

Pine Island and Stringfellow Road Review of Intersection Traffic Control

The intersection of Pine Island Road and Stringfellow Road experiences serious traffic delays during the peak traffic season in the area. In February 2020 a traffic count was conducted to review the traffic conditions and to determine what revisions to the intersection and its traffic control may be needed. The peak hour for entering traffic at the intersection was found to be at noon.

| Pine Island and Stringfellow Traffic County February 2020 | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
| 7:00 | 7 | 131 | 223 | 309 | 115 | 6 | 11 | 52 | 11 | 238 | 13 | 154 | 1270 |
| 8:00 | 13 | 256 | 273 | 387 | 234 | 12 | 17 | 78 | 17 | 331 | 17 | 194 | 1829 |
| 9:00 | 15 | 276 | 326 | 423 | 242 | 13 | 15 | 70 | 15 | 345 | 18 | 185 | 1942 |
| 10:00 | 18 | 351 | 344 | 400 | 244 | 13 | 19 | 88 | 19 | 326 | 17 | 215 | 2054 |
| 11:00 | 20 | 375 | 323 | 392 | 298 | 16 | 22 | 103 | 22 | 466 | 25 | 232 | 2293 |
| 12:00 | 24 | 464 | 272 | 375 | 306 | 16 | 21 | 99 | 21 | 562 | 30 | 205 | 2395 |
| 13:00 | 25 | 484 | 258 | 305 | 297 | 16 | 16 | 75 | 16 | 466 | 25 | 188 | 2170 |
| 14:00 | 23 | 432 | 275 | 417 | 285 | 15 | 17 | 77 | 17 | 446 | 23 | 247 | 2273 |
| 15:00 | 21 | 407 | 243 | 420 | 259 | 14 | 19 | 89 | 19 | 520 | 27 | 227 | 2265 |
| 16:00 | 22 | 409 | 227 | 393 | 220 | 12 | 15 | 70 | 15 | 423 | 22 | 263 | 2091 |
| 17:00 | 22 | 426 | 210 | 373 | 273 | 14 | 13 | 60 | 13 | 418 | 22 | 277 | 2120 |
| 18:00 | 13 | 256 | 147 | 174 | 184 | 10 | 9 | 43 | 9 | 288 | 15 | 174 | 1323 |

The intersection was analyzed using the HCS7 software. For the analysis, we looked at the existing condition, installing a traffic signal with existing lanes, installing a traffic signal with added left turn lanes, and a roundabout.

| Pine Island Road and Stringfellow Road | | | | |
|--|--------------------|----------|----------|----------|
| Traffic Delay Midday Peak | | | | |
| Count date - | 2/25/2020 | | | |
| | Delay per vehicle | | | |
| Condition | Intersection Delay | WB Delay | NB Delay | SB Delay |
| Existing 4-Way Stop* | 890 | 1020 | 1300 | 170 |
| Signal with existing lanes | 220 | 35 | 340 | 340 |
| Signal with left turn lanes all sides | 140 | 65 | 310 | 60 |
| Roundabout | 20 | 25 | 15 | 15 |
| | | | | |

*The calculated delay appears to exceed the limits of the model

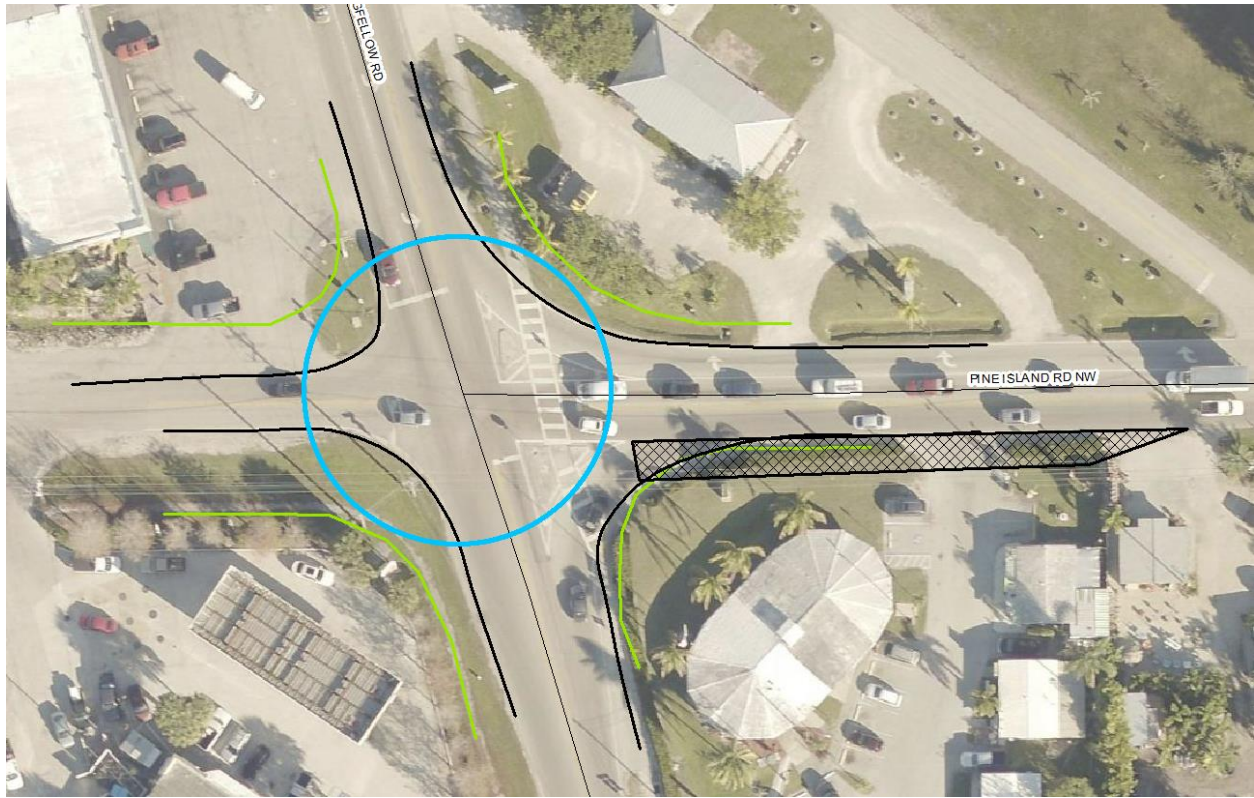
For the modified intersection with the traffic signal, a 400 foot left turn lane was added to the westbound approach and the northbound approach. The northbound right turn lane was extended to

400 feet. The westbound and northbound right turns were channelized under Yield control. Even with the extensive modifications to the lanes, the intersection still failed to operate with an acceptable delay. Northbound drivers would wait five minutes. In order to get an acceptable level of service, dual left turn lanes would be needed, and that would require extensive widening for about a quarter mile on Stringfellow and Pine Island Road to provide for a merge area.

