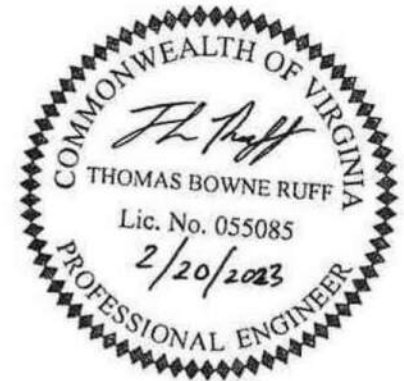


To: Tyler Ammermann
Up Campus Student Living, LLC
From: Thomas Ruff, PE, PTOE, AICP
RE: 1193 Seminole Trail
Turn Lane Warrant Analysis & Access Management Exception
Date: February 20, 2023
Copy: Clint Shifflett, PE (TG); Megan Nedostup, AICP (JLL)



Timmons Group performed a turn lane warrant analysis and access management exception (AM-E) for the proposed 1193 Seminole Trail residential development by Up Campus on US Route 29 in Albemarle, Virginia. The site is located just south of the US Route 29 at Greenbrier Drive intersection, on the southeast quadrant. See Figure 1 for the site location (all figures can be found at the end of this memorandum).

The proposed development will consist of approximately 300 dwelling units of multi-family housing in a 5-story building. The site will have approximately 7,500 SF of general commercial space on the first floor. Access to the site will be provided via two (2) proposed partial access entrances on US Route 29, one of which will be right-in only (370' from stop bar) and one of which will be a shared right-in/right-out entrance with the WaWa property located at 1215 Seminole Trail (125' from stop bar). The project is expected to be completed within 3 years; therefore, a 2026 buildout year has been assumed. The site layout is shown in Figure 2.

Background Information

US Route 29 is a ten-lane, divided principal arterial with a posted speed limit of 45 mph. According to 2019 VDOT count data, US Route 29 services approximately 54,000 vehicles per day and primarily serves as the major corridor for traffic through Albemarle County.

Greenbrier Drive (Route 866) is a three-lane, undivided urban major collector. To the west of US Route 29, the roadway is posted at 35 mph and carries approximately 8,000 vehicles per day. To the east of US Route 29, the roadway is posted at 25 mph and carries approximately 4,800 vehicles per day.

Existing Traffic Volumes

Peak hour directional turning movement (DTM) counts were collected on January 26, 2023, at the US Route 29 at Greenbrier Drive intersection during the AM (7-9) and PM (4-6) peak hours. Using the collected traffic data, the peak hours were determined to be 7:30 – 8:30 for the AM peak and 4:30 – 5:30 for the PM peak. The 2023 existing volumes can be found in Figure 3. A copy of all count data can be found in Appendix A.

Background Traffic Volumes

The 2023 existing volumes were grown by 1% for 3 years to develop the background 2026 traffic volumes. The 2026 background growth volumes can be found on Figure 4.

The existing entrance on US Route 29 for the WaWa development located at 1215 Seminole Trail is proposed to be shared with the 1193 Seminole Trail property. The WaWa development is currently developing at this time and data collection was not possible. The following represents the trip generation and distribution for the background traffic at the WaWa entrance.

The WaWa development will consist of approximately 18 fueling positions and a 6,000 SF convenience store. Trips were generated using the ITE's *Trip Generation Manual, 11th Edition* for Land Use Code 945 with fueling positions as the independent variable, respectively. The background trip generation estimate is summarized in Table 1 below:

**Table 1:
 Site-Generated Traffic for WaWa Development (Background)**

| WaWa Development Background | | | | Weekday ⁽¹⁾ | | | | | | |
|--|------|--------------|---------------|-----------------------------|--------------|--------------|--------------|--------------|--------------|------------------------------------|
| Land Use | Size | Units | Land Use Code | AM Peak Hour ⁽²⁾ | | | PM Peak Hour | | | Average Daily Trips ⁽³⁾ |
| | | | | In | Out | Total | In | Out | Total | |
| 1. ITE Trip Generation ⁽¹⁾ | | | | | | | | | | |
| Convenience Store/Gas Station | 18 | VFP | 945 | 285 | 284 | 569 | 242 | 242 | 484 | 6,224 |
| Total ITE Generated Trips | | | | 285 | 284 | 569 | 242 | 242 | 484 | 6,224 |
| 2. Pass-By Trip Reduction ⁽²⁾ | | Pass-By Rate | | | | | | | | |
| | | 76% AM | | (217) | (216) | (432) | (182) | (182) | (363) | (4,668) |
| | | 75% PM | | | | | | | | |
| Total Pass-By Trips | | | | (217) | (216) | (432) | (182) | (182) | (363) | (4,668) |
| 3. Net New Trips (ITE - Pass-By) | | | | 68 | 68 | 137 | 60 | 60 | 121 | 1,556 |

Notes: (1) Based on the Institute of Transportation Engineers Trip Generation, 11th Edition. Assumes General Urban/Suburban land use category.
 (2) Pass-by Rates from ITE Trip Generation 11th Edition. ADT set to equal PM as ITE has no ADT Pass-By data.

Pass-by trips are trips that would be drawn to the development from the existing traffic stream on adjacent streets. These trips are intermediate stops on the route from an origin to the primary destination (i.e. stopping for gas on the route from work to home). These trips will not add to the overall traffic volumes on the roadway but will add to the turning traffic at the site entrances.

In accordance with VDOT Chapter 527 guidelines, the pass-by trip reduction was obtained from the ITE Trip Generation Manual, 11th Edition and indicates a 76% pass-by reduction in the AM peak hour and a 75% pass-by reduction in the PM peak hour. The ADT pass-by rate was assumed to equal the PM rate as ITE has no ADT data.

Based on the existing roadway geometry and traffic volumes, it is estimated that 75% of the WaWa development site traffic will utilize the entrance on US Route 29 as a right-in/right-out for access and 25% will enter via the Greenbrier Drive entrance. The pass-by site trips breakdown is shown on Figure 5. The new site trips breakdown is shown on Figure 6.

The 2026 background growth volumes were added to the WaWa pass-by and new trip development volumes. The 2026 background volumes can be found on Figure 7.

Proposed Trip Generation & Distribution

The proposed 1193 Seminole Trail residential development will consist of approximately 300 dwelling units of multi-family housing in a 5-story building. The site will have approximately 7,500 SF of general commercial space on the first floor. Trips were generated using the ITE's *Trip Generation Manual, 11th Edition* for Land Use Codes 221 and 822 with dwelling units and square footage as the independent variable, respectively. The trip generation estimate is summarized in Table 1 below:

**Table 2:
 Site-Generated Traffic for 1193 Seminole Trail Development**

| 1193 Seminole Trail Development - UpCampus | | | | Weekday | | | | | | Average Daily Trips |
|---|-------|-------|---------------|--------------|-----------|------------|--------------|-----------|------------|---------------------|
| Land Use | Size | Units | Land Use Code | AM Peak Hour | | | PM Peak Hour | | | |
| | | | | In | Out | Total | In | Out | Total | |
| 1. ITE Trip Generation⁽¹⁾ | | | | | | | | | | |
| <u>Residential</u> | | | | | | | | | | |
| Multi-family Housing (Mid-Rise) | 300 | D.U. | 221 | 28 | 92 | 120 | 71 | 46 | 117 | 1,385 |
| Residential Subtotal | | | | 28 | 92 | 120 | 71 | 46 | 117 | 1,385 |
| <u>Retail</u> | | | | | | | | | | |
| General Commercial (<40,000 SF) | 7,500 | S.F. | 822 | 11 | 7 | 18 | 32 | 31 | 63 | 408 |
| Retail Subtotal | | | | 11 | 7 | 18 | 32 | 31 | 63 | 408 |
| Total ITE Generated Trips (Residential + Retail) | | | | 39 | 99 | 138 | 103 | 77 | 180 | 1,793 |

Notes: (1) Based on the Institute of Transportation Engineers Trip Generation, 11th Edition. Assumes General Urban/Suburban land use category.

Based on the existing roadway geometry and traffic volumes, all traffic for the proposed development will have to access the site via one of the two partial access entrances. Given the proximity it is estimated that 75% of the residential and commercial development site traffic will utilize the entrance the first entrance and 25% will utilize the second entrance for access. All exiting traffic will make a right out of the site from the second entrance. The proposed site trips breakdown is shown on Figure 8.

Projected Total Traffic

The 2026 background volumes shown on Figure 7 were combined with the site-generated traffic estimates shown on Figure 8 to calculate the 2026 total traffic volumes.

The 2026 total traffic volumes are shown on Figure 9.

Turn Lane Warrant Analysis

The 2026 total volumes (background growth + WaWA development + proposed site) shown on Figure 9 were used in conjunction with the appropriate left and right turn lane nomographs from Appendix F of the VDOT *Road Design Manual*. The northbound right turn movements on US Route 29 at both proposed entrances were analyzed for turn lane warrants.

The turn lane nomographs used in the analysis are shown on Figures 10 and 11.

The turn lane warrant analysis indicates the following:

- Northbound right turn lane is warranted on US Route 29 at the right-in only entrance
- Northbound right turn lane is warranted on US Route 29 at the shared entrance

Given the posted speed limit and urban classification, the minimum turn lane configuration on US Route 29 is 100' of storage and 100' of taper.

Access Management Exception Request

In accordance with Table 2-2 of the VDOT *Road Design Manual, Appendix F* and the characteristics of US Route 29 (principal arterial with posted 45 mph speed limit), the proposed shared right-in/right out entrance requires 495 feet (measured centerline to centerline) from the intersection of US Route 29 at Greenbrier Drive. As shown on the conceptual site plan, the proposed shared right-in/right-out entrance spacing from the signalized intersection is 185 feet, or 310 feet short of the standard. In addition, the proposed right-in only entrance requires 495 feet from the proposed shared right-in/right-out only entrance. As shown on the conceptual site plan, the proposed right-in only entrance spacing from the proposed shared right-in/right-out intersection is 245 feet, or 250 feet short of the standard. The proposed right-in only entrance is also located 50 feet from the existing entrance to 1185 Seminole Trail, which is 445 feet short of the standard.

An Access Management Exception (AM-E) request is required as both proposed entrances on US Route 29 do not meet spacing standards and both entrances are within the functional area of the adjacent US Route 29 at Greenbrier Drive signalized intersection.

An operational analysis of the existing, background, and proposed conditions has been performed to provide supporting documentation for the AM-E request.

Operational and Queuing Analysis

Per VDOT traffic engineering policy, the existing 2023 peak hour volumes, the 2026 background volumes with the WaWa development, and the projected 2026 total peak hour volumes were analyzed using appropriate TOSAM methodology to determine the operational effectiveness of the existing intersection geometry, the background geometry, and the impacts of the proposed new site traffic.

The operational and queuing analyses were performed using SYNCHRO Version 11 and HCM 6th Edition methodologies for the signalized intersection and HCM 2000 for the proposed unsignalized intersections due to the geometric limitations of HCM 6th Edition. It should be further noted that the number of lanes on US Route 29 is reduced to 4 for the background and total scenarios for the HCM 2000 analysis only, as HCM 2000 does not allow calculation of 5 lanes on the mainline. The SimTraffic analysis is completed using the appropriate geometry.

The analysis assumed level terrain, exclusion of bus or parking impacts, exclusion of pedestrians, heavy vehicle percentages based on collected traffic data, use of the existing PHF for all analysis years for the signalized intersection and used a PHF of factor 0.92 for the proposed intersections. The corresponding SYNCHRO worksheets are included in Appendix B.

Table 3 summarizes the existing 2023 intersection LOS, delay, 95th percentile queue lengths, and maximum queue lengths based on the existing traffic volumes the existing geometry.

**Table 3:
 Intersection Level of Service, Delay, and Queue Summary
 Existing 2023 Conditions**

| Intersection and Type of Control | Movement and Approach | TOSAM Turn Lane Storage (ft) | AM PEAK HOUR | | | | PM PEAK HOUR | | | |
|---|-----------------------|------------------------------|------------------------------|------------------|---------------------------------------|-------------------------------------|------------------------------|------------------|---------------------------------------|-------------------------------------|
| | | | Delay ¹ (sec/veh) | LOS ¹ | HCS 95th Percentile Queue Length (ft) | Simulated Maximum Queue Length (ft) | Delay ¹ (sec/veh) | LOS ¹ | HCS 95th Percentile Queue Length (ft) | Simulated Maximum Queue Length (ft) |
| 1. US Route 29 (N-S) at Greenbrier Drive (E-W) Signalized | EB Left | 200 | 48.1 | D | 137 | 169 | 53.3 | D | 183 | 192 |
| | EB Thru | | 49.9 | D | 90 | 155 | 50.3 | D | 113 | 172 |
| | EB Right | 325 | 50.8 | D | 0 | 78 | 47.2 | D | 24 | 90 |
| | <i>EB Approach</i> | | <i>49.4</i> | <i>D</i> | -- | -- | <i>50.1</i> | <i>D</i> | -- | -- |
| | WB Left | 425 | 45.2 | D | 107 | 158 | 44.7 | D | 98 | 128 |
| | WB Thru/Right | | 90.1 | F | #165 | 165 | 99.1 | F | #251 | 254 |
| | <i>WB Approach</i> | | <i>67.6</i> | <i>E</i> | -- | -- | <i>80.0</i> | <i>E</i> | -- | -- |
| | NB Dual Left | 750 | 48.6 | D | #135 | 207 | 55.8 | E | #171 | 236 |
| | NB Thru | | 19.9 | B | 219 | 311 | 23.8 | C | 391 | 410 |
| | NB Thru-Right | | 21.0 | C | -- | 61 | 25.8 | C | -- | 126 |
| | <i>NB Approach</i> | | <i>23.7</i> | <i>C</i> | -- | -- | <i>27.3</i> | <i>C</i> | -- | -- |
| | SB Left | 275 | 61.0 | E | 117 | 267 | 69.8 | E | 65 | 272 |
| | SB Thru | | 28.4 | C | 384 | 375 | 33.4 | C | 442 | 373 |
| | SB Right | 300 | 8.8 | A | 30 | 98 | 9.8 | A | 14 | 84 |
| | <i>SB Approach</i> | | <i>27.8</i> | <i>C</i> | -- | -- | <i>32.3</i> | <i>C</i> | -- | -- |
| Overall | | | 29.3 | C | -- | -- | 33.3 | C | -- | -- |

¹ Overall intersection LOS and delay reported for signalized intersections and roundabouts only.

- 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

As shown in Table 3, the overall signalized intersection operates at LOS C during both the AM and PM peak hours. The mainline movements on northbound and southbound US Route 29 do not have any operational issues. The side street approaches operate at LOS D for all movements except for the westbound through/right. The queuing analysis shows that all existing turn lanes are capable of handling the existing volumes.

It should be noted that the northbound through-right lane on US Route 29 at Greenbrier Drive has a simulated queue of 61 feet in the AM peak and 126 feet in the PM peak.

Table 4 summarizes the projected 2026 background intersection LOS, delay, 95th percentile queue lengths, and maximum queue lengths based on the background traffic volumes and background geometry with the WaWa right-in/right-out entrance.

**Table 4:
 Intersection Level of Service, Delay, and Queue Summary
 Background 2026 Conditions**

| Intersection and Type of Control | Movement and Approach | TOSAM Turn Lane Storage (ft) | AM PEAK HOUR | | | | PM PEAK HOUR | | | |
|--|-----------------------|------------------------------|------------------------------|------------------|---------------------------------------|-------------------------------------|------------------------------|------------------|---------------------------------------|-------------------------------------|
| | | | Delay ¹ (sec/veh) | LOS ¹ | HCS 95th Percentile Queue Length (ft) | Simulated Maximum Queue Length (ft) | Delay ¹ (sec/veh) | LOS ¹ | HCS 95th Percentile Queue Length (ft) | Simulated Maximum Queue Length (ft) |
| 1. US Route 29 (N-S) at Greenbrier Drive (E-W) Signalized | EB Left | 200 | 49.1 | D | 142 | 184 | 54.5 | D | 187 | 195 |
| | EB Thru | | 50.0 | D | 92 | 145 | 54.8 | D | 116 | 223 |
| | EB Right | 325 | 56.1 | E | 0 | 92 | 137.5 | F | 29 | 149 |
| | <i>EB Approach</i> | | <i>51.8</i> | <i>D</i> | <i>--</i> | <i>--</i> | <i>90.4</i> | <i>F</i> | <i>--</i> | <i>--</i> |
| | WB Left | 425 | 64.7 | E | #234 | 295 | 46.7 | D | 164 | 237 |
| | WB Thru/Right | | 94.0 | F | #169 | 215 | 106.7 | F | #261 | 274 |
| | <i>WB Approach</i> | | <i>75.3</i> | <i>E</i> | <i>--</i> | <i>--</i> | <i>77.6</i> | <i>E</i> | <i>--</i> | <i>--</i> |
| | NB Dual Left | 750 | 48.6 | D | #142 | 98 | 57.9 | E | #180 | 98 |
| | NB Thru | | 23.0 | C | 237 | 165 | 27.4 | C | 420 | 161 |
| | NB Thru-Right | | 24.5 | C | -- | 116 | 30.2 | C | -- | 123 |
| | <i>NB Approach</i> | | <i>26.4</i> | <i>C</i> | <i>--</i> | <i>--</i> | <i>30.8</i> | <i>C</i> | <i>--</i> | <i>--</i> |
| | SB Left | 275 | 122.4 | F | #268 | 274 | 176.8 | F | #215 | 274 |
| | SB Thru | | 28.3 | C | 378 | 512 | 33.4 | C | 455 | 430 |
| | SB Right | 300 | 9.0 | A | 33 | 98 | 9.5 | A | 16 | 126 |
| <i>SB Approach</i> | | <i>33.1</i> | <i>C</i> | <i>--</i> | <i>--</i> | <i>37.9</i> | <i>D</i> | <i>--</i> | <i>--</i> | |
| Overall | | | 33.9 | C | -- | -- | 40.6 | D | -- | -- |
| 2. US Route 29 (N-S) at WaWa RI/RO Entrance (E-W) Unsignalized | WB Right | | 19.8 | C | 67 | 121 | 27.3 | C | 81 | 203 |
| | <i>WB Approach</i> | | 19.8 | C | -- | -- | 27.3 | -- | -- | -- |
| | NB Thru | | † | † | † | † | † | † | † | † |
| | NB Thru-Right | | † | † | † | † | † | † | † | † |
| | <i>NB Approach</i> | | † | † | -- | -- | † | † | -- | -- |
| | SB Thru | | † | † | † | † | † | † | † | † |
| <i>SB Approach</i> | | † | † | -- | -- | † | † | -- | -- | |

¹ Overall intersection LOS and delay reported for signalized intersections and roundabouts only.

† SYNCHRO does not provide level of service or delay for unsignalized movements with no conflicting volumes.

- 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

As shown in Table 4, the overall signalized intersection continues to operate at LOS C during the AM peak but worsens to operate at LOS D during the PM peak. The mainline movements on northbound and southbound US Route 29 do not have any operational issues. The southbound left to access the WaWa through Greenbrier Drive sees additional operational delays but the queues are contained within the existing turn lane. The side street approaches have a worsening delay due to the additional background volumes and the additional WaWa volumes on Greenbrier Drive. The queuing analysis shows that all turn lanes are capable of handling the volumes.

It should be noted that the northbound through-right lane on US Route 29 at Greenbrier Drive has a simulated queue of 116 feet in the AM peak and 123 feet in the PM peak.

Table 5 summarizes the projected 2026 total intersection LOS, delay, 95th percentile queue lengths, and maximum queue lengths based on the total traffic volumes and proposed geometry with a shared right-in/right-out entrance with WaWa and a right-in only entrance. The right-in entrance is not shown on the figure as there is no operational results for an unsignalized through-right movement.

