

August 8, 2022

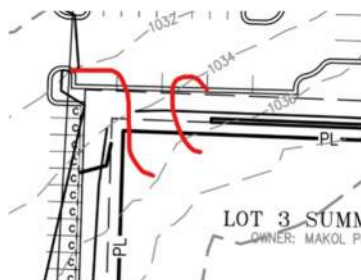
Brad Cooley, PE, RSP1
Senior Staff Engineer
City of Lee's Summit
220 SE Green Street
Lee's Summit, MO 64063

SUBJECT Traffic Study Comment Response
 Tudor Road Multifamily

Dear Mr. Cooley:

Thank you for your review comments on the Tudor Road Multifamily Traffic Study dated 06/22/2022. Below are responses to the comments:

1. Any redevelopment of Lot 3 will require the access from Douglas to be removed and internal access, through this development, be provided. The current plan shows a $\pm 4'$ retaining wall bordering Lot 3. Please show conceptually how internal access is planned for the future. **RESPONSE:** If Lot 3 re-develops in the future, access could be provided near the NW corner of Lot 3.



2. TIS: Please include a signal warrant analysis of Sloan/Main and Tudor. **RESPONSE:** Peak-hour signal warrant analysis was added to the TIS. A signal would not be warranted for any of the traffic volume scenarios.
3. Both driveways were discussed in the TIS and shown not complying with the AMC. The drive along Tudor is acceptable for aligning with the PD entrance across the road. However, the access along Commerce should be shifted to comply. If the access point will be located at the bottom of the hill, please provide sight distance analysis. **RESPONSE:** Driveway has been shifted to comply. The TIS has been updated to reflect new driveway location and sight distance was confirmed in the field at the new location.

-
4. The throat length at both of the proposed driveways is too small. Please review the parking lot to provide adequate space. **RESPONSE:** Throat lengths have been increased and are now acceptable. The TIS has been updated to reflect the new throat lengths.
 5. TIS: Trip distribution equals 85%. Please revise. **RESPONSE:** This was a typo in the report. The TIS has been updated to show the full 100% of distribution.
 6. The report and plan do not match. Please update the report to reflect the current site plan (additional buildings, units, etc.). **RESPONSE:** The TIS has been updated to match the current plan.

Attached is the updated traffic study. Please don't hesitate to contact me with any questions.

Respectfully submitted,

Merge Midwest Engineering, LLC

A handwritten signature in blue ink that reads 'Janelle M. Clayton'.

Janelle M. Clayton, P.E., PTOE
Manager / Co-Owner

TRAFFIC IMPACT STUDY

TUDOR ROAD MULTIFAMILY DEVELOPMENT

LEE'S SUMMIT, MISSOURI

Prepared For:
Phelps Engineering, Inc.

Prepared By:
Janelle Clayton, PE, PTOE

August 8, 2022



Table of Contents

INTRODUCTION	2
EXISTING CONDITIONS	3
PROPOSED CONDITIONS	5
ANALYSES	8
SUMMARY & RECOMMENDATIONS.....	10

List of Figures

VOLUMES

FIGURE 1	EXISTING TRAFFIC VOLUMES (AM & PM PEAK HOUR)
FIGURE 2	EXISTING + SITE TRAFFIC VOLUMES (AM PEAK HOUR)
FIGURE 3	EXISTING + SITE TRAFFIC VOLUMES (PM PEAK HOUR)
FIGURE 4	EXISTING + SITE + PLANNED TRAFFIC VOLUMES (AM PEAK HOUR)
FIGURE 5	EXISTING + SITE + PLANNED TRAFFIC VOLUMES (PM PEAK HOUR)
FIGURE 6	FUTURE + SITE + PLANNED TRAFFIC VOLUMES (AM PEAK HOUR)
FIGURE 7	FUTURE + SITE + PLANNED TRAFFIC VOLUMES (PM PEAK HOUR)

LEVELS OF SERVICE

FIGURE 8	EXISTING LEVELS OF SERVICE (AM PEAK HOUR)
FIGURE 9	EXISTING LEVELS OF SERVICE (PM PEAK HOUR)
FIGURE 10	EXISTING + SITE LEVELS OF SERVICE (AM PEAK HOUR)
FIGURE 11	EXISTING + SITE LEVELS OF SERVICE (PM PEAK HOUR)
FIGURE 12	EXISTING + SITE + PLANNED LEVELS OF SERVICE (AM PEAK HOUR)
FIGURE 13	EXISTING + SITE + PLANNED LEVELS OF SERVICE (PM PEAK HOUR)
FIGURE 14	FUTURE + SITE + PLANNED LEVELS OF SERVICE (AM PEAK HOUR)
FIGURE 15	FUTURE + SITE + PLANNED LEVELS OF SERVICE (PM PEAK HOUR)

INTRODUCTION

This traffic impact study presents the results of traffic analysis completed in conjunction with the Tudor Road Multifamily development. The development consists of eight four-story apartment buildings.

The proposed development is generally located in the southwest quadrant of the Douglas Street & Tudor Road intersection in Lee's Summit, Missouri. The approximate location of the proposed development is shown in the Google Earth image below.



This study analyzed the traffic impacts at the following intersections:

- a. Ward Road & Tudor Road
- b. Tudor Road & Commerce Drive / Sloan Street-Realigned Main Street
- c. Tudor Road & Proposed Drive 1 / Existing Gated Police Station Entrance
- d. Tudor Road & Douglas Street
- e. Douglas Street & Chipman Road
- f. Chipman Road & Commerce Drive
- g. Commerce Drive & Proposed Drive 2

The City has requested that traffic for the planned *Lee's Summit Logistics* development located in the northwest quadrant of the intersection of Tudor Road & Sloan Street be included in the analysis. Therefore, the following volume scenarios were analyzed:

- a. Existing
- b. Existing + Tudor Road Multifamily Site
- c. Existing + Tudor Road Multifamily Site + Planned *Lee's Summit Logistics* Development
- d. Future + Tudor Road Multifamily Site + Planned *Lee's Summit Logistics* Development

EXISTING CONDITIONS

Existing Traffic Volumes: Existing AM and PM peak-hour traffic volumes at the following intersections were recorded by Gewalt-Hamilton Associates (GHA) via video camera during the hours of 7:00-9:00 AM and 4:00-6:00 PM on Tuesday, June 7th, 2022. The counts were processed by Miovision Technologies, Inc. and can be found in the Appendix. The resulting peak hours of the intersections are listed below:

Intersection	AM Peak Hour	PM Peak Hour
Ward Road & Tudor Road	7:30 – 8:30 AM	4:45 – 5:45 PM
Tudor Road & Main St	7:30 – 8:30 AM	4:45 – 5:45 PM
Tudor Road & Douglas Street	7:15 – 8:15 AM	4:30 – 5:30 PM
Chipman Rd & Douglas Street	8:00 – 9:00 AM	4:30 – 5:30 PM
Chipman Road & Commerce Dr	8:00 – 9:00 AM	4:30 – 5:30 PM

The nearby interchange of Chipman Road & US-50 is currently under construction. Chipman Road is closed to the west of the site to US-50. Detours are currently being utilized on adjacent roadways to the site. Historic traffic counts at the intersections of Tudor Road & Douglas Street, Chipman Road & Douglas Street, and Chipman Road & Commerce Drive were provided by City staff to compare to the existing recorded counts.

The traffic study completed for the planned *Lee's Summit Logistics* development also included some existing traffic counts from June 2nd, 2021. The existing counts provided in the study also included traffic volumes from unbuilt portions of the *Summit Orchards* development. These adjusted existing traffic volumes were also compared to the existing recorded counts.

The higher volume for each movement from the existing counts, the historic counts, and the Lee's Summit Logistics existing counts was selected for each movement and balanced through the network to represent existing breaks in volumes between intersections. **Figure 1** depicts the adjusted existing AM and PM peak-hour traffic volumes.

According to *Exhibit 1 – Existing Land Use* in the City's *Thoroughfare Master Plan*, the existing parcel is a mix of agricultural, single-family residential and commercial land uses. *Exhibit 2 – Future Land Use* shows the parcel with a commercial (office/retail) land use. This site is mostly vacant today with the exception of the Advanced Risk Management building that fronts the west side of Douglas Road.

Existing Roadway Network: Current roadway characteristics near the study area are summarized in **Table 1**.

Table 1: Existing Roadway Characteristics

Roadway	Classification	Section	Median Type	Posted Speed Limit
Tudor Rd	Minor Arterial	4-Lane, Curb & Gutter	Median-Divided	35 mph
Ward Rd	Major Arterial	4-Lane, Curb & Gutter	Median-Divided	35 mph
Sloan	Local	2-Lane Grass Ditch	Undivided	25 mph
Commerce Dr	Commercial Collector	2-Lane Curb & Gutter	Undivided	25 mph
Douglas St	Major Arterial	4-Lane Curb & Gutter	Undivided South of Tudor Median-Divided North of Tudor	45 mph
Chipman Rd	Major Arterial	4-Lane Curb & Gutter	Median-Divided	45 mph

Classifications as shown on the City's Thoroughfare Master Plan

The existing traffic control at the study intersections are summarized in **Table 2** below:

Table 2: Current Intersection Control

Intersection	Intersection Control
Ward St & Tudor Rd	Traffic Signal
Tudor Rd & Sloan St / Commerce Dr	Stop-Control on Minor Approaches
Tudor Rd & Gated Police Station Entrance	Stop-Control on Minor Approach
Tudor Rd & Douglas St	Traffic Signal
Chipman Rd & Douglas St	Traffic Signal
Chipman Rd & Commerce Dr	Traffic Signal

It should be noted that the intersection of Tudor Road & Main Street will be vacated in the near future. Main Street will be realigned to connect to Sloan Street. For purposes of this study, the realigned configuration has been assumed as the existing condition.

Existing Multimodal Facilities: According to *Exhibit 3 – Greenway Master Plan* in the City’s *Thoroughfare Master Plan*, Tudor Road and Chipman Road have a multi-use trail, and portions of these roadways near the development site are considered “Planned Community Connectors”. Commerce Drive is also considered a “Planned Community Connector”.

Exhibit 4 – Bicycle Transportation Plan in the City’s *Thoroughfare Master Plan* indicates Tudor Road has an Existing Route (Path) along the frontage of the proposed development as well as a Planned Route (Path) and a Planned Route (Street Accommodation). Chipman Road has an Existing Route (Path). The portion of Commerce Road from Chipman Road to Main Street has an Existing Route (Street Accommodation) and also has a Planned Route (Path).

The City contracts with the Kansas City Area Transportation Authority (KCATA) to provide transit services. There is a RideKC Lee’s Summit Express park-and-ride lot located near US-50 Highway & Chipman Road.

PROPOSED CONDITIONS

Proposed Land Use: The proposed Tudor Road Multifamily development will consist of 358 units of apartments in eight separate 4-story buildings. The site plan for the proposed development is shown on **Exhibit 1**.

Proposed Access Plan: Two access driveways are proposed to serve the development and are summarized in **Table 3** below. Note: Distances taken from center of intersection.

Table 3: Proposed Site Access

Access Name	Intersecting Roadway	Access Type	Access Location
Drive 1	Tudor Road	Full Access	Approx. 365’ east of Commerce Drive / Sloan Street. Aligns with Police Station Entrance
Drive 2	Commerce Drive	Full Access	Approx. 352’ south of Tudor Road

According to the City’s *Access Management Code*, the minimum distance for a driveway along a minor arterial (Tudor Road) is 400’. Drive 1 would be 35’ shy of this distance. However, it is ideal to line up with the existing Police Station entrance rather than create another access point.

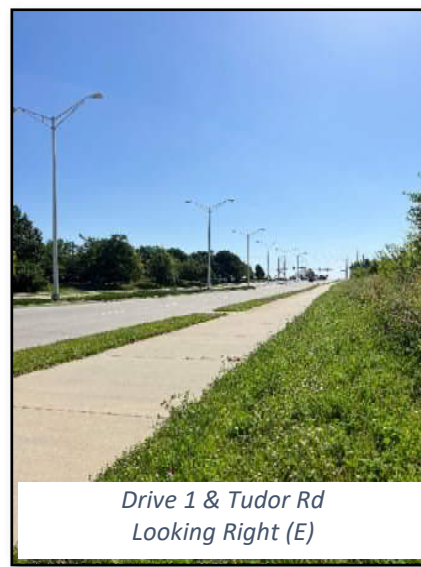
The minimum distance for a driveway on a commercial collector is 300'. The proposed location of Drive 2 satisfies the minimum spacing requirement.

Throat Distances: The driveway throat distance for Drive 1 is approximately 120' and the throat distance for Drive 2 is approximately 110'. The City's *Access Management Code* indicates that 75' throat length is desirable for a driveway that intersects a collector road (Commerce Drive) and 100' throat length is desirable for a driveway that intersects an arterial road (Tudor Road). Therefore, adequate throat lengths are provided.

Auxiliary Turn Lanes: According to the *Access Management Code*, a left-turn lane will be required at the intersection of Tudor Road & Drive 1. No other turn lanes are required per the *Access Management Code* or for capacity reasons at the driveway intersections.

Intersection Sight Distance: Intersection sight-distance measurements were taken in the field at the proposed driveway intersections. The City's *Access Management Code* indicated that 440' of sight distance is required for the intersection of Tudor Road & Drive 1. In addition, 280' of sight distance is required for the intersection of Commerce Drive & Drive 2. Adequate intersection sight distance is provided at all the driveway locations as shown in the photos below.

Drive 1 & Tudor Road



Drive 2 & Commerce Drive



Drive 2 & Commerce Dr
Looking Right (N)



Drive 2 & Commerce Dr
Looking Left (S)

Trip Generation: The estimated trip generation for the proposed Tudor Road Multifamily development was based upon the 11th Edition of the Institute of Transportation Engineers (ITE) *Trip Generation Manual*. **Table 4** depicts the trip generation for the site.

