



# 2015 Skagit County Road Segment & Intersection Concurrency

## INTRODUCTION

Skagit County Code 14.28.110 "Annual Concurrency Assessment" requires that the County Engineer annually produce this report to update the status of County road concurrency. The following is produced to meet said requirement.

## REQUIREMENTS

The concurrency assessment requires that "*the Skagit County Public Works Department, under the direction of the County Engineer, shall evaluate the High Traffic County Road Segments and High Traffic County Road Intersections using a Highway Capacity Manual type method (as selected by the County Engineer) to determine whether these road segments and intersections comply with the level of service standards adopted in the Comprehensive Plan*." These Levels of Service (LOS) are described as follows in Skagit County's Comprehensive Plan.

**8A-2.1** Level of Service Standards – The Level of Service (LOS) standard for County roads is C. LOS D is acceptable for all road segments that:

*a) Have Annualized Average Daily Traffic (AADT) greater than 7,000 vehicles; and*

*b) Are NOT federally functionally classified as an 09-Local Access Road; and*

*c) Are designated as a County Freight and Goods Transportation Systems Route (FGTS).*

The LOS standard for County road intersections is LOS D.

## LEVEL OF SERVICE DATA

### Road Segments

As outlined in Skagit County's Transportation Systems Plan (TSP), the methodology used to acquire the LOS of county road segments is outlined in Chapter Six of the TSP.

> *"The Skagit County Public Works Traffic Engineering Unit has selected an LOS study volume unit threshold of 7,000 AADT. This threshold is an indicator that a road segment may be approaching the LOS C/D threshold and should be studied in depth."*

Table 1 shows the current County roads that meet the criteria for further study and the current LOS as determined using the Transportation Research Board's Highway Capacity Manual and Highway Capacity Software developed for this use by the University of Florida. Also shown is the projected 5-year LOS. This projected LOS was determined using a 2 percent yearly growth factor for each road segment. Projects along these roadways that are scheduled to be completed within this 5 year period were not significant enough to include as separate items. As one can see from Table 1, all the criteria for LOS concurrency have been met.

Table 1 – Road Segments

| Road # | Road Name | FFC | Truck Rt | Beg MP | End MP | Length | 2015 AADT | 2016 Est | 2017 Est | 2018 Est | 2019 Est | 2020 Est | 2015 LOS | 2020 LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63000 | COOK ROAD | 07 | T2 | 1.750 | 1.800 | 0.050 | 17799 | 18155 | 18518 | 18888 | 19266 | 19652 | These two segments | |
| 63000 | COOK ROAD | 07 | T2 | 1.800 | 1.860 | 0.060 | 17799 | 18155 | 18518 | 18888 | 19266 | 19652 | are in WSDOT ROW | |
| 63000 | COOK ROAD | 07 | T2 | 1.860 | 1.890 | 0.030 | 13271 | 13536 | 13807 | 14083 | 14365 | 14652 | | |
| 63000 | COOK ROAD | 07 | T2 | 1.890 | 1.950 | 0.060 | 13271 | 13536 | 13807 | 14083 | 14365 | 14652 | | |
| 63000 | COOK ROAD | 07 | T2 | 1.950 | 1.970 | 0.020 | 13271 | 13536 | 13807 | 14083 | 14365 | 14652 | D | D |
| 63000 | COOK ROAD | 07 | T2 | 1.970 | 2.191 | 0.221 | 13271 | 13536 | 13807 | 14083 | 14365 | 14652 | | |
| 63000 | COOK ROAD | 07 | T2 | 2.191 | 3.080 | 0.889 | 13271 | 13536 | 13807 | 14083 | 14365 | 14652 | | |
| 63000 | COOK ROAD | 07 | T2 | 3.080 | 3.360 | 0.280 | 13271 | 13536 | 13807 | 14083 | 14365 | 14652 | | |
| 63000 | COOK ROAD | 07 | T2 | 3.360 | 3.820 | 0.460 | 14534 | 14825 | 15121 | 15424 | 15732 | 16047 | | |
| 63000 | COOK ROAD | 07 | T2 | 3.820 | 4.100 | 0.280 | 14534 | 14825 | 15121 | 15424 | 15732 | 16047 | D | D |
| 63000 | COOK ROAD | 07 | T2 | 4.100 | 4.320 | 0.220 | 14534 | 14825 | 15121 | 15424 | 15732 | 16047 | | |
| 63000 | COOK ROAD | 07 | T2 | 4.320 | 4.600 | 0.280 | 14534 | 14825 | 15121 | 15424 | 15732 | 16047 | | |
| 63000 | COOK ROAD | 07 | T2 | 4.600 | 4.880 | 0.280 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 07 | T2 | 4.880 | 5.000 | 0.120 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 07 | T2 | 5.000 | 5.080 | 0.080 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 07 | T2 | 5.080 | 5.260 | 0.180 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 07 | T2 | 5.260 | 5.320 | 0.060 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 07 | T2 | 5.320 | 5.390 | 0.070 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | D | D |
| 63000 | COOK ROAD | 16 | T2 | 5.390 | 5.470 | 0.080 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 16 | T2 | 5.470 | 5.500 | 0.030 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 16 | T2 | 5.500 | 5.510 | 0.010 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 63000 | COOK ROAD | 16 | T2 | 5.510 | 5.620 | 0.110 | 13004 | 13264 | 13529 | 13800 | 14076 | 14357 | | |
| 80090 | PIONEER HIGHWAY | 07 | T3 | 0.000 | 0.883 | 0.883 | 7915 | 8073 | 8235 | 8399 | 8567 | 8739 | C | C |
| 80090 | PIONEER HIGHWAY | 07 | T3 | 0.883 | 1.418 | 0.535 | 7985 | 8145 | 8308 | 8474 | 8643 | 8816 | C | C |
| 80090 | PIONEER HIGHWAY | 07 | T3 | 1.418 | 1.748 | 0.330 | 7985 | 8145 | 8308 | 8474 | 8643 | 8816 | | |
| 80090 | PIONEER HIGHWAY | 07 | T3 | 1.748 | 3.065 | 1.317 | 8293 | 8459 | 8628 | 8801 | 8977 | 9156 | C | C |
| 80090 | PIONEER HIGHWAY | 07 | T2 | 3.065 | 3.089 | 0.024 | 11904 | 12142 | 12385 | 12633 | 12885 | 13143 | D | D |

## Road Intersections

Intersection LOS

As with Road Segment LOS, Intersection LOS methodology is outlined in Chapter Six of the TSP. Intersection LOS, according to the Highway Capacity Manual, cannot be determined at stop controlled intersections. The individual stop-controlled leg LOS can be determined, but the overall intersection LOS cannot be determined. With regard to stop-controlled intersections, the TSP states that Skagit County will perform intersection analysis on;

> *"…intersections that may be approaching traffic signal warrants as described in the Manual on Uniform Traffic Control Devices (MUTCD). Signalization is considered as a possible solution to poor side street LOS; however, there have been many other considerations before concluding a traffic signal is required. Overall intersection safety is a major consideration and often results in alternatives to traffic signals such as roundabouts, route changes, additional lanes or new connections. When signalization occurs at an intersection the LOS can be determined as the average control delay to vehicles approaching the intersection."*

The TSP goes on regarding signalized and unsignalized intersections;

> *"Public Works staff will evaluate the LOS of all signalized locations on County Roads. They will also monitor traffic volumes on potential signalized locations to evaluate traffic signal warrants. This procedure will identify side street delay so capital projects may be identified and scoped. If signalization occurs, routes will be added to the list of intersections being monitored for LOS."*

Table 2 shows the signalized and unsignalized intersections on which Skagit County is collecting LOS data on a regular basis.

