LATSON INTERCHANGE DEVELOPMENT
TRAFFIC STUDIES

Genoa Township, Livingston County, MI

DRAFT
TRAFFIC STUDY FOR
I-96 AT LATSON RD INTERCHANGE

Livingston County
CS 47065 JN 101622C

Submitted to:
Michigan Department of Transportation

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December 2008

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Introduction

This project includes construction of a new rural type diamond interchange on I-96 at Latson Road in Livingston County. The construction includes a new Latson Road structure across I-96, EB/WB Entrance and Exit Ramps from I-96 to Latson Road, widening Latson Road to a five lane cross section from just north of I-96BL (Grand River Ave) to just south of the interchange, reconstructing and widening Nixon Road, widening the I-96BL (Grand River Avenue)/Latson Road intersection to provide dual left turn lanes in all directions with right turn lanes, and relocation of Grand Oaks Road and Beck Road intersections.

The purpose of the report is to analyze and recommend geometry and traffic control on Latson Road at I-96BL (Grand River Avenue), the ramp terminals, and the Nixon Road/ Beck Road intersection. Several laneage and geometric alternatives were analyzed using 2010 (build out year) and 2030 (future) projected volumes. The traffic volume data was provided by MDOT. Synchro 7 was used to analyze the different alternatives for intersection laneages during the AM and PM peak hours. HCS+ was used to analyze the merges and diverges for the ramps at I-96. The following summarizes our findings and recommended geometrics at each intersection. Analysis reports and recommended laneage requirements are shown in the Appendix.

Level of Service Analysis and Geometric Recommendations

Summary of Analysis

Latson Road at I-96BL (Grand River Avenue)

This intersection was analyzed with three alternative laneage configurations during the AM and PM peak hours for years 2010 and 2030 traffic volumes:

Alternatives:

A. Two thru lanes, single left turn lanes and a single right turn lanes on I-96BL (Grand River Avenue) and Latson Road on all approaches.
B. Two thru lanes, single left turn and a single right turn lanes on the I-96BL (Grand River Avenue) approaches; two thru lanes, dual left turn lanes and single right turn lanes on the Latson Road approaches.
C. Two thru lanes, dual left turn lanes and single right turn lanes on all of the I-96BL (Grand River Avenue) and on Latson Road approaches. We also analyzed the intersection with the same laneage except the southbound right turn lane on Latson Road was eliminated.

The existing phasing and timing at the I-96BL (Grand River Avenue) and Latson Road intersection were used in the analysis for Alternative A. Based on the projected 2010 volumes, the intersection of Latson Road and I-96BL (Grand River Ave) would operate at LOS C and LOS E during the AM and PM peak, respectively. The intersection would operate at LOS F during the AM and PM peak for year 2030.

Alternative B was analyzed with a split phase on Latson Road due to the directional volume split for northbound and southbound during the AM and PM peak periods. The higher traffic volume approaches are southbound and eastbound for the AM peak, and westbound and northbound for the PM peak. Based on the projected 2010 volumes, the intersection of Latson Road and I-96BL (Grand River Avenue) would operate at LOS C during the AM and PM peak hours. The intersection would operate at LOS E and LOS F during the AM and PM peak hours for year 2030, respectively.

Alternative C was analyzed with a split phase on Latson Road and leading protected only left turn phasing on I-96BL (Grand River Avenue). Based on the projected 2010 volumes, the intersection of Latson Road and I-96BL (Grand River Avenue) would operate at LOS C during the AM and PM peak hours. The intersection would operate at LOS E and LOS F during the AM and PM peak hours for the year 2030. With the southbound right turn lane eliminated the level of service for the southbound thru traffic would degrade from a LOS D to LOS E. It is therefore recommended that a right turn lane be added to southbound Latson Road at I-96BL (Grand River Avenue).

See Appendix A - Sheet No. 1 to 3 – Latson Road at I-96BL (Grand River Avenue) Intersection

Recommendation: Alternative C is the recommended geometry (two thru lanes, dual left turn lanes and single right turn lanes on all of the I-96BL (Grand River Avenue) and Latson Road approaches). This alternative provides the greatest capacity for future traffic growth at the intersection. Signal optimization is recommended after construction is completed and traffic volumes are established. Since the future intersection LOS in year 2030 is poor during the PM peak, an additional thru lane along I-96BL (Grand River Avenue) may be a feasible alternative if and when the projected traffic volumes are reached.

<u>Latson Road at the I-96 Westbound Exit Ramp</u>

This intersection was analyzed with three alternatives during the AM and PM peak hour for year 2010 and 2030:

A. Two lane ramp terminal
B. Three lane ramp terminal with the center lane as a shared movement for left and right turns
C. Three lane ramp terminal with a dual right turns and single left turn lane; added southbound right turn lane on Latson Road into the ramp.

A three phase signal was used in the analysis for Alternative A with a permissive-protected northbound left turn phase. The highest traffic volumes approaching the intersection are the southbound approach in the AM peak and the northbound approach in the PM peak. Based on the projected 2010 volumes, the intersection of Latson Road and I-96 WB Exit Ramp would operate at LOS B during the AM and PM peak hours. The

intersection would operate at LOS D and LOS C during the AM and PM peak hours for year 2030 traffic volumes.

Alternative B was analyzed with the addition of shared left and right turn lane on the exit ramp at the terminal. The timing for this alternative was optimized based on the geometry and projected traffic volumes. Based on the projected 2010 volumes, the intersection of Latson Road and I-96 WB Exit Ramp would operate at LOS B during the AM and PM peak hours. The intersection would operate at LOS D and LOS C during the AM and PM peak hours in the year 2030.

Alternative C was analyzed with dual right turn lanes and a single left turn lane at the ramp terminal, and the addition of a southbound right turn lane on Latson Road. The timing for this alternative was optimized based on the geometry and projected traffic volumes. Based on the projected 2010 volumes, the intersection of Latson Road and I-96 WB Exit Ramp would operate at LOS B during the AM and PM peak hours. The intersection would operate at LOS B during the AM and PM peak hours in year 2030.

See Appendix A - Sheet No. 4 to 6 – Latson Road at I-96 WB Exit Ramp Intersection

Recommendation: Alternative C is the recommended geometry and laneage configuration for this intersection. This alternative provides the best overall intersection level of service for year 2030, and three lane ramp approach also provides the greatest capacity for future traffic growth. The southbound Latson Road right turn lane onto the Westbound Entrance Ramp is recommended based on the high right turning traffic volume (840 vph in year 2030), improved LOS, and to be in compliance with Geometric Design Guide GEO-370-C.

<u>Latson Road at I-96 Eastbound Exit Ramp</u>

This intersection was analyzed with three alternatives during the AM and PM peak hour for year 2010 and 2030:

A. Two lane ramp terminal
B. Three lane ramp terminal with the center lane as a shared movement for left and right turns
C. Three lane ramp terminal with a dual left turn and single right turn lane and added northbound Latson Road right turn lane into the eastbound entrance ramp.

Alternative A was analyzed with a three phase signal operation with a permissive-protected southbound left turn. The highest traffic volume approaches at the intersection is southbound Latson Road in the AM peak hour, and the ramp approach in the PM peak hour. Based on the projected 2010 volumes, the intersection of Latson Road and I-96 EB Exit Ramp would operate at LOS B and LOS C during the AM and PM peak hours. The intersection would operate at LOS C and LOS F during the AM and PM peak hours, respectively for year 2030.

Alternative B was analyzed with the addition of shared left and right turn lane at the ramp terminal. The timing for this alternative was optimized based on the geometry and projected traffic volumes. Based on the projected 2010 volumes, the intersection of Latson Road and I-96 EB Exit Ramp would operate at LOS B during the AM and PM peak hours. The intersection would operate at LOS C and LOS D during the AM and PM peak hours for year 2030 traffic.

Alternative C was analyzed with dual left turn lanes and a single right turn lane at the ramp terminal, and the addition of a northbound right turn lane on Latson Road. The timing for this alternative was optimized based on the geometry and projected traffic volumes. Based on the projected 2010 volumes, the intersection of Latson Road and I-96 EB Exit Ramp would operate at LOS B during the AM and PM peak hours. The intersection would operate at LOS B and LOS D during the AM and PM peak hours for year 2030 traffic.

See Appendix A - Sheet No. 7 to 9 – Latson Road at I-96 EB Exit Ramp Intersection

Recommendation: Alternative C is the recommended geometry for this intersection. This alternative provides the best overall intersection level of service in year 2030. Alternative C also provides the greatest capacity for future traffic growth at the intersection. The northbound Latson Road right turn lane into the Eastbound Entrance Ramp is recommended based on the high right turning traffic volume (325 vph in year 2030) and to be in compliance with Geometric Design Guide GEO-370-C.

Nixon Road at Relocated Beck Road

This intersection was analyzed with two alternatives during the AM and PM peak hour for year 2010 and 2030 traffic volumes:

A. One lane approach on Beck Road with a shared thru, right and left turn lane
B. Two lane approach on Beck Road with headed up left turn lanes and shared thru and right turn lanes in both directions.
C. Three lane approach on westbound Beck Road with a left turn lane, thru lane, and right turn lane. A two lane approach on eastbound Beck Road with a left turn lane and a shared thru and right turn lane.

Alternative A was analyzed with a two phase signal. The highest traffic volume turning movements at the intersection are the westbound right, eastbound left, and southbound left turns. Based on the projected 2010 volumes, the intersection of Nixon Road and Beck Road would operate at LOS B during the AM and PM peak hours. The intersection would operate at LOS B and LOS C during the AM and PM peak hours for year 2030 traffic volumes.

Alternative B was analyzed with the addition of eastbound and westbound left turn lane at the intersection. The timing for this alternative was optimized based on the geometry and projected traffic volumes. Based on the projected 2010 volumes, the intersection of Nixon Road and Beck Road would operate at LOS B during the AM and PM peak hours. The intersection would operate at LOS B and LOS C during the AM and PM peak hours in the year 2030. Alternative A and B both have an acceptable intersection LOS for year 2010 and 2030.

Alternative C is the same geometry as Alternative B with the addition of a separate westbound right turn lane on Beck Road. Based on the projected 2010 volumes, the intersection of Nixon Road and Beck Road would operate at LOS B during the AM and PM peak hours. The intersection would operate at LOS B during the AM and PM peak hours in the year 2030. Alternative A and B both have an acceptable intersection LOS for year 2010 and 2030. However, Alternative C has a much better individual approach LOS for eastbound Beck Road.

See Appendix A - Sheet No. 10 to 12 – Nixon Road at Beck Road Intersection

Recommendation: Alternative C provides a better LOS for the certain critical movements at the intersection and provides greater intersection capacity for future traffic growth. Headed up left turn lanes are normally required at any signalized intersection to not only improve level of service but to also improve safety. The right turn volume on Nixon Road meets the guidelines for right turn lanes shown in Traffic and Safety Note 604A. However, since the LOS at the intersection is B/C assuming 2030 projected traffic and the five lane cross section ends just south of the railroad crossing, right turn lanes are not recommended on Nixon Road.

Intersection Geometry Conclusions and Recommendations:

Latson Road at the I-96BL (Grand River Avenue) Intersection
Construct two thru lanes, dual left turn lanes with 500’ storage lengths, and standard right turn lanes on the I-96BL (Grand River Avenue) approaches. Construct two thru lanes, dual left turn lanes, and standard right turn lanes on Latson Road approaches to the intersection. A 500’ storage length is recommended for the northbound left turn lanes and standard storage length (250 ft) for the southbound left turn lanes. To accommodate the eastbound and westbound dual left turn movements, a 12’ setback with 150’ taper is recommended northbound and southbound on Latson at the NE and SW quadrants. A split phase signal operation is recommended for Latson Road based on the directional traffic volume split. Based on the year 2030 projected traffic volumes particularly in the PM peak, an additional thru lane may be needed to increase capacity on I-96BL (Grand River Avenue) and to provide a better overall intersection level of service.

Latson Road at the I-96 WB Exit Ramp
Construct a three lane ramp terminal marked as two right turn lanes and a single left turn lane with standard geometry. Construct two thru lanes, standard northbound left turn lane, and standard southbound right turn lane on Latson Road. The center lane at the

ramp terminal may be used as a shared left and right turn lane in the future based on possible traffic pattern changes and traffic growth on the ramp. To accommodate the westbound dual right turn movement, a 12' setback with 150' taper is recommended northbound on Latson at the NE quadrant (see GEO-370-C). This ramp should be signalized as part of the construction project to provide a safe and efficient operation.

Latson Road at the I-96 EB Exit Ramp

Construct a three lane ramp terminal marked as two left turn lanes and a right turn lane with 500 feet of three lane storage (see GEO-370-C). Construct two thru lanes, standard southbound left turn lane, and standard northbound right turn lane on Latson Road. The center lane at the ramp terminal may be used as a shared left and right turn lane in the future based on possible traffic pattern changes and traffic growth on the ramp. To accommodate the eastbound dual left turn movement, a 12' offset and a 150' taper is recommended in the northeast quadrant of the ramps with Latson Road (GEO-370-C). In addition, a 12' setback with 150' taper is also recommended on southbound Latson Road in the SW quadrant. This ramp should be signalized as part of the construction project to provide a safe and efficient operation.

Nixon Road at Relocated Beck Rd

Construct two thru lanes in each direction and standard left turn lanes on Nixon Rd. Construct one thru lane and standard left turn lanes on both Beck Road approaches. In addition construct a right turn lane on the westbound Beck Road approach to Nixon Road. This intersection should not be signalized until actual traffic volumes meet or exceed traffic signal warrants and signalization would improve traffic operations and safety.

Traffic Signal Warrant Analysis

The following data addresses the need for stop and go traffic signals at the two proposed ramps terminals on Latson Road, and on Nixon Road at relocated Beck Road.

Traffic Data Requirements

In order to assess the need for stop and go traffic signals at the two ramp terminals, the following traffic volume data was provided by MDOT:

- Projected traffic volumes 2010 AM and PM peak hours.

Normal Traffic Signal Warrant Analysis should include the following:

- Traffic volumes for an average day (12 hours)
- Gap Study
- Delay Study
- Turning volumes

Since only the two peak hour's traffic was available, a Two-Way stop analysis was used to determine the peak hour delay for Warrant 3, Peak Hour.

Signal Installation Evaluation Criteria

In the State of Michigan all traffic control devices installed on public roads, including traffic signals, must conform to standards established in the Michigan Manual of Uniform Traffic Control Devices (MMUTCD), 2005 edition. An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the locations must be performed to determine whether installation of a traffic control signal is justified at a particular location. Investigation of the need for a traffic control signal shall include an analysis of the applicable factors contained in the MMUTCD traffic signal warrants and other factors related to existing operation and safety at the study locations. The Manual states that traffic control signals should not be installed unless one or more of the signal warrants are met. It also states that the satisfaction of a warrant or warrants is not in itself justification for a signal. Additional factors such as backups and delays, gaps in the mainline traffic flow, percent of right turns from the cross street, type and number of reported crashes, system signal spacing and several other traffic engineering issues must be considered when evaluating the need for stop and go signal control.

There are eight signal warrants detailed in the MMUTCD. They are summarized below.

Warrant 1, Eight-Hour Vehicular Volume

The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied, but where the traffic volume on a major street is so heavy that a lesser volume of traffic on an intersecting street experiences excessive delay or conflict entering or crossing the major street.

The basic minimum traffic volume criteria for conditions A and B are outlined in the 100 percent columns in MMUTCD Table 4C-1.

If the posted or statutory speed limit, or the 85^{th}-percentile speed, on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000 (the "rural" condition), 70 percent of Table 4C-1 volumes are considered as satisfying warrant #1 criteria.

Where neither condition A or B is met, the 80 or 56 percent columns in Table 4C-1 can be used, subject to conditions detailed in the MMUTCD.

Warrant 2, Four-Hour Vehicular Volume

The Four-Hour Vehicular Volume signal warrant is intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal. Warranting volumes are detailed in Figure 4C-1 of the MMUTCD. Where speeds exceed 40 mph, Figure 4C-2 details the appropriate warranting criteria.

Warrant 3, Peak Hour

The Peak Hour signal warrant is intended for use at locations where traffic conditions are so severe that, for a minimum of 1 hour on an average day, minor-street traffic suffers undue delay when entering or crossing the major street. This signal warrant shall be applied only in unusual cases, such as adjacent to office complexes, industrial facilities, or other high-occupancy facilities that attract or discharge large numbers of vehicles over a short time.

Warrant 3 prescribes that a traffic control signal may be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:

   1. Total stopped time delay experienced by traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and
   2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and
   3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes. For the higher speed/lower population condition, Figure 4C-4 is used in place of Figure 4C-3.

Warrant 4, Pedestrian Volume

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay crossing the major street.

The need for a traffic control signal at an intersection or mid-block crossing shall be considered if an engineering study finds that both of the following criteria are met:

A. The pedestrian volume crossing the major street at an intersection or mid-block location during an average day is 100 or more for each of any 4 hours or 190 or more during any 1 hour; and

B. There are fewer than 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic.

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 ft, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Warrant 5, School Crossing

The School Crossing signal warrant is intended for application where school children crossing the major street are the principal reason to consider installing a traffic control signal.

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream, as related to the number and size of groups of school children at an established school crossing across the major street, shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period, and there are a minimum of 20 students during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 ft, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Warrant 6, Coordinated Signal System

Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction; the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning; or

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.

Warrant 7, Crash Experience

The Crash Experience signal warrant is intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

The need for a traffic control signal may be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A, Table 4C-1 of the manual, or the vph in both of the 80 percent columns of Condition B, Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

In the higher speed/lower population application, traffic volume in the 56% columns of Table 4C-1 may be used in place of the 80 percent columns.

Warrant 8, Roadway Network

Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study that meet one or more of Warrants 1, 2 and 3 during an average weekday; or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non normal business day (Saturday or Sunday).

A major route as used in this signal warrant shall have one or more of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow; or

B. It includes rural or suburban highways outside, entering, or traversing a City; or

C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Analysis of MMUTCD Signal Warrants

EB I-96 Exit Ramp at Latson Road

Traffic volumes (2010), estimated by MDOT, were used for the AM and PM peak Hours.

Warrant 1, **is not applicable** since projected traffic volumes are available for only the AM and PM peak hour. The AM and PM peak hour traffic volumes both meet the volume criteria and it appears that the intersection would meet for the required eight hours.

Warrant 2 – **Is not applicable** since projected traffic volumes are available for only the AM and PM peak hours. The AM and PM peak hour traffic volumes both meet the volume criteria and it appears that the intersection would meet for the required four hours.

. Warrant 3 – **Is met**, The Highway Capacity Software was used to determine peak hour delay, the AM and PM peak hours had 400.9 and 1415.0 vehicle-hours delays for cross street traffic volumes.

Warrant 4 – **Is not applicable**.

Warrant 5 – **Is not applicable**.

Warrant 6 – **Is not applicable**.

Warrant 7 – **Is not applicable** since the ramp is not open to traffic and crash history does not exist.

Warrant 8 – **Is not applicable**.

WB I-96 at Latson Road

Traffic volumes (2010), estimated by MDOT were used for the AM and PM peak Hours.

Warrant 1, **is not applicable** since projected traffic volumes are available for only the AM and PM peak hours. The AM and PM peak hour traffic volumes both meet the volume criteria and it appears that the intersection would meet for the required eight hours.

Warrant 2 – **Is not applicable** since projected traffic volumes are available for only the AM and PM peak hours. The AM and PM peak hour traffic volumes

both meet the volume criteria and it appears that the intersection would meet for the required four hours.

. Warrant 3 – **Is met**, The Highway Capacity Software was used to determine peak hour delay, the AM and PM peak hours had 27.8 and 71.4 vehicle-hours delays for cross street traffic volumes.

Warrant 4 – **Is not applicable**.

Warrant 5 – **Is not applicable**.

Warrant 6 – **Is not applicable**.

Warrant 7 – **Is not applicable** since the interchange is not open to traffic and crash history does not exist.

Warrant 8 – **Is not applicable**.

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Nixon Road at Relocated Beck Road

Traffic volumes (2010), estimated by MDOT were used for the AM and PM peak hours.

Warrant 1, **is not applicable** since projected traffic volumes are available for only the AM and PM peak hours. The AM and PM peak hour traffic volumes both meet the volume criteria and it appears that the intersection would meet for the required eight hours.

Warrant 2 – **Is not applicable** since projected traffic volumes are available for only the AM and PM peak hour. The AM and PM peak hour traffic volumes both meet the volume criteria and it appears that the intersection would meet for the required four hours.

. Warrant 3 – **Is met**, The Highway Capacity Software was used to determine peak hour delay, the AM and PM peak hours had 3.3 and 20.9 vehicle-hours delays for cross street traffic volumes.

Warrant 4 – **Is not applicable.**

Warrant 5 – **Is not applicable**.

Warrant 6 – **Is not applicable.**

Warrant 7 – **Is not applicable** since the interchange is not open to traffic and a representative crash history does not exist.

Warrant 8 – **Is not applicable**.

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Traffic Signal Warrant Analysis Conclusions & Recommendations

MMUTCD's stop and go traffic signal Warrant 3, Peak Hour is satisfied at all three intersections using 2010 estimated traffic. Warrants 1 and 2 would also be met if traffic volumes were available for more than the AM and PM peak hours. Traffic signals are recommended and should be installed as part of the construction project at both I-96 ramp terminals with Latson Road. The Nixon Road /Beck Road intersection should not be signalized until actual traffic volumes meet or exceed traffic signal warrants and signalization would improve traffic operations and safety.

Freeway Mainline and Ramp Terminal LOS Analysis

The ramp merges and diverges at the freeway mainline were analyzed using 2030 AM and PM traffic provided by MDOT. The results are shown in Appendix A. The merges and diverges operate at LOS B or better during the AM peak. The merges and diverges operate at LOS B and C during the PM peak hour. The I-96 mainline will operate at LOS B and C during both the AM and PM peak hours. Storage length requirements and laneages on the exit ramp terminals at Latson Road are included in the previous analysis of the signalized terminals.

See Appendix A- Sheet 13 and 14

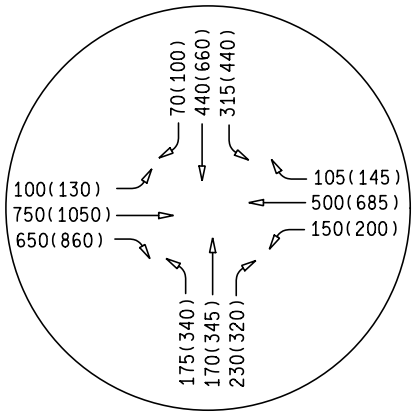
Nixon Road at Railroad Crossing Analysis

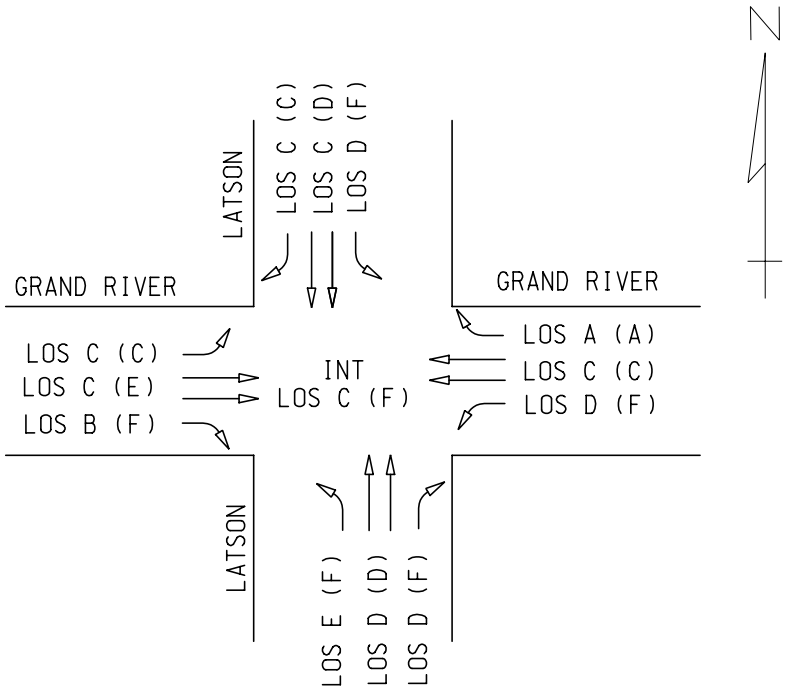
An estimate of traffic queuing was determined on Nixon Road during a traffic stoppage created by train arrivals. . The track currently has a 50 mph speed and carriers 14 trains per day. The assumptions used in the analysis were three trains during the peak hours with each arrival creating a three minute closure of the crossing. During the AM peak for year 2010, the maximum queue on Nixon Rd extends 296 feet north of Beck Rd during the crossing closure for the train movement. The maximum queue on Nixon Rd extends 255 feet north of Beck Rd during the PM peak for year 2010 traffic volumes. During the year 2030 in the AM peak, the maximum queue on Nixon Road extends 435 feet north of Beck Rd. During the PM peak, the maximum queue on Nixon Road extends 432 feet north of Beck Rd. Based on the above assumptions the traffic backup north of the crossing on Nixon Road will not extend across the I-96 ramp terminals adversely affecting freeway traffic.