Table 4:
Proposed Trip Generation

				AM Peak Hour (VPH)			PM Peak Hour (VPH)		
Land Use	Qty	Unit	ADT (VPD)	TOTAL	IN	OUT	TOTAL	IN	OUT
221 – Multifamily Housing (Mid-Rise)	358	DU	1,661	146	34	112	140	85	55

Estimates of the expected trip distribution to and from the Tudor Road Multifamily development were based upon the available and planned street network and existing traffic flow. The trip-distribution patterns that were utilized are as follows:

- To/From the north via Ward Road 20%
- To/From the north via Sloan 5%
- To/From the north via Douglas Street 25%
- To/From the east via Tudor Road 15%
- To/From the south via Douglas Street 10%
- To/From the east via NW Chipman 10%
- To/From the south via Ward Road 15%

Existing + Site Traffic Volumes: The trips for the Tudor Road Multifamily development were added to the existing traffic volumes (adjusted as noted previously) to calculate the *Existing + Site* AM and PM peak-hour volumes and are shown on **Figures 2 & 3**, respectively.

Existing + Site + Planned Traffic Volumes: The expected development-related traffic volumes for the full buildout of the *Lee's Summit Logistics* development were added to the *Existing + Site* volumes to calculate the *Existing + Site + Planned* AM and PM peak-hour volumes. The resulting volumes are shown on **Figures 4 & 5**, respectively.

Future + Site + Planned Traffic Volumes: The existing traffic volumes, adjusted as noted previously, at the intersections of Ward Road & Tudor Road, Tudor Road & Douglas Street, and Douglas Street & Chipman Road, were grown at 2% per year for 20 years to develop the future background volumes. The volumes were then pushed through the other study intersections to increase the through volumes. The Tudor Road Multifamily development-related volumes and the expected development-related traffic volumes for the full buildout of the *Lee's Summit Logistics* development were added to the background future volumes to calculate the *Future + Site + Planned* AM and PM peak-hour volumes. The resulting volumes are shown on **Figures 6 & 7**, respectively.

ANALYSES

A series of intersection capacity analyses were completed at the study intersections to determine the expected levels of service, the lengths of delays, and the vehicle queues experienced by drivers. The study intersections were analyzed based upon the 6th Edition of the Transportation Research Board's (TRB) *Highway Capacity Manual*. A description of the level-of-service criteria used in these analyses is shown below:

Level of Service Definitions		
Level of Service	Signalized Intersection Average Control Delay (sec/veh)	Unsignalized Intersection Average Control Delay (sec/veh)
A	<10	<10
B	<20	<15
C	<35	<25
D	<55	<35
E	<80	<50
F	≥80	≥50

The amount of control delay is assigned a level of service based on driver acceptance, with LOS "A" representing little or no delay and LOS "F" representing long delays. The queues shown on the figures represent the 95th percentile queue, or the queue that has only a 5% chance of being exceeded during the peak hour. It should be noted that all completed analyses utilized the Synchro

11 software package, and analysis output is included in the Appendix attached to this report. Existing signal timings for the study intersections were provided by City Staff and the Mid-America Regional Council Operation Greenlight Staff. These timings were utilized in the analysis for all scenarios. The signalized intersections of Douglas Street & Chipman Road and Chipman Road & Commerce Drive are currently operating in coordination along Chipman Road. All other signalized intersections are running “FREE” during the peak hours.

Existing Traffic Conditions: Figures 8 & 9 depict the results of the completed analyses for the *Existing* AM and PM peak-hour traffic volume scenario. The completed analyses indicate that most of the intersections and individual movements at the study intersections currently operate at LOS “C” or better during the peak hours. The intersection of Tudor Road & Douglas Street currently operates at LOS “D” during the PM peak hour. This is due to the large volume of westbound right-turns at the intersection. The actual count showed 182 vehicles per hour (vph) turning right. The adjusted volume, reflecting the higher of the historic and the *Lee’s Summit Logistics* volume is 259 vph. There is not a separate westbound right-turn lane to serve this movement, which results in the lower level of service.

The eastbound and westbound left-turn movements at the intersection of Chipman Road & Commerce Drive currently operate at LOS “E” during the PM peak hour, but with minimal queues.

The eastbound left-turn movement at the intersection of Chipman Road & Douglas Street currently operates at LOS “E” during the PM peak hour, but with a queue that fits into existing storage.

Existing + Site Traffic Conditions: As shown on Figures 10 & 11, the completed analyses indicate that very similar operations to the *Existing* condition would be expected with the addition of the Tudor Multifamily site-generated traffic. LOS “C” or better would be expected for most movements and intersections except for the movements noted in the *Existing* conditions analysis.

Existing + Site + Planned Traffic Conditions: As shown on Figures 12 & 13, the completed analyses indicate that most of the individual movements at the study intersections would be expected to operate at LOS “C” or better during the peak hours for the *Existing + Site + Planned* scenario. As with the other scenarios, the westbound right-turn movement at the intersection of Douglas Street & Tudor Road, the eastbound and westbound left-turn movements at the intersection of Chipman Road & Commerce Drive and the eastbound left-turn lane at the intersection of Chipman Road & Douglas Street would continue to experience poor levels of service during the PM peak hour, but with queues that are contained in existing storage.

Future + Site + Planned Traffic Conditions: As shown on Figures 14 & 15, the completed analyses indicate that if volumes increase as projected, poor levels of service would be expected for the intersection of Tudor Road & Douglas Street and Chipman Road & Douglas Street. Geometric improvements will most likely need to be constructed to provide acceptable operations at these intersections in the future to achieve acceptable operations.

Some of the stop-controlled approaches at the unsignalized intersections would experience LOS “E” or LOS “F” during the peak hours, but with minimal queueing. It is not uncommon for side-street

movements to encounter longer wait times during the peak hours at unsignalized intersections. The delay values are not overly excessive, and the maximum queue would not exceed 100' (4 vehicles).

Tudor Road & Sloan/Main Street Peak-Hour Signal Warrant Analysis:

Due to the LOS "E" and "F" for the side-street approaches in the *Future + Site + Planned* scenario, the peak-hour signal warrant (Warrant 3 – *Manual on Uniform Traffic Control Devices* 2009 Edition), was analyzed. The analysis is included in the Appendix. The peak-hour warrant would not be met for any of the AM or PM traffic volume scenarios. It should be noted that it is not uncommon for drivers to experience longer delays and queues during peak-hour periods on the minor road approaches to a two-way stop-controlled intersection and further mitigation is not always necessary.

SUMMARY & RECOMMENDATIONS

This traffic study summarizes the anticipated traffic impacts of the proposed Tudor Road Multifamily development. The City requested that the traffic volumes for the approved adjacent *Lee's Summit Logistics* development be included in the analysis as "planned traffic" for the *Existing + Site + Planned* volume scenario.

In general, acceptable traffic operations can be expected throughout the study network with the addition of the Tudor Road Multifamily development and with the addition of the traffic from the full buildout of the Lee's Summit Logistics development.

A few of the movements at signalized intersections currently experience poor levels of service during the PM peak hour. The westbound right-turn movement at the intersection of Douglas Street & Tudor Road currently operates a LOS "F" during the PM peak hour due to the high volume of right-turns and no separate right-turn lane. The eastbound and westbound left-turn movements at the intersection of Chipman Road & Commerce Drive currently operate at LOS "E" during the PM peak hour, but with minimal queues. The eastbound left-turn movement at the intersection of Chipman Road & Douglas Street currently operates at LOS "E" during the PM peak hour, but with a queue that fits into existing storage. The addition of the site-generated traffic does not significantly degrade these movements.

To adhere to the City's *Access Management Code*, a westbound left-turn lane is required at the intersection of Tudor Road & Drive 1. The lane should be constructed to provide 200' of storage plus taper. No other turn lanes are recommended at the proposed driveway intersections.

Peak-hour traffic signal warrant analyses were completed for the intersection of Tudor Road & Sloan/Main Street. The peak-hour warrant would not be met for any of the traffic volume scenarios.

We appreciate the opportunity to serve you on this very important project. Please feel free to contact us if you should have any questions.

Respectfully submitted,

Merge Midwest Engineering, LLC

A handwritten signature in blue ink that reads "Janelle M. Clayton". The signature is written in a cursive, flowing style.

Janelle M. Clayton, P.E., PTOE
Manager / Co-Owner

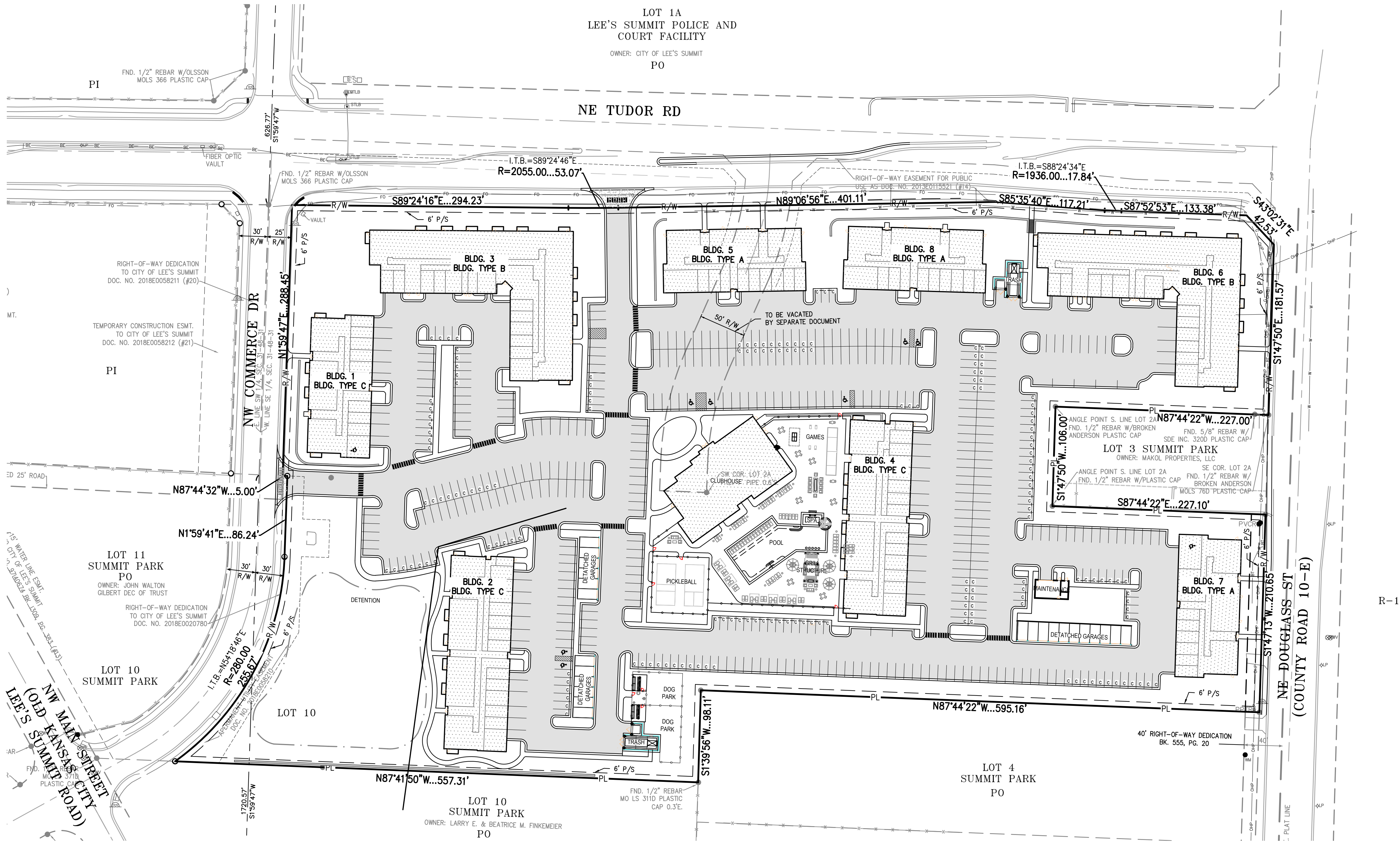
EXHIBIT 1

	INDEX
C1	SITE PLAN
C2-C3	SITE DIMENSION PLAN
C4	GRADING PLAN
C5	UTILITY PLAN
C6	STANDARD DETAILS

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SITE PLAN
TUDOR MULTIFAMILY



R-1

OIL-GAS WELLS:

ACCORDING TO THE MISSOURI DEPARTMENT OF NATURAL RESOURCES STATE OIL & GAS COUNCIL WELLS, LOCATED AT www.dnr.mo.gov/geology/geosrv/oilandgas.htm, THERE ARE NO OIL OR GAS WELLS ON THE PROPERTY SHOWN HEREON.

LEGAL DESCRIPTION:

All that part of the Southeast Quarter of Section 31, Township 48 North, Range 31 West, in the City of Lee's Summit, Jackson County, Missouri, being more particularly described as follows:

Beginning at the Southeast corner of Lot 2A, NEW LEE'S SUMMIT POLICE AND COURT FACILITY, a subdivision of land in the City of Lee's Summit, Jackson County, Missouri; thence N 87°44'22" W, a distance of 227.00 feet; thence S 01°47'50" W, a distance of 106.00 feet; thence S 87°44'22" E, a distance of 227.10 feet, to a point on the West Right-of-Way line of NE Douglas Street, as now established; thence S 01°47'13" W, along said West Right-of-Way line, a distance of 210.85 feet; thence N 87°44'22" W, a distance of 595.16 feet; thence S 01°39'58" W, a distance of 98.11 feet; thence N 87°41'50" W, a distance of 557.31 feet, to a point on the East Right-of-Way line of NW Commerce Drive, as now established; thence along said East Right-of-Way line for the following four (4) courses; thence Northeasterly on a curve to the left, said curve having an initial tangent bearing of N 87°41'46" E, and a radius of 280.00 feet, on arc distance of 255.67 feet; thence N 01°59'41" E, a distance of 86.24 feet; thence N 87°44'32" W, a distance of 5.00 feet; thence N 01°59'47" E, a distance of 288.45 feet, to a point on the South Right-of-Way line of NE Tudor Road, as now established; thence along said South Right-of-Way line for the following seven (7) courses; thence S 89°24'16" E, a distance of 294.23 feet; thence Easterly on a curve to the left, said curve having an initial tangent bearing of S 89°24'46" E, and a radius of 2055.00 feet, on arc distance of 53.07 feet; thence N 89°06'56" E, a distance of 401.11 feet; thence S 85°35'40" E, a distance of 117.21 feet; thence Easterly on a curve to the left, said curve having an initial tangent bearing of S 88°24'34" E and a radius of 1936.00 feet, on arc distance of 17.84 feet; thence S 87°52'53" E, a distance of 133.38 feet; thence S 43°02'31" E, a distance of 42.53 feet, to a point on the West Right-of-Way line of NE Douglas Street, as now established; thence S 01°47'50" W, along said West Right-of-Way, a distance of 181.57 feet, to the Point of Beginning, containing 567,567 square feet or 13.0295 acres, more or less, of unplatted land.