Table 2 – Intersections

| Intersection Name | Intersection Type | NB Approach LOS | SB Approach LOS | EB Approach LOS | WB Approach LOS | Overall LOS |
|---|---|---|---|---|---|---|
| **2015** | | | | | | |
| Cook Road / Old Hwy 99 N | Signalized | B | B | B | A | B |
| **2020 Est** | | | | | | |
| Cook Road / Old Hwy 99 N | Signalized | B | B | B | B | B |

The full Highway Capacity Reports on the intersection of Cook Road and Old Hwy 99 N for the current year and 5-year estimate are included in this Assessment as Appendix A and Appendix B respectively. This 5-year projected LOS was determined using a 2 percent yearly growth factor for each approach volume. The reports include the same data as last year's 2014 Concurrency Report as its data was collected on June 17, 2015 and remains current for the 2015 Concurrency Report.

It should be noted that this intersection was studied during the Peak PM hour for the Highway Capacity report as per industry standards and Concurrency requirements. However, during the Peak AM hour the LOS from the Westbound (WB) and Eastbound (EB) approaches would differ due to the prevailing traffic patterns for work-bound and home-bound trips. There are also two to three AM peak hour trains that travel through the at-grade rail crossing just east of the intersection that directly effect LOS during the morning commute.

## SUMMARY

As of December 31, 2015 all Skagit County road segments and signalized intersections meet the current LOS standards as adopted in the Transportation Systems Plan and Comprehensive Plan of Skagit County. Therefore, all Skagit County road segments and intersections are concurrent.

Analyst: Given Kutz
Agency: Skagit County
Date: 06/29/2015
Period: 5:00 pm
Project ID: 2015 Concurrency Assessment
E/W St: Cook Road

Inter.: Int #1
Area Type: All other areas
Jurisd: County
Year : 2015
N/S St: Old Hwy 99 N

## SIGNALIZED INTERSECTION SUMMARY

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| No. Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| LGConfig | L | TR | | L | TR | | L | TR | | L | T | R |
| Volume | 132 | 514 | 71 | 51 | 391 | 64 | 97 | 199 | 140 | 84 | 104 | 131 |
| Lane Width | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | 12.0 |
| RTOR Vol | | 5 | | | 6 | | | 27 | | | 97 | |

Duration 0.25 Area Type: All other areas

## Signal Operations

| Phase Combination | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| EB Left | A | | | | NB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| WB Left | A | | | | SB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| NB Right | | | | | EB Right | | | |
| SB Right | | | | | WB Right | | | |
| Green | 27.0 | | | | 17.1 | | | |
| Yellow | 4.0 | | | | 3.6 | | | |
| All Red | 1.0 | | | | 1.0 | | | |

Cycle Length: 53.7 secs

## Intersection Performance Summary

| Appr/ Lane Grp | Lane Group Capacity | Adj Sat Flow Rate (s) | Ratios v/c | Ratios g/C | Lane Group Delay | Lane Group LOS | Approach Delay | Approach LOS |
|---|---|---|---|---|---|---|---|---|
| Eastbound | | | | | | | | |
| L | 354 | 705 | 0.40 | 0.50 | 9.1 | A | | |
| TR | 894 | 1779 | 0.71 | 0.50 | 12.9 | B | 12.2 | B |
| Westbound | | | | | | | | |
| L | 252 | 501 | 0.22 | 0.50 | 7.9 | A | | |
| TR | 892 | 1774 | 0.55 | 0.50 | 9.9 | A | 9.7 | A |
| Northbound | | | | | | | | |
| L | 394 | 1238 | 0.27 | 0.32 | 14.0 | B | | |
| TR | 538 | 1691 | 0.63 | 0.32 | 18.0 | B | 17.0 | B |
| Southbound | | | | | | | | |
| L | 248 | 778 | 0.37 | 0.32 | 15.0 | B | | |
| T | 576 | 1810 | 0.20 | 0.32 | 13.5 | B | 14.0 | B |
| R | 481 | 1509 | 0.08 | 0.32 | 12.9 | B | | |

Intersection Delay = 12.8 (sec/veh) Intersection LOS = B

Baseline

Phone: Fax:
E-Mail:

## OPERATIONAL ANALYSIS

Analyst: Given Kutz
Agency/Co.: Skagit County
Date Performed: 06/29/2015
Analysis Time Period: 5:00 pm
Intersection: Int #1
Area Type: All other areas
Jurisdiction: County
Analysis Year: 2015
Project ID: 2015 Concurrency Assessment
E/W St: Cook Road N/S St: Old Hwy 99 N

## VOLUME DATA

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Volume | 132 | 514 | 71 | 51 | 391 | 64 | 97 | 199 | 140 | 84 | 104 | 131 |
| % Heavy Veh | 7 | 5 | 5 | 5 | 5 | 5 | 5 | 7 | 5 | 5 | 5 | 7 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PK 15 Vol | 36 | 140 | 19 | 14 | 106 | 17 | 26 | 54 | 38 | 23 | 28 | 36 |
| Hi Ln Vol | | | | | | | | | | | | |
| % Grade | | 0 | | | 0 | | | 0 | | | 0 | |
| Ideal Sat | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | 1900 |
| ParkExist | | | | | | | | | | | | |
| NumPark | | | | | | | | | | | | |
| No. Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| LGConfig | L | TR | | L | TR | | L | TR | | L | T | R |
| Lane Width | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | 12.0 |
| RTOR Vol | | 5 | | | 6 | | | 27 | | | 97 | |
| Adj Flow | 143 | 631 | | 55 | 488 | | 105 | 339 | | 91 | 113 | 37 |
| %InSharedLn | | | | | | | | | | | | |
| Prop LTs | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | |
| Prop RTs | 0.114 | | | 0.129 | | | 0.363 | | | 0.000 | 1.000 | |
| Peds Bikes | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Buses | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 |
| %InProtPhase | | | | | | | | | | | | |

Duration 0.25 Area Type: All other areas

## OPERATING PARAMETERS

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Init Unmet | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 |
| Arriv. Type | 3 | 3 | | 3 | 3 | | 3 | 3 | | 3 | 3 | 3 |
| Unit Ext. | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | 3.0 |
| I Factor | | 1.000 | | | 1.000 | | | 1.000 | | | 1.000 | |
| Lost Time | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 2.0 |
| Ext of g | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 2.0 |
| Ped Min g | | 3.2 | | | 3.2 | | | 3.2 | | | 3.2 | |

## PHASE DATA

| Phase Combination | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| EB Left | A | | | | NB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| WB Left | A | | | | SB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| NB Right | | | | | EB Right | | | |
| SB Right | | | | | WB Right | | | |
| Green | 27.0 | | | | 17.1 | | | |
| Yellow | 4.0 | | | | 3.6 | | | |
| All Red | 1.0 | | | | 1.0 | | | |

Cycle Length: 53.7 secs

## VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Volume, V | 132 | 514 | 71 | 51 | 391 | 64 | 97 | 199 | 140 | 84 | 104 | 131 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj flow | 143 | 559 | 72 | 55 | 425 | 63 | 105 | 216 | 123 | 91 | 113 | 37 |
| No. Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Lane group | L | TR | | L | TR | | L | TR | | L | T | R |
| Adj flow | 143 | 631 | | 55 | 488 | | 105 | 339 | | 91 | 113 | 37 |
| Prop LTs | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | |
| Prop RTs | 0.114 | | | 0.129 | | | 0.363 | | | 0.000 | 1.000 | |