APPENDIX A

INTERSECTION AND FREEWAY LEVELS OF SERVICE

CYCLE:90 / OFFSET:7	
EB/WB THRU	32 SEC
EB/WB LT	13 SEC
SB THRU/LT	25 SEC
NB THRU/LT	20 SEC





AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:16	
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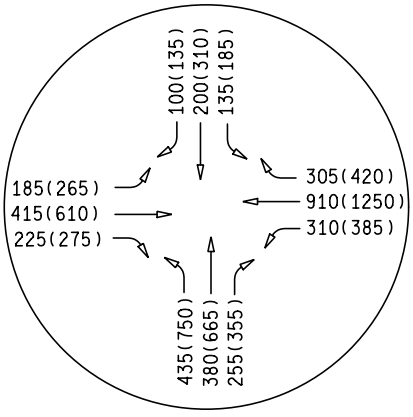
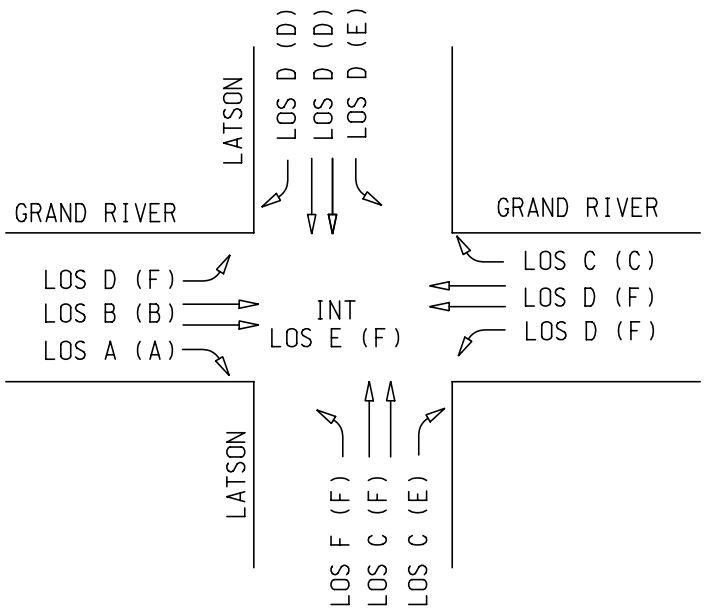
EB/WB LT	13 SEC
SB THRU/LT	15 SEC
NB THRU/LT	26 SEC





PM PEAK 2010 (2030)

Wilcox Professional Services (AN ISO 9001:2000 CERTIFIED COMPANY)	LATSON RD / GRAND RIVER AVE - ALTERNATIVE A				
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	12/5/08	NONE	47065	101622	1

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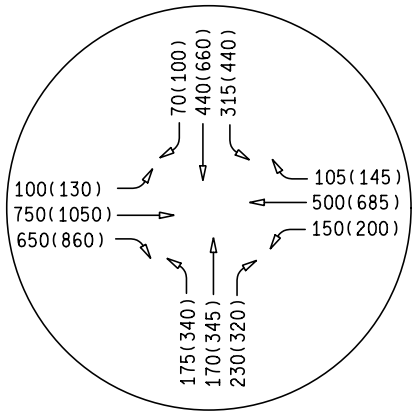
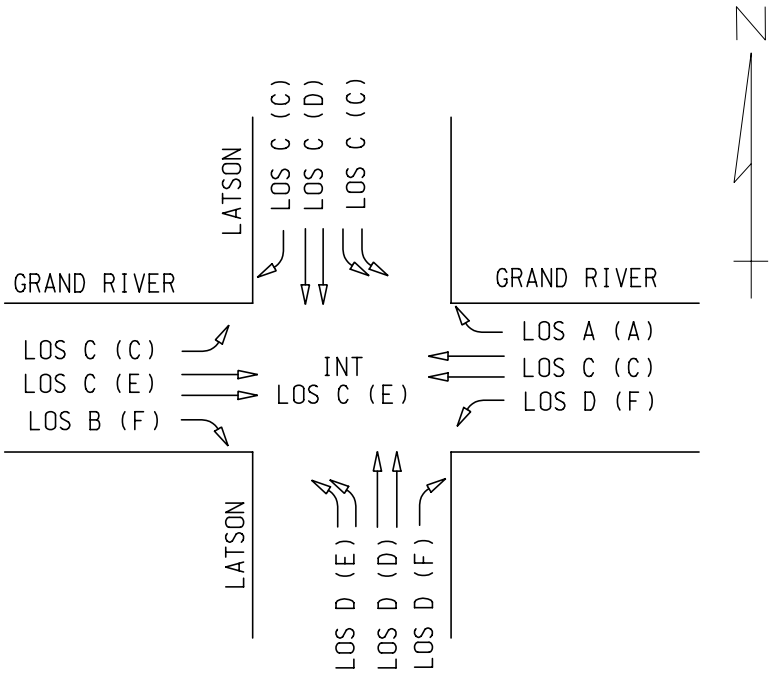
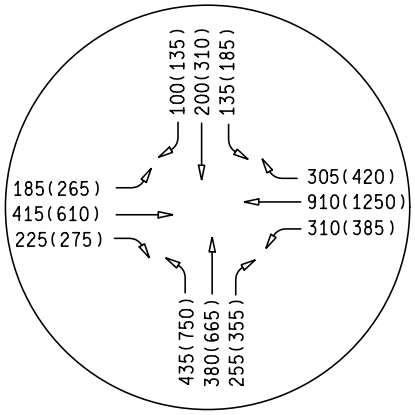
EB/WB LT	13 SEC
SB THRU/LT	25 SEC
NB THRU/LT	20 SEC

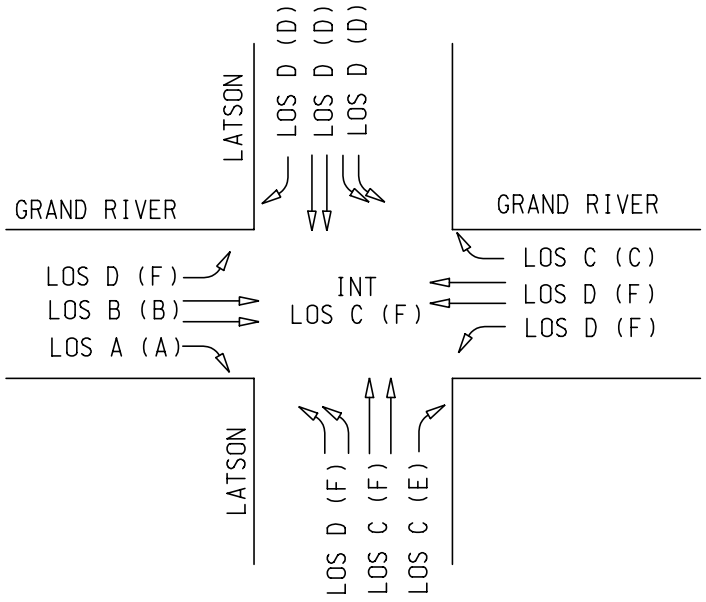




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:16	
EB/WB THRU	36 SEC
EB/WB LT	13 SEC
SB THRU/LT	15 SEC
NB THRU/LT	26 SEC



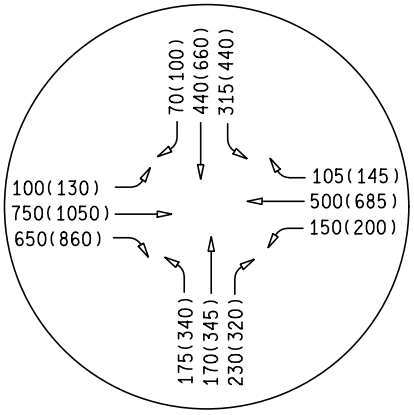


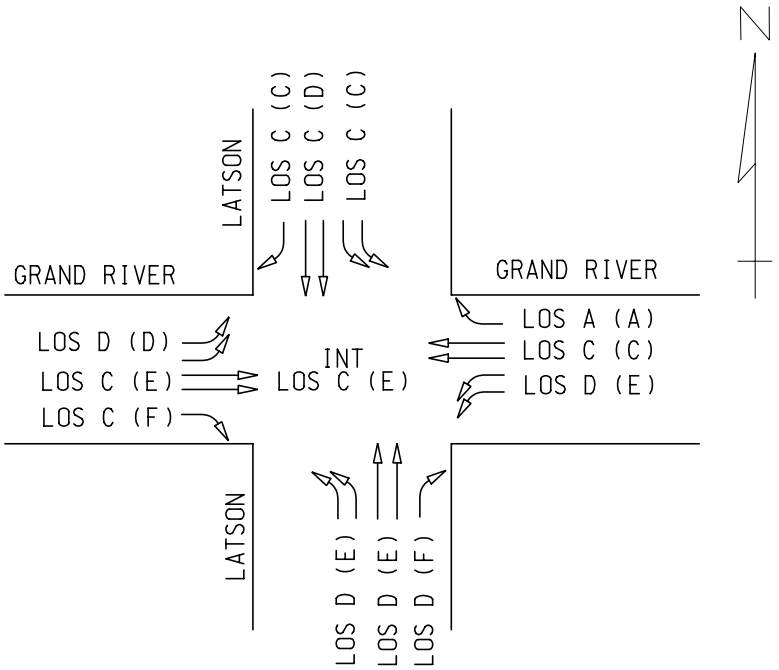
PM PEAK 2010 (2030)

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

Wilcox Professional Services	LATSON RD / GRAND RIVER AVE - ALTERNATIVE B				
	DATE 12/5/08	SCALE NONE	CONT. SEC. 47065	JOB NO. 101622	SHEET NO. 2

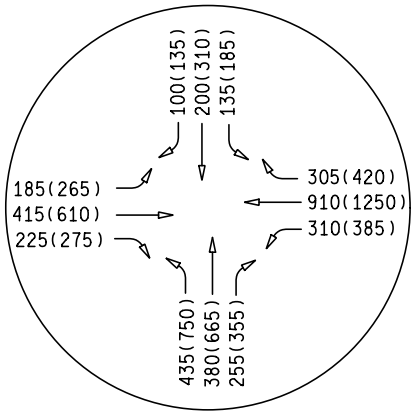
CYCLE:90 / OFFSET:7	
EB/WB LT	13 SEC
EB/WB THRU	33 SEC
SB THRU/LT	25 SEC
NB THRU/LT	19 SEC

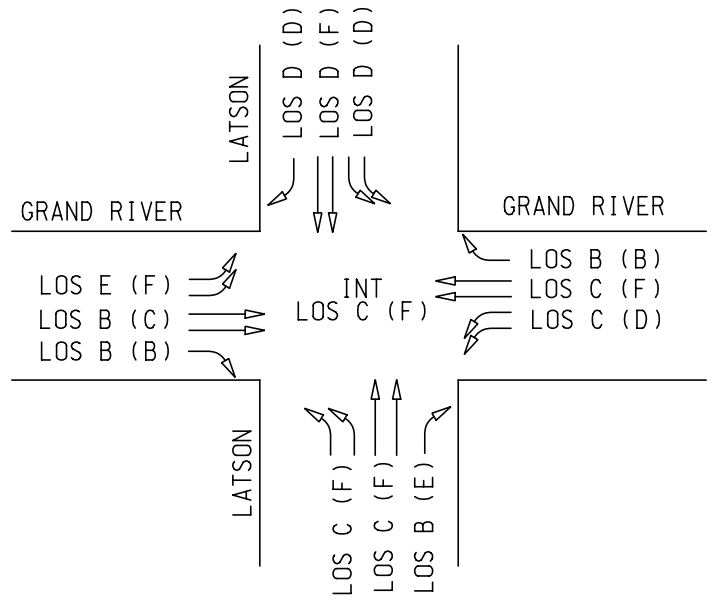




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:16	
EB/WB LT	12/20
EB/WB THRU	31/39
SB THRU/LT	13 SEC
NB THRU/LT	26 SEC



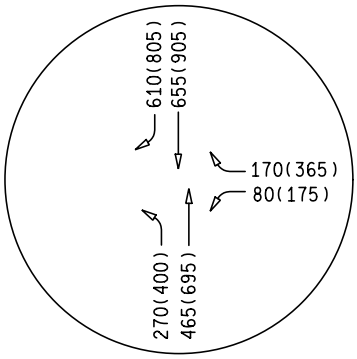


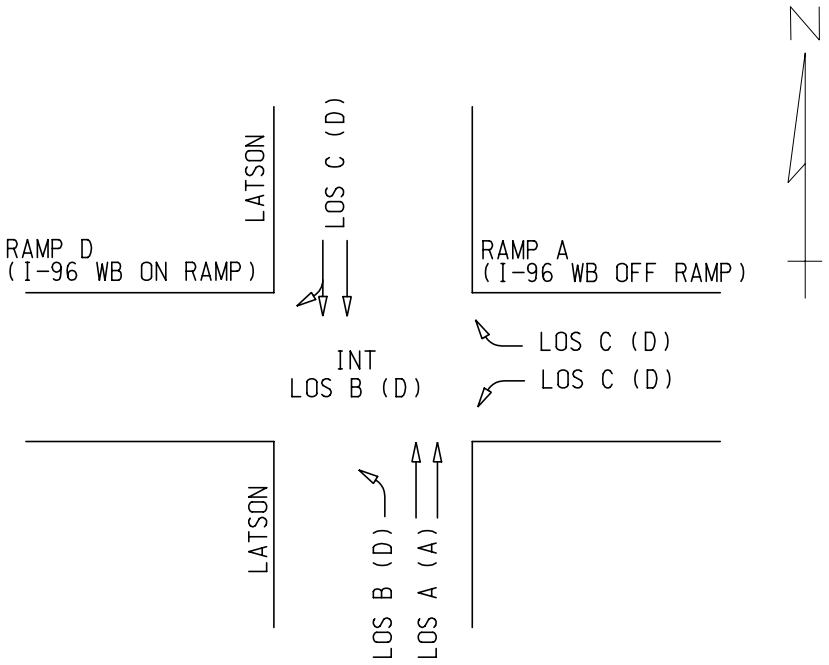
PM PEAK 2010 (2030)

Wilcox Professional Services	LATSON RD / GRAND RIVER AVE - ALTERNATIVE C				
	DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
	12/5/08	NONE	47065	101622	3

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

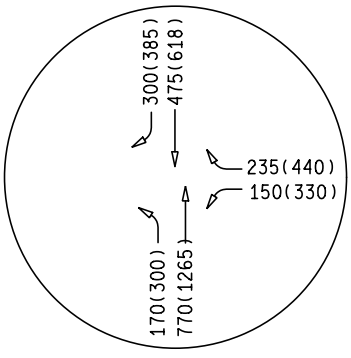
CYCLE:90 / OFFSET:62	
NB/SB THRU	43 (47) SEC
NB THRU/LT	25 (23) SEC
WB	22 (20) SEC

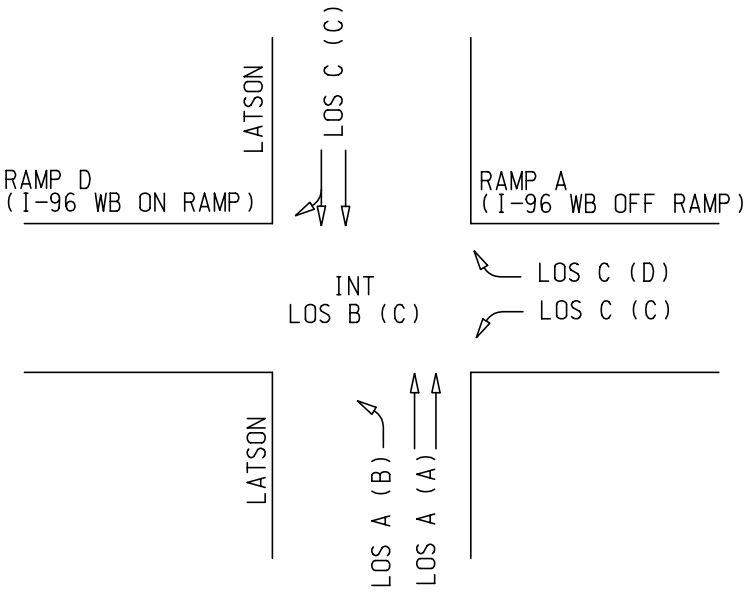




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:21	
NB/SB THRU	42 (37) SEC
NB THRU/LT	20 (20) SEC
WB	28 (33) SEC



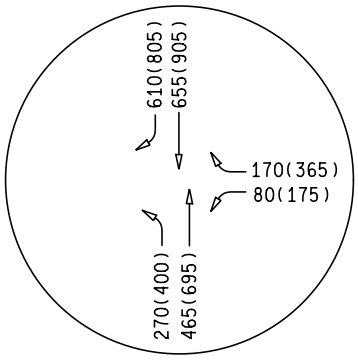


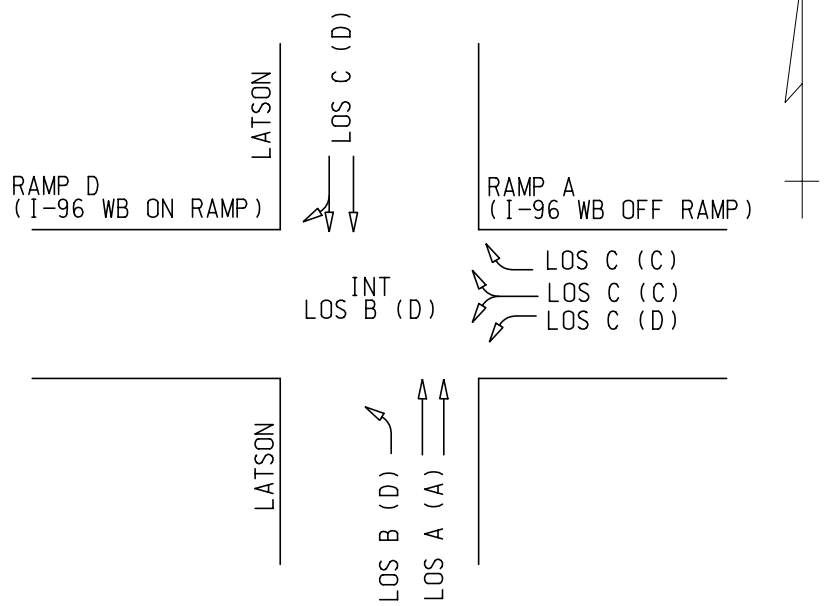
PM PEAK 2010 (2030)

Wilcox Professional Services	LATSON RD / I-96 WB OFF RAMP - ALTERNATIVE A				
	DATE 12/5/08	SCALE NONE	CONT. SEC. 47065	JOB NO. 101622	SHEET NO. 4

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

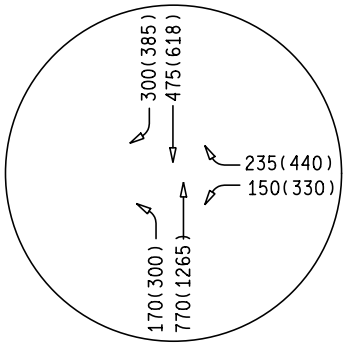
CYCLE:90 / OFFSET:62	
NB/SB THRU	43 (47) SEC
NB THRU/LT	25 (23) SEC
WB	22 (20) SEC

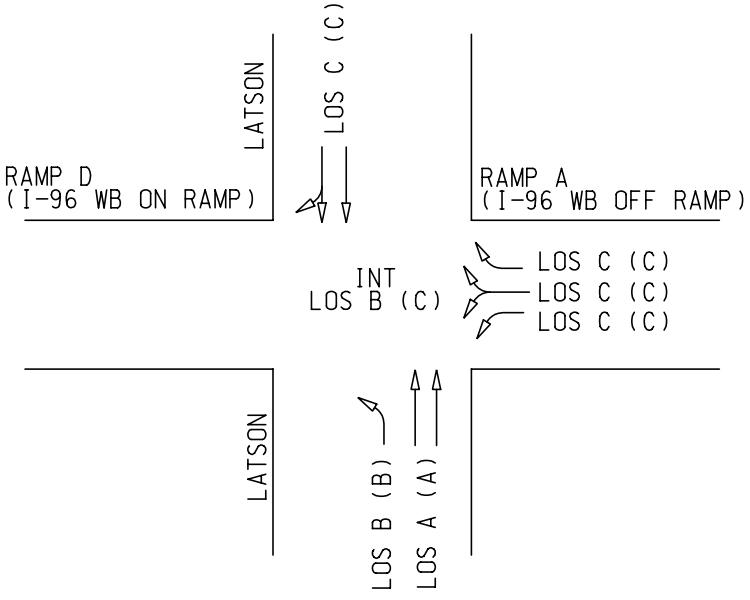




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:21	
NB/SB THRU	42 (37) SEC
NB THRU/LT	20 (20) SEC
WB	28 (33) SEC





PM PEAK 2010 (2030)

Wilcox Professional Services	LATSON RD / I-96 WB OFF RAMP - ALTERNATIVE B				
	DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
	12/5/08	NONE	47065	101622	5

FILE NAME: P:\Projects\22915.0013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

CYCLE:90 / OFFSET:62	
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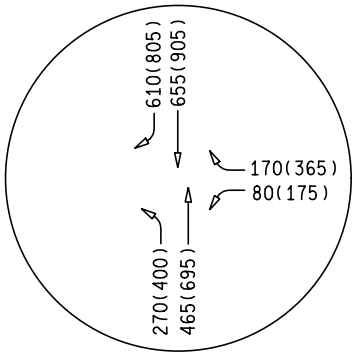
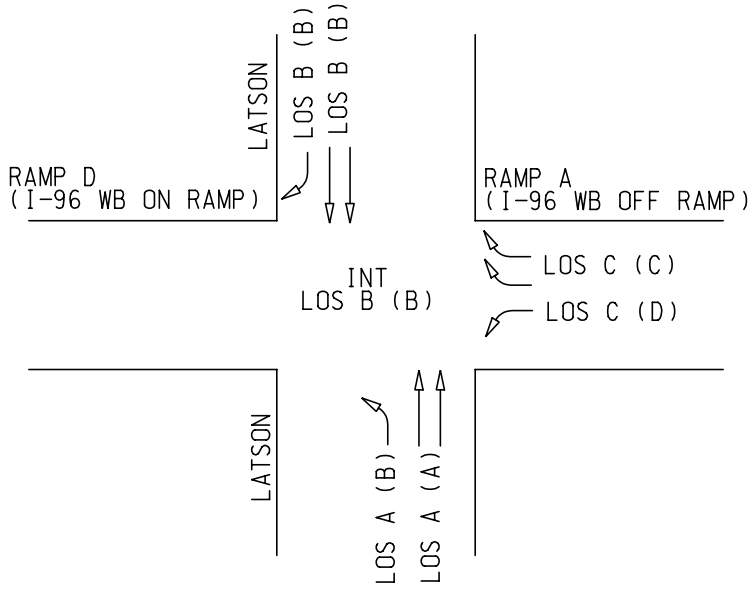
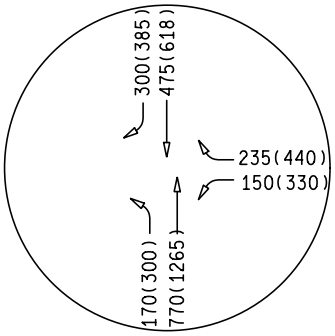
NB THRU/LT	25 (23) SEC
WB	22 (20) SEC

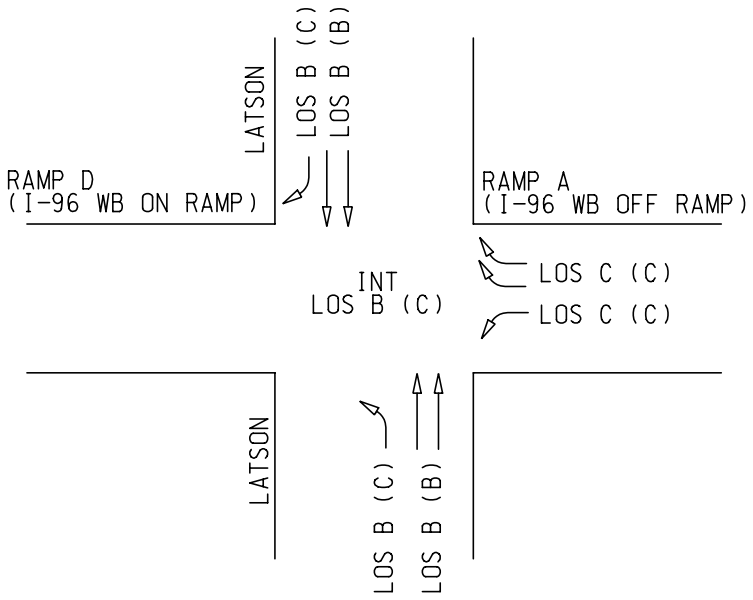




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:21	
NB/SB THRU	42 (37) SEC
NB THRU/LT	20 (20) SEC
WB	28 (33) SEC



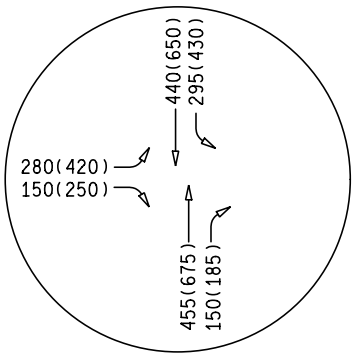


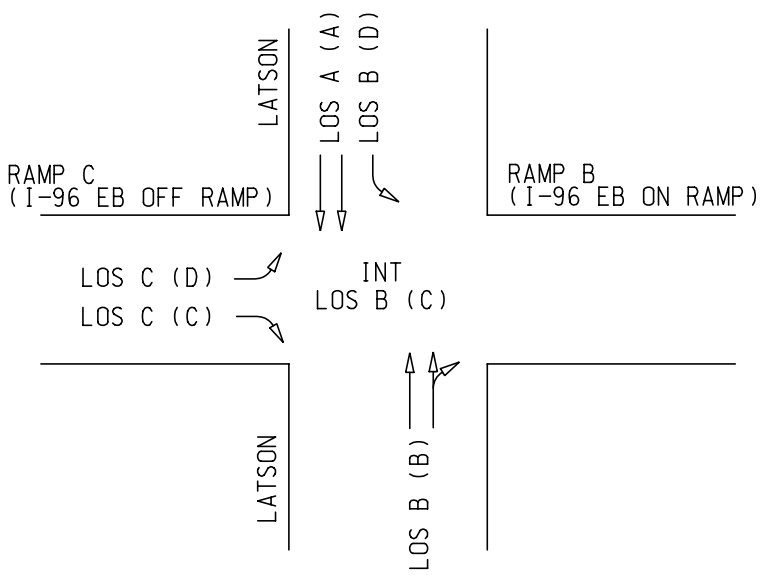
PM PEAK 2010 (2030)

Wilcox Professional Services	LATSON RD / I-96 WB OFF RAMP - ALTERNATIVE C				
	DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
	12/5/08	NONE	47065	101622	6

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

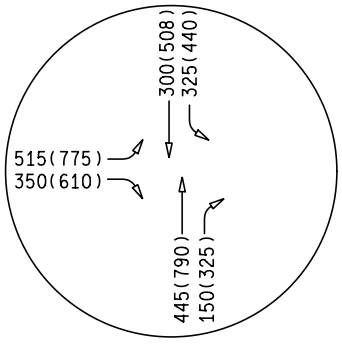
CYCLE:90 / OFFSET:84	
NB/SB THRU	41 (38) SEC
SB THRU/LT	18 (22) SEC
EB	31 (30) SEC

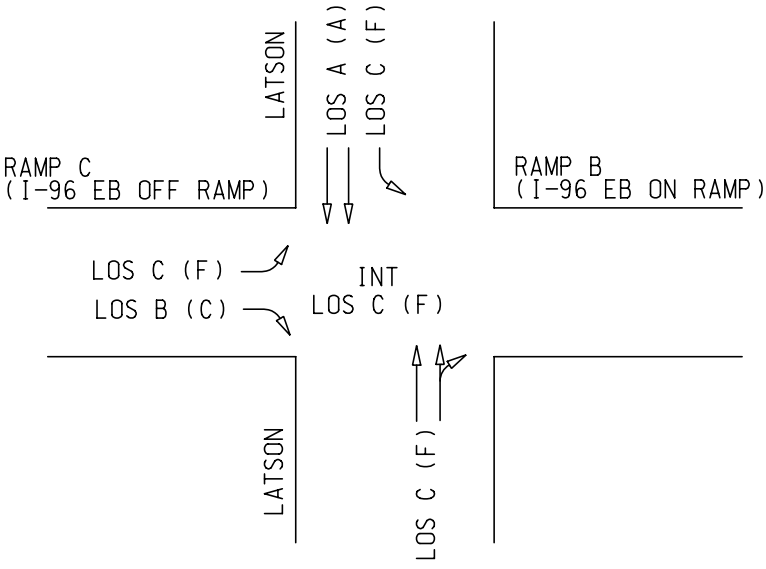




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:30	
NB/SB THRU	30 SEC
SB THRU/LT	20 SEC
EB	40 SEC



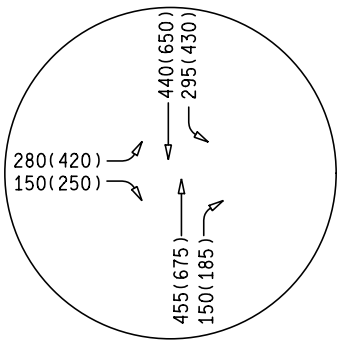


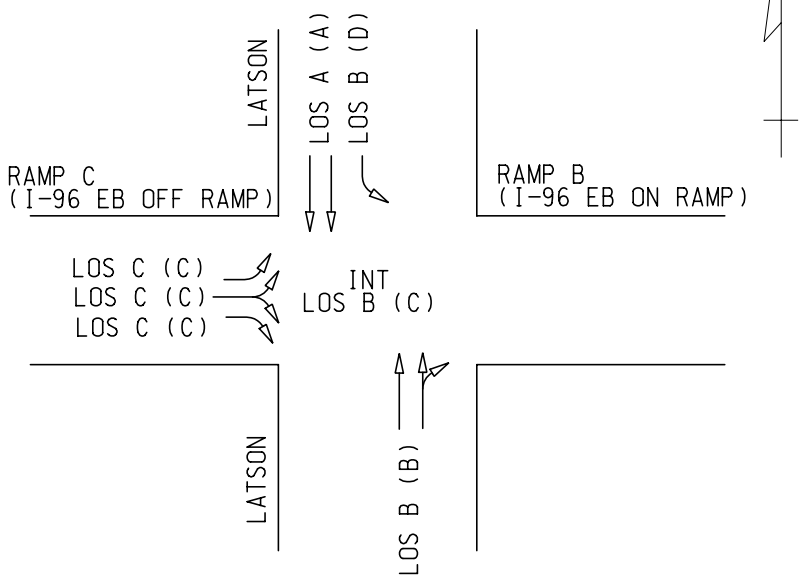
PM PEAK 2010 (2030)

Wilcox Professional Services	LATSON RD / I-96 EB OFF RAMP - ALTERNATIVE A				
	DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
	12/5/08	NONE	47065	101622	7

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

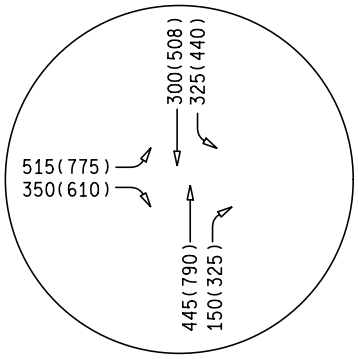
CYCLE:90 / OFFSET:84	
NB/SB THRU	41 (38) SEC
SB THRU/LT	18 (22) SEC
EB	31 (30) SEC

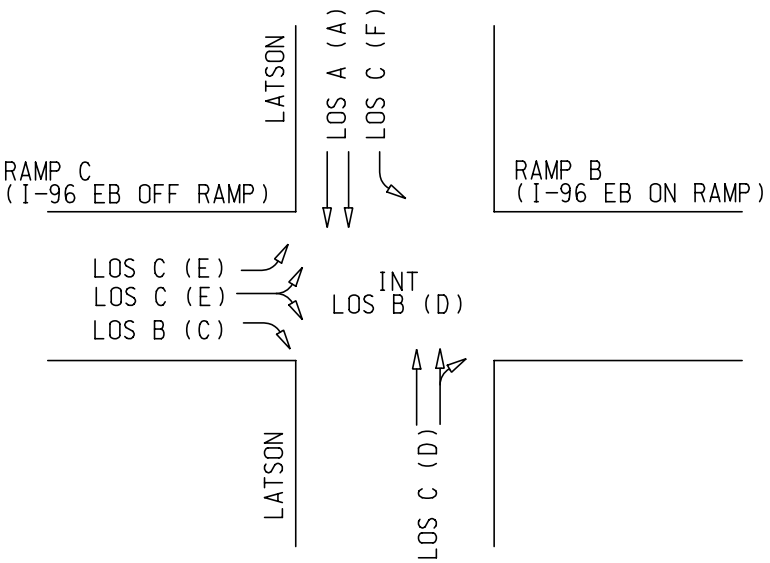




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:30	
NB/SB THRU	30 (35) SEC
SB THRU/LT	20 (23) SEC
EB	40 (32) SEC