**Table 5:
 Intersection Level of Service, Delay, and Queue Summary
 Total 2026 Conditions**

| Intersection and Type of Control | Movement and Approach | TOSAM Turn Lane Storage (ft) | AM PEAK HOUR | | | | PM PEAK HOUR | | | |
|--|-----------------------|------------------------------|------------------------------|------------------|---------------------------------------|-------------------------------------|------------------------------|------------------|---------------------------------------|-------------------------------------|
| | | | Delay ¹ (sec/veh) | LOS ¹ | HCS 95th Percentile Queue Length (ft) | Simulated Maximum Queue Length (ft) | Delay ¹ (sec/veh) | LOS ¹ | HCS 95th Percentile Queue Length (ft) | Simulated Maximum Queue Length (ft) |
| 1. US Route 29 (N-S) at Greenbrier Drive (E-W) Signalized | EB Left | 200 | 49.1 | D | 142 | 162 | 54.5 | D | 187 | 192 |
| | EB Thru | | 50.0 | D | 92 | 119 | 54.8 | D | 116 | 246 |
| | EB Right | 325 | 56.1 | E | 0 | 84 | 137.5 | F | 29 | 185 |
| | <i>EB Approach</i> | | 51.8 | D | -- | -- | 90.4 | F | -- | -- |
| | WB Left | 425 | 64.7 | E | #234 | 318 | 46.7 | D | 164 | 211 |
| | WB Thru/Right | | 94.0 | F | #169 | 249 | 106.7 | F | #261 | 261 |
| | <i>WB Approach</i> | | 75.3 | E | -- | -- | 77.6 | E | -- | -- |
| | NB Dual Left | 750 | 48.6 | D | #142 | 98 | 57.9 | E | #180 | 98 |
| | NB Thru | | 23.4 | C | 255 | 163 | 28.0 | C | 440 | 161 |
| | NB Thru-Right | | 25.1 | C | -- | 117 | 31.1 | C | -- | 122 |
| | <i>NB Approach</i> | | 26.7 | C | -- | -- | 31.3 | C | -- | -- |
| | SB Left | 275 | 122.4 | F | #268 | 274 | 176.8 | F | #215 | 274 |
| | SB Thru | | 28.3 | C | 378 | 492 | 33.4 | C | 455 | 492 |
| | SB Right | 300 | 9.0 | A | 33 | 108 | 9.5 | A | 16 | 129 |
| | <i>SB Approach</i> | | 33.1 | C | -- | -- | 37.9 | D | -- | -- |
| Overall | | | 33.9 | C | -- | -- | 40.7 | D | -- | -- |
| 2. US Route 29 (N-S) at WaWa RI/RO Entrance (E-W) Unsignalized | WB Right | | 30.5 | D | 145 | 212 | 47.9 | D | 175 | 290 |
| | <i>WB Approach</i> | | 30.5 | D | -- | -- | 47.9 | -- | -- | -- |
| | NB Thru | | † | † | † | † | † | † | † | † |
| | NB Thru-Right | | † | † | † | † | † | † | † | † |
| | <i>NB Approach</i> | | † | † | -- | -- | † | † | -- | -- |
| | SB Thru | | † | † | † | † | † | † | † | † |
| <i>SB Approach</i> | | † | † | -- | -- | † | † | -- | -- | |

¹ Overall intersection LOS and delay reported for signalized intersections and roundabouts only.

† SYNCHRO does not provide level of service or delay for unsignalized movements with no conflicting volumes.

- 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

As shown in Table 5, the overall signalized intersection continues to operate at LOS C during the AM peak and at LOS D during the PM peak. The mainline movements on northbound and southbound US Route 29 do not have any operational issues. The southbound left to access the WaWa through Greenbrier Drive sees additional operational delays but the queues are contained within the existing turn lane. The side street approaches have a worsening delay due to the additional background volumes and the additional WaWa volumes on Greenbrier Drive. The queuing analysis shows that all turn lanes are capable of handling the volumes.

It should be noted that the northbound through-right lane on US Route 29 at Greenbrier Drive has a simulated queue of 117 feet in the AM peak and 122 feet in the PM peak.

Conclusions

A turn lane warrant analysis, queuing analysis, and operational analysis were prepared in support of the proposed residential development located at 1193 Seminole Trail.

The results of the analysis indicate the following:

- The proposed development on US Route 29 will consist of approximately 300 dwelling units of multi-family housing with approximately 7,500 SF of commercial space in the first floor. The proposed development will generate a total of 1,793 daily trips, 138 AM peak trips (39 in and 99 out), and 180 PM peak trips (103 in and 77 out).
- Access to the site will be provided via two (2) proposed partial access entrances on US Route 29, one of which will be right-in only (370' from stop bar) and one of which will be a shared right-in/right-out entrance with the WaWa property located at 1215 Seminole Trail (125' from stop bar).
- A turn lane warrant analysis was performed for the northbound right turn movements on US Route 29 at the two (2) proposed entrances. The analysis shows that both entrances warrant right turn lanes based on the proposed traffic volumes.
- The operational analysis of the 2023 existing conditions found that the overall signalized intersection of US Route 29 at Greenbrier Drive operated at LOS C during both peak hours. The queuing analysis shows that all existing turn lanes are capable of handling the existing volumes.
- Under 2026 background conditions with the WaWa development only, the overall signalized intersection of US Route 29 at Greenbrier Drive maintained similar levels of service to the existing, with only the SB left and WB left operating poorly due to the additional traffic from the gas station. The queuing analysis shows that all existing turn lanes are capable of handling the background volumes.
- Under 2026 total conditions with the proposed mixed-use development only, the overall signalized intersection of US Route 29 at Greenbrier Drive maintained similar levels of service to the background and did not make the side streets worse. The queuing analysis shows that all existing turn lanes are capable of handling the background volumes.
- Per VDOT standards, a proposed partial access entrances on a principal arterial posted at 45 mph will require 495 feet from any other intersection. The proposed shared right-in/right-out entrance with WaWa is located 185 feet from the signalized intersection and will require an exception of 310 feet. The proposed right-in only entrance is located 50 feet from the existing entrance to 1185 Seminole Trail, which will require an exception of 445 feet.

Recommendations

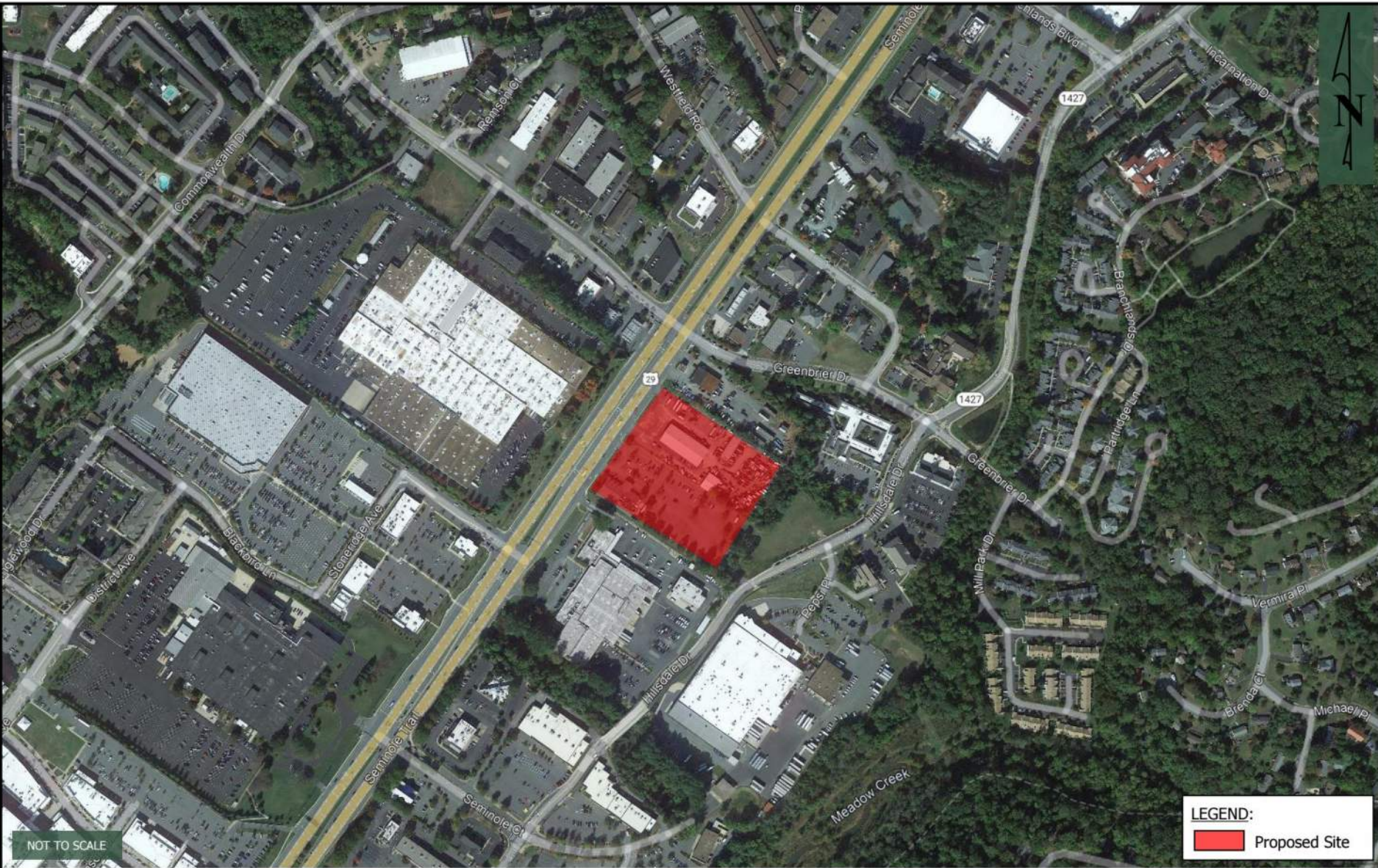
While the turn lane warrant analysis indicates a northbound right turn lane is warranted at both proposed partial access entrances to US Route 29, the installation of those improvements is not recommended for the following reasons:

1. Improvement on Existing Conditions – The parcel for 1215 Seminole Trail (WaWa) has 2 existing right-in/right-out partial entrances on US Route 29. The parcel for 1193 Seminole Trail (new development) has 2 existing right-in/right-out partial entrances on US Route 29. The proposed development will condense the 4 existing partial access entrances down to 2 partial access entrances, one of which will be right-in only.
2. Existing Through-Right Lane – The existing northbound US Route 29 corridor has a 5-lane section that is made up of 4 through lanes and 1 through-right lane. The operational analysis found that the queuing for the northbound through-right lane at the signalized intersection was less than 130 feet in the existing conditions, which indicates that the lane has capacity to perform as a de facto right turn lane.
3. Impact on Adjacent Property – Based on survey data, the existing right-of-way along US Route 29 is insufficient to accommodate widening associated with the aforementioned auxiliary turn lane. The geometric improvements would require the acquisition of right-of-way from adjacent landowners and construction costs in excess of \$1,000,000 for the benefit of 4 left turns.
4. Operational Analysis – Per the operational analysis, the through-right lane on US Route 29 northbound does not have queuing or capacity concerns. The analysis shows that the addition of the traffic volumes for the proposed development will not have a negative impact on the operations of the signalized intersection nor the US Route 29 corridor.

Based on the summary of information provided in this report, a northbound right turn lane on US Route 29 is not recommended for installation in association with the proposed residential development for either the proposed shared right-in/right-out partial entrance or the proposed right-in partial entrance.

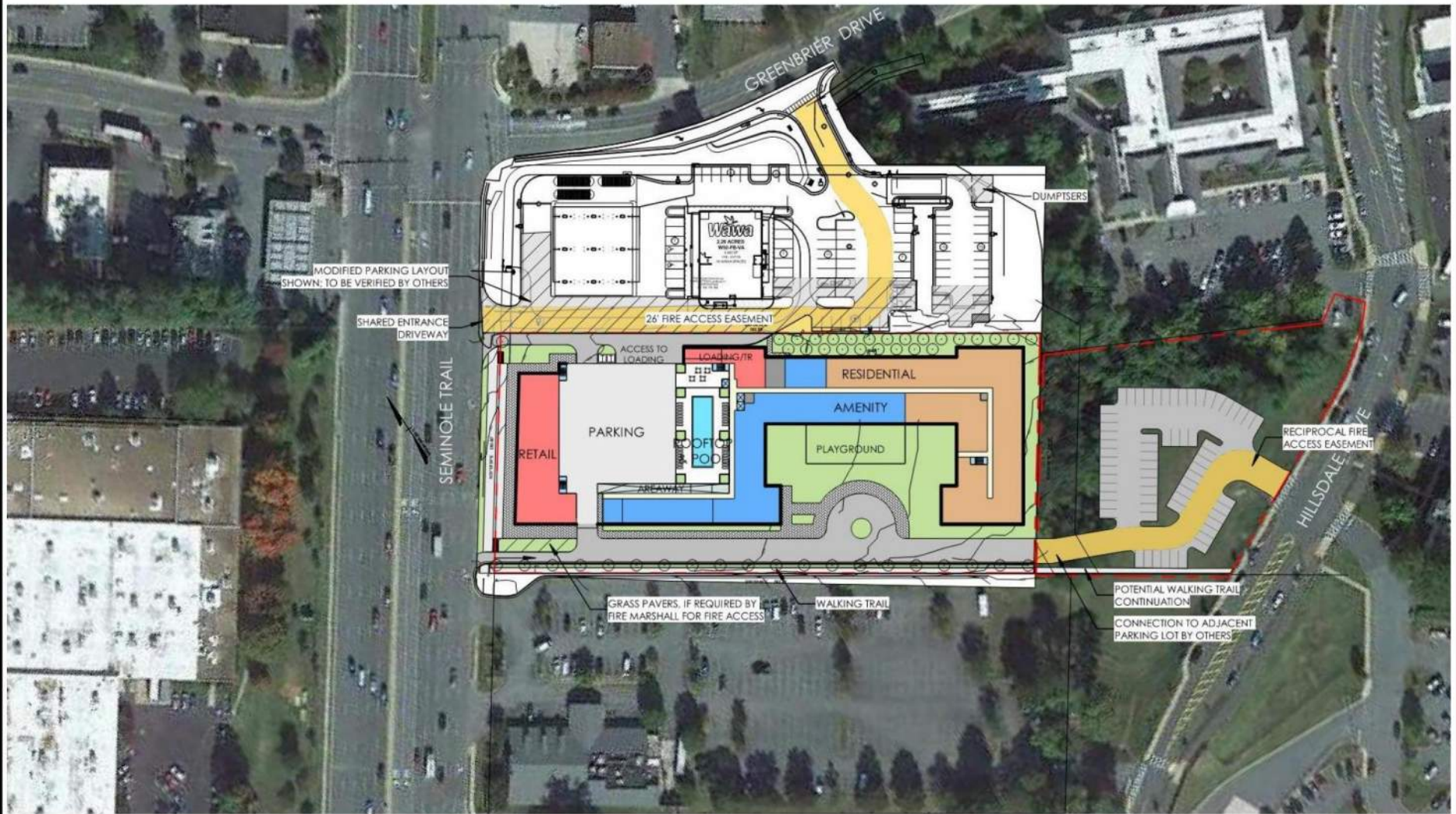
In addition, given the improvement to the existing access management on US Route 29 northbound, it is recommended that the Access Management Exception (AM-E) be approved for both proposed partial access entrances to be installed at less than the minimum spacing standard.

The VDOT form for requesting an AM-E is included in Appendix C.



1193 Seminole Trail Residential Development
Surrounding Roadway Network and Site Location
Albemarle, VA

Figure
1

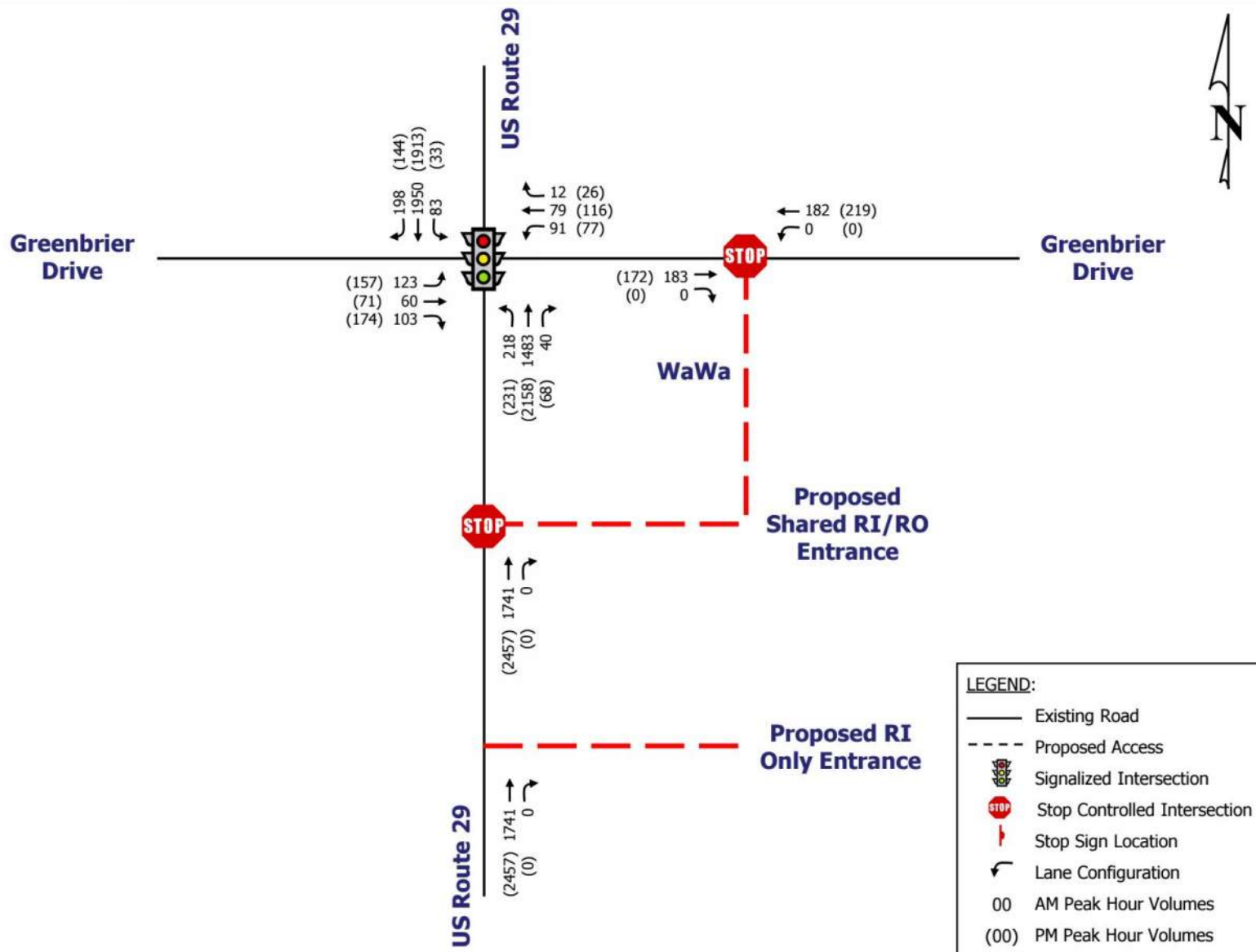


NOT TO SCALE



1193 Seminole Trail Residential Development Conceptual Site Plan Albemarle, VA

Figure
2

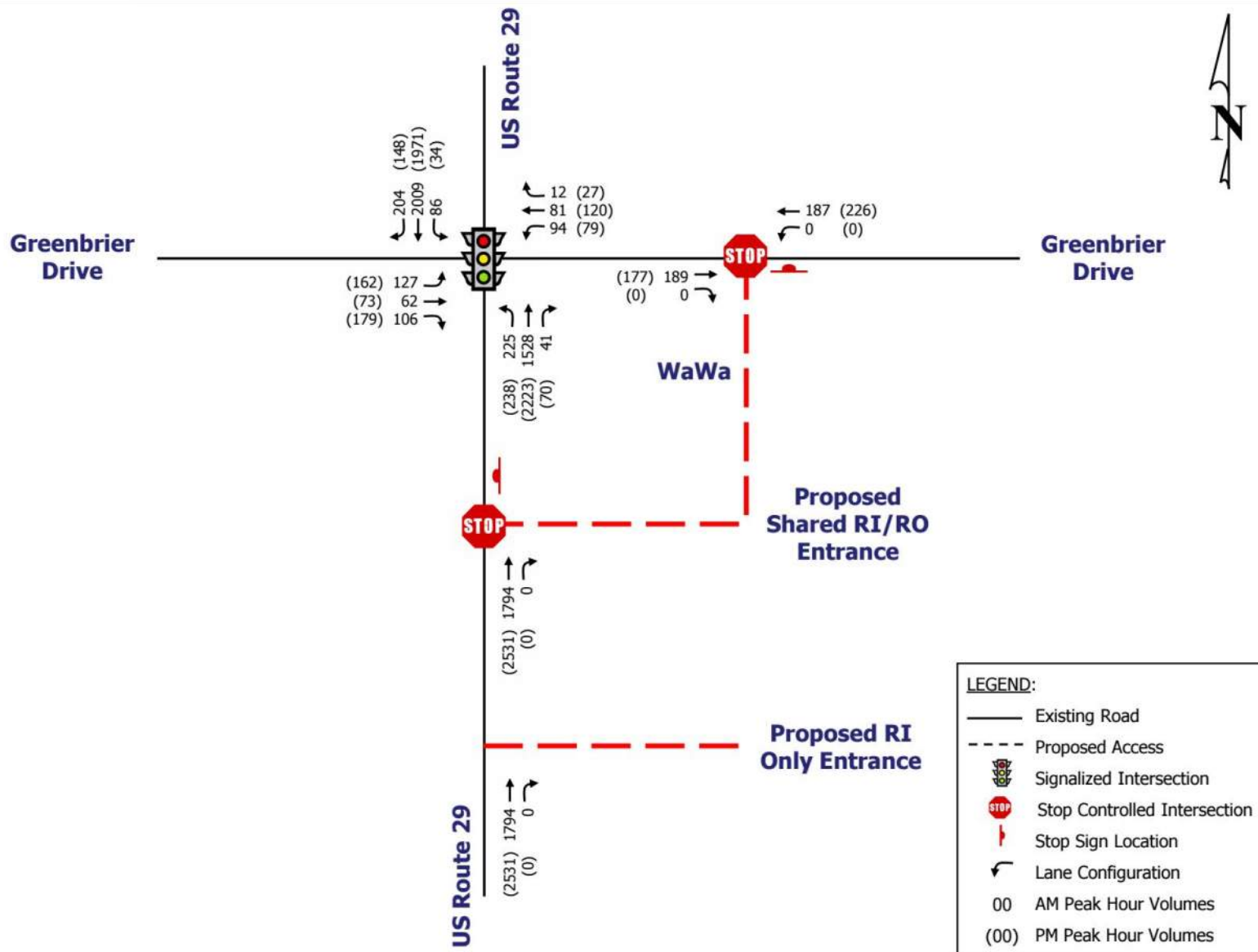


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1193 Seminole Trail Residential Development
 2023 Existing Volumes
 Albemarle, VA