GROSS AREA = ±13.0295 ACRES / ±567,567 SQ.FT.

FLOOD NOTE:

THIS PROPERTY LIES WITHIN ZONE X, DEFINED AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON THE FLOOD INSURANCE RATE MAP PREPARED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY FOR THE CITY OF LEE'S SUMMIT, COMMUNITY NO. 290174, JACKSON COUNTY, MISSOURI, MAP NO. 29095C0417G, AND DATED JANUARY 20, 2017.

BUILDING & SITE DATA

LOT AREA	13.03 AC/567,567 SQ. FT.
PROPOSED ZONING	RP-4
NUMBER OF UNITS	358 UNITS
DENSITY (UNITS/ACRE)	27.47 DU/AC
TOTAL BUILDING SQ. FOOTAGE	243,096 SQ. FT.
FLOOR AREA RATIO (FAR)	0.43
(243,096 S.F./567,567 S.F.)	
% IMPERVIOUS	71.9%
(408,011 S.F./567,567 S.F.)	

PARKING CALCULATIONS

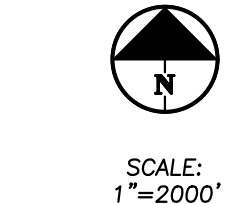
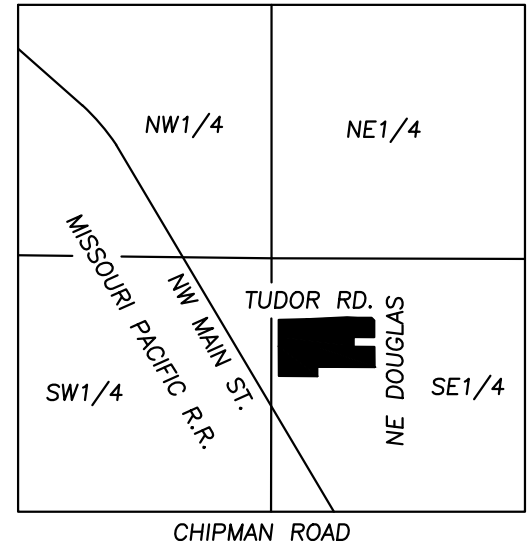
PARKING CALCULATIONS (CITY STANDARDS)

REQUIRED PARKING	716 SPACES
STUDIO	2 X 1.00 = 2
1 BDR.	209 X 1.50 = 314
2 BDR.	147 X 1.50 = 221
VISITOR	372 X 0.50 = 179

PROVIDED PARKING	622 SPACES
STANDARD	295
HANDICAP	7
COMPACT	168
DRIVEWAY	39
GARAGE (ATTACHED)	90
GARAGE (DETACHED)	23

LEGEND

- PL PROPERTY LINE
- LL LOT LINE
- R/W RIGHT-OF-WAY
- 2' CURB & GUTTER
- P/S PARKING SETBACK LINE
- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- RETAINING WALL
- FENCE - 6" PAINT COATED, DECORATIVE & ORNAMENTAL STEEL PICKET

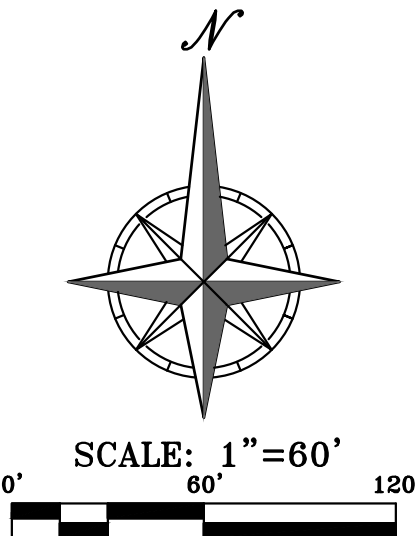


VICINITY MAP
SEC. 31-48N-31W



Know what's below.
Call before you dig.

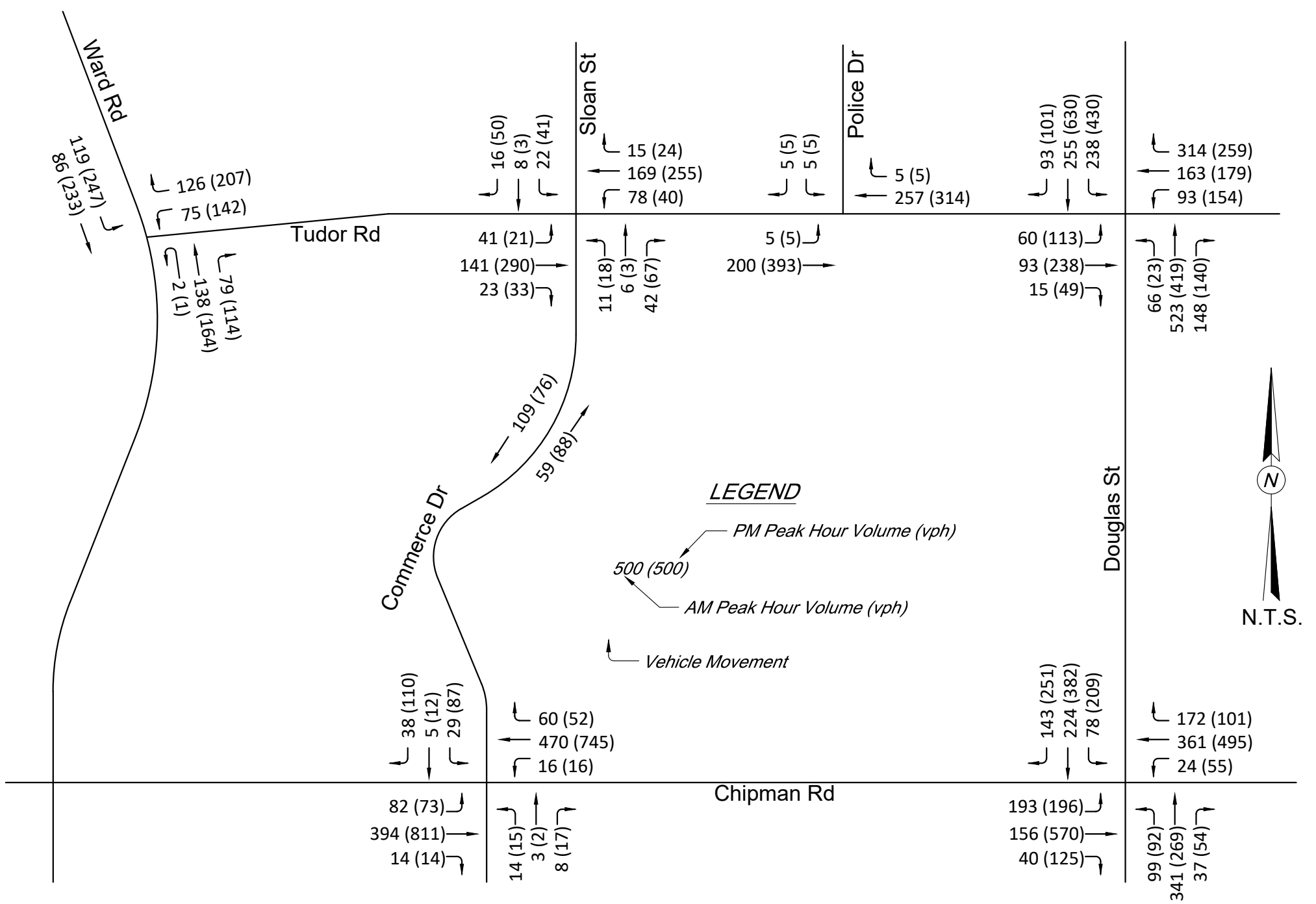
UTILITY NOTES:
VISUAL INDICATIONS OF UTILITIES ARE AS SHOWN.
UNDERGROUND LOCATIONS SHOWN, AS FURNISHED BY THEIR LESSORS, ARE APPROXIMATE AND SHOULD BE VERIFIED IN THE FIELD AT THE TIME OF CONSTRUCTION. FOR ACTUAL FIELD LOCATIONS OF UNDERGROUND UTILITIES CALL 811.

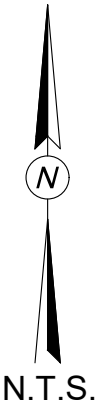
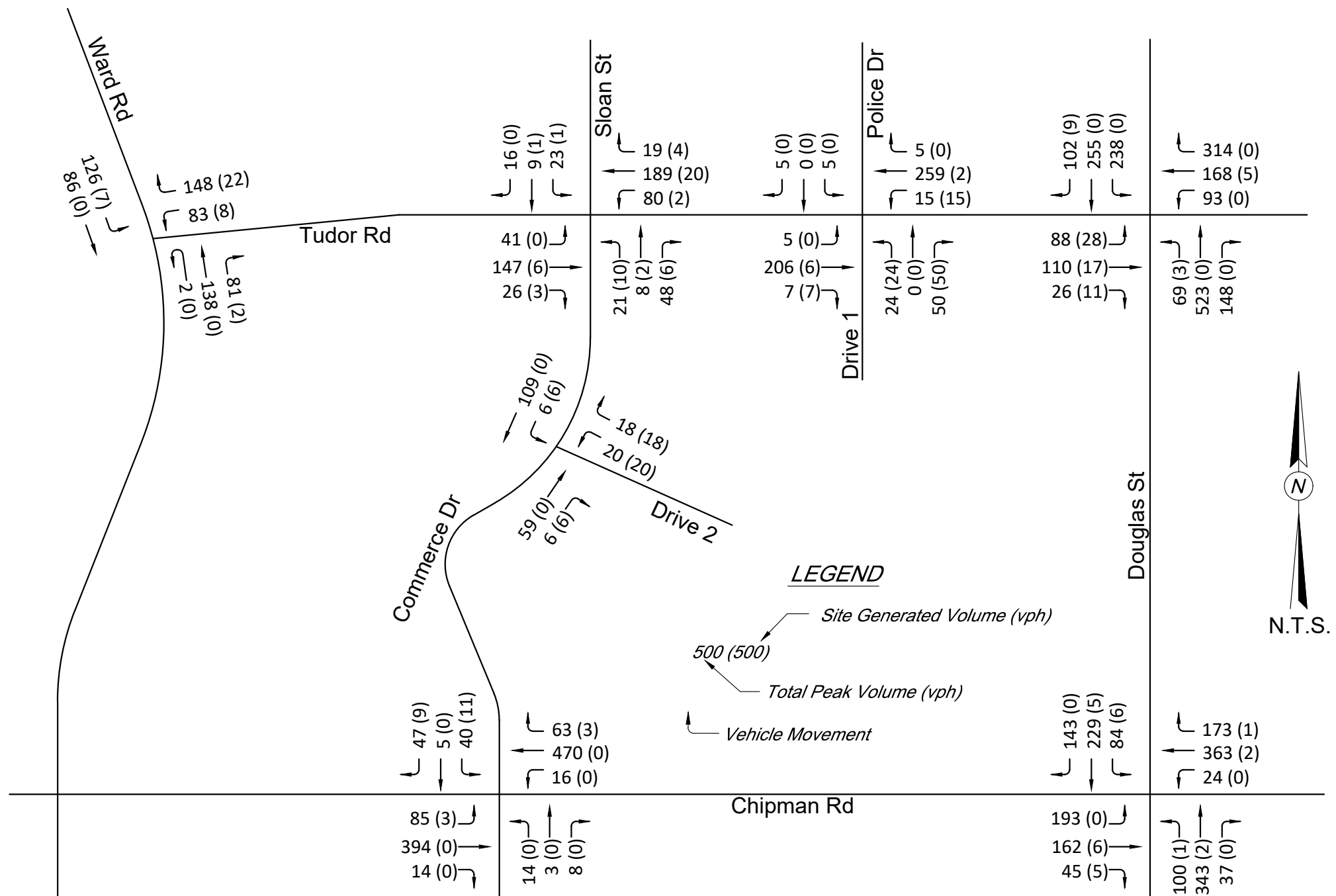