PM PEAK 2010 (2030)

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

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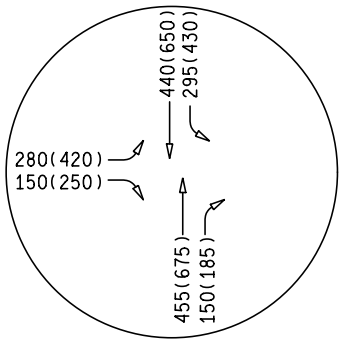
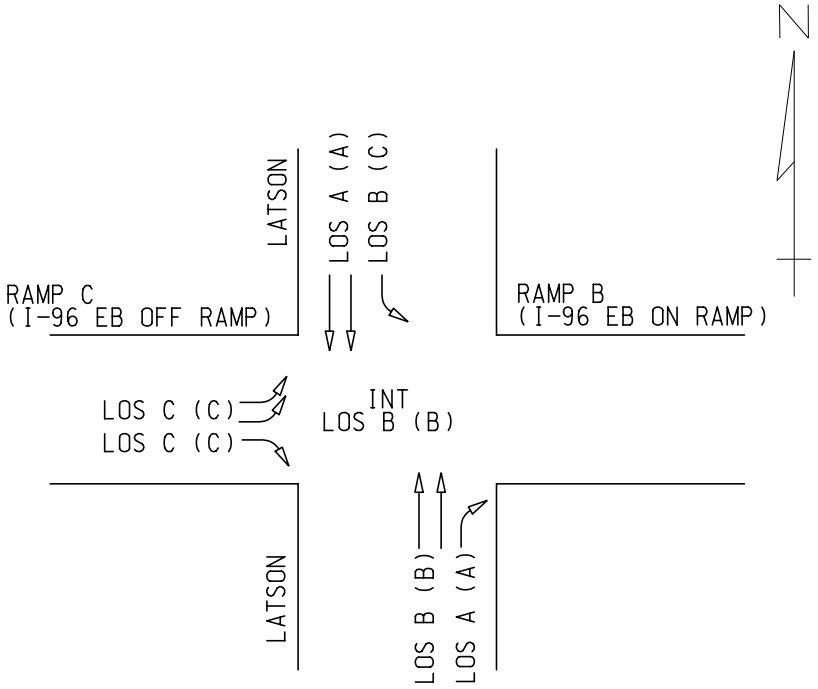
LATSON RD / I-96 EB OFF RAMP - ALTERNATIVE B

DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
12/5/08	NONE	47065	101622	8

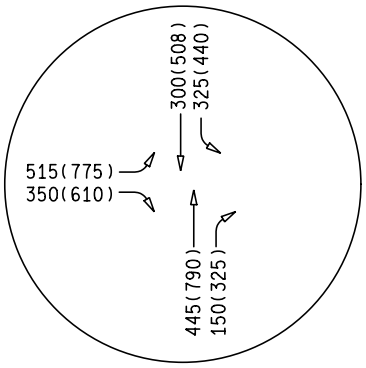
CYCLE:90 / OFFSET:84	
NB/SB THRU	41 (38) SEC
SB THRU/LT	18 (22) SEC
EB	31 (30) SEC

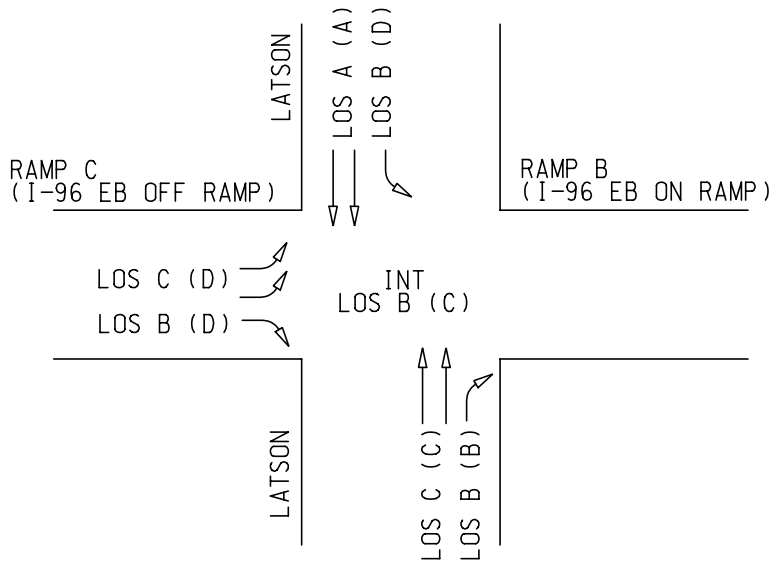




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:12	
NB/SB THRU	30 (35) SEC
SB THRU/LT	20 (23) SEC
EB	40 (32) SEC





PM PEAK 2010 (2030)

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

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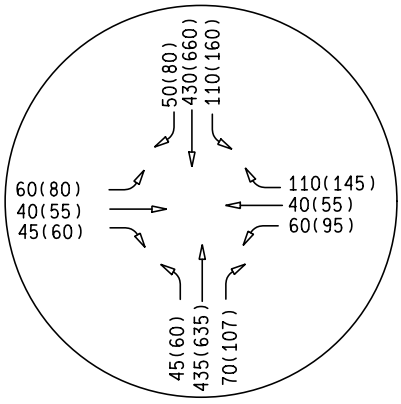
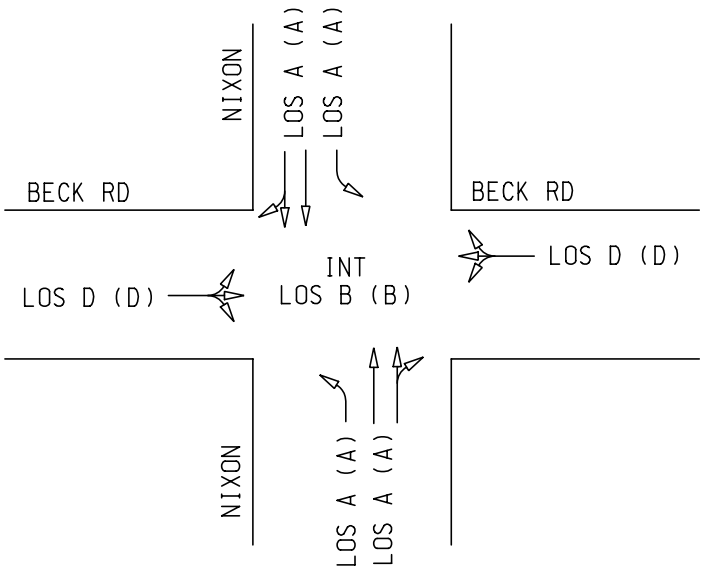
LATSON RD / I-96 EB OFF RAMP - ALTERNATIVE C

DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
12/5/08	NONE	47065	101622	9

CYCLE:90 / OFFSET:12 (7)	
NB/SB	51 (56) SEC
EB/WB	39 (34) SEC





AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:43 (26)	
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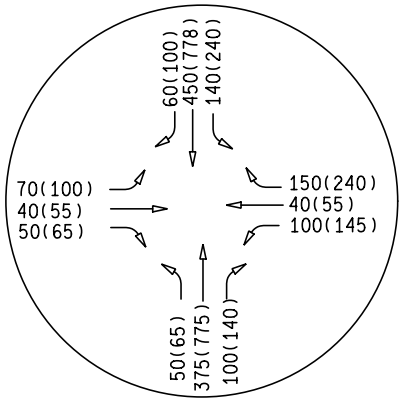
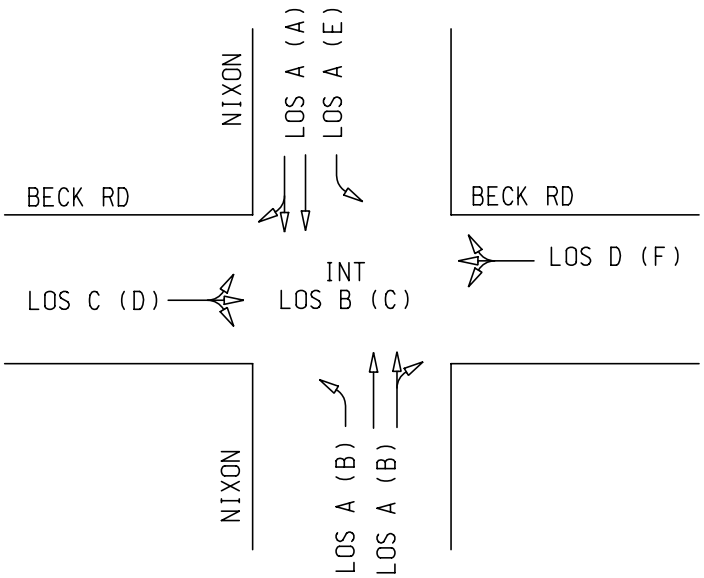
EB/WB	42 (32) SEC





PM PEAK 2010 (2030)

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

Wilcox Professional Services
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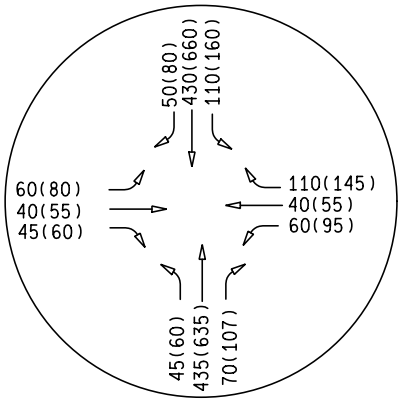
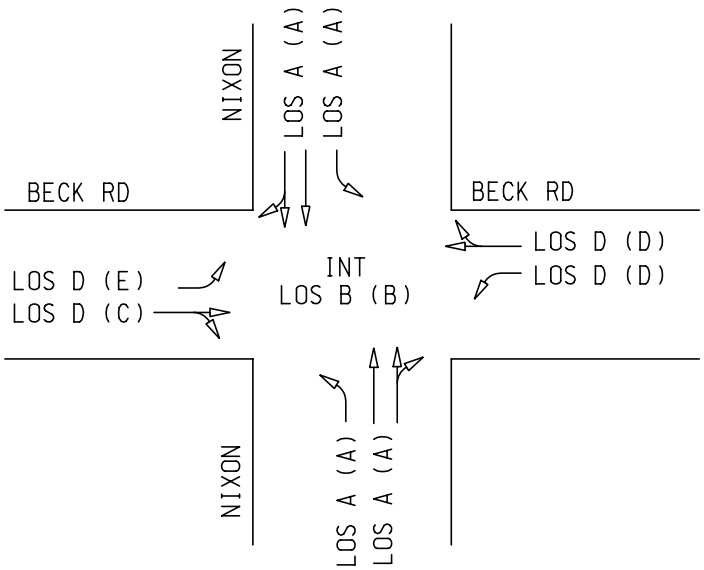
NIXON RD / BECK RD - ALTERNATIVE A

DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
12/5/08	NONE	47065	101622	10

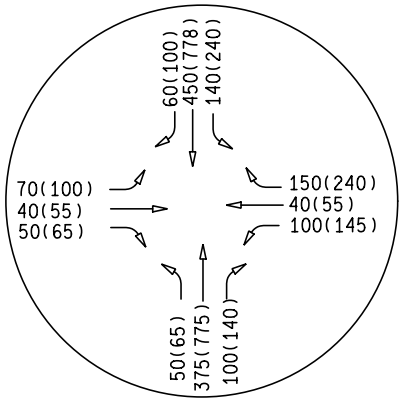
CYCLE:90 / OFFSET:22 (10)	
NB/SB	42 (43) SEC
NB/SB LT	16 (20) SEC
EB/WB	32 (27) SEC

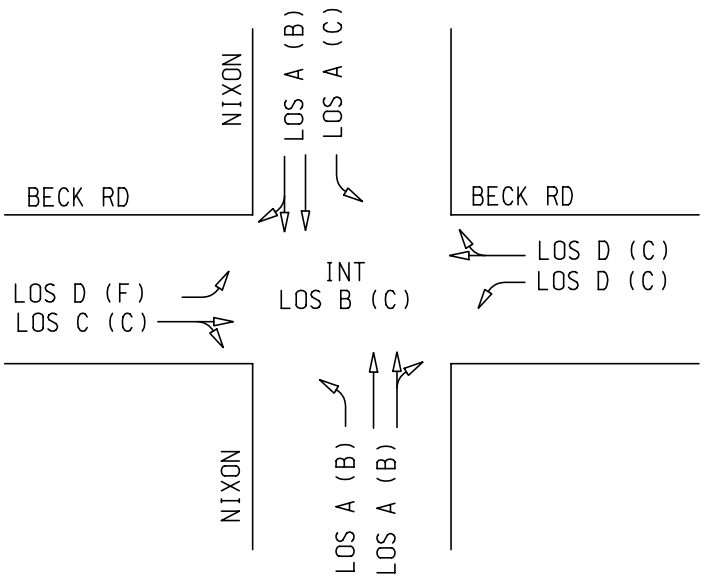




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:28 (6)	
NB/SB	38 (48) SEC
NB/SB LT	20 (16) SEC
EB/WB	32 (26) SEC



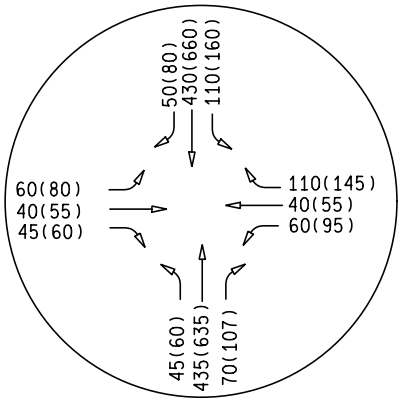


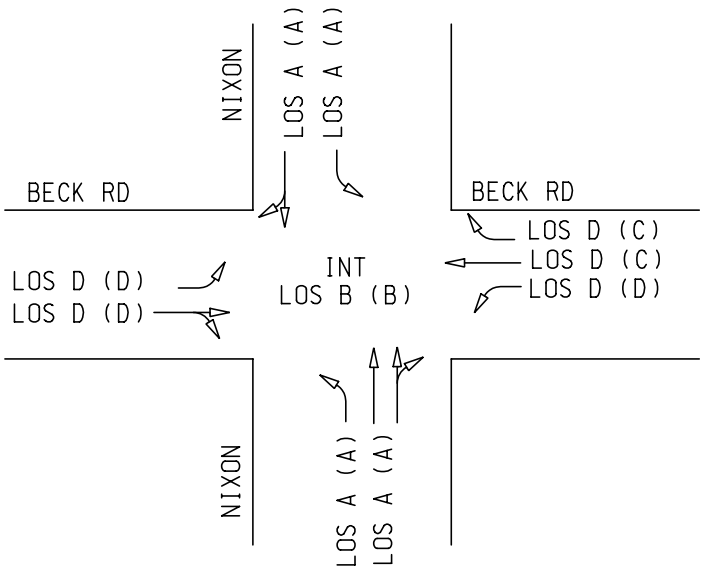
PM PEAK 2010 (2030)

Wilcox Professional Services	NIXON RD / BECK RD- ALTERNATIVE B				
	DATE	SCALE	CONT. SEC.	JOB NO.	SHEET NO.
	12/5/08	NONE	47065	101622	11

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

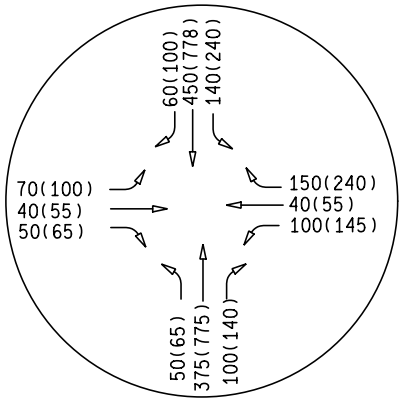
CYCLE:90 / OFFSET:22 (10)	
NB/SB	42 (43) SEC
NB/SB LT	16 (20) SEC
EB/WB	32 (27) SEC

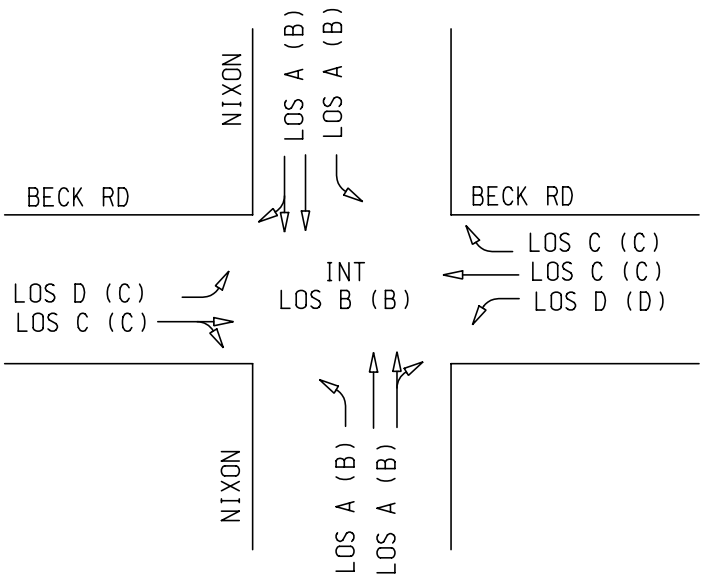




AM PEAK 2010 (2030)

CYCLE:90 / OFFSET:28 (6)	
NB/SB	38 (48) SEC
NB/SB LT	20 (16) SEC
EB/WB	32 (26) SEC



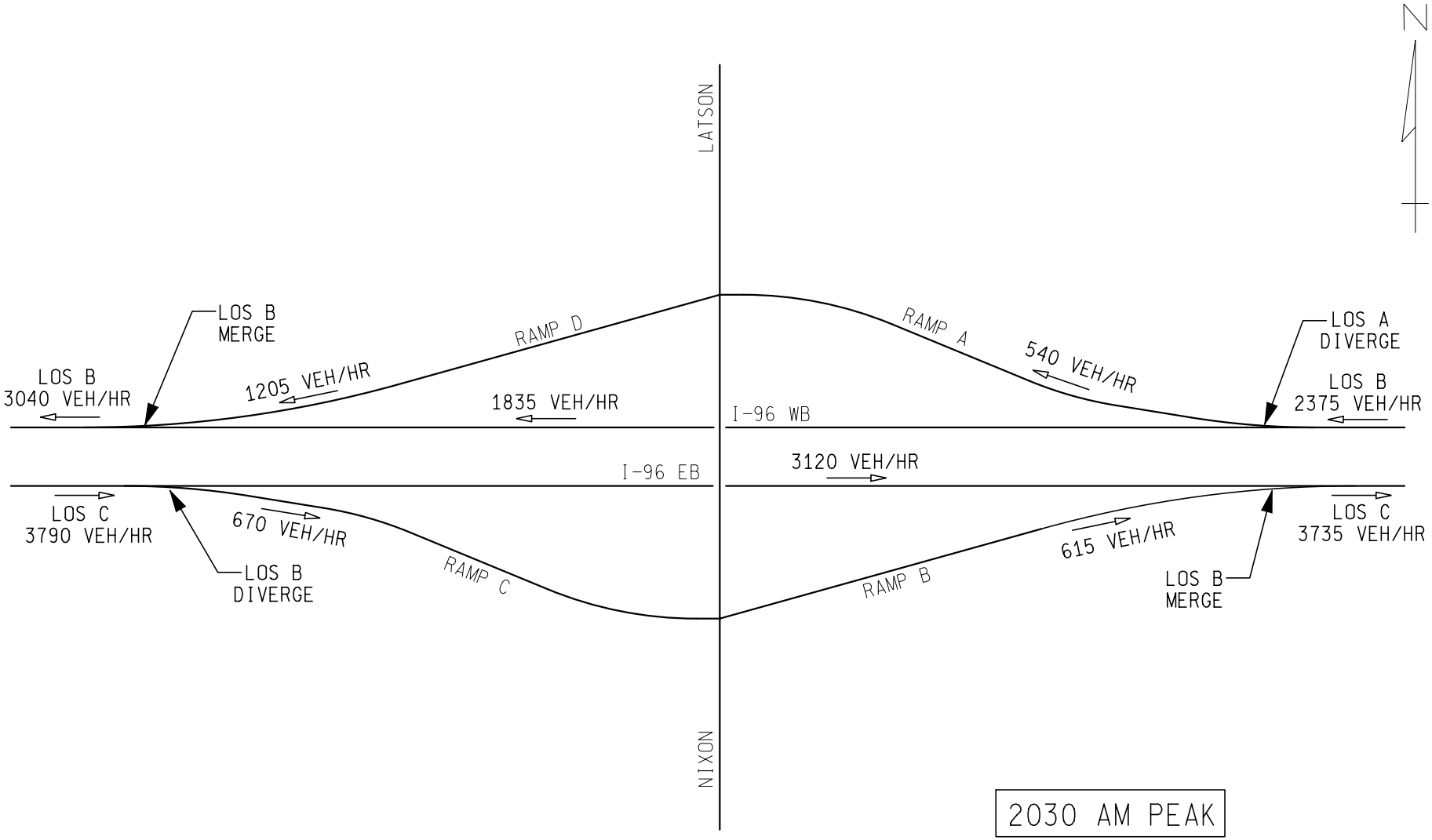


PM PEAK 2010 (2030)

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:

Wilcox Professional Services	NIXON RD / BECK RD- ALTERNATIVE C				
	DATE 12/5/08	SCALE NONE	CONT. SEC. 47065	JOB NO. 101622	SHEET NO. 12

FILE NAME: P:\Projects\22915.00013\01 Road\Traffic Study\Synchro Analysis\LOS Diagrams.dgn LAST CORRECTION BY: DATE:



Wilcox Professional Services (AN ISO 9001:2000 CERTIFIED COMPANY)	I-96 & LATSON INTERCHANGE LEVELS OF SERVICE				
	DATE 12/5/08	SCALE NONE	CONT. SEC. 47065	JOB NO. 101622	SHEET NO. 13

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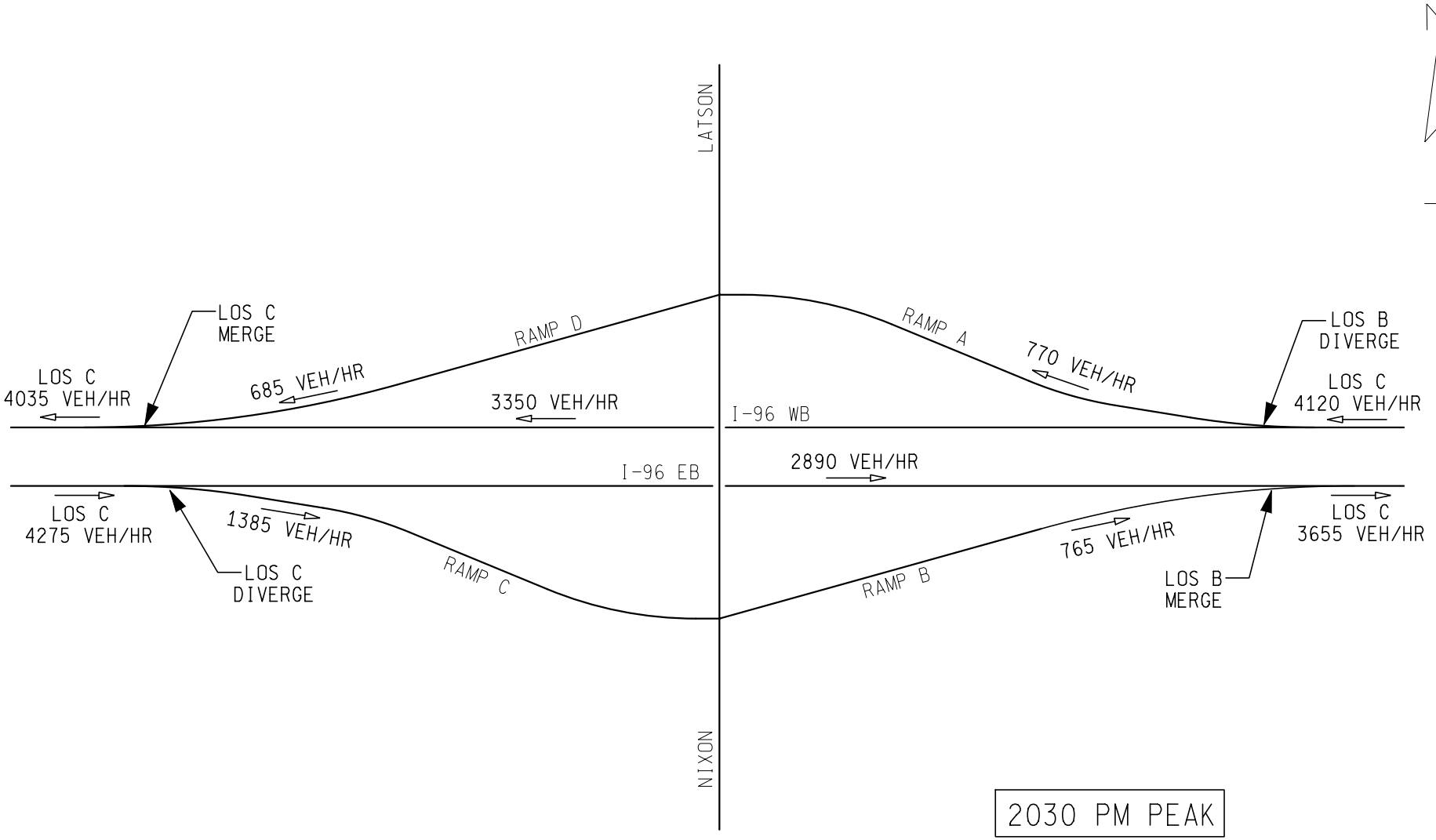
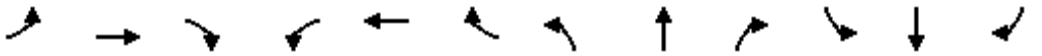


Wilcox Professional Services AN ISO 9001:2000 CERTIFIED COMPANY	I-96 & LATSON INTERCHANGE LEVELS OF SERVICE				
	DATE 12/5/08	SCALE NONE	CONT. SEC. 47065	JOB NO. 101622	SHEET NO. 14

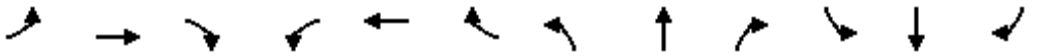
APPENDIX B

SYNCHRO REPORTS FOR LATSON RD/I-96BL (GRAND RIVER AVE) INTERSECTION



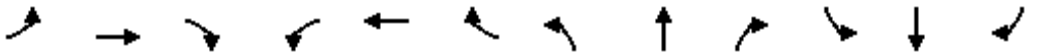
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	750	650	150	500	105	175	170	230	315	440	70
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	1719	3437	1589	1827	3410	1667
Flt Permitted	0.25	1.00	1.00	0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	447	3551	1536	275	3532	1580	1719	3437	1589	1827	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	114	852	739	197	658	138	273	266	359	339	473	75
RTOR Reduction (vph)	0	0	51	0	0	62	0	0	173	0	0	58
Lane Group Flow (vph)	114	852	688	197	658	76	273	266	186	339	473	18
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	31.6	25.3	39.3	31.6	25.3	44.3	14.0	14.0	14.0	19.0	19.0	19.0
Effective Green, g (s)	37.0	28.0	44.7	37.0	28.0	49.7	16.0	16.0	16.0	21.0	21.0	21.0
Actuated g/C Ratio	0.41	0.31	0.50	0.41	0.31	0.55	0.18	0.18	0.18	0.23	0.23	0.23
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	311	1105	819	268	1099	873	306	611	282	426	796	389
v/s Ratio Prot	0.04	0.24	c0.16	c0.07	0.19	0.02	0.16	0.08		c0.19	0.14	
v/s Ratio Perm	0.11		0.29	0.23		0.03			0.12			0.01
v/c Ratio	0.37	0.77	0.84	0.74	0.60	0.09	0.89	0.44	0.66	0.80	0.59	0.04
Uniform Delay, d1	26.8	28.1	19.6	32.6	26.2	9.5	36.2	33.0	34.5	32.5	30.7	26.7
Progression Factor	0.77	0.76	0.56	0.94	0.93	0.57	1.09	1.09	1.24	1.00	1.00	1.00
Incremental Delay, d2	0.6	4.4	8.7	9.8	2.4	0.2	30.0	2.2	11.5	14.3	3.3	0.2
Delay (s)	21.2	25.9	19.6	40.3	26.8	5.6	69.3	38.3	54.3	46.7	34.0	26.9
Level of Service	C	C	B	D	C	A	E	D	D	D	C	C
Approach Delay (s)		22.9			26.5			54.1			38.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	33.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