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LG | L | TR | | L | TR | | L | TR | | L | T | R |
| So | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | 1900 |
| Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| fW | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fHV | 0.935 | 0.952 | | 0.952 | 0.952 | | 0.952 | 0.941 | | 0.952 | 0.952 | 0.935 |
| fG | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fP | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fBB | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fA | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fLU | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fRT | | 0.983 | | | 0.981 | | | 0.946 | | | 1.000 | 0.850 |
| fLT | 0.397 | 1.000 | | 0.277 | 1.000 | | 0.684 | 1.000 | | 0.430 | 1.000 | |
| Sec. | | | | | | | | | | | | |
| fLpb | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | |
| fRpb | | 1.000 | | | 1.000 | | | 1.000 | | | 1.000 | 1.000 |
| S | 705 | 1779 | | 501 | 1774 | | 1238 | 1691 | | 778 | 1810 | 1509 |
| Sec. | | | | | | | | | | | | |

## CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

| Appr/ Mvmt | Lane Group | Adj Flow Rate (v) | Adj Sat Flow Rate (s) | | Flow Ratio (v/s) | Green Ratio (g/C) | --Lane Group-- Capacity (c) | v/c Ratio |
|---|---|---|---|---|---|---|---|---|
| Eastbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 143 | 705 | | 0.20 | 0.50 | 354 | 0.40 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | TR | 631 | 1779 | # | 0.35 | 0.50 | 894 | 0.71 |
| Right | | | | | | | | |
| Westbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 55 | 501 | | 0.11 | 0.50 | 252 | 0.22 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | TR | 488 | 1774 | | 0.28 | 0.50 | 892 | 0.55 |
| Right | | | | | | | | |
| Northbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 105 | 1238 | | 0.08 | 0.32 | 394 | 0.27 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | TR | 339 | 1691 | # | 0.20 | 0.32 | 538 | 0.63 |
| Right | | | | | | | | |
| Southbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 91 | 778 | | 0.12 | 0.32 | 248 | 0.37 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | T | 113 | 1810 | | 0.06 | 0.32 | 576 | 0.20 |
| Right | R | 37 | 1509 | | 0.02 | 0.32 | 481 | 0.08 |

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.56
Total lost time per cycle, L = 9.60 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.68

Control Delay and LOS Determination

| Appr/ Lane | Ratios | | Unf Del | Prog Adj | Lane Grp | Incremental Factor | Del | Res Del | Lane Group | | Approach | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grp | v/c | g/C | d1 | Fact | Cap | k | d2 | d3 | Delay | LOS | Delay | LOS |
| Eastbound | | | | | | | | | | | | |
| L | 0.40 | 0.50 | 8.3 | 1.000 | 354 | 0.11 | 0.8 | 0.0 | 9.1 | A | | |
| TR | 0.71 | 0.50 | 10.3 | 1.000 | 894 | 0.27 | 2.6 | 0.0 | 12.9 | B | 12.2 | B |
| Westbound | | | | | | | | | | | | |
| L | 0.22 | 0.50 | 7.5 | 1.000 | 252 | 0.11 | 0.4 | 0.0 | 7.9 | A | | |
| TR | 0.55 | 0.50 | 9.2 | 1.000 | 892 | 0.15 | 0.7 | 0.0 | 9.9 | A | 9.7 | A |
| Northbound | | | | | | | | | | | | |
| L | 0.27 | 0.32 | 13.6 | 1.000 | 394 | 0.11 | 0.4 | 0.0 | 14.0 | B | | |
| TR | 0.63 | 0.32 | 15.6 | 1.000 | 538 | 0.21 | 2.4 | 0.0 | 18.0 | B | 17.0 | B |
| Southbound | | | | | | | | | | | | |
| L | 0.37 | 0.32 | 14.1 | 1.000 | 248 | 0.11 | 0.9 | 0.0 | 15.0 | B | | |
| T | 0.20 | 0.32 | 13.3 | 1.000 | 576 | 0.11 | 0.2 | 0.0 | 13.5 | B | 14.0 | B |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| R | 0.08 | 0.32 | 12.8 | 1.000 | 481 | 0.11 | 0.1 | 0.0 | 12.9 | B |

Intersection delay = 12.8 (sec/veh) Intersection LOS = B

## SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

| | | EB | WB | NB | SB |
|---|---|---|---|---|---|
| Opposed by Single(S) or Multiple(M) lane approach | | M | M | M | M |
| Cycle length, C | 53.7 sec | | | | |
| Total actual green time for LT lane group, G (s) | | 27.0 | 27.0 | 17.1 | 17.1 |
| Effective permitted green time for LT lane group, g(s) | | 27.0 | 27.0 | 17.1 | 17.1 |
| Opposing effective green time, go (s) | | 27.0 | 27.0 | 17.1 | 17.1 |
| Number of lanes in LT lane group, N | | 1 | 1 | 1 | 1 |
| Number of lanes in opposing approach, No | | 1 | 1 | 1 | 1 |
| Adjusted LT flow rate, VLT (veh/h) | | 143 | 55 | 105 | 91 |
| Proportion of LT in LT lane group, PLT | | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion of LT in opposing flow, PLTo | | 0.00 | 0.00 | 0.00 | 0.00 |
| Adjusted opposing flow rate, Vo (veh/h) | | 488 | 631 | 113 | 339 |
| Lost time for LT lane group, tL | | 5.00 | 5.00 | 4.60 | 4.60 |
| Computation | | | | | |
| LT volume per cycle, LTC=VLTC/3600 | | 2.13 | 0.82 | 1.57 | 1.36 |
| Opposing lane util. factor, fLUo | | 1.000 | 1.000 | 1.000 | 1.000 |
| Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc) | | 7.28 | 9.41 | 1.69 | 5.06 |
| gf=G[exp(- a * (LTC ** b))]-tl, gf<=g | | 0.0 | 0.0 | 0.0 | 0.0 |
| Opposing platoon ratio, Rpo (refer Exhibit 16-11) | | 1.00 | 1.00 | 1.00 | 1.00 |
| Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0] | | 0.50 | 0.50 | 0.68 | 0.68 |
| gq, (see Exhibit C16-4,5,6,7,8) | | 4.93 | 9.41 | 0.00 | 3.89 |
| gu=g-gq if gq>=gf, or = g-gf if gq<gf | | 22.07 | 17.59 | 17.10 | 13.21 |
| n=Max(gq-gf)/2,0) | | 2.47 | 4.71 | 0.00 | 1.95 |
| PTHo=1-PLTo | | 1.00 | 1.00 | 1.00 | 1.00 |
| PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)] | | 1.00 | 1.00 | 1.00 | 1.00 |
| EL1 (refer to Exhibit C16-3) | | 2.06 | 2.35 | 1.46 | 1.80 |
| EL2=Max((1-Ptho**n)/Plto, 1.0) | | | | | |
| fmin=2(1+PL)/g or fmin=2(1+Pl)/g | | 0.15 | 0.15 | 0.23 | 0.23 |
| gdiff=max(gq-gf,0) | | 0.00 | 0.00 | 0.00 | 0.00 |
| fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00) | | 0.40 | 0.28 | 0.68 | 0.43 |
| flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N** | | | | | |
| Left-turn adjustment, fLT | | 0.397 | 0.277 | 0.684 | 0.430 |

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

## SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

| | | EB | WB | NB | SB |
|---|---|---|---|---|---|
| Opposed by Single(S) or Multiple(M) lane approach | | | | | |
| Cycle length, C | 53.7 sec | | | | |
| Total actual green time for LT lane group, G (s) | | | | | |
| Effective permitted green time for LT lane group, g(s) | | | | | |
| Opposing effective green time, go (s) | | | | | |
| Number of lanes in LT lane group, N | | | | | |

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach,
see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto
left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach
or when gf>gq, see text.