Figure
 3

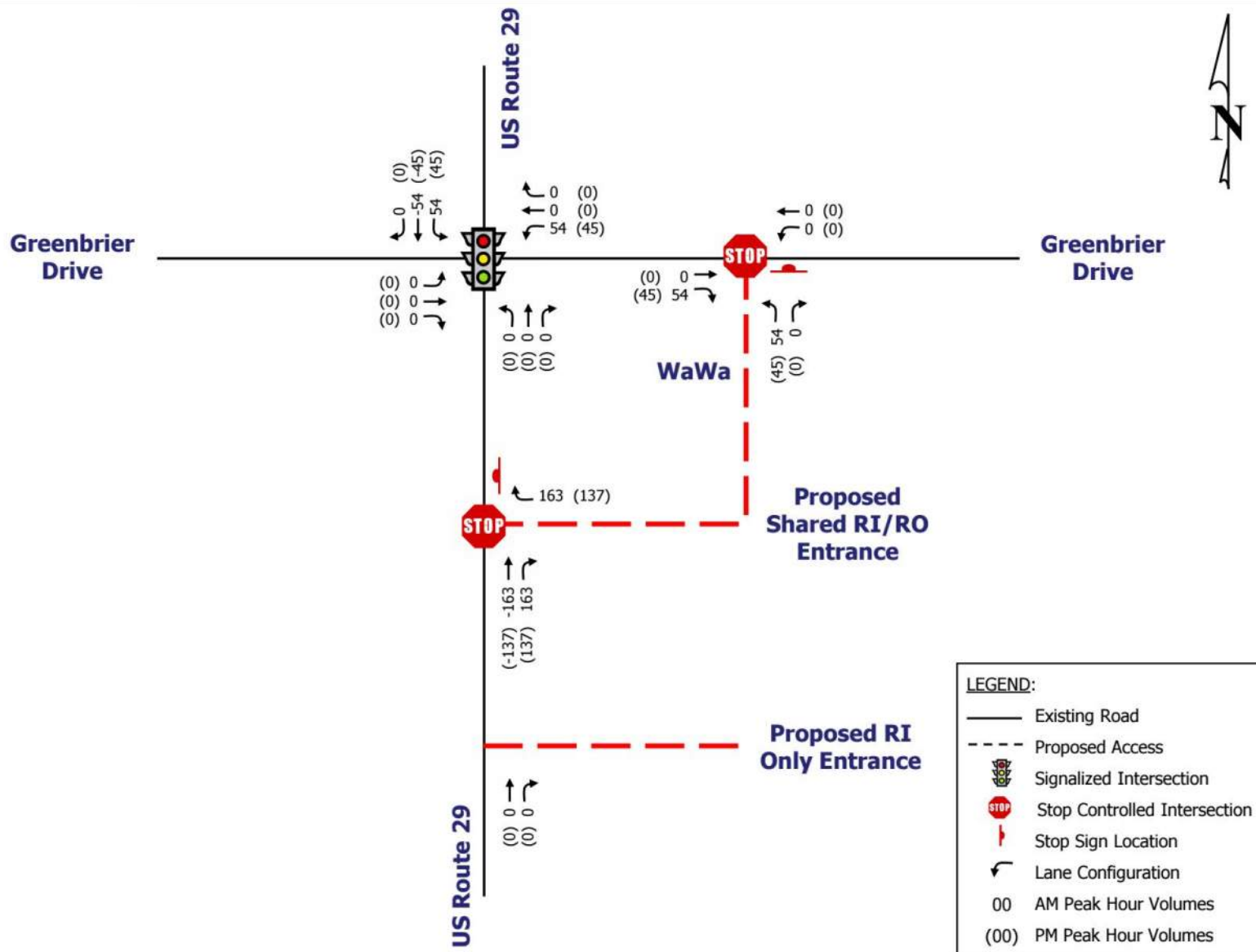


NOT TO SCALE



1193 Seminole Trail Residential Development
 2026 Background Growth
 Albemarle, VA

Figure
 4

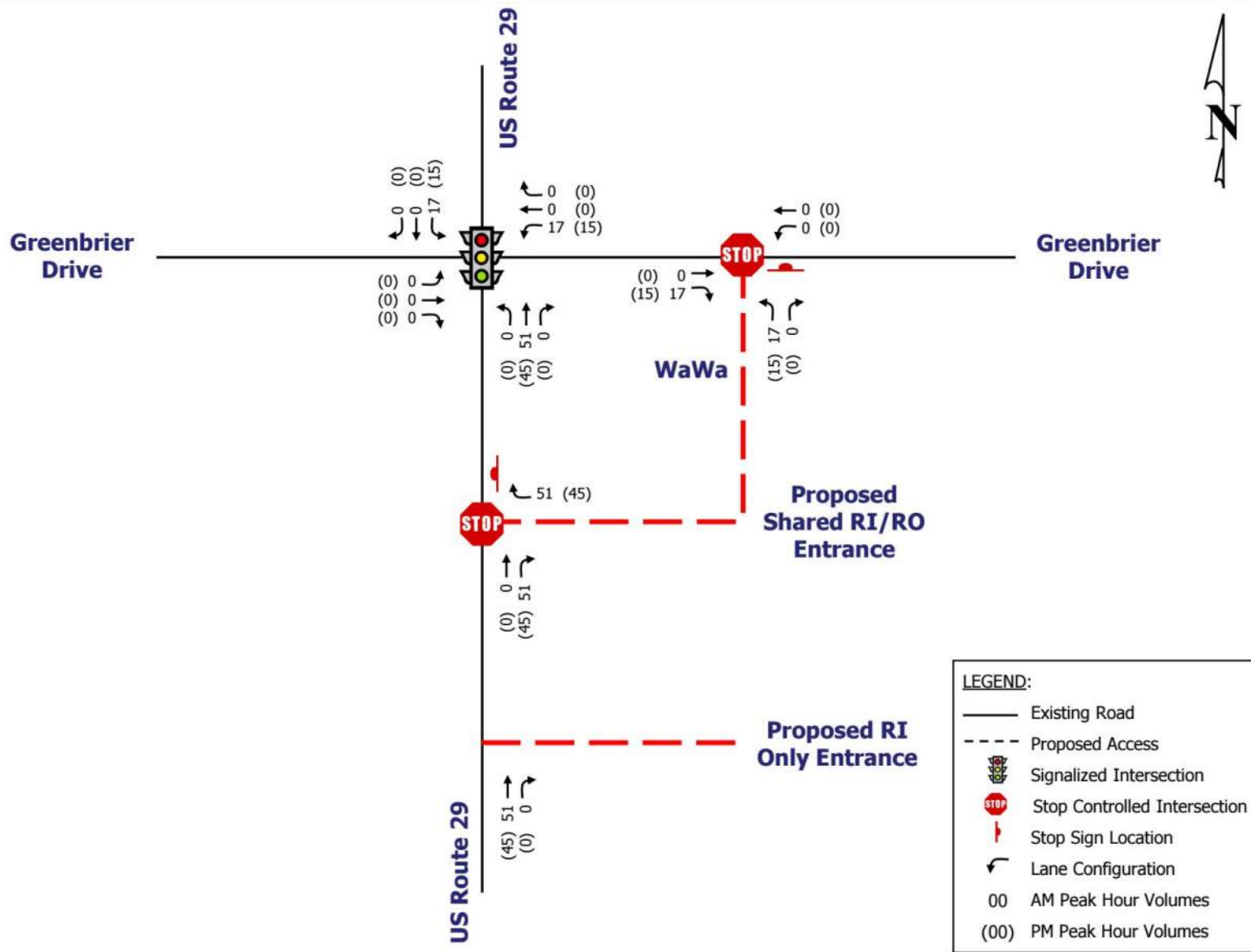


NOT TO SCALE



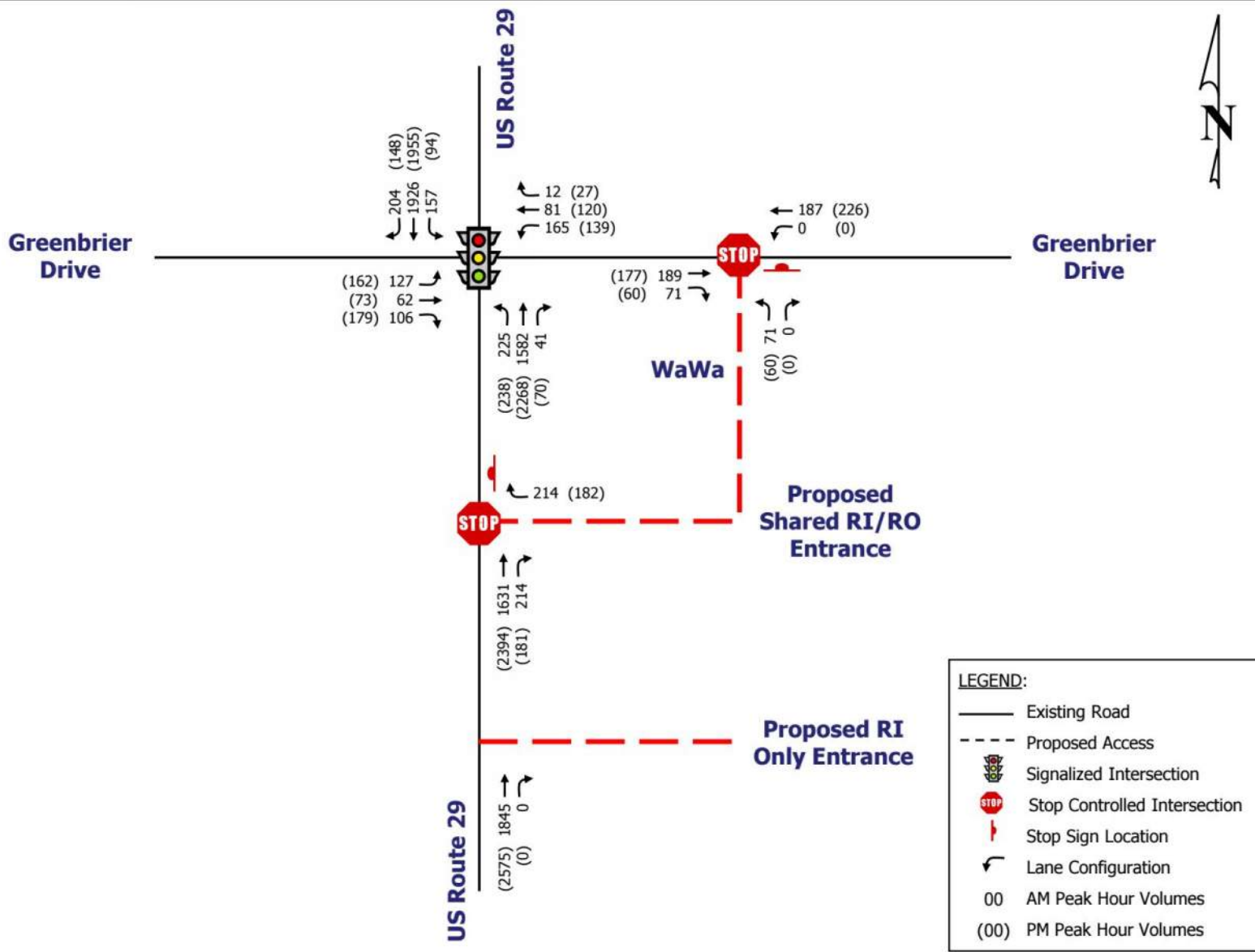
1193 Seminole Trail Residential Development
 WaWa Pass-By Trips
 Albemarle, VA

Figure
 5



1193 Seminole Trail Residential Development
 WaWa New Site Trips
 Albemarle, VA

Figure
 6

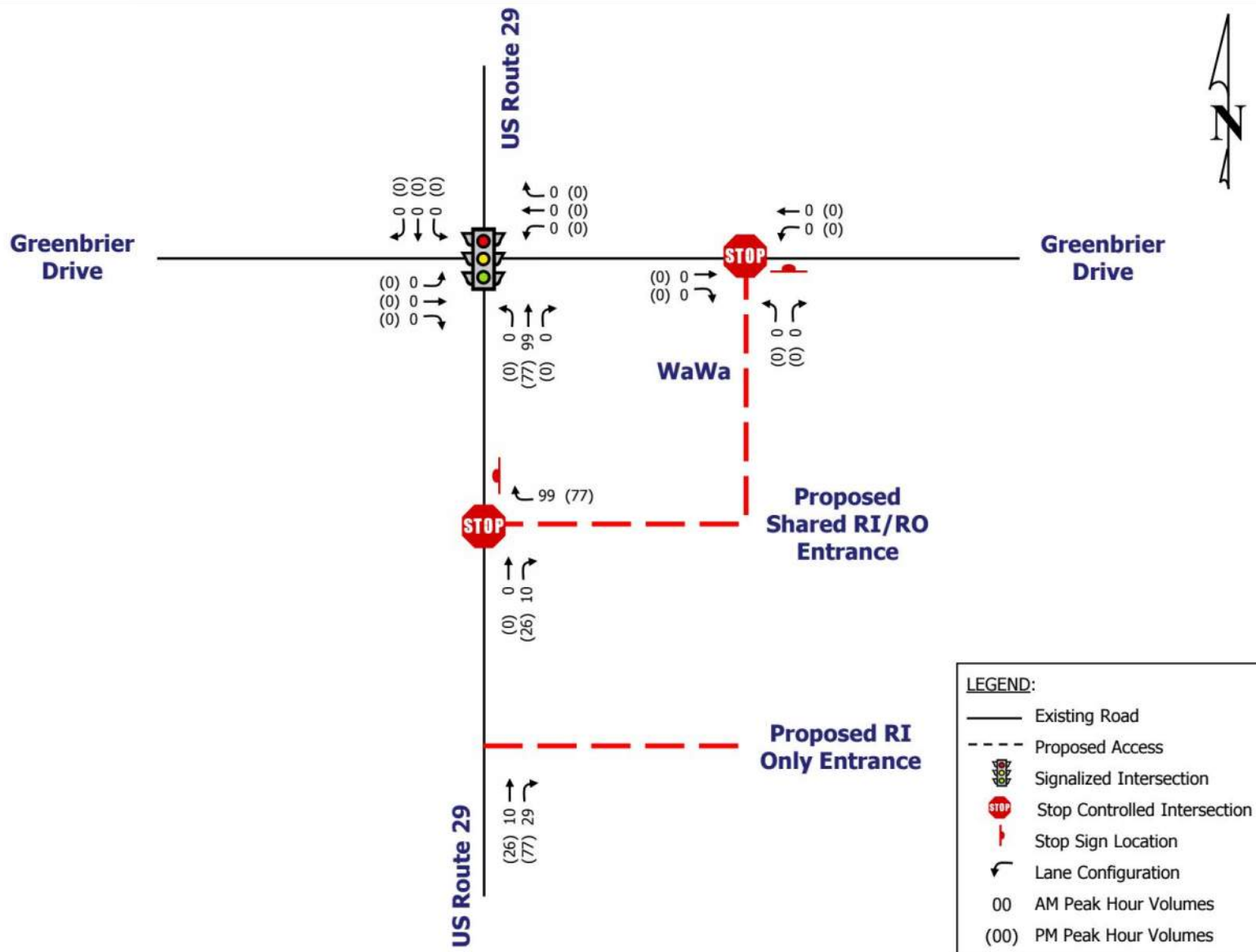


NOT TO SCALE



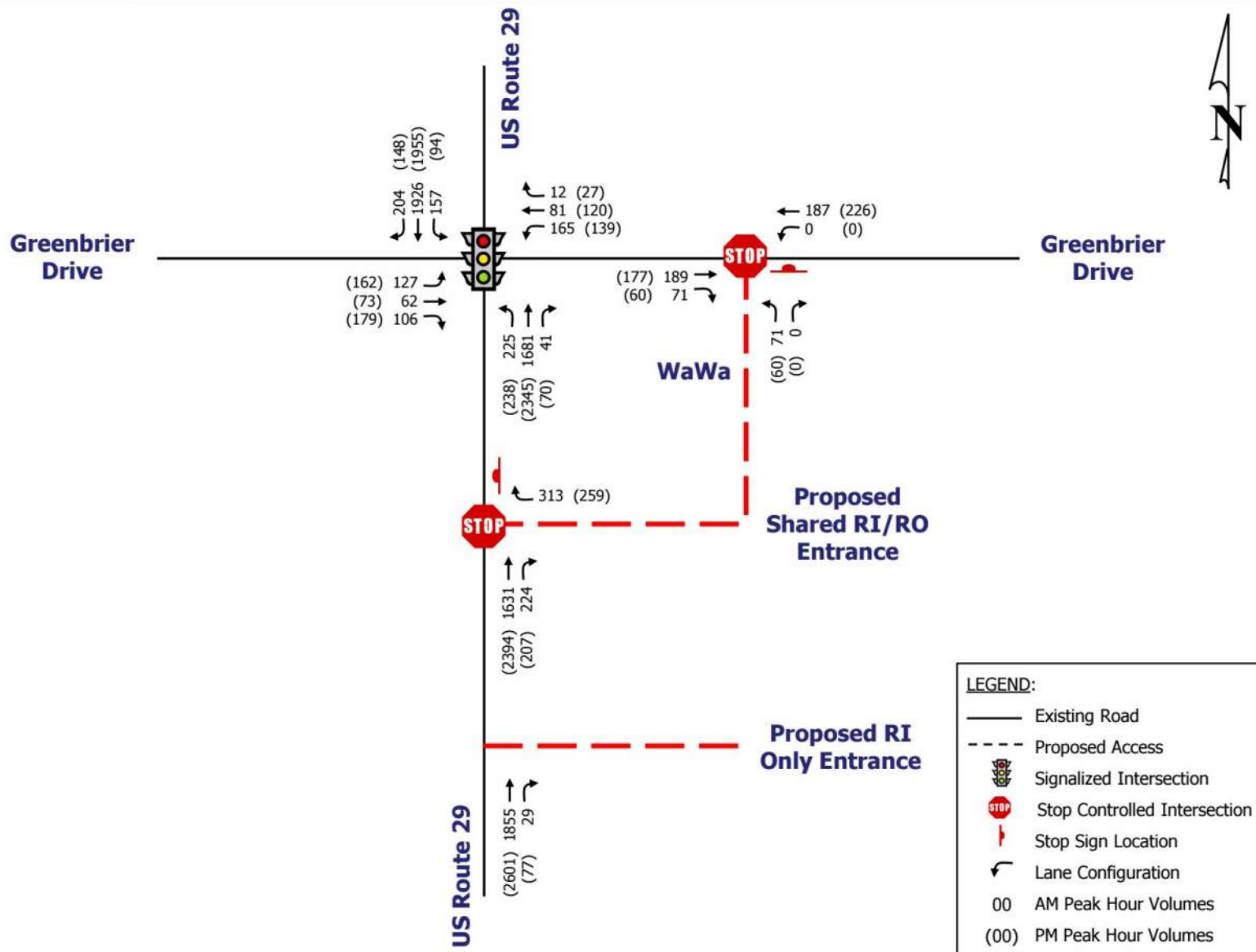
1193 Seminole Trail Residential Development 2026 Background Volumes Albemarle, VA