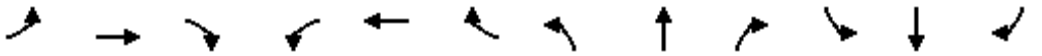
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	750	650	150	500	105	175	170	230	315	440	70
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.25	1.00	1.00	0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	447	3551	1536	275	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	114	852	739	197	658	138	273	266	359	339	473	75
RTOR Reduction (vph)	0	0	51	0	0	62	0	0	173	0	0	58
Lane Group Flow (vph)	114	852	688	197	658	76	273	266	186	339	473	18
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	31.6	25.3	39.3	31.6	25.3	44.3	14.0	14.0	14.0	19.0	19.0	19.0
Effective Green, g (s)	37.0	28.0	44.7	37.0	28.0	49.7	16.0	16.0	16.0	21.0	21.0	21.0
Actuated g/C Ratio	0.41	0.31	0.50	0.41	0.31	0.55	0.18	0.18	0.18	0.23	0.23	0.23
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	311	1105	819	268	1099	873	593	611	282	827	796	389
v/s Ratio Prot	0.04	0.24	c0.16	c0.07	0.19	0.02	0.08	0.08		0.10	c0.14	
v/s Ratio Perm	0.11		0.29	0.23		0.03			0.12			0.01
v/c Ratio	0.37	0.77	0.84	0.74	0.60	0.09	0.46	0.44	0.66	0.41	0.59	0.04
Uniform Delay, d1	26.8	28.1	19.6	32.6	26.2	9.5	33.1	33.0	34.5	29.2	30.7	26.7
Progression Factor	0.77	0.76	0.56	0.94	0.93	0.57	1.07	1.07	1.19	1.00	1.00	1.00
Incremental Delay, d2	0.6	4.4	8.7	9.8	2.4	0.2	2.6	2.2	11.5	1.5	3.3	0.2
Delay (s)	21.2	25.9	19.6	40.3	26.8	5.6	38.1	37.6	52.7	30.8	34.0	26.9
Level of Service	C	C	B	D	C	A	D	D	D	C	C	C
Approach Delay (s)		22.9			26.5			43.8			32.1	
Approach LOS		C			C			D			C	

Intersection Summary					
HCM Average Control Delay	29.7	HCM Level of Service	C		
HCM Volume to Capacity ratio	0.75				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.3		
Intersection Capacity Utilization	74.5%	ICU Level of Service	D		
Analysis Period (min)	15				
c Critical Lane Group					



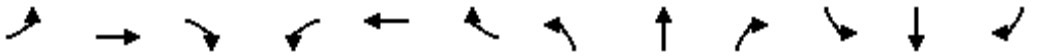
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	750	650	150	500	105	175	170	230	315	440	70
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	114	852	739	197	658	138	273	266	359	339	473	75
RTOR Reduction (vph)	0	0	37	0	0	60	0	0	173	0	0	58
Lane Group Flow (vph)	114	852	702	197	658	78	273	266	186	339	473	18
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	Prot		pm+ov	Prot		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	6.3	26.3	39.3	6.3	26.3	45.3	13.0	13.0	13.0	19.0	19.0	19.0
Effective Green, g (s)	9.0	29.0	44.7	9.0	29.0	50.7	15.0	15.0	15.0	21.0	21.0	21.0
Actuated g/C Ratio	0.10	0.32	0.50	0.10	0.32	0.56	0.17	0.17	0.17	0.23	0.23	0.23
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	333	1144	763	354	1138	890	556	573	265	827	796	389
v/s Ratio Prot	0.03	0.24	c0.16	c0.06	0.19	0.02	0.08	0.08		0.10	c0.14	
v/s Ratio Perm			0.30			0.03			0.12			0.01
v/c Ratio	0.34	0.74	0.92	0.56	0.58	0.09	0.49	0.46	0.70	0.41	0.59	0.04
Uniform Delay, d1	37.7	27.2	21.0	38.6	25.4	9.0	34.0	33.9	35.4	29.2	30.7	26.7
Progression Factor	1.25	0.76	0.81	1.26	0.93	0.40	1.02	1.02	1.10	1.00	1.00	1.00
Incremental Delay, d2	0.5	3.8	15.9	1.9	2.1	0.2	3.1	2.7	14.3	1.5	3.3	0.2
Delay (s)	47.8	24.4	32.9	50.7	25.7	3.8	37.9	37.3	53.3	30.8	34.0	26.9
Level of Service	D	C	C	D	C	A	D	D	D	C	C	C
Approach Delay (s)		29.6			27.6			43.9			32.1	
Approach LOS		C			C			D			C	

Intersection Summary				
HCM Average Control Delay	32.5	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.6	
Intersection Capacity Utilization	70.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				



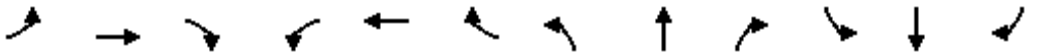
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	185	415	225	310	910	305	435	380	255	135	200	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	1719	3437	1589	1827	3410	1667
Flt Permitted	0.12	1.00	1.00	0.40	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	226	3551	1536	773	3532	1580	1719	3437	1589	1827	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	210	472	256	408	1197	401	680	594	398	145	215	108
RTOR Reduction (vph)	0	0	44	0	0	37	0	0	247	0	0	95
Lane Group Flow (vph)	210	472	212	408	1197	364	680	594	151	145	215	13
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	35.6	29.3	49.3	35.6	29.3	38.3	20.0	20.0	20.0	9.0	9.0	9.0
Effective Green, g (s)	41.0	32.0	54.7	41.0	32.0	43.7	22.0	22.0	22.0	11.0	11.0	11.0
Actuated g/C Ratio	0.46	0.36	0.61	0.46	0.36	0.49	0.24	0.24	0.24	0.12	0.12	0.12
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252	1263	990	458	1256	767	420	840	388	223	417	204
v/s Ratio Prot	0.08	0.13	0.05	c0.09	c0.34	0.06	c0.40	0.17		c0.08	0.06	
v/s Ratio Perm	0.30		0.08	0.32		0.17			0.09			0.01
v/c Ratio	0.83	0.37	0.21	0.89	0.95	0.48	1.62	0.71	0.39	0.65	0.52	0.06
Uniform Delay, d1	36.0	21.6	8.0	25.2	28.3	15.5	34.0	31.1	28.4	37.7	37.0	34.9
Progression Factor	0.96	0.65	0.13	1.17	0.88	1.32	0.89	0.88	0.90	1.00	1.00	1.00
Incremental Delay, d2	20.0	0.8	0.5	16.9	14.7	1.8	289.2	4.9	2.9	13.8	4.5	0.6
Delay (s)	54.7	14.8	1.5	46.4	39.7	22.3	319.4	32.2	28.6	51.5	41.5	35.6
Level of Service	D	B	A	D	D	C	F	C	C	D	D	D
Approach Delay (s)		20.1			37.6			148.1			43.2	
Approach LOS		C			D			F			D	

Intersection Summary			
HCM Average Control Delay	71.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



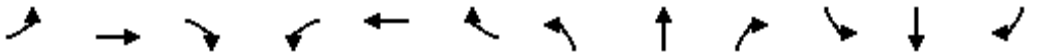
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	185	415	225	310	910	305	435	380	255	135	200	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.12	1.00	1.00	0.40	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	226	3551	1536	773	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	210	472	256	408	1197	401	680	594	398	145	215	108
RTOR Reduction (vph)	0	0	44	0	0	37	0	0	247	0	0	95
Lane Group Flow (vph)	210	472	212	408	1197	364	680	594	151	145	215	13
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	35.6	29.3	49.3	35.6	29.3	38.3	20.0	20.0	20.0	9.0	9.0	9.0
Effective Green, g (s)	41.0	32.0	54.7	41.0	32.0	43.7	22.0	22.0	22.0	11.0	11.0	11.0
Actuated g/C Ratio	0.46	0.36	0.61	0.46	0.36	0.49	0.24	0.24	0.24	0.12	0.12	0.12
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252	1263	990	458	1256	767	815	840	388	433	417	204
v/s Ratio Prot	0.08	0.13	0.05	c0.09	c0.34	0.06	c0.20	0.17		0.04	c0.06	
v/s Ratio Perm	0.30		0.08	0.32		0.17			0.09			0.01
v/c Ratio	0.83	0.37	0.21	0.89	0.95	0.48	0.83	0.71	0.39	0.33	0.52	0.06
Uniform Delay, d1	36.0	21.6	8.0	25.2	28.3	15.5	32.3	31.1	28.4	36.2	37.0	34.9
Progression Factor	0.96	0.65	0.13	1.17	0.88	1.32	0.87	0.87	0.90	1.00	1.00	1.00
Incremental Delay, d2	20.0	0.8	0.5	16.9	14.7	1.8	9.8	4.9	2.9	2.1	4.5	0.6
Delay (s)	54.7	14.8	1.5	46.4	39.7	22.3	37.9	31.9	28.5	38.2	41.5	35.6
Level of Service	D	B	A	D	D	C	D	C	C	D	D	D
Approach Delay (s)		20.1			37.6			33.5			39.1	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM Average Control Delay	33.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



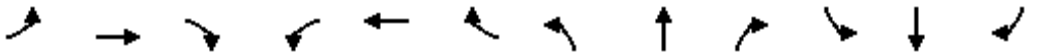
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	185	415	225	310	910	305	435	380	255	135	200	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	210	472	256	408	1197	401	680	594	398	145	215	108
RTOR Reduction (vph)	0	0	24	0	0	21	0	0	233	0	0	97
Lane Group Flow (vph)	210	472	232	408	1197	380	680	594	165	145	215	11
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	Prot		pm+ov	Prot		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	5.3	24.7	44.7	12.9	32.3	39.3	20.0	20.0	20.0	7.0	7.0	7.0
Effective Green, g (s)	8.0	27.4	50.1	15.6	35.0	44.7	22.0	22.0	22.0	9.0	9.0	9.0
Actuated g/C Ratio	0.09	0.30	0.56	0.17	0.39	0.50	0.24	0.24	0.24	0.10	0.10	0.10
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	296	1081	855	614	1374	785	815	840	388	354	341	167
v/s Ratio Prot	0.06	0.13	0.07	c0.12	c0.34	0.05	c0.20	0.17		0.04	c0.06	
v/s Ratio Perm			0.08			0.19			0.10			0.01
v/c Ratio	0.71	0.44	0.27	0.66	0.87	0.48	0.83	0.71	0.43	0.41	0.63	0.06
Uniform Delay, d1	39.9	25.1	10.4	34.8	25.4	15.0	32.3	31.1	28.7	38.0	38.9	36.7
Progression Factor	1.38	0.68	1.24	0.92	0.87	0.95	0.72	0.71	0.39	1.00	1.00	1.00
Incremental Delay, d2	7.4	1.2	0.8	2.3	6.8	1.8	9.7	4.9	3.4	3.5	8.6	0.7
Delay (s)	62.2	18.4	13.7	34.3	29.0	16.1	32.8	26.9	14.5	41.5	47.5	37.4
Level of Service	E	B	B	C	C	B	C	C	B	D	D	D
Approach Delay (s)		26.9			27.5			26.3			43.3	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



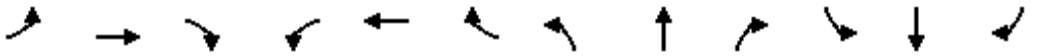
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	1050	860	200	685	145	340	345	320	440	660	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	1719	3437	1589	1827	3410	1667
Flt Permitted	0.14	1.00	1.00	0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	258	3551	1536	275	3532	1580	1719	3437	1589	1827	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	148	1193	977	263	901	191	531	539	500	473	710	108
RTOR Reduction (vph)	0	0	19	0	0	46	0	0	136	0	0	83
Lane Group Flow (vph)	148	1193	958	263	901	145	531	539	364	473	710	25
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	31.6	25.3	39.3	31.6	25.3	44.3	14.0	14.0	14.0	19.0	19.0	19.0
Effective Green, g (s)	37.0	28.0	44.7	37.0	28.0	49.7	16.0	16.0	16.0	21.0	21.0	21.0
Actuated g/C Ratio	0.41	0.31	0.50	0.41	0.31	0.55	0.18	0.18	0.18	0.23	0.23	0.23
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252	1105	819	268	1099	873	306	611	282	426	796	389
v/s Ratio Prot	0.06	0.34	c0.22	c0.10	0.26	0.04	c0.31	0.16		c0.26	0.21	
v/s Ratio Perm	0.18		0.41	0.31		0.05			0.23			0.02
v/c Ratio	0.59	1.08	1.17	0.98	0.82	0.17	1.74	0.88	1.29	1.11	0.89	0.06
Uniform Delay, d1	32.6	31.0	22.6	37.2	28.7	9.9	37.0	36.1	37.0	34.5	33.4	26.9
Progression Factor	0.71	0.78	0.64	0.94	0.93	0.46	1.03	1.02	1.04	1.00	1.00	1.00
Incremental Delay, d2	2.2	46.7	85.0	48.3	6.6	0.4	343.9	16.4	153.6	77.0	14.4	0.3
Delay (s)	25.4	71.0	99.6	83.4	33.2	4.9	382.0	53.2	192.2	111.5	47.8	27.2
Level of Service	C	E	F	F	C	A	F	D	F	F	D	C
Approach Delay (s)		80.1			39.0			208.7			69.4	
Approach LOS		F			D			F			E	

Intersection Summary			
HCM Average Control Delay	100.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



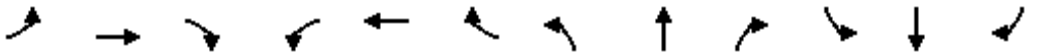
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	1050	860	200	685	145	340	345	320	440	660	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.14	1.00	1.00	0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	258	3551	1536	275	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	148	1193	977	263	901	191	531	539	500	473	710	108
RTOR Reduction (vph)	0	0	19	0	0	46	0	0	136	0	0	83
Lane Group Flow (vph)	148	1193	958	263	901	145	531	539	364	473	710	25
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	31.6	25.3	39.3	31.6	25.3	44.3	14.0	14.0	14.0	19.0	19.0	19.0
Effective Green, g (s)	37.0	28.0	44.7	37.0	28.0	49.7	16.0	16.0	16.0	21.0	21.0	21.0
Actuated g/C Ratio	0.41	0.31	0.50	0.41	0.31	0.55	0.18	0.18	0.18	0.23	0.23	0.23
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252	1105	819	268	1099	873	593	611	282	827	796	389
v/s Ratio Prot	0.06	0.34	c0.22	c0.10	0.26	0.04	0.16	0.16		0.13	c0.21	
v/s Ratio Perm	0.18		0.41	0.31		0.05			c0.23			0.02
v/c Ratio	0.59	1.08	1.17	0.98	0.82	0.17	0.90	0.88	1.29	0.57	0.89	0.06
Uniform Delay, d1	32.6	31.0	22.6	37.2	28.7	9.9	36.2	36.1	37.0	30.5	33.4	26.9
Progression Factor	0.71	0.78	0.64	0.94	0.93	0.46	1.06	1.06	1.10	1.00	1.00	1.00
Incremental Delay, d2	2.2	46.7	85.0	48.3	6.6	0.4	18.4	16.6	153.8	2.9	14.4	0.3
Delay (s)	25.4	71.0	99.6	83.4	33.2	4.9	56.6	54.7	194.5	33.4	47.8	27.2
Level of Service	C	E	F	F	C	A	E	D	F	C	D	C
Approach Delay (s)		80.1			39.0			99.9			40.8	
Approach LOS		F			D			F			D	

Intersection Summary			
HCM Average Control Delay	68.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



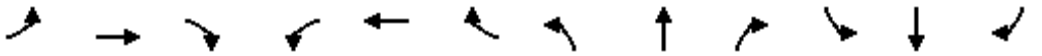
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	1050	860	200	685	145	340	345	320	440	660	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	148	1193	977	263	901	191	531	539	500	473	710	108
RTOR Reduction (vph)	0	0	10	0	0	26	0	0	136	0	0	83
Lane Group Flow (vph)	148	1193	967	263	901	165	531	539	364	473	710	25
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	Prot		pm+ov	Prot		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	6.3	26.3	39.3	6.3	26.3	45.3	13.0	13.0	13.0	19.0	19.0	19.0
Effective Green, g (s)	9.0	29.0	44.7	9.0	29.0	50.7	15.0	15.0	15.0	21.0	21.0	21.0
Actuated g/C Ratio	0.10	0.32	0.50	0.10	0.32	0.56	0.17	0.17	0.17	0.23	0.23	0.23
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	333	1144	763	354	1138	890	556	573	265	827	796	389
v/s Ratio Prot	0.04	0.34	c0.22	c0.07	0.26	0.04	0.16	0.16		0.13	c0.21	
v/s Ratio Perm			0.41			0.06			c0.23			0.02
v/c Ratio	0.44	1.04	1.27	0.74	0.79	0.19	0.96	0.94	1.37	0.57	0.89	0.06
Uniform Delay, d1	38.1	30.5	22.6	39.4	27.8	9.6	37.2	37.1	37.5	30.5	33.4	26.9
Progression Factor	1.27	0.77	0.73	1.23	0.93	0.66	0.97	0.97	0.95	1.00	1.00	1.00
Incremental Delay, d2	0.6	33.4	127.1	7.8	5.4	0.4	28.1	25.0	189.9	2.9	14.4	0.3
Delay (s)	49.1	56.9	143.6	56.3	31.2	6.8	64.1	60.9	225.6	33.4	47.8	27.2
Level of Service	D	E	F	E	C	A	E	E	F	C	D	C
Approach Delay (s)		93.0			32.6			114.4			40.8	
Approach LOS		F			C			F			D	

Intersection Summary			
HCM Average Control Delay	75.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



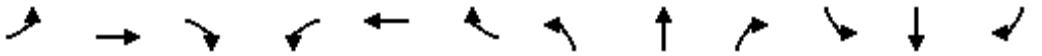
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	610	275	385	1250	420	750	665	355	185	310	135
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	1719	3437	1589	1827	3410	1667
Flt Permitted	0.12	1.00	1.00	0.26	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	226	3551	1536	496	3532	1580	1719	3437	1589	1827	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	301	693	312	507	1645	553	1172	1039	555	199	333	145
RTOR Reduction (vph)	0	0	11	0	0	10	0	0	176	0	0	110
Lane Group Flow (vph)	301	693	301	507	1645	543	1172	1039	379	199	333	35
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	35.6	29.3	49.3	35.6	29.3	38.3	20.0	20.0	20.0	9.0	9.0	9.0
Effective Green, g (s)	41.0	32.0	54.7	41.0	32.0	43.7	22.0	22.0	22.0	11.0	11.0	11.0
Actuated g/C Ratio	0.46	0.36	0.61	0.46	0.36	0.49	0.24	0.24	0.24	0.12	0.12	0.12
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252	1263	990	359	1256	767	420	840	388	223	417	204
v/s Ratio Prot	0.12	0.20	0.08	c0.14	0.47	0.09	c0.68	0.30		c0.11	0.10	
v/s Ratio Perm	0.42		0.12	c0.50		0.25			0.24			0.02
v/c Ratio	1.19	0.55	0.30	1.41	1.31	0.71	2.79	1.24	0.98	0.89	0.80	0.17
Uniform Delay, d1	37.3	23.2	8.5	28.8	29.0	18.2	34.0	34.0	33.7	38.9	38.4	35.4
Progression Factor	0.89	0.58	0.33	1.06	0.82	1.18	0.92	0.92	0.84	1.00	1.00	1.00
Incremental Delay, d2	117.7	1.6	0.7	196.4	143.3	3.7	811.9	116.1	38.5	37.7	14.7	1.8
Delay (s)	150.9	15.0	3.5	227.0	167.2	25.2	843.0	147.3	66.9	76.6	53.1	37.3
Level of Service	F	B	A	F	F	C	F	F	E	E	D	D
Approach Delay (s)		43.6			149.4			425.9			56.6	
Approach LOS		D			F			F			E	

Intersection Summary			
HCM Average Control Delay	225.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	117.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



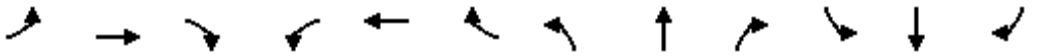
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	610	275	385	1250	420	750	665	355	185	310	135
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1717	3551	1536	1827	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.12	1.00	1.00	0.26	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	226	3551	1536	496	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	301	693	312	507	1645	553	1172	1039	555	199	333	145
RTOR Reduction (vph)	0	0	11	0	0	10	0	0	176	0	0	110
Lane Group Flow (vph)	301	693	301	507	1645	543	1172	1039	379	199	333	35
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Actuated Green, G (s)	35.6	29.3	49.3	35.6	29.3	38.3	20.0	20.0	20.0	9.0	9.0	9.0
Effective Green, g (s)	41.0	32.0	54.7	41.0	32.0	43.7	22.0	22.0	22.0	11.0	11.0	11.0
Actuated g/C Ratio	0.46	0.36	0.61	0.46	0.36	0.49	0.24	0.24	0.24	0.12	0.12	0.12
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252	1263	990	359	1256	767	815	840	388	433	417	204
v/s Ratio Prot	0.12	0.20	0.08	c0.14	0.47	0.09	c0.35	0.30		0.06	c0.10	
v/s Ratio Perm	0.42		0.12	c0.50		0.25			0.24			0.02
v/c Ratio	1.19	0.55	0.30	1.41	1.31	0.71	1.44	1.24	0.98	0.46	0.80	0.17
Uniform Delay, d1	37.3	23.2	8.5	28.8	29.0	18.2	34.0	34.0	33.7	36.7	38.4	35.4
Progression Factor	0.89	0.58	0.33	1.06	0.82	1.18	0.93	0.93	0.88	1.00	1.00	1.00
Incremental Delay, d2	117.7	1.6	0.7	196.4	143.3	3.7	203.8	116.3	39.1	3.5	14.7	1.8
Delay (s)	150.9	15.0	3.5	227.0	167.2	25.2	235.5	148.1	68.7	40.2	53.1	37.3
Level of Service	F	B	A	F	F	C	F	F	E	D	D	D
Approach Delay (s)		43.6			149.4			169.2			45.9	
Approach LOS		D			F			F			D	

Intersection Summary			
HCM Average Control Delay	128.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	610	275	385	1250	420	750	665	355	185	310	135
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3410	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	301	693	312	507	1645	553	1172	1039	555	199	333	145
RTOR Reduction (vph)	0	0	8	0	0	2	0	0	178	0	0	104
Lane Group Flow (vph)	301	693	304	507	1645	551	1172	1039	377	199	333	41
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	Prot		pm+ov	Prot		pm+ov	Split		Perm	Split		Perm
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases			2			6			8			4
Actuated Green, G (s)	5.3	24.3	44.3	13.3	32.3	39.3	20.0	20.0	20.0	7.0	7.0	7.0
Effective Green, g (s)	8.0	27.0	49.7	16.0	35.0	44.7	22.0	22.0	22.0	9.0	9.0	9.0
Actuated g/C Ratio	0.09	0.30	0.55	0.18	0.39	0.50	0.24	0.24	0.24	0.10	0.10	0.10
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	296	1065	848	630	1374	785	815	840	388	354	341	167
v/s Ratio Prot	c0.09	0.20	0.09	0.14	c0.47	0.08	c0.35	0.30		0.06	c0.10	
v/s Ratio Perm			0.11			0.27			0.24			0.02
v/c Ratio	1.02	0.65	0.36	0.80	1.20	0.70	1.44	1.24	0.97	0.56	0.98	0.24
Uniform Delay, d1	41.0	27.4	11.3	35.5	27.5	17.5	34.0	34.0	33.7	38.6	40.4	37.4
Progression Factor	1.39	0.63	0.94	1.00	0.83	0.85	0.75	0.75	0.54	1.00	1.00	1.00
Incremental Delay, d2	54.7	2.9	1.1	5.1	93.8	3.5	203.6	116.1	37.3	6.3	43.2	3.4
Delay (s)	111.8	20.1	11.6	40.4	116.6	18.3	229.1	141.6	55.6	44.9	83.6	40.8
Level of Service	F	C	B	D	F	B	F	F	E	D	F	D
Approach Delay (s)		39.2			82.2			161.4			63.1	
Approach LOS		D			F			F			E	

Intersection Summary			
HCM Average Control Delay	102.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

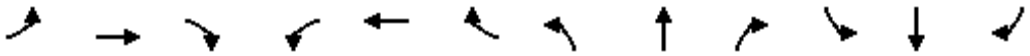


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	1050	860	200	685	145	340	345	320	440	660	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	12	11	12	11	11	12	12	13	12	10	13
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	3.3	4.0	4.0	3.3	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3337	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3330	3551	1536	3544	3532	1580	3334	3437	1589	3544	3337	
Peak-hour factor, PHF	0.88	0.88	0.88	0.76	0.76	0.76	0.64	0.64	0.64	0.93	0.93	0.93
Adj. Flow (vph)	148	1193	977	263	901	191	531	539	500	473	710	108
RTOR Reduction (vph)	0	0	10	0	0	26	0	0	136	0	13	0
Lane Group Flow (vph)	148	1193	967	263	901	165	531	539	364	473	805	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	7%	7%	7%	4%	4%	4%	10%	10%	10%	4%	4%	4%
Turn Type	Prot		pm+ov	Prot		pm+ov	Split		Perm	Split		
Protected Phases	5	2	8	1	6	4	8	8		4	4	
Permitted Phases			2			6			8			
Actuated Green, G (s)	6.3	26.3	39.3	6.3	26.3	45.3	13.0	13.0	13.0	19.0	19.0	
Effective Green, g (s)	9.0	29.0	44.7	9.0	29.0	50.7	15.0	15.0	15.0	21.0	21.0	
Actuated g/C Ratio	0.10	0.32	0.50	0.10	0.32	0.56	0.17	0.17	0.17	0.23	0.23	
Clearance Time (s)	6.7	6.7	6.0	6.7	6.7	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	333	1144	763	354	1138	890	556	573	265	827	779	
v/s Ratio Prot	0.04	0.34	c0.22	c0.07	0.26	0.04	0.16	0.16		0.13	c0.24	
v/s Ratio Perm			0.41			0.06			c0.23			
v/c Ratio	0.44	1.04	1.27	0.74	0.79	0.19	0.96	0.94	1.37	0.57	1.03	
Uniform Delay, d1	38.1	30.5	22.6	39.4	27.8	9.6	37.2	37.1	37.5	30.5	34.5	
Progression Factor	1.27	0.77	0.73	1.23	0.93	0.66	0.99	0.99	0.98	1.00	1.00	
Incremental Delay, d2	0.6	33.4	127.1	7.8	5.4	0.4	28.3	25.3	190.2	2.9	41.1	
Delay (s)	49.1	56.9	143.6	56.3	31.2	6.8	65.0	61.9	227.1	33.4	75.6	
Level of Service	D	E	F	E	C	A	E	E	F	C	E	
Approach Delay (s)		93.0			32.6			115.6			60.2	
Approach LOS		F			C			F			E	

Intersection Summary			
HCM Average Control Delay	79.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

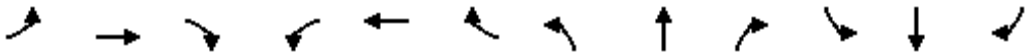
APPENDIX C

SYNCHRO REPORTS FOR LATSON RD/I-96 WB EXIT RAMP INTERSECTION



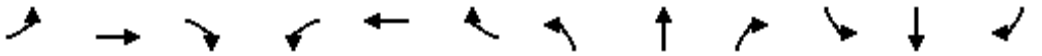
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	80	0	170	270	465	0	0	655	610
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	
Lane Util. Factor				1.00		1.00	1.00	0.95			0.95	
Frt				1.00		0.85	1.00	1.00			0.93	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1863		1667	1863	3725			3456	
Flt Permitted				0.95		1.00	0.09	1.00			1.00	
Satd. Flow (perm)				1863		1667	182	3725			3456	
Peak-hour factor, 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 (vph)	0	0	0	87	0	185	293	505	0	0	712	663
RTOR Reduction (vph)	0	0	0	0	0	151	0	0	0	0	187	0
Lane Group Flow (vph)	0	0	0	87	0	34	293	505	0	0	1188	0
Turn Type				Prot		custom	pm+pt					
Protected Phases				8		8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				16.5		16.5	62.5	62.5			37.5	
Effective Green, g (s)				16.5		16.5	62.5	62.5			37.5	
Actuated g/C Ratio				0.18		0.18	0.69	0.69			0.42	
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				342		306	491	2587			1440	
v/s Ratio Prot				c0.05		0.02	c0.13	0.14			c0.34	
v/s Ratio Perm							0.28					
v/c Ratio				0.25		0.11	0.60	0.20			0.83	
Uniform Delay, d1				31.5		30.6	24.5	4.9			23.3	
Progression Factor				1.00		1.00	0.45	0.33			0.85	
Incremental Delay, d2				1.8		0.7	1.7	0.1			4.1	
Delay (s)				33.3		31.4	12.7	1.8			23.9	
Level of Service				C		C	B	A			C	
Approach Delay (s)		0.0			32.0			5.8			23.9	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