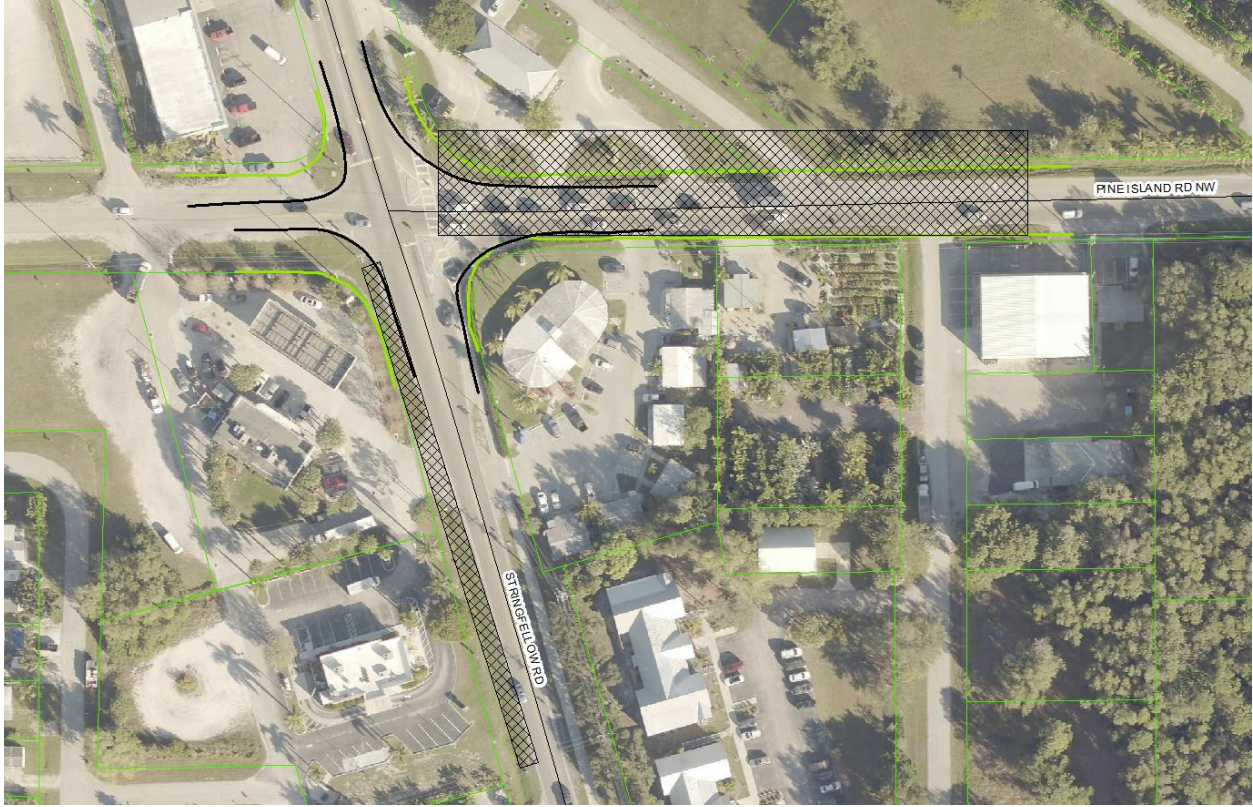
For the roundabout, it was shown that a single lane for the north, east, and south sides would be sufficient. For the west side, two lanes would be needed for the southbound left. A right turn lane and merge areas would also be needed for the northbound right and the westbound right turns.

If the County was to make improvements to this intersection, a roundabout would be the best option.

Prepared by:
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March 2, 2020



For the Roundabout, a 120 diameter inscribed circle appears as though it would fit in the existing right-of-way. Some right-of-way would likely be needed on Pine Island Road to provide for the north-to-east right turn merge.



For a traffic signal, Pine Island Road would need to be widened to 5 lanes. The right-of-way appears to be 50 or 60 feet, so significant takings would be necessary. On the south leg of Stringfellow Rd, the road will need to be widened to add the left turn lane and extend the right turn lane. It appears as though right-of-way would be needed for that approach, also.

HCS7 All-Way Stop-Control Text Report

ALL-WAY STOP CONTROL (AWSC) Analysis

File Name: 2020 Mdday all way stop.xaw
 Analyst: SMJ
 Agency: Lee DOT
 Date Performed: 3/2/2020
 Time Analyzed: Mdday
 Jurisdiction: Lee County
 Analysis Year: 2020
 Project Description: Existing Traffic
 Units: U. S. Customary
 Intersection Name: Pine Island & Stringfello
 East/West Street Name: pine island rd
 North/South Street Name: stringfellow rd
 Analysis Time Period (hrs): 1.00
 Peak Hour Factor, PHF: 0.92

Vehicle Volumes and Adjustments

| Approach Movement | EastBound | | | WestBound | | | NorthBound | | | SouthBound | | |
|------------------------|-----------|-----|----|-----------|----|-----|------------|-----|-----|------------|-----|----|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Volume | 20 | 100 | 20 | 560 | 30 | 210 | 30 | 460 | 780 | 380 | 310 | 20 |
| % Thrus in Shared Lane | | | | | | | | | | | | |
| Flow Rate, v_i | 22 | 109 | 22 | 609 | 33 | 228 | 33 | 500 | 848 | 413 | 337 | 22 |

Step 2: LANE FLOW RATES

| Approach Lane | EastBound | | | WestBound | | | NorthBound | | | SouthBound | | |
|--------------------|-----------|----|----|-----------|-----|----|------------|-----|----|------------|-----|----|
| | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 |
| Lane Configuration | LTR | | | LT | R | | LT | R | | L | TR | |
| Lane Flow Rate | 152 | | | 641 | 228 | | 533 | 848 | | 413 | 359 | |
| % Heavy Vehicles | 2 | | | 2 | 2 | | 2 | 2 | | 2 | 2 | |