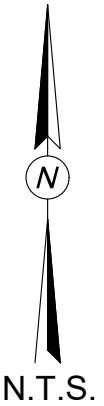
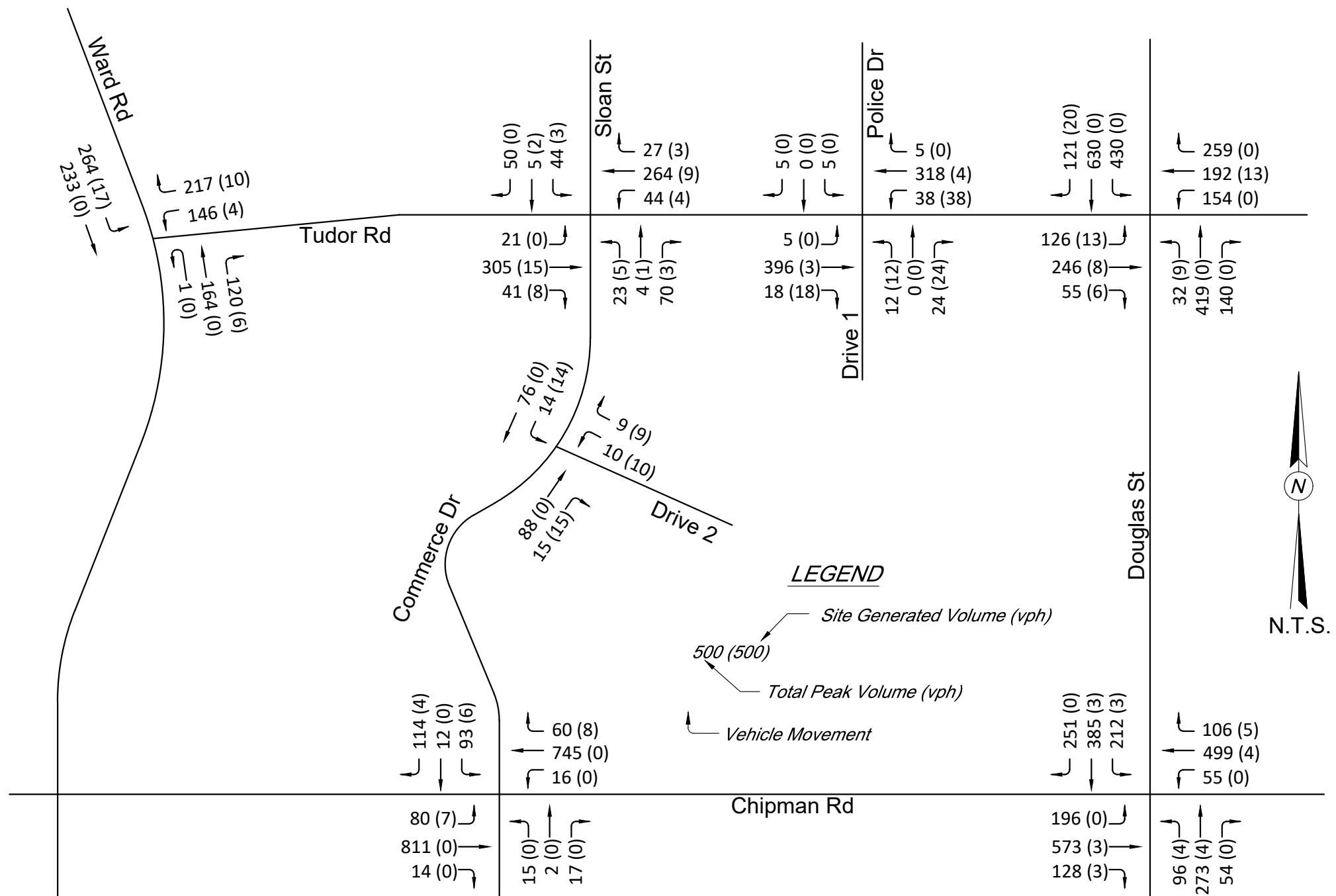
PROJECT NO.	220231	DATE	08-05-2022	DRAWN/BAG	CHECKED	DEU	APPROVED	DEU
CERTIFICATE OF AUTHORIZATION								
LAND SURVEYING - LS-82								
ENGINEERING - E-361								
CERTIFICATE OF AUTHORIZATION								
LAND SURVEYING-20070128								
ENGINEERING-20070028								

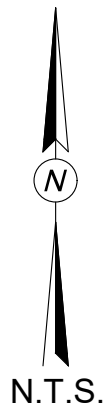
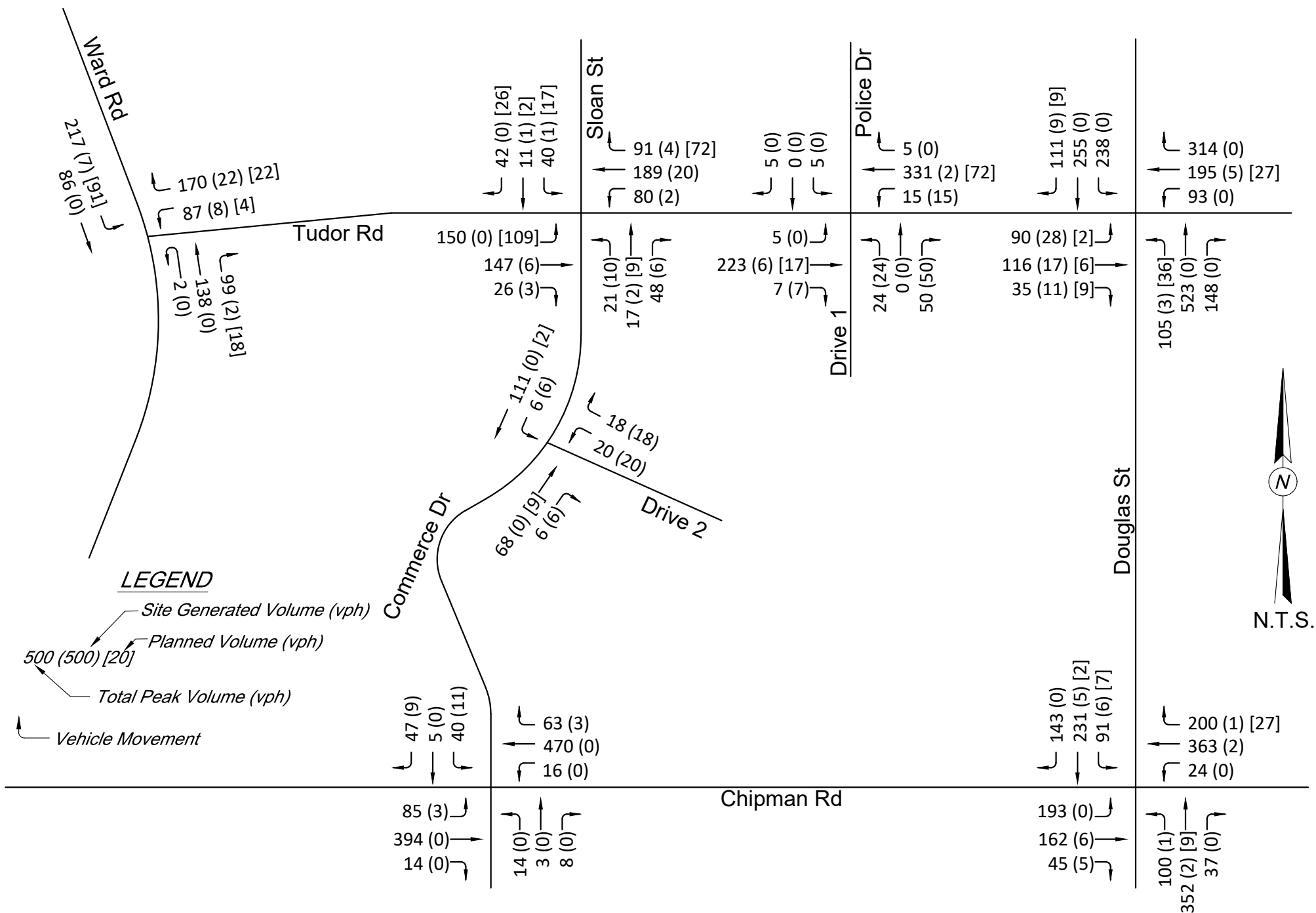
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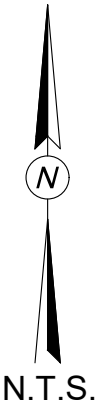
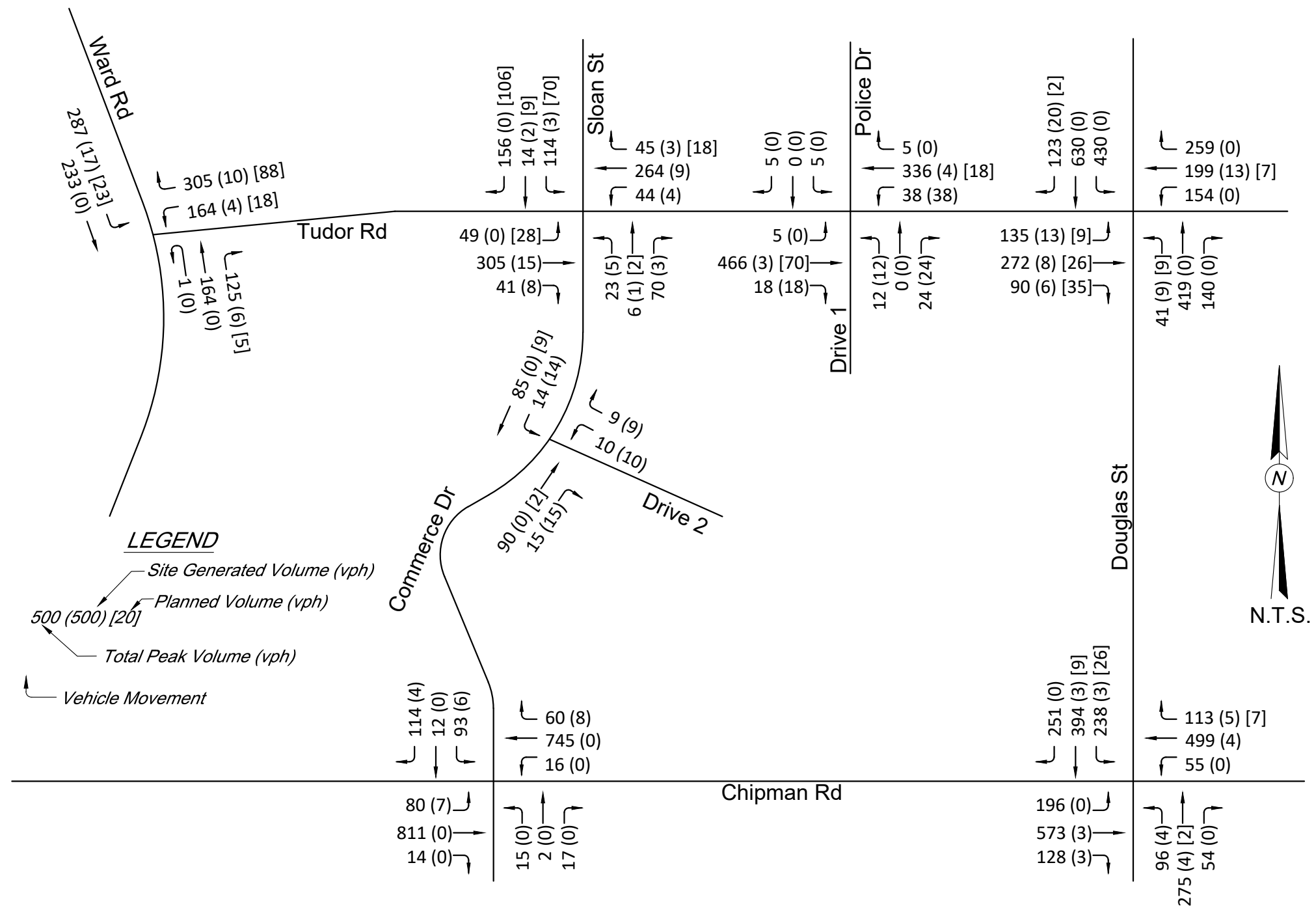
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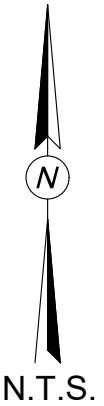
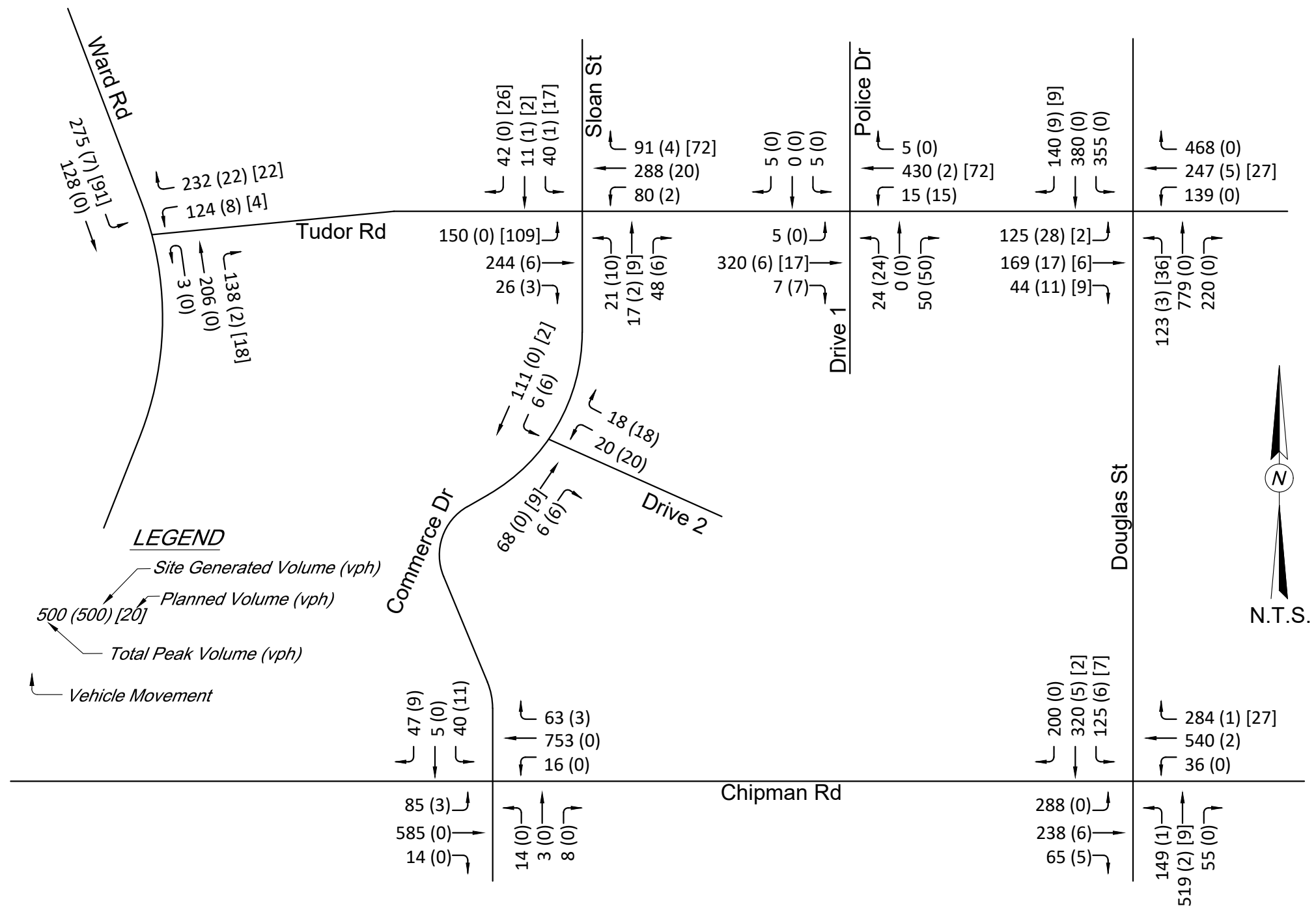