_____SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET_____
Permitted Left Turns

| | EB | WB | NB | SB |
|---|---|---|---|---|
| Effective pedestrian green time, gp (s) | 27.0 | 27.0 | 17.1 | 17.1 |
| Conflicting pedestrian volume, Vped (p/h) | 0 | 0 | 0 | 0 |
| Pedestrian flow rate, Vpedg (p/h) | 0 | 0 | 0 | 0 |
| OCCpedg | 0.000 | 0.000 | 0.000 | 0.000 |
| Opposing queue clearing green, gq (s) | 4.93 | 9.41 | 0.00 | 3.89 |
| Eff. ped. green consumed by opp. veh. queue, gq/gp | 0.183 | 0.349 | 0.000 | 0.228 |
| OCCpedu | 0.000 | 0.000 | 0.000 | 0.000 |
| Opposing flow rate, Vo (veh/h) | 488 | 631 | 113 | 339 |
| OCCr | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of cross-street receiving lanes, Nrec | 1 | 1 | 1 | 1 |
| Number of turning lanes, Nturn | 1 | 1 | 1 | 1 |
| ApbT | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion of left turns, PLT | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion of left turns using protected phase, PLTA | 0.000 | 0.000 | 0.000 | 0.000 |
| Left-turn adjustment, fLpb | 1.000 | 1.000 | 1.000 | 1.000 |
| Permitted Right Turns | | | | |
| Effective pedestrian green time, gp (s) | 27.0 | 27.0 | 17.1 | 17.1 |
| Conflicting pedestrian volume, Vped (p/h) | 0 | 0 | 0 | 0 |
| Conflicting bicycle volume, Vbic (bicycles/h) | 0 | 0 | 0 | 0 |
| Vpedg | 0 | 0 | 0 | 0 |
| OCCpedg | 0.000 | 0.000 | 0.000 | 0.000 |
| Effective green, g (s) | 27.0 | 27.0 | 17.1 | 17.1 |
| Vbicg | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| OCCbicg | 0.020 | 0.020 | 0.020 | 0.020 |
| OCCr | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of cross-street receiving lanes, Nrec | 1 | 1 | 1 | 1 |
| Number of turning lanes, Nturn | 1 | 1 | 1 | 1 |
| ApbT | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion right-turns, PRT | 0.114 | 0.129 | 0.363 | 1.000 |
| Proportion right-turns using protected phase, PRTA | 0.000 | 0.000 | 0.000 | 0.000 |
| Right turn adjustment, fRpb | 1.000 | 1.000 | 1.000 | 1.000 |

## SUPPLEMENTAL UNIFORM DELAY WORKSHEET

| | EBLT | WBLT | NBLT | SBLT |
|---|---|---|---|---|
| Cycle length, C 53.7 sec | | | | |
| Adj. LT vol from Vol Adjustment Worksheet, v | | | | |
| v/c ratio from Capacity Worksheet, X | | | | |
| Protected phase effective green interval, g (s) | | | | |
| Opposing queue effective green interval, gq | | | | |
| Unopposed green interval, gu | | | | |
| Red time r=(C-g-gq-gu) | | | | |
| Arrival rate, qa=v/(3600(max[X,1.0])) | | | | |
| Protected ph. departure rate, Sp=s/3600 | | | | |
| Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600) | | | | |
| XPerm | | | | |
| XProt | | | | |
| Case | | | | |
| Queue at beginning of green arrow, Qa | | | | |
| Queue at beginning of unsaturated green, Qu | | | | |
| Residual queue, Qr | | | | |
| Uniform Delay, d1 | | | | |

## DELAY/LOS WORKSHEET WITH INITIAL QUEUE

| Appr/ Lane Group | Initial Unmet Demand Q veh | Dur. Unmet Demand t hrs. | Uniform Delay ds | Adj. d1 sec | Initial Queue Param. u | Final Unmet Demand Q veh | Initial Queue Delay d3 sec | Lane Group Delay d sec |
|---|---|---|---|---|---|---|---|---|
| **Eastbound** | | | | | | | | |
| L | 0.0 | 0.00 | 13.3 | 8.3 | 0.00 | 0.0 | 0.0 | 9.1 |
| TR | 0.0 | 0.00 | 13.3 | 10.3 | 0.00 | 0.0 | 0.0 | 12.9 |
| | 0.0 | | | | | | 0.0 | |
| **Westbound** | | | | | | | | |
| L | 0.0 | 0.00 | 13.3 | 7.5 | 0.00 | 0.0 | 0.0 | 7.9 |
| TR | 0.0 | 0.00 | 13.3 | 9.2 | 0.00 | 0.0 | 0.0 | 9.9 |
| | 0.0 | | | | | | 0.0 | |
| **Northbound** | | | | | | | | |
| L | 0.0 | 0.00 | 18.3 | 13.6 | 0.00 | 0.0 | 0.0 | 14.0 |
| TR | 0.0 | 0.00 | 18.3 | 15.6 | 0.00 | 0.0 | 0.0 | 18.0 |
| | 0.0 | | | | | | 0.0 | |
| **Southbound** | | | | | | | | |
| L | 0.0 | 0.00 | 18.3 | 14.1 | 0.00 | 0.0 | 0.0 | 15.0 |
| T | 0.0 | 0.00 | 18.3 | 13.3 | 0.00 | 0.0 | 0.0 | 13.5 |
| R | 0.0 | 0.00 | 18.3 | 12.8 | 0.00 | 0.0 | 0.0 | 12.9 |