Step 3: GEOMETRY GROUPS

| Approach | EastBound | WestBound | NorthBound | SouthBound |
|------------------------------|-----------|-----------|------------|------------|
| Approach No. of Lanes | 1 | 2 | 2 | 2 |
| Opposing No. of Lanes | 2 | 1 | 2 | 2 |
| Conflicting No. of Lanes | 2 | 2 | 2 | 1 |
| Geometry Group | Group4B | Group5 | Group5 | Group5 |
| Possible DOC Combinations, i | 64 | | | |

Step 4: SATURATION HEADWAY ADJUSTMENTS

| Approach Lane | EastBound | | | WestBound | | | NorthBound | | | SouthBound | | |
|---------------------|-----------|----|----|-----------|-------|----|------------|-------|----|------------|-------|----|
| | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 |
| h_LT, adj | 0.20 | | | 0.50 | 0.50 | | 0.50 | 0.50 | | 0.50 | 0.50 | |
| h_RT, adj | -0.60 | | | -0.70 | -0.70 | | -0.70 | -0.70 | | -0.70 | -0.70 | |
| h_HV, adj | 1.70 | | | 1.70 | 1.70 | | 1.70 | 1.70 | | 1.70 | 1.70 | |
| Prop. Lefts, P_LT | 0.14 | | | 0.95 | 0.00 | | 0.06 | 0.00 | | 1.00 | 0.00 | |
| Prop. Rights, P_RT | 0.14 | | | 0.00 | 1.00 | | 0.00 | 1.00 | | 0.00 | 0.06 | |
| Prop. HV, P_HV | 0.02 | | | 0.02 | 0.02 | | 0.02 | 0.02 | | 0.02 | 0.02 | |
| Headway Adj., h_adj | -0.02 | | | 0.51 | -0.67 | | 0.06 | -0.67 | | 0.53 | -0.01 | |

Steps 5-11: DEPARTURE HEADWAY ITERATIONS FOR CONVERGENCE

| Approach Lane | EastBound | | | WestBound | | | NorthBound | | | SouthBound | | |
|----------------------|-----------|-----|----|-----------|-------|----|------------|-------|----|------------|-------|----|
| | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 |
| Lane Flow Rate | 152 | | | 641 | 228 | | 533 | 848 | | 413 | 359 | |
| h_d (initial) | 3.20 | | | 3.20 | 3.20 | | 3.20 | 3.20 | | 3.20 | 3.20 | |
| x (initial) | 0.135 | | | 0.570 | 0.203 | | 0.473 | 0.754 | | 0.367 | 0.319 | |
| h_d (second to last) | 10.03 | | | 9.75 | 8.59 | | 8.91 | 8.19 | | 9.49 | 8.95 | |
| x (second to last) | 0.42 | | | 1.00 | 0.54 | | 1.00 | 1.00 | | 1.00 | 0.89 | |
| h_d (final) | 10.03 | | | 9.79 | 8.62 | | 8.96 | 8.24 | | 9.53 | 8.99 | |
| x (final) | 0.424 | | | 1.744 | 0.547 | | 1.326 | 1.941 | | 1.094 | 0.896 | |
| No. of Iterations | | 4 | | | | | | | | | | |
| Convergence? | | Yes | | | | | | | | | | |

Steps 12-16: CAPACITY, DELAY and LEVEL OF SERVICE

| Approach Lane | EastBound | | | WestBound | | | NorthBound | | | SouthBound | | |
|--------------------------|-----------|----|----|-----------|-------|----|------------|-------|----|------------|-------|----|
| | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 |
| Lane Flow Rate | 152 | | | 641 | 228 | | 533 | 848 | | 413 | 359 | |
| Move-Up Time, m | 2.0 | | | 2.3 | 2.3 | | 2.3 | 2.3 | | 2.3 | 2.3 | |
| Service Time, t_s | 8.03 | | | 7.49 | 6.32 | | 6.66 | 5.94 | | 7.23 | 6.69 | |
| Degree of Utilization, x | 0.424 | | | 1.744 | 0.547 | | 1.326 | 1.941 | | 1.094 | 0.896 | |
| Departure Headway, h_d | 10.03 | | | 9.79 | 8.62 | | 8.96 | 8.24 | | 9.53 | 8.99 | |
| Capacity | 359 | | | 368 | 417 | | 402 | 437 | | 378 | 400 | |

| | | | | | | | |
|------------------------|-------|--------|--------|-------|--------|-------|-------|
| v/c Ratio | 0.4 | 1.7 | 0.5 | 1.3 | 1.9 | 1.1 | 0.9 |
| 95% Queue Length, Q_95 | 2.2 | 143.5 | 3.5 | 76.0 | 211.5 | 35.3 | 15.0 |
| Lane Control Delay | 20.3 | 1374.6 | 21.6 | 633.1 | 1721.1 | 257.4 | 70.6 |
| Lane LOS | C | F | C | F | F | F | F |
| Approach Delay | 20.3 | | 1019.5 | | 1301.3 | | 170.6 |
| Approach LOS | C | | F | | F | | F |
| Intersection Delay | 887.7 | | | | | | |
| Intersection LOS | F | | | | | | |

This AWSC text report was created in HCS™ AWSC Version 7.8 on 3/2/2020 10:00:16 AM