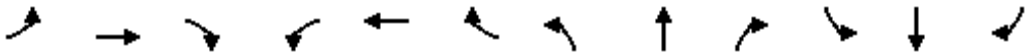
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	80	0	170	270	465	0	0	655	610
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frt				1.00	0.86	0.85	1.00	1.00			0.93	
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1770	1534	1583	1863	3725			3456	
Flt Permitted				0.95	1.00	1.00	0.09	1.00			1.00	
Satd. Flow (perm)				1770	1534	1583	182	3725			3456	
Peak-hour factor, 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 (vph)	0	0	0	87	0	185	293	505	0	0	712	663
RTOR Reduction (vph)	0	0	0	0	73	78	0	0	0	0	187	0
Lane Group Flow (vph)	0	0	0	78	25	18	293	505	0	0	1188	0
Turn Type				Split		Prot	pm+pt					
Protected Phases				8	8	8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				16.5	16.5	16.5	62.5	62.5			37.5	
Effective Green, g (s)				16.5	16.5	16.5	62.5	62.5			37.5	
Actuated g/C Ratio				0.18	0.18	0.18	0.69	0.69			0.42	
Clearance Time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				325	281	290	491	2587			1440	
v/s Ratio Prot				c0.04	0.02	0.01	c0.13	0.14			c0.34	
v/s Ratio Perm							0.28					
v/c Ratio				0.24	0.09	0.06	0.60	0.20			0.83	
Uniform Delay, d1				31.4	30.5	30.4	24.5	4.9			23.3	
Progression Factor				1.00	1.00	1.00	0.59	0.51			0.85	
Incremental Delay, d2				1.7	0.6	0.4	1.8	0.2			4.1	
Delay (s)				33.1	31.1	30.8	16.3	2.6			23.9	
Level of Service				C	C	C	B	A			C	
Approach Delay (s)		0.0			31.6			7.7			23.9	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM Average Control Delay	19.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



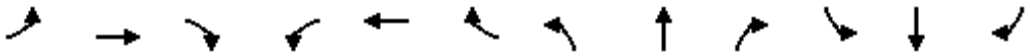
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	80	0	170	270	465	0	0	655	610
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Lane Util. Factor				1.00		0.88	1.00	0.95			0.95	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1863		2933	1863	3725			3725	1667
Flt Permitted				0.95		1.00	0.31	1.00			1.00	1.00
Satd. Flow (perm)				1863		2933	603	3725			3725	1667
Peak-hour factor, 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 (vph)	0	0	0	87	0	185	293	505	0	0	712	663
RTOR Reduction (vph)	0	0	0	0	0	151	0	0	0	0	0	387
Lane Group Flow (vph)	0	0	0	87	0	34	293	505	0	0	712	276
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				16.5		16.5	62.5	62.5			37.5	37.5
Effective Green, g (s)				16.5		16.5	62.5	62.5			37.5	37.5
Actuated g/C Ratio				0.18		0.18	0.69	0.69			0.42	0.42
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				342		538	692	2587			1552	695
v/s Ratio Prot				c0.05		0.01	c0.09	0.14			c0.19	
v/s Ratio Perm							0.20					0.17
v/c Ratio				0.25		0.06	0.42	0.20			0.46	0.40
Uniform Delay, d1				31.5		30.4	11.7	4.9			18.9	18.4
Progression Factor				1.00		1.00	0.45	0.47			0.91	0.95
Incremental Delay, d2				1.8		0.2	0.4	0.2			0.7	1.2
Delay (s)				33.3		30.6	5.7	2.4			18.0	18.6
Level of Service				C		C	A	A			B	B
Approach Delay (s)		0.0			31.4			3.6			18.3	
Approach LOS		A			C			A			B	

Intersection Summary			
HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



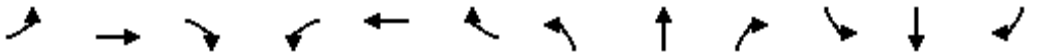
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	150	0	235	170	770	0	0	475	300
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	
Lane Util. Factor				1.00		1.00	1.00	0.95			0.95	
Frt				1.00		0.85	1.00	1.00			0.94	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1863		1667	1863	3725			3509	
Flt Permitted				0.95		1.00	0.24	1.00			1.00	
Satd. Flow (perm)				1863		1667	470	3725			3509	
Peak-hour factor, 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 (vph)	0	0	0	163	0	255	185	837	0	0	516	326
RTOR Reduction (vph)	0	0	0	0	0	143	0	0	0	0	111	0
Lane Group Flow (vph)	0	0	0	163	0	113	185	837	0	0	731	0
Turn Type				Prot		custom	pm+pt					
Protected Phases				8		8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				22.5		22.5	56.5	56.5			36.5	
Effective Green, g (s)				22.5		22.5	56.5	56.5			36.5	
Actuated g/C Ratio				0.25		0.25	0.63	0.63			0.41	
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				466		417	519	2338			1423	
v/s Ratio Prot				c0.09		0.07	0.06	c0.22			c0.21	
v/s Ratio Perm							0.17					
v/c Ratio				0.35		0.27	0.36	0.36			0.51	
Uniform Delay, d1				27.7		27.1	16.0	8.0			20.1	
Progression Factor				1.00		1.00	0.49	0.38			1.15	
Incremental Delay, d2				2.1		1.6	0.3	0.3			1.2	
Delay (s)				29.8		28.7	8.2	3.3			24.2	
Level of Service				C		C	A	A			C	
Approach Delay (s)		0.0			29.1			4.2			24.2	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



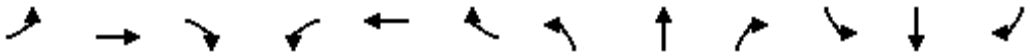
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	150	0	235	170	770	0	0	475	300
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frt				1.00	0.87	0.85	1.00	1.00			0.94	
Flt Protected				0.95	0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1770	1539	1583	1863	3725			3509	
Flt Permitted				0.95	0.99	1.00	0.24	1.00			1.00	
Satd. Flow (perm)				1770	1539	1583	470	3725			3509	
Peak-hour factor, 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 (vph)	0	0	0	163	0	255	185	837	0	0	516	326
RTOR Reduction (vph)	0	0	0	0	90	101	0	0	0	0	111	0
Lane Group Flow (vph)	0	0	0	147	46	34	185	837	0	0	731	0
Turn Type				Split		Prot	pm+pt					
Protected Phases				8	8	8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				22.5	22.5	22.5	56.5	56.5			36.5	
Effective Green, g (s)				22.5	22.5	22.5	56.5	56.5			36.5	
Actuated g/C Ratio				0.25	0.25	0.25	0.63	0.63			0.41	
Clearance Time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				443	385	396	519	2338			1423	
v/s Ratio Prot				c0.08	0.03	0.02	0.06	c0.22			c0.21	
v/s Ratio Perm							0.17					
v/c Ratio				0.33	0.12	0.09	0.36	0.36			0.51	
Uniform Delay, d1				27.6	26.1	25.9	16.0	8.0			20.1	
Progression Factor				1.00	1.00	1.00	0.65	0.59			1.15	
Incremental Delay, d2				2.0	0.6	0.4	0.4	0.4			1.2	
Delay (s)				29.6	26.7	26.3	10.8	5.1			24.2	
Level of Service				C	C	C	B	A			C	
Approach Delay (s)		0.0			27.6			6.1			24.2	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



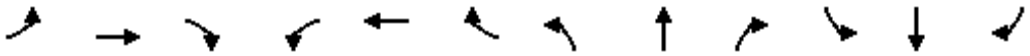
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	150	0	235	170	770	0	0	475	300
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Lane Util. Factor				1.00		0.88	1.00	0.95			0.95	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1863		2933	1863	3725			3725	1667
Flt Permitted				0.95		1.00	0.42	1.00			1.00	1.00
Satd. Flow (perm)				1863		2933	818	3725			3725	1667
Peak-hour factor, 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 (vph)	0	0	0	163	0	255	185	837	0	0	516	326
RTOR Reduction (vph)	0	0	0	0	0	191	0	0	0	0	0	194
Lane Group Flow (vph)	0	0	0	163	0	64	185	837	0	0	516	132
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				22.5		22.5	56.5	56.5			36.5	36.5
Effective Green, g (s)				22.5		22.5	56.5	56.5			36.5	36.5
Actuated g/C Ratio				0.25		0.25	0.63	0.63			0.41	0.41
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				466		733	682	2338			1511	676
v/s Ratio Prot				c0.09		0.02	0.04	c0.22			0.14	
v/s Ratio Perm							0.13					0.08
v/c Ratio				0.35		0.09	0.27	0.36			0.34	0.20
Uniform Delay, d1				27.7		25.9	9.8	8.0			18.5	17.3
Progression Factor				1.00		1.00	1.87	1.81			0.74	0.99
Incremental Delay, d2				2.1		0.2	0.2	0.4			0.6	0.6
Delay (s)				29.8		26.1	18.6	14.9			14.2	17.7
Level of Service				C		C	B	B			B	B
Approach Delay (s)		0.0			27.5			15.6			15.5	
Approach LOS		A			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



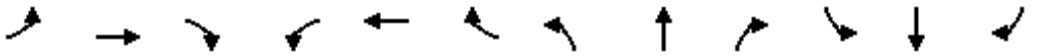
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	175	0	365	400	695	0	0	905	805
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	
Lane Util. Factor				1.00		1.00	1.00	0.95			0.95	
Frt				1.00		0.85	1.00	1.00			0.93	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1863		1667	1863	3725			3462	
Flt Permitted				0.95		1.00	0.09	1.00			1.00	
Satd. Flow (perm)				1863		1667	167	3725			3462	
Peak-hour factor, 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 (vph)	0	0	0	190	0	397	435	755	0	0	984	875
RTOR Reduction (vph)	0	0	0	0	0	232	0	0	0	0	178	0
Lane Group Flow (vph)	0	0	0	190	0	165	435	755	0	0	1681	0
Turn Type				Prot		custom	pm+pt					
Protected Phases				8		8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				14.5		14.5	64.5	64.5			41.5	
Effective Green, g (s)				14.5		14.5	64.5	64.5			41.5	
Actuated g/C Ratio				0.16		0.16	0.72	0.72			0.46	
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				300		269	449	2670			1596	
v/s Ratio Prot				c0.10		0.10	c0.19	0.20			c0.49	
v/s Ratio Perm							0.51					
v/c Ratio				0.63		0.61	0.97	0.28			1.05	
Uniform Delay, d1				35.3		35.1	32.0	4.5			24.2	
Progression Factor				1.00		1.00	0.54	0.43			0.89	
Incremental Delay, d2				9.8		10.0	25.1	0.2			29.6	
Delay (s)				45.1		45.1	42.3	2.1			51.1	
Level of Service				D		D	D	A			D	
Approach Delay (s)		0.0			45.1			16.8			51.1	
Approach LOS		A			D			B			D	

Intersection Summary			
HCM Average Control Delay	38.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



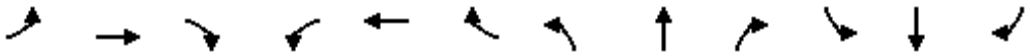
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	175	0	365	400	695	0	0	905	805
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frt				1.00	0.86	0.85	1.00	1.00			0.93	
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1770	1534	1583	1863	3725			3462	
Flt Permitted				0.95	1.00	1.00	0.09	1.00			1.00	
Satd. Flow (perm)				1770	1534	1583	167	3725			3462	
Peak-hour factor, 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 (vph)	0	0	0	190	0	397	435	755	0	0	984	875
RTOR Reduction (vph)	0	0	0	0	160	173	0	0	0	0	178	0
Lane Group Flow (vph)	0	0	0	171	50	33	435	755	0	0	1681	0
Turn Type				Split		Prot	pm+pt					
Protected Phases				8	8	8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				14.5	14.5	14.5	64.5	64.5			41.5	
Effective Green, g (s)				14.5	14.5	14.5	64.5	64.5			41.5	
Actuated g/C Ratio				0.16	0.16	0.16	0.72	0.72			0.46	
Clearance Time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				285	247	255	449	2670			1596	
v/s Ratio Prot				c0.10	0.03	0.02	c0.19	0.20			c0.49	
v/s Ratio Perm							0.51					
v/c Ratio				0.60	0.20	0.13	0.97	0.28			1.05	
Uniform Delay, d1				35.1	32.7	32.3	32.0	4.5			24.2	
Progression Factor				1.00	1.00	1.00	0.53	0.33			0.89	
Incremental Delay, d2				9.0	1.8	1.1	29.1	0.2			29.6	
Delay (s)				44.1	34.6	33.4	46.0	1.7			51.1	
Level of Service				D	C	C	D	A			D	
Approach Delay (s)		0.0			36.9			17.9			51.1	
Approach LOS		A			D			B			D	

Intersection Summary			
HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



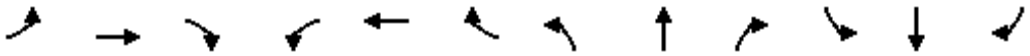
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	175	0	365	400	695	0	0	905	805
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Lane Util. Factor				1.00		0.88	1.00	0.95			0.95	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1863		2933	1863	3725			3725	1667
Flt Permitted				0.95		1.00	0.20	1.00			1.00	1.00
Satd. Flow (perm)				1863		2933	400	3725			3725	1667
Peak-hour factor, 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 (vph)	0	0	0	190	0	397	435	755	0	0	984	875
RTOR Reduction (vph)	0	0	0	0	0	333	0	0	0	0	0	316
Lane Group Flow (vph)	0	0	0	190	0	64	435	755	0	0	984	559
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				14.5		14.5	64.5	64.5			41.5	41.5
Effective Green, g (s)				14.5		14.5	64.5	64.5			41.5	41.5
Actuated g/C Ratio				0.16		0.16	0.72	0.72			0.46	0.46
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				300		473	571	2670			1718	769
v/s Ratio Prot				c0.10		0.02	c0.15	0.20			0.26	
v/s Ratio Perm							c0.40					0.34
v/c Ratio				0.63		0.14	0.76	0.28			0.57	0.73
Uniform Delay, d1				35.3		32.4	17.6	4.5			17.8	19.7
Progression Factor				1.00		1.00	0.45	0.29			0.87	0.76
Incremental Delay, d2				9.8		0.6	5.2	0.2			0.4	1.8
Delay (s)				45.1		33.0	13.1	1.6			15.9	16.7
Level of Service				D		C	B	A			B	B
Approach Delay (s)		0.0			36.9			5.8			16.3	
Approach LOS		A			D			A			B	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



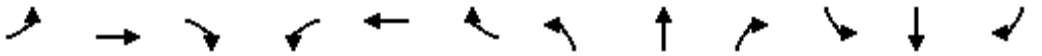
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	330	0	440	300	1265	0	0	618	385
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	
Lane Util. Factor				1.00		1.00	1.00	0.95			0.95	
Frt				1.00		0.85	1.00	1.00			0.94	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1863		1667	1863	3725			3511	
Flt Permitted				0.95		1.00	0.11	1.00			1.00	
Satd. Flow (perm)				1863		1667	212	3725			3511	
Peak-hour factor, 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 (vph)	0	0	0	359	0	478	326	1375	0	0	672	418
RTOR Reduction (vph)	0	0	0	0	0	30	0	0	0	0	107	0
Lane Group Flow (vph)	0	0	0	359	0	448	326	1375	0	0	983	0
Turn Type				Prot		custom	pm+pt					
Protected Phases				8		8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				27.5		27.5	51.5	51.5			31.5	
Effective Green, g (s)				27.5		27.5	51.5	51.5			31.5	
Actuated g/C Ratio				0.31		0.31	0.57	0.57			0.35	
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				569		509	387	2132			1229	
v/s Ratio Prot				0.19		c0.27	c0.14	0.37			0.28	
v/s Ratio Perm							c0.35					
v/c Ratio				0.63		0.88	0.84	0.64			0.80	
Uniform Delay, d1				26.9		29.7	28.5	13.1			26.4	
Progression Factor				1.00		1.00	0.53	0.23			1.13	
Incremental Delay, d2				5.2		19.2	1.6	0.1			3.8	
Delay (s)				32.1		48.9	16.8	3.2			33.6	
Level of Service				C		D	B	A			C	
Approach Delay (s)		0.0			41.7			5.8			33.6	
Approach LOS		A			D			A			C	

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	108.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	330	0	440	300	1265	0	0	618	385
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frt				1.00	0.89	0.85	1.00	1.00			0.94	
Flt Protected				0.95	0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1770	1563	1583	1863	3725			3511	
Flt Permitted				0.95	0.99	1.00	0.11	1.00			1.00	
Satd. Flow (perm)				1770	1563	1583	212	3725			3511	
Peak-hour factor, 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 (vph)	0	0	0	359	0	478	326	1375	0	0	672	418
RTOR Reduction (vph)	0	0	0	0	30	30	0	0	0	0	107	0
Lane Group Flow (vph)	0	0	0	291	248	238	326	1375	0	0	983	0
Turn Type				Split		Prot	pm+pt					
Protected Phases				8	8	8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				27.5	27.5	27.5	51.5	51.5			31.5	
Effective Green, g (s)				27.5	27.5	27.5	51.5	51.5			31.5	
Actuated g/C Ratio				0.31	0.31	0.31	0.57	0.57			0.35	
Clearance Time (s)				5.5	5.5	5.5	5.5	5.5			5.5	
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				541	478	484	387	2132			1229	
v/s Ratio Prot				c0.16	0.16	0.15	c0.14	0.37			0.28	
v/s Ratio Perm							c0.35					
v/c Ratio				0.54	0.52	0.49	0.84	0.64			0.80	
Uniform Delay, d1				26.0	25.8	25.5	28.5	13.1			26.4	
Progression Factor				1.00	1.00	1.00	0.63	0.36			1.13	
Incremental Delay, d2				3.8	4.0	3.5	1.6	0.1			3.8	
Delay (s)				29.8	29.8	29.1	19.7	4.9			33.6	
Level of Service				C	C	C	B	A			C	
Approach Delay (s)		0.0			29.6			7.7			33.6	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

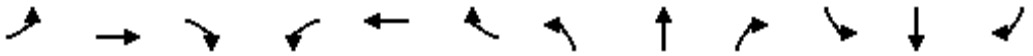


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	330	0	440	300	1265	0	0	618	385
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Lane Util. Factor				1.00		0.88	1.00	0.95			0.95	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1863		2933	1863	3725			3725	1667
Flt Permitted				0.95		1.00	0.30	1.00			1.00	1.00
Satd. Flow (perm)				1863		2933	592	3725			3725	1667
Peak-hour factor, 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 (vph)	0	0	0	359	0	478	326	1375	0	0	672	418
RTOR Reduction (vph)	0	0	0	0	0	53	0	0	0	0	0	272
Lane Group Flow (vph)	0	0	0	359	0	425	326	1375	0	0	672	146
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				27.5		27.5	51.5	51.5			31.5	31.5
Effective Green, g (s)				27.5		27.5	51.5	51.5			31.5	31.5
Actuated g/C Ratio				0.31		0.31	0.57	0.57			0.35	0.35
Clearance Time (s)				5.5		5.5	5.5	5.5			5.5	5.5
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				569		896	544	2132			1304	583
v/s Ratio Prot				c0.19		0.14	0.10	c0.37			0.18	
v/s Ratio Perm							0.25					0.09
v/c Ratio				0.63		0.47	0.60	0.64			0.52	0.25
Uniform Delay, d1				26.9		25.4	20.1	13.1			23.2	20.8
Progression Factor				1.00		1.00	1.04	0.95			0.81	1.19
Incremental Delay, d2				5.2		1.8	1.2	1.0			1.2	0.9
Delay (s)				32.1		27.2	22.1	13.4			19.9	25.6
Level of Service				C		C	C	B			B	C
Approach Delay (s)		0.0			29.3			15.1			22.1	
Approach LOS		A			C			B			C	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

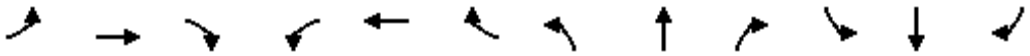
APPENDIX D

SYNCHRO REPORTS FOR LATSON RD/I-96 EB EXIT RAMP INTERSECTION



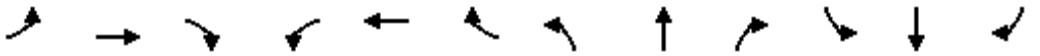
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	280	0	150	0	0	0	0	455	150	295	440	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5		5.5	5.5	
Lane Util. Factor	1.00		1.00					0.95		1.00	0.95	
Frt	1.00		0.85					0.96		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1863		1667					3587		1863	3725	
Flt Permitted	0.95		1.00					1.00		0.33	1.00	
Satd. Flow (perm)	1863		1667					3587		644	3725	
Peak-hour factor, 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 (vph)	304	0	163	0	0	0	0	495	163	321	478	0
RTOR Reduction (vph)	0	0	117	0	0	0	0	36	0	0	0	0
Lane Group Flow (vph)	304	0	46	0	0	0	0	622	0	321	478	0
Turn Type	Prot		custom							pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	25.5		25.5					35.5		53.5	53.5	
Effective Green, g (s)	25.5		25.5					35.5		53.5	53.5	
Actuated g/C Ratio	0.28		0.28					0.39		0.59	0.59	
Clearance Time (s)	5.5		5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	528		472					1415		552	2214	
v/s Ratio Prot	c0.16		0.03					0.17		c0.08	0.13	
v/s Ratio Perm										c0.26		
v/c Ratio	0.58		0.10					0.44		0.58	0.22	
Uniform Delay, d1	27.6		23.8					20.0		18.1	8.5	
Progression Factor	1.00		1.00					0.79		0.97	0.56	
Incremental Delay, d2	4.5		0.4					1.0		0.9	0.1	
Delay (s)	32.1		24.2					16.7		18.5	4.9	
Level of Service	C		C					B		B	A	
Approach Delay (s)		29.4			0.0			16.7			10.4	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



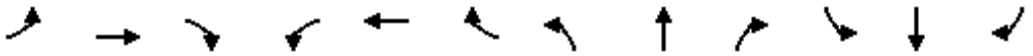
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	280	0	150	0	0	0	0	455	150	295	440	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Lane Util. Factor	0.95	0.91	0.95					0.95		1.00	0.95	
Frt	1.00	0.98	0.85					0.96		1.00	1.00	
Flt Protected	0.95	0.96	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1770	1680	1583					3587		1863	3725	
Flt Permitted	0.95	0.96	1.00					1.00		0.33	1.00	
Satd. Flow (perm)	1770	1680	1583					3587		644	3725	
Peak-hour factor, 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 (vph)	304	0	163	0	0	0	0	495	163	321	478	0
RTOR Reduction (vph)	0	5	104	0	0	0	0	36	0	0	0	0
Lane Group Flow (vph)	161	156	41	0	0	0	0	622	0	321	478	0
Turn Type	Split		Prot							pm+pt		
Protected Phases	4	4	4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	25.5	25.5	25.5					35.5		53.5	53.5	
Effective Green, g (s)	25.5	25.5	25.5					35.5		53.5	53.5	
Actuated g/C Ratio	0.28	0.28	0.28					0.39		0.59	0.59	
Clearance Time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	502	476	449					1415		552	2214	
v/s Ratio Prot	0.09	c0.09	0.03					0.17		c0.08	0.13	
v/s Ratio Perm										c0.26		
v/c Ratio	0.32	0.33	0.09					0.44		0.58	0.22	
Uniform Delay, d1	25.4	25.5	23.7					20.0		18.1	8.5	
Progression Factor	1.00	1.00	1.00					0.72		0.95	0.54	
Incremental Delay, d2	1.7	1.8	0.4					1.0		0.9	0.1	
Delay (s)	27.1	27.3	24.1					15.3		18.2	4.7	
Level of Service	C	C	C					B		B	A	
Approach Delay (s)		26.3			0.0			15.3			10.2	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



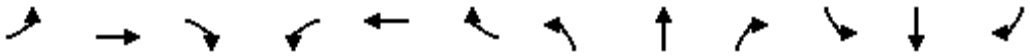
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	280	0	150	0	0	0	0	455	150	295	440	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Lane Util. Factor	0.97		1.00					0.95	1.00	1.00	0.95	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3614		1667					3725	1667	1863	3725	
Flt Permitted	0.95		1.00					1.00	1.00	0.43	1.00	
Satd. Flow (perm)	3614		1667					3725	1667	840	3725	
Peak-hour factor, 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 (vph)	304	0	163	0	0	0	0	495	163	321	478	0
RTOR Reduction (vph)	0	0	117	0	0	0	0	0	99	0	0	0
Lane Group Flow (vph)	304	0	46	0	0	0	0	495	64	321	478	0
Turn Type	Prot		custom						Perm	pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases									2	6		
Actuated Green, G (s)	25.5		25.5					35.5	35.5	53.5	53.5	
Effective Green, g (s)	25.5		25.5					35.5	35.5	53.5	53.5	
Actuated g/C Ratio	0.28		0.28					0.39	0.39	0.59	0.59	
Clearance Time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1024		472					1469	658	641	2214	
v/s Ratio Prot	c0.08		0.03					0.13		c0.07	0.13	
v/s Ratio Perm									0.04	c0.23		
v/c Ratio	0.30		0.10					0.34	0.10	0.50	0.22	
Uniform Delay, d1	25.2		23.8					19.0	17.2	13.8	8.5	
Progression Factor	1.00		1.00					0.77	0.29	1.13	0.49	
Incremental Delay, d2	0.7		0.4					0.6	0.3	0.6	0.2	
Delay (s)	26.0		24.2					15.3	5.2	16.2	4.3	
Level of Service	C		C					B	A	B	A	
Approach Delay (s)		25.4			0.0			12.8			9.1	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



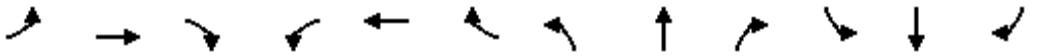
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	515	0	350	0	0	0	0	445	150	325	300	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5		5.5	5.5	
Lane Util. Factor	1.00		1.00					0.95		1.00	0.95	
Frt	1.00		0.85					0.96		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1863		1667					3585		1863	3725	
Flt Permitted	0.95		1.00					1.00		0.27	1.00	
Satd. Flow (perm)	1863		1667					3585		537	3725	
Peak-hour factor, 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 (vph)	560	0	380	0	0	0	0	484	163	353	326	0
RTOR Reduction (vph)	0	0	234	0	0	0	0	36	0	0	0	0
Lane Group Flow (vph)	560	0	146	0	0	0	0	611	0	353	326	0
Turn Type	Prot		custom							pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	34.5		34.5					24.5		44.5	44.5	
Effective Green, g (s)	34.5		34.5					24.5		44.5	44.5	
Actuated g/C Ratio	0.38		0.38					0.27		0.49	0.49	
Clearance Time (s)	5.5		5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	714		639					976		479	1842	
v/s Ratio Prot	c0.30		0.09					0.17		c0.12	0.09	
v/s Ratio Perm										c0.25		
v/c Ratio	0.78		0.23					0.63		0.74	0.18	
Uniform Delay, d1	24.5		18.8					28.7		24.5	12.6	
Progression Factor	1.00		1.00					0.77		0.64	0.47	
Incremental Delay, d2	8.4		0.8					2.9		5.2	0.2	
Delay (s)	32.9		19.6					25.1		20.9	6.1	
Level of Service	C		B					C		C	A	
Approach Delay (s)		27.5			0.0			25.1			13.8	
Approach LOS		C			A			C			B	

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



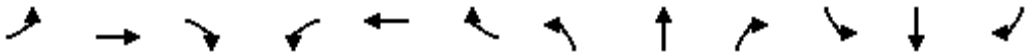
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	515	0	350	0	0	0	0	445	150	325	300	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Lane Util. Factor	0.95	0.91	0.95					0.95		1.00	0.95	
Frt	1.00	0.96	0.85					0.96		1.00	1.00	
Flt Protected	0.95	0.96	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1770	1653	1583					3585		1863	3725	
Flt Permitted	0.95	0.96	1.00					1.00		0.27	1.00	
Satd. Flow (perm)	1770	1653	1583					3585		537	3725	
Peak-hour factor, 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 (vph)	560	0	380	0	0	0	0	484	163	353	326	0
RTOR Reduction (vph)	0	14	183	0	0	0	0	36	0	0	0	0
Lane Group Flow (vph)	325	305	113	0	0	0	0	611	0	353	326	0
Turn Type	Split		Prot							pm+pt		
Protected Phases	4	4	4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	34.5	34.5	34.5					24.5		44.5	44.5	
Effective Green, g (s)	34.5	34.5	34.5					24.5		44.5	44.5	
Actuated g/C Ratio	0.38	0.38	0.38					0.27		0.49	0.49	
Clearance Time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	679	634	607					976		479	1842	
v/s Ratio Prot	0.18	c0.18	0.07					0.17		c0.12	0.09	
v/s Ratio Perm										c0.25		
v/c Ratio	0.48	0.48	0.19					0.63		0.74	0.18	
Uniform Delay, d1	21.0	21.0	18.4					28.7		24.5	12.6	
Progression Factor	1.00	1.00	1.00					0.89		0.64	0.47	
Incremental Delay, d2	2.4	2.6	0.7					3.0		5.2	0.2	
Delay (s)	23.4	23.6	19.1					28.4		20.7	6.1	
Level of Service	C	C	B					C		C	A	
Approach Delay (s)		22.1			0.0			28.4			13.7	
Approach LOS		C			A			C			B	