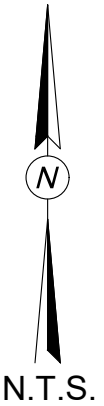
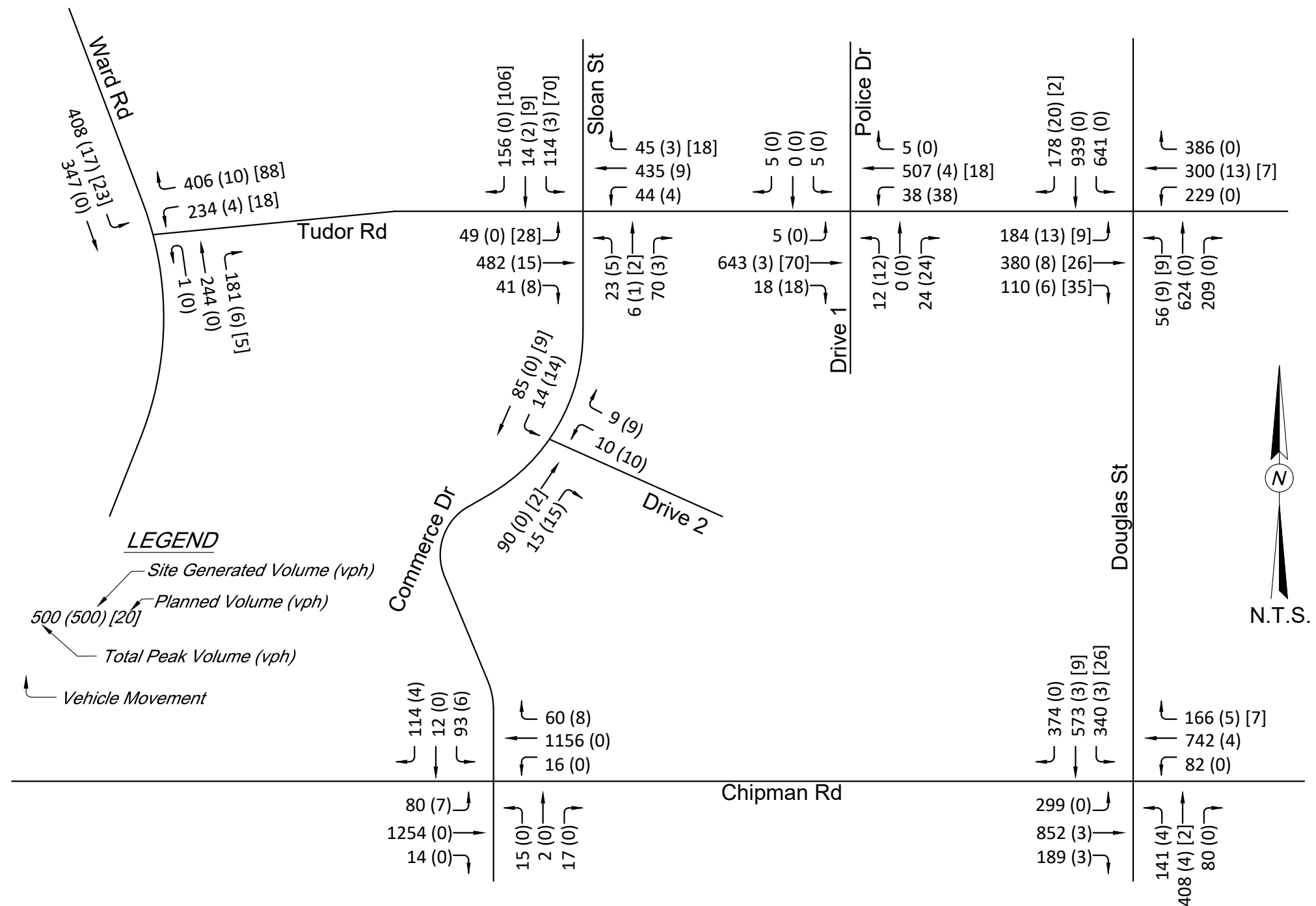


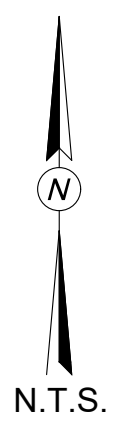
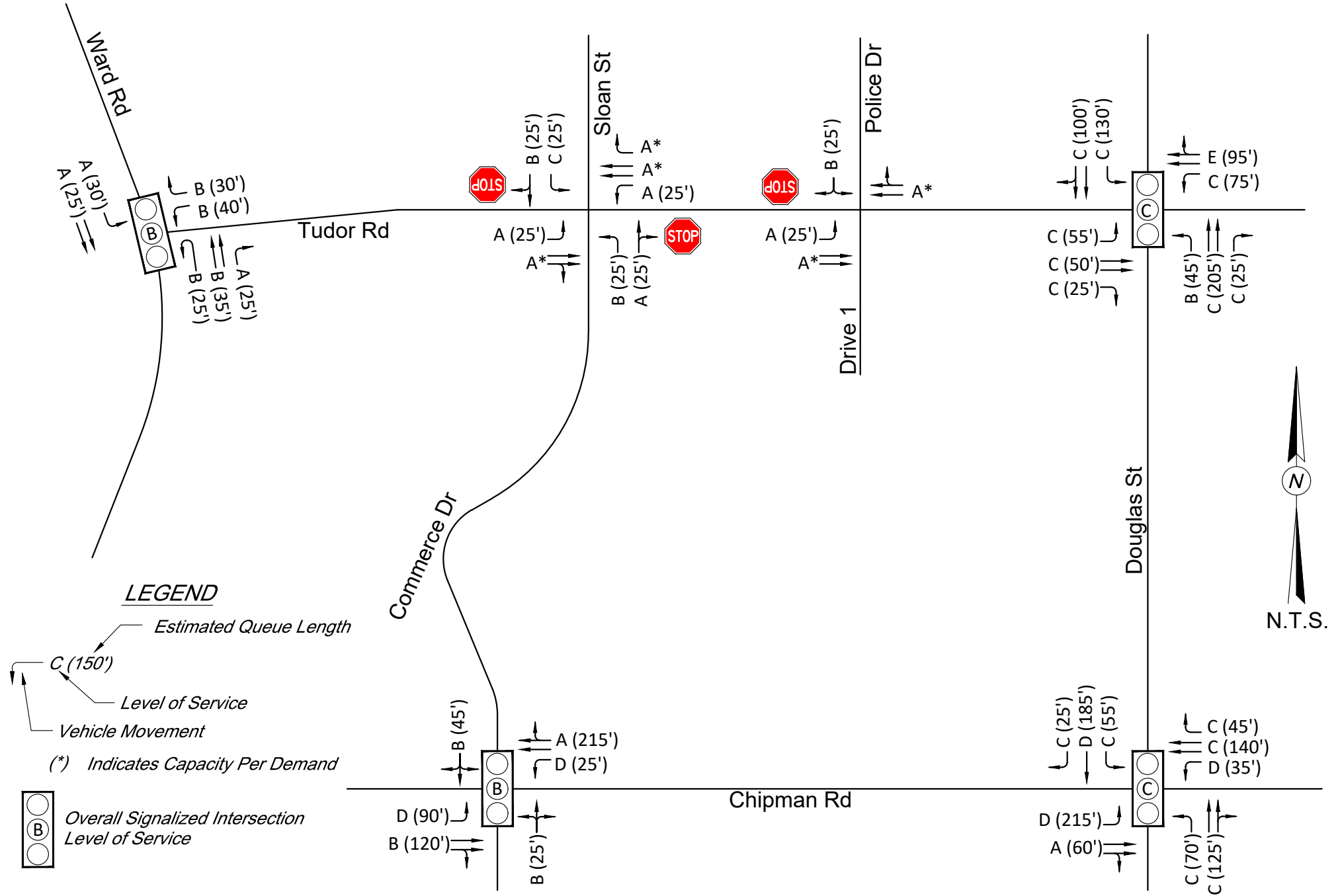