HCS7 Signalized Intersection Results Summary

| General Information | | | | Intersection Information | | | | | |
|---------------------|----------------------------|---------------|---------------------------------------|--------------------------|--|--|--|-----------------|----------|
| Agency | | Duration, h | 1.00 | | | | | | |
| Analyst | | Analysis Date | 3/2/2020 | | | | | Area Type | Other |
| Jurisdiction | | Time Period | | | | | | PHF | 1.00 |
| Urban Street | Pine Island Rd | Analysis Year | 2020 | | | | | Analysis Period | 1 > 7:00 |
| Intersection | Stringfellow Rd | File Name | 2020 Midday Signal Existing Lanes.xus | | | | | | |
| Project Description | Midday 2020 Existing Lanes | | | | | | | | |

| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---------------------|----|-----|----|-----|----|-----|----|-----|-----|-----|-----|----|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Approach Movement | | | | | | | | | | | | |
| Demand (v), veh/h | 20 | 100 | 20 | 560 | 30 | 210 | 30 | 460 | 270 | 380 | 310 | 20 |

| Signal Information | | | | | | | | | | | | | | | |
|--------------------|-------|-----------------|-----|------|------|------|------|-----|-----|--|--|--|--|--|--|
| Cycle, s | 138.0 | Reference Phase | 2 | | | | | | | | | | | | |
| Offset, s | 0 | Reference Point | End | | | | | | | | | | | | |
| Uncoordinated | Yes | Simult. Gap E/W | On | | | | | | | | | | | | |
| Force Mode | Fixed | Simult. Gap N/S | On | | | | | | | | | | | | |
| | | Green | | 13.8 | 50.2 | 20.0 | 30.0 | 0.0 | 0.0 | | | | | | |
| | | Yellow | | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 | 0.0 | | | | | | |
| | | Red | | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 0.0 | | | | | | |

| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|--|-----|------|------|------|-----|------|------|------|
| Assigned Phase | | 2 | 1 | 6 | | 8 | 7 | 4 |
| Case Number | | 8.3 | 8.0 | 13.0 | | 7.3 | 1.0 | 4.0 |
| Phase Duration, s | | 19.8 | 56.2 | 76.0 | | 36.0 | 26.0 | 62.0 |
| Change Period, (Y+R _c), s | | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Max Allow Headway (MAH), s | | 3.1 | 0.0 | 3.3 | | 3.1 | 3.1 | 3.1 |
| Queue Clearance Time (g _s), s | | 13.5 | | 71.9 | | 32.0 | 22.0 | 21.7 |
| Green Extension Time (g _e), s | | 0.2 | 0.0 | 0.0 | | 0.0 | 0.0 | 1.8 |
| Phase Call Probability | | 1.00 | | 1.00 | | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 0.00 | | 1.00 | | 1.00 | 1.00 | 0.21 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|--|-------|---|----|-------------|---|----|-------------|---|----|--------------|---|----|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate (v), veh/h | 140 | | | 590 210 | | | 490 270 | | | 380 330 | | |
| Adjusted Saturation Flow Rate (s), veh/h/ln | 1648 | | | 1310 1460 | | | 1678 1460 | | | 1641 1704 | | |
| Queue Service Time (g _s), s | 0.0 | | | 6.0 8.1 | | | 20.7 13.1 | | | 20.0 19.7 | | |
| Cycle Queue Clearance Time (g _c), s | 11.5 | | | 69.9 8.1 | | | 30.0 13.1 | | | 20.0 19.7 | | |
| Green Ratio (g/C) | 0.10 | | | 0.51 0.65 | | | 0.22 0.58 | | | 0.38 0.41 | | |
| Capacity (c), veh/h | 194 | | | 715 952 | | | 392 849 | | | 291 692 | | |
| Volume-to-Capacity Ratio (X) | 0.722 | | | 0.825 0.221 | | | 1.249 0.318 | | | 1.307 0.477 | | |
| Back of Queue (Q), ft/ln (50 th percentile) | 124.5 | | | 472.7 63.8 | | | 1650.6 2.2 | | | 1387.9 205.4 | | |
| Back of Queue (Q), veh/ln (50 th percentile) | 4.9 | | | 18.6 2.5 | | | 65.0 0.1 | | | 54.6 8.1 | | |
| Queue Storage Ratio (RQ) (50 th percentile) | 0.00 | | | 0.00 0.16 | | | 0.00 0.04 | | | 9.25 0.00 | | |
| Uniform Delay (d ₁), s/veh | 61.1 | | | 34.2 9.7 | | | 54.9 6.4 | | | 41.5 30.2 | | |
| Incremental Delay (d ₂), s/veh | 1.9 | | | 7.8 0.0 | | | 470.1 0.1 | | | 577.0 0.2 | | |
| Initial Queue Delay (d ₃), s/veh | 0.0 | | | 0.0 0.0 | | | 0.0 0.0 | | | 0.0 0.0 | | |
| Control Delay (d), s/veh | 63.0 | | | 42.0 9.8 | | | 525.0 6.5 | | | 618.5 30.4 | | |
| Level of Service (LOS) | E | | | D A | | | F A | | | F C | | |
| Approach Delay, s/veh / LOS | 63.0 | E | | 33.6 | C | | 340.8 | F | | 345.2 | F | |
| Intersection Delay, s/veh / LOS | 224.0 | | | | | | F | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|----------------------------|------|---|------|---|------|---|------|---|
| Pedestrian LOS Score / LOS | 1.93 | B | 1.91 | B | 1.95 | B | 1.70 | B |
| Bicycle LOS Score / LOS | 0.72 | A | 1.81 | B | 1.74 | B | 1.66 | B |

HCS7 Signalized Intersection Results Summary

| General Information | | | | Intersection Information | | | | | |
|---------------------|---------------------------------|---------------|--|--------------------------|--|--|--|-----------------|----------|
| Agency | | Duration, h | 1.00 | | | | | | |
| Analyst | | Analysis Date | 3/2/2020 | | | | | Area Type | Other |
| Jurisdiction | | Time Period | | | | | | PHF | 1.00 |
| Urban Street | Pine Island Rd | Analysis Year | 2020 | | | | | Analysis Period | 1 > 7:00 |
| Intersection | Stringfellow Rd | File Name | 2020 Midday Signal Add Left Turn Lanes.xus | | | | | | |
| Project Description | Midday 2020 Add Left Turn Lanes | | | | | | | | |

| Demand Information | EB | | | WB | | | NB | | | SB | | |
|-----------------------|----|-----|----|-----|----|-----|----|-----|-----|-----|-----|----|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Approach Movement | | | | | | | | | | | | |
| Demand (v), veh/h | 20 | 100 | 20 | 560 | 30 | 210 | 30 | 460 | 270 | 380 | 310 | 20 |

| Signal Information | | | | | | | | | | | | |
|--------------------|-------|-----------------|------|------|------|------|-----|-----|--|--|--|--|
| Cycle, s | 183.8 | Reference Phase | 2 | | | | | | | | | |
| Offset, s | 0 | Reference Point | End | | | | | | | | | |
| Uncoordinated | Yes | Simult. Gap E/W | On | | | | | | | | | |
| Force Mode | Fixed | Simult. Gap N/S | On | | | | | | | | | |
| | | Green | 59.5 | 20.0 | 40.3 | 40.0 | 0.0 | 0.0 | | | | |
| | | Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 | 0.0 | | | | |
| | | Red | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 0.0 | | | | |