Intersection Delay 12.8 sec/veh Intersection LOS B

## BACK OF QUEUE WORKSHEET

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LaneGroup | L | TR | | L | TR | | L | TR | | L | T | R |
| Init Queue | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 |
| Flow Rate | 143 | 631 | | 55 | 488 | | 105 | 339 | | 91 | 113 | 37 |
| So | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | 1900 |
| No.Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| SL | 705 | 1779 | | 501 | 1774 | | 1238 | 1691 | | 778 | 1810 | 1509 |
| LnCapacity | 354 | 894 | | 252 | 892 | | 394 | 538 | | 248 | 576 | 481 |
| Flow Ratio | 0.2 | 0.4 | | 0.1 | 0.3 | | 0.1 | 0.2 | | 0.1 | 0.1 | 0.0 |
| v/c Ratio | 0.40 | 0.71 | | 0.22 | 0.55 | | 0.27 | 0.63 | | 0.37 | 0.20 | 0.08 |
| Grn Ratio | 0.50 | 0.50 | | 0.50 | 0.50 | | 0.32 | 0.32 | | 0.32 | 0.32 | 0.32 |
| I Factor | | 1.000 | | | 1.000 | | | 1.000 | | | 1.000 | |
| AT or PVG | 3 | 3 | | 3 | 3 | | 3 | 3 | | 3 | 3 | 3 |
| Pltn Ratio | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| PF2 | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Q1 | 1.3 | 7.3 | | 0.5 | 5.0 | | 1.2 | 4.3 | | 1.0 | 1.2 | 0.4 |
| kB | 0.3 | 0.5 | | 0.2 | 0.5 | | 0.3 | 0.3 | | 0.2 | 0.4 | 0.3 |
| Q2 | 0.2 | 1.1 | | 0.1 | 0.6 | | 0.1 | 0.6 | | 0.1 | 0.1 | 0.0 |
| Q Average | 1.5 | 8.4 | | 0.5 | 5.6 | | 1.3 | 4.9 | | 1.2 | 1.3 | 0.4 |
| Q Spacing | 25.0 | 25.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | 25.0 |
| Q Storage | 155 | 0 | | 275 | 0 | | 170 | 0 | | 280 | 0 | 100 |
| Q S Ratio | 0.2 | | | 0.0 | | | 0.2 | | | 0.1 | | 0.1 |
| 70th Percentile Output: | | | | | | | | | | | | |
| fB% | 1.2 | 1.2 | | 1.2 | 1.2 | | 1.2 | 1.2 | | 1.2 | 1.2 | 1.2 |
| BOQ | 1.8 | 9.9 | | 0.6 | 6.6 | | 1.5 | 5.8 | | 1.4 | 1.6 | 0.5 |
| QSRatio | 0.3 | | | 0.1 | | | 0.2 | | | 0.1 | | 0.1 |
| 85th Percentile Output: | | | | | | | | | | | | |
| fB% | 1.6 | 1.5 | | 1.6 | 1.5 | | 1.6 | 1.6 | | 1.6 | 1.6 | 1.6 |
| BOQ | 2.4 | 12.8 | | 0.8 | 8.6 | | 2.0 | 7.6 | | 1.9 | 2.1 | 0.7 |
| QSRatio | 0.4 | | | 0.1 | | | 0.3 | | | 0.2 | | 0.2 |
| 90th Percentile Output: | | | | | | | | | | | | |
| fB% | 1.8 | 1.7 | | 1.8 | 1.7 | | 1.8 | 1.7 | | 1.8 | 1.8 | 1.8 |
| BOQ | 2.7 | 13.9 | | 0.9 | 9.5 | | 2.3 | 8.4 | | 2.1 | 2.3 | 0.7 |
| QSRatio | 0.4 | | | 0.1 | | | 0.3 | | | 0.2 | | 0.2 |
| 95th Percentile Output: | | | | | | | | | | | | |
| fB% | 2.1 | 1.9 | | 2.1 | 1.9 | | 2.1 | 2.0 | | 2.1 | 2.1 | 2.1 |
| BOQ | 3.1 | 15.7 | | 1.1 | 10.8 | | 2.6 | 9.6 | | 2.4 | 2.7 | 0.9 |
| QSRatio | 0.5 | | | 0.1 | | | 0.4 | | | 0.2 | | 0.2 |
| 98th Percentile Output: | | | | | | | | | | | | |
| fB% | 2.6 | 2.2 | | 2.7 | 2.4 | | 2.6 | 2.4 | | 2.6 | 2.6 | 2.7 |
| BOQ | 3.9 | 18.6 | | 1.4 | 13.1 | | 3.3 | 11.7 | | 3.1 | 3.4 | 1.1 |
| QSRatio | 0.6 | | | 0.1 | | | 0.5 | | | 0.3 | | 0.3 |

## ERROR MESSAGES

No errors to report.

Analyst: Given Kutz
Agency: Skagit County
Date: 06/29/2015
Period: 5:00 pm
Project ID: 2015 Concurrency Assessment
E/W St: Cook Road

Inter.: Int #1
Area Type: All other areas
Jurisd: County
Year : 2015
N/S St: Old Hwy 99 N

## SIGNALIZED INTERSECTION SUMMARY

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| No. Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| LGConfig | L | TR | | L | TR | | L | TR | | L | T | R |
| Volume | 146 | 567 | 78 | 56 | 432 | 71 | 107 | 220 | 155 | 93 | 115 | 145 |
| Lane Width | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | 12.0 |
| RTOR Vol | | | 5 | | | 6 | | | 27 | | | 97 |

Duration 0.25 Area Type: All other areas

## Signal Operations

| Phase Combination | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| EB Left | A | | | | NB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| WB Left | A | | | | SB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| NB Right | | | | | EB Right | | | |
| SB Right | | | | | WB Right | | | |
| Green | 27.0 | | | | | 17.1 | | |
| Yellow | 4.0 | | | | | 3.6 | | |
| All Red | 1.0 | | | | | 1.0 | | |

Cycle Length: 53.7 secs

## Intersection Performance Summary

| Appr/ Lane Grp | Lane Group Capacity | Adj Sat Flow Rate (s) | Ratios v/c | Ratios g/C | Lane Group Delay | Lane Group LOS | Approach Delay | Approach LOS |
|---|---|---|---|---|---|---|---|---|
| Eastbound | | | | | | | | |
| L | 314 | 624 | 0.51 | 0.50 | 10.2 | B | | |
| TR | 894 | 1779 | 0.78 | 0.50 | 15.3 | B | 14.4 | B |
| Westbound | | | | | | | | |
| L | 205 | 408 | 0.30 | 0.50 | 8.6 | A | | |
| TR | 892 | 1774 | 0.61 | 0.50 | 10.7 | B | 10.5 | B |
| Northbound | | | | | | | | |
| L | 390 | 1225 | 0.30 | 0.32 | 14.2 | B | | |
| TR | 538 | 1689 | 0.70 | 0.32 | 20.2 | C | 18.8 | B |
| Southbound | | | | | | | | |
| L | 217 | 681 | 0.47 | 0.32 | 16.2 | B | | |
| T | 576 | 1810 | 0.22 | 0.32 | 13.6 | B | 14.4 | B |
| R | 481 | 1509 | 0.11 | 0.32 | 13.0 | B | | |

Intersection Delay = 14.3 (sec/veh) Intersection LOS = B

Baseline

Phone: Fax:
E-Mail:

## OPERATIONAL ANALYSIS

Analyst: Given Kutz
Agency/Co.: Skagit County
Date Performed: 06/29/2015
Analysis Time Period: 5:00 pm
Intersection: Int #1
Area Type: All other areas
Jurisdiction: County
Analysis Year: 2015
Project ID: 2015 Concurrency Assessment
E/W St: Cook Road N/S St: Old Hwy 99 N

## VOLUME DATA

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Volume | 146 | 567 | 78 | 56 | 432 | 71 | 107 | 220 | 155 | 93 | 115 | 145 |
| % Heavy Veh | 7 | 5 | 5 | 5 | 5 | 5 | 5 | 7 | 5 | 5 | 5 | 7 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| PK 15 Vol | 40 | 154 | 21 | 15 | 117 | 19 | 29 | 60 | 42 | 25 | 31 | 39 |
| Hi Ln Vol | | | | | | | | | | | | |
| % Grade | | 0 | | | 0 | | | 0 | | | 0 | |
| Ideal Sat | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | 1900 |
| ParkExist | | | | | | | | | | | | |
| NumPark | | | | | | | | | | | | |
| No. Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| LGConfig | L | TR | | L | TR | | L | TR | | L | T | R |
| Lane Width | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | 12.0 |
| RTOR Vol | | 5 | | | 6 | | | 27 | | | 97 | |
| Adj Flow | 159 | 695 | | 61 | 541 | | 116 | 378 | | 101 | 125 | 52 |
| %InSharedLn | | | | | | | | | | | | |
| Prop LTs | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | |
| Prop RTs | 0.114 | | | 0.131 | | | 0.368 | | | 0.000 | 1.000 | |
| Peds Bikes | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Buses | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 |
| %InProtPhase | | | | | | | | | | | | |