Figure
7



1193 Seminole Trail Residential Development
 Proposed New Site Trips
 Albemarle, VA

Figure
 8



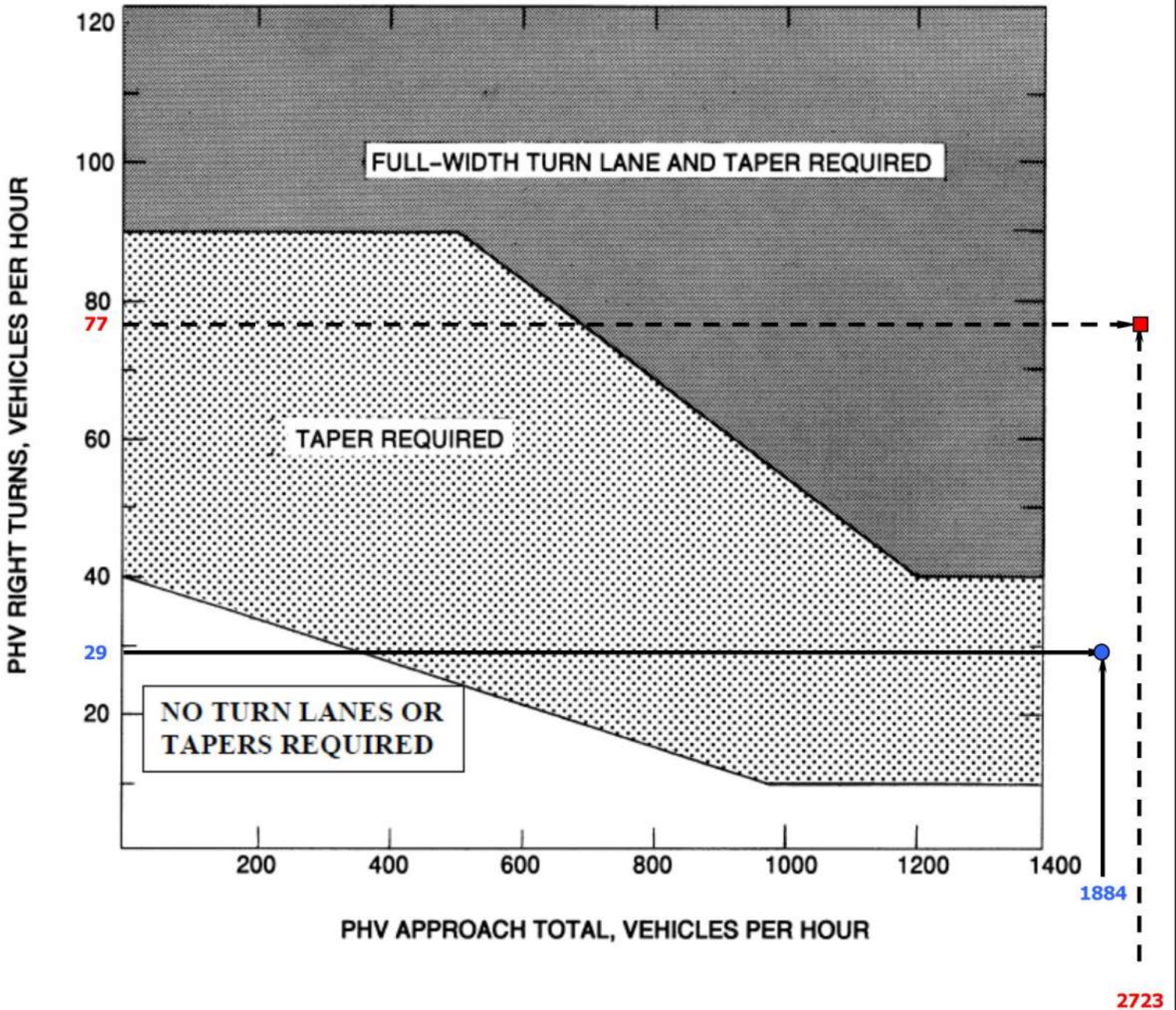
NOT TO SCALE



1193 Seminole Trail Residential Development
 2026 Total Future Volumes
 Albemarle, VA

Figure
 9

GUIDELINES FOR RIGHT TURN TREATMENT (4-LANE HIGHWAY)
 FIGURE 3-27 VDOT ROAD DESIGN MANUAL APPENDIX F



LEGEND

- AM Peak Hour
- PM Peak Hour

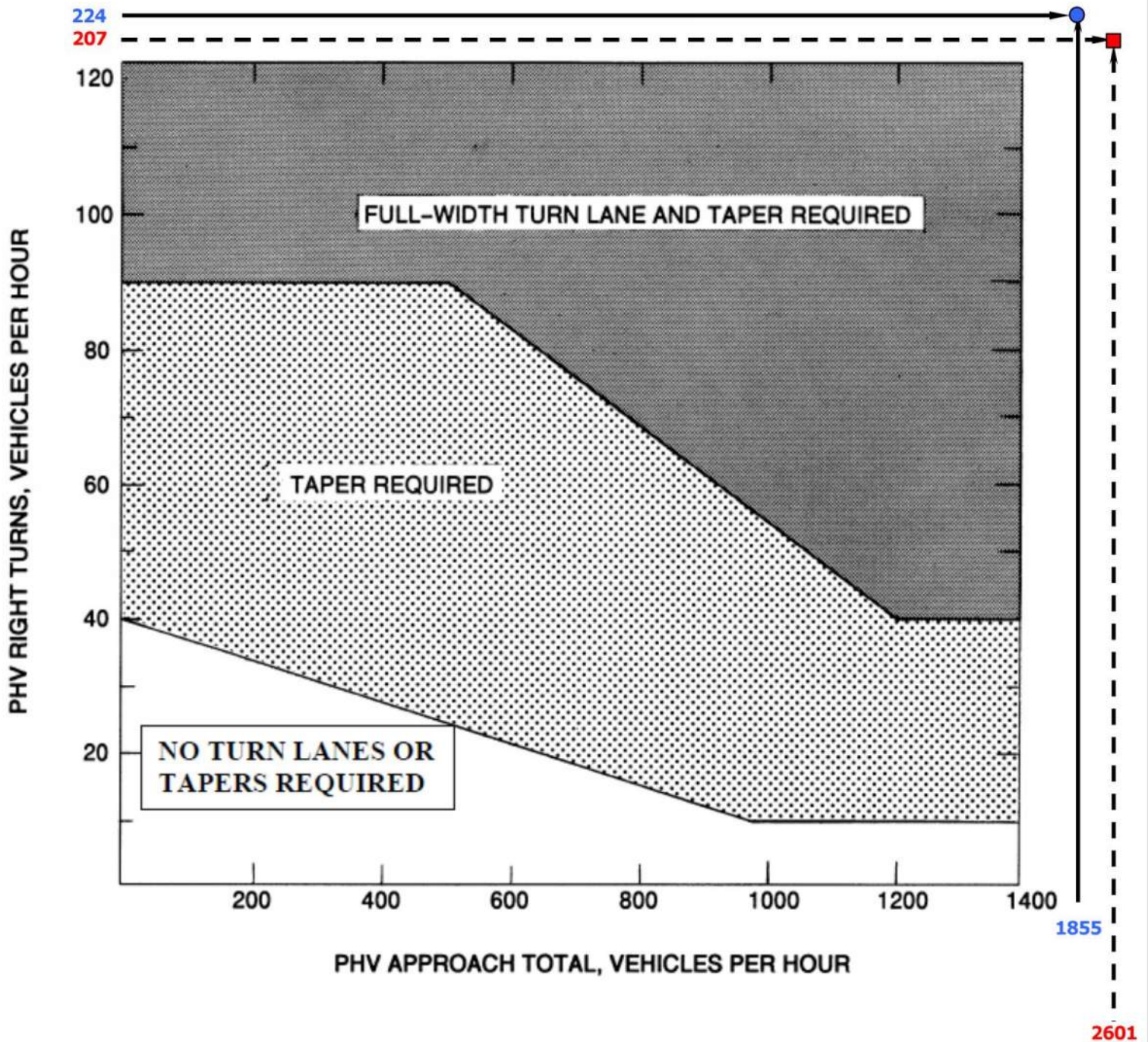
RIGHT TURN LANE WARRANTED



Right-Turn Lane Guideline
 2026 Total Volumes
 NB Right on US 29 at RI Only Entrance

Figure
 10

GUIDELINES FOR RIGHT TURN TREATMENT (4-LANE HIGHWAY)
 FIGURE 3-27 VDOT ROAD DESIGN MANUAL APPENDIX F



LEGEND

- AM Peak Hour
- PM Peak Hour

RIGHT TURN LANE WARRANTED



Right-Turn Lane Guideline
 2026 Total Volumes
 NB Right on US 29 at Shared Entrance

Figure
 11

APPENDIX A

2022 Traffic Data

Data Collection Group

LSmith@DataCollectionGroup.net

File Name : Rte 29 and Greenbrier

Site Code :

Start Date : 1/26/2023

Page No : 1

Groups Printed- Passenger Veh - Trucks

| Start Time | Rte 29 From North | | | | Greenbrier Dr From East | | | | Rte 29 From South | | | | Greenbrier Dr From West | | | | Int. Total |
|-----------------|----------------------|------|-------|------------|----------------------------|------|-------|------------|----------------------|------|-------|------------|----------------------------|------|-------|------------|------------|
| | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | |
| 07:00 AM | 8 | 321 | 37 | 366 | 13 | 14 | 5 | 32 | 20 | 251 | 6 | 277 | 13 | 8 | 10 | 31 | 706 |
| 07:15 AM | 9 | 427 | 31 | 467 | 18 | 5 | 3 | 26 | 19 | 278 | 8 | 305 | 18 | 5 | 15 | 38 | 836 |
| 07:30 AM | 15 | 498 | 41 | 554 | 28 | 15 | 4 | 47 | 44 | 338 | 9 | 391 | 35 | 16 | 16 | 67 | 1059 |
| 07:45 AM | 19 | 520 | 63 | 602 | 23 | 27 | 4 | 54 | 61 | 377 | 6 | 444 | 29 | 14 | 31 | 74 | 1174 |
| Total | 51 | 1766 | 172 | 1989 | 82 | 61 | 16 | 159 | 144 | 1244 | 29 | 1417 | 95 | 43 | 72 | 210 | 3775 |
| 08:00 AM | 23 | 496 | 45 | 564 | 21 | 13 | 2 | 36 | 56 | 404 | 14 | 474 | 30 | 12 | 28 | 70 | 1144 |
| 08:15 AM | 26 | 436 | 49 | 511 | 19 | 24 | 2 | 45 | 57 | 364 | 11 | 432 | 29 | 18 | 28 | 75 | 1063 |
| 08:30 AM | 7 | 478 | 60 | 545 | 23 | 19 | 2 | 44 | 27 | 353 | 12 | 392 | 31 | 12 | 27 | 70 | 1051 |
| 08:45 AM | 16 | 493 | 66 | 575 | 12 | 23 | 9 | 44 | 52 | 341 | 16 | 409 | 32 | 15 | 26 | 73 | 1101 |
| Total | 72 | 1903 | 220 | 2195 | 75 | 79 | 15 | 169 | 192 | 1462 | 53 | 1707 | 122 | 57 | 109 | 288 | 4359 |
| 04:00 PM | 8 | 388 | 30 | 426 | 18 | 19 | 11 | 48 | 47 | 550 | 21 | 618 | 61 | 29 | 62 | 152 | 1244 |
| 04:15 PM | 12 | 442 | 31 | 485 | 19 | 16 | 10 | 45 | 59 | 517 | 20 | 596 | 43 | 24 | 42 | 109 | 1235 |
| 04:30 PM | 8 | 425 | 22 | 455 | 22 | 27 | 11 | 60 | 63 | 566 | 22 | 651 | 39 | 15 | 47 | 101 | 1267 |
| 04:45 PM | 11 | 479 | 37 | 527 | 16 | 30 | 6 | 52 | 51 | 524 | 14 | 589 | 33 | 21 | 47 | 101 | 1269 |
| Total | 39 | 1734 | 120 | 1893 | 75 | 92 | 38 | 205 | 220 | 2157 | 77 | 2454 | 176 | 89 | 198 | 463 | 5015 |
| 05:00 PM | 9 | 519 | 42 | 570 | 21 | 36 | 5 | 62 | 70 | 554 | 18 | 642 | 51 | 19 | 47 | 117 | 1391 |
| 05:15 PM | 5 | 490 | 43 | 538 | 18 | 23 | 4 | 45 | 47 | 514 | 14 | 575 | 34 | 16 | 33 | 83 | 1241 |
| 05:30 PM | 6 | 482 | 43 | 531 | 23 | 14 | 5 | 42 | 41 | 499 | 20 | 560 | 29 | 13 | 42 | 84 | 1217 |
| 05:45 PM | 4 | 418 | 27 | 449 | 15 | 16 | 6 | 37 | 44 | 459 | 8 | 511 | 34 | 18 | 33 | 85 | 1082 |
| Total | 24 | 1909 | 155 | 2088 | 77 | 89 | 20 | 186 | 202 | 2026 | 60 | 2288 | 148 | 66 | 155 | 369 | 4931 |
| Grand Total | 186 | 7312 | 667 | 8165 | 309 | 321 | 89 | 719 | 758 | 6889 | 219 | 7866 | 541 | 255 | 534 | 1330 | 18080 |
| Apprch % | 2.3 | 89.6 | 8.2 | | 43 | 44.6 | 12.4 | | 9.6 | 87.6 | 2.8 | | 40.7 | 19.2 | 40.2 | | |
| Total % | 1 | 40.4 | 3.7 | 45.2 | 1.7 | 1.8 | 0.5 | 4 | 4.2 | 38.1 | 1.2 | 43.5 | 3 | 1.4 | 3 | 7.4 | |
| Passenger Veh | 177 | 7058 | 641 | 7876 | 291 | 307 | 86 | 684 | 740 | 6680 | 214 | 7634 | 533 | 241 | 522 | 1296 | 17490 |
| % Passenger Veh | 95.2 | 96.5 | 96.1 | 96.5 | 94.2 | 95.6 | 96.6 | 95.1 | 97.6 | 97 | 97.7 | 97.1 | 98.5 | 94.5 | 97.8 | 97.4 | 96.7 |
| Trucks | 9 | 254 | 26 | 289 | 18 | 14 | 3 | 35 | 18 | 209 | 5 | 232 | 8 | 14 | 12 | 34 | 590 |
| % Trucks | 4.8 | 3.5 | 3.9 | 3.5 | 5.8 | 4.4 | 3.4 | 4.9 | 2.4 | 3 | 2.3 | 2.9 | 1.5 | 5.5 | 2.2 | 2.6 | 3.3 |

Data Collection Group

L.Smith@DataCollectionGroup.net

File Name : Rte 29 and Greenbrier

Site Code :

Start Date : 1/26/2023

Page No : 2

| Start Time | Rte 29 From North | | | | Greenbrier Dr From East | | | | Rte 29 From South | | | | Greenbrier Dr From West | | | | Int. Total |
|--|----------------------|------------|-----------|------------|----------------------------|-----------|-------|------------|----------------------|------------|-----------|------------|----------------------------|-----------|-----------|------------|-------------|
| | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | |
| Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1 | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 07:30 AM | | | | | | | | | | | | | | | | | |
| 07:30 AM | 15 | 498 | 41 | 554 | 28 | 15 | 4 | 47 | 44 | 338 | 9 | 391 | 35 | 16 | 16 | 67 | 1059 |
| 07:45 AM | 19 | 520 | 63 | 602 | 23 | 27 | 4 | 54 | 61 | 377 | 6 | 444 | 29 | 14 | 31 | 74 | 1174 |
| 08:00 AM | 23 | 496 | 45 | 564 | 21 | 13 | 2 | 36 | 56 | 404 | 14 | 474 | 30 | 12 | 28 | 70 | 1144 |
| 08:15 AM | 26 | 436 | 49 | 511 | 19 | 24 | 2 | 45 | 57 | 364 | 11 | 432 | 29 | 18 | 28 | 75 | 1063 |
| Total Volume | 83 | 1950 | 198 | 2231 | 91 | 79 | 12 | 182 | 218 | 1483 | 40 | 1741 | 123 | 60 | 103 | 286 | 4440 |
| % App. Total | 3.7 | 87.4 | 8.9 | | 50 | 43.4 | 6.6 | | 12.5 | 85.2 | 2.3 | | 43 | 21 | 36 | | |
| PHF | .798 | .938 | .786 | .926 | .813 | .731 | .750 | .843 | .893 | .918 | .714 | .918 | .879 | .833 | .831 | .953 | .945 |
| Passenger Veh | 79 | 1853 | 187 | 2119 | 85 | 77 | 10 | 172 | 213 | 1416 | 38 | 1667 | 122 | 57 | 95 | 274 | 4232 |
| % Passenger Veh | 95.2 | 95.0 | 94.4 | 95.0 | 93.4 | 97.5 | 83.3 | 94.5 | 97.7 | 95.5 | 95.0 | 95.7 | 99.2 | 95.0 | 92.2 | 95.8 | 95.3 |
| Trucks | 4 | 97 | 11 | 112 | 6 | 2 | 2 | 10 | 5 | 67 | 2 | 74 | 1 | 3 | 8 | 12 | 208 |
| % Trucks | 4.8 | 5.0 | 5.6 | 5.0 | 6.6 | 2.5 | 16.7 | 5.5 | 2.3 | 4.5 | 5.0 | 4.3 | 0.8 | 5.0 | 7.8 | 4.2 | 4.7 |

Data Collection Group

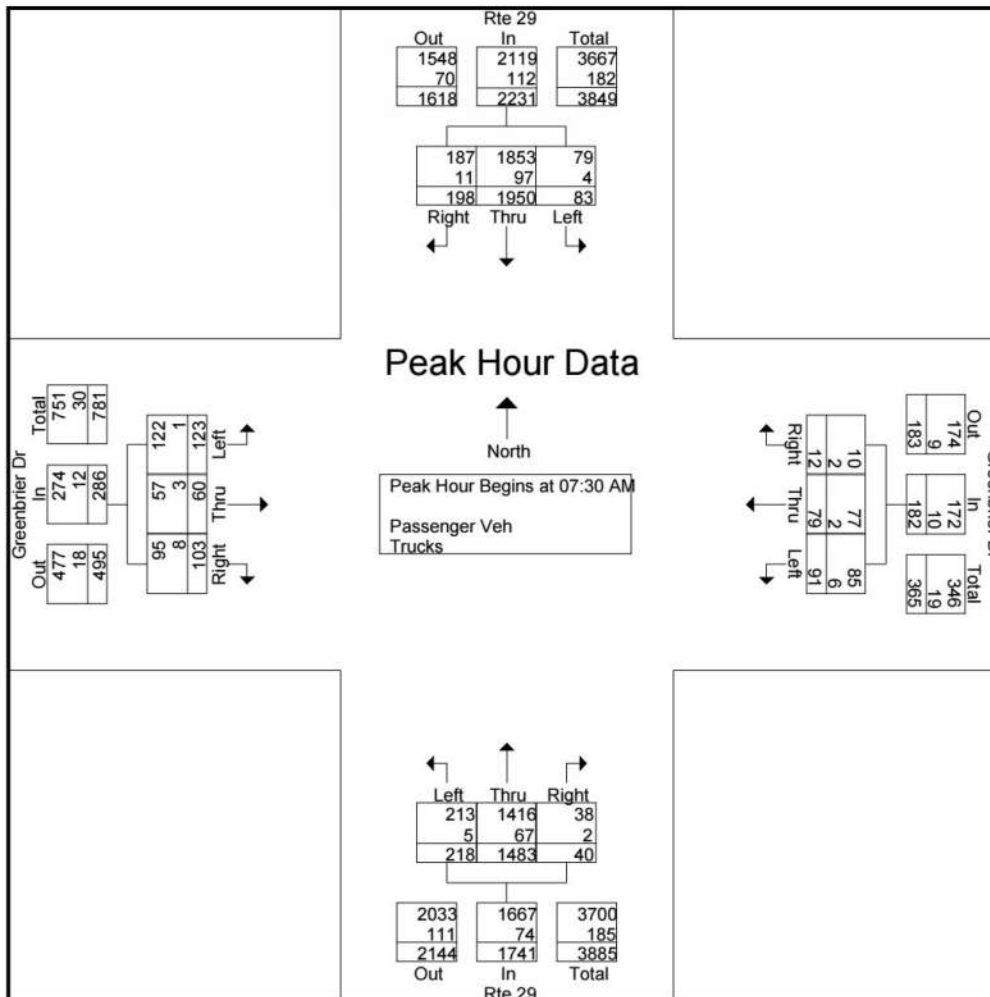
LSmith@DataCollectionGroup.net

File Name : Rte 29 and Greenbrier

Site Code :