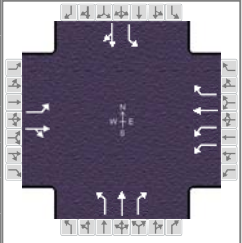
| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|-----------------------------------|-----|------|------|------|-----|------|------|------|
| Assigned Phase | | 2 | 1 | 6 | | 8 | 7 | 4 |
| Case Number | | 6.3 | 1.0 | 3.0 | | 5.3 | 1.0 | 4.0 |
| Phase Duration, s | | 26.0 | 65.5 | 91.5 | | 46.0 | 46.3 | 92.3 |
| Change Period, ($Y+R_c$), s | | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Max Allow Headway (MAH), s | | 3.3 | 3.1 | 3.3 | | 3.1 | 3.1 | 3.1 |
| Queue Clearance Time (g_s), s | | 22.0 | 58.4 | 11.7 | | 42.0 | 39.6 | 25.4 |
| Green Extension Time (g_e), s | | 0.0 | 1.0 | 0.5 | | 0.0 | 0.7 | 1.3 |
| Phase Call Probability | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 1.00 | 0.01 | 0.03 | | 1.00 | 0.00 | 0.65 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|-------|-------|----|-------|-------|-----|-------|--------|-----|-------|-------|----|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate (v), veh/h | 20 | 120 | | 560 | 30 | 210 | 30 | 460 | 270 | 380 | 330 | |
| Adjusted Saturation Flow Rate (s), veh/h/ln | 1401 | 1651 | | 1667 | 1723 | | 1067 | 1723 | | 1641 | 1704 | |
| Queue Service Time (g_s), s | 2.4 | 12.8 | | 56.4 | 1.7 | | 4.2 | 40.0 | | 37.6 | 23.4 | |
| Cycle Queue Clearance Time (g_c), s | 2.4 | 12.8 | | 56.4 | 1.7 | | 4.2 | 40.0 | | 37.6 | 23.4 | |
| Green Ratio (g/C) | 0.11 | 0.11 | | 0.44 | 0.47 | | 0.22 | 0.22 | | 0.45 | 0.47 | |
| Capacity (c), veh/h | 191 | 180 | | 579 | 801 | | 271 | 375 | | 399 | 800 | |
| Volume-to-Capacity Ratio (X) | 0.105 | 0.668 | | 0.968 | 0.037 | | 0.111 | 1.227 | | 0.952 | 0.412 | |
| Back of Queue (Q), ft/ln (50 th percentile) | 21.6 | 149.2 | | 742.2 | 18.8 | | 28.6 | 1595.5 | | 519.5 | 250.1 | |
| Back of Queue (Q), veh/ln (50 th percentile) | 0.9 | 5.9 | | 29.7 | 0.7 | | 1.1 | 62.8 | | 20.5 | 9.8 | |
| Queue Storage Ratio (RQ) (50 th percentile) | 0.11 | 0.00 | | 1.86 | 0.00 | | 0.14 | 0.00 | | 3.46 | 0.00 | |
| Uniform Delay (d_1), s/veh | 74.1 | 78.7 | | 52.0 | 26.8 | | 57.9 | 71.9 | | 58.3 | 32.1 | |
| Incremental Delay (d_2), s/veh | 0.1 | 7.8 | | 38.6 | 0.0 | | 0.1 | 433.9 | | 25.9 | 0.1 | |
| Initial Queue Delay (d_3), s/veh | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Control Delay (d), s/veh | 74.2 | 86.5 | | 90.6 | 26.8 | 0.0 | 58.0 | 505.9 | 0.0 | 84.2 | 32.2 | |
| Level of Service (LOS) | E | F | | F | C | A | E | F | A | F | C | |
| Approach Delay, s/veh / LOS | 84.7 | F | | 64.4 | E | | 308.5 | F | | 60.0 | E | |
| Intersection Delay, s/veh / LOS | 141.3 | | | | | | F | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|----------------------------|------|---|------|---|------|---|------|---|
| Pedestrian LOS Score / LOS | 2.16 | B | 1.93 | B | 2.15 | B | 1.93 | B |
| Bicycle LOS Score / LOS | 0.72 | A | 1.81 | B | 1.74 | B | 1.66 | B |

HCS7 Signalized Intersection Results Summary

| General Information | | | | | Intersection Information | | | | | | | |
|---------------------|-------------------------------|--|---------------|---|--------------------------|-----------------|-----------|-------|-----|------|--|--|
| Agency | | | | | Duration, h | 1.00 | | | | | | |
| Analyst | | | | Analysis Date | 3/2/2020 | | Area Type | Other | | | | |
| Jurisdiction | | | | Time Period | | | | | PHF | 1.00 | | |
| Urban Street | Pine Island Rd | | Analysis Year | 2020 | | Analysis Period | 1 > 7:00 | | | | | |
| Intersection | Stringfellow Rd | | File Name | 2020 Midday Signal Add 2 WB Left Turn Lanes.xus | | | | | | | | |
| Project Description | Midday 2020 Add 2 WB LT Lanes | | | | | | | | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---------------------|----|-----|----|-----|----|-----|----|-----|-----|-----|-----|----|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Approach Movement | | | | | | | | | | | | |
| Demand (v), veh/h | 20 | 100 | 20 | 560 | 30 | 210 | 30 | 460 | 270 | 380 | 310 | 20 |

| Signal Information | | | | Phase Diagrams | | | | | | | | |
|--------------------|-------|-----------------|------|----------------|-----|-----|--|--|--|--|--|--|
| Cycle, s | 127.7 | Reference Phase | 2 | | | | | | | | | |
| Offset, s | 0 | Reference Point | End | | | | | | | | | |
| Uncoordinated | Yes | Simult. Gap E/W | On | | | | | | | | | |
| Force Mode | Fixed | Simult. Gap N/S | On | | | | | | | | | |
| Green | 21.4 | 20.0 | 25.8 | 36.5 | 0.0 | 0.0 | | | | | | |
| Yellow | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 | 0.0 | | | | | | |
| Red | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 0.0 | | | | | | |

| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|--|-----|------|------|------|-----|------|------|------|
| Assigned Phase | | 2 | 1 | 6 | | 8 | 7 | 4 |
| Case Number | | 6.3 | 1.0 | 3.0 | | 5.3 | 1.0 | 4.0 |
| Phase Duration, s | | 26.0 | 27.4 | 53.4 | | 42.5 | 31.8 | 74.3 |
| Change Period, (Y+R _c), s | | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Max Allow Headway (MAH), s | | 3.3 | 3.1 | 3.3 | | 3.1 | 3.1 | 3.1 |
| Queue Clearance Time (g _s), s | | 22.0 | 19.8 | 11.2 | | 35.4 | 24.8 | 16.3 |
| Green Extension Time (g _e), s | | 0.0 | 1.4 | 0.6 | | 0.9 | 0.7 | 2.1 |
| Phase Call Probability | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Max Out Probability | | 1.00 | 0.00 | 0.02 | | 0.64 | 0.00 | 0.04 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|--|-------|-------|----|-------|-------|-----|-------|-------|-----|-------|-------|----|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Adjusted Flow Rate (v), veh/h | 20 | 120 | | 560 | 30 | 210 | 30 | 460 | 270 | 380 | 330 | |
| Adjusted Saturation Flow Rate (s), veh/h/ln | 1401 | 1651 | | 1618 | 1723 | | 1067 | 1723 | | 1641 | 1704 | |
| Queue Service Time (g _s), s | 1.6 | 8.5 | | 17.8 | 1.4 | | 2.7 | 33.4 | | 22.8 | 14.3 | |
| Cycle Queue Clearance Time (g _c), s | 1.6 | 8.5 | | 17.8 | 1.4 | | 2.7 | 33.4 | | 22.8 | 14.3 | |
| Green Ratio (g/C) | 0.16 | 0.16 | | 0.34 | 0.37 | | 0.29 | 0.29 | | 0.51 | 0.54 | |
| Capacity (c), veh/h | 274 | 257 | | 655 | 638 | | 361 | 493 | | 412 | 914 | |
| Volume-to-Capacity Ratio (X) | 0.073 | 0.466 | | 0.855 | 0.047 | | 0.083 | 0.932 | | 0.922 | 0.361 | |
| Back of Queue (Q), ft/ln (50 th percentile) | 13.8 | 89.6 | | 175.8 | 15.1 | | 17.3 | 460.2 | | 308.2 | 140.3 | |
| Back of Queue (Q), veh/ln (50 th percentile) | 0.6 | 3.5 | | 7.0 | 0.6 | | 0.7 | 18.1 | | 12.1 | 5.5 | |
| Queue Storage Ratio (RQ) (50 th percentile) | 0.07 | 0.00 | | 0.44 | 0.00 | | 0.09 | 0.00 | | 2.05 | 0.00 | |
| Uniform Delay (d ₁), s/veh | 46.4 | 49.3 | | 35.8 | 25.9 | | 33.6 | 44.6 | | 34.2 | 17.1 | |
| Incremental Delay (d ₂), s/veh | 0.0 | 0.5 | | 1.3 | 0.0 | | 0.0 | 29.8 | | 4.0 | 0.1 | |
| Initial Queue Delay (d ₃), s/veh | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Control Delay (d), s/veh | 46.5 | 49.8 | | 37.1 | 25.9 | 0.0 | 33.7 | 74.4 | 0.0 | 38.2 | 17.2 | |
| Level of Service (LOS) | D | D | | D | C | A | C | E | A | D | B | |
| Approach Delay, s/veh / LOS | 49.4 | | D | 26.9 | | C | 46.4 | | D | 28.4 | | C |
| Intersection Delay, s/veh / LOS | 34.8 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|----------------------------|------|---|------|---|------|---|------|---|
| Pedestrian LOS Score / LOS | 2.31 | B | 1.93 | B | 2.30 | B | 1.90 | B |
| Bicycle LOS Score / LOS | 0.72 | A | 1.81 | B | 1.74 | B | 1.66 | B |

HCS7 Roundabouts Text Report

ROUNDAABOUT ANALYSIS

File Name: 2020 Roundabout Mi dday. xro
 Analyst: SMJ
 Agency: LeeDOT
 Date Performed: 3/2/2020
 Time Analyzed: Mi dday
 Jurisdiction: Lee DOT
 Analysis Year: 2020
 Project Description: Existing Traffic
 Units: U. S. Customary
 Intersection Name: Pine Island & Stringfello
 East/West Street Name: Pine Island Rd
 North/South Street Name: Stringfellow Rd

Volume Adjustments and Site Characteristics

| | | | | | | | | | | |
|--------------------------|-------|---------------|-------|-------|-------|---------------|------------|-------|-------|--|
| Peak Hour Factor, PHF | 0.92 | | | | | | | | | |
| Analysis Time Period, T | 1.00 | | | | | | | | | |
| | | Eastbound | | | | | Westbound | | | |
| | U | L | T | R | U | L | T | R | | |
| Number of Lanes | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | | |
| Volume (veh/h) | 0 | 20 | 100 | 20 | 0 | 560 | 30 | 210 | | |
| % Thrus Left Lane | | | | | | | | | | |
| % Heavy Vehicles | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | |
| Heavy Vehicle Adjustment | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | |
| Lane Assignment | | | | | | | | | | |
| Right-Turn Bypass | | None | | | | Non-Yield ing | | | | |
| Flow Rate, (pc/h) | 0 | 22 | 112 | 22 | 0 | 627 | 34 | 235 | | |
| Conflict. Lanes (Entry) | | 2 | | | | 1 | | | | |
| Conflict. Lanes (Bypass) | | | | | | | | | | |
| No. of Peds Crossing | | 0 | | | | 0 | | | | |
| Pedestrian Adjustment | | 1.000 | | | | 1.000 | | | | |
| | | Northbound | | | | | Southbound | | | |
| | U | L | T | R | U | L | T | R | | |
| Number of Lanes | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | | |
| Volume (veh/h) | 0 | 30 | 460 | 280 | 0 | 380 | 310 | 20 | | |
| % Thrus Left Lane | | | | | | | | | | |
| % Heavy Vehicles | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | |
| Heavy Vehicle Adjustment | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | |
| Lane Assignment | | | | | | | | | | |
| Right-Turn Bypass | | Non-Yield ing | | | | None | | | | |
| Flow Rate, (pc/h) | 0 | 34 | 515 | 313 | 0 | 425 | 347 | 22 | | |
| Conflict. Lanes (Entry) | | 1 | | | | 1 | | | | |
| Conflict. Lanes (Bypass) | | | | | | | | | | |
| No. of Peds Crossing | | 0 | | | | 0 | | | | |
| Pedestrian Adjustment | | 1.000 | | | | 1.000 | | | | |

