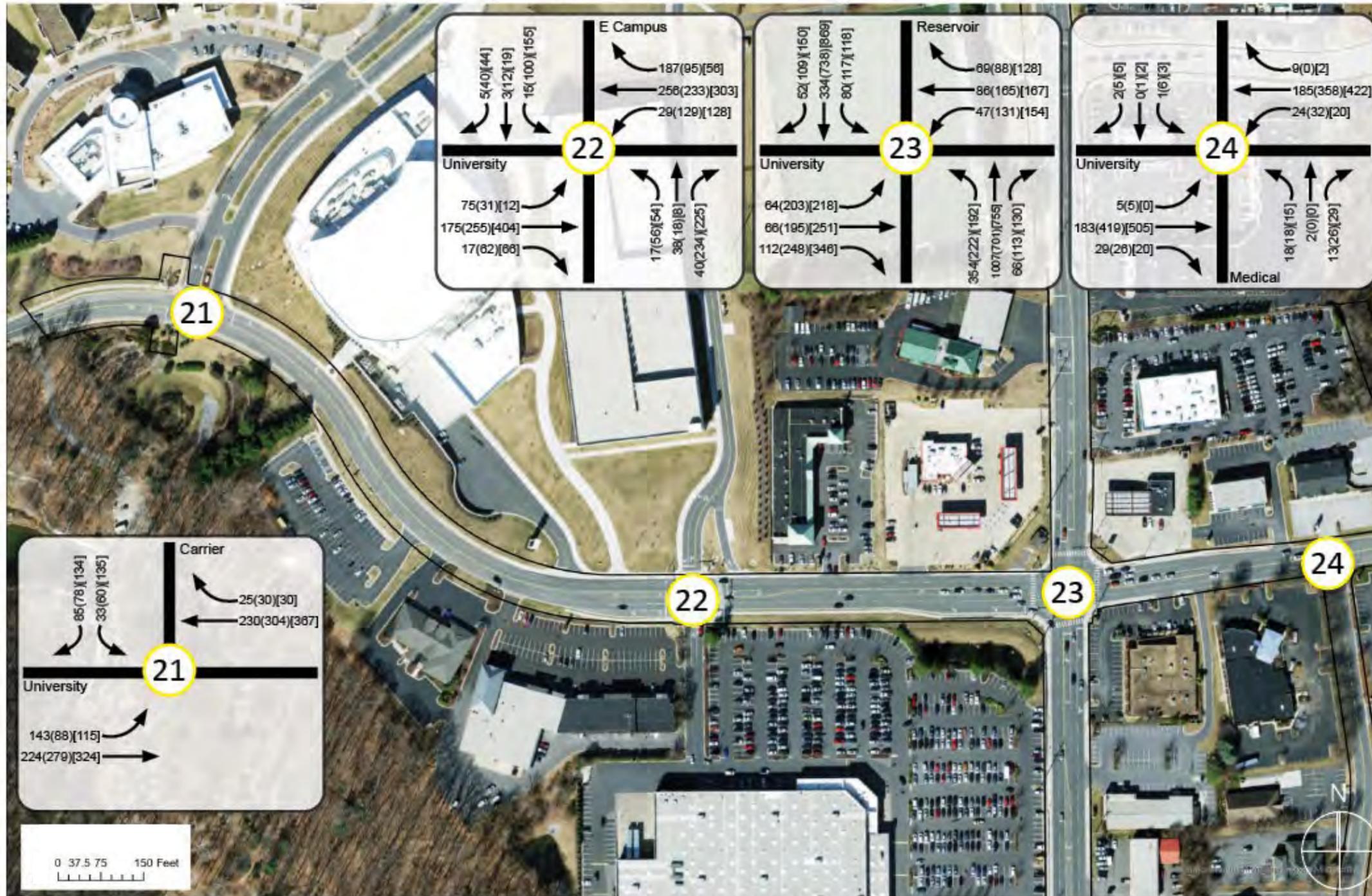


Figure 7: Neff Avenue Existing 2024 Peak Hour Traffic Volumes



Figure 8: Burgess Road 2040 Peak Hour Traffic Volumes

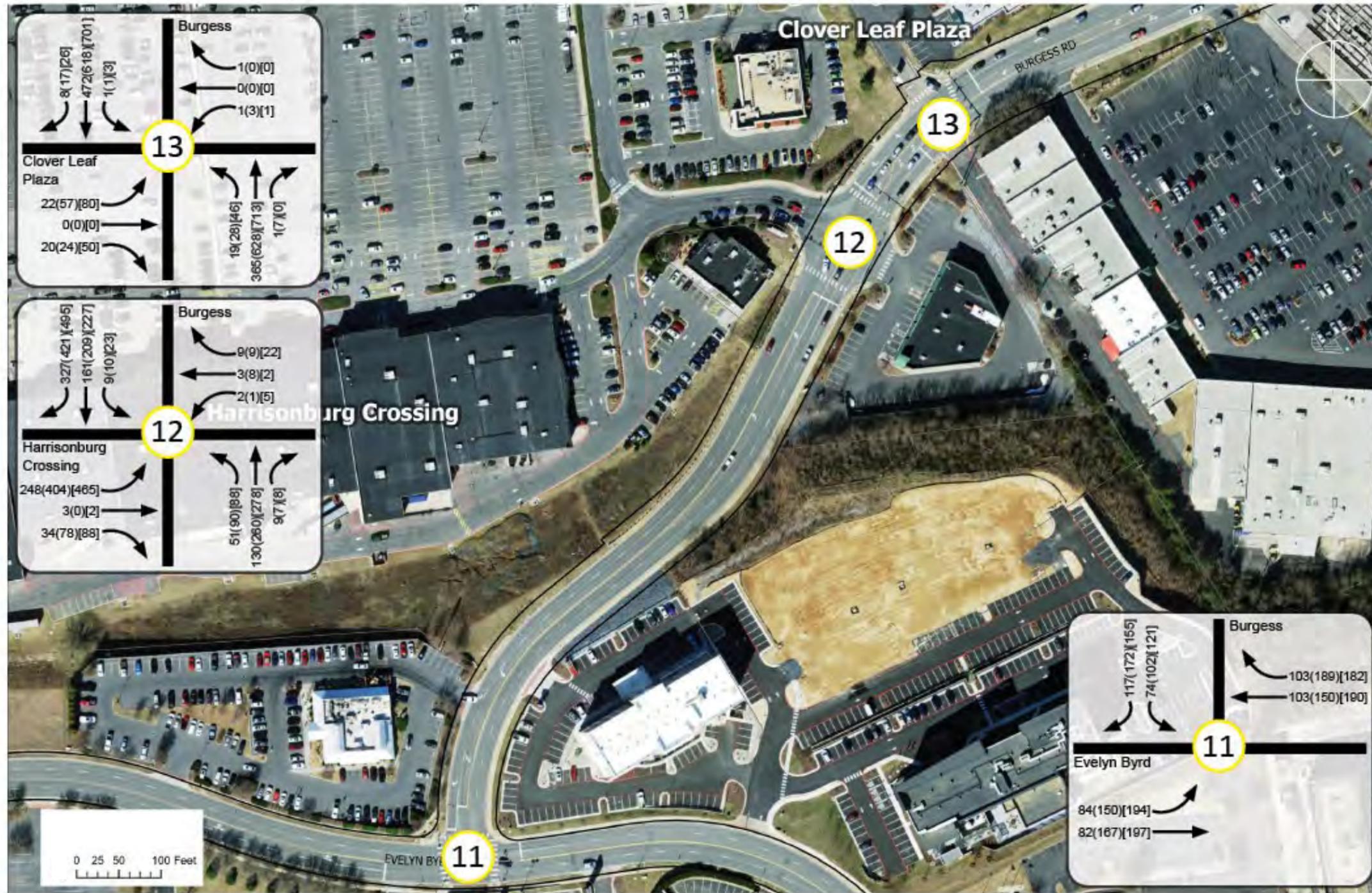


Figure 9: University Boulevard 2040 Peak Hour Traffic Volumes

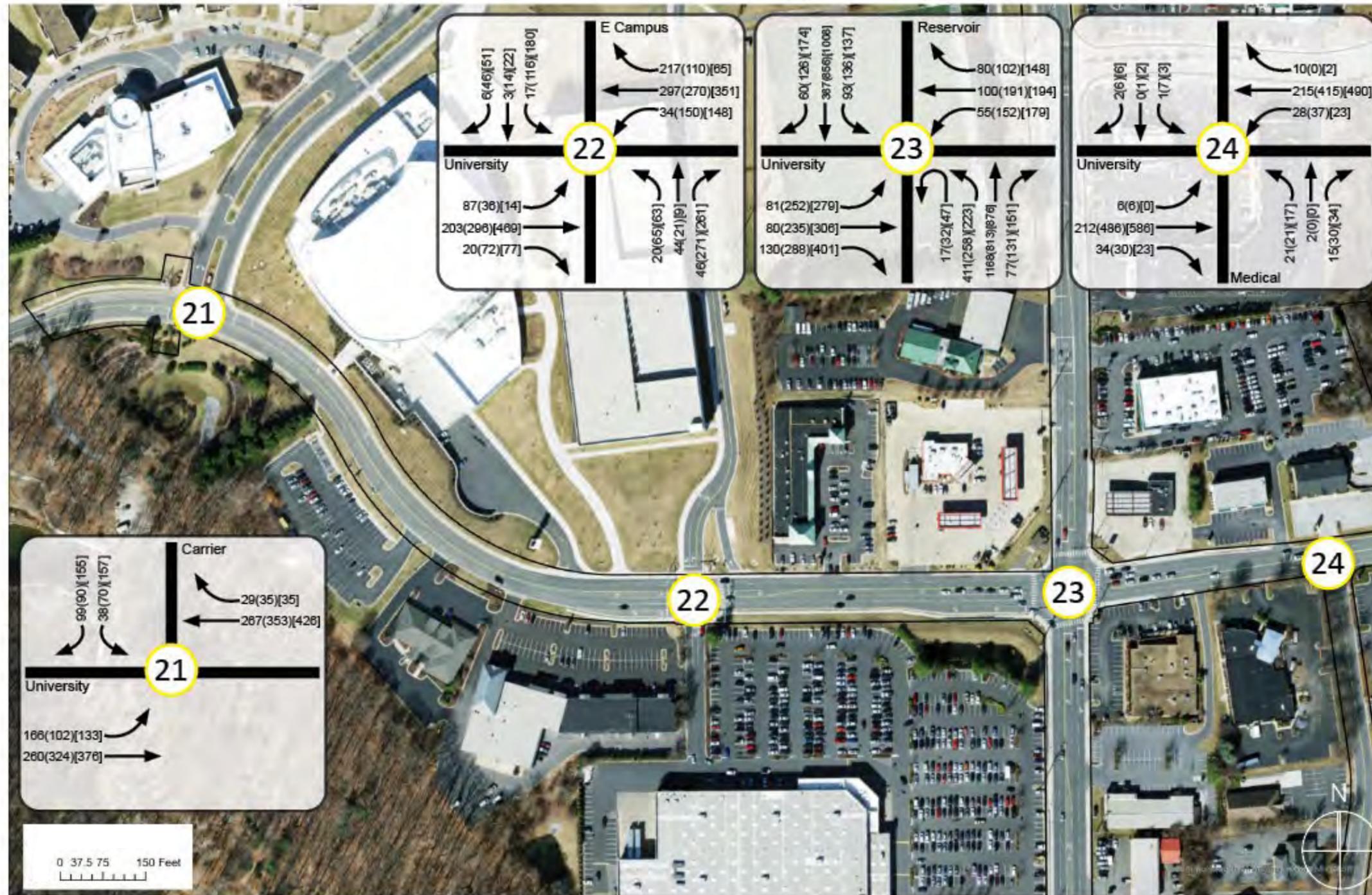


Figure 10: Neff Avenue 2040 Peak Hour Traffic Volumes



Crash Summary

City of Harrisonburg Staff provided the following crash information for each corridor. Crash data was collected and analyzed for a five-year period from 2019 through 2023.

The data provided indicates that in the five years of data provided between 2019 and 2023, 13 crashes were recorded on the study segment of Burgess Road, 71 crashes were recorded on the study segment of University Boulevard, and 130 crashes occurred on the study segment of Neff Avenue. Angle collisions were the most frequent crash type on all three corridors followed by sideswipe on Burgess Road and rear end on both University Boulevard and Neff Avenue. There were no fatalities recorded and only one severe injury on Neff Avenue. Property damage only crashes were the most frequent severity making up 77% of Burgess Road crashes, 87% of University Boulevard and 77% of Neff Avenue crashes.

There were five crashes involving bicycles during this time period in the study area. All were injury crashes. Two occurred near the University Boulevard and Reservoir Drive intersection. Two others occurred at the mid-block crossing at Neff Avenue (between Putter Court and Sunchase Drive), and another involved a hit and run at the Putter Court intersection.

Burgess Road

The blue crashes shown in Figure 11 were analyzed for this study. Figure 12 illustrates these crashes by crash type. These crashes are summarized in Tables 5 and 6 by severity and type, respectively. A total of 13 crashes were reported within the Burgess Road study area during the five-year study period. No crashes in the study area involved bicyclists or pedestrians.



Figure 11: Burgess Road Crashes

Table 5: Burgess Road Crashes by Severity

| Year | Crash Severity | | | | | Total |
|-------------------|----------------|-----------|-----------|------------|------------|-------------|
| | K | A | B | C | O | |
| 2019 | 0 | 0 | 1 | 0 | 2 | 3 |
| 2020 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2021 | 0 | 0 | 0 | 0 | 1 | 1 |
| 2022 | 0 | 0 | 0 | 0 | 3 | 3 |
| 2023 | 0 | 0 | 0 | 2 | 4 | 6 |
| Total | 0 | 0 | 1 | 2 | 10 | 13 |
| Percentage | 0% | 0% | 8% | 15% | 77% | 100% |

Figure 12: Burgess Road Crashes by Type

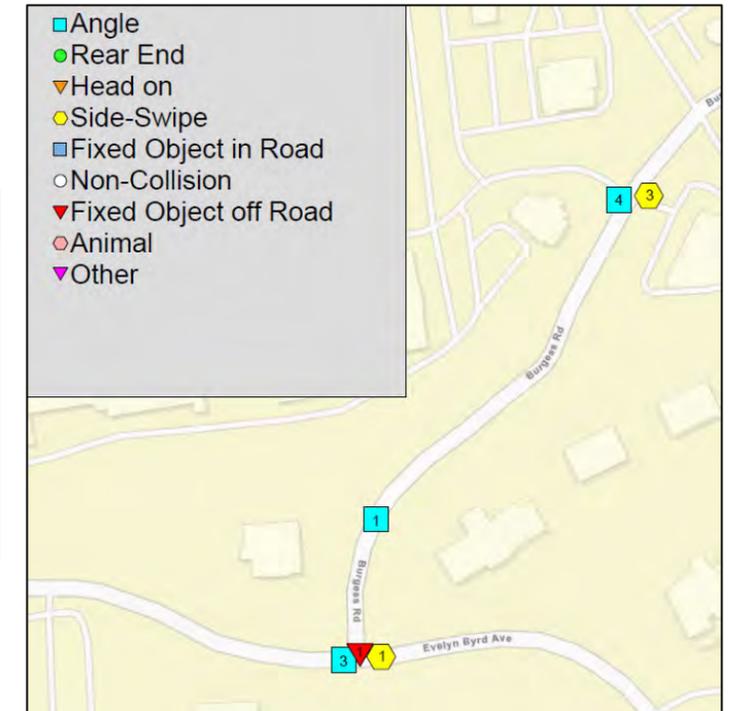


Table 6: Burgess Road Crashes by Type

| Year | Crash Type | | | | | | | | | Total |
|-------------------|------------|------------|-----------|------------|----------------------|---------------|-----------------------|-----------|-----------|-------------|
| | Rear End | Angle | Head On | Side-swipe | Fixed Object in Road | Non-Collision | Fixed Object Off Road | Animal | Other | |
| 2019 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 |
| 2020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2021 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2022 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| 2023 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 6 |
| Total | 0 | 8 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 13 |
| Percentage | 0% | 62% | 0% | 31% | 0% | 0% | 8% | 0% | 0% | 100% |

University Boulevard

The blue crashes shown in Figure 13 were analyzed for this study. Figure 14 illustrates these crashes by crash type. These crashes are summarized in Tables 7 and 8 by severity and type, respectively. A total of 71 crashes were reported within the University Boulevard study area during the five-year study period. Two of the injury crashes involved bicyclists and the locations are noted with stars on Figure 14.