Start Date : 1/26/2023

Page No : 3



Data Collection Group

L.Smith@DataCollectionGroup.net

File Name : Rte 29 and Greenbrier

Site Code :

Start Date : 1/26/2023

Page No : 4

| Start Time | Rte 29 From North | | | | Greenbrier Dr From East | | | | Rte 29 From South | | | | Greenbrier Dr From West | | | | Int. Total |
|--|----------------------|------|-------|------------|----------------------------|------|-------|------------|----------------------|------|-------|------------|----------------------------|------|-------|------------|------------|
| | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | Left | Thru | Right | App. Total | |
| Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1 | | | | | | | | | | | | | | | | | |
| Peak Hour for Entire Intersection Begins at 04:30 PM | | | | | | | | | | | | | | | | | |
| 04:30 PM | 8 | 425 | 22 | 455 | 22 | 27 | 11 | 60 | 63 | 566 | 22 | 651 | 39 | 15 | 47 | 101 | 1267 |
| 04:45 PM | 11 | 479 | 37 | 527 | 16 | 30 | 6 | 52 | 51 | 524 | 14 | 589 | 33 | 21 | 47 | 101 | 1269 |
| 05:00 PM | 9 | 519 | 42 | 570 | 21 | 36 | 5 | 62 | 70 | 554 | 18 | 642 | 51 | 19 | 47 | 117 | 1391 |
| 05:15 PM | 5 | 490 | 43 | 538 | 18 | 23 | 4 | 45 | 47 | 514 | 14 | 575 | 34 | 16 | 33 | 83 | 1241 |
| Total Volume | 33 | 1913 | 144 | 2090 | 77 | 116 | 26 | 219 | 231 | 2158 | 68 | 2457 | 157 | 71 | 174 | 402 | 5168 |
| % App. Total | 1.6 | 91.5 | 6.9 | | 35.2 | 53 | 11.9 | | 9.4 | 87.8 | 2.8 | | 39.1 | 17.7 | 43.3 | | |
| PHF | .750 | .921 | .837 | .917 | .875 | .806 | .591 | .883 | .825 | .953 | .773 | .944 | .770 | .845 | .926 | .859 | .929 |
| Passenger Veh | 32 | 1870 | 140 | 2042 | 73 | 112 | 26 | 211 | 227 | 2119 | 68 | 2414 | 156 | 69 | 174 | 399 | 5066 |
| % Passenger Veh | 97.0 | 97.8 | 97.2 | 97.7 | 94.8 | 96.6 | 100 | 96.3 | 98.3 | 98.2 | 100 | 98.2 | 99.4 | 97.2 | 100 | 99.3 | 98.0 |
| Trucks | 1 | 43 | 4 | 48 | 4 | 4 | 0 | 8 | 4 | 39 | 0 | 43 | 1 | 2 | 0 | 3 | 102 |
| % Trucks | 3.0 | 2.2 | 2.8 | 2.3 | 5.2 | 3.4 | 0 | 3.7 | 1.7 | 1.8 | 0 | 1.8 | 0.6 | 2.8 | 0 | 0.7 | 2.0 |

Data Collection Group

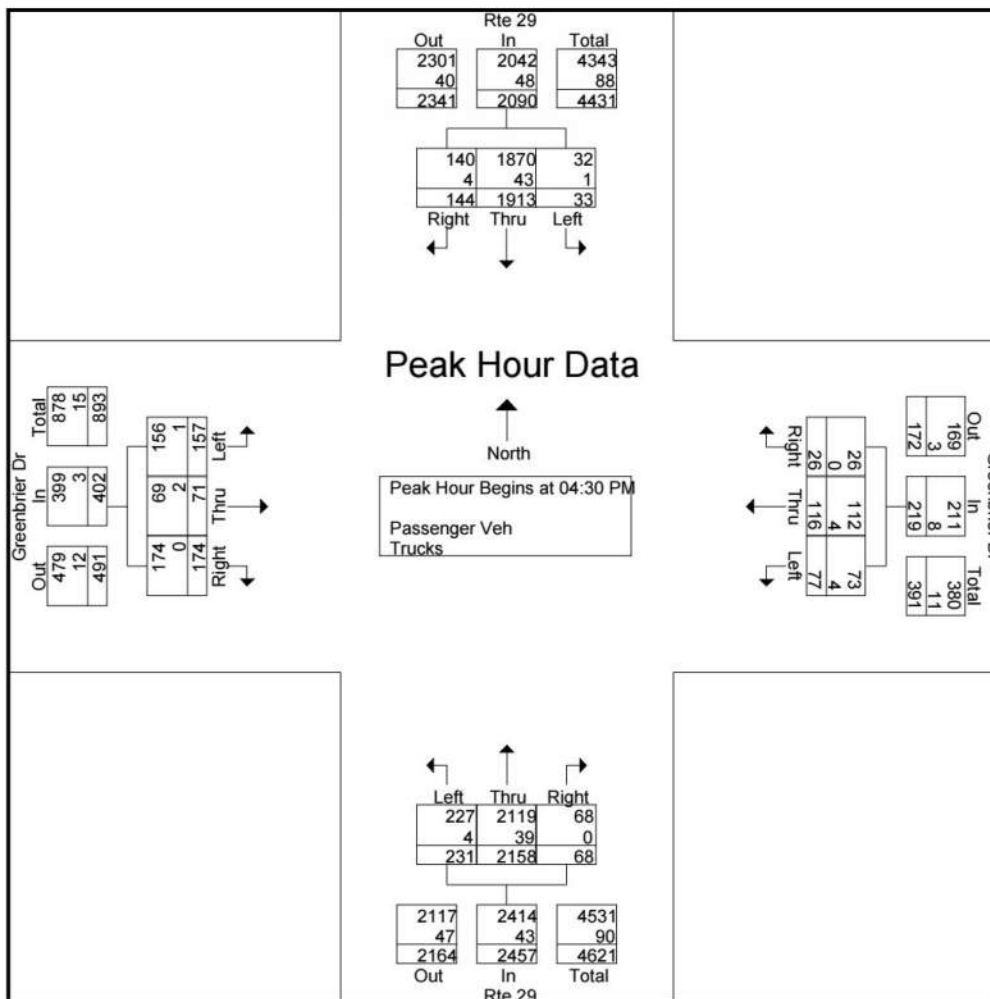
LSmith@DataCollectionGroup.net

File Name : Rte 29 and Greenbrier

Site Code :

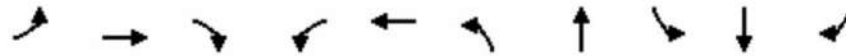
Start Date : 1/26/2023

Page No : 5



APPENDIX B

Synchro/SimTraffic Analysis Outputs



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|-------------------------|------|------|------|------|------|------|------|------|------|------|
| Lane Group Flow (vph) | 129 | 63 | 108 | 96 | 96 | 229 | 1603 | 87 | 2053 | 208 |
| v/c Ratio | 0.59 | 0.41 | 0.28 | 0.48 | 0.83 | 0.74 | 0.43 | 0.64 | 0.69 | 0.24 |
| Control Delay | 49.8 | 57.9 | 1.9 | 46.8 | 97.9 | 66.3 | 18.8 | 71.2 | 25.2 | 2.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 49.8 | 57.9 | 1.9 | 46.8 | 97.9 | 66.3 | 18.8 | 71.2 | 25.2 | 2.3 |
| Queue Length 50th (ft) | 80 | 45 | 0 | 58 | 68 | 86 | 189 | 63 | 340 | 0 |
| Queue Length 95th (ft) | 137 | 90 | 0 | 107 | #165 | #135 | 219 | 117 | 384 | 30 |
| Internal Link Dist (ft) | | 785 | | | 946 | | 982 | | 1665 | |
| Turn Bay Length (ft) | 200 | | 325 | 425 | | 750 | | 275 | | 300 |
| Base Capacity (vph) | 227 | 162 | 385 | 201 | 117 | 322 | 3751 | 162 | 2971 | 849 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.57 | 0.39 | 0.28 | 0.48 | 0.82 | 0.71 | 0.43 | 0.54 | 0.69 | 0.24 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2023 Existing - AM
1: US Route 29 & Greenbrier Drive

Existing AM
HCM 6th Signalized Intersection Summary



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|-------|-------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | ↖ | ↑ | ↗ | ↖ | ↗ | | ↖↗ | ↑↑↑↑ | | ↖ | ↑↑↑↑ | ↗ |
| Traffic Volume (veh/h) | 123 | 60 | 103 | 91 | 79 | 12 | 218 | 1483 | 40 | 83 | 1950 | 198 |
| Future Volume (veh/h) | 123 | 60 | 103 | 91 | 79 | 12 | 218 | 1483 | 40 | 83 | 1950 | 198 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1885 | 1826 | 1781 | 1796 | 1856 | 1648 | 1870 | 1826 | 1826 | 1826 | 1826 | 1811 |
| Adj Flow Rate, veh/h | 129 | 63 | 108 | 96 | 83 | 13 | 229 | 1561 | 42 | 87 | 2053 | 208 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 1 | 5 | 8 | 7 | 3 | 17 | 2 | 5 | 5 | 5 | 5 | 6 |
| Cap, veh/h | 222 | 164 | 135 | 223 | 99 | 16 | 415 | 3620 | 97 | 109 | 2779 | 679 |
| Arrive On Green | 0.08 | 0.09 | 0.09 | 0.05 | 0.06 | 0.06 | 0.12 | 0.48 | 0.48 | 0.06 | 0.44 | 0.44 |
| Sat Flow, veh/h | 1795 | 1826 | 1510 | 1711 | 1566 | 245 | 3456 | 7504 | 202 | 1739 | 6281 | 1535 |
| Grp Volume(v), veh/h | 129 | 63 | 108 | 96 | 0 | 96 | 229 | 1230 | 373 | 87 | 2053 | 208 |
| Grp Sat Flow(s),veh/h/ln | 1795 | 1826 | 1510 | 1711 | 0 | 1811 | 1728 | 1479 | 1790 | 1739 | 1570 | 1535 |
| Q Serve(g_s), s | 7.6 | 3.7 | 5.6 | 5.9 | 0.0 | 6.0 | 7.2 | 15.6 | 15.7 | 5.7 | 31.1 | 6.1 |
| Cycle Q Clear(g_c), s | 7.6 | 3.7 | 5.6 | 5.9 | 0.0 | 6.0 | 7.2 | 15.6 | 15.7 | 5.7 | 31.1 | 6.1 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.14 | 1.00 | | 0.11 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 222 | 164 | 135 | 223 | 0 | 115 | 415 | 2854 | 863 | 109 | 2779 | 679 |
| V/C Ratio(X) | 0.58 | 0.39 | 0.80 | 0.43 | 0.00 | 0.83 | 0.55 | 0.43 | 0.43 | 0.80 | 0.74 | 0.31 |
| Avail Cap(c_a), veh/h | 222 | 164 | 135 | 223 | 0 | 115 | 415 | 2854 | 863 | 165 | 2944 | 719 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 45.5 | 49.4 | 24.9 | 44.7 | 0.0 | 53.3 | 47.7 | 19.4 | 19.5 | 53.2 | 26.6 | 7.7 |
| Incr Delay (d2), s/veh | 2.5 | 0.6 | 25.9 | 0.5 | 0.0 | 36.8 | 0.9 | 0.5 | 1.6 | 7.8 | 1.8 | 1.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.5 | 1.7 | 1.0 | 2.5 | 0.0 | 3.9 | 3.1 | 5.1 | 6.5 | 2.7 | 11.2 | 3.6 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 48.1 | 49.9 | 50.8 | 45.2 | 0.0 | 90.1 | 48.6 | 19.9 | 21.0 | 61.0 | 28.4 | 8.8 |
| LnGrp LOS | D | D | D | D | A | F | D | B | C | E | C | A |
| Approach Vol, veh/h | | 300 | | | 192 | | | 1832 | | | 2348 | |
| Approach Delay, s/veh | | 49.4 | | | 67.6 | | | 23.7 | | | 27.8 | |
| Approach LOS | | D | | | E | | | C | | | C | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 15.3 | 63.7 | 16.0 | 20.0 | 22.0 | 57.0 | 19.0 | 17.0 | | | | |
| Change Period (Y+Rc), s | * 8.1 | * 8.2 | 9.7 | 9.7 | 8.2 | 6.1 | 9.7 | 9.7 | | | | |
| Max Green Setting (Gmax), s | * 11 | * 54 | 6.3 | 10.3 | 10.8 | 53.9 | 9.3 | 7.3 | | | | |
| Max Q Clear Time (g_c+1), s | 7.7 | 17.7 | 7.9 | 7.6 | 9.2 | 33.1 | 9.6 | 8.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 19.4 | 0.0 | 0.1 | 0.1 | 17.7 | 0.0 | 0.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 29.3 |
| HCM 6th LOS | C |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: US Route 29 & Greenbrier Drive

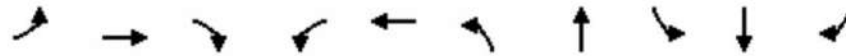
| Movement | EB | EB | EB | WB | WB | NB | NB | NB | NB | NB | NB | NB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| Directions Served | L | T | R | L | TR | L | L | T | T | T | T | TR |
| Maximum Queue (ft) | 169 | 155 | 78 | 158 | 165 | 184 | 207 | 311 | 290 | 231 | 159 | 61 |
| Average Queue (ft) | 79 | 55 | 30 | 73 | 79 | 85 | 136 | 206 | 185 | 128 | 40 | 19 |
| 95th Queue (ft) | 144 | 122 | 59 | 135 | 146 | 178 | 202 | 301 | 272 | 226 | 110 | 48 |
| Link Distance (ft) | | 774 | | | 931 | | | 1018 | 1018 | 1018 | 1018 | 1018 |
| Upstream Blk Time (%) | | | | | | | | | | | | |
| Queuing Penalty (veh) | | | | | | | | | | | | |
| Storage Bay Dist (ft) | 200 | | 325 | 425 | | 750 | 750 | | | | | |
| Storage Blk Time (%) | 0 | 0 | | | | | | | | | | |
| Queuing Penalty (veh) | 0 | 0 | | | | | | | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | SB | SB | SB | SB | SB | SB |
|-----------------------|-----|------|------|------|------|-----|
| Directions Served | L | T | T | T | T | R |
| Maximum Queue (ft) | 267 | 375 | 367 | 314 | 250 | 98 |
| Average Queue (ft) | 91 | 260 | 250 | 203 | 122 | 43 |
| 95th Queue (ft) | 213 | 350 | 337 | 294 | 233 | 79 |
| Link Distance (ft) | | 1695 | 1695 | 1695 | 1695 | |
| Upstream Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |
| Storage Bay Dist (ft) | 275 | | | | | 300 |
| Storage Blk Time (%) | 0 | 4 | | | 0 | |
| Queuing Penalty (veh) | 0 | 3 | | | 0 | |

Network Summary

| |
|---------------------------------|
| Network wide Queuing Penalty: 4 |
|---------------------------------|



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|-------------------------|------|------|------|------|------|------|------|------|------|------|
| Lane Group Flow (vph) | 169 | 76 | 187 | 83 | 153 | 248 | 2393 | 35 | 2057 | 155 |
| v/c Ratio | 0.62 | 0.35 | 0.46 | 0.31 | 0.87 | 0.82 | 0.58 | 0.42 | 0.69 | 0.18 |
| Control Delay | 50.3 | 58.3 | 5.8 | 40.3 | 96.4 | 79.3 | 21.2 | 74.7 | 29.3 | 1.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 50.3 | 58.3 | 5.8 | 40.3 | 96.4 | 79.3 | 21.2 | 74.7 | 29.3 | 1.3 |
| Queue Length 50th (ft) | 115 | 59 | 0 | 54 | 123 | 107 | 359 | 29 | 398 | 0 |
| Queue Length 95th (ft) | 183 | 113 | 24 | 98 | #251 | #171 | 391 | 65 | 442 | 14 |
| Internal Link Dist (ft) | | 785 | | | 946 | | 982 | | 1665 | |
| Turn Bay Length (ft) | 200 | | 325 | 425 | | 750 | | 275 | | 300 |
| Base Capacity (vph) | 287 | 216 | 404 | 312 | 180 | 311 | 4123 | 92 | 2976 | 838 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.59 | 0.35 | 0.46 | 0.27 | 0.85 | 0.80 | 0.58 | 0.38 | 0.69 | 0.18 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2023 Existing - PM
1: US Route 29 & Greenbrier Drive

Existing PM
HCM 6th Signalized Intersection Summary



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|-------|-------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | ↖ | ↑ | ↗ | ↖ | ↗ | | ↖↗ | ↑↑↑↑ | | ↖ | ↑↑↑↑ | ↗ |
| Traffic Volume (veh/h) | 157 | 71 | 174 | 77 | 116 | 26 | 231 | 2158 | 68 | 33 | 1913 | 144 |
| Future Volume (veh/h) | 157 | 71 | 174 | 77 | 116 | 26 | 231 | 2158 | 68 | 33 | 1913 | 144 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1885 | 1856 | 1900 | 1826 | 1856 | 1900 | 1870 | 1870 | 1900 | 1856 | 1870 | 1856 |
| Adj Flow Rate, veh/h | 169 | 76 | 187 | 83 | 125 | 28 | 248 | 2320 | 73 | 35 | 2057 | 155 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 1 | 3 | 0 | 5 | 3 | 0 | 2 | 2 | 0 | 3 | 2 | 3 |
| Cap, veh/h | 246 | 260 | 226 | 261 | 139 | 31 | 417 | 3855 | 121 | 49 | 2744 | 671 |
| Arrive On Green | 0.10 | 0.14 | 0.14 | 0.05 | 0.09 | 0.09 | 0.12 | 0.50 | 0.50 | 0.03 | 0.43 | 0.43 |
| Sat Flow, veh/h | 1795 | 1856 | 1610 | 1739 | 1468 | 329 | 3456 | 7646 | 241 | 1767 | 6434 | 1572 |
| Grp Volume(v), veh/h | 169 | 76 | 187 | 83 | 0 | 153 | 248 | 1839 | 554 | 35 | 2057 | 155 |
| Grp Sat Flow(s),veh/h/ln | 1795 | 1856 | 1610 | 1739 | 0 | 1796 | 1728 | 1515 | 1827 | 1767 | 1609 | 1572 |
| Q Serve(g_s), s | 10.9 | 4.8 | 10.3 | 5.3 | 0.0 | 11.0 | 8.8 | 28.1 | 28.1 | 2.6 | 35.0 | 5.0 |
| Cycle Q Clear(g_c), s | 10.9 | 4.8 | 10.3 | 5.3 | 0.0 | 11.0 | 8.8 | 28.1 | 28.1 | 2.6 | 35.0 | 5.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.18 | 1.00 | | 0.13 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 246 | 260 | 226 | 261 | 0 | 170 | 417 | 3055 | 921 | 49 | 2744 | 671 |
| V/C Ratio(X) | 0.69 | 0.29 | 0.83 | 0.32 | 0.00 | 0.90 | 0.60 | 0.60 | 0.60 | 0.72 | 0.75 | 0.23 |
| Avail Cap(c_a), veh/h | 252 | 260 | 226 | 333 | 0 | 170 | 417 | 3055 | 921 | 94 | 2915 | 712 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 47.2 | 50.1 | 26.6 | 44.5 | 0.0 | 58.2 | 54.2 | 22.9 | 22.9 | 62.7 | 31.4 | 9.0 |
| Incr Delay (d2), s/veh | 6.1 | 0.2 | 20.6 | 0.3 | 0.0 | 40.8 | 1.6 | 0.9 | 2.9 | 7.1 | 1.9 | 0.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.3 | 2.2 | 5.3 | 2.3 | 0.0 | 6.9 | 3.9 | 9.7 | 12.2 | 1.2 | 13.3 | 3.1 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 53.3 | 50.3 | 47.2 | 44.7 | 0.0 | 99.1 | 55.8 | 23.8 | 25.8 | 69.8 | 33.4 | 9.8 |
| LnGrp LOS | D | D | D | D | A | F | E | C | C | E | C | A |
| Approach Vol, veh/h | | 432 | | | 236 | | | 2641 | | | 2247 | |
| Approach Delay, s/veh | | 50.1 | | | 80.0 | | | 27.3 | | | 32.3 | |
| Approach LOS | | D | | | E | | | C | | | C | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 11.7 | 73.7 | 16.6 | 27.9 | 23.9 | 61.5 | 22.6 | 22.0 | | | | |
| Change Period (Y+Rc), s | * 8.1 | * 8.2 | 9.7 | 9.7 | 8.2 | 6.1 | 9.7 | 9.7 | | | | |
| Max Green Setting (Gmax), s | * 6.9 | * 64 | 12.3 | 13.3 | 11.8 | 58.9 | 13.3 | 12.3 | | | | |
| Max Q Clear Time (g_c+1), s | 4.6 | 30.1 | 7.3 | 12.3 | 10.8 | 37.0 | 12.9 | 13.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 27.8 | 0.0 | 0.1 | 0.0 | 18.4 | 0.0 | 0.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 33.3 |
| HCM 6th LOS | C |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | EB | EB | EB | WB | WB | NB | NB | NB | NB | NB | NB | NB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| Directions Served | L | T | R | L | TR | L | L | T | T | T | T | TR |
| Maximum Queue (ft) | 192 | 172 | 90 | 128 | 254 | 218 | 236 | 410 | 384 | 330 | 226 | 126 |
| Average Queue (ft) | 105 | 61 | 37 | 53 | 119 | 104 | 150 | 271 | 254 | 198 | 99 | 38 |
| 95th Queue (ft) | 182 | 132 | 71 | 105 | 211 | 209 | 223 | 373 | 357 | 299 | 203 | 93 |
| Link Distance (ft) | | 774 | | | 931 | | | 1018 | 1018 | 1018 | 1018 | 1018 |
| Upstream Blk Time (%) | | | | | | | | | | | | |
| Queuing Penalty (veh) | | | | | | | | | | | | |
| Storage Bay Dist (ft) | 200 | | 325 | 425 | | 750 | 750 | | | | | |
| Storage Blk Time (%) | 1 | 0 | | | | | | | | | | |
| Queuing Penalty (veh) | 3 | 0 | | | | | | | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | SB | SB | SB | SB | SB | SB |
|-----------------------|-----|------|------|------|------|-----|
| Directions Served | L | T | T | T | T | R |
| Maximum Queue (ft) | 272 | 373 | 372 | 324 | 265 | 84 |
| Average Queue (ft) | 45 | 283 | 269 | 225 | 149 | 36 |
| 95th Queue (ft) | 157 | 356 | 342 | 305 | 247 | 69 |
| Link Distance (ft) | | 1695 | 1695 | 1695 | 1695 | |
| Upstream Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |
| Storage Bay Dist (ft) | 275 | | | | | 300 |
| Storage Blk Time (%) | 0 | 7 | | | 0 | |
| Queuing Penalty (veh) | 0 | 2 | | | 0 | |