Critical and Follow-Up Headway Adjustments

| | | | | | | | | | | | | | | | | |
|-------------------------|---|-----------|----|---|--------|-----------|---|--------|----|------------|--------|----|---|------------|----|--|
| | | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | |
| | L | R | BP | L | R | BP | L | R | BP | L | R | BP | L | R | BP | |
| Critical Headway (sec) | | 4.3276 | | | 4.9763 | | | 4.9763 | | 4.5436 | 4.5436 | | | 4.5436 | | |
| Follow-Up Headway (sec) | | 2.5352 | | | 2.6087 | | | 2.6087 | | 2.5352 | 2.5352 | | | 2.5352 | | |

Step 1: Convert Movement Demand Volumes to Flow Rates

| | | | | | | | | | | |
|------------------------|---|------------|-----|-----|------|-----|------------|-----|--|--|
| | | Eastbound | | | | | Westbound | | | |
| | U | L | T | R | U | L | T | R | | |
| Volume (veh/h) | 0 | 20 | 100 | 20 | 0 | 560 | 30 | 210 | | |
| Peak Hour Factor, PHF | | | | | 0.92 | | | | | |
| Flow Rate, v_i (veh/h) | 0 | 22 | 109 | 22 | 0 | 609 | 33 | 228 | | |
| | | Northbound | | | | | Southbound | | | |
| | U | L | T | R | U | L | T | R | | |
| Volume (veh/h) | 0 | 30 | 460 | 280 | 0 | 380 | 310 | 20 | | |
| Peak Hour Factor, PHF | | | | | 0.92 | | | | | |
| Flow Rate, v_i (veh/h) | 0 | 33 | 500 | 304 | 0 | 413 | 337 | 22 | | |

Step 2: Adjust Flow Rates for Heavy Vehicles

| | | | | | | | | | | |
|----------------------|-------|-----------|-------|-------|-------|-------|-----------|-------|-------|--|
| | | Eastbound | | | | | Westbound | | | |
| | U | L | T | R | U | L | T | R | | |
| Flow Rate (veh/h) | 0 | 22 | 109 | 22 | 0 | 609 | 33 | 228 | | |
| HV Adjustment Factor | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | |
| Flow Rate (pc/h) | 0 | 22 | 112 | 22 | 0 | 627 | 34 | 235 | | |

| | | Northbound | | | | | Southbound | | | |
|----------------------|-------|------------|-------|-------|-------|-------|------------|-------|--|--|
| | U | L | T | R | U | L | T | R | | |
| Flow Rate (veh/h) | 0 | 33 | 500 | 304 | 0 | 413 | 337 | 22 | | |
| HV Adjustment Factor | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | 0.971 | | |
| Flow Rate (pc/h) | 0 | 34 | 515 | 313 | 0 | 425 | 347 | 22 | | |

Step 3: Determining Circulating and Exiting Flow Rates

| | Eastbound | Westbound | Northbound | Southbound |
|--------------------------------------|-----------|-----------|------------|------------|
| Circulating Flow, v_c , pce (pc/h) | 1399 | 571 | 559 | 695 |
| Exiting Flow, v_{ex} , pce (pc/h) | 537 | 90 | 537 | 996 |

Steps 4 and 5: Entry Flow Rates and Capacities

| | Eastbound | | | Westbound | | |
|--------------------------------------|-----------|------|----|-----------|-----|-----|
| | L | R | BP | L | R | BP |
| Flow Rate, v_i , pce (pc/h) | | 156 | | | 661 | 235 |
| Conflicting Circulating Lanes | | 2 | | | 1 | |
| Conflicting Exiting Lanes | | | | | | |
| Conflicting Flow, v_c , pce (pc/h) | | 1399 | | | 571 | |
| Exiting Flow, v_{ex} , pce (pc/h) | | 537 | | | 90 | |
| Lane Capacity, c_i , pce (pc/h) | | 432 | | | 771 | |

| | Northbound | | | Southbound | | |
|--------------------------------------|------------|-----|-----|------------|-----|----|
| | L | R | BP | L | R | BP |
| Flow Rate, v_i , pce (pc/h) | | 549 | 313 | 425 | 369 | |
| Conflicting Circulating Lanes | | 1 | | | 1 | |
| Conflicting Exiting Lanes | | | | | | |
| Conflicting Flow, v_c , pce (pc/h) | | 559 | | | 695 | |
| Exiting Flow, v_{ex} , pce (pc/h) | | 537 | | | 996 | |
| Lane Capacity, c_i , pce (pc/h) | | 780 | | 754 | 754 | |

Step 6: Determine Pedestrian Impedance to Vehicles

| | Eastbound | Westbound | Northbound | Southbound |
|--|-----------|-----------|------------|------------|
| Conflicting Flow, v_c , pce (pc/h) | 1399 | 571 | 559 | 695 |
| No. of Peds. Crossing, n_{ped} (p/h) | 0 | 0 | 0 | 0 |
| Entry Cap. Adj. for Peds., f_{ped} | 1.000 | 1.000 | 1.000 | 1.000 |