Figure 13: University Boulevard Crashes

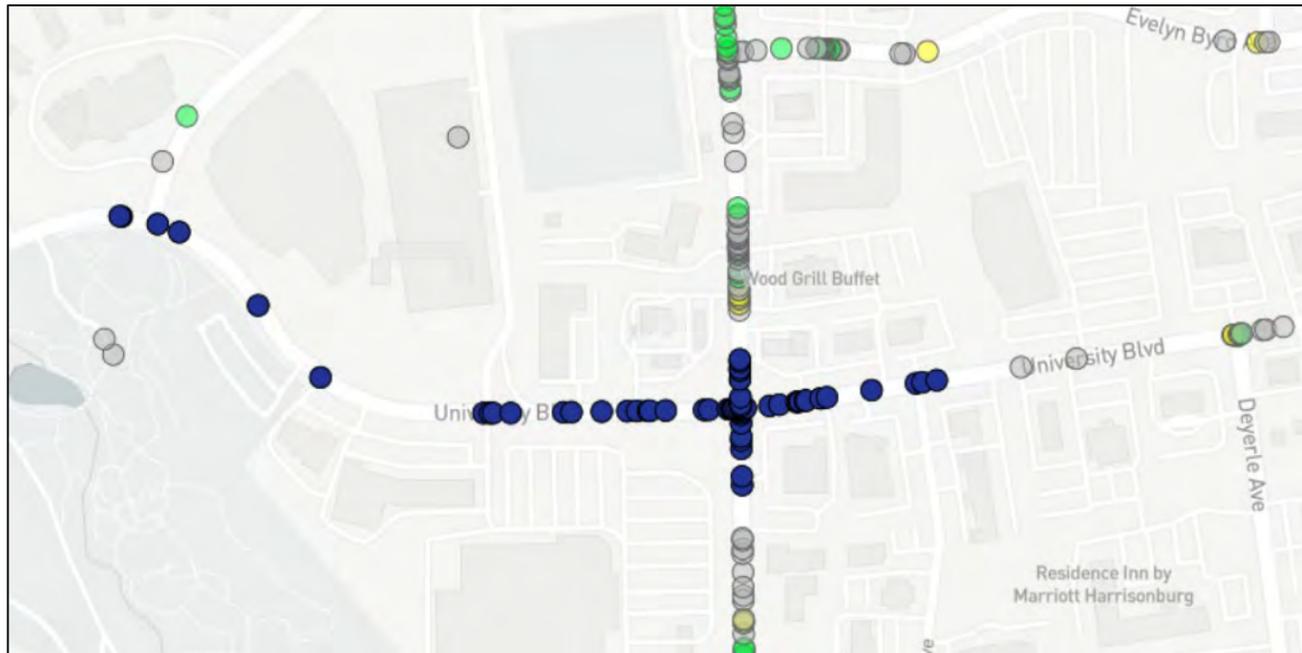


Table 7: University Boulevard Crashes by Severity

| Year | Crash Severity | | | | | Total |
|--------------|----------------|----------|----------|----------|-----------|-----------|
| | K | A | B | C | O | |
| 2019 | 0 | 0 | 3 | 0 | 12 | 15 |
| 2020 | 0 | 0 | 1 | 0 | 4 | 5 |
| 2021 | 0 | 0 | 0 | 2 | 15 | 17 |
| 2022 | 0 | 0 | 0 | 1 | 19 | 20 |
| 2023 | 0 | 0 | 0 | 2 | 12 | 14 |
| Total | 0 | 0 | 4 | 5 | 62 | 71 |
| Percentage | 0% | 0% | 6% | 7% | 87% | 100% |

Figure 14: University Boulevard Crashes by Type

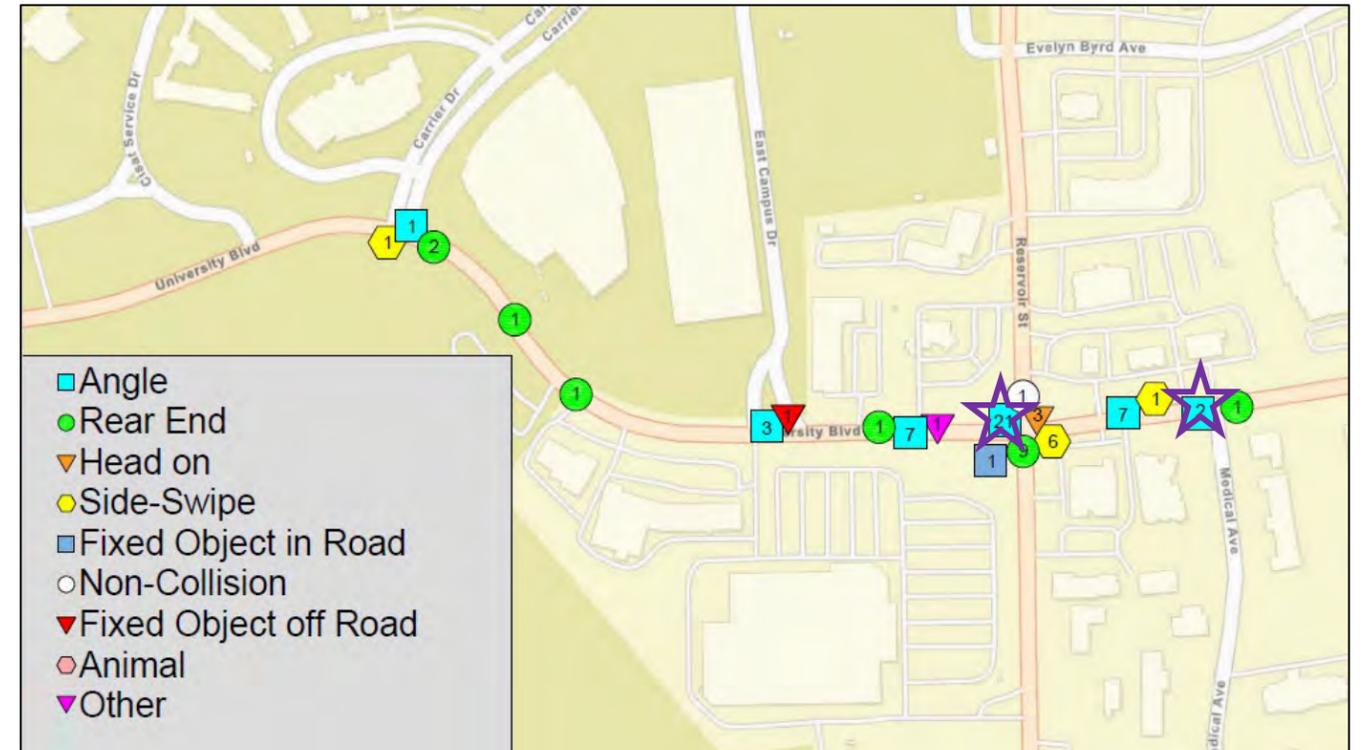


Table 8: University Boulevard Crashes by Type

| Year | CrashType | | | | | | | | | Total |
|--------------|-----------|-----------|----------|------------|----------------------|---------------|-----------------------|----------|----------|-----------|
| | Rear End | Angle | Head On | Side-swipe | Fixed Object in Road | Non-Collision | Fixed Object Off Road | Animal | Other | |
| 2019 | 3 | 8 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 15 |
| 2020 | 1 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 5 |
| 2021 | 3 | 11 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 17 |
| 2022 | 6 | 10 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 20 |
| 2023 | 2 | 9 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 14 |
| Total | 15 | 41 | 3 | 8 | 1 | 1 | 1 | 0 | 1 | 71 |
| Percentage | 21% | 58% | 4% | 11% | 1% | 1% | 1% | 0% | 1% | 100% |

Neff Avenue

The blue crashes shown in Figure 15 were analyzed for this study. Figure 16 illustrates these crashes by crash type. These crashes are summarized in Tables 9 and 10 by severity and type, respectively. A total of 105 crashes were reported within the Neff Avenue study area during the five-year study period. Two of the injury crashes involved bicyclists using the mid-block crossing, while another involved a hit and run at Putter Court. The crash locations involving bicyclists are shown with stars in Figure 16.

Figure 15: Neff Avenue Crashes

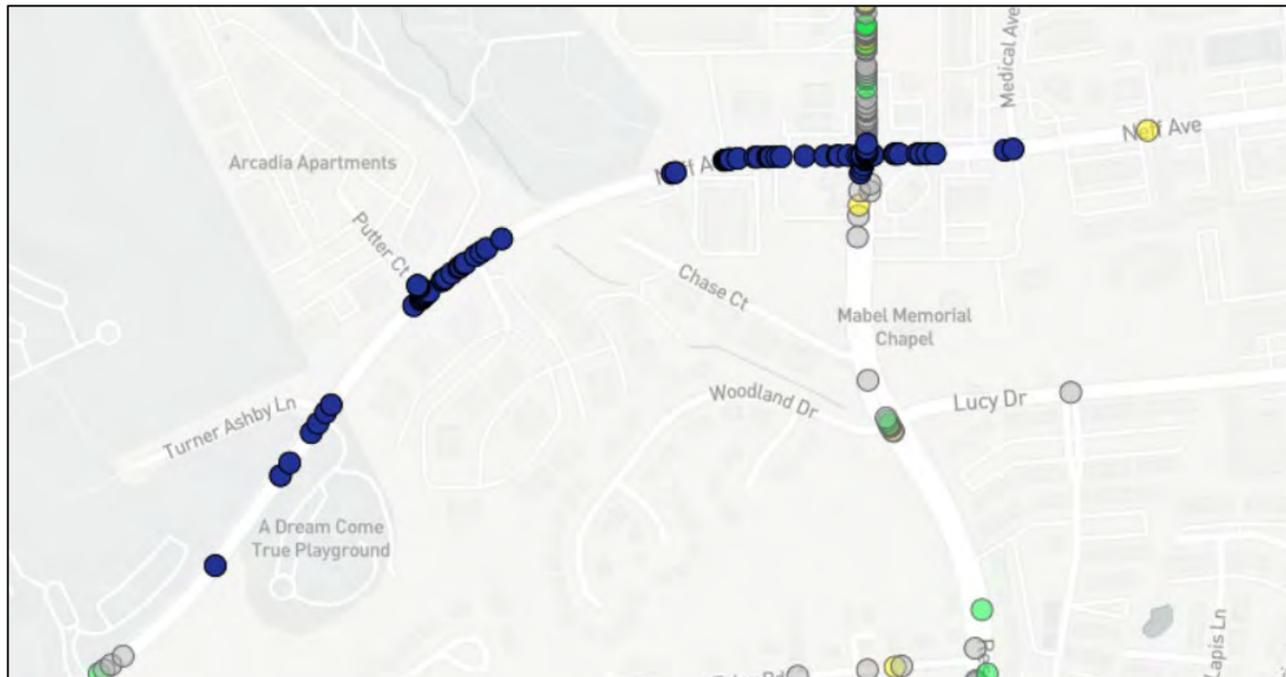


Table 9: Neff Avenue Crashes by Severity

| Year | Crash Severity | | | | | Total |
|--------------|----------------|----------|-----------|-----------|-----------|------------|
| | K | A | B | C | O | |
| 2019 | 0 | 1 | 1 | 0 | 16 | 18 |
| 2020 | 0 | 0 | 2 | 1 | 13 | 16 |
| 2021 | 0 | 0 | 2 | 5 | 23 | 30 |
| 2022 | 0 | 0 | 1 | 1 | 15 | 17 |
| 2023 | 0 | 0 | 5 | 5 | 14 | 24 |
| Total | 0 | 1 | 11 | 12 | 81 | 105 |
| Percentage | 0% | 1% | 10% | 11% | 77% | 100% |

Figure 16: Neff Avenue Crashes by Type

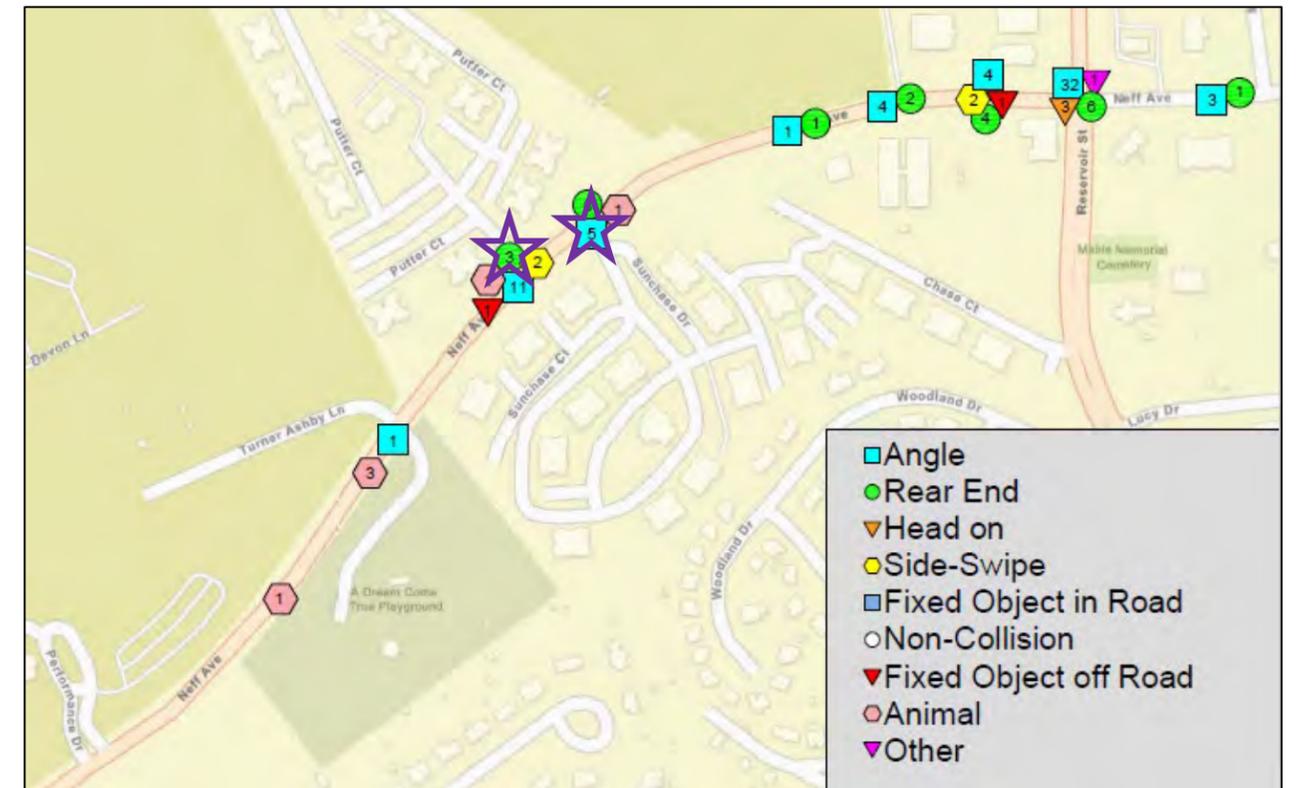


Table 10: Neff Avenue Crashes by Type

| Year | Crash Type | | | | | | | | | Total |
|--------------|------------|-----------|----------|------------|----------------------|---------------|-----------------------|----------|----------|------------|
| | Rear End | Angle | Head On | Side-swipe | Fixed Object in Road | Non-Collision | Fixed Object Off Road | Animal | Other | |
| 2019 | 5 | 12 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 18 |
| 2020 | 10 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| 2021 | 5 | 17 | 2 | 1 | 0 | 0 | 2 | 2 | 1 | 30 |
| 2022 | 5 | 10 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 17 |
| 2023 | 4 | 14 | 1 | 3 | 0 | 0 | 0 | 2 | 0 | 24 |
| Total | 29 | 59 | 3 | 5 | 0 | 0 | 2 | 6 | 1 | 105 |
| Percentage | 28% | 56% | 3% | 5% | 0% | 0% | 2% | 6% | 1% | 100% |