Intersection Summary			
HCM Average Control Delay	21.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



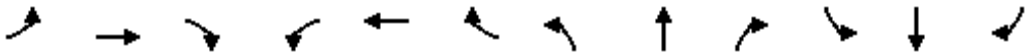
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	515	0	350	0	0	0	0	445	150	325	300	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Lane Util. Factor	0.97		1.00					0.95	1.00	1.00	0.95	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3614		1667					3725	1667	1863	3725	
Flt Permitted	0.95		1.00					1.00	1.00	0.39	1.00	
Satd. Flow (perm)	3614		1667					3725	1667	768	3725	
Peak-hour factor, 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 (vph)	560	0	380	0	0	0	0	484	163	353	326	0
RTOR Reduction (vph)	0	0	234	0	0	0	0	0	119	0	0	0
Lane Group Flow (vph)	560	0	146	0	0	0	0	484	44	353	326	0
Turn Type	Prot		custom						Perm	pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases									2	6		
Actuated Green, G (s)	34.5		34.5					24.5	24.5	44.5	44.5	
Effective Green, g (s)	34.5		34.5					24.5	24.5	44.5	44.5	
Actuated g/C Ratio	0.38		0.38					0.27	0.27	0.49	0.49	
Clearance Time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1385		639					1014	454	556	1842	
v/s Ratio Prot	c0.15		0.09					0.13		c0.10	0.09	
v/s Ratio Perm									0.03	c0.21		
v/c Ratio	0.40		0.23					0.48	0.10	0.63	0.18	
Uniform Delay, d1	20.3		18.8					27.4	24.5	21.6	12.6	
Progression Factor	1.00		1.00					0.78	0.40	0.37	0.41	
Incremental Delay, d2	0.9		0.8					1.6	0.4	2.3	0.2	
Delay (s)	21.1		19.6					23.1	10.3	10.3	5.3	
Level of Service	C		B					C	B	B	A	
Approach Delay (s)		20.5			0.0			19.9			7.9	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



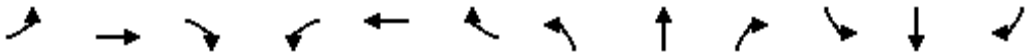
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	420	0	250	0	0	0	0	675	185	430	650	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5		5.5	5.5	
Lane Util. Factor	1.00		1.00					0.95		1.00	0.95	
Frt	1.00		0.85					0.97		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1863		1667					3605		1863	3725	
Flt Permitted	0.95		1.00					1.00		0.18	1.00	
Satd. Flow (perm)	1863		1667					3605		345	3725	
Peak-hour factor, 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 (vph)	457	0	272	0	0	0	0	734	201	467	707	0
RTOR Reduction (vph)	0	0	173	0	0	0	0	27	0	0	0	0
Lane Group Flow (vph)	457	0	99	0	0	0	0	908	0	467	707	0
Turn Type	Prot		custom							pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	24.5		24.5					32.5		54.5	54.5	
Effective Green, g (s)	24.5		24.5					32.5		54.5	54.5	
Actuated g/C Ratio	0.27		0.27					0.36		0.61	0.61	
Clearance Time (s)	5.5		5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	507		454					1302		487	2256	
v/s Ratio Prot	c0.25		0.06					0.25		c0.18	0.19	
v/s Ratio Perm										c0.40		
v/c Ratio	0.90		0.22					0.70		0.96	0.31	
Uniform Delay, d1	31.6		25.3					24.5		25.0	8.6	
Progression Factor	1.00		1.00					0.74		1.00	0.62	
Incremental Delay, d2	21.8		1.1					2.9		12.5	0.1	
Delay (s)	53.4		26.4					21.2		37.4	5.4	
Level of Service	D		C					C		D	A	
Approach Delay (s)		43.3			0.0			21.2			18.1	
Approach LOS		D			A			C			B	

Intersection Summary			
HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



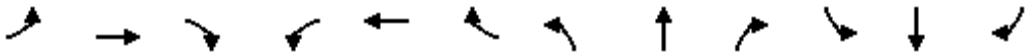
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	420	0	250	0	0	0	0	675	185	430	650	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Lane Util. Factor	0.95	0.91	0.95					0.95		1.00	0.95	
Frt	1.00	0.97	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.96	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1770	1668	1583					3605		1863	3725	
Flt Permitted	0.95	0.96	1.00					1.00		0.18	1.00	
Satd. Flow (perm)	1770	1668	1583					3605		345	3725	
Peak-hour factor, 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 (vph)	457	0	272	0	0	0	0	734	201	467	707	0
RTOR Reduction (vph)	0	9	166	0	0	0	0	27	0	0	0	0
Lane Group Flow (vph)	251	241	62	0	0	0	0	908	0	467	707	0
Turn Type	Split		Prot							pm+pt		
Protected Phases	4	4	4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	24.5	24.5	24.5					32.5		54.5	54.5	
Effective Green, g (s)	24.5	24.5	24.5					32.5		54.5	54.5	
Actuated g/C Ratio	0.27	0.27	0.27					0.36		0.61	0.61	
Clearance Time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	482	454	431					1302		487	2256	
v/s Ratio Prot	0.14	c0.14	0.04					0.25		c0.18	0.19	
v/s Ratio Perm										c0.40		
v/c Ratio	0.52	0.53	0.14					0.70		0.96	0.31	
Uniform Delay, d1	27.8	27.9	24.8					24.5		25.0	8.6	
Progression Factor	1.00	1.00	1.00					0.67		0.98	0.60	
Incremental Delay, d2	4.0	4.4	0.7					2.9		12.9	0.1	
Delay (s)	31.8	32.3	25.5					19.3		37.5	5.3	
Level of Service	C	C	C					B		D	A	
Approach Delay (s)		30.0			0.0			19.3			18.1	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



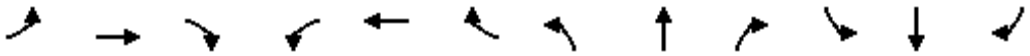
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	420	0	250	0	0	0	0	675	185	430	650	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Lane Util. Factor	0.97		1.00					0.95	1.00	1.00	0.95	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3614		1667					3725	1667	1863	3725	
Flt Permitted	0.95		1.00					1.00	1.00	0.27	1.00	
Satd. Flow (perm)	3614		1667					3725	1667	535	3725	
Peak-hour factor, 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 (vph)	457	0	272	0	0	0	0	734	201	467	707	0
RTOR Reduction (vph)	0	0	173	0	0	0	0	0	128	0	0	0
Lane Group Flow (vph)	457	0	99	0	0	0	0	734	73	467	707	0
Turn Type	Prot		custom						Perm	pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases									2	6		
Actuated Green, G (s)	24.5		24.5					32.5	32.5	54.5	54.5	
Effective Green, g (s)	24.5		24.5					32.5	32.5	54.5	54.5	
Actuated g/C Ratio	0.27		0.27					0.36	0.36	0.61	0.61	
Clearance Time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	984		454					1345	602	567	2256	
v/s Ratio Prot	c0.13		0.06					0.20		c0.15	0.19	
v/s Ratio Perm									0.04	c0.35		
v/c Ratio	0.46		0.22					0.55	0.12	0.82	0.31	
Uniform Delay, d1	27.3		25.3					22.9	19.2	20.5	8.6	
Progression Factor	1.00		1.00					0.70	0.30	1.16	0.59	
Incremental Delay, d2	1.6		1.1					1.5	0.4	7.9	0.3	
Delay (s)	28.9		26.4					17.6	6.1	31.6	5.4	
Level of Service	C		C					B	A	C	A	
Approach Delay (s)		28.0			0.0			15.1			15.8	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



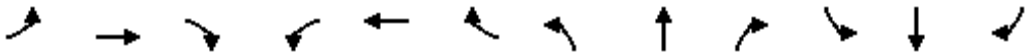
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	775	0	610	0	0	0	0	790	325	440	508	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5		5.5	5.5	
Lane Util. Factor	1.00		1.00					0.95		1.00	0.95	
Frt	1.00		0.85					0.96		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1863		1667					3563		1863	3725	
Flt Permitted	0.95		1.00					1.00		0.13	1.00	
Satd. Flow (perm)	1863		1667					3563		261	3725	
Peak-hour factor, 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 (vph)	842	0	663	0	0	0	0	859	353	478	552	0
RTOR Reduction (vph)	0	0	157	0	0	0	0	49	0	0	0	0
Lane Group Flow (vph)	842	0	506	0	0	0	0	1163	0	478	552	0
Turn Type	Prot		custom							pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	34.5		34.5					24.5		44.5	44.5	
Effective Green, g (s)	34.5		34.5					24.5		44.5	44.5	
Actuated g/C Ratio	0.38		0.38					0.27		0.49	0.49	
Clearance Time (s)	5.5		5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	714		639					970		387	1842	
v/s Ratio Prot	c0.45		0.30					0.33		c0.20	0.15	
v/s Ratio Perm										c0.41		
v/c Ratio	1.18		0.79					1.20		1.24	0.30	
Uniform Delay, d1	27.8		24.6					32.8		33.8	13.5	
Progression Factor	1.00		1.00					0.75		0.76	0.52	
Incremental Delay, d2	94.8		9.7					97.5		119.6	0.3	
Delay (s)	122.5		34.3					121.9		145.3	7.3	
Level of Service	F		C					F		F	A	
Approach Delay (s)		83.6			0.0			121.9			71.3	
Approach LOS		F			A			F			E	

Intersection Summary			
HCM Average Control Delay	92.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	108.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	775	0	610	0	0	0	0	790	325	440	508	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Lane Util. Factor	0.95	0.91	0.95					0.95		1.00	0.95	
Frt	1.00	0.94	0.85					0.96		1.00	1.00	
Flt Protected	0.95	0.97	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1770	1633	1583					3563		1863	3725	
Flt Permitted	0.95	0.97	1.00					1.00		0.11	1.00	
Satd. Flow (perm)	1770	1633	1583					3563		224	3725	
Peak-hour factor, 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 (vph)	842	0	663	0	0	0	0	859	353	478	552	0
RTOR Reduction (vph)	0	24	226	0	0	0	0	50	0	0	0	0
Lane Group Flow (vph)	522	488	245	0	0	0	0	1162	0	478	552	0
Turn Type	Split		Prot							pm+pt		
Protected Phases	4	4	4					2		1	6	
Permitted Phases										6		
Actuated Green, G (s)	26.5	26.5	26.5					29.5		52.5	52.5	
Effective Green, g (s)	26.5	26.5	26.5					29.5		52.5	52.5	
Actuated g/C Ratio	0.29	0.29	0.29					0.33		0.58	0.58	
Clearance Time (s)	5.5	5.5	5.5					5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)	521	481	466					1168		449	2173	
v/s Ratio Prot	0.29	c0.30	0.15					0.33		c0.21	0.15	
v/s Ratio Perm										c0.41		
v/c Ratio	1.00	1.01	0.53					1.00		1.06	0.25	
Uniform Delay, d1	31.7	31.7	26.5					30.2		31.6	9.2	
Progression Factor	1.00	1.00	1.00					0.62		0.98	0.74	
Incremental Delay, d2	39.9	44.7	4.2					22.8		53.4	0.2	
Delay (s)	71.7	76.5	30.7					41.7		84.4	7.0	
Level of Service	E	E	C					D		F	A	
Approach Delay (s)		60.5			0.0			41.7			42.9	
Approach LOS		E			A			D			D	

Intersection Summary			
HCM Average Control Delay	49.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

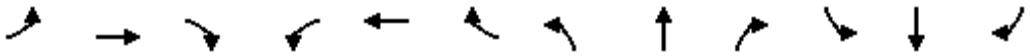


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	775	0	610	0	0	0	0	790	325	440	508	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Lane Util. Factor	0.97		1.00					0.95	1.00	1.00	0.95	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3614		1667					3725	1667	1863	3725	
Flt Permitted	0.95		1.00					1.00	1.00	0.19	1.00	
Satd. Flow (perm)	3614		1667					3725	1667	373	3725	
Peak-hour factor, 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 (vph)	842	0	663	0	0	0	0	859	353	478	552	0
RTOR Reduction (vph)	0	0	226	0	0	0	0	0	237	0	0	0
Lane Group Flow (vph)	842	0	437	0	0	0	0	859	116	478	552	0
Turn Type	Prot		custom						Perm	pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases									2	6		
Actuated Green, G (s)	26.5		26.5					29.5	29.5	52.5	52.5	
Effective Green, g (s)	26.5		26.5					29.5	29.5	52.5	52.5	
Actuated g/C Ratio	0.29		0.29					0.33	0.33	0.58	0.58	
Clearance Time (s)	5.5		5.5					5.5	5.5	5.5	5.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1064		491					1221	546	507	2173	
v/s Ratio Prot	0.23		c0.26					0.23		c0.18	0.15	
v/s Ratio Perm									0.07	c0.37		
v/c Ratio	0.79		0.89					0.70	0.21	0.94	0.25	
Uniform Delay, d1	29.2		30.4					26.4	21.9	25.1	9.2	
Progression Factor	1.00		1.00					0.69	0.47	0.50	0.25	
Incremental Delay, d2	6.0		20.9					3.1	0.8	23.3	0.2	
Delay (s)	35.2		51.3					21.2	11.0	35.8	2.5	
Level of Service	D		D					C	B	D	A	
Approach Delay (s)		42.3			0.0			18.2			18.0	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	27.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

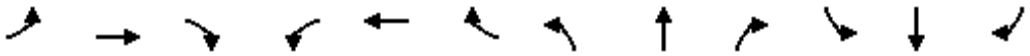
APPENDIX E

SYNCHRO REPORTS FOR NIXON RD/BECK RD INTERSECTION



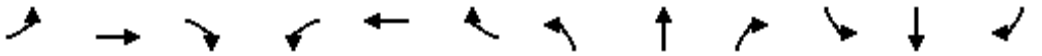
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	40	45	60	40	110	45	435	70	110	430	50
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.93		1.00	0.98		1.00	0.98	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1840			1796		1863	3648		1863	3668	
Flt Permitted		0.63			0.82		0.46	1.00		0.45	1.00	
Satd. Flow (perm)		1186			1501		900	3648		876	3668	
Peak-hour factor, 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 (vph)	65	43	49	65	43	120	49	473	76	120	467	54
RTOR Reduction (vph)	0	24	0	0	59	0	0	8	0	0	6	0
Lane Group Flow (vph)	0	133	0	0	169	0	49	541	0	120	515	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.7			14.7		64.3	64.3		64.3	64.3	
Effective Green, g (s)		14.7			14.7		64.3	64.3		64.3	64.3	
Actuated g/C Ratio		0.16			0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		194			245		643	2606		626	2621	
v/s Ratio Prot								c0.15			0.14	
v/s Ratio Perm		0.11			c0.11		0.05			0.14		
v/c Ratio		0.68			0.69		0.08	0.21		0.19	0.20	
Uniform Delay, d1		35.5			35.5		3.9	4.3		4.3	4.3	
Progression Factor		1.00			1.00		1.00	1.00		0.47	0.40	
Incremental Delay, d2		9.6			7.8		0.2	0.2		0.7	0.2	
Delay (s)		45.0			43.3		4.1	4.5		2.7	1.9	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		45.0			43.3			4.5			2.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



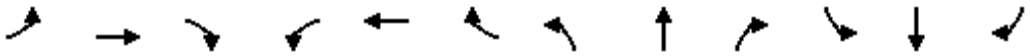
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	40	45	60	40	110	45	435	70	110	430	50
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.89		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1804		1863	1744		1863	3648		1863	3668	
Flt Permitted	0.50	1.00		0.70	1.00		0.46	1.00		0.44	1.00	
Satd. Flow (perm)	983	1804		1367	1744		894	3648		865	3668	
Peak-hour factor, 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 (vph)	65	43	49	65	43	120	49	473	76	120	467	54
RTOR Reduction (vph)	0	43	0	0	106	0	0	9	0	0	6	0
Lane Group Flow (vph)	65	49	0	65	57	0	49	540	0	120	515	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.4	10.4		10.4	10.4		63.1	57.3		63.1	57.3	
Effective Green, g (s)	10.4	10.4		10.4	10.4		63.1	57.3		63.1	57.3	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.70	0.64		0.70	0.64	
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	114	208		158	202		689	2323		671	2335	
v/s Ratio Prot		0.03			0.03		0.00	c0.15		c0.01	0.14	
v/s Ratio Perm	c0.07			0.05			0.05			0.11		
v/c Ratio	0.57	0.23		0.41	0.28		0.07	0.23		0.18	0.22	
Uniform Delay, d1	37.7	36.2		37.0	36.4		4.4	7.0		4.9	6.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.56	0.56	
Incremental Delay, d2	6.7	0.6		1.7	0.8		0.0	0.2		0.1	0.2	
Delay (s)	44.4	36.8		38.7	37.2		4.4	7.2		2.9	4.1	
Level of Service	D	D		D	D		A	A		A	A	
Approach Delay (s)		39.9			37.6			7.0			3.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



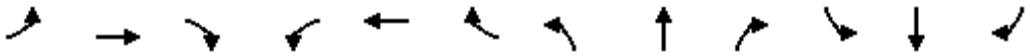
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	40	45	60	40	110	45	435	70	110	430	50
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1804		1863	1961	1667	1863	3648		1863	3668	
Flt Permitted	0.73	1.00		0.70	1.00	1.00	0.46	1.00		0.44	1.00	
Satd. Flow (perm)	1429	1804		1367	1961	1667	896	3648		866	3668	
Peak-hour factor, 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 (vph)	65	43	49	65	43	120	49	473	76	120	467	54
RTOR Reduction (vph)	0	44	0	0	0	107	0	9	0	0	6	0
Lane Group Flow (vph)	65	48	0	65	43	13	49	540	0	120	515	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	10.0	10.0		10.0	10.0	10.0	63.5	57.7		63.5	57.7	
Effective Green, g (s)	10.0	10.0		10.0	10.0	10.0	63.5	57.7		63.5	57.7	
Actuated g/C Ratio	0.11	0.11		0.11	0.11	0.11	0.71	0.64		0.71	0.64	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	159	200		152	218	185	694	2339		675	2352	
v/s Ratio Prot		0.03			0.02		0.00	c0.15		c0.01	0.14	
v/s Ratio Perm	0.05			c0.05		0.01	0.05			0.11		
v/c Ratio	0.41	0.24		0.43	0.20	0.07	0.07	0.23		0.18	0.22	
Uniform Delay, d1	37.2	36.5		37.3	36.4	35.8	4.2	6.8		4.8	6.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.76	0.56	
Incremental Delay, d2	1.7	0.6		1.9	0.4	0.2	0.0	0.2		0.1	0.2	
Delay (s)	39.0	37.2		39.3	36.8	36.0	4.3	7.0		3.8	4.0	
Level of Service	D	D		D	D	D	A	A		A	A	
Approach Delay (s)		37.9			37.1			6.8			3.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



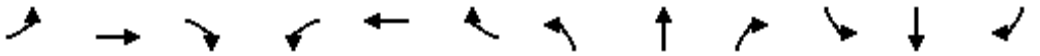
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	40	50	100	40	150	50	375	100	140	450	60
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.5			5.5		5.6	5.5		5.5	5.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.93		1.00	0.97		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1838			1793		1863	3608		1863	3660	
Flt Permitted		0.63			0.80		0.44	1.00		0.46	1.00	
Satd. Flow (perm)		1192			1464		862	3608		902	3660	
Peak-hour factor, 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 (vph)	76	43	54	109	43	163	54	408	109	152	489	65
RTOR Reduction (vph)	0	24	0	0	55	0	0	18	0	0	8	0
Lane Group Flow (vph)	0	149	0	0	260	0	54	499	0	152	546	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.7			20.7		58.3	58.3		58.3	58.3	
Effective Green, g (s)		20.7			20.7		58.2	58.3		58.3	58.3	
Actuated g/C Ratio		0.23			0.23		0.65	0.65		0.65	0.65	
Clearance Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		274			337		557	2337		584	2371	
v/s Ratio Prot								0.14			0.15	
v/s Ratio Perm		0.13			c0.18		0.06			c0.17		
v/c Ratio		0.54			0.77		0.10	0.21		0.26	0.23	
Uniform Delay, d1		30.5			32.4		6.0	6.5		6.7	6.6	
Progression Factor		1.00			1.00		1.00	1.00		0.74	0.70	
Incremental Delay, d2		2.2			10.4		0.3	0.2		1.0	0.2	
Delay (s)		32.7			42.8		6.3	6.7		6.0	4.8	
Level of Service		C			D		A	A		A	A	
Approach Delay (s)		32.7			42.8			6.7			5.1	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



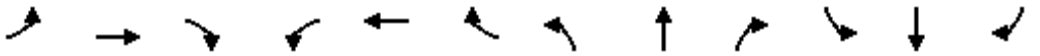
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	40	50	100	40	150	50	375	100	140	450	60
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5		5.6	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.88		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1797		1863	1728		1863	3608		1863	3660	
Flt Permitted	0.40	1.00		0.69	1.00		0.43	1.00		0.45	1.00	
Satd. Flow (perm)	787	1797		1361	1728		852	3608		892	3660	
Peak-hour factor, 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 (vph)	76	43	54	109	43	163	54	408	109	152	489	65
RTOR Reduction (vph)	0	47	0	0	140	0	0	16	0	0	7	0
Lane Group Flow (vph)	76	51	0	109	66	0	54	501	0	152	547	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.5	12.5		12.5	12.5		61.0	55.1		61.0	55.1	
Effective Green, g (s)	12.5	12.5		12.5	12.5		60.8	55.1		61.0	55.1	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.68	0.61		0.68	0.61	
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	109	250		189	240		641	2209		668	2241	
v/s Ratio Prot		0.03			0.04		0.01	0.14		c0.01	c0.15	
v/s Ratio Perm	c0.10			0.08			0.05			0.14		
v/c Ratio	0.70	0.20		0.58	0.27		0.08	0.23		0.23	0.24	
Uniform Delay, d1	36.9	34.3		36.3	34.7		5.5	7.9		5.9	8.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.82	0.79	
Incremental Delay, d2	17.6	0.4		4.2	0.6		0.1	0.2		0.2	0.3	
Delay (s)	54.6	34.7		40.5	35.3		5.5	8.1		5.0	6.6	
Level of Service	D	C		D	D		A	A		A	A	
Approach Delay (s)		43.5			37.1			7.9			6.2	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



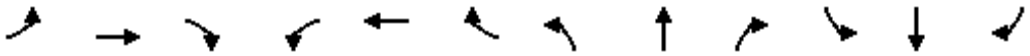
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	40	50	100	40	150	50	375	100	140	450	60
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	5.6	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1797		1863	1961	1667	1863	3608		1863	3660	
Flt Permitted	0.73	1.00		0.69	1.00	1.00	0.43	1.00		0.45	1.00	
Satd. Flow (perm)	1429	1797		1361	1961	1667	852	3608		892	3660	
Peak-hour factor, 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 (vph)	76	43	54	109	43	163	54	408	109	152	489	65
RTOR Reduction (vph)	0	47	0	0	0	140	0	16	0	0	7	0
Lane Group Flow (vph)	76	51	0	109	43	23	54	501	0	152	547	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	12.5	12.5		12.5	12.5	12.5	61.0	55.1		61.0	55.1	
Effective Green, g (s)	12.5	12.5		12.5	12.5	12.5	60.8	55.1		61.0	55.1	
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.68	0.61		0.68	0.61	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	198	250		189	272	232	641	2209		668	2241	
v/s Ratio Prot		0.03			0.02		0.01	0.14		c0.01	c0.15	
v/s Ratio Perm	0.05			c0.08		0.01	0.05			0.14		
v/c Ratio	0.38	0.20		0.58	0.16	0.10	0.08	0.23		0.23	0.24	
Uniform Delay, d1	35.2	34.3		36.3	34.1	33.8	5.5	7.9		5.9	8.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.59	0.65	
Incremental Delay, d2	1.2	0.4		4.2	0.3	0.2	0.1	0.2		0.2	0.2	
Delay (s)	36.5	34.7		40.5	34.4	34.0	5.5	8.1		3.7	5.5	
Level of Service	D	C		D	C	C	A	A		A	A	
Approach Delay (s)		35.5			36.3			7.9			5.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



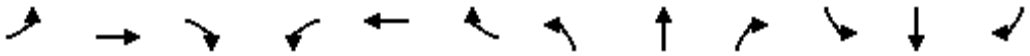
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	55	60	95	55	145	60	635	107	160	660	80
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.93		1.00	0.98		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1842			1802		1863	3645		1863	3665	
Flt Permitted		0.63			0.78		0.32	1.00		0.32	1.00	
Satd. Flow (perm)		1190			1437		630	3645		628	3665	
Peak-hour factor, 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 (vph)	87	60	65	103	60	158	65	690	116	174	717	87
RTOR Reduction (vph)	0	20	0	0	43	0	0	12	0	0	9	0
Lane Group Flow (vph)	0	192	0	0	278	0	65	794	0	174	795	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.4			21.4		57.6	57.6		57.6	57.6	
Effective Green, g (s)		21.4			21.4		57.6	57.6		57.6	57.6	
Actuated g/C Ratio		0.24			0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		283			342		403	2333		402	2346	
v/s Ratio Prot								0.22			0.22	
v/s Ratio Perm		0.16			c0.19		0.10			c0.28		
v/c Ratio		0.68			0.81		0.16	0.34		0.43	0.34	
Uniform Delay, d1		31.2			32.4		6.5	7.5		8.1	7.4	
Progression Factor		1.00			1.00		1.00	1.00		0.79	0.59	
Incremental Delay, d2		6.3			13.6		0.9	0.4		3.2	0.4	
Delay (s)		37.5			46.0		7.4	7.9		9.6	4.7	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		37.5			46.0			7.8			5.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



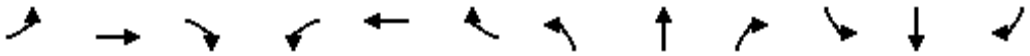
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	55	60	95	55	145	60	635	107	160	660	80
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.89		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1808		1863	1748		1863	3645		1863	3665	
Flt Permitted	0.38	1.00		0.66	1.00		0.31	1.00		0.31	1.00	
Satd. Flow (perm)	750	1808		1304	1748		614	3645		612	3665	
Peak-hour factor, 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 (vph)	87	60	65	103	60	158	65	690	116	174	717	87
RTOR Reduction (vph)	0	49	0	0	118	0	0	10	0	0	7	0
Lane Group Flow (vph)	87	76	0	103	100	0	65	796	0	174	797	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.2	13.2		13.2	13.2		60.3	54.3		60.3	54.3	
Effective Green, g (s)	13.2	13.2		13.2	13.2		60.3	54.3		60.3	54.3	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.67	0.60		0.67	0.60	
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	110	265		191	256		495	2199		493	2211	
v/s Ratio Prot		0.04			0.06		0.01	c0.22		c0.02	0.22	
v/s Ratio Perm	c0.12			0.08			0.08			0.21		
v/c Ratio	0.79	0.29		0.54	0.39		0.13	0.36		0.35	0.36	
Uniform Delay, d1	37.1	34.2		35.6	34.8		7.6	9.1		9.3	9.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.75	0.39	
Incremental Delay, d2	31.0	0.6		2.9	1.0		0.1	0.5		0.4	0.4	
Delay (s)	68.1	34.8		38.5	35.8		7.7	9.5		7.3	3.9	
Level of Service	E	C		D	D		A	A		A	A	
Approach Delay (s)		48.5			36.6			9.4			4.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