Duration 0.25 Area Type: All other areas

## OPERATING PARAMETERS

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Init Unmet | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 |
| Arriv. Type | 3 | 3 | | 3 | 3 | | 3 | 3 | | 3 | 3 | 3 |
| Unit Ext. | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | 3.0 |
| I Factor | | 1.000 | | | 1.000 | | | 1.000 | | | 1.000 | |
| Lost Time | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 2.0 |
| Ext of g | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 2.0 |
| Ped Min g | | 3.2 | | | 3.2 | | | 3.2 | | | 3.2 | |

## PHASE DATA

| Phase Combination | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| EB Left | A | | | | NB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| WB Left | A | | | | SB Left | A | | |
| Thru | A | | | | Thru | A | | |
| Right | A | | | | Right | A | | |
| Peds | X | | | | Peds | X | | |
| NB Right | | | | | EB Right | | | |
| SB Right | | | | | WB Right | | | |
| Green | 27.0 | | | | 17.1 | | | |
| Yellow | 4.0 | | | | 3.6 | | | |
| All Red | 1.0 | | | | 1.0 | | | |

Cycle Length: 53.7 secs

## VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | R | L | T | R | L | T | R | L | T | R |
| Volume, V | 146 | 567 | 78 | 56 | 432 | 71 | 107 | 220 | 155 | 93 | 115 | 145 |
| PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj flow | 159 | 616 | 79 | 61 | 470 | 71 | 116 | 239 | 139 | 101 | 125 | 52 |
| No. Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Lane group | L | TR | | L | TR | | L | TR | | L | T | R |
| Adj flow | 159 | 695 | | 61 | 541 | | 116 | 378 | | 101 | 125 | 52 |
| Prop LTs | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | | 1.000 | 0.000 | |
| Prop RTs | 0.114 | | | 0.131 | | | 0.368 | | | 0.000 | 1.000 | |

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LG | L | TR | | L | TR | | L | TR | | L | T | R |
| So | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | 1900 |
| Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| fW | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fHV | 0.935 | 0.952 | | 0.952 | 0.952 | | 0.952 | 0.941 | | 0.952 | 0.952 | 0.935 |
| fG | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fP | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fBB | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fA | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fLU | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 |
| fRT | | 0.983 | | | 0.980 | | | 0.945 | | | 1.000 | 0.850 |
| fLT | 0.351 | 1.000 | | 0.226 | 1.000 | | 0.677 | 1.000 | | 0.376 | 1.000 | |
| Sec. | | | | | | | | | | | | |
| fLpb | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | |
| fRpb | | 1.000 | | | 1.000 | | | 1.000 | | | 1.000 | 1.000 |
| S | 624 | 1779 | | 408 | 1774 | | 1225 | 1689 | | 681 | 1810 | 1509 |
| Sec. | | | | | | | | | | | | |

## CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

| Appr/ Mvmt | Lane Group | Adj Flow Rate (v) | Adj Sat Flow Rate (s) | | Flow Ratio (v/s) | Green Ratio (g/C) | --Lane Group-- Capacity (c) | v/c Ratio |
|---|---|---|---|---|---|---|---|---|
| Eastbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 159 | 624 | | 0.25 | 0.50 | 314 | 0.51 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | TR | 695 | 1779 | # | 0.39 | 0.50 | 894 | 0.78 |
| Right | | | | | | | | |
| Westbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 61 | 408 | | 0.15 | 0.50 | 205 | 0.30 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | TR | 541 | 1774 | | 0.30 | 0.50 | 892 | 0.61 |
| Right | | | | | | | | |
| Northbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 116 | 1225 | | 0.09 | 0.32 | 390 | 0.30 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | TR | 378 | 1689 | # | 0.22 | 0.32 | 538 | 0.70 |
| Right | | | | | | | | |
| Southbound | | | | | | | | |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Left | L | 101 | 681 | | 0.15 | 0.32 | 217 | 0.47 |
| Prot | | | | | | | | |
| Perm | | | | | | | | |
| Thru | T | 125 | 1810 | | 0.07 | 0.32 | 576 | 0.22 |
| Right | R | 52 | 1509 | | 0.03 | 0.32 | 481 | 0.11 |

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.61
Total lost time per cycle, L = 9.60 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.75

Control Delay and LOS Determination

| Appr/ Lane | Ratios | | Unf Del | Prog Adj | Lane Grp | Incremental Factor | Del | Res Del | Lane Group | | Approach | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grp | v/c | g/C | d1 | Fact | Cap | k | d2 | d3 | Delay | LOS | Delay | LOS |
| Eastbound | | | | | | | | | | | | |
| L | 0.51 | 0.50 | 8.9 | 1.000 | 314 | 0.11 | 1.3 | 0.0 | 10.2 | B | | |
| TR | 0.78 | 0.50 | 10.9 | 1.000 | 894 | 0.33 | 4.4 | 0.0 | 15.3 | B | 14.4 | B |
| Westbound | | | | | | | | | | | | |
| L | 0.30 | 0.50 | 7.8 | 1.000 | 205 | 0.11 | 0.8 | 0.0 | 8.6 | A | | |
| TR | 0.61 | 0.50 | 9.5 | 1.000 | 892 | 0.19 | 1.2 | 0.0 | 10.7 | B | 10.5 | B |
| Northbound | | | | | | | | | | | | |
| L | 0.30 | 0.32 | 13.8 | 1.000 | 390 | 0.11 | 0.4 | 0.0 | 14.2 | B | | |
| TR | 0.70 | 0.32 | 16.1 | 1.000 | 538 | 0.27 | 4.1 | 0.0 | 20.2 | C | 18.8 | B |
| Southbound | | | | | | | | | | | | |
| L | 0.47 | 0.32 | 14.6 | 1.000 | 217 | 0.11 | 1.6 | 0.0 | 16.2 | B | | |
| T | 0.22 | 0.32 | 13.4 | 1.000 | 576 | 0.11 | 0.2 | 0.0 | 13.6 | B | 14.4 | B |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| R | 0.11 | 0.32 | 12.9 | 1.000 | 481 | 0.11 | 0.1 | 0.0 | 13.0 | B |