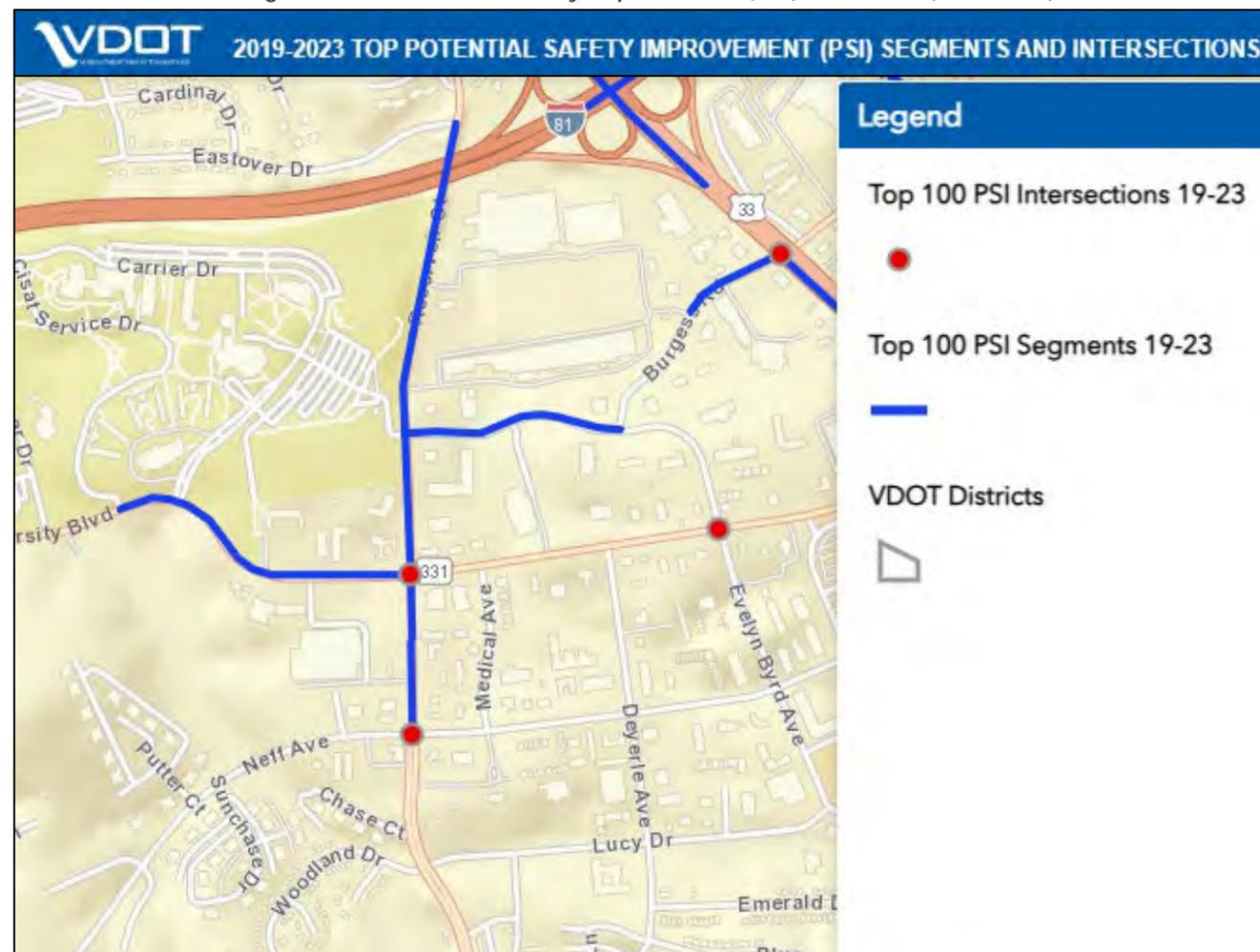
Potential for Safety Improvement (PSI) and Pedestrian Bicycle Safety Action Plan (PBSAP)

PSI is a calculation that determines if the observed crash frequency exceeds the expected crash frequency on a road with similar characteristics and traffic volumes. PSI is the best available measure for understanding whether crashes at an intersection are higher or lower than expected.

VDOT publishes a ranking of intersections and road segments with PSI for each VDOT District. The PSI rankings used in this study use 2019-2023 crash data.

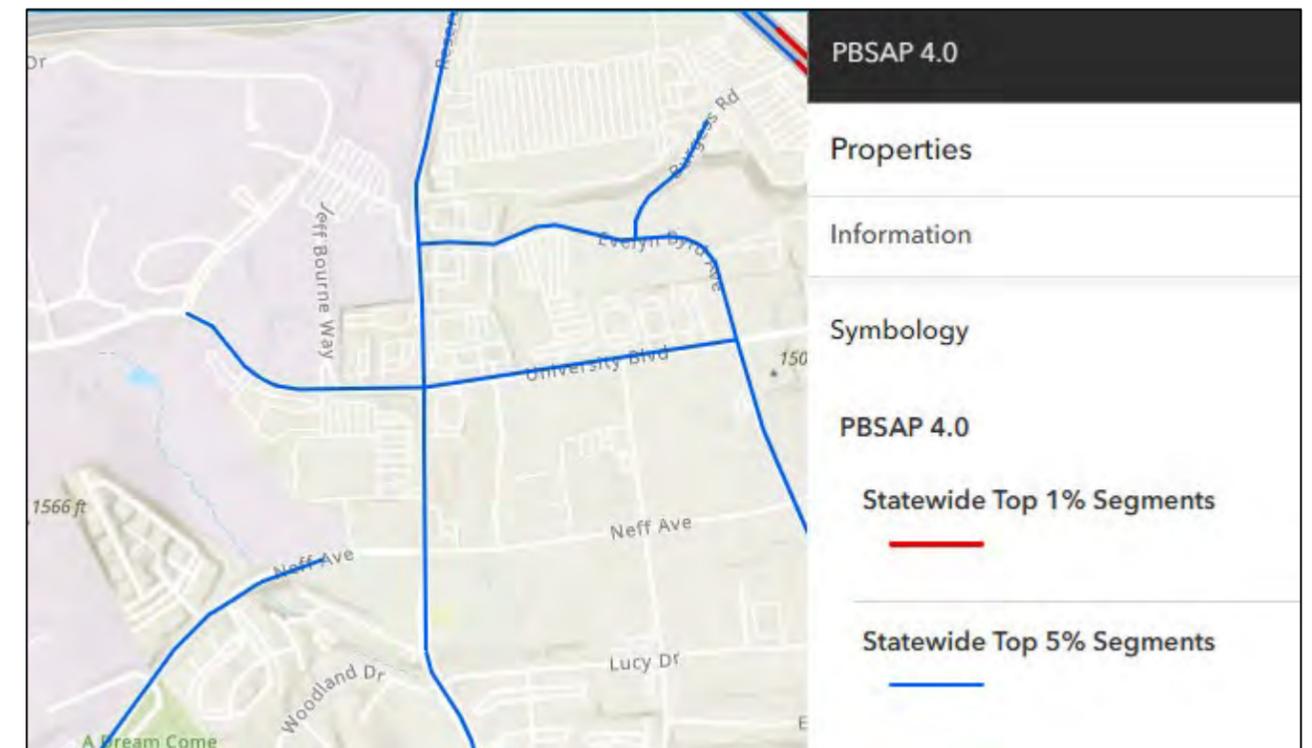
All three corridors include either a PSI segment or intersection as shown in Figure 17.

Figure 17: Potential for Safety Improvement (PSI) Locations (2019-2023)



Similar to PSI, the Pedestrian Bicycle Safety Action Plan (PBSAP) is a proactive network screening focused on roadway attributes and context. This systemic approach identifies potential high bicycle and pedestrian crash areas. Portions of all three corridors fall in the Statewide Top 5% of PBSAP corridors as shown in Figure 18.

Figure 18: PBSAP 4.0 Locations



Roadway Reconfiguration Alternatives

Roadway Reconfiguration Feasibility

ADT guidelines from the *FHWA Road Diet Informational Guide*¹ used to determine the feasibility of a road diet are shown in Table 11.

Table 11: ADT Road Diet Feasibility Guidelines

| AADT | Good Candidate? | Capacity Affected |
|-------------------------|---|--|
| < 10,000 vpd | Great | Most Likely Not |
| 10,000 vpd – 15,000 vpd | Good | Intersection analyses should be conducted and signal retiming considered with implementation |
| 15,000 vpd – 20,000 vpd | Good | Maybe – Corridor analysis should be conducted |
| > 20,000 vpd | Feasibility study required to determine | |

Table 12 includes the 2024 and projected 2040 average daily traffic (ADT).

Table 12: Study Corridor 2024 and 2040 ADT

| Corridor | 2024 ADT | 2040 ADT |
|----------------------|------------|----------|
| Burgess Road | 7,270 vpd | 8,430 |
| University Boulevard | 9,540 vpd | 11,060 |
| Neff Avenue | 19,000 vpd | 22,040 |

An assessment of the 2024 and projected 2040 ADT indicates that the Burgess Road corridor is a great candidate, University Boulevard corridor is a good/great candidate, and the Neff Avenue corridor requires a feasibility study to determine if it is a candidate for a road diet. As suggested, intersection and corridor analyses were conducted and signal retiming recommended where appropriate. The traffic operations analyses are summarized in this report.

Relevant Guidelines, Standards and Assumptions

The design elements included in the concepts rely on the following design guidance:

- MUTCD, 2009 Edition
- VDOT Road Design Manual
- AASHTO, Guide for the Development of Bicycle Facilities, 5th Edition

The City has generally used 11-foot vehicle lane widths with recent roadway designs. As such, 11-foot lanes were used in all three concepts. In locations where a two-way center left-turn lane is included, if ROW is constrained the TWLTL was reduced to 10 feet as needed to maintain minimum widths for the bicycle lanes and buffers.

Where new bike lanes are proposed, widths of four feet (exclusive of curb and gutter where curb and gutter is present) have been applied within the City and were considered the minimum.

¹ Knapp, Keith, et al. *Road diet informational guide*. No. FHWA-SA-14-028. United States. Federal Highway Administration. Office of Safety, 2014.

Traffic Operations Analysis

Traffic operational analysis was performed using Synchro 11 and SimTraffic 11 software for all study intersections along the three corridors. Inputs and analysis methodologies were consistent with the VDOT Traffic Operations and Safety Analysis Manual (TOSAM) guidelines. All peak hour analyses were performed for the existing year 2024 and future year 2040.

Measures of Effectiveness

For the purposes of this study, guidance for reporting MOEs for signalized and unsignalized intersections was obtained from Chapter 4 of the VDOT TOSAM. A summary of the MOEs evaluated for the study intersections is presented below:

- Control Delay (measured in seconds per vehicle)
- Level of service (LOS)
- Maximum Queue Length from SimTraffic (measured in feet)

The HCM 6th Edition methodology was used to analyze the unsignalized intersections. Control delay and LOS are reported from the Synchro analysis. Maximum queue length is reported from SimTraffic.

Existing 2024 Traffic Operations Analysis Results

Tables 13 through 15 summarize the existing conditions (2024) model outputs and the reports are included in Appendix C.

Burgess Road

The Burgess Road study area intersections are currently operating under capacity and the only queues that extend beyond the storage area provided are between the closely spaced Harrisonburg Crossing and Cloverleaf Plaza entrances. Queues noted in red extend beyond the effective storage area.

Table 13: Burgess Road 2024 Existing Traffic Operations Analysis Results

| Approach | Move-ment | Effec- tive Storage | Existing MID | | | Existing PM | | |
|---|-----------|---------------------------|--------------|----------------|------------------------|-------------|----------------|------------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 11. Burgess Road/Evelyn Byrd Avenue <i>Signalized</i> | | | | | | | | |
| Evelyn Byrd Avenue | EBL/T | 300 | A | 7.0 | 137 | A | 6.3 | 156 |
| | EBT | - | A | 7.0 | 44 | A | 6.3 | 88 |
| Evelyn Byrd Avenue | WBT | - | A | 6.5 | 81 | A | 5.7 | 87 |
| | WBT/R | - | A | 6.5 | 76 | A | 5.7 | 79 |
| Burgess Road | SBL | 770 | B | 10.2 | 93 | B | 11.7 | 103 |
| | SBR | 800 | A | 9.9 | 90 | B | 11.1 | 96 |
| Intersection | | | A | 7.7 | | A | 7.4 | |
| 12. Burgess Road/Harrisonburg Crossing Entrance <i>Signalized</i> | | | | | | | | |
| Harrisonburg Crossing | EBL | - | C | 30.4 | 212 | C | 32.7 | 222 |
| | EBL/T/R | - | C | 27.3 | 202 | C | 32.3 | 205 |
| Game Stop Driveway | WBL/T/R | - | D | 45.8 | 43 | D | 47.3 | 60 |
| Burgess Road | NBL | 290 | D | 48.5 | 139 | D | 49.9 | 134 |
| | NBT | 770 | C | 27.7 | 122 | C | 30.6 | 127 |
| | NBT/R | 770 | C | 27.7 | 130 | C | 30.6 | 144 |
| Burgess Road | SBL | 35 | D | 51.4 | 33 | D | 53.2 | 40 |
| | SBT | 100 | C | 26.7 | 141 | C | 28.4 | 126 |
| | SBR | 100 | B | 12.7 | 89 | B | 18.9 | 103 |
| Intersection | | | C | 25.4 | | C | 29.1 | |
| 13. Burgess Road/Clover Leaf Plaza Entrance <i>Signalized</i> | | | | | | | | |
| Clover Leaf Plaza | EBL/T/R | - | D | 46.5 | 119 | D | 46.4 | 199 |
| Market Square Service | WBL/T/R | - | D | 45.6 | 37 | D | 47.0 | 13 |
| Burgess Road | NBL | 60 | D | 40.0 | 46 | D | 41.5 | 55 |
| | NBT | 80 | A | 2.8 | 69 | A | 2.7 | 95 |
| | NBT/R | 80 | A | 2.8 | 51 | A | 2.7 | 73 |
| Burgess Road | SBL | 65 | B | 11.0 | 6 | B | 12.0 | 37 |
| | SBT | 450 | B | 13.2 | 163 | B | 14.7 | 222 |
| | SBT/R | 450 | B | 13.2 | 225 | B | 14.7 | 262 |
| Intersection | | | B | 11.0 | | B | 12.7 | |

University Boulevard

Three of the four University Boulevard study area intersections are currently operating under capacity. The intersection of University Boulevard and Reservoir Street operates at overall LOS D during the peak hours studied. However, a number of movements operate at LOS E and F. Levels of service E are noted in orange and F in red.