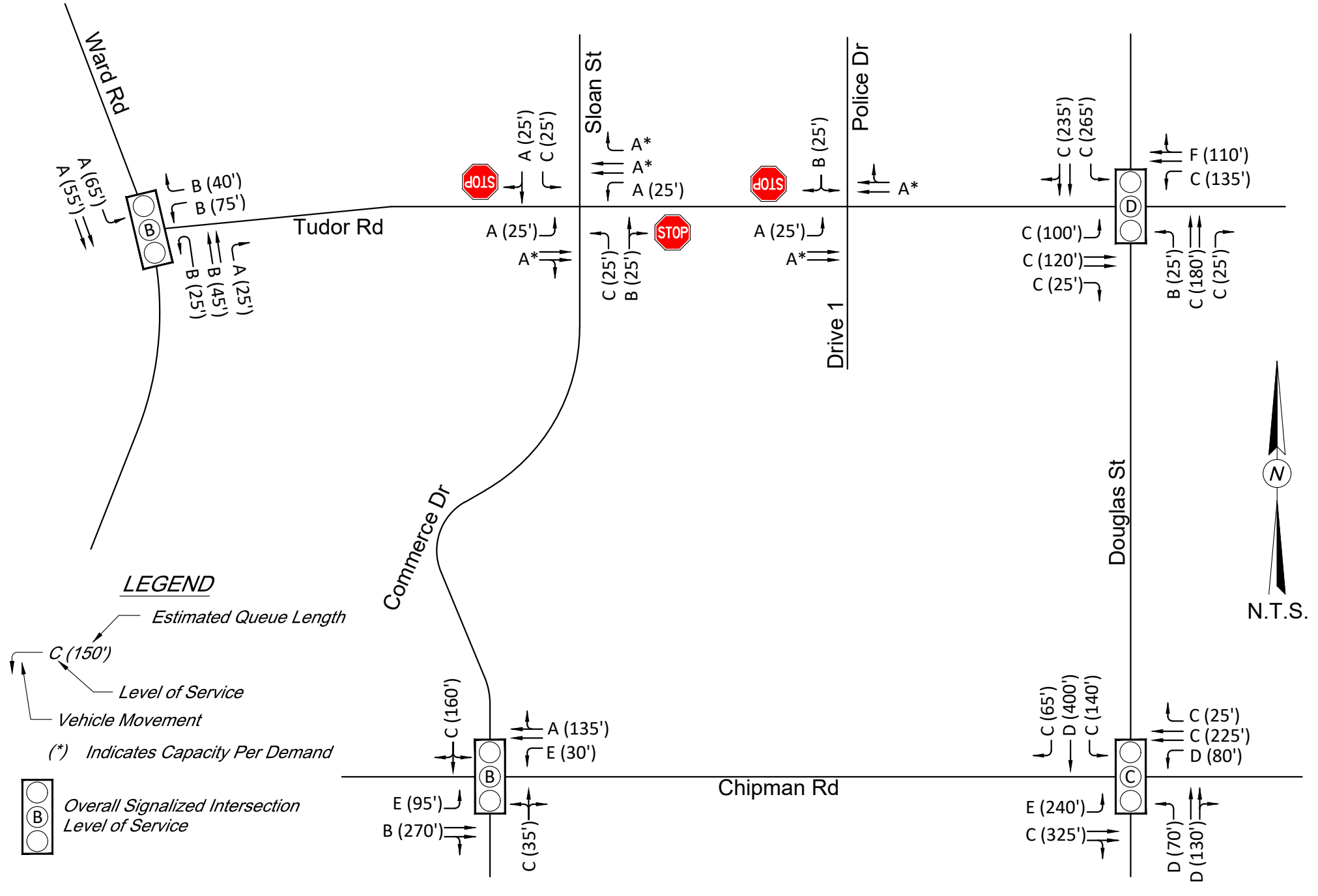


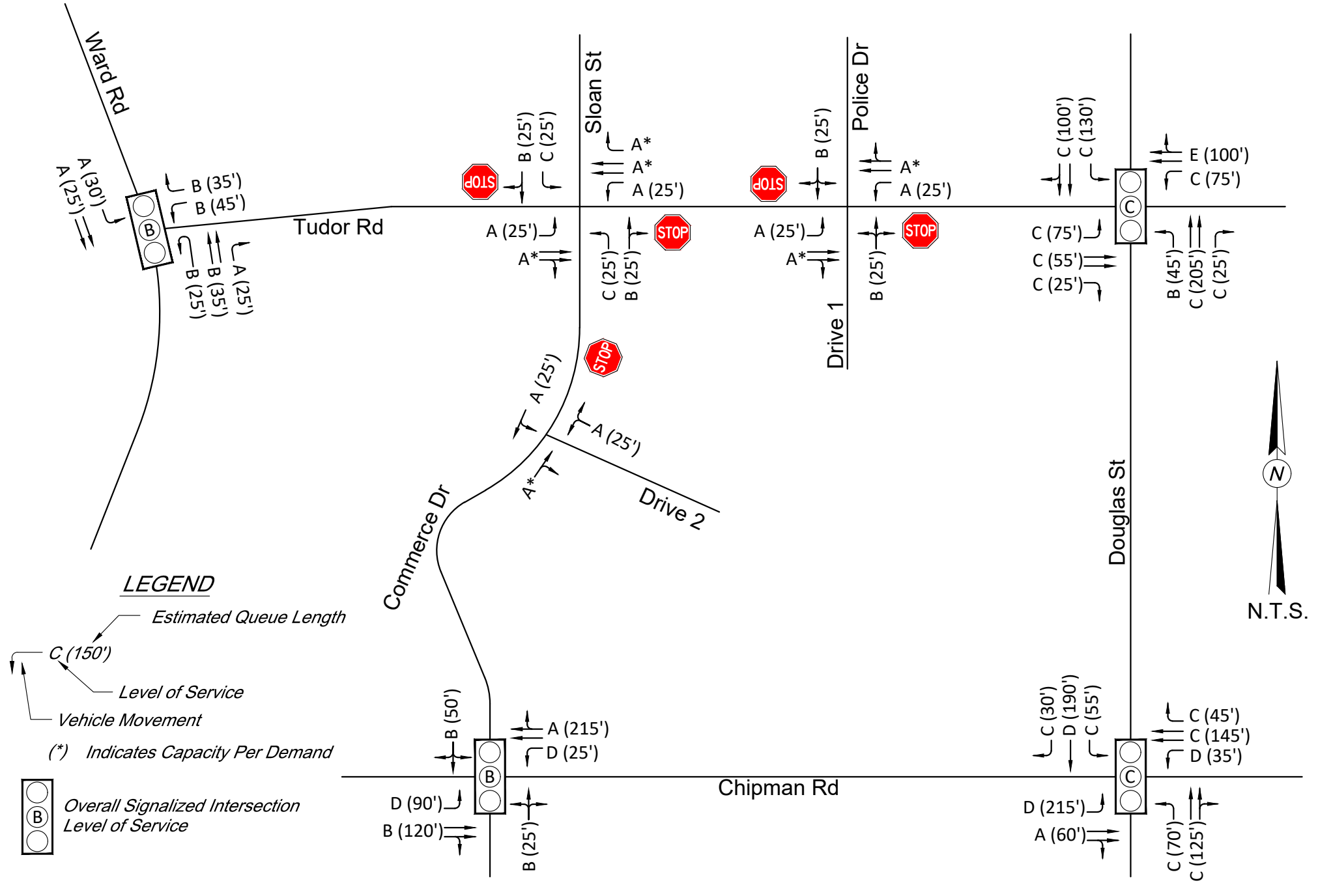


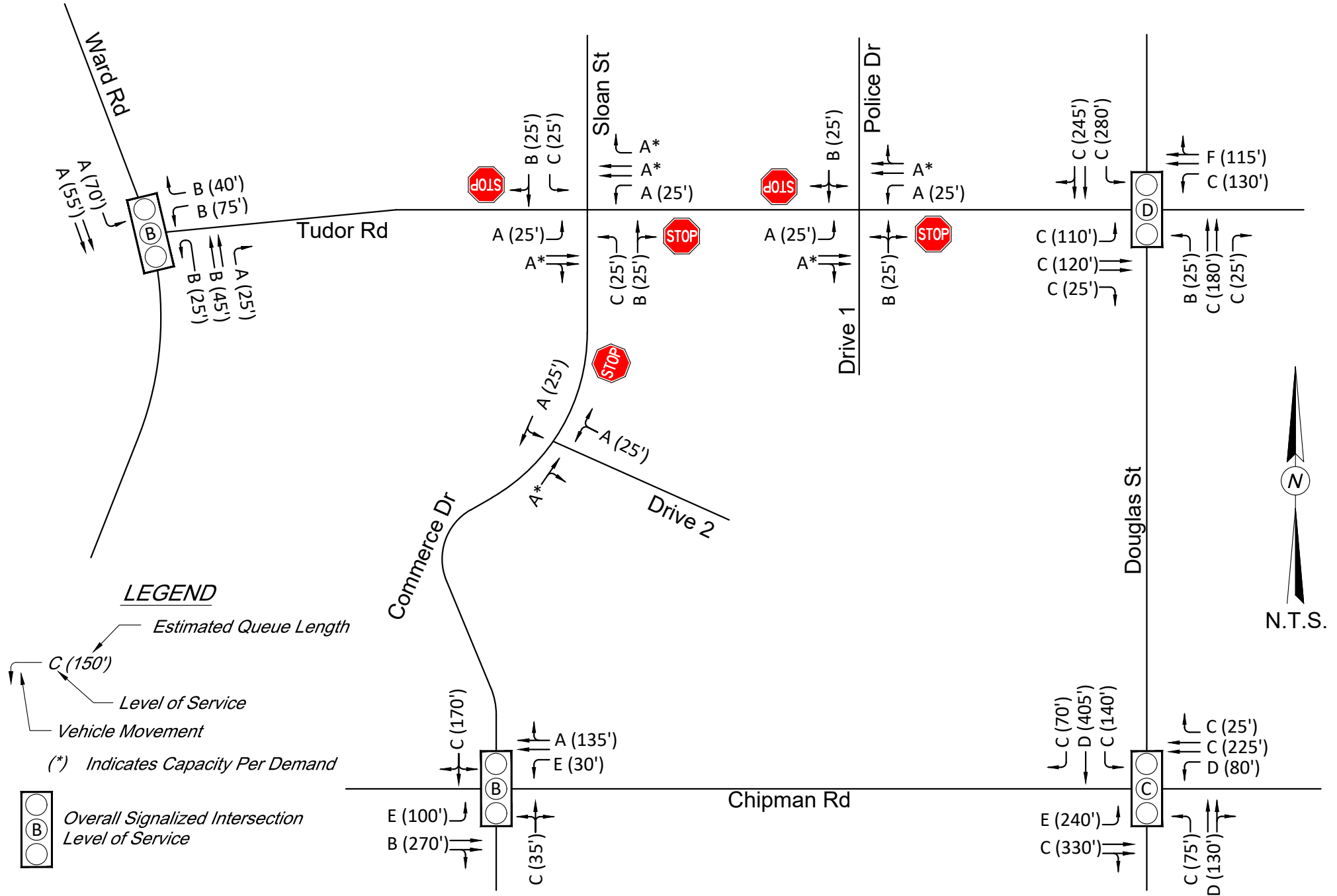


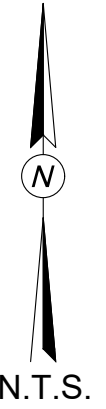
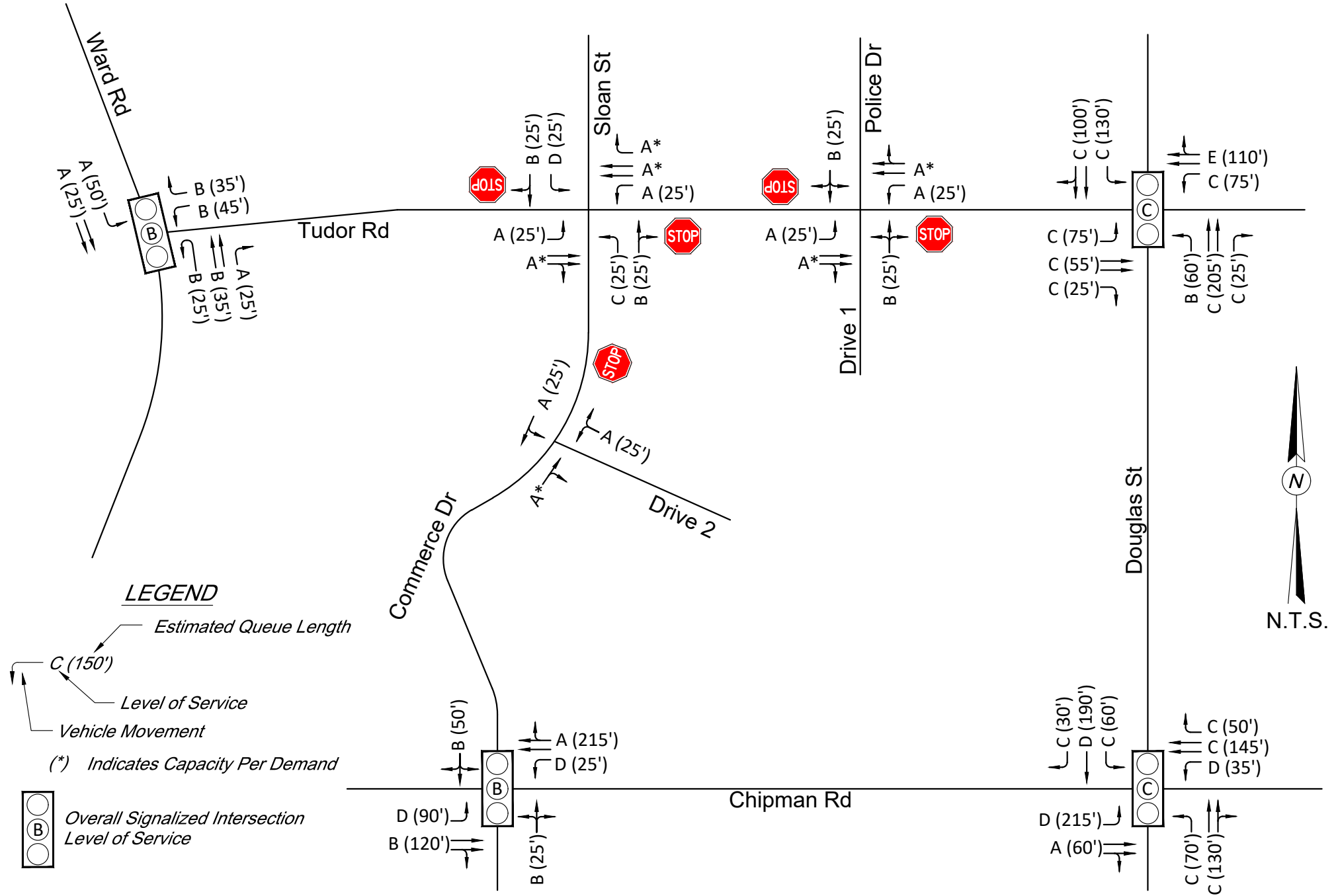