Intersection delay = 14.3 (sec/veh) Intersection LOS = B

## SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

| | | EB | WB | NB | SB |
|---|---|---|---|---|---|
| Opposed by Single(S) or Multiple(M) lane approach | | M | M | M | M |
| Cycle length, C | 53.7 sec | | | | |
| Total actual green time for LT lane group, G (s) | | 27.0 | 27.0 | 17.1 | 17.1 |
| Effective permitted green time for LT lane group, g(s) | | 27.0 | 27.0 | 17.1 | 17.1 |
| Opposing effective green time, go (s) | | 27.0 | 27.0 | 17.1 | 17.1 |
| Number of lanes in LT lane group, N | | 1 | 1 | 1 | 1 |
| Number of lanes in opposing approach, No | | 1 | 1 | 1 | 1 |
| Adjusted LT flow rate, VLT (veh/h) | | 159 | 61 | 116 | 101 |
| Proportion of LT in LT lane group, PLT | | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion of LT in opposing flow, PLTo | | 0.00 | 0.00 | 0.00 | 0.00 |
| Adjusted opposing flow rate, Vo (veh/h) | | 541 | 695 | 125 | 378 |
| Lost time for LT lane group, tL | | 5.00 | 5.00 | 4.60 | 4.60 |
| Computation | | | | | |
| LT volume per cycle, LTC=VLTC/3600 | | 2.37 | 0.91 | 1.73 | 1.51 |
| Opposing lane util. factor, fLUo | | 1.000 | 1.000 | 1.000 | 1.000 |
| Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc) | | 8.07 | 10.37 | 1.86 | 5.64 |
| gf=G[exp(- a * (LTC ** b))]-tl, gf<=g | | 0.0 | 0.0 | 0.0 | 0.0 |
| Opposing platoon ratio, Rpo (refer Exhibit 16-11) | | 1.00 | 1.00 | 1.00 | 1.00 |
| Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0] | | 0.50 | 0.50 | 0.68 | 0.68 |
| gq, (see Exhibit C16-4,5,6,7,8) | | 6.47 | 11.79 | 0.00 | 5.13 |
| gu=g-gq if gq>=gf, or = g-gf if gq<gf | | 20.53 | 15.21 | 17.10 | 11.97 |
| n=Max(gq-gf)/2,0) | | 3.24 | 5.90 | 0.00 | 2.56 |
| PTHo=1-PLTo | | 1.00 | 1.00 | 1.00 | 1.00 |
| PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)] | | 1.00 | 1.00 | 1.00 | 1.00 |
| EL1 (refer to Exhibit C16-3) | | 2.16 | 2.50 | 1.48 | 1.86 |
| EL2=Max((1-Ptho**n)/Plto, 1.0) | | | | | |
| fmin=2(1+PL)/g or fmin=2(1+Pl)/g | | 0.15 | 0.15 | 0.23 | 0.23 |
| gdiff=max(gq-gf,0) | | 0.00 | 0.00 | 0.00 | 0.00 |
| fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00) | | 0.35 | 0.23 | 0.68 | 0.38 |
| flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N** | | | | | |
| Left-turn adjustment, fLT | | 0.351 | 0.226 | 0.677 | 0.376 |

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

## SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

| | | EB | WB | NB | SB |
|---|---|---|---|---|---|
| Opposed by Single(S) or Multiple(M) lane approach | | | | | |
| Cycle length, C | 53.7 sec | | | | |
| Total actual green time for LT lane group, G (s) | | | | | |
| Effective permitted green time for LT lane group, g(s) | | | | | |
| Opposing effective green time, go (s) | | | | | |
| Number of lanes in LT lane group, N | | | | | |

| | | | | |
|---|---|---|---|---|
| Number of lanes in opposing approach, No | | | | |
| Adjusted LT flow rate, VLT (veh/h) | | | | |
| Proportion of LT in LT lane group, PLT | 0.000 | 0.000 | 0.000 | 0.000 |
| Proportion of LT in opposing flow, PLTo | | | | |
| Adjusted opposing flow rate, Vo (veh/h) | | | | |
| Lost time for LT lane group, tL | | | | |
| Computation | | | | |
| LT volume per cycle, LTC=VLTC/3600 | | | | |
| Opposing lane util. factor, fLUo | 1.000 | 1.000 | 1.000 | 1.000 |
| Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc) | | | | |
| gf=G[exp(- a * (LTC ** b))]-tl, gf<=g | | | | |
| Opposing platoon ratio, Rpo (refer Exhibit 16-11) | | | | |
| Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0] | | | | |
| gq, (see Exhibit C16-4,5,6,7,8) | | | | |
| gu=g-gq if gq>=gf, or = g-gf if gq<gf | | | | |
| n=Max(gq-gf)/2,0) | | | | |
| PTHo=1-PLTo | | | | |
| PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)] | | | | |
| EL1 (refer to Exhibit C16-3) | | | | |
| EL2=Max((1-Ptho**n)/Plto, 1.0) | | | | |
| fmin=2(1+PL)/g or fmin=2(1+Pl)/g | | | | |
| gdiff=max(gq-gf,0) | | | | |
| fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00) | | | | |
| flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) | | | | |
| or flt=[fm+0.91(N-1)]/N** | | | | |
| Left-turn adjustment, fLT | | | | |

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

## SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

| Permitted Left Turns | EB | WB | NB | SB |
|---|---|---|---|---|
| Effective pedestrian green time, gp (s) | 27.0 | 27.0 | 17.1 | 17.1 |
| Conflicting pedestrian volume, Vped (p/h) | 0 | 0 | 0 | 0 |
| Pedestrian flow rate, Vpedg (p/h) | 0 | 0 | 0 | 0 |
| OCCpedg | 0.000 | 0.000 | 0.000 | 0.000 |
| Opposing queue clearing green, gq (s) | 6.47 | 11.79 | 0.00 | 5.13 |
| Eff. ped. green consumed by opp. veh. queue, gq/gp | 0.240 | 0.437 | 0.000 | 0.300 |
| OCCpedu | 0.000 | 0.000 | 0.000 | 0.000 |
| Opposing flow rate, Vo (veh/h) | 541 | 695 | 125 | 378 |
| OCCr | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of cross-street receiving lanes, Nrec | 1 | 1 | 1 | 1 |
| Number of turning lanes, Nturn | 1 | 1 | 1 | 1 |
| ApbT | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion of left turns, PLT | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion of left turns using protected phase, PLTA | 0.000 | 0.000 | 0.000 | 0.000 |
| Left-turn adjustment, fLpb | 1.000 | 1.000 | 1.000 | 1.000 |
| Permitted Right Turns | | | | |
| Effective pedestrian green time, gp (s) | 27.0 | 27.0 | 17.1 | 17.1 |
| Conflicting pedestrian volume, Vped (p/h) | 0 | 0 | 0 | 0 |
| Conflicting bicycle volume, Vbic (bicycles/h) | 0 | 0 | 0 | 0 |
| Vpedg | 0 | 0 | 0 | 0 |
| OCCpedg | 0.000 | 0.000 | 0.000 | 0.000 |
| Effective green, g (s) | 27.0 | 27.0 | 17.1 | 17.1 |
| Vbicg | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| OCCbicg | 0.020 | 0.020 | 0.020 | 0.020 |
| OCCr | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of cross-street receiving lanes, Nrec | 1 | 1 | 1 | 1 |
| Number of turning lanes, Nturn | 1 | 1 | 1 | 1 |
| ApbT | 1.000 | 1.000 | 1.000 | 1.000 |
| Proportion right-turns, PRT | 0.114 | 0.131 | 0.368 | 1.000 |
| Proportion right-turns using protected phase, PRTA | 0.000 | 0.000 | 0.000 | 0.000 |
| Right turn adjustment, fRpb | 1.000 | 1.000 | 1.000 | 1.000 |