The only queue that extends beyond the storage area provided is the westbound left turn lane at East Campus Drive. Queues noted in red extend beyond the effective storage area.

Table 14: University Boulevard 2024 Existing Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | Existing MID | | | Existing PM | | |
|--|-----------|--------------------|--------------|-------------|------------------|-------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 21. University Boulevard/Carrier Drive <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 140 | A | 6.9 | 114 | A | 9.6 | 129 |
| | EBT | - | A | 4.4 | 150 | A | 6.5 | 164 |
| University Boulevard | WBT | 950 | B | 12.2 | 204 | B | 17.6 | 234 |
| | WBR | 150 | A | 5.5 | 64 | A | 5.2 | 63 |
| Carrier Drive | SBL | - | C | 20.9 | 78 | C | 20.7 | 149 |
| | SBR | - | B | 19.6 | 80 | B | 18.5 | 105 |
| Intersection | | | B | 10.1 | | B | 13.7 | |
| 22. University Boulevard/E Campus Drive <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 180 | B | 11.5 | 46 | B | 12.8 | 34 |
| | EBT | 950 | B | 16.7 | 113 | C | 21.2 | 168 |
| | EBR | 130 | B | 15.4 | 77 | B | 18.3 | 114 |
| University Boulevard | WBL | 100 | B | 11.9 | 98 | B | 13.7 | 100 |
| | WBT | 515 | B | 13.8 | 146 | B | 15.0 | 172 |
| | WBR | 130 | B | 13.0 | 12 | B | 13.7 | 12 |
| Costco Access | NBL | 70 | B | 16.7 | 64 | B | 18.3 | 68 |
| | NBT/R | - | B | 17.0 | 146 | B | 18.6 | 133 |
| E Campus Drive | SBL/T | - | B | 19.4 | 111 | C | 26.8 | 188 |
| | SBR | 180 | B | 15.6 | 54 | B | 17.3 | 107 |
| Intersection | | | B | 15.5 | | B | 18.8 | |

Table 14: University Boulevard 2024 Existing Traffic Operations Analysis Results (continued)

| Approach | Move-ment | Effec-tive Storage | Existing MID | | | Existing PM | | |
|--|-----------|--------------------|--------------|-------------|------------------|-------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 23. University Boulevard/Reservoir Street <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 420 | E | 57.6 | 243 | F | 91.2 | 309 |
| | EBT | 515 | D | 53.8 | 175 | E | 61.0 | 208 |
| | EBR | 180 | D | 40.5 | 161 | E | 65.9 | 178 |
| University Boulevard | WBL | 370 | D | 44.3 | 168 | D | 52.6 | 193 |
| | WBT | 515 | E | 55.9 | 176 | E | 58.9 | 211 |
| | WBT/R | 255 | E | 55.9 | 180 | E | 58.9 | 217 |
| Reservoir Street | NBL | 260 | C | 21.8 | 248 | C | 23.3 | 255 |
| | NBT | 880 | C | 25.8 | 323 | C | 24.8 | 355 |
| | NBT/R | 880 | C | 25.8 | 321 | C | 24.8 | 354 |
| Reservoir Street | SBL | 390 | B | 16.7 | 214 | B | 16.3 | 264 |
| | SBT | 780 | C | 33.4 | 352 | C | 30.8 | 410 |
| | SBT/R | 780 | C | 33.4 | 363 | C | 30.8 | 397 |
| Intersection | | | D | 35.7 | | D | 41.2 | |
| 24. University Boulevard/Medical Avenue <i>Unsignalized</i> | | | | | | | | |
| University Boulevard | EBL/T | 150 | A | 8.0 | 35 | A | 0.0 | 0 |
| | EBT/R | 370 | A | 0.0 | 0 | A | 0.0 | 0 |
| University Boulevard | WBL/T | 150 | A | 8.4 | 54 | A | 8.6 | 50 |
| | WBT/R | 790 | A | 0.1 | 4 | A | 0.1 | 0 |
| Medical Avenue | NBL/T/R | - | B | 13.5 | 55 | B | 14.0 | 47 |
| Business Access | SBL/T/R | - | B | 14.0 | 36 | B | 14.8 | 31 |

Neff Avenue

The study intersections along Neff Avenue operate at LOS D or better with a few exceptions. The intersection of Neff Avenue and Reservoir Street currently operates at LOS D overall during both peak hours. However, the westbound through movement operates at LOS E. A number of the side street movements at the unsignalized intersections operate at LOS E and F. Levels of service E are noted in orange and F in red.

All of the Neff Avenue queues at the Reservoir Street intersection extend beyond the effective storage areas, as do the southbound Reservoir Street left and right turn queues. The eastbound queue extends more than 500 feet west of Warwick Drive. Queues noted in red extend beyond the effective storage area and queues noted in maroon are greater than 500 feet.

Table 15: Neff Avenue 2024 Existing Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | Existing AM | | | Existing PM | | |
|---|-----------|--------------------|-------------|-------------|------------------|-------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 31. Neff Avenue/Reservoir Street <i>Signalized</i> | | | | | | | | |
| Neff Avenue | EBL | 360 | D | 42.4 | 384 | D | 52.1 | 387 |
| | EBT | 360 | C | 33.8 | 354 | D | 49.3 | 378 |
| | EBR | 230 | C | 28.8 | 211 | D | 41.8 | 230 |
| Neff Avenue | WBL | 165 | C | 26.0 | 93 | D | 36.4 | 165 |
| | WBT | - | D | 47.5 | 163 | E | 67.1 | 775 |
| | WBT | 180 | D | 47.5 | 137 | E | 67.1 | 180 |
| | WBR | 130 | D | 39.1 | 87 | D | 47.7 | 170 |
| Reservoir Street | NBL | 375 | C | 21.3 | 271 | C | 24.7 | 217 |
| | NBT | 740 | D | 45.4 | 430 | C | 31.1 | 307 |
| | NBT/R | 740 | D | 45.4 | 404 | C | 31.1 | 286 |
| Reservoir Street | SBL | 220 | C | 25.1 | 98 | C | 21.3 | 220 |
| | SBT | 870 | C | 27.8 | 159 | D | 35.7 | 445 |
| | SBR | 255 | B | 12.0 | 69 | B | 16.1 | 255 |
| Intersection | | | D | 37.4 | | D | 37.3 | |
| 32. Neff Avenue/Warwick Drive <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL/T | - | A | 8.5 | 240 | B | 11.2 | 536 |
| | EBT | - | A | 0.5 | 125 | A | 1.3 | 521 |
| Neff Avenue | WBT | - | A | 0.0 | 0 | A | 0.0 | 9 |
| | WBT/R | - | A | 0.0 | 0 | A | 0.0 | 27 |
| Warwick Drive | SBL/R | - | B | 10.5 | 59 | D | 31.6 | 293 |

Table 15: Neff Avenue 2024 Existing Traffic Operations Analysis Results (continued)

| Approach | Move-ment | Effec-tive Storage | Existing AM | | | Existing PM | | |
|--|-----------|--------------------|-------------|-------------|------------------|-------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 33. Neff Avenue/Sunchase Drive <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBT | 160 | A | 0.0 | 23 | A | 0.0 | 49 |
| | EBT/R | 160 | A | 0.0 | 22 | A | 0.0 | 58 |
| Neff Avenue | WBL/T | 830 | A | 9.7 | 36 | B | 10.4 | 86 |
| | WBT | 830 | A | 0.1 | 0 | A | 1.3 | 16 |
| Sunchase Drive | NBL/R | - | C | 23.1 | 74 | F | 65.4 | 103 |
| 34. Neff Avenue/Putter Court <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL/T | 460 | A | 8.4 | 61 | B | 10.8 | 125 |
| | EBT | 460 | A | 0.1 | 0 | A | 0.6 | 99 |
| Neff Avenue | WBT | 160 | A | 0.0 | 14 | A | 0.0 | 3 |
| | WBT/R | 160 | A | 0.0 | 0 | A | 0.0 | 16 |
| Putter Court | SBL | - | C | 20.7 | 76 | F | 70.7 | 98 |
| | SBR | 90 | B | 10.3 | 78 | B | 13.2 | 80 |
| 35. Neff Avenue/Turner Ashby Lane <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL/T | - | A | 8.6 | 24 | B | 10.3 | 23 |
| | EBT/R | - | A | 0.0 | 0 | A | 0.0 | 2 |
| Neff Avenue | WBL/T | 460 | A | 0.0 | 0 | A | 9.9 | 28 |
| | WBT/R | 460 | A | 0.0 | 0 | A | 0.0 | 0 |
| Thomas Bowers Circle | NBL/T/R | - | C | 17.4 | 22 | C | 17.4 | 30 |
| Turner Ashby Lane | SBL/T/R | - | B | 14.0 | 24 | E | 40.8 | 23 |

2040 No Build Traffic Operations Analysis

Traffic operations analyses were conducted to evaluate the overall performance of the study corridors in 2040 peak hour conditions. The intent of the future no build conditions analysis is to provide a general understanding of the baseline future traffic conditions for comparison to potential roadway reconfiguration concepts.

The existing conditions Synchro models were used as a basis to develop the no build models for the peak hour conditions. The models were updated with the projected 2040 no build traffic volumes. No build inputs and analysis methodologies were applied consistently with TOSAM Version 2.0. The full Synchro and SimTraffic reports are included in **Appendix D** and shown in **Tables 16, 17, and 18**.

Burgess Road

In addition to the updated 2040 traffic volumes, the future no build analysis for Burgess Road includes the Evelyn Byrd Avenue roadway reconfiguration improvements which are currently being designed. **Figure 19** illustrates the 60% plans for the proposed improvements. It should be noted that minor changes to the crosswalk and ramp locations will be reflected in future drawings.

Similar to existing conditions, the Burgess Road study area intersections are currently operating under capacity and the only queues that extend beyond the storage area provided are between the closely spaced Harrisonburg Crossing and Cloverleaf Plaza entrances. Queues noted in red extend beyond the effective storage area.

Table 16: Burgess Road 2040 No Build Traffic Operations Analysis Results

| Approach | Move-ment | Effec- tive Storage | 2040 No Build MID | | | 2040 No Build PM | | |
|---|-----------|---------------------------|-------------------|----------------|------------------------|------------------|----------------|------------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 11. Burgess Road/Evelyn Byrd Avenue <i>Signalized</i> | | | | | | | | |
| Evelyn Byrd Avenue | EBL | 300 | A | 6.3 | 110 | A | 7.1 | 125 |
| | EBT | - | A | 5.2 | 101 | A | 5.3 | 123 |
| Evelyn Byrd Avenue | WBTR | - | B | 14.0 | 185 | B | 16.9 | 215 |
| Burgess Road | SBL | 770 | B | 17.3 | 139 | B | 18.6 | 136 |
| | SBR | 800 | B | 16.5 | 146 | B | 17.3 | 125 |
| Intersection | | | B | 12.0 | | B | 13.2 | |
| 12. Burgess Road/Harrisonburg Crossing Entrance <i>Signalized</i> | | | | | | | | |
| Harrisonburg Crossing | EBL | - | C | 33.7 | 209 | D | 37.3 | 211 |
| | EBL/T/R | - | C | 28.8 | 208 | D | 36.0 | 205 |
| Game Stop Driveway | WBL/T/R | - | D | 43.8 | 54 | D | 43.9 | 70 |
| Burgess Road | NBL | 290 | E | 61.8 | 181 | E | 62.6 | 166 |
| | NBT | 770 | C | 26.3 | 148 | C | 28.2 | 165 |
| | NBT/R | 770 | C | 26.3 | 157 | C | 28.2 | 167 |
| Burgess Road | SBL | 35 | D | 47.6 | 34 | D | 48.8 | 43 |
| | SBT | 100 | C | 23.9 | 132 | C | 24.7 | 127 |
| | SBR | 100 | B | 18.5 | 106 | C | 28.3 | 122 |
| Intersection | | | C | 27.9 | | C | 32.8 | |
| 13. Burgess Road/Clover Leaf Plaza Entrance <i>Signalized</i> | | | | | | | | |
| Clover Leaf Plaza | EBL/T/R | - | D | 44.8 | 162 | D | 43.5 | 227 |
| Market Square Service | WBL/T/R | - | D | 43.5 | 29 | D | 43.5 | 17 |
| Burgess Road | NBL | 60 | D | 42.9 | 45 | D | 40.2 | 55 |
| | NBT | 80 | A | 3.2 | 80 | A | 2.8 | 98 |
| | NBT/R | 80 | A | 3.2 | 72 | A | 2.8 | 87 |
| Burgess Road | SBL | 65 | B | 10.8 | 10 | B | 11.7 | 41 |
| | SBT | 450 | B | 13.4 | 171 | B | 14.9 | 258 |
| | SBT/R | 450 | B | 13.4 | 292 | B | 14.9 | 304 |
| Intersection | | | B | 11.2 | | B | 12.6 | |

University Boulevard

In addition to the updated 2040 traffic volumes, the future no build analysis for University Boulevard includes the roadway reconfiguration improvements east of Medical Avenue which are currently being designed. **Figure 20** conceptually illustrates the proposed improvements between Reservoir Street and Medical Avenue. **Figure 21** illustrates the 60% plans east of Medical Avenue.

Similar to existing conditions, three of the four University Boulevard study area intersections are currently operating under capacity. The intersection of University Boulevard and Reservoir Street operates at

overall LOS D during the midday peak hour and LOS E during the PM peak hour and a number of movements operate at LOS E and F. Levels of service E are noted in orange and F in red.

While the 2040 no build levels of service are similar to existing conditions, the 2040 queues increase significantly during the PM peak hour. With the exception of westbound University Boulevard, each of the through queues is 580 feet or greater with queues greater than 700 feet on Reservoir Street. Queues noted in red extend beyond the effective storage area and queues noted in maroon exceed 500 feet.