Network Summary

| |
|---------------------------------|
| Network wide Queuing Penalty: 5 |
|---------------------------------|



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|-------------------------|------|------|------|------|------|------|------|-------|------|------|
| Lane Group Flow (vph) | 134 | 65 | 112 | 174 | 98 | 237 | 1708 | 165 | 2027 | 215 |
| v/c Ratio | 0.60 | 0.45 | 0.30 | 0.84 | 0.82 | 0.76 | 0.50 | 0.93 | 0.69 | 0.25 |
| Control Delay | 50.4 | 59.9 | 2.0 | 76.0 | 95.1 | 67.7 | 22.0 | 103.1 | 25.2 | 2.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 50.4 | 59.9 | 2.0 | 76.0 | 95.1 | 67.7 | 22.0 | 103.1 | 25.2 | 2.5 |
| Queue Length 50th (ft) | 83 | 46 | 0 | 112 | 69 | 89 | 209 | ~126 | 334 | 0 |
| Queue Length 95th (ft) | 142 | 92 | 0 | #234 | #169 | #142 | 237 | #268 | 378 | 33 |
| Internal Link Dist (ft) | | 785 | | | 946 | | 96 | | 1665 | |
| Turn Bay Length (ft) | 200 | | 325 | 425 | | 750 | | 275 | | 300 |
| Base Capacity (vph) | 229 | 162 | 385 | 206 | 120 | 322 | 3437 | 178 | 2952 | 845 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.59 | 0.40 | 0.29 | 0.84 | 0.82 | 0.74 | 0.50 | 0.93 | 0.69 | 0.25 |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2026 Background - AM
1: US Route 29 & Greenbrier Drive

Background 2026 AM
HCM 6th Signalized Intersection Summary



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|-------|-------|------|------|------|------|------|------|------|-------|------|------|
| Lane Configurations | ↖ | ↑ | ↗ | ↖ | ↗ | | ↖↗ | ↑↑↑↑ | | ↖ | ↑↑↑↑ | ↗ |
| Traffic Volume (veh/h) | 127 | 62 | 106 | 165 | 81 | 12 | 225 | 1582 | 41 | 157 | 1926 | 204 |
| Future Volume (veh/h) | 127 | 62 | 106 | 165 | 81 | 12 | 225 | 1582 | 41 | 157 | 1926 | 204 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1885 | 1826 | 1781 | 1796 | 1856 | 1648 | 1870 | 1826 | 1826 | 1826 | 1826 | 1811 |
| Adj Flow Rate, veh/h | 134 | 65 | 112 | 174 | 85 | 13 | 237 | 1665 | 43 | 165 | 2027 | 215 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 1 | 5 | 8 | 7 | 3 | 17 | 2 | 5 | 5 | 5 | 5 | 6 |
| Cap, veh/h | 221 | 164 | 135 | 221 | 100 | 15 | 422 | 3384 | 87 | 165 | 2766 | 676 |
| Arrive On Green | 0.08 | 0.09 | 0.09 | 0.05 | 0.06 | 0.06 | 0.12 | 0.45 | 0.45 | 0.09 | 0.44 | 0.44 |
| Sat Flow, veh/h | 1795 | 1826 | 1510 | 1711 | 1572 | 240 | 3456 | 7513 | 194 | 1739 | 6281 | 1535 |
| Grp Volume(v), veh/h | 134 | 65 | 112 | 174 | 0 | 98 | 237 | 1311 | 397 | 165 | 2027 | 215 |
| Grp Sat Flow(s),veh/h/ln | 1795 | 1826 | 1510 | 1711 | 0 | 1812 | 1728 | 1479 | 1791 | 1739 | 1570 | 1535 |
| Q Serve(g_s), s | 7.9 | 3.9 | 5.8 | 6.3 | 0.0 | 6.2 | 7.4 | 18.0 | 18.0 | 10.9 | 30.7 | 6.4 |
| Cycle Q Clear(g_c), s | 7.9 | 3.9 | 5.8 | 6.3 | 0.0 | 6.2 | 7.4 | 18.0 | 18.0 | 10.9 | 30.7 | 6.4 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.13 | 1.00 | | 0.11 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 221 | 164 | 135 | 221 | 0 | 115 | 422 | 2665 | 807 | 165 | 2766 | 676 |
| V/C Ratio(X) | 0.61 | 0.40 | 0.83 | 0.79 | 0.00 | 0.85 | 0.56 | 0.49 | 0.49 | 1.00 | 0.73 | 0.32 |
| Avail Cap(c_a), veh/h | 221 | 164 | 135 | 221 | 0 | 115 | 422 | 2783 | 843 | 165 | 2944 | 719 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 45.7 | 49.4 | 24.9 | 49.1 | 0.0 | 53.3 | 47.6 | 22.3 | 22.3 | 52.1 | 26.6 | 7.8 |
| Incr Delay (d2), s/veh | 3.4 | 0.6 | 31.3 | 15.7 | 0.0 | 40.7 | 1.0 | 0.7 | 2.1 | 70.4 | 1.8 | 1.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.7 | 1.8 | 3.3 | 3.1 | 0.0 | 4.1 | 3.2 | 6.0 | 7.6 | 7.8 | 11.0 | 0.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 49.1 | 50.0 | 56.1 | 64.7 | 0.0 | 94.0 | 48.6 | 23.0 | 24.5 | 122.4 | 28.3 | 9.0 |
| LnGrp LOS | D | D | E | E | A | F | D | C | C | F | C | A |
| Approach Vol, veh/h | | 311 | | | 272 | | | 1945 | | | 2407 | |
| Approach Delay, s/veh | | 51.8 | | | 75.3 | | | 26.4 | | | 33.1 | |
| Approach LOS | | D | | | E | | | C | | | C | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 19.0 | 60.0 | 16.0 | 20.0 | 22.3 | 56.7 | 19.0 | 17.0 | | | | |
| Change Period (Y+Rc), s | * 8.1 | * 8.2 | 9.7 | 9.7 | 8.2 | 6.1 | 9.7 | 9.7 | | | | |
| Max Green Setting (Gmax), s | * 11 | * 54 | 6.3 | 10.3 | 10.8 | 53.9 | 9.3 | 7.3 | | | | |
| Max Q Clear Time (g_c+1), s | 12.9 | 20.0 | 8.3 | 7.8 | 9.4 | 32.7 | 9.9 | 8.2 | | | | |
| Green Ext Time (p_c), s | 0.0 | 20.1 | 0.0 | 0.1 | 0.1 | 18.0 | 0.0 | 0.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 33.9 |
| HCM 6th LOS | C |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



| Movement | WBL | WBR | NBT | NBR | SBL | SBT | | | | |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|--|
| Lane Configurations | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 214 | 1631 | 214 | 0 | 2197 | | | | |
| Future Volume (Veh/h) | 0 | 214 | 1631 | 214 | 0 | 2197 | | | | |
| Sign Control | Stop | | Free | | | Free | | | | |
| Grade | 0% | | 0% | | | 0% | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | |
| Hourly flow rate (vph) | 0 | 233 | 1773 | 233 | 0 | 2388 | | | | |
| Pedestrians | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | |
| Median type | | | | | | | | | | |
| Median storage veh | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | |
| pX, platoon unblocked | 0.75 | | | | | | 176 | | | |
| vC, conflicting volume | 2486 | 560 | | | 2006 | | | | | |
| vC1, stage 1 conf vol | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | |
| vCu, unblocked vol | 1304 | 560 | | | 2006 | | | | | |
| tC, single (s) | 6.8 | 6.9 | | | 4.1 | | | | | |
| tC, 2 stage (s) | | | | | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | | | | | |
| p0 queue free % | 100 | 51 | | | 100 | | | | | |
| cM capacity (veh/h) | 114 | 472 | | | 289 | | | | | |
| Direction, Lane # | WB 1 | NB 1 | NB 2 | NB 3 | NB 4 | SB 1 | SB 2 | SB 3 | SB 4 | |
| Volume Total | 233 | 507 | 507 | 507 | 486 | 597 | 597 | 597 | 597 | |
| Volume Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Volume Right | 233 | 0 | 0 | 0 | 233 | 0 | 0 | 0 | 0 | |
| cSH | 472 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | |
| Volume to Capacity | 0.49 | 0.30 | 0.30 | 0.30 | 0.29 | 0.35 | 0.35 | 0.35 | 0.35 | |
| Queue Length 95th (ft) | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Control Delay (s) | 19.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Lane LOS | C | | | | | | | | | |
| Approach Delay (s) | 19.8 | 0.0 | | | | 0.0 | | | | |
| Approach LOS | C | | | | | | | | | |
| Intersection Summary | | | | | | | | | | |
| Average Delay | | | 1.0 | | | | | | | |
| Intersection Capacity Utilization | | | 47.1% | | ICU Level of Service | | | | A | |
| Analysis Period (min) | | | 15 | | | | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | EB | EB | EB | WB | WB | NB | NB | NB | NB | NB | NB | NB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Directions Served | L | T | R | L | TR | L | L | T | T | T | T | TR |
| Maximum Queue (ft) | 184 | 145 | 92 | 295 | 215 | 96 | 98 | 165 | 163 | 147 | 124 | 116 |
| Average Queue (ft) | 87 | 51 | 31 | 154 | 91 | 73 | 91 | 134 | 117 | 105 | 78 | 80 |
| 95th Queue (ft) | 150 | 105 | 65 | 292 | 209 | 119 | 108 | 162 | 148 | 133 | 129 | 121 |
| Link Distance (ft) | | 774 | | | 932 | | | 98 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | | | | | | 5 | 26 | 69 | 46 | 22 | 3 | 9 |
| Queuing Penalty (veh) | | | | | | 0 | 0 | 256 | 170 | 83 | 12 | 33 |
| Storage Bay Dist (ft) | 200 | | 325 | 425 | | 750 | 750 | | | | | |
| Storage Blk Time (%) | 0 | 0 | | 0 | 0 | 5 | 26 | 69 | | | | |
| Queuing Penalty (veh) | 1 | 0 | | 0 | 0 | 16 | 84 | 155 | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

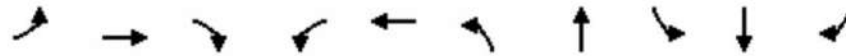
| Movement | SB | SB | SB | SB | SB | SB |
|-----------------------|-----|------|------|------|------|-----|
| Directions Served | L | T | T | T | T | R |
| Maximum Queue (ft) | 274 | 512 | 467 | 366 | 242 | 98 |
| Average Queue (ft) | 184 | 282 | 268 | 205 | 128 | 46 |
| 95th Queue (ft) | 311 | 443 | 410 | 301 | 229 | 84 |
| Link Distance (ft) | | 1695 | 1695 | 1695 | 1695 | |
| Upstream Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |
| Storage Bay Dist (ft) | 275 | | | | | 300 |
| Storage Blk Time (%) | 8 | 6 | | | 0 | |
| Queuing Penalty (veh) | 38 | 9 | | | 0 | |

Intersection: 2: US Route 29 & WaWa Entrance

| Movement | WB | NB | NB | NB | NB | NB | SB | SB | SB | SB |
|-----------------------|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Directions Served | R | T | T | T | T | TR | T | T | T | T |
| Maximum Queue (ft) | 121 | 636 | 589 | 444 | 240 | 110 | 12 | 34 | 36 | 17 |
| Average Queue (ft) | 55 | 423 | 373 | 238 | 44 | 6 | 0 | 2 | 1 | 1 |
| 95th Queue (ft) | 93 | 591 | 541 | 405 | 173 | 47 | 9 | 18 | 17 | 11 |
| Link Distance (ft) | 346 | 862 | 862 | 862 | 862 | 862 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | | | | | | | | 0 | 0 | |
| Queuing Penalty (veh) | | | | | | | | 0 | 0 | |
| Storage Bay Dist (ft) | | | | | | | | | | |
| Storage Blk Time (%) | | | | | | | | | | |
| Queuing Penalty (veh) | | | | | | | | | | |

Network Summary

| |
|-----------------------------------|
| Network wide Queuing Penalty: 857 |
|-----------------------------------|



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|-------------------------|------|------|------|------|-------|------|------|-------|------|------|
| Lane Group Flow (vph) | 174 | 78 | 192 | 149 | 158 | 256 | 2514 | 101 | 2102 | 159 |
| v/c Ratio | 0.64 | 0.41 | 0.50 | 0.53 | 0.90 | 0.81 | 0.68 | 0.96 | 0.71 | 0.19 |
| Control Delay | 51.3 | 61.8 | 6.9 | 46.5 | 100.4 | 78.1 | 26.2 | 139.1 | 30.2 | 1.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 51.3 | 61.8 | 6.9 | 46.5 | 100.4 | 78.1 | 26.2 | 139.1 | 30.2 | 1.5 |
| Queue Length 50th (ft) | 119 | 63 | 0 | 100 | 128 | 111 | 386 | ~95 | 411 | 0 |
| Queue Length 95th (ft) | 187 | 116 | 29 | 164 | #261 | #180 | 420 | #215 | 455 | 16 |
| Internal Link Dist (ft) | | 785 | | | 946 | | 96 | | 1665 | |
| Turn Bay Length (ft) | 200 | | 325 | 425 | | 750 | | 275 | | 300 |
| Base Capacity (vph) | 284 | 191 | 386 | 293 | 179 | 315 | 3711 | 105 | 2941 | 831 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.61 | 0.41 | 0.50 | 0.51 | 0.88 | 0.81 | 0.68 | 0.96 | 0.71 | 0.19 |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2026 Background - PM
1: US Route 29 & Greenbrier Drive

Background 2026 PM
HCM 6th Signalized Intersection Summary



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|-------|-------|-------|------|------|-------|------|------|------|-------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 162 | 73 | 179 | 139 | 120 | 27 | 238 | 2268 | 70 | 94 | 1955 | 148 |
| Future Volume (veh/h) | 162 | 73 | 179 | 139 | 120 | 27 | 238 | 2268 | 70 | 94 | 1955 | 148 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1885 | 1856 | 1900 | 1826 | 1856 | 1900 | 1870 | 1870 | 1900 | 1856 | 1870 | 1856 |
| Adj Flow Rate, veh/h | 174 | 78 | 192 | 149 | 129 | 29 | 256 | 2439 | 75 | 101 | 2102 | 159 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 1 | 3 | 0 | 5 | 3 | 0 | 2 | 2 | 0 | 3 | 2 | 3 |
| Cap, veh/h | 247 | 196 | 170 | 285 | 139 | 31 | 396 | 3644 | 112 | 94 | 2768 | 676 |
| Arrive On Green | 0.10 | 0.11 | 0.11 | 0.09 | 0.09 | 0.09 | 0.11 | 0.48 | 0.48 | 0.05 | 0.43 | 0.43 |
| Sat Flow, veh/h | 1795 | 1856 | 1610 | 1739 | 1467 | 330 | 3456 | 7653 | 235 | 1767 | 6434 | 1572 |
| Grp Volume(v), veh/h | 174 | 78 | 192 | 149 | 0 | 158 | 256 | 1931 | 583 | 101 | 2102 | 159 |
| Grp Sat Flow(s),veh/h/ln | 1795 | 1856 | 1610 | 1739 | 0 | 1796 | 1728 | 1515 | 1828 | 1767 | 1609 | 1572 |
| Q Serve(g_s), s | 11.2 | 5.1 | 9.9 | 9.8 | 0.0 | 11.4 | 9.2 | 31.9 | 31.9 | 6.9 | 35.9 | 5.1 |
| Cycle Q Clear(g_c), s | 11.2 | 5.1 | 9.9 | 9.8 | 0.0 | 11.4 | 9.2 | 31.9 | 31.9 | 6.9 | 35.9 | 5.1 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.18 | 1.00 | | 0.13 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 247 | 196 | 170 | 285 | 0 | 170 | 396 | 2886 | 871 | 94 | 2768 | 676 |
| V/C Ratio(X) | 0.71 | 0.40 | 1.13 | 0.52 | 0.00 | 0.93 | 0.65 | 0.67 | 0.67 | 1.08 | 0.76 | 0.24 |
| Avail Cap(c_a), veh/h | 248 | 196 | 170 | 292 | 0 | 170 | 396 | 2988 | 901 | 94 | 2915 | 712 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 47.1 | 54.3 | 30.0 | 46.1 | 0.0 | 58.4 | 55.0 | 26.2 | 26.2 | 61.6 | 31.3 | 8.7 |
| Incr Delay (d2), s/veh | 7.5 | 0.5 | 107.5 | 0.7 | 0.0 | 48.3 | 2.9 | 1.3 | 4.1 | 115.2 | 2.0 | 0.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.5 | 2.4 | 9.0 | 4.3 | 0.0 | 7.5 | 4.1 | 11.1 | 14.1 | 6.0 | 13.7 | 3.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 54.5 | 54.8 | 137.5 | 46.7 | 0.0 | 106.7 | 57.9 | 27.4 | 30.2 | 176.8 | 33.4 | 9.5 |
| LnGrp LOS | D | D | F | D | A | F | E | C | C | F | C | A |
| Approach Vol, veh/h | | 444 | | | 307 | | | 2770 | | | 2362 | |
| Approach Delay, s/veh | | 90.4 | | | 77.6 | | | 30.8 | | | 37.9 | |
| Approach LOS | | F | | | E | | | C | | | D | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 15.0 | 70.1 | 21.5 | 23.4 | 23.1 | 62.0 | 22.9 | 22.0 | | | | |
| Change Period (Y+Rc), s | * 8.1 | * 8.2 | 9.7 | 9.7 | 8.2 | 6.1 | 9.7 | 9.7 | | | | |
| Max Green Setting (Gmax), s | * 6.9 | * 64 | 12.3 | 13.3 | 11.8 | 58.9 | 13.3 | 12.3 | | | | |
| Max Q Clear Time (g_c+1), s | 8.9 | 33.9 | 11.8 | 11.9 | 11.2 | 37.9 | 13.2 | 13.4 | | | | |
| Green Ext Time (p_c), s | 0.0 | 26.0 | 0.0 | 0.1 | 0.0 | 18.0 | 0.0 | 0.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 40.6 |
| HCM 6th LOS | D |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