## SUPPLEMENTAL UNIFORM DELAY WORKSHEET

| | EBLT | WBLT | NBLT | SBLT |
|---|---|---|---|---|
| Cycle length, C 53.7 sec | | | | |
| Adj. LT vol from Vol Adjustment Worksheet, v | | | | |
| v/c ratio from Capacity Worksheet, X | | | | |
| Protected phase effective green interval, g (s) | | | | |
| Opposing queue effective green interval, gq | | | | |
| Unopposed green interval, gu | | | | |
| Red time r=(C-g-gq-gu) | | | | |
| Arrival rate, qa=v/(3600(max[X,1.0])) | | | | |
| Protected ph. departure rate, Sp=s/3600 | | | | |
| Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600) | | | | |
| XPerm | | | | |
| XProt | | | | |
| Case | | | | |
| Queue at beginning of green arrow, Qa | | | | |
| Queue at beginning of unsaturated green, Qu | | | | |
| Residual queue, Qr | | | | |
| Uniform Delay, d1 | | | | |

## DELAY/LOS WORKSHEET WITH INITIAL QUEUE

| Appr/ Lane Group | Initial Unmet Demand Q veh | Dur. Unmet Demand t hrs. | Uniform Delay Unadj. ds | Uniform Delay Adj. d1 sec | Initial Queue Param. u | Final Unmet Demand Q veh | Initial Queue Delay d3 sec | Lane Group Delay d sec |
|---|---|---|---|---|---|---|---|---|
| Eastbound | | | | | | | | |
| L | 0.0 | 0.00 | 13.3 | 8.9 | 0.00 | 0.0 | 0.0 | 10.2 |
| TR | 0.0 | 0.00 | 13.3 | 10.9 | 0.00 | 0.0 | 0.0 | 15.3 |
| | 0.0 | | | | | | 0.0 | |
| Westbound | | | | | | | | |
| L | 0.0 | 0.00 | 13.3 | 7.8 | 0.00 | 0.0 | 0.0 | 8.6 |
| TR | 0.0 | 0.00 | 13.3 | 9.5 | 0.00 | 0.0 | 0.0 | 10.7 |
| | 0.0 | | | | | | 0.0 | |
| Northbound | | | | | | | | |
| L | 0.0 | 0.00 | 18.3 | 13.8 | 0.00 | 0.0 | 0.0 | 14.2 |
| TR | 0.0 | 0.00 | 18.3 | 16.1 | 0.00 | 0.0 | 0.0 | 20.2 |
| | 0.0 | | | | | | 0.0 | |
| Southbound | | | | | | | | |
| L | 0.0 | 0.00 | 18.3 | 14.6 | 0.00 | 0.0 | 0.0 | 16.2 |
| T | 0.0 | 0.00 | 18.3 | 13.4 | 0.00 | 0.0 | 0.0 | 13.6 |
| R | 0.0 | 0.00 | 18.3 | 12.9 | 0.00 | 0.0 | 0.0 | 13.0 |

Intersection Delay 14.3 sec/veh Intersection LOS B

## BACK OF QUEUE WORKSHEET

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LaneGroup | L | TR | | L | TR | | L | TR | | L | T | R |
| Init Queue | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 |
| Flow Rate | 159 | 695 | | 61 | 541 | | 116 | 378 | | 101 | 125 | 52 |
| So | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | | 1900 | 1900 | 1900 |
| No.Lanes | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| SL | 624 | 1779 | | 408 | 1774 | | 1225 | 1689 | | 681 | 1810 | 1509 |
| LnCapacity | 314 | 894 | | 205 | 892 | | 390 | 538 | | 217 | 576 | 481 |
| Flow Ratio | 0.3 | 0.4 | | 0.1 | 0.3 | | 0.1 | 0.2 | | 0.1 | 0.1 | 0.0 |
| v/c Ratio | 0.51 | 0.78 | | 0.30 | 0.61 | | 0.30 | 0.70 | | 0.47 | 0.22 | 0.11 |
| Grn Ratio | 0.50 | 0.50 | | 0.50 | 0.50 | | 0.32 | 0.32 | | 0.32 | 0.32 | 0.32 |
| I Factor | | 1.000 | | | 1.000 | | | 1.000 | | | 1.000 | |
| AT or PVG | 3 | 3 | | 3 | 3 | | 3 | 3 | | 3 | 3 | 3 |
| Pltn Ratio | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| PF2 | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Q1 | 1.6 | 8.5 | | 0.5 | 5.8 | | 1.3 | 5.0 | | 1.2 | 1.4 | 0.5 |
| kB | 0.3 | 0.5 | | 0.2 | 0.5 | | 0.3 | 0.3 | | 0.2 | 0.4 | 0.3 |
| Q2 | 0.3 | 1.6 | | 0.1 | 0.7 | | 0.1 | 0.8 | | 0.2 | 0.1 | 0.0 |
| Q Average | 1.8 | 10.0 | | 0.6 | 6.5 | | 1.4 | 5.7 | | 1.4 | 1.5 | 0.6 |
| Q Spacing | 25.0 | 25.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | 25.0 |
| Q Storage | 155 | 0 | | 275 | 0 | | 170 | 0 | | 280 | 0 | 100 |
| Q S Ratio | 0.3 | | | 0.1 | | | 0.2 | | | 0.1 | | 0.1 |
| 70th Percentile Output: | | | | | | | | | | | | |
| fB% | 1.2 | 1.2 | | 1.2 | 1.2 | | 1.2 | 1.2 | | 1.2 | 1.2 | 1.2 |
| BOQ | 2.2 | 11.8 | | 0.7 | 7.7 | | 1.7 | 6.8 | | 1.7 | 1.8 | 0.7 |
| QSRatio | 0.4 | | | 0.1 | | | 0.3 | | | 0.1 | | 0.2 |
| 85th Percentile Output: | | | | | | | | | | | | |
| fB% | 1.6 | 1.5 | | 1.6 | 1.5 | | 1.6 | 1.5 | | 1.6 | 1.6 | 1.6 |
| BOQ | 2.9 | 15.2 | | 1.0 | 10.0 | | 2.3 | 8.9 | | 2.2 | 2.3 | 0.9 |
| QSRatio | 0.5 | | | 0.1 | | | 0.3 | | | 0.2 | | 0.2 |
| 90th Percentile Output: | | | | | | | | | | | | |
| fB% | 1.8 | 1.6 | | 1.8 | 1.7 | | 1.8 | 1.7 | | 1.8 | 1.8 | 1.8 |
| BOQ | 3.2 | 16.5 | | 1.1 | 11.0 | | 2.5 | 9.8 | | 2.4 | 2.6 | 1.0 |
| QSRatio | 0.5 | | | 0.1 | | | 0.4 | | | 0.2 | | 0.3 |
| 95th Percentile Output: | | | | | | | | | | | | |
| fB% | 2.0 | 1.8 | | 2.1 | 1.9 | | 2.1 | 1.9 | | 2.1 | 2.1 | 2.1 |
| BOQ | 3.8 | 18.5 | | 1.3 | 12.4 | | 2.9 | 11.1 | | 2.8 | 3.0 | 1.2 |
| QSRatio | 0.6 | | | 0.1 | | | 0.4 | | | 0.3 | | 0.3 |
| 98th Percentile Output: | | | | | | | | | | | | |
| fB% | 2.6 | 2.2 | | 2.7 | 2.3 | | 2.6 | 2.3 | | 2.6 | 2.6 | 2.7 |
| BOQ | 4.7 | 21.7 | | 1.6 | 15.0 | | 3.7 | 13.5 | | 3.6 | 3.8 | 1.6 |
| QSRatio | 0.8 | | | 0.1 | | | 0.5 | | | 0.3 | | 0.4 |

## ERROR MESSAGES

No errors to report.