Figure 20: University Boulevard Roadway Reconfiguration Plans Reservoir Street to Medical Ave

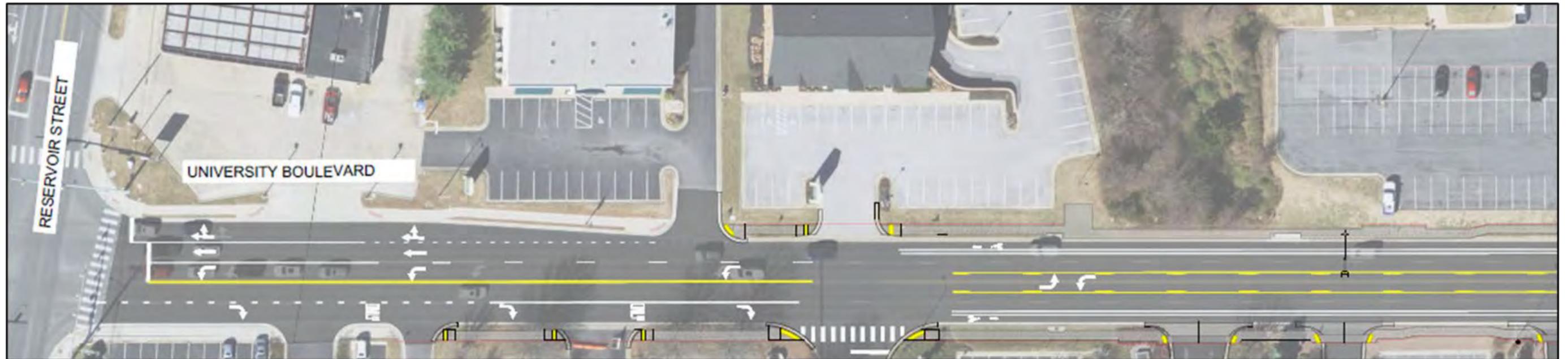


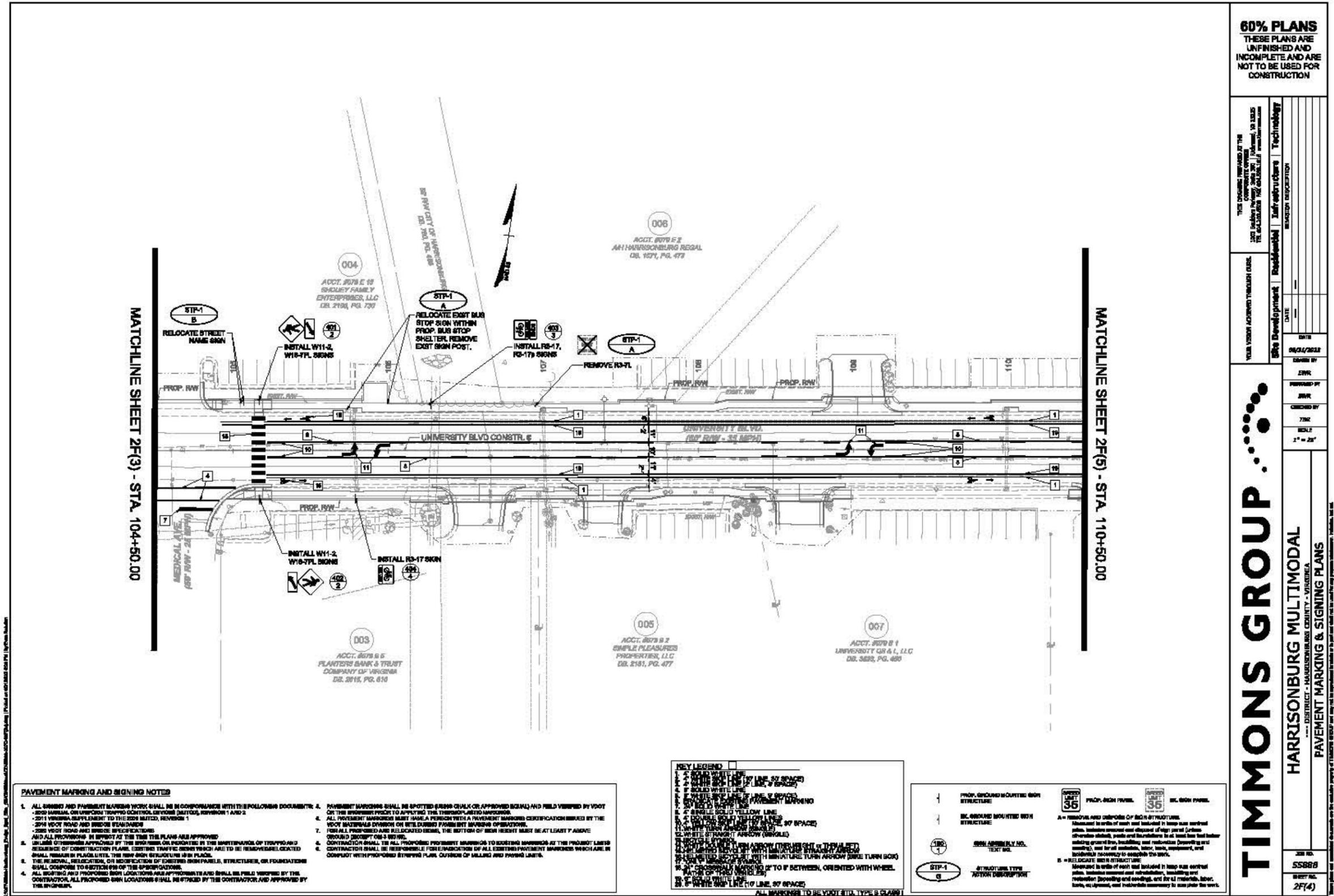
Table 17: University Boulevard 2040 No Build Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | 2040 No Build MID | | | 2040 No Build PM | | |
|---|-----------|--------------------|-------------------|-------------|------------------|------------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 21. University Boulevard/Carrier Drive <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 140 | A | 7.2 | 105 | B | 10.1 | 137 |
| | EBT | - | A | 4.5 | 144 | A | 6.7 | 216 |
| University Boulevard | WBT | 950 | B | 12.1 | 235 | B | 17.4 | 274 |
| | WBR | 150 | A | 5.2 | 48 | A | 4.8 | 73 |
| Carrier Drive | SBL | - | C | 20.6 | 100 | B | 19.8 | 152 |
| | SBR | - | B | 19.3 | 105 | B | 17.6 | 119 |
| Intersection | | | B | 10.1 | | B | 13.5 | |
| 22. University Boulevard/E Campus Drive <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 180 | B | 11.5 | 53 | B | 12.5 | 53 |
| | EBT | 950 | B | 15.8 | 134 | B | 18.2 | 279 |
| | EBR | 130 | B | 14.4 | 100 | B | 15.5 | 130 |
| University Boulevard | WBL | 100 | B | 12.1 | 100 | B | 13.7 | 100 |
| | WBT | 515 | B | 13.9 | 177 | B | 14.8 | 184 |
| | WBR | 130 | B | 13.0 | 25 | B | 13.3 | 25 |
| Costco Access | NBL | 70 | B | 16.3 | 67 | B | 16.9 | 67 |
| | NBT/R | - | B | 16.6 | 173 | B | 17.1 | 176 |
| E Campus Drive | SBL/T | - | C | 21.3 | 145 | C | 31.1 | 236 |
| | SBR | 180 | B | 15.1 | 51 | B | 15.8 | 130 |
| Intersection | | | B | 15.3 | | B | 18.0 | |

Table 17: University Boulevard 2040 No Build Traffic Operations Analysis Results (continued)

| Approach | Move-ment | Effec-tive Storage | 2040 No Build MID | | | 2040 No Build PM | | |
|---|-----------|--------------------|-------------------|-------------|------------------|------------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 23. University Boulevard/Reservoir Street <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 420 | F | 120.7 | 332 | F | 111.8 | 395 |
| | EBT | 515 | D | 50.8 | 334 | D | 52.7 | 580 |
| | EBR | 180 | D | 51.1 | 180 | E | 70.8 | 180 |
| University Boulevard | WBL | 370 | D | 48.3 | 226 | D | 51.6 | 289 |
| | WBT | 515 | E | 56.5 | 197 | E | 56.7 | 233 |
| | WBT/R | 255 | E | 56.5 | 190 | E | 56.7 | 220 |
| Reservoir Street | NBU/L | 260 | D | 44.3 | 260 | F | 116.7 | 260 |
| | NBT | 880 | C | 28.1 | 464 | C | 33.3 | 811 |
| | NBT/R | 880 | C | 28.1 | 438 | C | 33.3 | 763 |
| Reservoir Street | SBL | 390 | B | 18.6 | 317 | C | 23.8 | 390 |
| | SBT | 780 | D | 47.6 | 475 | D | 50.8 | 727 |
| | SBT/R | 780 | D | 47.6 | 459 | D | 50.8 | 714 |
| Intersection | | | D | 47.5 | | E | 56.6 | |
| 24. University Boulevard/Medical Avenue <i>Unsignalized</i> | | | | | | | | |
| University Boulevard | EBL | 150 | A | 8.2 | 21 | A | 0.0 | 0 |
| | EBT/R | 370 | A | 0.0 | 0 | A | 0.0 | 0 |
| University Boulevard | WBL | 150 | A | 8.6 | 45 | A | 8.9 | 33 |
| | WBT/R | 790 | A | 0.0 | 0 | A | 0.0 | 0 |
| Medical Avenue | NBL/T/R | - | C | 19.0 | 60 | C | 21.2 | 60 |
| Business Access | SBL/T/R | - | C | 19.6 | 33 | C | 20.1 | 33 |

Figure 21: University Boulevard Roadway Reconfiguration Plans east of Medical Avenue



Neff Avenue

In 2040, at least one movement operates at LOS F at each of the study intersections along Neff Avenue. The intersection of Neff Avenue and Reservoir Street degrades from overall LOS D to E in the AM peak hour. The westbound through movement continues to operate at LOS E and the eastbound left turn movement and northbound movements degrade to LOS E and F. Levels of service E are noted in orange and F in red.

All of the queues at the Reservoir Street intersection extend beyond the effective storage. The eastbound queue extends nearly 250 feet west of Sunchase Drive, a significant increase from existing conditions. Queues noted in red extend beyond the effective storage area and queues noted in maroon are greater than 500 feet.

Table 18: Neff Avenue 2040 No Build Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | 2040 No Build AM | | | 2040 No Build PM | | |
|---|-----------|--------------------|------------------|-------------|------------------|------------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 31. Neff Avenue/Reservoir Street <i>Signalized</i> | | | | | | | | |
| Neff Avenue | EBL | 360 | F | 151.2 | 387 | E | 78.7 | 384 |
| | EBT | 360 | D | 39.4 | 368 | D | 45.4 | 368 |
| | EBR | 230 | C | 31.0 | 230 | D | 38.0 | 230 |
| Neff Avenue | WBL | 165 | C | 29.4 | 93 | D | 35.3 | 165 |
| | WBT | - | D | 39.9 | 159 | E | 61.7 | 386 |
| | WBT | 180 | D | 39.9 | 148 | E | 61.7 | 180 |
| | WBR | 130 | D | 38.0 | 86 | D | 51.5 | 170 |
| Reservoir Street | NBL | 375 | B | 19.0 | 375 | E | 65.2 | 346 |
| | NBT | 740 | E | 55.8 | 582 | D | 39.4 | 378 |
| | NBT/R | 740 | E | 55.8 | 549 | D | 39.4 | 350 |
| Reservoir Street | SBU/L | 220 | C | 28.1 | 149 | C | 29.8 | 220 |
| | SBT | 870 | C | 25.3 | 155 | D | 43.7 | 886 |
| | SBR | 255 | B | 16.6 | 83 | C | 21.9 | 255 |
| Intersection | | | E | 57.5 | | D | 45.2 | |
| 32. Neff Avenue/Warwick Drive <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL/T | 830 | A | 8.8 | 874 | B | 12.0 | 407 |
| | EBT | 830 | A | 0.7 | 880 | A | 1.8 | 342 |
| Neff Avenue | WBT | 360 | A | 0.0 | 0 | A | 0.0 | 5 |
| | WBT/R | 360 | A | 0.0 | 4 | A | 0.0 | 18 |
| Warwick Drive | SBL/R | - | B | 10.9 | 84 | F | 57.4 | 308 |

Table 18: Neff Avenue 2040 No Build Traffic Operations Analysis Results (continued)

| Approach | Move-ment | Effec-tive Storage | 2040 No Build AM | | | 2040 No Build PM | | |
|--|-----------|--------------------|------------------|-------------|------------------|------------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 33. Neff Avenue/Sunchase Drive <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBT | 160 | A | 0.0 | 247 | A | 0.0 | 24 |
| | EBT/R | 160 | A | 0.0 | 248 | A | 0.0 | 31 |
| Neff Avenue | WBL/T | 830 | B | 10.1 | 43 | B | 11.3 | 79 |
| | WBT | 830 | A | 0.2 | 0 | A | 2.1 | 27 |
| Sunchase Drive | NBL/R | - | D | 29.5 | 235 | F | 256.5 | 127 |
| 34. Neff Avenue/Putter Court <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL/T | 460 | A | 8.6 | 452 | B | 11.6 | 182 |
| | EBT | 460 | A | 0.1 | 459 | A | 0.9 | 151 |
| Neff Avenue | WBT | 160 | A | 0.0 | 11 | A | 0.0 | 11 |
| | WBT/R | 160 | A | 0.0 | 4 | A | 0.0 | 18 |
| Putter Court | SBL | - | D | 26.4 | 380 | F | 141.2 | 233 |
| | SBR | 90 | B | 10.7 | 90 | B | 14.3 | 90 |
| 35. Neff Avenue/Turner Ashby Lane <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL/T | - | A | 8.7 | 368 | B | 10.9 | 45 |
| | EBT/R | - | A | 0.0 | 360 | A | 0.0 | 12 |
| Neff Avenue | WBL/T | 460 | A | 0.0 | 0 | B | 10.4 | 37 |
| | WBT/R | 460 | A | 0.0 | 0 | A | 0.1 | 0 |
| Thomas Bowers Circle | NBL/T/R | - | C | 18.7 | 25 | C | 19.3 | 30 |
| Turner Ashby Lane | SBL/T/R | - | B | 14.8 | 24 | F | 54.5 | 29 |

Alternatives Analysis

Traffic operations analyses were conducted to evaluate a variety of reconfiguration concepts for each of the study corridors in 2040 peak hour conditions. The goal of the alternatives is to reduce the space occupied by vehicular movements and repurpose it for use for bicycle accommodations.

The no build conditions Synchro models were used as a basis to develop the build models for the peak hour conditions. The models were updated with adjusted lane configurations and signal timings were optimized. All inputs and analysis methodologies were applied consistently with TOSAM Version 2.0. The full Synchro and SimTraffic reports are included in **Appendix E**.

A summary of the alternatives and resulting traffic operations follows.

Burgess Road

The following alternatives were considered for the Burgess Road corridor.

- ~~Single through lane southbound~~
- ~~Single through lane northbound~~
- Single through lane southbound between Harrisonburg Crossing and Evelyn Byrd Avenue only
- Single through lane southbound between Harrisonburg Crossing and Evelyn Byrd Avenue with a left turn lane into the future Hyatt Place entrance

Both the single through lane southbound and northbound through the full study corridor resulted in very long queues either through the Route 33 (E Market Street) intersection or into the Harrisonburg Crossing Shopping Center. As a result, these alternatives were dismissed and are shown with strike through text above.

Results of the analysis of a single southbound through lane between Harrisonburg Crossing and Evelyn Byrd Avenue are shown in **Table 19**.

Similar to existing and no build conditions, the Burgess Road study area intersections operate under capacity and the only queues that extend beyond the storage area provided are between the closely spaced Harrisonburg Crossing and Cloverleaf Plaza entrances with the modified lane configuration between Evelyn Byrd Avenue and the Harrisonburg Crossing entrance.

With the modified lane configuration, the queues at the Evelyn Byrd Avenue intersection increase for all movements compared to no build. However, the increase is two vehicles or less on both approaches of Evelyn Byrd Avenue and approximately four vehicles, or 100 feet, on Burgess Road. Queues noted in red extend beyond the effective storage area.