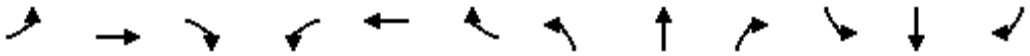
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	55	60	95	55	145	60	635	107	160	660	80
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1808		1863	1961	1667	1863	3645		1863	3665	
Flt Permitted	0.72	1.00		0.66	1.00	1.00	0.31	1.00		0.31	1.00	
Satd. Flow (perm)	1408	1808		1297	1961	1667	617	3645		615	3665	
Peak-hour factor, 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 (vph)	87	60	65	103	60	158	65	690	116	174	717	87
RTOR Reduction (vph)	0	49	0	0	0	136	0	10	0	0	7	0
Lane Group Flow (vph)	87	76	0	103	60	22	65	796	0	174	797	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	12.5	12.5		12.5	12.5	12.5	61.0	55.0		61.0	55.0	
Effective Green, g (s)	12.5	12.5		12.5	12.5	12.5	61.0	55.0		61.0	55.0	
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.68	0.61		0.68	0.61	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	196	251		180	272	232	501	2228		500	2240	
v/s Ratio Prot		0.04			0.03		0.01	c0.22		c0.02	0.22	
v/s Ratio Perm	0.06			c0.08		0.01	0.08			0.21		
v/c Ratio	0.44	0.30		0.57	0.22	0.09	0.13	0.36		0.35	0.36	
Uniform Delay, d1	35.6	34.8		36.2	34.4	33.8	7.2	8.7		8.8	8.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.86	0.33	
Incremental Delay, d2	1.6	0.7		4.3	0.4	0.2	0.1	0.4		0.4	0.4	
Delay (s)	37.2	35.5		40.6	34.8	34.0	7.3	9.2		7.9	3.3	
Level of Service	D	D		D	C	C	A	A		A	A	
Approach Delay (s)		36.2			36.3			9.0			4.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



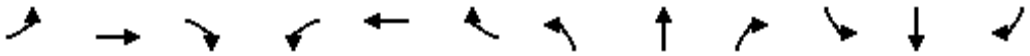
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	55	65	145	55	240	65	775	140	240	778	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.5			5.5		5.6	5.5		5.5	5.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.93		1.00	0.98		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1841			1787		1863	3640		1863	3662	
Flt Permitted		0.57			0.78		0.25	1.00		0.23	1.00	
Satd. Flow (perm)		1072			1424		486	3640		459	3662	
Peak-hour factor, 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 (vph)	109	60	71	158	60	261	71	842	152	261	846	109
RTOR Reduction (vph)	0	17	0	0	48	0	0	16	0	0	11	0
Lane Group Flow (vph)	0	223	0	0	431	0	71	978	0	261	944	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		26.5			26.5		52.5	52.5		52.5	52.5	
Effective Green, g (s)		26.5			26.5		52.4	52.5		52.5	52.5	
Actuated g/C Ratio		0.29			0.29		0.58	0.58		0.58	0.58	
Clearance Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		316			419		283	2123		268	2136	
v/s Ratio Prot								0.27			0.26	
v/s Ratio Perm		0.21			c0.30		0.15			c0.57		
v/c Ratio		0.71			1.03		0.25	0.46		0.97	0.44	
Uniform Delay, d1		28.3			31.7		9.2	10.7		18.1	10.5	
Progression Factor		1.00			1.00		1.00	1.00		0.96	0.86	
Incremental Delay, d2		7.0			51.5		2.1	0.7		43.3	0.5	
Delay (s)		35.3			83.3		11.3	11.4		60.7	9.6	
Level of Service		D			F		B	B		E	A	
Approach Delay (s)		35.3			83.3			11.4			20.5	
Approach LOS		D			F			B			C	

Intersection Summary			
HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	55	65	145	55	240	65	775	140	240	778	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5		5.6	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.88		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1801		1863	1722		1863	3640		1863	3662	
Flt Permitted	0.27	1.00		0.67	1.00		0.22	1.00		0.21	1.00	
Satd. Flow (perm)	535	1801		1315	1722		440	3640		411	3662	
Peak-hour factor, 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 (vph)	109	60	71	158	60	261	71	842	152	261	846	109
RTOR Reduction (vph)	0	48	0	0	177	0	0	15	0	0	10	0
Lane Group Flow (vph)	109	83	0	158	144	0	71	979	0	261	945	0
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.1	19.1		19.1	19.1		54.4	46.0		54.4	46.0	
Effective Green, g (s)	19.1	19.1		19.1	19.1		54.2	46.0		54.4	46.0	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.60	0.51		0.60	0.51	
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	114	382		279	365		396	1860		384	1872	
v/s Ratio Prot		0.05			0.08		0.02	0.27		c0.06	0.26	
v/s Ratio Perm	c0.20			0.12			0.09			c0.35		
v/c Ratio	0.96	0.22		0.57	0.39		0.18	0.53		0.68	0.50	
Uniform Delay, d1	35.0	29.3		31.7	30.5		14.2	14.7		22.1	14.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.09	0.69	
Incremental Delay, d2	69.8	0.3		2.6	0.7		0.2	1.1		4.1	0.8	
Delay (s)	104.8	29.6		34.4	31.2		14.4	15.8		28.2	10.8	
Level of Service	F	C		C	C		B	B		C	B	
Approach Delay (s)		63.8			32.2			15.7			14.5	
Approach LOS		E			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

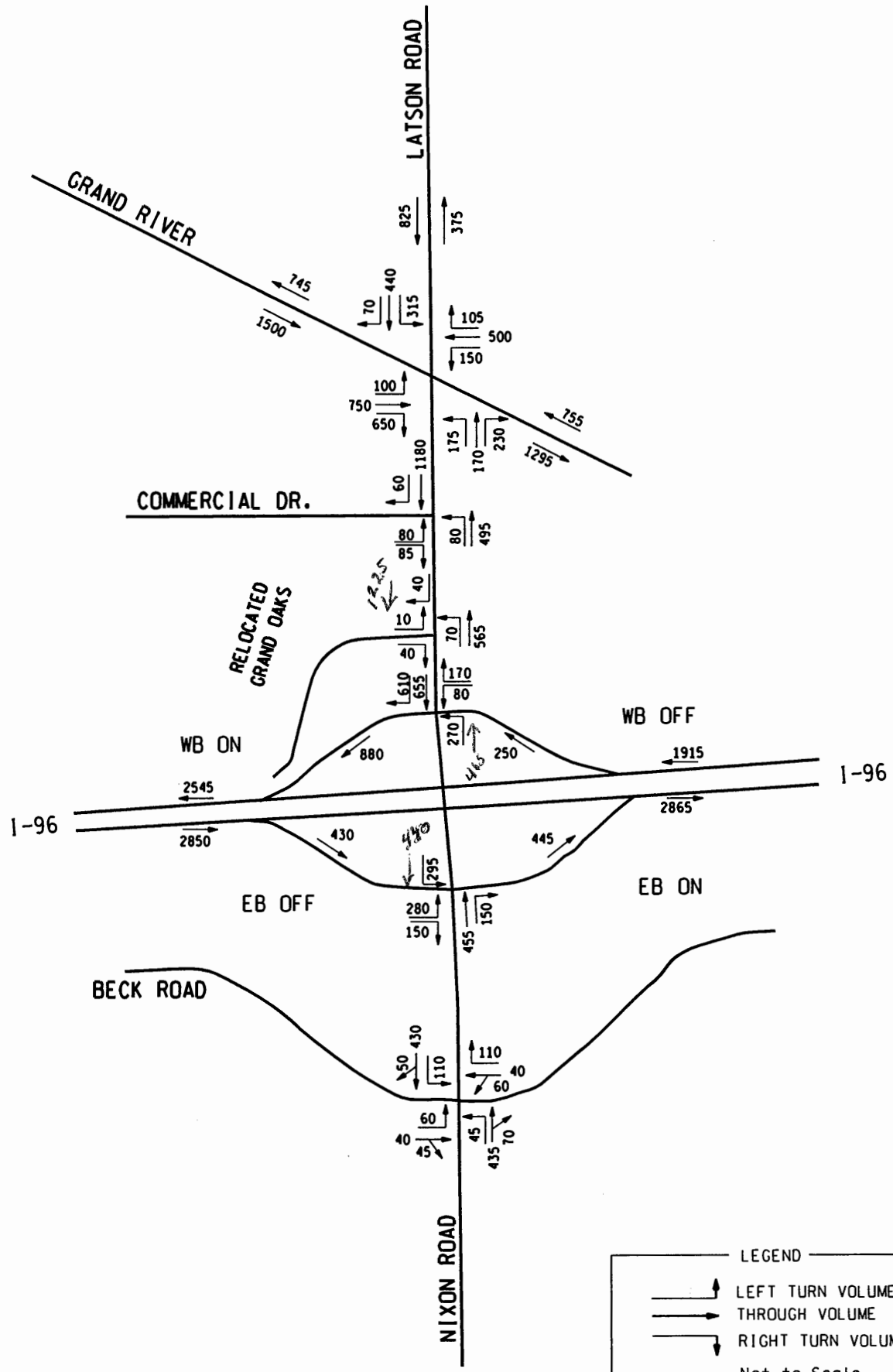


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	55	65	145	55	240	65	775	140	240	778	100
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	5.6	5.5		5.5	5.5	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1801		1863	1961	1667	1863	3640		1863	3662	
Flt Permitted	0.72	1.00		0.66	1.00	1.00	0.24	1.00		0.22	1.00	
Satd. Flow (perm)	1408	1801		1292	1961	1667	468	3640		440	3662	
Peak-hour factor, 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 (vph)	109	60	71	158	60	261	71	842	152	261	846	109
RTOR Reduction (vph)	0	50	0	0	0	215	0	14	0	0	9	0
Lane Group Flow (vph)	109	81	0	158	60	46	71	980	0	261	946	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	15.7	15.7		15.7	15.7	15.7	57.8	49.7		57.8	49.7	
Effective Green, g (s)	15.7	15.7		15.7	15.7	15.7	57.6	49.7		57.8	49.7	
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.17	0.64	0.55		0.64	0.55	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	246	314		225	342	291	424	2010		411	2022	
v/s Ratio Prot		0.04			0.03		0.01	0.27		c0.06	0.26	
v/s Ratio Perm	0.08			c0.12		0.03	0.09			c0.35		
v/c Ratio	0.44	0.26		0.70	0.18	0.16	0.17	0.49		0.64	0.47	
Uniform Delay, d1	33.2	32.1		35.0	31.6	31.5	11.4	12.3		19.3	12.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.81	1.23	
Incremental Delay, d2	1.3	0.4		9.5	0.2	0.3	0.2	0.8		2.5	0.6	
Delay (s)	34.5	32.5		44.5	31.9	31.8	11.6	13.2		18.0	15.5	
Level of Service	C	C		D	C	C	B	B		B	B	
Approach Delay (s)		33.4			36.0			13.1			16.1	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX F

TRAFFIC VOLUME PROJECTIONS



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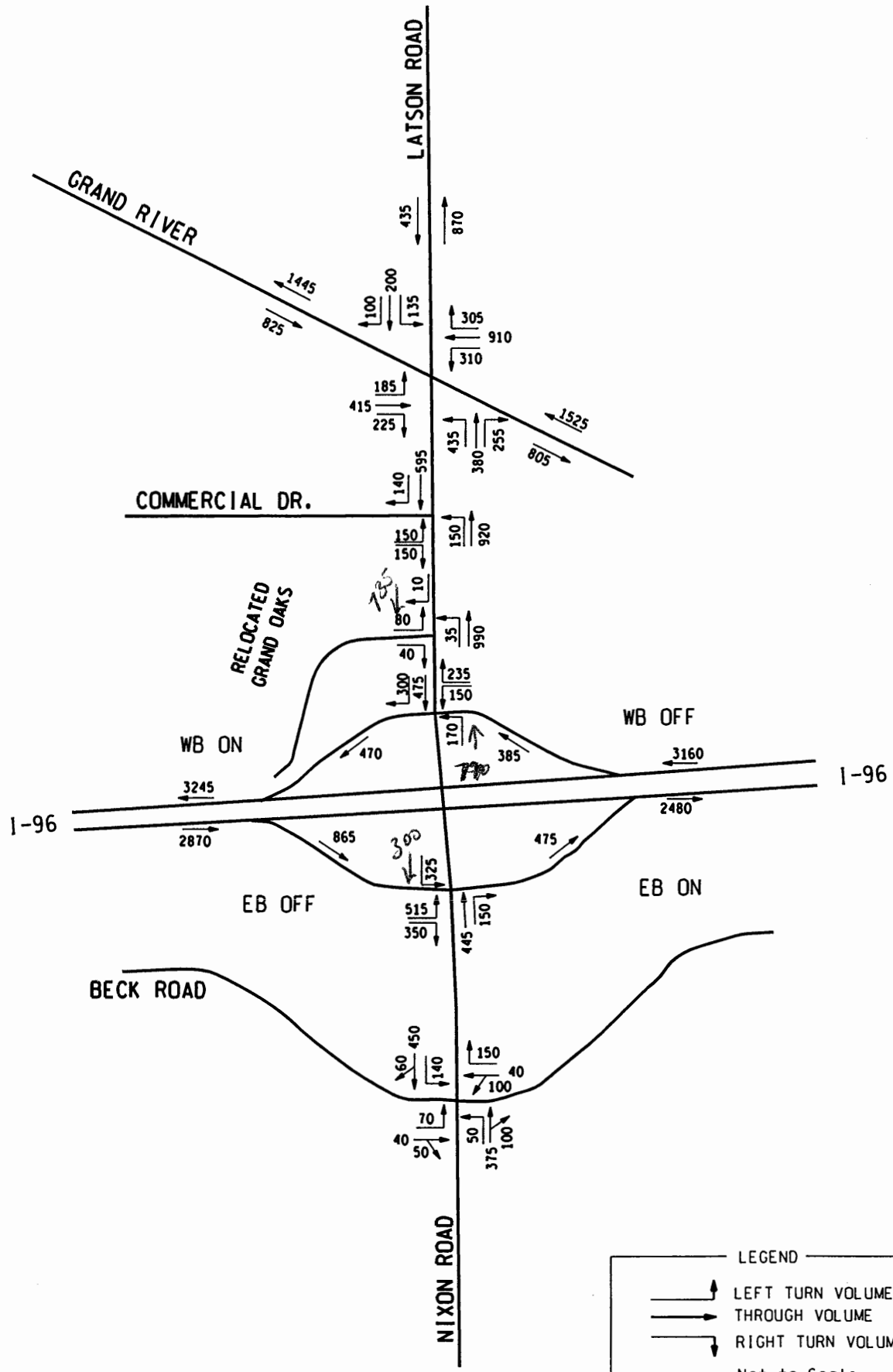
2010 AM PEAK HOUR Traffic Volumes



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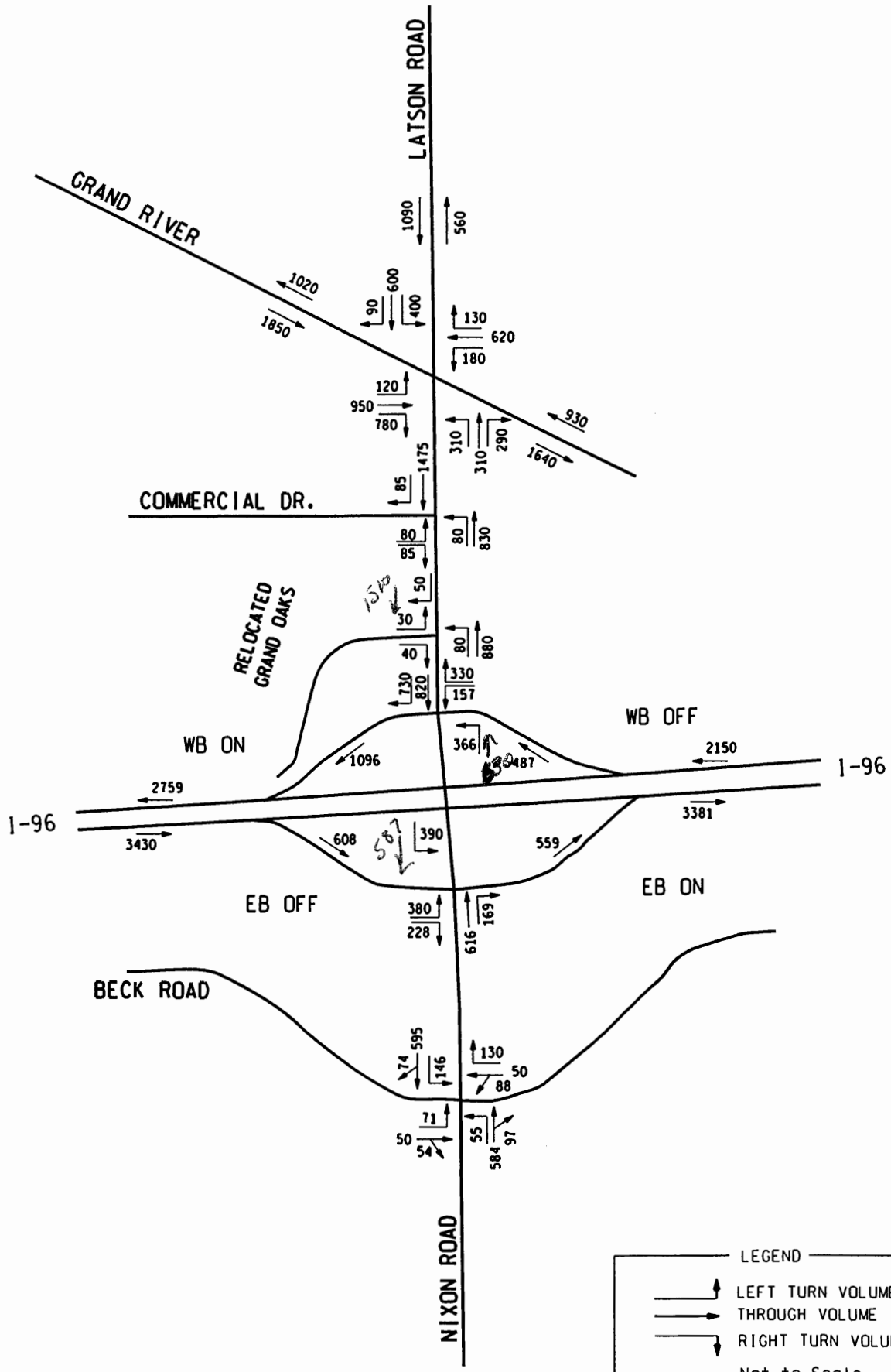
I-96 / Latson Road Proposed Interchange

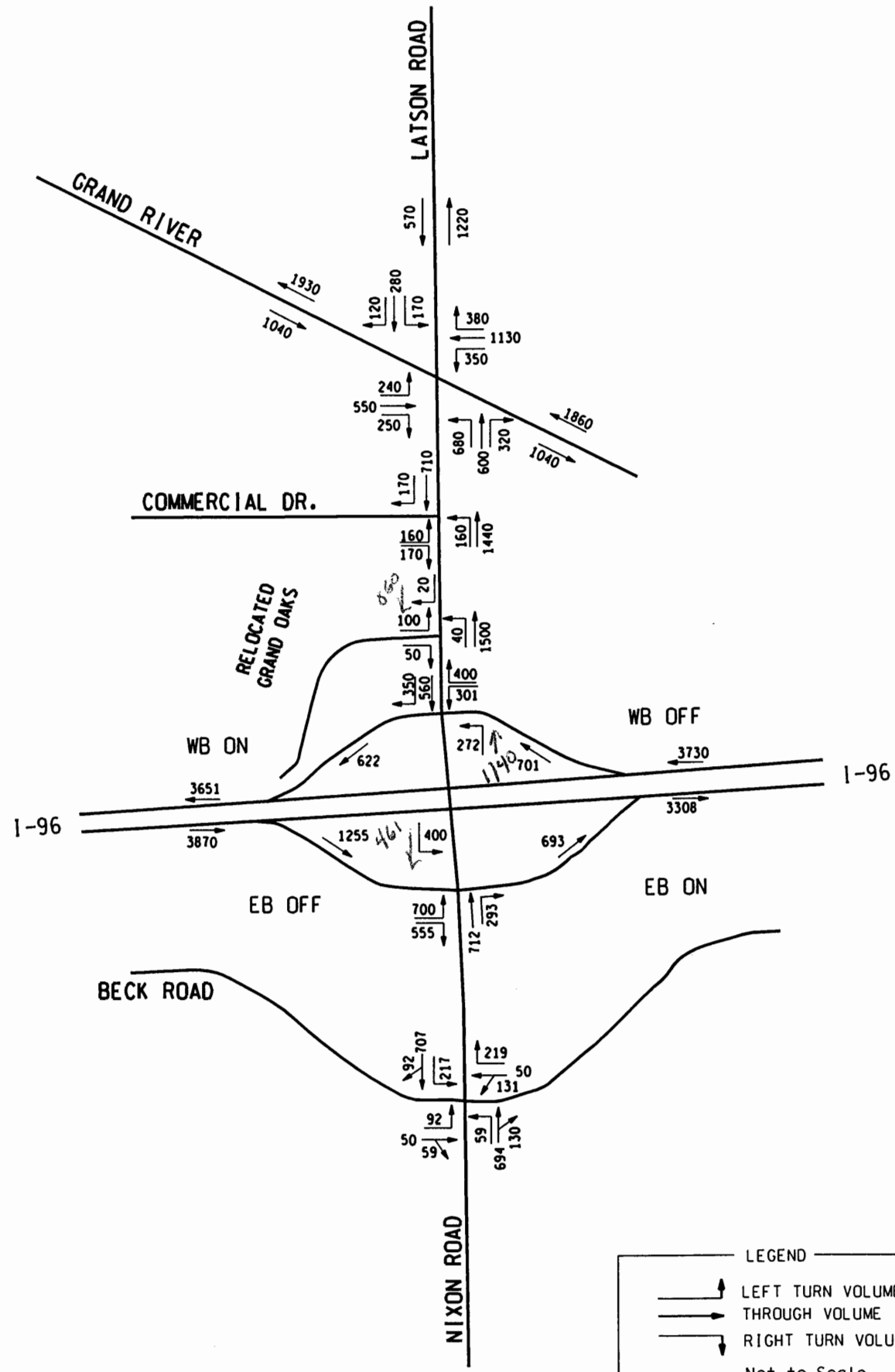
2010 PM PEAK HOUR Traffic Volumes



MDOT
Michigan Department of Transportation
Project Planning

I-96 / Latson Road Proposed Interchange

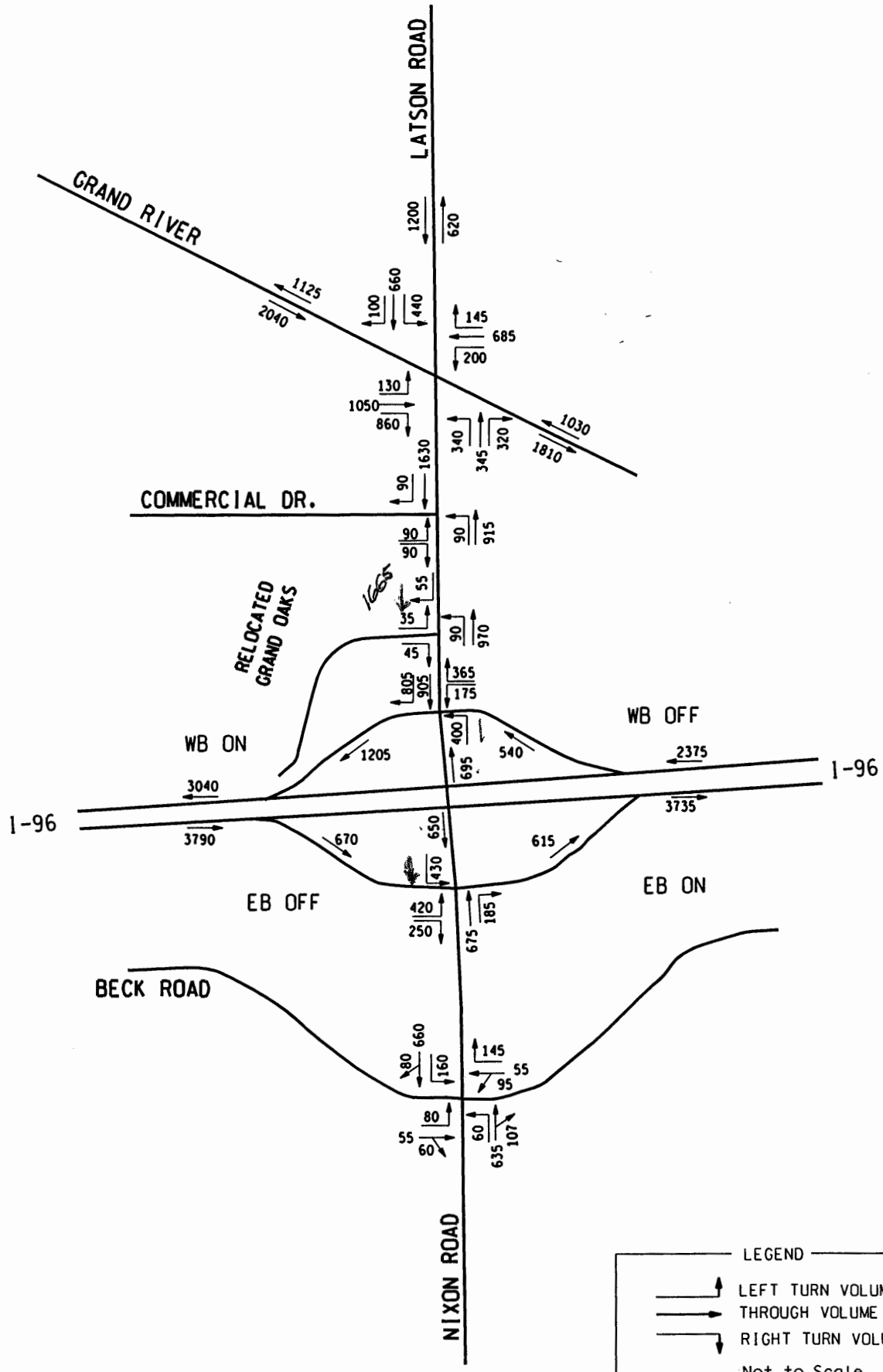
2020 AM PEAK HOUR Traffic Volumes



MDOT
Michigan Department of Transportation
Project Planning

I-96 / Latson Road
Proposed Interchange

2020 PM PEAK HOUR
Traffic Volumes



LEGEND

LEFT TURN VOLUME
THROUGH VOLUME
RIGHT TURN VOLUME

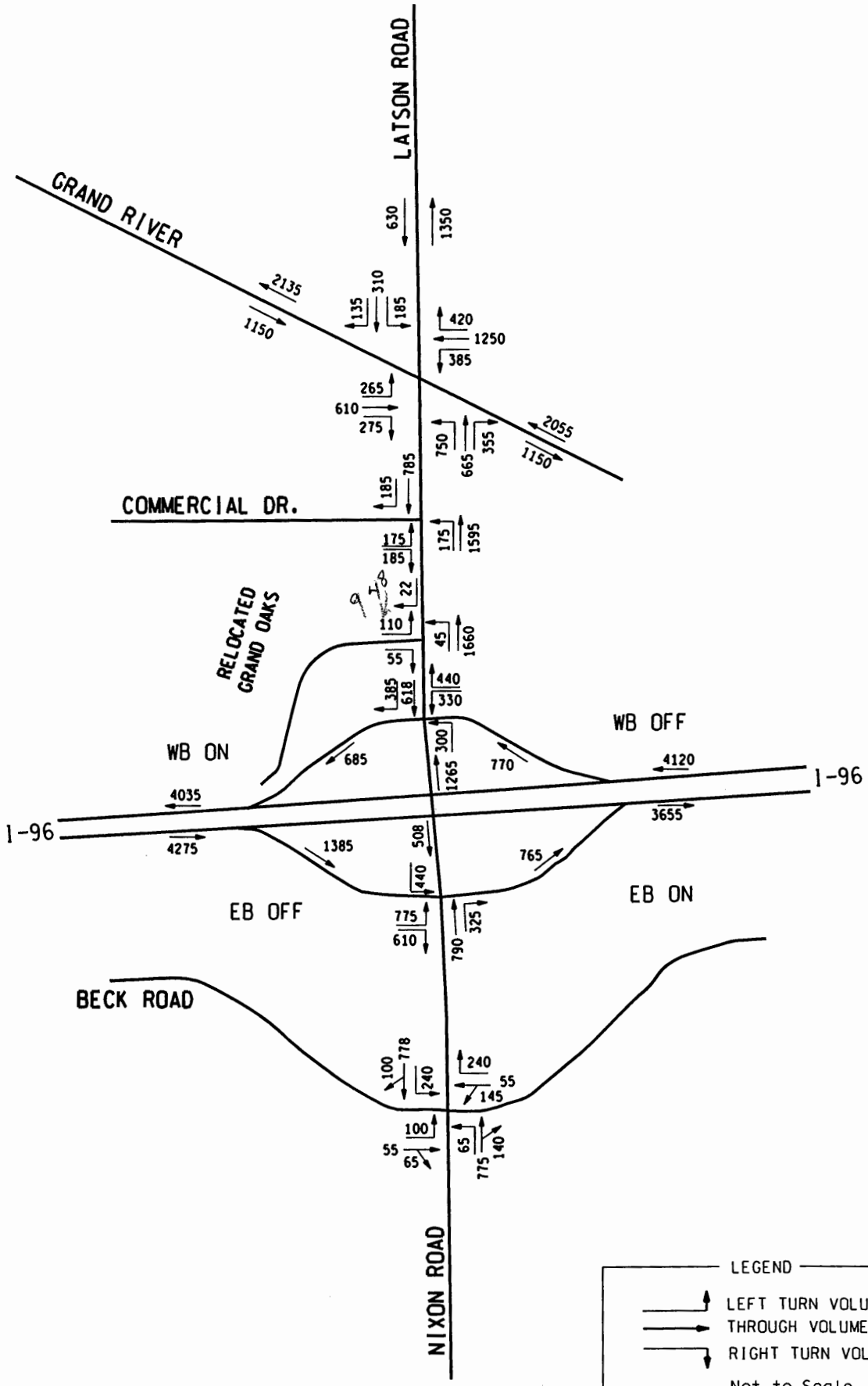
N

Not to Scale

MDOT
Michigan Department of Transportation
Project Planning

I-96 / Latson Road
Proposed Interchange

2030 AM PEAK HOUR
Traffic Volumes



MDOT
Michigan Department of Transportation
Project Planning

I-96 / Latson Road Proposed Interchange

2030 PM PEAK HOUR Traffic Volumes

APPENDIX G

HIGHWAY CAPACITY SOFTWARE REPORTS

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JJS*
Agency/Co.	*Wilcox Professional Services*
Date Performed	*11/7/2008*
Analysis Time Period	*2010 AM Peak*