| Movement | WBL | WBR | NBT | NBR | SBL | SBT | | | | |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|--|
| Lane Configurations | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 182 | 2394 | 181 | 0 | 2273 | | | | |
| Future Volume (Veh/h) | 0 | 182 | 2394 | 181 | 0 | 2273 | | | | |
| Sign Control | Stop | | Free | | | Free | | | | |
| Grade | 0% | | 0% | | | 0% | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | |
| Hourly flow rate (vph) | 0 | 198 | 2602 | 197 | 0 | 2471 | | | | |
| Pedestrians | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | |
| Median type | None | | | | None | | | | | |
| Median storage (veh) | | | | | | | | | | |
| Upstream signal (ft) | | | | | | 176 | | | | |
| pX, platoon unblocked | 0.74 | | | | | | | | | |
| vC, conflicting volume | 3318 | 749 | | | | | 2799 | | | |
| vC1, stage 1 conf vol | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | |
| vCu, unblocked vol | 2367 | 749 | | | | | 2799 | | | |
| tC, single (s) | 6.8 | 6.9 | | | | | 4.1 | | | |
| tC, 2 stage (s) | | | | | | | | | | |
| tF (s) | 3.5 | 3.3 | | | | | 2.2 | | | |
| p0 queue free % | 100 | 44 | | | | | 100 | | | |
| cM capacity (veh/h) | 22 | 354 | | | | | 136 | | | |
| Direction, Lane # | WB 1 | NB 1 | NB 2 | NB 3 | NB 4 | SB 1 | SB 2 | SB 3 | SB 4 | |
| Volume Total | 198 | 743 | 743 | 743 | 569 | 618 | 618 | 618 | 618 | |
| Volume Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Volume Right | 198 | 0 | 0 | 0 | 197 | 0 | 0 | 0 | 0 | |
| cSH | 354 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | |
| Volume to Capacity | 0.56 | 0.44 | 0.44 | 0.44 | 0.33 | 0.36 | 0.36 | 0.36 | 0.36 | |
| Queue Length 95th (ft) | 81 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Control Delay (s) | 27.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Lane LOS | D | | | | | | | | | |
| Approach Delay (s) | 27.3 | 0.0 | | | | | 0.0 | | | |
| Approach LOS | D | | | | | | | | | |
| Intersection Summary | | | | | | | | | | |
| Average Delay | | | 1.0 | | | | | | | |
| Intersection Capacity Utilization | | | 55.6% | | ICU Level of Service | | | | B | |
| Analysis Period (min) | | | 15 | | | | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | EB | EB | EB | WB | WB | NB | NB | NB | NB | NB | NB | NB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Directions Served | L | T | R | L | TR | L | L | T | T | T | T | TR |
| Maximum Queue (ft) | 195 | 223 | 149 | 237 | 274 | 96 | 98 | 161 | 152 | 147 | 133 | 123 |
| Average Queue (ft) | 115 | 71 | 44 | 98 | 128 | 82 | 94 | 132 | 111 | 110 | 102 | 95 |
| 95th Queue (ft) | 196 | 177 | 98 | 185 | 251 | 113 | 103 | 160 | 135 | 132 | 122 | 123 |
| Link Distance (ft) | | 774 | | | 932 | | | 98 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | | | | | | 18 | 48 | 76 | 45 | 37 | 21 | 16 |
| Queuing Penalty (veh) | | | | | | 0 | 0 | 391 | 231 | 193 | 107 | 82 |
| Storage Bay Dist (ft) | 200 | | 325 | 425 | | 750 | 750 | | | | | |
| Storage Blk Time (%) | 2 | 0 | 0 | | 0 | 18 | 48 | 76 | | | | |
| Queuing Penalty (veh) | 6 | 1 | 0 | | 0 | 82 | 216 | 181 | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

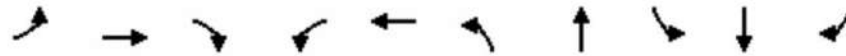
| Movement | SB | SB | SB | SB | SB | SB |
|-----------------------|-----|------|------|------|------|-----|
| Directions Served | L | T | T | T | T | R |
| Maximum Queue (ft) | 274 | 430 | 423 | 383 | 279 | 126 |
| Average Queue (ft) | 134 | 303 | 289 | 241 | 158 | 39 |
| 95th Queue (ft) | 277 | 401 | 378 | 331 | 256 | 93 |
| Link Distance (ft) | | 1695 | 1695 | 1695 | 1695 | |
| Upstream Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |
| Storage Bay Dist (ft) | 275 | | | | | 300 |
| Storage Blk Time (%) | 2 | 9 | | | 0 | 0 |
| Queuing Penalty (veh) | 10 | 8 | | | 0 | 0 |

Intersection: 2: US Route 29 & WaWa Entrance

| Movement | WB | NB | NB | NB | NB | NB | SB | SB | SB | SB |
|-----------------------|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Directions Served | R | T | T | T | T | TR | T | T | T | T |
| Maximum Queue (ft) | 203 | 881 | 801 | 650 | 448 | 282 | 9 | 13 | 28 | 18 |
| Average Queue (ft) | 71 | 657 | 603 | 441 | 252 | 84 | 0 | 0 | 1 | 1 |
| 95th Queue (ft) | 157 | 891 | 818 | 623 | 397 | 246 | 7 | 10 | 16 | 11 |
| Link Distance (ft) | 346 | 862 | 862 | 862 | 862 | 862 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | 0 | 6 | 0 | | | | | | 0 | |
| Queuing Penalty (veh) | 0 | 0 | 0 | | | | | | 0 | |
| Storage Bay Dist (ft) | | | | | | | | | | |
| Storage Blk Time (%) | | | | | | | | | | |
| Queuing Penalty (veh) | | | | | | | | | | |

Network Summary

| |
|------------------------------------|
| Network wide Queuing Penalty: 1507 |
|------------------------------------|



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|-------------------------|------|------|------|------|------|------|------|-------|------|------|
| Lane Group Flow (vph) | 134 | 65 | 112 | 174 | 98 | 237 | 1812 | 165 | 2027 | 215 |
| v/c Ratio | 0.60 | 0.45 | 0.30 | 0.84 | 0.82 | 0.76 | 0.54 | 0.93 | 0.69 | 0.25 |
| Control Delay | 50.4 | 59.9 | 2.0 | 76.0 | 95.1 | 67.7 | 22.6 | 103.1 | 25.2 | 2.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 50.4 | 59.9 | 2.0 | 76.0 | 95.1 | 67.7 | 22.6 | 103.1 | 25.2 | 2.5 |
| Queue Length 50th (ft) | 83 | 46 | 0 | 112 | 69 | 89 | 225 | ~126 | 334 | 0 |
| Queue Length 95th (ft) | 142 | 92 | 0 | #234 | #169 | #142 | 255 | #268 | 378 | 33 |
| Internal Link Dist (ft) | | 785 | | | 946 | | 96 | | 1665 | |
| Turn Bay Length (ft) | 200 | | 325 | 425 | | 750 | | 275 | | 300 |
| Base Capacity (vph) | 229 | 162 | 385 | 206 | 120 | 322 | 3436 | 178 | 2952 | 845 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.59 | 0.40 | 0.29 | 0.84 | 0.82 | 0.74 | 0.53 | 0.93 | 0.69 | 0.25 |

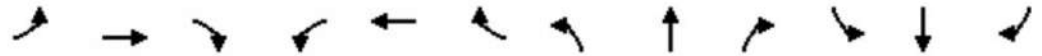
Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2026 Total - AM
1: US Route 29 & Greenbrier Drive

Total 2026 AM
HCM 6th Signalized Intersection Summary



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|-------|-------|------|------|------|------|------|------|------|-------|------|------|
| Lane Configurations | ↖ | ↗ | ↘ | ↖ | ↗ | | ↖ | ↑↑↑↑ | | ↖ | ↑↑↑↑ | ↗ |
| Traffic Volume (veh/h) | 127 | 62 | 106 | 165 | 81 | 12 | 225 | 1681 | 41 | 157 | 1926 | 204 |
| Future Volume (veh/h) | 127 | 62 | 106 | 165 | 81 | 12 | 225 | 1681 | 41 | 157 | 1926 | 204 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1885 | 1826 | 1781 | 1796 | 1856 | 1648 | 1870 | 1826 | 1826 | 1826 | 1826 | 1811 |
| Adj Flow Rate, veh/h | 134 | 65 | 112 | 174 | 85 | 13 | 237 | 1769 | 43 | 165 | 2027 | 215 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 1 | 5 | 8 | 7 | 3 | 17 | 2 | 5 | 5 | 5 | 5 | 6 |
| Cap, veh/h | 221 | 164 | 135 | 221 | 100 | 15 | 422 | 3390 | 82 | 165 | 2766 | 676 |
| Arrive On Green | 0.08 | 0.09 | 0.09 | 0.05 | 0.06 | 0.06 | 0.12 | 0.45 | 0.45 | 0.09 | 0.44 | 0.44 |
| Sat Flow, veh/h | 1795 | 1826 | 1510 | 1711 | 1572 | 240 | 3456 | 7526 | 183 | 1739 | 6281 | 1535 |
| Grp Volume(v), veh/h | 134 | 65 | 112 | 174 | 0 | 98 | 237 | 1390 | 422 | 165 | 2027 | 215 |
| Grp Sat Flow(s),veh/h/ln | 1795 | 1826 | 1510 | 1711 | 0 | 1812 | 1728 | 1479 | 1793 | 1739 | 1570 | 1535 |
| Q Serve(g_s), s | 7.9 | 3.9 | 5.8 | 6.3 | 0.0 | 6.2 | 7.4 | 19.4 | 19.4 | 10.9 | 30.7 | 6.4 |
| Cycle Q Clear(g_c), s | 7.9 | 3.9 | 5.8 | 6.3 | 0.0 | 6.2 | 7.4 | 19.4 | 19.4 | 10.9 | 30.7 | 6.4 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.13 | 1.00 | | 0.10 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 221 | 164 | 135 | 221 | 0 | 115 | 422 | 2665 | 808 | 165 | 2766 | 676 |
| V/C Ratio(X) | 0.61 | 0.40 | 0.83 | 0.79 | 0.00 | 0.85 | 0.56 | 0.52 | 0.52 | 1.00 | 0.73 | 0.32 |
| Avail Cap(c_a), veh/h | 221 | 164 | 135 | 221 | 0 | 115 | 422 | 2783 | 843 | 165 | 2944 | 719 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 45.7 | 49.4 | 24.9 | 49.1 | 0.0 | 53.3 | 47.6 | 22.7 | 22.7 | 52.1 | 26.6 | 7.8 |
| Incr Delay (d2), s/veh | 3.4 | 0.6 | 31.3 | 15.7 | 0.0 | 40.7 | 1.0 | 0.7 | 2.4 | 70.4 | 1.8 | 1.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.7 | 1.8 | 3.3 | 3.1 | 0.0 | 4.1 | 3.2 | 6.5 | 8.3 | 7.8 | 11.0 | 0.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 49.1 | 50.0 | 56.1 | 64.7 | 0.0 | 94.0 | 48.6 | 23.4 | 25.1 | 122.4 | 28.3 | 9.0 |
| LnGrp LOS | D | D | E | E | A | F | D | C | C | F | C | A |
| Approach Vol, veh/h | | 311 | | | 272 | | | 2049 | | | 2407 | |
| Approach Delay, s/veh | | 51.8 | | | 75.3 | | | 26.7 | | | 33.1 | |
| Approach LOS | | D | | | E | | | C | | | C | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 19.0 | 60.0 | 16.0 | 20.0 | 22.3 | 56.7 | 19.0 | 17.0 | | | | |
| Change Period (Y+Rc), s | * 8.1 | * 8.2 | 9.7 | 9.7 | 8.2 | 6.1 | 9.7 | 9.7 | | | | |
| Max Green Setting (Gmax), s | * 11 | * 54 | 6.3 | 10.3 | 10.8 | 53.9 | 9.3 | 7.3 | | | | |
| Max Q Clear Time (g_c+1), s | 12.9 | 21.4 | 8.3 | 7.8 | 9.4 | 32.7 | 9.9 | 8.2 | | | | |
| Green Ext Time (p_c), s | 0.0 | 20.9 | 0.0 | 0.1 | 0.1 | 18.0 | 0.0 | 0.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 33.9 |
| HCM 6th LOS | C |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

2026 Total - AM
2: US Route 29 & Shared WaWa Entrance

Total 2026 AM
HCM Unsignalized Intersection Capacity Analysis



| Movement | WBL | WBR | NBT | NBR | SBL | SBT | | | |
|-----------------------------------|------|------|-------|----------------------|------|------|------|------|------|
| Lane Configurations | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 313 | 1631 | 224 | 0 | 2197 | | | |
| Future Volume (Veh/h) | 0 | 313 | 1631 | 224 | 0 | 2197 | | | |
| Sign Control | Stop | | Free | | | Free | | | |
| Grade | 0% | | 0% | | | 0% | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | |
| Hourly flow rate (vph) | 0 | 340 | 1773 | 243 | 0 | 2388 | | | |
| Pedestrians | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | |
| Percent Blockage | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | |
| Median type | | | | | | | | | |
| Median storage (veh) | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | |
| pX, platoon unblocked | 0.75 | | | | | | | | |
| vC, conflicting volume | 2492 | 565 | | | | | 2016 | | |
| vC1, stage 1 conf vol | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | |
| vCu, unblocked vol | 1311 | 565 | | | | | 2016 | | |
| tC, single (s) | 6.8 | 6.9 | | | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | |
| tF (s) | 3.5 | 3.3 | | | | | 2.2 | | |
| p0 queue free % | 100 | 27 | | | | | 100 | | |
| cM capacity (veh/h) | 112 | 468 | | | | | 287 | | |
| Direction, Lane # | WB 1 | NB 1 | NB 2 | NB 3 | NB 4 | SB 1 | SB 2 | SB 3 | SB 4 |
| Volume Total | 340 | 507 | 507 | 507 | 496 | 597 | 597 | 597 | 597 |
| Volume Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Volume Right | 340 | 0 | 0 | 0 | 243 | 0 | 0 | 0 | 0 |
| cSH | 468 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 0.73 | 0.30 | 0.30 | 0.30 | 0.29 | 0.35 | 0.35 | 0.35 | 0.35 |
| Queue Length 95th (ft) | 146 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Control Delay (s) | 30.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | D | | | | | | | | |
| Approach Delay (s) | 30.5 | 0.0 | | | | | 0.0 | | |
| Approach LOS | D | | | | | | | | |
| Intersection Summary | | | | | | | | | |
| Average Delay | | | 2.2 | | | | | | |
| Intersection Capacity Utilization | | | 53.4% | ICU Level of Service | | | | A | |
| Analysis Period (min) | | | 15 | | | | | | |

2026 Total - AM
3: US Route 29 & Proposed RI Only

Total 2026 AM
HCM Unsignalized Intersection Capacity Analysis



| Movement | WBL | WBR | NBT | NBR | SBL | SBT | | |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|
| Lane Configurations | | | ↑↑↑↑ | | | ↑↑↑↑ | | |
| Traffic Volume (veh/h) | 0 | 0 | 1855 | 29 | 0 | 2197 | | |
| Future Volume (Veh/h) | 0 | 0 | 1855 | 29 | 0 | 2197 | | |
| Sign Control | Stop | | Free | | Free | | | |
| Grade | 0% | | 0% | | 0% | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | |
| Hourly flow rate (vph) | 0 | 0 | 2016 | 32 | 0 | 2388 | | |
| Pedestrians | | | | | | | | |
| Lane Width (ft) | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | |
| Percent Blockage | | | | | | | | |
| Right turn flare (veh) | | | | | | | | |
| Median type | None | | | | None | | | |
| Median storage (veh) | | | | | | | | |
| Upstream signal (ft) | | | | | | | 423 | |
| pX, platoon unblocked | 0.75 | | | | | | | |
| vC, conflicting volume | 2629 | 520 | | | 2048 | | | |
| vC1, stage 1 conf vol | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | |
| vCu, unblocked vol | 1509 | 520 | | | 2048 | | | |
| tC, single (s) | 6.8 | 6.9 | | | 4.1 | | | |
| tC, 2 stage (s) | | | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | | | |
| p0 queue free % | 100 | 100 | | | 100 | | | |
| cM capacity (veh/h) | 84 | 501 | | | 271 | | | |
| Direction, Lane # | NB 1 | NB 2 | NB 3 | NB 4 | SB 1 | SB 2 | SB 3 | SB 4 |
| Volume Total | 576 | 576 | 576 | 320 | 597 | 597 | 597 | 597 |
| Volume Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Volume Right | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 |
| cSH | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 0.34 | 0.34 | 0.34 | 0.19 | 0.35 | 0.35 | 0.35 | 0.35 |
| Queue Length 95th (ft) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Control Delay (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | | | | | | | | |
| Approach Delay (s) | 0.0 | | | | 0.0 | | | |
| Approach LOS | | | | | | | | |
| Intersection Summary | | | | | | | | |
| Average Delay | | | 0.0 | | | | | |
| Intersection Capacity Utilization | | | 35.2% | | ICU Level of Service | | A | |
| Analysis Period (min) | | | 15 | | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | EB | EB | EB | WB | WB | NB | NB | NB | NB | NB | NB | NB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Directions Served | L | T | R | L | TR | L | L | T | T | T | T | TR |
| Maximum Queue (ft) | 162 | 119 | 84 | 318 | 249 | 95 | 98 | 163 | 163 | 158 | 128 | 117 |
| Average Queue (ft) | 89 | 48 | 32 | 157 | 88 | 77 | 92 | 132 | 117 | 109 | 89 | 95 |
| 95th Queue (ft) | 155 | 102 | 63 | 304 | 200 | 117 | 108 | 158 | 147 | 142 | 127 | 124 |
| Link Distance (ft) | | 774 | | | 932 | | | 98 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | | | | | | 8 | 29 | 72 | 48 | 28 | 9 | 17 |
| Queuing Penalty (veh) | | | | | | 0 | 0 | 281 | 187 | 111 | 34 | 67 |
| Storage Bay Dist (ft) | 200 | | 325 | 425 | | 750 | 750 | | | | | |
| Storage Blk Time (%) | 0 | 0 | | 0 | 0 | 8 | 29 | 72 | | | | |
| Queuing Penalty (veh) | 0 | 0 | | 0 | 0 | 27 | 99 | 162 | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | SB | SB | SB | SB | SB | SB |
|-----------------------|-----|------|------|------|------|-----|
| Directions Served | L | T | T | T | T | R |
| Maximum Queue (ft) | 274 | 492 | 459 | 365 | 246 | 108 |
| Average Queue (ft) | 194 | 297 | 283 | 209 | 134 | 47 |
| 95th Queue (ft) | 313 | 478 | 440 | 307 | 229 | 87 |
| Link Distance (ft) | | 1695 | 1695 | 1695 | 1695 | |
| Upstream Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |
| Storage Bay Dist (ft) | 275 | | | | | 300 |
| Storage Blk Time (%) | 11 | 5 | | | 0 | |
| Queuing Penalty (veh) | 55 | 8 | | | 0 | |

Intersection: 2: US Route 29 & Shared WaWa Entrance

| Movement | WB | NB | NB | NB | NB | NB | SB | SB | SB | SB |
|-----------------------|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Directions Served | R | T | T | T | T | TR | T | T | T | T |
| Maximum Queue (ft) | 212 | 232 | 261 | 231 | 198 | 156 | 16 | 33 | 25 | 20 |
| Average Queue (ft) | 88 | 214 | 219 | 178 | 68 | 17 | 1 | 1 | 1 | 1 |
| 95th Queue (ft) | 165 | 230 | 257 | 259 | 190 | 83 | 14 | 15 | 13 | 12 |
| Link Distance (ft) | 345 | 203 | 203 | 203 | 203 | 203 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | | 43 | 18 | 3 | 0 | 0 | 0 | 0 | | |
| Queuing Penalty (veh) | | 162 | 66 | 10 | 1 | 0 | 0 | 0 | | |
| Storage Bay Dist (ft) | | | | | | | | | | |
| Storage Blk Time (%) | | | | | | | | | | |
| Queuing Penalty (veh) | | | | | | | | | | |

Intersection: 3: US Route 29 & Proposed RI Only

| Movement | NB | NB | NB | NB | NB | SB | SB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|
| Directions Served | T | T | T | T | TR | T | T |
| Maximum Queue (ft) | 502 | 440 | 269 | 37 | 10 | 4 | 2 |
| Average Queue (ft) | 282 | 224 | 59 | 2 | 0 | 0 | 0 |
| 95th Queue (ft) | 500 | 447 | 218 | 34 | 10 | 4 | 2 |
| Link Distance (ft) | 612 | 612 | 612 | 612 | 612 | 203 | 203 |
| Upstream Blk Time (%) | 1 | | | | | | |
| Queuing Penalty (veh) | 0 | | | | | | |
| Storage Bay Dist (ft) | | | | | | | |
| Storage Blk Time (%) | | | | | | | |
| Queuing Penalty (veh) | | | | | | | |