Table 19: Burgess Road 2040 Single Southbound Through Lane Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | 2040 Build MID | | | 2040 Build PM | | |
|---|-----------|--------------------|----------------|-------------|------------------|---------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 11. Burgess Road/Evelyn Byrd Avenue <i>Signalized</i> | | | | | | | | |
| Evelyn Byrd Avenue | EBL | 300 | A | 7.5 | 118 | A | 8.2 | 138 |
| | EBT | - | A | 6.2 | 120 | A | 6.2 | 134 |
| Evelyn Byrd Avenue | WBT/R | - | B | 15.7 | 224 | B | 18.3 | 240 |
| Burgess Road | SBL/R | 800 | B | 17.4 | 219 | C | 20.2 | 240 |
| Intersection | | | B | 13.2 | | B | 14.6 | |
| 12. Burgess Road/Harrisonburg Crossing Entrance <i>Signalized</i> | | | | | | | | |
| Harrisonburg Crossing | EBL | - | C | 33.7 | 215 | D | 37.3 | 220 |
| | EBL/T/R | - | C | 28.8 | 198 | D | 36.0 | 209 |
| Game Stop Driveway | WBL/T/R | - | D | 43.8 | 49 | D | 43.9 | 68 |
| Burgess Road | NBL | 290 | E | 61.8 | 148 | E | 62.6 | 170 |
| | NBT | 770 | C | 26.3 | 129 | C | 28.2 | 133 |
| | NBT/R | 770 | C | 26.3 | 133 | C | 28.2 | 141 |
| Burgess Road | SBL | 35 | D | 47.6 | 34 | D | 48.8 | 46 |
| | SBT | 100 | C | 23.9 | 133 | C | 24.7 | 129 |
| | SBR | 100 | B | 18.5 | 114 | C | 28.3 | 112 |
| Intersection | | | C | 27.9 | | C | 32.8 | |
| 13. Burgess Road/Clover Leaf Plaza Entrance <i>Signalized</i> | | | | | | | | |
| Clover Leaf Plaza | EBL/T/R | - | D | 44.8 | 127 | D | 43.5 | 254 |
| Market Square Service | WBL/T/R | - | D | 43.5 | 47 | D | 43.5 | 13 |
| Burgess Road | NBL | 60 | D | 42.9 | 48 | D | 40.2 | 56 |
| | NBT | 80 | A | 3.2 | 83 | A | 2.8 | 93 |
| | NBT/R | 80 | A | 3.2 | 67 | A | 2.8 | 79 |
| Burgess Road | SBL | 65 | B | 10.8 | 5 | B | 11.7 | 40 |
| | SBT | 450 | B | 13.4 | 159 | B | 14.9 | 216 |
| | SBT/R | 450 | B | 13.4 | 278 | B | 14.9 | 300 |
| Intersection | | | B | 11.2 | | B | 12.6 | |

University Boulevard

The following alternatives were considered for the University Boulevard corridor.

- ~~• Single through lanes eastbound and westbound~~
- ~~• Single through lanes eastbound and westbound with dual eastbound left turn lanes at Reservoir Street~~
- Shared westbound through/right turn lane at Carrier Drive, no changes to the other intersections
- ~~• Single through lanes eastbound and westbound with dual eastbound left turn lanes at Reservoir Street, shared westbound through/right turn lane at Carrier Drive, and separate westbound right turn lane at Reservoir Street~~
- Single through lanes eastbound and westbound west of E Campus Drive, single through lane westbound at E Campus Drive and Reservoir Street, two through lanes eastbound at E Campus Drive and Reservoir Street

All of the alternatives that included single through lanes eastbound and westbound through the full study corridor resulted in very long queues. As a result, these alternatives were dismissed and are shown with strike through text above.

Results of the analysis with removal of the separate westbound right turn lane at Carrier Drive are shown in **Table 20**. As shown, the intersection operates at LOS B overall and all movements can be accommodated within the provided storage areas. With removal of the separate westbound right turn lane the westbound queue increases by only 37 feet, less than two vehicles.

Table 20: University Boulevard and Carrier Drive 2040 Modified Lane Configuration Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | 2040 Build MID | | | 2040 Build PM | | |
|---|-----------|--------------------|----------------|-------------|------------------|---------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| <i>21. University Boulevard/Carrier Drive</i> | | | | | | | | |
| <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 140 | A | 7.1 | 114 | B | 10.5 | 129 |
| | EBT | - | A | 4.5 | 150 | A | 6.7 | 219 |
| University Boulevard | WBT/R | 950 | B | 12.6 | 225 | B | 17.9 | 237 |
| Carrier Drive | SBL | - | C | 21.2 | 92 | B | 20.0 | 165 |
| | SBR | - | B | 19.8 | 100 | B | 17.7 | 125 |
| Intersection | | | B | 10.6 | | B | 14.0 | |

Results of the analysis with single through lanes at Carrier Drive and a single westbound through lane throughout the entire corridor are shown in **Table 21**.

Similar to existing conditions and 2040 no build conditions, three of the four University Boulevard study area intersections operate under capacity with the modified lane configurations. The intersection of University Boulevard and Reservoir Street operates at overall LOS D during the midday peak hour and LOS E during the PM peak hour and a number of movements operate at LOS E and F. Levels of service E are noted in orange and F in red.

While the 2040 levels of service with the modified lane configurations are similar to no build conditions, the queues at Reservoir Street extend through Neff Avenue to the south and Evelyn Byrd Avenue to the north and both the northbound and southbound left turn queues exceed the provided storage area. Queues noted in red extend beyond the effective storage area and queues noted in maroon exceed 500 feet.

Table 21: University Blvd 2040 Modified Lane Configuration Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | 2040 Build MID | | | 2040 Build PM | | |
|---|-----------|--------------------|----------------|-------------|------------------|---------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 21. University Boulevard/Carrier Drive <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 140 | A | 7.1 | 110 | B | 10.5 | 137 |
| | EBT | - | A | 4.5 | 170 | A | 6.7 | 221 |
| University Boulevard | WBT/R | 950 | B | 12.6 | 200 | B | 17.9 | 277 |
| Carrier Drive | SBL | - | C | 21.2 | 92 | B | 20.0 | 142 |
| | SBR | - | B | 19.8 | 96 | B | 17.7 | 131 |
| Intersection | | | B | 10.6 | | B | 14.0 | |
| 22. University Boulevard/E Campus Drive <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 180 | B | 11.4 | 54 | B | 12.7 | 32 |
| | EBT | 950 | B | 15.6 | 156 | B | 18.2 | 256 |
| | EBR | 130 | B | 14.2 | 121 | B | 15.5 | 130 |
| University Boulevard | WBL | 100 | B | 12.0 | 100 | B | 13.7 | 100 |
| | WBT | 515 | B | 15.4 | 265 | B | 17.9 | 296 |
| | WBR | 130 | B | 12.8 | 130 | B | 13.3 | 130 |
| Costco Access | NBL | 70 | B | 16.9 | 69 | B | 16.9 | 69 |
| | NBT/R | - | B | 17.3 | 154 | B | 17.1 | 178 |
| E Campus Drive | SBL/T | - | C | 22.5 | 141 | C | 31.1 | 236 |
| | SBR | 180 | B | 15.7 | 69 | B | 15.8 | 140 |
| Intersection | | | B | 15.8 | | B | 18.6 | |

Table 21: University Blvd 2040 Modified Lane Configuration Traffic Operations Analysis Results (continued)

| Approach | Move-ment | Effec-tive Storage | 2040 Build MID | | | 2040 Build PM | | |
|---|-----------|--------------------|----------------|-------------|------------------|---------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 23. University Boulevard/Reservoir Street <i>Signalized</i> | | | | | | | | |
| University Boulevard | EBL | 420 | F | 101.3 | 376 | F | 98.9 | 407 |
| | EBT | 515 | D | 47.9 | 353 | D | 51.8 | 574 |
| | EBR | 180 | D | 48.3 | 180 | E | 67.6 | 180 |
| University Boulevard | WBL | 370 | D | 43.9 | 206 | D | 50.4 | 287 |
| | WBT | 255 | E | 63.1 | 252 | E | 65.8 | 284 |
| | WBR | 255 | D | 47.5 | 170 | D | 51.2 | 225 |
| Reservoir Street | NBU/L | 260 | D | 54.2 | 260 | F | 117.1 | 260 |
| | NBT | 880 | C | 30.9 | 519 | C | 34.4 | 885 |
| | NBT/R | 880 | C | 30.9 | 454 | C | 34.4 | 863 |
| Reservoir Street | SBL | 390 | C | 21.1 | 389 | C | 24.3 | 390 |
| | SBT | 780 | D | 52.2 | 555 | D | 52.6 | 842 |
| | SBT/R | 780 | D | 52.2 | 539 | D | 52.6 | 800 |
| Intersection | | | D | 48.5 | | E | 56.4 | |
| 24. University Boulevard/Medical Avenue <i>Unsignalized</i> | | | | | | | | |
| University Boulevard | EBL | 150 | A | 8.2 | 24 | A | 0.0 | 0 |
| | EBT/R | - | A | 0.0 | 0 | A | 0.0 | 0 |
| University Boulevard | WBL | 150 | A | 8.6 | 49 | A | 8.9 | 39 |
| | WBT/R | - | A | 0.0 | 0 | A | 0.0 | 17 |
| Medical Avenue | NBL/T/R | - | C | 19.0 | 54 | C | 21.2 | 67 |
| Business Access | SBL/T/R | - | C | 19.6 | 39 | C | 20.1 | 28 |

Neff Avenue

The Neff Avenue corridor varies from Burgess Road and University Boulevard as it currently provides bicycle lanes in both directions throughout the length of the study area and a mid-block pedestrian crossing between Putter Court and Sunchase Drive. As a result, the goals of the reconfiguration for this corridor vary from the others. The goals for the Neff Avenue corridor are to improve the existing mid-block pedestrian crossing and provide improved bicycle facilities.

A refuge island was proposed to improve the pedestrian crossing. Various lane configurations were considered to accommodate the refuge island and possible widening of the bicycle lanes. The following alternatives were considered for the Neff Avenue corridor.

- ~~Single through lane eastbound, two through lanes westbound (1)~~
 - ~~Dual eastbound left turn lanes at Reservoir Street (3)~~
- ~~Two through lanes eastbound, single through lane westbound (2)~~
 - ~~Dual eastbound left turn lanes at Reservoir Street (4)~~
- ~~Single through lanes eastbound and westbound throughout the corridor, left turn lanes at the unsignalized intersections, dual eastbound left turn lanes at Reservoir Street~~
 - ~~Warwick Street (Costco entrance) westbound right turn taper~~
 - ~~Warwick Street (Costco entrance) separate eastbound left turn lane and eastbound through lane~~
 - ~~Warwick Street (Costco entrance) right in/right out only~~
- Two eastbound through lanes that transition to dual eastbound left turn lanes and a single through lane east of Sunchase Drive, single westbound through lane, left turn lanes at the unsignalized intersections

The alternatives that included a single through lane eastbound resulted in very long queues, extending nearly 650 feet west of Turner Ashby Lane. Dual eastbound left turn lanes were added to this alternative and the eastbound queue decreased to 400 feet west of Putter Court. While an improvement, these alternatives were dismissed due to lengthy queues and are shown with strike through text above.

Similarly, the alternatives that included a single through lane westbound without turn lanes at the unsignalized intersections resulted in very long queues, exceeding 1,300 feet on the westbound approach at Reservoir Street and extending through the adjacent signalized intersections on Reservoir Drive with University Boulevard and Lucy Drive to the north and south, respectively. As a result, these alternatives were dismissed and are shown with strike through text above.

Results of the analysis with two eastbound through lanes, a single westbound through lane, and left turn lanes at the unsignalized intersections are shown in **Table 22**. As shown, the intersection of Neff Avenue and Reservoir Street operates at overall LOS E and D during the AM and PM peak hours, respectively.

The eastbound left turn movements operate at LOS F during the AM peak and the westbound left turn movement operates at LOS E along with a number of other movements.

The most notable impact of the roadway reconfiguration on traffic operations occurs on the eastbound and westbound through queues which both extend beyond 1,100 feet. The northbound and southbound queues on Reservoir Street extend beyond 600 feet but do not extend through the adjacent signalized intersections.

At each of the unsignalized intersections the side streets experience LOS F during the PM peak. At Sunchase Drive the delay is in excess of eight minutes.

Table 22: Neff Avenue 2040 Modified Lane Configuration Traffic Operations Analysis Results

| Approach | Move-ment | Effec-tive Storage | 2040 Build AM | | | 2040 Build PM | | |
|--|-----------|--------------------|---------------|-------------|------------------|---------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 31. Neff Avenue/Reservoir Street <i>Signalized</i> | | | | | | | | |
| Neff Avenue | EBL | 300 | F | 172.2 | 300 | E | 79.1 | 268 |
| | EBL | 360 | F | 172.2 | 397 | E | 79.1 | 289 |
| | EBT | 360 | D | 38.1 | 382 | E | 64.2 | 362 |
| | EBR | 230 | C | 30.3 | 230 | D | 45.5 | 230 |
| Neff Avenue | WBL | 165 | E | 55.5 | 129 | E | 56.4 | 165 |
| | WBT | - | D | 40.6 | 232 | E | 79.9 | 1165 |
| | WBR | 180 | D | 36.1 | 169 | D | 43.5 | 180 |
| Reservoir Street | NBL | 375 | C | 20.9 | 375 | E | 74.9 | 337 |
| | NBT | 740 | E | 74.8 | 643 | D | 41.9 | 476 |
| | NBT/R | 740 | E | 74.8 | 608 | D | 41.9 | 448 |
| Reservoir Street | SBU/L | 220 | C | 30.3 | 139 | C | 34.1 | 220 |
| | SBT | 870 | C | 26.9 | 176 | D | 47.7 | 785 |
| | SBR | 255 | B | 17.6 | 100 | C | 28.9 | 255 |
| Intersection | | | E | 68.4 | | D | 51.9 | |
| 32. Neff Avenue/Warwick Drive <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL/T | 830 | A | 8.8 | 763 | B | 12.0 | 331 |
| | EBT | 830 | A | 0.6 | 764 | A | 1.8 | 187 |
| Neff Avenue | WBT/R | 360 | A | 0.0 | 22 | A | 0.0 | 243 |
| Warwick Drive | SBL/R | - | B | 12.6 | 96 | F | 137.4 | 329 |

Table 22: Neff Avenue 2040 Modified Lane Configuration Traffic Operations Analysis Results (continued)

| Approach | Move-ment | Effec-tive Storage | 2040 Build AM | | | 2040 Build PM | | |
|---|-----------|--------------------|---------------|-------------|------------------|---------------|-------------|------------------|
| | | | LOS | Delay (sec) | Max Queue (feet) | LOS | Delay (sec) | Max Queue (feet) |
| 33. Neff Avenue/Sunchase Drive <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBT | 160 | A | 0.0 | 127 | A | 0.0 | 20 |
| | EBT/R | 160 | A | 0.0 | 138 | A | 0.0 | 34 |
| Neff Avenue | WBL | 150 | B | 10.0 | 36 | B | 11.2 | 113 |
| | WBT | 830 | A | 0.0 | 24 | A | 0.0 | 625 |
| Sunchase Drive | NBL/R | - | E | 41.7 | 195 | F | 485.4 | 248 |
| 34. Neff Avenue/Putter Court <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL | 150 | A | 8.6 | 54 | B | 11.6 | 61 |
| | EBT | 460 | A | 0.0 | 153 | A | 0.0 | 0 |
| Neff Avenue | WBT/R | 160 | A | 0.0 | 31 | A | 0.0 | 36 |
| Putter Court | SBL | - | C | 24.6 | 189 | F | 97.8 | 306 |
| | SBR | 90 | B | 13.1 | 82 | C | 24.3 | 90 |
| 35. Neff Avenue/Turner Ashby Lane <i>Unsignalized</i> | | | | | | | | |
| Neff Avenue | EBL | 150 | A | 8.7 | 17 | B | 10.9 | 20 |
| | EBT | - | A | 0.0 | 14 | A | 0.0 | 2 |
| | EBT/R | - | A | 0.0 | 10 | A | 0.0 | 0 |
| Neff Avenue | WBL | 150 | A | 0.0 | 0 | B | 10.4 | 21 |
| | WBT/R | 460 | A | 0.0 | 0 | A | 0.0 | 0 |
| Thomas Bowers Circle | NBL/T/R | - | C | 24.8 | 25 | D | 30.8 | 28 |
| Turner Ashby Lane | SBL/T/R | - | C | 15.9 | 25 | F | 51.3 | 22 |

Preferred Alternative

Burgess Road

While evaluating the alternatives and through discussions with the City, it was determined that the impacts on traffic operations resulting from removing a northbound lane at the Harrisonburg Crossing entrance intersection were not acceptable. As a result, the space available was not sufficient to provide bicycle lanes in both directions on Burgess Road. The decision to provide a bicycle lane in the southbound direction rather than the northbound direction was based on the significant uphill grade when traveling southbound.