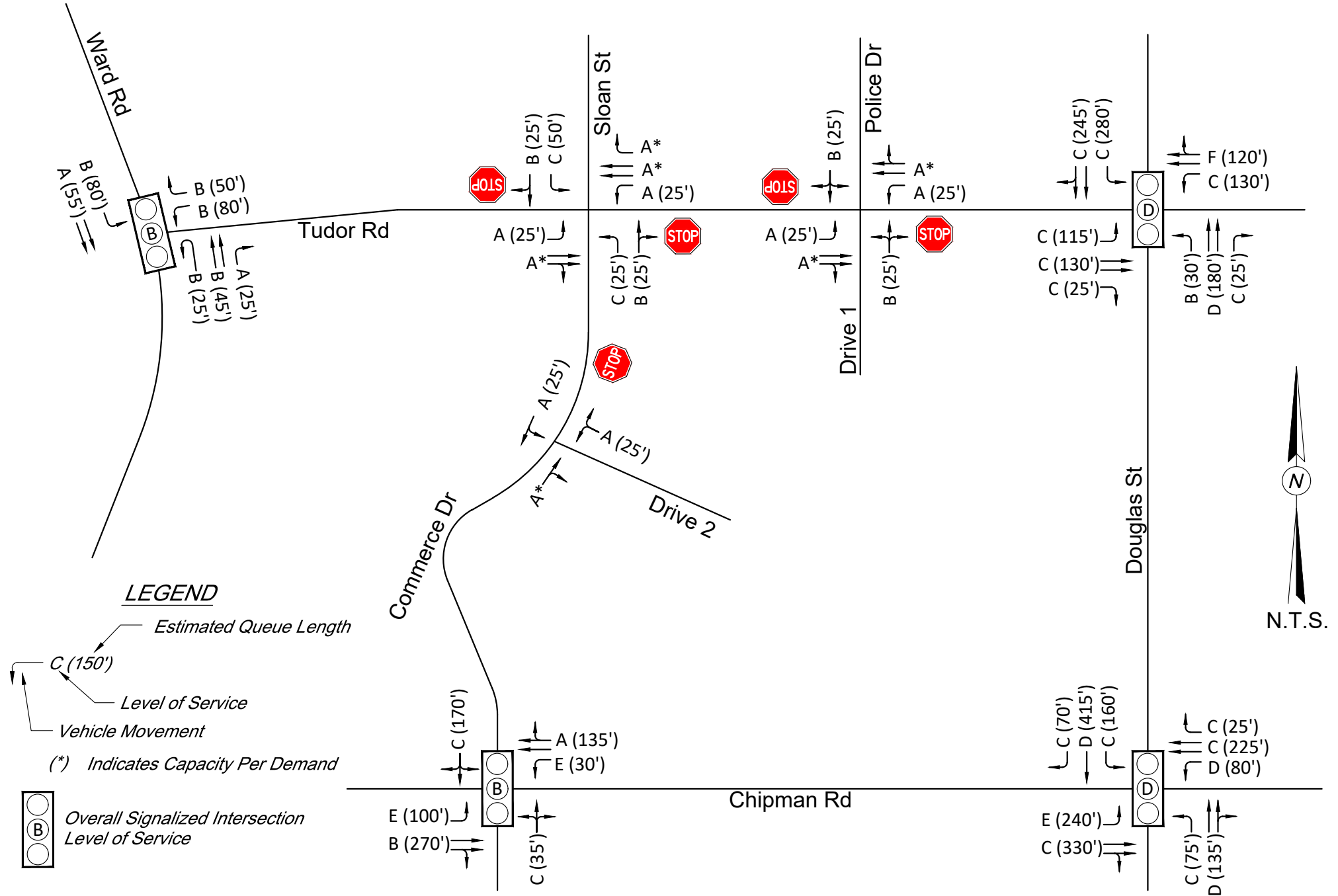


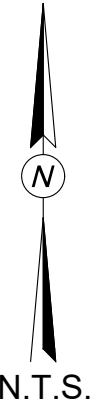
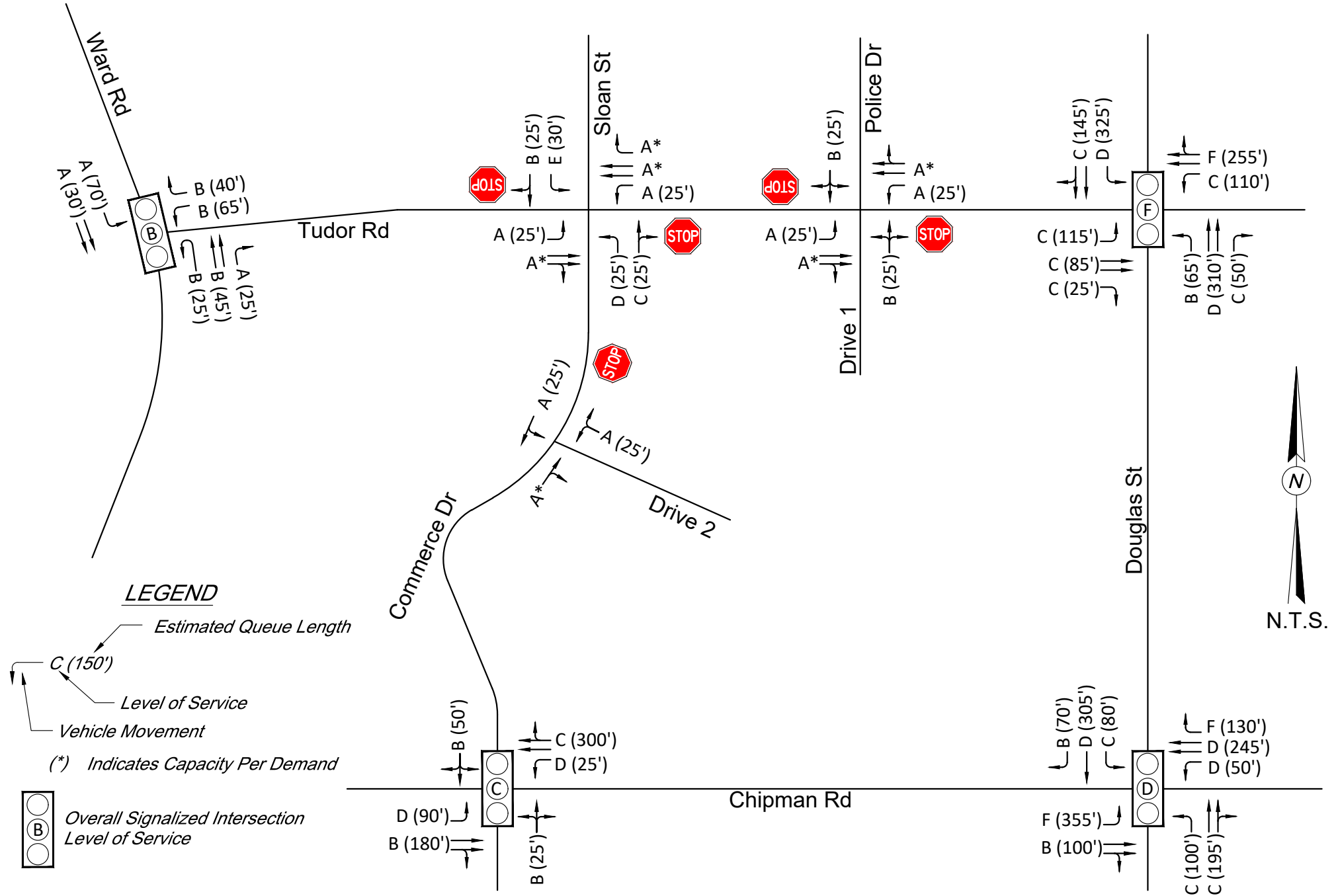
PROJECT NUMBER
22035

DATE
AUGUST 2022

FIGURE 12

EXISTING + SITE + PLANNED
LEVELS OF SERVICE
AM PEAK HOUR



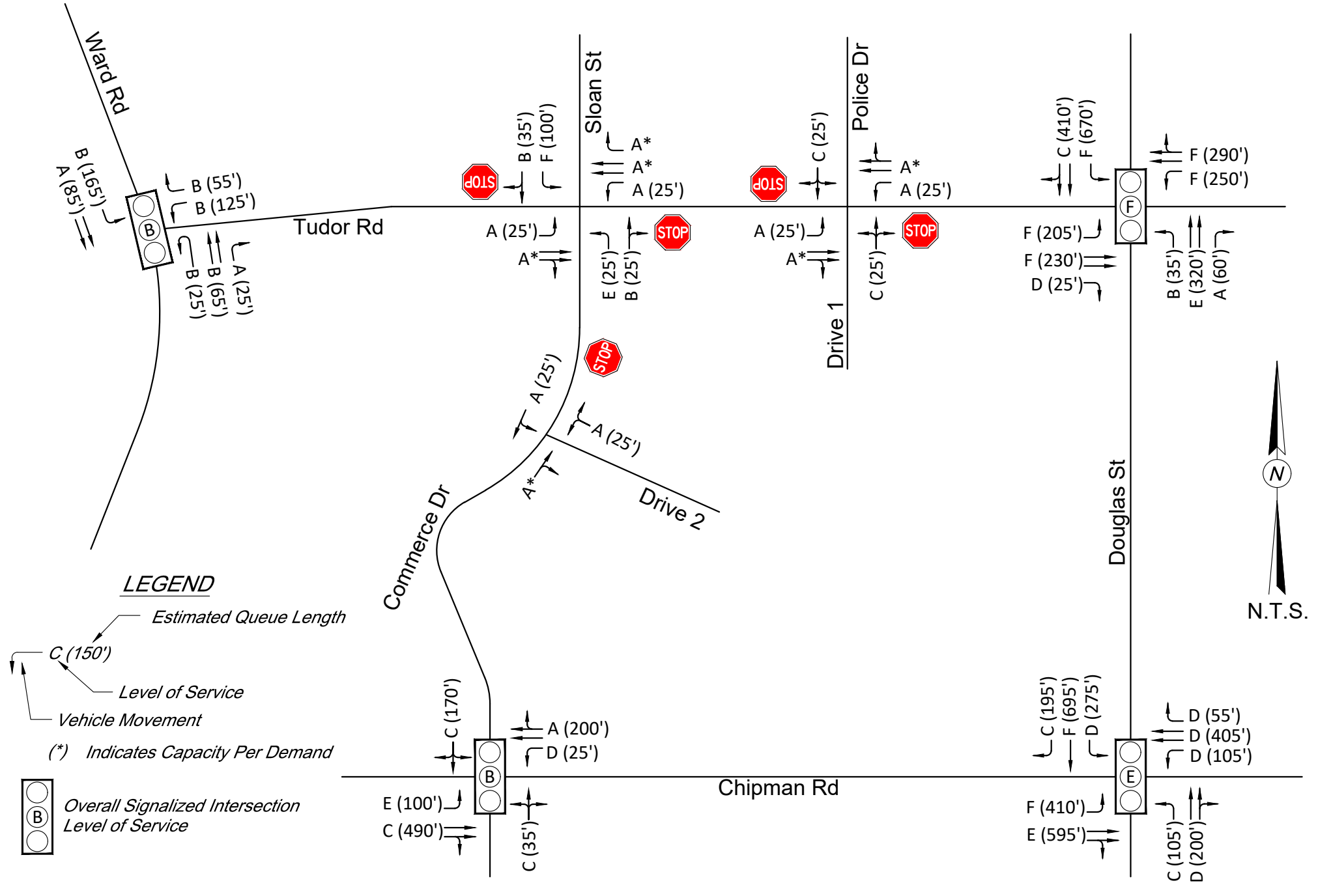


PROJECT NUMBER
22035

DATE
AUGUST 2022

FIGURE 14

FUTURE + SITE + PLANNED
LEVELS OF SERVICE
AM PEAK HOUR





Appendix

Traffic Counts

Tudor Road & NW Ward Road - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959806, Location: 38.930406, -94.392548



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Ward Southbound					Tudor Westbound					Ward Northbound					
Time	T	L	U	App	Ped*	R	L	U	App	Ped*	R	T	U	App	Ped*	Int
2022-06-07 7:00AM	20	28	0	48	1	15	7	0	22	0	3	28	1	32	0	102
7:15AM	11	25	0	36	0	32	6	0	38	0	13	44	1	58	0	132
7:30AM	24	22	0	46	0	30	16	1	47	0	12	35	0	47	0	140
7:45AM	21	33	0	54	0	37	13	1	51	0	16	27	0	43	0	148
Hourly Total	76	108	0	184	1	114	42	2	158	0	44	134	2	180	0	522
8:00AM	14	29	0	43	0	28	11	0	39	0	14	43	2	59	0	141
8:15AM	17	35	0	52	0	31	15	1	47	0	17	33	0	50	0	149
8:30AM	15	30	0	45	0	27	9	0	36	0	4	33	0	37	0	118
8:45AM	21	39	0	60	0	34	16	0	50	0	14	26	0	40	0	150
Hourly Total	67	133	0	200	0	120	51	1	172	0	49	135	2	186	0	558
4:00PM	34	44	0	78	1	51	25	0	76	0	16	34	0	50	0	204
4:15PM	39	62	0	101	0	33	19	2	54	0	14	50	2	66	0	221
4:30PM	62	55	0	117	0	41	13	1	55	0	14	33	0	47	0	219
4:45PM	56	67	0	123	0	49	26	2	77	0	22	26	0	48	0	248
Hourly Total	191	228	0	419	1	174	83	5	262	0	66	143	2	211	0	892
5:00PM	54	57	0	111	0	55	35	0	90	0	23	53	0	76	1	277
5:15PM	61	63	0	124	0	61	24	1	86	0	19	43	1	63	2	273
5:30PM	62	60	0	122	0	42	17	0	59	0	20	40	0	60	0	241
5:45PM	37	61	1	99	0	40	18	0	58	0	24	40	1	65	0	222
Hourly Total	214	241	1	456	0	198	94	1	293	0	86	176	2	264	3	1013
Total	548	710	1	1259	2	606	270	9	885	0	245	588	8	841	3	2985
% Approach	43.5%	56.4%	0.1%	-	-	68.5%	30.5%	1.0%	-	-	29.1%	69.9%	1.0%	-	-	-
% Total	18.4%	23.8%	0%	42.2%	-	20.3%	9.0%	0.3%	29.6%	-	8.2%	19.7%	0.3%	28.2%	-	-
Lights	535	706	1	1242	-	603	268	9	880	-	239	584	8	831	-	2953
% Lights	97.6%	99.4%	100%	98.6%	-	99.5%	99.3%	100%	99.4%	-	97.6%	99.3%	100%	98.8%	-	98.9%
Articulated Trucks	3	1	0	4	-	1	0	0	1	-	0	0	0	0	-	5
% Articulated Trucks	0.5%	0.1%	0%	0.3%	-	0.2%	0%	0%	0.1%	-	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	10	3	0	13	-	2	2	0	4	-	6	4	0	10	-	27
% Buses and Single-Unit Trucks	1.8%	0.4%	0%	1.0%	-	0.3%	0.7%	0%	0.5%	-	2.4%	0.7%	0%	1.2%	-	0.9%
Pedestrians	-	-	-	-	2	-	-	-	-	0	-	-	-	-	3	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Tudor Road & NW Ward Road - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

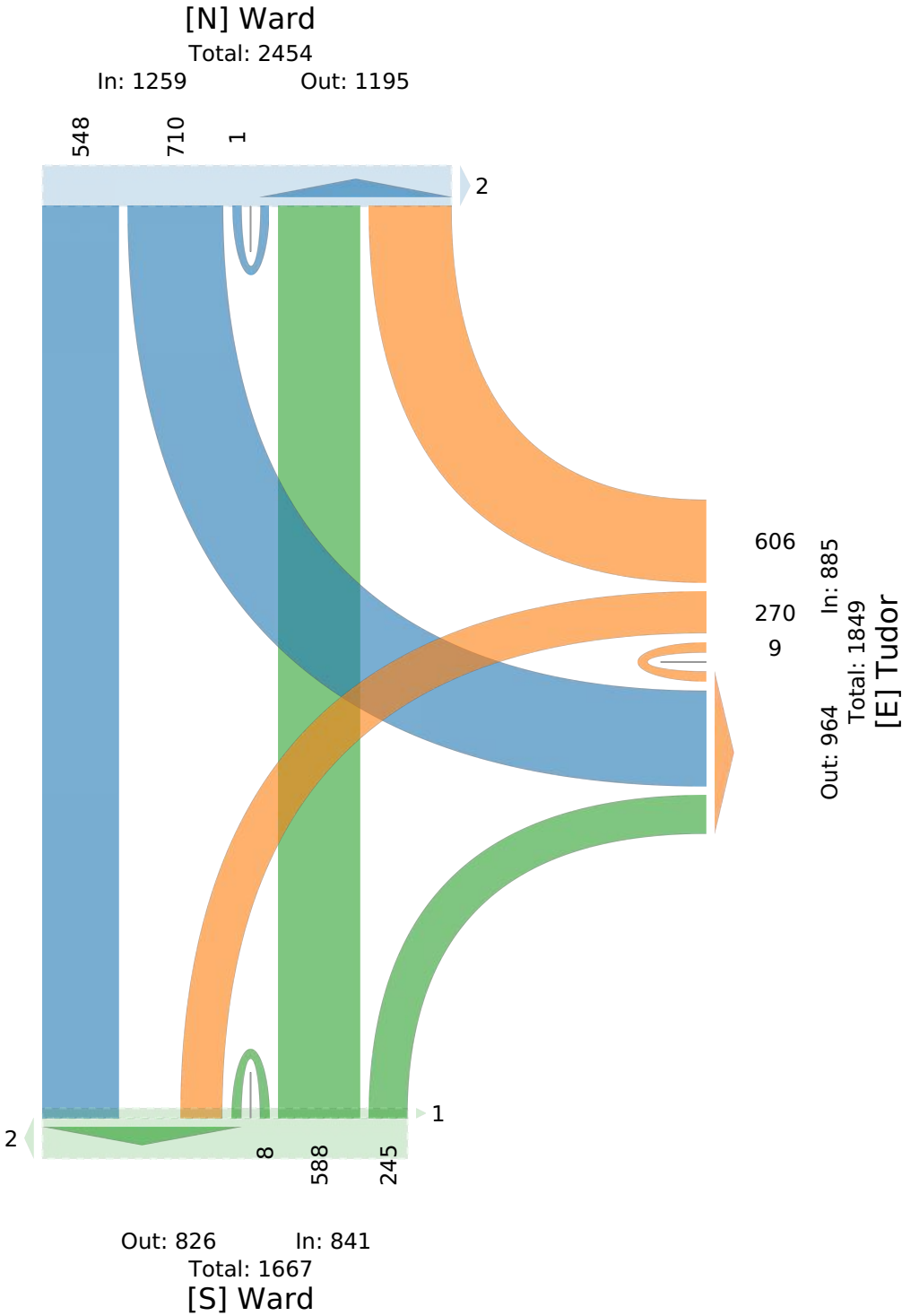
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959806, Location: 38.930406, -94.392548