Network Summary

Network wide Queuing Penalty: 1273



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|-------------------------|------|------|------|------|-------|------|------|-------|------|------|
| Lane Group Flow (vph) | 174 | 78 | 192 | 149 | 158 | 256 | 2597 | 101 | 2102 | 159 |
| v/c Ratio | 0.64 | 0.41 | 0.50 | 0.53 | 0.90 | 0.81 | 0.70 | 0.96 | 0.71 | 0.19 |
| Control Delay | 51.3 | 61.8 | 6.9 | 46.5 | 100.4 | 78.1 | 26.7 | 139.1 | 30.2 | 1.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 51.3 | 61.8 | 6.9 | 46.5 | 100.4 | 78.1 | 26.7 | 139.1 | 30.2 | 1.5 |
| Queue Length 50th (ft) | 119 | 63 | 0 | 100 | 128 | 111 | 406 | ~95 | 411 | 0 |
| Queue Length 95th (ft) | 187 | 116 | 29 | 164 | #261 | #180 | 440 | #215 | 455 | 16 |
| Internal Link Dist (ft) | | 785 | | | 946 | | 96 | | 1665 | |
| Turn Bay Length (ft) | 200 | | 325 | 425 | | 750 | | 275 | | 300 |
| Base Capacity (vph) | 284 | 191 | 386 | 293 | 179 | 315 | 3710 | 105 | 2941 | 831 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.61 | 0.41 | 0.50 | 0.51 | 0.88 | 0.81 | 0.70 | 0.96 | 0.71 | 0.19 |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2026 Total - PM
1: US Route 29 & Greenbrier Drive

Total 2026 PM
HCM 6th Signalized Intersection Summary



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|-------|-------|-------|------|------|-------|------|------|------|-------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 162 | 73 | 179 | 139 | 120 | 27 | 238 | 2345 | 70 | 94 | 1955 | 148 |
| Future Volume (veh/h) | 162 | 73 | 179 | 139 | 120 | 27 | 238 | 2345 | 70 | 94 | 1955 | 148 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1885 | 1856 | 1900 | 1826 | 1856 | 1900 | 1870 | 1870 | 1900 | 1856 | 1870 | 1856 |
| Adj Flow Rate, veh/h | 174 | 78 | 192 | 149 | 129 | 29 | 256 | 2522 | 75 | 101 | 2102 | 159 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 1 | 3 | 0 | 5 | 3 | 0 | 2 | 2 | 0 | 3 | 2 | 3 |
| Cap, veh/h | 247 | 196 | 170 | 285 | 139 | 31 | 396 | 3648 | 108 | 94 | 2768 | 676 |
| Arrive On Green | 0.10 | 0.11 | 0.11 | 0.09 | 0.09 | 0.09 | 0.11 | 0.48 | 0.48 | 0.05 | 0.43 | 0.43 |
| Sat Flow, veh/h | 1795 | 1856 | 1610 | 1739 | 1467 | 330 | 3456 | 7661 | 228 | 1767 | 6434 | 1572 |
| Grp Volume(v), veh/h | 174 | 78 | 192 | 149 | 0 | 158 | 256 | 1995 | 602 | 101 | 2102 | 159 |
| Grp Sat Flow(s),veh/h/ln | 1795 | 1856 | 1610 | 1739 | 0 | 1796 | 1728 | 1515 | 1829 | 1767 | 1609 | 1572 |
| Q Serve(g_s), s | 11.2 | 5.1 | 9.9 | 9.8 | 0.0 | 11.4 | 9.2 | 33.4 | 33.4 | 6.9 | 35.9 | 5.1 |
| Cycle Q Clear(g_c), s | 11.2 | 5.1 | 9.9 | 9.8 | 0.0 | 11.4 | 9.2 | 33.4 | 33.4 | 6.9 | 35.9 | 5.1 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.18 | 1.00 | | 0.12 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 247 | 196 | 170 | 285 | 0 | 170 | 396 | 2886 | 871 | 94 | 2768 | 676 |
| V/C Ratio(X) | 0.71 | 0.40 | 1.13 | 0.52 | 0.00 | 0.93 | 0.65 | 0.69 | 0.69 | 1.08 | 0.76 | 0.24 |
| Avail Cap(c_a), veh/h | 248 | 196 | 170 | 292 | 0 | 170 | 396 | 2988 | 902 | 94 | 2915 | 712 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 47.1 | 54.3 | 30.0 | 46.1 | 0.0 | 58.4 | 55.0 | 26.6 | 26.6 | 61.6 | 31.3 | 8.7 |
| Incr Delay (d2), s/veh | 7.5 | 0.5 | 107.5 | 0.7 | 0.0 | 48.3 | 2.9 | 1.4 | 4.5 | 115.2 | 2.0 | 0.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.5 | 2.4 | 9.0 | 4.3 | 0.0 | 7.5 | 4.1 | 11.7 | 14.9 | 6.0 | 13.7 | 3.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 54.5 | 54.8 | 137.5 | 46.7 | 0.0 | 106.7 | 57.9 | 28.0 | 31.1 | 176.8 | 33.4 | 9.5 |
| LnGrp LOS | D | D | F | D | A | F | E | C | C | F | C | A |
| Approach Vol, veh/h | | 444 | | | 307 | | | 2853 | | | 2362 | |
| Approach Delay, s/veh | | 90.4 | | | 77.6 | | | 31.3 | | | 37.9 | |
| Approach LOS | | F | | | E | | | C | | | D | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 15.0 | 70.1 | 21.5 | 23.4 | 23.1 | 62.0 | 22.9 | 22.0 | | | | |
| Change Period (Y+Rc), s | * 8.1 | * 8.2 | 9.7 | 9.7 | 8.2 | 6.1 | 9.7 | 9.7 | | | | |
| Max Green Setting (Gmax), s | * 6.9 | * 64 | 12.3 | 13.3 | 11.8 | 58.9 | 13.3 | 12.3 | | | | |
| Max Q Clear Time (g_c+1), s | 8.9 | 35.4 | 11.8 | 11.9 | 11.2 | 37.9 | 13.2 | 13.4 | | | | |
| Green Ext Time (p_c), s | 0.0 | 25.3 | 0.0 | 0.1 | 0.0 | 18.0 | 0.0 | 0.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 40.7 |
| HCM 6th LOS | D |

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

2026 Total - PM
2: US Route 29 & Shared WaWa Entrance

Total 2026 PM
HCM Unsignalized Intersection Capacity Analysis



| Movement | WBL | WBR | NBT | NBR | SBL | SBT | | | |
|-----------------------------------|------|------|-------|----------------------|------|------|------|------|------|
| Lane Configurations | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 259 | 2394 | 207 | 0 | 2273 | | | |
| Future Volume (Veh/h) | 0 | 259 | 2394 | 207 | 0 | 2273 | | | |
| Sign Control | Stop | | Free | | | Free | | | |
| Grade | 0% | | 0% | | | 0% | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | |
| Hourly flow rate (vph) | 0 | 282 | 2602 | 225 | 0 | 2471 | | | |
| Pedestrians | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | |
| Percent Blockage | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | |
| Median type | | | | | | | | | |
| Median storage (veh) | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | |
| pX, platoon unblocked | 0.74 | | | | | | | | |
| vC, conflicting volume | 3332 | 763 | | | | | 2827 | | |
| vC1, stage 1 conf vol | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | |
| vCu, unblocked vol | 2386 | 763 | | | | | 2827 | | |
| tC, single (s) | 6.8 | 6.9 | | | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | |
| tF (s) | 3.5 | 3.3 | | | | | 2.2 | | |
| p0 queue free % | 100 | 19 | | | | | 100 | | |
| cM capacity (veh/h) | 21 | 347 | | | | | 133 | | |
| Direction, Lane # | WB 1 | NB 1 | NB 2 | NB 3 | NB 4 | SB 1 | SB 2 | SB 3 | SB 4 |
| Volume Total | 282 | 743 | 743 | 743 | 597 | 618 | 618 | 618 | 618 |
| Volume Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Volume Right | 282 | 0 | 0 | 0 | 225 | 0 | 0 | 0 | 0 |
| cSH | 347 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 0.81 | 0.44 | 0.44 | 0.44 | 0.35 | 0.36 | 0.36 | 0.36 | 0.36 |
| Queue Length 95th (ft) | 175 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Control Delay (s) | 47.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | E | | | | | | | | |
| Approach Delay (s) | 47.9 | 0.0 | | | | | 0.0 | | |
| Approach LOS | E | | | | | | | | |
| Intersection Summary | | | | | | | | | |
| Average Delay | | | 2.4 | | | | | | |
| Intersection Capacity Utilization | | | 60.9% | ICU Level of Service | | | | B | |
| Analysis Period (min) | | | 15 | | | | | | |

2026 Total - PM
3: US Route 29 & Proposed RI Only

Total 2026 PM
HCM Unsignalized Intersection Capacity Analysis



| Movement | WBL | WBR | NBT | NBR | SBL | SBT | | | |
|-----------------------------------|------|------|-------|------|------|----------------------|------|------|--|
| Lane Configurations | | | ↑↑↑↑ | | | ↑↑↑↑ | | | |
| Traffic Volume (veh/h) | 0 | 0 | 2601 | 77 | 0 | 2273 | | | |
| Future Volume (Veh/h) | 0 | 0 | 2601 | 77 | 0 | 2273 | | | |
| Sign Control | Stop | | Free | | | Free | | | |
| Grade | 0% | | 0% | | | 0% | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | |
| Hourly flow rate (vph) | 0 | 0 | 2827 | 84 | 0 | 2471 | | | |
| Pedestrians | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | |
| Percent Blockage | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | |
| Median type | None | | | | None | | | | |
| Median storage (veh) | | | | | | | | | |
| Upstream signal (ft) | | | | | | | 423 | | |
| pX, platoon unblocked | 0.74 | | | | | | | | |
| vC, conflicting volume | 3487 | 749 | | | | | 2911 | | |
| vC1, stage 1 conf vol | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | |
| vCu, unblocked vol | 2605 | 749 | | | | | 2911 | | |
| tC, single (s) | 6.8 | 6.9 | | | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | |
| tF (s) | 3.5 | 3.3 | | | | | 2.2 | | |
| p0 queue free % | 100 | 100 | | | | | 100 | | |
| cM capacity (veh/h) | 15 | 355 | | | | | 123 | | |
| Direction, Lane # | NB 1 | NB 2 | NB 3 | NB 4 | SB 1 | SB 2 | SB 3 | SB 4 | |
| Volume Total | 808 | 808 | 808 | 488 | 618 | 618 | 618 | 618 | |
| Volume Left | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Volume Right | 0 | 0 | 0 | 84 | 0 | 0 | 0 | 0 | |
| cSH | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | 1700 | |
| Volume to Capacity | 0.48 | 0.48 | 0.48 | 0.29 | 0.36 | 0.36 | 0.36 | 0.36 | |
| Queue Length 95th (ft) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Control Delay (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Lane LOS | | | | | | | | | |
| Approach Delay (s) | 0.0 | | | | 0.0 | | | | |
| Approach LOS | | | | | | | | | |
| Intersection Summary | | | | | | | | | |
| Average Delay | | | 0.0 | | | | | | |
| Intersection Capacity Utilization | | | 42.3% | | | ICU Level of Service | | A | |
| Analysis Period (min) | | | 15 | | | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | EB | EB | EB | WB | WB | NB | NB | NB | NB | NB | NB | NB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Directions Served | L | T | R | L | TR | L | L | T | T | T | T | TR |
| Maximum Queue (ft) | 192 | 246 | 185 | 211 | 261 | 95 | 98 | 161 | 156 | 152 | 137 | 122 |
| Average Queue (ft) | 109 | 64 | 48 | 95 | 127 | 79 | 93 | 133 | 113 | 111 | 104 | 100 |
| 95th Queue (ft) | 191 | 158 | 118 | 179 | 227 | 115 | 106 | 157 | 138 | 135 | 127 | 119 |
| Link Distance (ft) | | 774 | | | 932 | | | 98 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | | | | | | 14 | 38 | 76 | 47 | 40 | 26 | 24 |
| Queuing Penalty (veh) | | | | | | 0 | 0 | 405 | 251 | 214 | 137 | 127 |
| Storage Bay Dist (ft) | 200 | | 325 | 425 | | 750 | 750 | | | | | |
| Storage Blk Time (%) | 2 | 0 | 0 | | 0 | 14 | 38 | 76 | | | | |
| Queuing Penalty (veh) | 5 | 2 | 0 | | 0 | 64 | 178 | 182 | | | | |

Intersection: 1: US Route 29 & Greenbrier Drive

| Movement | SB | SB | SB | SB | SB | SB |
|-----------------------|-----|------|------|------|------|-----|
| Directions Served | L | T | T | T | T | R |
| Maximum Queue (ft) | 274 | 492 | 464 | 418 | 326 | 129 |
| Average Queue (ft) | 153 | 316 | 300 | 247 | 167 | 41 |
| 95th Queue (ft) | 297 | 475 | 446 | 379 | 284 | 96 |
| Link Distance (ft) | | 1695 | 1695 | 1695 | 1695 | |
| Upstream Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |
| Storage Bay Dist (ft) | 275 | | | | | 300 |
| Storage Blk Time (%) | 5 | 11 | | | 0 | 0 |
| Queuing Penalty (veh) | 23 | 11 | | | 1 | 0 |

Intersection: 2: US Route 29 & Shared WaWa Entrance

| Movement | WB | NB | NB | NB | NB | NB | SB | SB | SB | SB |
|-----------------------|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Directions Served | R | T | T | T | T | TR | T | T | T | T |
| Maximum Queue (ft) | 290 | 232 | 266 | 262 | 218 | 208 | 9 | 13 | 46 | 25 |
| Average Queue (ft) | 128 | 214 | 231 | 219 | 181 | 96 | 0 | 0 | 2 | 1 |
| 95th Queue (ft) | 262 | 227 | 268 | 251 | 248 | 211 | 10 | 8 | 20 | 16 |
| Link Distance (ft) | 345 | 203 | 203 | 203 | 203 | 203 | 98 | 98 | 98 | 98 |
| Upstream Blk Time (%) | 2 | 61 | 31 | 14 | 3 | 1 | 0 | | | |
| Queuing Penalty (veh) | 0 | 316 | 163 | 73 | 14 | 3 | 0 | | | |
| Storage Bay Dist (ft) | | | | | | | | | | |
| Storage Blk Time (%) | | | | | | | | | | |
| Queuing Penalty (veh) | | | | | | | | | | |

Intersection: 3: US Route 29 & Proposed RI Only

| Movement | NB | NB | NB | NB | NB | SB | SB | SB |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Directions Served | T | T | T | T | TR | T | T | T |
| Maximum Queue (ft) | 639 | 598 | 460 | 287 | 58 | 3 | 23 | 16 |
| Average Queue (ft) | 509 | 438 | 267 | 60 | 3 | 0 | 1 | 1 |
| 95th Queue (ft) | 709 | 616 | 467 | 214 | 34 | 3 | 24 | 10 |
| Link Distance (ft) | 612 | 612 | 612 | 612 | 612 | 203 | 203 | 203 |
| Upstream Blk Time (%) | 9 | 0 | | | | | 0 | |
| Queuing Penalty (veh) | 0 | 0 | | | | | 0 | |
| Storage Bay Dist (ft) | | | | | | | | |
| Storage Blk Time (%) | | | | | | | | |
| Queuing Penalty (veh) | | | | | | | | |

Network Summary

Network wide Queuing Penalty: 2167

APPENDIX C

Synchro/SimTraffic Analysis Outputs

ACCESS MANAGEMENT EXCEPTION REQUEST: AM-E
ACCESS MANAGEMENT REGULATIONS 24 VAC 30-73
SECTION 120

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|--|--|-----------------------------------|
| Submitted by: Thomas Ruff, PE, PTOE | | Date: 02/20/2023 |
| Email Address: thomas.ruff@timmons.com | | Phone: 434.774.0023 |
| Address: 608 Preston Avenue, Suite 200, Charlottesville, VA 22903 | | |
| Project Name: 1193 Seminole Trail - Up Campus | Rte # US Route 29 | Locality: Albemarle County |
| Description of Project: The proposed development consists of a 300 unit multi-family housing with approximately 7,500 SF of commercial on the first floor. Access to the site is proposed via one right-in/right-out partial access on US Route 29 that will be shared with the existing WaWa development, which is located 185' from the Greenbrier Drive signalized intersection. A second access is proposed via one right-in only partial access on US Route 29, which is located 50' from another partial access entrance to the south. The AM-F is requested for spacing standards for both entrances. | | |
| VDOT District: Culpeper | Area Land Use Engineer: Doug McAvoy, PE | |

- NOTES:**
- Submit this form and any attachments to one of the District's Area Land Use Engineers.
 - See Section 120 of the Regulations for details on the requirements, exceptions, and exception request review process.
 - Attach additional information as necessary to justify the exception request(s).
 - If a traffic engineering study is required, the decision on the request will be based on VDOT engineering judgment.
 - Use the LD-440 Design Exception or the LD-448 Design Waiver forms for *design and engineering standards*, e.g. radius, grade, sight distance. See [IIM-LD-227](#) on VDOT web site for additional instructions.

Select the Exception(s) Being Requested

Exception to the shared commercial entrance requirement. (Access M. Regulations Section 120 C.2)

Reason for exception:

A. An agreement to share the entrance could not be reached with adjoining property owner.

Attached: Written evidence that adjoining property owner will not share the entrance.

B. Physical constraints: topography, adjacent hazardous land use, stream, wetland, other.

Specify constraint: _____

Attached: Documentation of constraint such as aerial photo or topographic map.

Exception to the vehicular connection to adjoining undeveloped property requirement. (Section 120 C.4)

Reason for exception:

A. Physical constraints: topography, adjacent hazardous land use, stream, wetland, other.

Specify constraint: _____

Attached: Documentation of constraint such as aerial photo or topographic map.

B. Other reason: _____

Exception to the commercial entrance shall not be located within the functional area of an intersection requirement. (See Regulation Section 120 C. 1; Appendix F, Rd Design Manual)

Attached: A traffic engineering study documenting that the operation of the intersection and public safety will not be adversely impacted.

EXCEPTION TO THE SPACING STANDARDS FOR:

- **Commercial entrances; intersections/median crossovers (Table 2-2);**
- **Commercial entrances/intersections near interchange ramps (Tables 2-3, 2-4); or**
- **Corner clearance (Figure 4-4).** Appendix F, Road Design Manual

Information on the Exception Request

ON A STATE HIGHWAY

Functional classification: Principal Arterial: Minor Arterial: Collector: Local:

Posted speed limit: 45 mph

NEAR AN INTERCHANGE RAMP (Submittal of a traffic engineering study required)

CORNER CLEARANCE (Submittal of a traffic engineering study required)

Type of intersection/entrance: Signalized Unsignalized Full Access Partial Access

Required spacing distance 495 ft

Proposed spacing distance 185 ft

Requested exception: Reduction in required spacing 310 ft

REASON FOR EXCEPTION:

A. To be located on an older, established business corridor along a highway where existing spacing did not meet the standards prior to 7/1/08 or 10/14/09. (Regulation Section 120 C.3.c)

Attached: Dated aerial photo of corridor identifying proposed entrance/intersection location.

B. Not enough property frontage to meet spacing standard, but the applicant does not want a partial access right-in/right-out entrance. (Section 120 C.3.f)

Attached: A traffic engineering study documenting that left turn movements at the entrance will not have a negative impact on highway operation or safety.

C. To be located within a new urbanism mixed use type development. (Section 120 C.3.d)

Attached: The design of the development and compliance with intersection sight distance.

D. The proposed entrance meets the signal warrants but does not meet the signalized intersection spacing standard. The applicant requests an exception to the spacing standard.

Attached: A traffic engineering study that (i) evaluates the location's suitability for a roundabout and (ii) provides documentation that the proposed signal will not impact safety and traffic flow. (Section 120 C.5)

- E. The development's 2nd (or additional) entrance does not meet the spacing standards but is necessary for the streets to be accepted into the secondary system. (Section 120 C.3.e)
 - Attached: Information on the development that identifies the location of entrances.
- F. To be located within the limits of a VDOT and locality approved access management corridor plan.
 - Attached: Aerial photo of corridor identifying proposed entrance/intersection location. (Sect 120 C.3.b)

FOR VDOT USE ONLY

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| Recommendation on Exception Request: Approve <input type="checkbox"/> Deny <input type="checkbox"/> Date: _____ |
| Area Land Use Engineer or: _____ Name _____ |
| Remarks: |

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| Exception Request Action: Approved <input type="checkbox"/> Denied <input type="checkbox"/> Date: _____ |
| District Administrator or Designee: _____ Name (and position if Designee) _____ |
| Remarks: |

District Staff: Please email copy to Bradley.Shelton@VDOT.Virginia.gov