Roadway Reconfiguration Improvement Concept

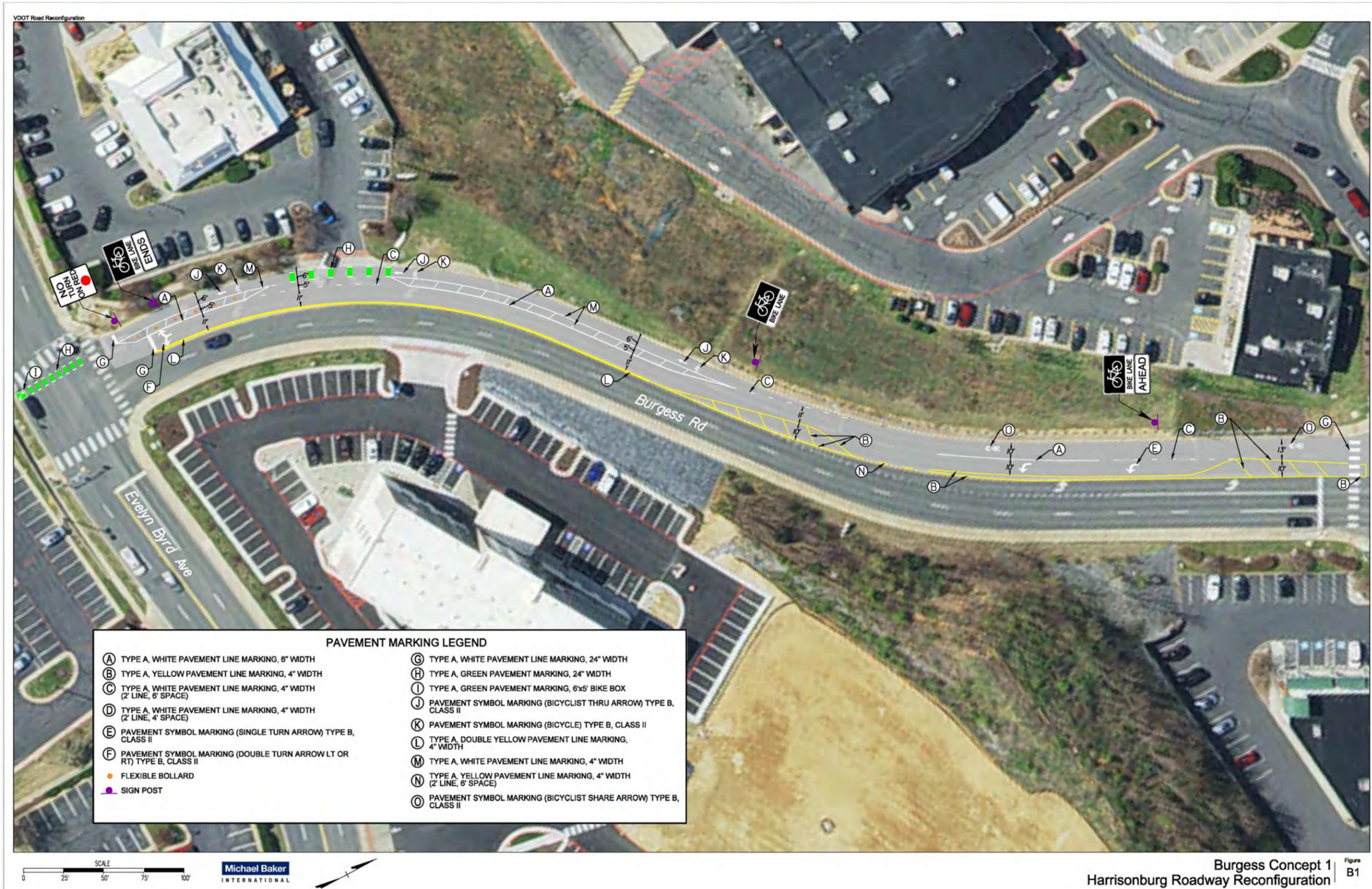
Figure 22 illustrates the preferred roadway reconfiguration concept which provides a southbound buffered bicycle lane between Evelyn Byrd Avenue and the Harrisonburg Crossing entrance intersection. The concept also includes the proposed roadway reconfiguration improvements along Evelyn Byrd Avenue. To protect cyclists at the Harrisonburg Crossing entrance intersection, tubular delineators are recommended to direct right turning vehicles to the single through lane.

A new entrance into the Hyatt Place property was approved by the City and requires a left turn lane. The entrance has yet to be designed and has an unknown construction date. However, a concept was developed to ensure that the proposed roadway reconfiguration would not preclude addition of the turn lane into the Hyatt Place property and is shown in Figure 23. As shown, addition of the left turn lane shifts the start of the bicycle lane further south and includes shared lane markings in the through lane adjacent to the left turn lane. While the buffered bicycle lane is preferable through the entire segment of roadway, the area where the buffered bicycle lane remains is the most important as it has the steepest grade.

Figure 22: Burgess Road Roadway Reconfiguration Concept



Figure 23: Burgess Road Roadway Reconfiguration Concept with Left Turn Lane



University Boulevard

While evaluating the alternatives and through discussions with the City, it was determined that the impacts on traffic operations resulting from removing a through lane in both the eastbound and westbound directions throughout the entire corridor were not acceptable. However, removal of a through lane in both directions west of E Campus Drive does not change the level of service for any of the movements at the Carrier Drive intersection and the greatest change in the queue for any movement is approximately one vehicle (26 feet).

At the intersections of E Campus Drive, Reservoir Street, and Medical Avenue, reducing the westbound direction to a single through lane and maintaining two eastbound through lanes was analyzed and the traffic operations improved compared to single through lanes in both directions.

Compared to no build conditions, the greatest impacts of reducing the westbound direction to a single through lane occurred on the northbound and southbound approaches of the intersection of Reservoir Street. With the reduction to a single through lane westbound, the northbound and southbound Reservoir Street queues extend through the adjacent signalized intersections during the PM peak hour. During the Midday peak hour the northbound and southbound queues increase, but by less than 100 feet and they do not extend through the adjacent signalized intersections. The northbound and southbound left turn lane queues also extend beyond the provided storage areas.

Aside from the spillback through the adjacent signalized intersections on Reservoir Street, the delay, levels of service, and queues vary minimally between the no build conditions and reducing the westbound direction to a single through lane throughout the length of the study area.

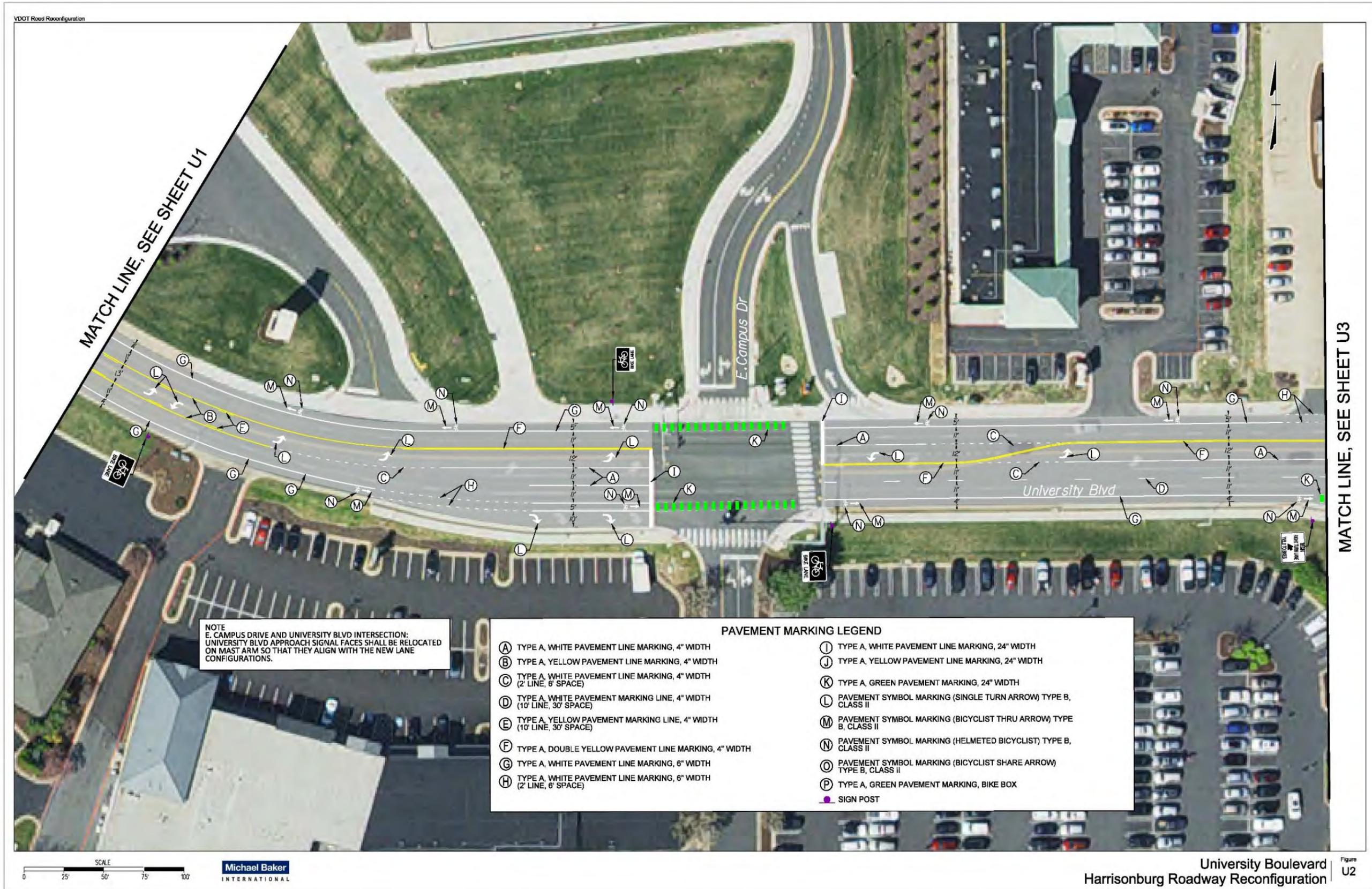
Two possibilities for implementation are available. One option is to implement the changes with the next repaving and if traffic volumes increase at the rates anticipated in this study, return the roadway to its current markings if the vehicular capacity is needed. A second option is to implement the changes only west of E Campus Drive where the impacts on traffic operations are minimal.

Roadway Reconfiguration Improvement Concept

Figure 24 illustrates the preferred roadway reconfiguration concept which provides:

- Eastbound and westbound buffered bicycle lanes between Carrier Drive and E Campus Drive
- Eastbound and westbound bicycle lanes between E Campus Drive and Reservoir Street
- Eastbound and westbound shared lane bicycle markings east of Reservoir Street connecting to the bicycle lanes that begin at Medical Avenue

Figure 24: University Boulevard Roadway Reconfiguration Concept (continued)



Neff Avenue

The primary goal for the Neff Avenue corridor is to improve the existing mid-block pedestrian crossing. To do so a refuge island is desired. In addition to adding a pedestrian island, continuing the bicycle lanes through the intersection of Reservoir Street is also desired. In order to accommodate either of these improvements within the existing curb lines, removal of a vehicular travel lane is necessary. While evaluating the alternatives and through discussions with the City, it was determined that the impacts on traffic operations resulting from removing a through lane in both the eastbound and westbound directions were not acceptable.

Removal of a through lane in either the eastbound or westbound direction was considered and analyzed. Removal of a through lane in the westbound direction had less impact on traffic operations than removal of a through lane in the eastbound direction.

Compared to no build conditions, the greatest negative impacts of reducing the westbound direction to a single through lane occur at the Reservoir Drive intersection and include:

- Neff Avenue westbound queue increases by 985 feet to more than 1,100 feet
- Neff Avenue eastbound through movement degrades from LOS D to LOS E in the PM peak
- Neff Avenue westbound left turn movement degrades from LOS C to LOS E in the AM peak and LOS D to LOS E in the PM peak
- Warwick Drive southbound delay increases by 80 seconds, from 57.4 seconds to 137.4 seconds during the PM peak hour
- Sunchase Drive northbound delay increases by nearly 230 seconds, from 256.5 seconds to 485.4 seconds during the PM peak hour

While the roadway reconfiguration increases the delays and queues for some movements, the addition of the left turn lanes on Neff Avenue at the unsignalized intersections reduces the eastbound queues at Sunchase Drive, Putter Court, and Turner Ashby Lane.

Understanding that the roadway reconfiguration alternative significantly impacts vehicular traffic operations, the City will have to consider whether implementation is feasible and within tolerable congestion thresholds.