Site Information

Intersection	*WB I-96 @ Latson Interchange*
Jurisdiction	*MDOT*
Analysis Year	*2010 AM Peak*

Project Description *I-96 @ Latson Interchange*

East/West Street: *WB I-96 Off Ramp* | North/South Street: *Latson Road*

Intersection Orientation: *North-South* | Study Period (hrs): *1.00*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*270*	*415*			*655*	*610*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*86*	*0*	*184*
Percent Heavy Vehicles	*0*	--	--	*7*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*80*		*170*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*711*	*663*	*293*	*451*	*0*
Percent Heavy Vehicles	*7*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (veh/h)	*293*		*86*		*184*			
C (m) (veh/h)	*506*		*57*		*783*			
v/c	*0.58*		*1.51*		*0.23*			
95% queue length	*3.98*		*20.72*		*0.92*			
Control Delay (s/veh)	*21.8*		*1143*		*11.0*			
LOS	*C*		*F*		*B*			
Approach Delay (s/veh)	--	--	*371.7*					
Approach LOS	--	--	*F*					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JJS*
Agency/Co.	*Wilcox Professional Services*
Date Performed	*11/7/2008*
Analysis Time Period	*2010 PM Peak*

Site Information

Intersection	*WB I-96 @ Latson Interchange*
Jurisdiction	*MDOT*
Analysis Year	*2010 PM Peak*

Project Description *I-96 @ Latson Interchange*

East/West Street: *WB I-96 Off Ramp* North/South Street: *Latson Road*

Intersection Orientation: *North-South* Study Period (hrs): *1.00*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*170*	*790*			*475*	*300*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*163*	*0*	*255*
Percent Heavy Vehicles	*0*	--	--	*7*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*150*		*235*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*516*	*326*	*184*	*858*	*0*
Percent Heavy Vehicles	*7*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (veh/h)	*184*		*163*		*255*			
C (m) (veh/h)	*802*		*91*		*580*			
v/c	*0.23*		*1.79*		*0.44*			
95% queue length	*0.89*		*41.84*		*2.32*			
Control Delay (s/veh)	*10.8*		*1553*		*16.1*			
LOS	*B*		*F*		*C*			
Approach Delay (s/veh)	--	--	*615.5*					
Approach LOS	--	--	*F*					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*jjs*
Agency/Co.	*Wilcox Professional Services*
Date Performed	*11/7/2008*
Analysis Time Period	*2010 AM Peak*

Site Information

Intersection	*EB I-96 @ Latson Interchange*
Jurisdiction	*MDOT*
Analysis Year	*2010 Am Peak*

Project Description *I-96 @ Latson Interchange*

East/West Street: *EB I-96 Off Ramp* | North/South Street: *Latson Road*

Intersection Orientation: *North-South* | Study Period (hrs): *1.00*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*455*	*150*	*295*	*440*	
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*304*	*0*	*163*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	--	--	*7*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*280*		*150*			
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*320*	*478*	*0*	*0*	*494*	*163*
Percent Heavy Vehicles	*7*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (veh/h)		*320*				*304*		*163*
C (m) (veh/h)		*893*				*85*		*768*
v/c		*0.36*				*3.58*		*0.21*
95% queue length		*1.67*				*113.52*		*0.81*
Control Delay (s/veh)		*11.3*				*4743*		*10.9*
LOS		*B*				*F*		*B*
Approach Delay (s/veh)	--	--				*3091*		
Approach LOS	--	--				*F*		

HCS+™ Version 5.2

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*jjs*
Agency/Co.	*Wilcox Professional Services*
Date Performed	*11/7/2008*
Analysis Time Period	*2010 PM Peak*

Site Information

Intersection	
Jurisdiction	*MDOT*
Analysis Year	*2010 PM Peak*

Project Description *I-96 @ Latson Interchange*

East/West Street: *EB I-96 Off Ramp* North/South Street: *Latson Road*

Intersection Orientation: *North-South* Study Period (hrs): *1.00*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*445*	*150*	*325*	*300*	
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*559*	*0*	*380*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	--	--	*7*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*515*		*350*			
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*353*	*326*	*0*	*0*	*483*	*163*
Percent Heavy Vehicles	*7*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (veh/h)		*353*				*559*		*380*
C (m) (veh/h)		*902*				*93*		*859*
v/c		*0.39*				*6.01*		*0.44*
95% queue length		*1.92*				*236.54*		*2.36*
Control Delay (s/veh)		*11.6*				*9109*		*12.5*
LOS		*B*				*F*		*B*
Approach Delay (s/veh)	--	--				*5428*		
Approach LOS	--	--				*F*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	
Agency/Co.	*Wilcox Professional Services*
Date Performed	*11/7/2008*
Analysis Time Period	*2010 AM Peak*

Site Information

Intersection	*Nixon at Beck*
Jurisdiction	*MDOT*
Analysis Year	*2010 Am Peak*

Project Description *Nixon at Beck*

East/West Street: *Beck* | North/South Street: *Nixon Road*

Intersection Orientation: *North-South* | Study Period (hrs): *1.00*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*45*	*435*	*70*	*110*	*430*	*50*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*65*	*43*	*48*	*65*	*43*	*119*
Percent Heavy Vehicles	*0*	--	--	*7*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*60*	*40*	*45*	*60*	*40*	*110*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*119*	*467*	*54*	*48*	*472*	*76*
Percent Heavy Vehicles	*7*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*L*		*TR*	*L*		*TR*
v (veh/h)	*48*	*119*	*65*		*162*	*65*		*91*
C (m) (veh/h)	*1056*	*984*	*102*		*320*	*89*		*220*
v/c	*0.05*	*0.12*	*0.64*		*0.51*	*0.73*		*0.41*
95% queue length	*0.14*	*0.41*	*4.28*		*2.96*	*5.55*		*2.05*
Control Delay (s/veh)	*8.6*	*9.2*	*97.3*		*27.6*	*137.5*		*32.8*
LOS	*A*	*A*	*F*		*D*	*F*		*D*
Approach Delay (s/veh)	--	--	*47.6*			*76.4*		
Approach LOS	--	--	*E*			*F*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*jjs*
Agency/Co.	*Wilcox Professional Services*
Date Performed	*11/7/2008*
Analysis Time Period	*2010 PM Peak*

Site Information

Intersection	*Nixon at Beck*
Jurisdiction	*Livingston County*
Analysis Year	*2010 PM Peak*

Project Description *Nixon at Beck*

East/West Street: *Beck Road* | North/South Street: *Nixon Road*

Intersection Orientation: *North-South* | Study Period (hrs): *1.00*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*50*	*375*	*100*	*140*	*450*	*60*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*76*	*43*	*54*	*108*	*43*	*163*
Percent Heavy Vehicles	*0*	--	--	*7*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*70*	*40*	*50*	*100*	*40*	*150*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*152*	*489*	*65*	*54*	*407*	*108*
Percent Heavy Vehicles	*7*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*L*		*TR*	*L*		*TR*
v (veh/h)	*54*	*152*	*108*		*206*	*76*		*97*
C (m) (veh/h)	*1026*	*1013*	*87*		*338*	*68*		*202*
v/c	*0.05*	*0.15*	*1.24*		*0.61*	*1.12*		*0.48*
95% queue length	*0.17*	*0.53*	*19.02*		*4.39*	*12.86*		*2.64*
Control Delay (s/veh)	*8.7*	*9.2*	*637.3*		*31.9*	*506.9*		*39.0*
LOS	*A*	*A*	*F*		*D*	*F*		*E*
Approach Delay (s/veh)	--	--	*240.1*			*244.6*		
Approach LOS	--	--	*F*			*F*		

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	2030 AM Peak Westbound On Ramp	Freeway/Dir of Travel	I-96 Westbound On Ramp
Agency or Company	Wilcox Professional Services	Junction	I-96 at Latson
Date Performed	11/7/2008	Jurisdiction	MDOT
Analysis Time Period	2030 AM Peak	Analysis Year	2030 Am Peak

Project Description I-96 Westbound at Latson On Ramp

Site Information

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 4000 ft

V_u = 540 veh/h

Terrain: Level

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1835	0.90	Level	10	0	0.952	1.00	2141
Ramp	1205	0.90	Level	6	0	0.971	1.00	1379
UpStream	540	0.90	Level	6	0	0.971	1.00	618
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = 767.56 (Equation 25-2 or 25-3)

P_{FM} = 0.614 using Equation (Exhibit 25-5)

V_{12} = 1316 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3520	See Exhibit 25-7	No
V_{R12}	2695	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 17.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.286 (Exibit 25-19)

S_R = 62.0 mph (Exhibit 25-19)

S_0 = 68.8 mph (Exhibit 25-19)

S = 63.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	2030 AM Westbounf Off Ramp	Freeway/Dir of Travel	I-96 Westbound
Agency or Company	Wilcox Professional Services	Junction	Latson Raod Interchange
Date Performed	11/6/2008	Jurisdiction	MDOT
Analysis Time Period	2030 AM Westbound	Analysis Year	2030 AM

Project Description I-96 at Latson Westbound OffRamp

Inputs

Upstream Adj Ramp	Terrain: Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 4000 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 1205 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2375	0.90	Level	10	0	0.952	1.00	2771
Ramp	540	0.90	Level	6	0	0.971	1.00	618
UpStream								
DownStream	1205	0.90	Level	6	0	0.971	1.00	1379

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.662 using Equation (Exhibit 25-11)

V_{12} = 2044 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	2771	7200	No
V_{12}	2044	4400:All	No
$V_{FO} = V_F - V_R$	2153	7200	No
V_R	618	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 10.0 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Estimation

D_s = 0.484 (Exhibit 25-19)

S_R = 56.5 mph (Exhibit 25-19)

S_0 = 76.8 mph (Exhibit 25-19)

S = 60.7 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	2030 PM Peak Westbound On Ramp	Freeway/Dir of Travel	I-96 Westbound On Ramp
Agency or Company	Wilcox Professional Services	Junction	I-96 at Latson
Date Performed	11/7/2008	Jurisdiction	MDOT
Analysis Time Period	2030PM Peak	Analysis Year	2030 PM Peak

Project Description I-96 Westbound at Latson On Ramp

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 4000 ft
Vu = 540 veh/h

Terrain: Level

S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3350	0.90	Level	10	0	0.952	1.00	3908
Ramp	685	0.90	Level	6	0	0.971	1.00	784
UpStream	540	0.90	Level	6	0	0.971	1.00	618
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1018.37 (Equation 25-2 or 25-3)
P_{FM} = 0.614 using Equation (Exhibit 25-5)
V_{12} = 2401 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4692	See Exhibit 25-7	No
V_{R12}	3185	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 21.7 (pc/mi/ln)
LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.323 (Exibit 25-19)
S_R = 61.0 mph (Exhibit 25-19)
S_0 = 66.4 mph (Exhibit 25-19)
S = 62.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-11)
V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	2030 PM Westbounf Off Ramp	Freeway/Dir of Travel	I-96 Westbound
Agency or Company	Wilcox Professional Services	Junction	Latson Raod Interchange
Date Performed	11/6/2008	Jurisdiction	MDOT
Analysis Time Period	2030 PM Westbound	Analysis Year	2030 PM

Project Description I-96 at Latson Westbound OffRamp

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp
☐ Yes ☑ On
☐ No ☐ Off
L_{down} = 4000 ft
V_D = 1205 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4120	0.90	Level	10	0	0.952	1.00	4807
Ramp	770	0.90	Level	6	0	0.971	1.00	881
UpStream								
DownStream	1205	0.90	Level	6	0	0.971	1.00	1379

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.599 using Equation (Exhibit 25-11)

V_{12} = 3234 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4807	7200	No
V_{12}	3234	4400:All	No
$V_{FO} = V_F - V_R$	3926	7200	No
V_R	881	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 20.2 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.507 (Exhibit 25-19)

S_R = 55.8 mph (Exhibit 25-19)

S_0 = 74.6 mph (Exhibit 25-19)

S = 60.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	2030 AM Eastbounf Off Ramp	Freeway/Dir of Travel	I-96 Eastbound
Agency or Company	Wilcox Professional Services	Junction	Latson Raod Interchange
Date Performed	11/6/2008	Jurisdiction	MDOT
Analysis Time Period	2030 AM Eastbnound	Analysis Year	2030 AM
Project Description	I-96 at Latson Eastbound Off Ramp		

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Level

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 4000 ft

V_D = 615 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3790	0.90	Level	10	0	0.952	1.00	4422
Ramp	670	0.90	Level	6	0	0.971	1.00	767
UpStream								
DownStream	615	0.90	Level	6	0	0.971	1.00	704

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.614 using Equation (Exhibit 25-11)

V_{12} = 3012 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4422	7200	No
V_{12}	3012	4400:All	No
$V_{FO} = V_F - V_R$	3655	7200	No
V_R	767	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$

D_R = 18.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

D_s = 0.497 (Exhibit 25-19)

S_R = 56.1 mph (Exhibit 25-19)

S_0 = 75.2 mph (Exhibit 25-19)

S = 61.0 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	2030 AM Peak Eastbound On Ramp	Freeway/Dir of Travel	I-96 Eastbound On Ramp
Agency or Company	Wilcox Professional Services	Junction	I-96 at Latson
Date Performed	11/7/2008	Jurisdiction	MDOT
Analysis Time Period	2030 AM Peak	Analysis Year	2030 Am Peak

Project Description I-96 Eastbound at Latson On Ramp

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1000 ft

V_u = 670 veh/h

Terrain: Level

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3120	0.90	Level	10	0	0.952	1.00	3640
Ramp	615	0.90	Level	6	0	0.971	1.00	704
UpStream	670	0.90	Level	6	0	0.971	1.00	767
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 943.90 (Equation 25-2 or 25-3)

P_{FM} = 0.614 using Equation (Exhibit 25-5)

V_{12} = 2237 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4344	See Exhibit 25-7	No
V_{R12}	2941	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 19.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.302 (Exibit 25-19)

S_R = 61.5 mph (Exhibit 25-19)

S_0 = 66.7 mph (Exhibit 25-19)

S = 63.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.0009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	2030 AM Eastbounf Off Ramp	Freeway/Dir of Travel	I-96 Eastbound
Agency or Company	Wilcox Professional Services	Junction	Latson Raod Interchange
Date Performed	11/6/2008	Jurisdiction	MDOT
Analysis Time Period	2030 PM Eastbnound	Analysis Year	2030 PM

Project Description I-96 at Latson Eastbound Off Ramp

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 4000 ft
V_D = 765 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4275	0.90	Level	10	0	0.952	1.00	4988
Ramp	1385	0.90	Level	6	0	0.971	1.00	1585
UpStream								
DownStream	765	0.90	Level	6	0	0.971	1.00	876

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}			
V_{R12}			

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Estimation

M_S = (Exibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.562 using Equation (Exhibit 25-11)
V_{12} = 3499 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$	4988	7200	No
V_{12}	3499	4400:All	No
$V_{FO} = V_F - V_R$	3403	7200	No
V_R	1585	2000	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.0009\ L_D$
D_R = 22.5 (pc/mi/ln)
LOS = C (Exhibit 25-4)

Speed Estimation

D_s = 0.571 (Exhibit 25-19)
S_R = 54.0 mph (Exhibit 25-19)
S_0 = 74.9 mph (Exhibit 25-19)
S = 58.9 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	2030 PM Peak Eastbound On Ramp	Freeway/Dir of Travel	I-96 Eastbound On Ramp
Agency or Company	Wilcox Professional Services	Junction	I-96 at Latson
Date Performed	11/7/2008	Jurisdiction	MDOT
Analysis Time Period	2030 PM Peak	Analysis Year	2030 PM Peak

Project Description I-96 Eastbound at Latson On Ramp

Site Information

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☐ No ☑ Off

L_{up} = 1000 ft

Vu = 670 veh/h

Terrain: Level

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2890	0.90	Level	10	0	0.952	1.00	3372
Ramp	765	0.90	Level	6	0	0.971	1.00	876
UpStream	670	0.90	Level	6	0	0.971	1.00	767
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 923.35 (Equation 25-2 or 25-3)

P_{FM} = 0.614 using Equation (Exhibit 25-5)

V_{12} = 2072 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	4248	See Exhibit 25-7	No
V_{R12}	2948	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 19.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.303 (Exibit 25-19)

S_R = 61.5 mph (Exhibit 25-19)

S_0 = 67.1 mph (Exhibit 25-19)

S = 63.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-11)

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI} = V_F$			
V_{12}			
$V_{FO} = V_F - V_R$			
V_R			

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

APPENDIX H

WARRANT ANALYSIS GRAPHS

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
Prepared by Wilcox Professional Services for the 2005 Edition of the MMUTCD

Intersection: WB I-96 RAMPS @ LATSON ROAD 2010 VOLUMES
City: 0

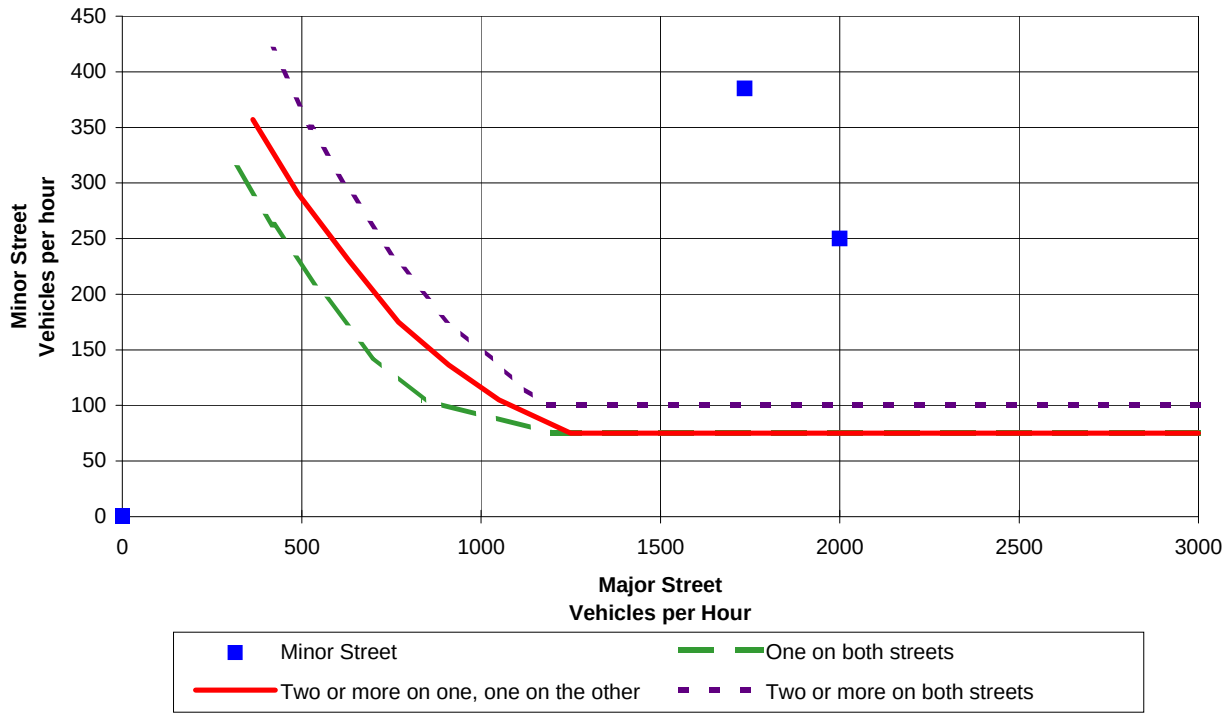
Warrant 3B - Peak Hour - 70%

The peak hour volume warrant is also intended for application when traffic conditions are such that for one hour of the day minor street traffic suffers undue traffic delay in entering or crossing the main street.

The peak hour volume warrant is satisfied when the plotted point representing vehicles per hour on the higher volume minor street for one hour falls above the curve in Figure 4C-4.

This Figure can be used if the 85th percentile speed of the major street exceeds 40 mph or when the intersection lies within a built-up area of an isolated community having a population less than 10,000.

Peak Hour volume warrant - Major and Minor Streets for Urban Locations - Warrant 3B



Can the 70% Warrant be used? **Yes**

Is Peak Hour Volume Warrant Met? **Yes**

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
Prepared by Wilcox Professional Services for the 2005 Edition of the MMUTCD

Intersection: EB I-96 RAMPS @ LATSON ROAD 2010 VOLUMES
City: 0

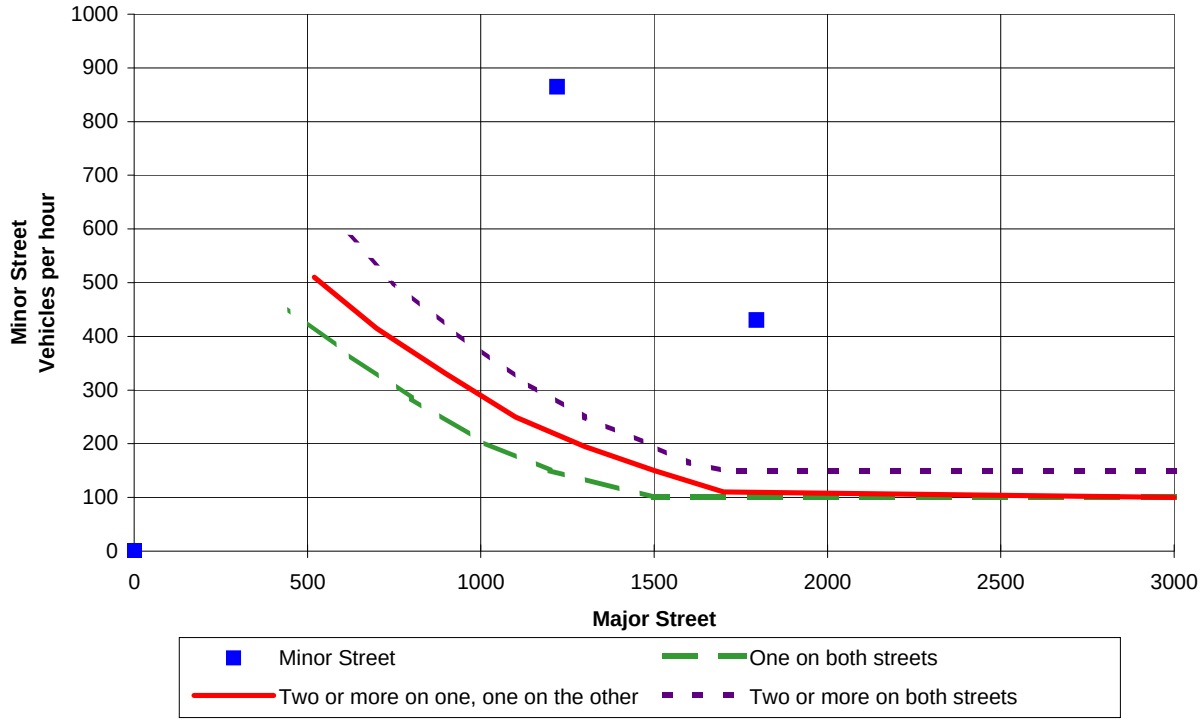
Warrant 3B - Peak Hour

The peak hour volume warrant is also intended for application when traffic conditions are such that for one hour of the day minor street traffic suffers undue traffic delay in entering or crossing the main street.

The peak hour volume warrant is satisfied when the plotted point representing vehicles per hour on the higher volume minor street for one hour falls above the curve in Figure 4C-3.

Figure 4C-4 may be used if the 85th percentile speed of the major street exceeds 40 mph or when the intersection lies within a built-up area of an isolated community having a population less than 10,000.

Peak Hour volume warrant - Major and Minor Streets for Urban Locations - Warrant 3B



Warrant 3 CAN be used because of Peak Hour Delay requirements.
(see Warrant 3A for more details).

Can the Peak Hour Volume Warrant be used? **Use 70%**
Is Peak Hour Volume Warrant Met? **YES**

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
Prepared by Wilcox Professional Services for the 2005 Edition of the MMUTCD

Intersection: Nixon @ Beck
City: 0

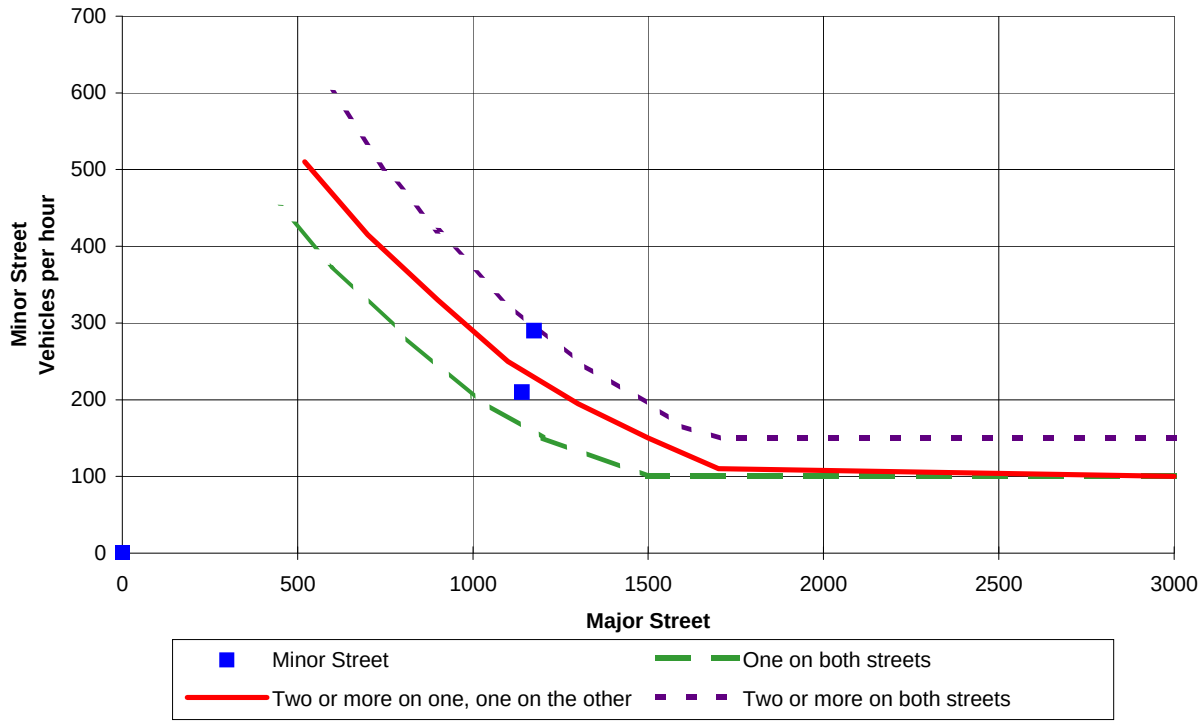
Warrant 3B - Peak Hour

The peak hour volume warrant is also intended for application when traffic conditions are such that for one hour of the day minor street traffic suffers undue traffic delay in entering or crossing the main street.

The peak hour volume warrant is satisfied when the plotted point representing vehicles per hour on the higher volume minor street for one hour falls above the curve in Figure 4C-3.

Figure 4C-4 may be used if the 85th percentile speed of the major street exceeds 40 mph or when the intersection lies within a built-up area of an isolated community having a population less than 10,000.

Peak Hour volume warrant - Major and Minor Streets for Urban Locations - Warrant 3B



Warrant 3 CAN be used because of Peak Hour Delay requirements.
(see Warrant 3A for more details).

Can the Peak Hour Volume Warrant be used? Yes
Is Peak Hour Volume Warrant Met? Yes


Wilcox