Step 7: Convert Lane Flow Rates and Capacities into Vehicles per Hour

| | Eastbound | | | Westbound | | |
|--|-----------|-------|----|-----------|-------|-----|
| | L | R | BP | L | R | BP |
| Flow Rate, v_i , pce (pc/h) | | 156 | | | 661 | 235 |
| Flow Rate, v_i (veh/h) | | 151 | | | 642 | 228 |
| Lane Capacity, c_i , pce (pc/h) | | 432 | | | 771 | |
| Pedestrian Impedance Factor, f_{ped} | | 1.000 | | | 1.000 | |
| Lane Capacity, c_i (veh/h) | | 420 | | | 748 | |

| | Northbound | | | Southbound | | |
|--|------------|-------|-----|------------|-------|----|
| | L | R | BP | L | R | BP |
| Flow Rate, v_i , pce (pc/h) | | 549 | 313 | 425 | 369 | |
| Flow Rate, v_i (veh/h) | | 533 | 304 | 413 | 358 | |
| Lane Capacity, c_i , pce (pc/h) | | 780 | | 754 | 754 | |
| Pedestrian Impedance Factor, f_{ped} | | 1.000 | | | 1.000 | |
| Lane Capacity, c_i (veh/h) | | 758 | | 732 | 732 | |

Steps 8-10: Volume-to-Capacity Ratio, Average Control Delay, and LOS

| | Eastbound | | | Westbound | | |
|----------------------------------|-----------|------|----|-----------|------|-----|
| | L | R | BP | L | R | BP |
| Flow Rate, v_i (veh/h) | | 151 | | | 642 | 228 |
| Lane Capacity, c_i (veh/h) | | 420 | | | 748 | |
| Volume-to-Capacity Ratio, x_i | | 0.36 | | | 0.86 | |
| Time Period, T (h) | | | | | | |
| Average Control Delay, d (s/veh) | | 15.2 | | 1.00 | 35.4 | |
| Level of Service, LOS | | C | | | E | A |

| | Northbound | | | Southbound | | |
|----------------------------------|------------|------|-----|------------|------|------|
| | L | R | BP | L | R | BP |
| Flow Rate, v_i (veh/h) | | 533 | 304 | 413 | 358 | |
| Lane Capacity, c_i (veh/h) | | 758 | | 732 | 732 | |
| Volume-to-Capacity Ratio, x_i | | 0.70 | | 0.56 | 0.49 | |
| Time Period, T (h) | | | | | | |
| Average Control Delay, d (s/veh) | | 19.3 | | 1.00 | 14.0 | 12.0 |
| Level of Service, LOS | | C | A | | B | B |

Step 11: Approach and Intersection Delay and LOS

| | Eastbound | | | Westbound | | | | | | | | |
|---|-------------------|------|----|-------------------|------|----|--------------------|--|--|--------------------|--|--|
| | L | R | BP | L | R | BP | | | | | | |
| Average Control Delay, d (s/veh) | | 15.2 | | | 35.4 | | | | | | | |
| | Northbound | | | Southbound | | | | | | | | |
| | L | R | BP | L | R | BP | | | | | | |
| Average Control Delay, d (s/veh) | | 19.3 | | 14.0 | 12.0 | | | | | | | |
| Approach Delay, d _{approach} (s/veh) | Eastbound 15.2 | | | Westbound 26.1 | | | Northbound 12.3 | | | Southbound 13.1 | | |
| Approach LOS | C | | | D | | | B | | | B | | |
| Intersection Delay, d _{int} (s/veh) | | | | | | | 17.3 | | | | | |
| Intersection LOS | | | | | | | C | | | | | |

Step 12: Compute 95th Percentile Queues for Each Lane

| | Eastbound | | | Westbound | | | | | |
|--|------------|------|----|------------|------|----|------|--|--|
| | L | R | BP | L | R | BP | | | |
| Lane Capacity, c (veh/h) | | 420 | | | 748 | | | | |
| Volume-to-Capacity Ratio, x | | 0.36 | | | 0.86 | | | | |
| Time Period, T (h) | | | | | | | 1.00 | | |
| 95th Percentile Queue, Q ₉₅ (veh) | | 1.7 | | | 14.3 | | | | |
| | Northbound | | | Southbound | | | | | |
| | L | R | BP | L | R | BP | | | |
| Lane Capacity, c (veh/h) | | 758 | | 732 | 732 | | | | |
| Volume-to-Capacity Ratio, x | | 0.70 | | 0.56 | 0.49 | | | | |
| Time Period, T (h) | | | | | | | 1.00 | | |
| 95th Percentile Queue, Q ₉₅ (veh) | | 6.7 | | 3.8 | 2.8 | | | | |

Capacity and Level of Service

| | Eastbound | | | Westbound | | | | | | | | |
|---|-------------------|------|-----|-------------------|------|-----|--------------------|--|--|--------------------|--|--|
| | L | R | BP | L | R | BP | | | | | | |
| Flow Rate, v _i (veh/h) | | 151 | | | 642 | 228 | | | | | | |
| Lane Capacity, c _i (veh/h) | | 420 | | | 748 | | | | | | | |
| Volume-to-Capacity Ratio, x _i | | 0.36 | | | 0.86 | | | | | | | |
| Average Control Delay, d (s/veh) | | 15.2 | | | 35.4 | | | | | | | |
| Lane Level of Service, LOS | | C | | | E | A | | | | | | |
| 95th Percentile Queue, Q ₉₅ (veh) | | 1.7 | | | 14.3 | | | | | | | |
| | Northbound | | | Southbound | | | | | | | | |
| | L | R | BP | L | R | BP | | | | | | |
| Flow Rate, v _i (veh/h) | | 533 | 304 | 413 | 358 | | | | | | | |
| Lane Capacity, c _i (veh/h) | | 758 | | 732 | 732 | | | | | | | |
| Volume-to-Capacity Ratio, x _i | | 0.70 | | 0.56 | 0.49 | | | | | | | |
| Average Control Delay, d (s/veh) | | 19.3 | | 14.0 | 12.0 | | | | | | | |
| Lane Level of Service, LOS | | C | A | B | B | | | | | | | |
| 95th Percentile Queue, Q ₉₅ (veh) | | 6.7 | | 3.8 | 2.8 | | | | | | | |
| Approach Delay, d _{approach} (s/veh) | Eastbound 15.2 | | | Westbound 26.1 | | | Northbound 12.3 | | | Southbound 13.1 | | |
| Approach LOS | C | | | D | | | B | | | B | | |
| Intersection Delay, d _{int} (s/veh) | | | | | | | 17.3 | | | | | |
| Intersection LOS | | | | | | | C | | | | | |