Roadway Reconfiguration Improvement Concept

Figure 25 illustrates the preferred roadway reconfiguration concept which provides:

- Pedestrian refuge island at the existing crosswalk
- Left turn lanes at Putter Court and Sunchase Drive
- Dual eastbound left turn lanes at Reservoir Street
- Eastbound and westbound bicycle lanes through the intersection with Reservoir Street

Figure 25: Neff Avenue Roadway Reconfiguration Concept

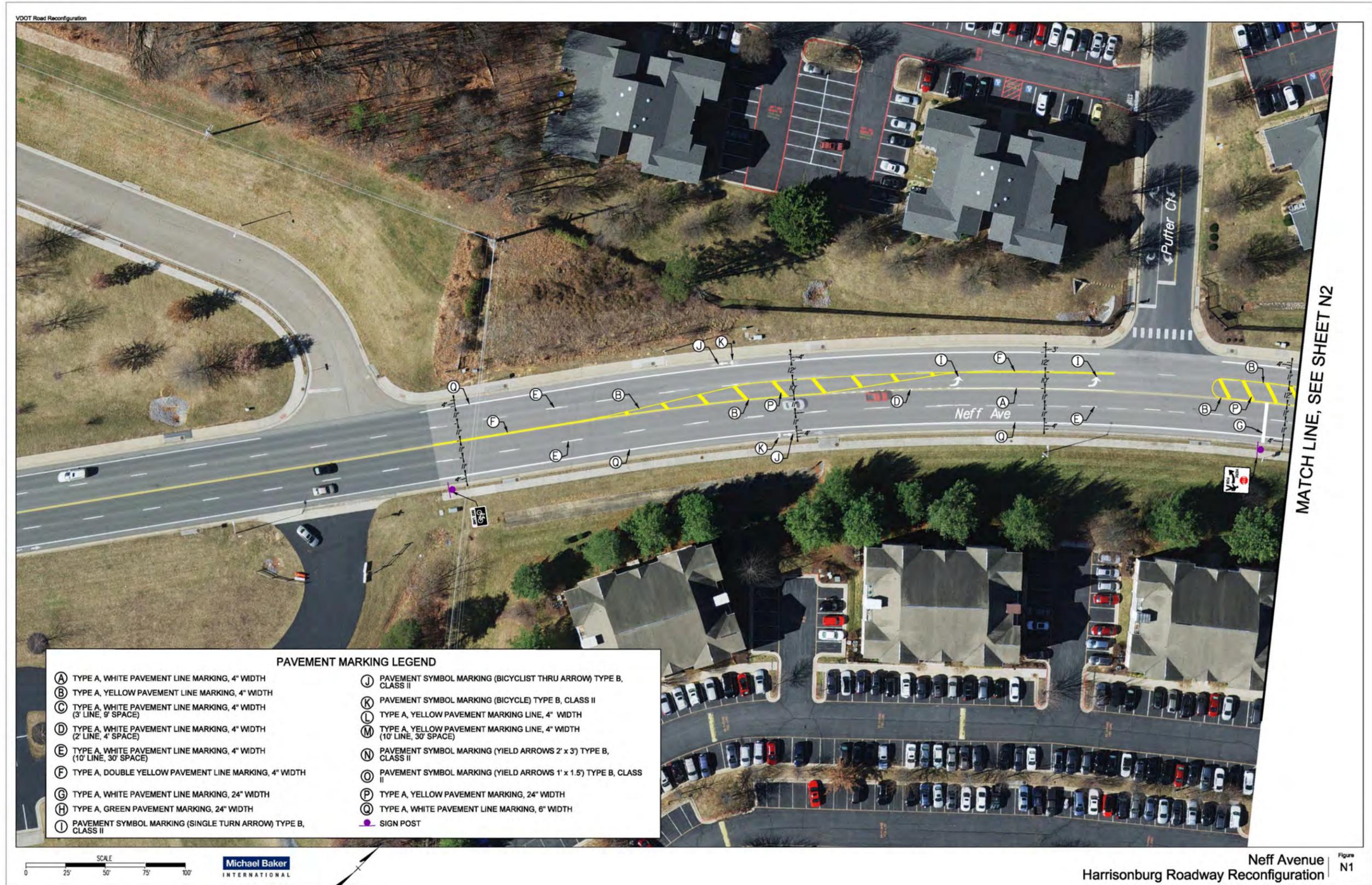


Figure 25: Neff Avenue Roadway Reconfiguration Concept

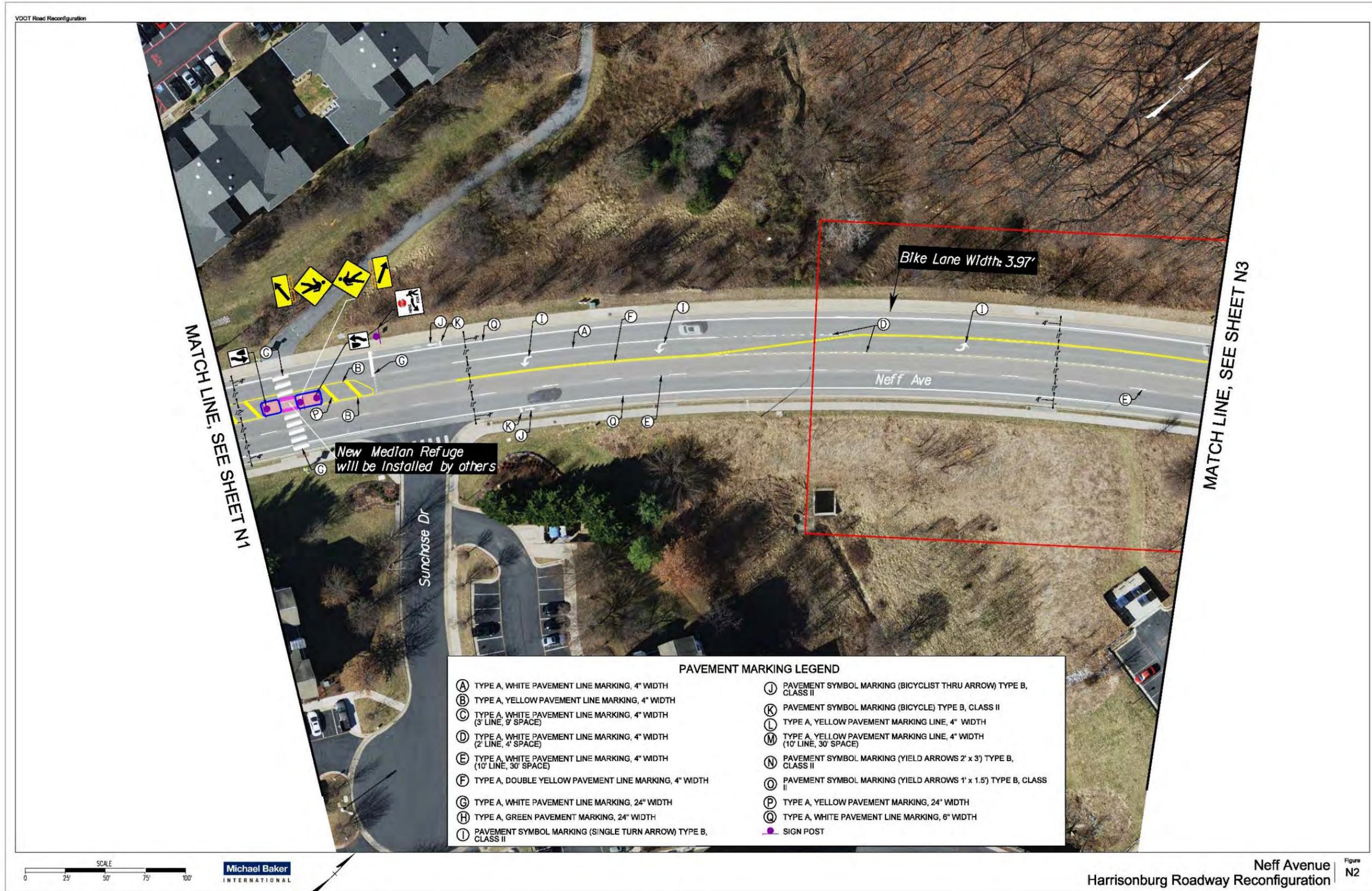


Figure 25: Neff Avenue Roadway Reconfiguration Concept

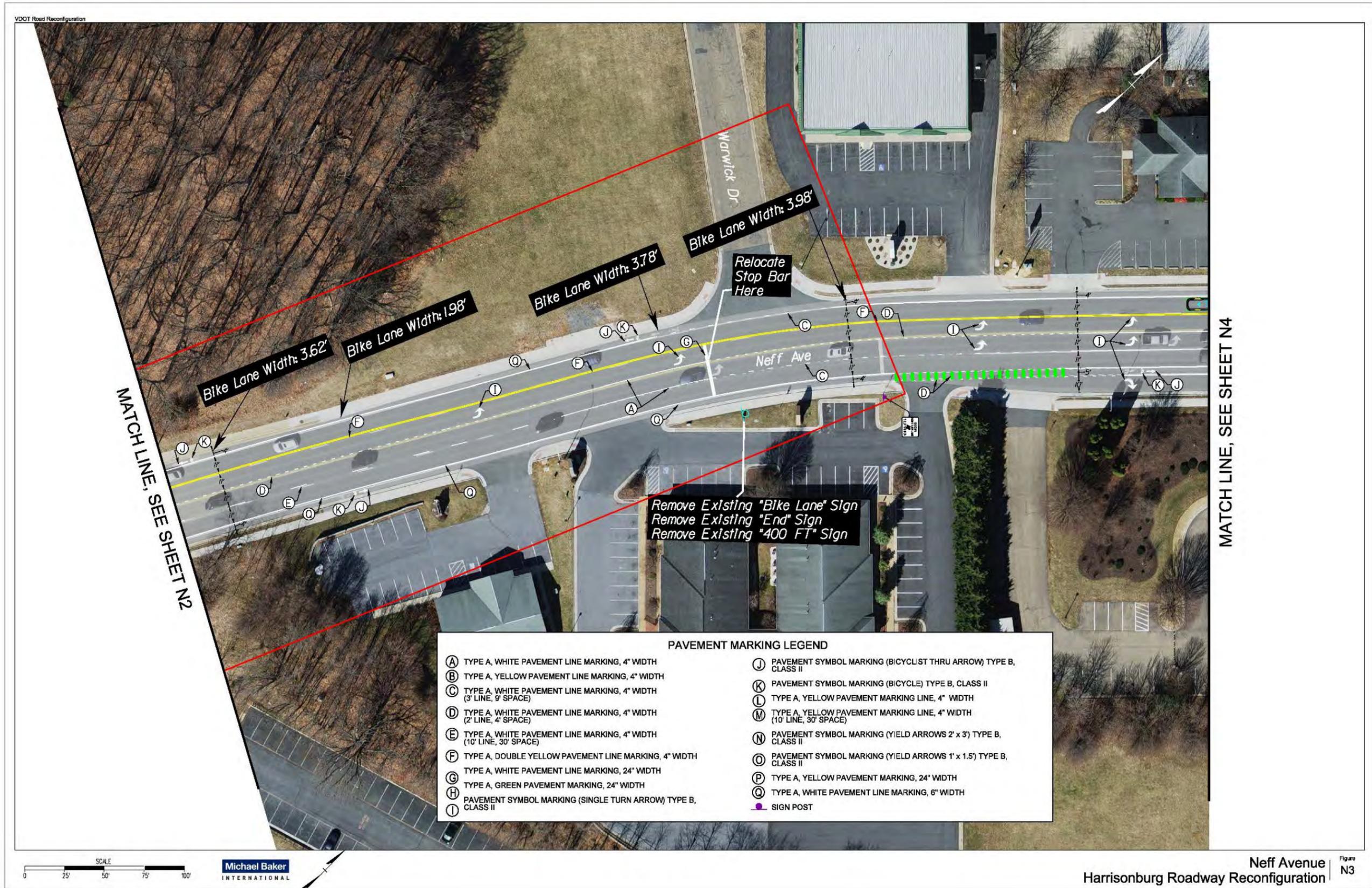
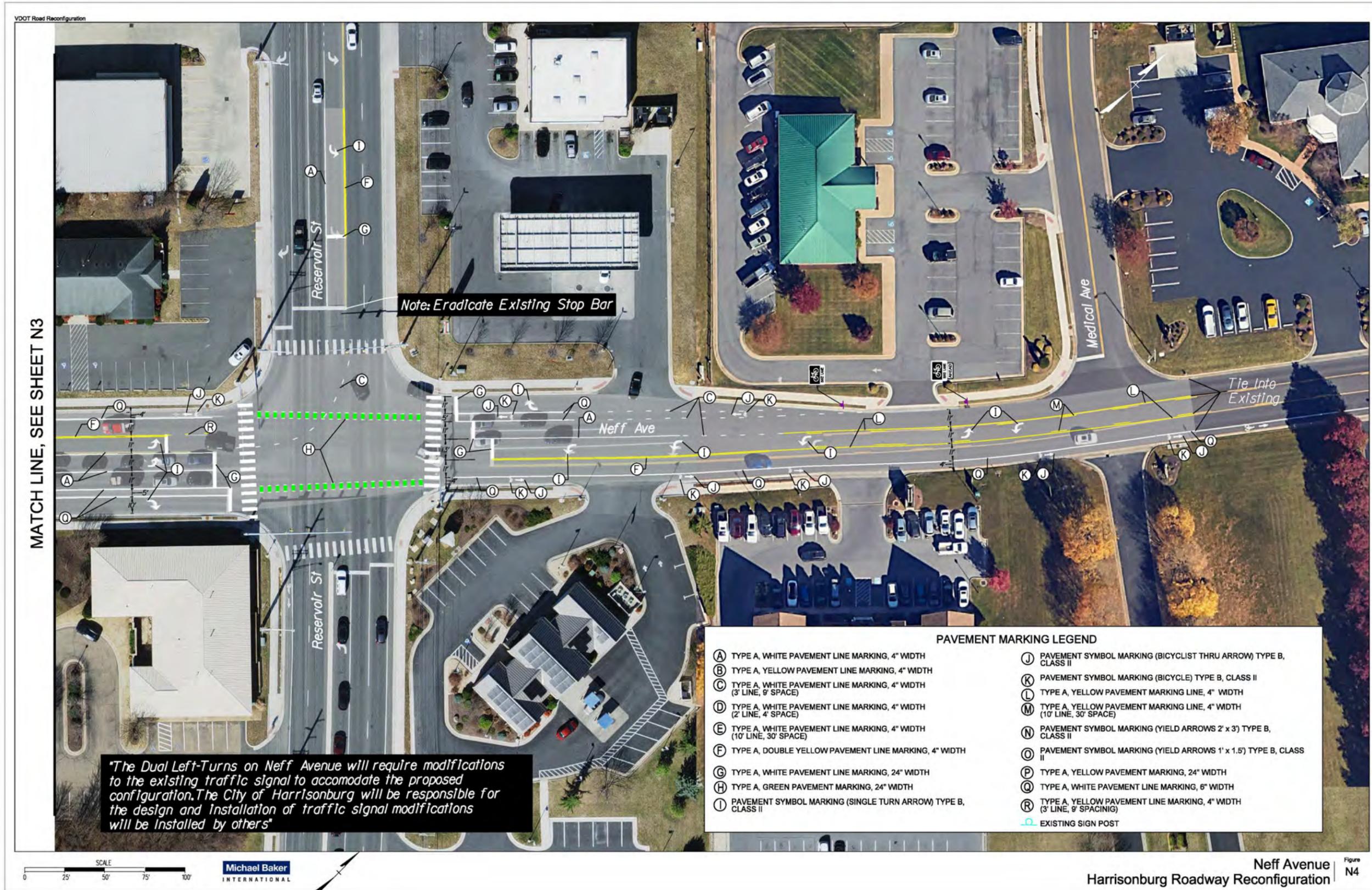


Figure 25: Neff Avenue Roadway Reconfiguration Concept



Cost Estimates

An engineer's preliminary opinion of probable cost was created for each corridor. No right of way acquisition costs or utility relocation costs are expected. The estimates are based on two-year statewide unit costs and are summarized in **Table 23**. Detailed cost estimates are included in **Appendix F**.

The cost estimate for the Burgess Road corridor is for the option shown in **Figure 22** which includes a southbound buffered bike lane from the Harrisonburg Crossing entrance to Evelyn Byrd Avenue and does not include a left turn lane into Hyatt Place. While not included in **Table 23**, the cost estimate for the left turn lane option is included in **Appendix F**.

Table 23: Roadway Reconfiguration Cost Estimates

| Corridor | Cost | Contingency | Mobilization | Total* |
|----------------------|-----------|-------------|--------------|-------------|
| Burgess Road | \$28,100 | \$7,000 | \$3,500 | \$39,000 |
| University Boulevard | \$458,400 | \$160,400 | \$61,900 | \$681,000 |
| Neff Avenue | \$702,700 | \$246,000 | \$94,900 | \$1,044,000 |

*Rounded to nearest \$1,000

Noteworthy assumptions related to the cost estimates include:

- Mill and overlay is assumed for Neff Avenue and University Boulevard; however, these costs are not included and were assumed to be completed by others through City maintenance program.
- Traffic signal work is included in the Neff Avenue and University Boulevard projects, with the contingency increased due to additional complexity.
- Thermoplastic material assumed for pavement markings with Methyl Methacrylate (MMA) pavement marking material assumed for the green traffic paint markings.

An additional concept and cost estimate for Neff Avenue with a single eastbound left turn lane at Reservoir Street is also included in **Appendix F**.