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Tudor Road & NW Ward Road - TMC

Tue Jun 7, 2022

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959806, Location: 38.930406, -94.392548



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Ward Southbound					Tudor Westbound					Ward Northbound					
Time	T	L	U	App	Ped*	R	L	U	App	Ped*	R	T	U	App	Ped*	Int
2022-06-07 7:30AM	24	22	0	46	0	30	16	1	47	0	12	35	0	47	0	140
7:45AM	21	33	0	54	0	37	13	1	51	0	16	27	0	43	0	148
8:00AM	14	29	0	43	0	28	11	0	39	0	14	43	2	59	0	141
8:15AM	17	35	0	52	0	31	15	1	47	0	17	33	0	50	0	149
Total	76	119	0	195	0	126	55	3	184	0	59	138	2	199	0	578
% Approach	39.0%	61.0%	0%	-	-	68.5%	29.9%	1.6%	-	-	29.6%	69.3%	1.0%	-	-	-
% Total	13.1%	20.6%	0%	33.7%	-	21.8%	9.5%	0.5%	31.8%	-	10.2%	23.9%	0.3%	34.4%	-	-
PHF	0.792	0.850	-	0.903	-	0.851	0.859	0.750	0.902	-	0.868	0.802	0.250	0.843	-	0.970
Lights	76	117	0	193	-	125	54	3	182	-	58	138	2	198	-	573
% Lights	100%	98.3%	0%	99.0%	-	99.2%	98.2%	100%	98.9%	-	98.3%	100%	100%	99.5%	-	99.1%
Articulated Trucks	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%
Buses and Single-Unit Trucks	0	2	0	2	-	1	1	0	2	-	1	0	0	1	-	5
% Buses and Single-Unit Trucks	0%	1.7%	0%	1.0%	-	0.8%	1.8%	0%	1.1%	-	1.7%	0%	0%	0.5%	-	0.9%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Tudor Road & NW Ward Road - TMC

Tue Jun 7, 2022

AM Peak (7:30 AM - 8:30 AM)

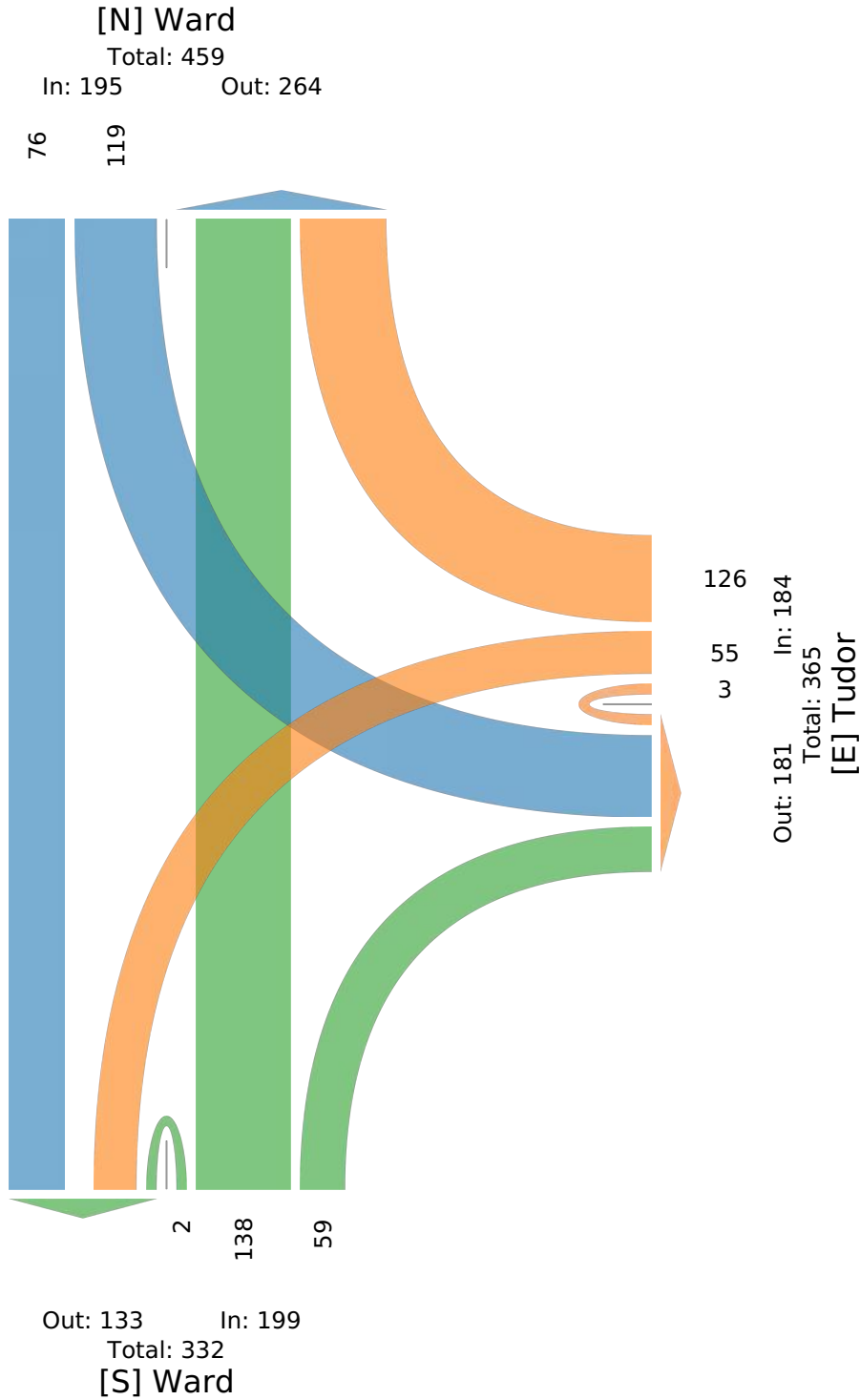
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959806, Location: 38.930406, -94.392548



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Tudor Road & NW Ward Road - TMC

Tue Jun 7, 2022

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959806, Location: 38.930406, -94.392548



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Ward Southbound					Tudor Westbound					Ward Northbound					
Time	T	L	U	App	Ped*	R	L	U	App	Ped*	R	T	U	App	Ped*	Int
2022-06-07 4:45PM	56	67	0	123	0	49	26	2	77	0	22	26	0	48	0	248
5:00PM	54	57	0	111	0	55	35	0	90	0	23	53	0	76	1	277
5:15PM	61	63	0	124	0	61	24	1	86	0	19	43	1	63	2	273
5:30PM	62	60	0	122	0	42	17	0	59	0	20	40	0	60	0	241
Total	233	247	0	480	0	207	102	3	312	0	84	162	1	247	3	1039
% Approach	48.5%	51.5%	0%	-	-	66.3%	32.7%	1.0%	-	-	34.0%	65.6%	0.4%	-	-	-
% Total	22.4%	23.8%	0%	46.2%	-	19.9%	9.8%	0.3%	30.0%	-	8.1%	15.6%	0.1%	23.8%	-	-
PHF	0.940	0.922	-	0.968	-	0.848	0.729	0.375	0.867	-	0.913	0.764	0.250	0.813	-	0.938
Lights	228	247	0	475	-	205	102	3	310	-	83	161	1	245	-	1030
% Lights	97.9%	100%	0%	99.0%	-	99.0%	100%	100%	99.4%	-	98.8%	99.4%	100%	99.2%	-	99.1%
Articulated Trucks	1	0	0	1	-	1	0	0	1	-	0	0	0	0	-	2
% Articulated Trucks	0.4%	0%	0%	0.2%	-	0.5%	0%	0%	0.3%	-	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	4	0	0	4	-	1	0	0	1	-	1	1	0	2	-	7
% Buses and Single-Unit Trucks	1.7%	0%	0%	0.8%	-	0.5%	0%	0%	0.3%	-	1.2%	0.6%	0%	0.8%	-	0.7%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	3	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Tudor Road & NW Ward Road - TMC

Tue Jun 7, 2022

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

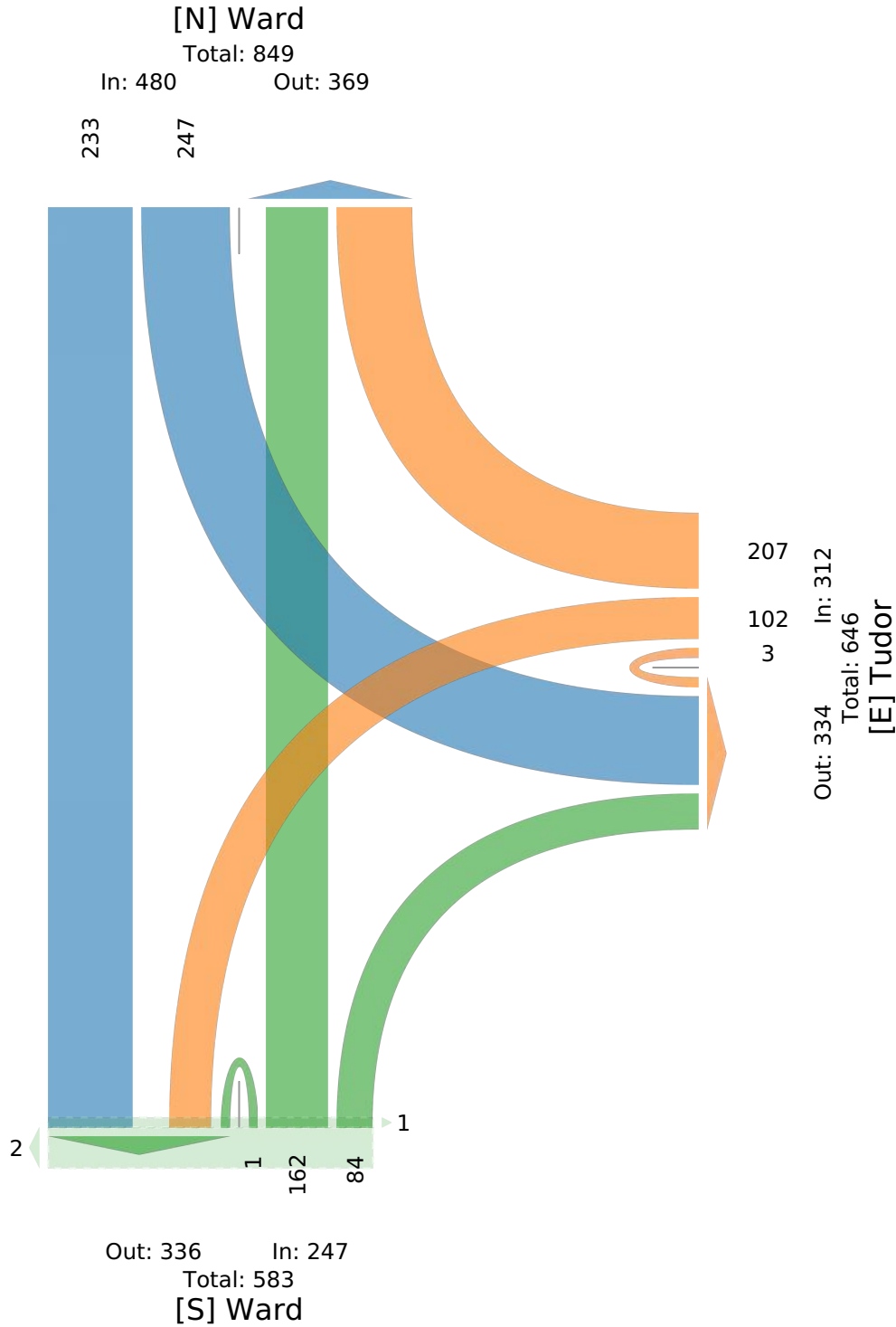
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959806, Location: 38.930406, -94.392548



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



NW Main Street & Tudor Road - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959802, Location: 38.93072, -94.385379



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Main Southbound					Tudor Westbound					Tudor Eastbound					
Time	R	L	U	App	Ped*	R	T	U	App	Ped*	T	L	U	App	Ped*	Int
2022-06-07 7:00AM	0	0	0	0	0	0	18	0	18	0	30	4	0	34	0	52
7:15AM	0	0	0	0	0	0	38	0	38	0	40	0	0	40	0	78
7:30AM	0	0	0	0	0	1	53	0	54	0	36	0	0	36	0	90
7:45AM	0	0	0	0	0	0	51	0	51	0	53	0	0	53	0	104
Hourly Total	0	0	0	0	0	1	160	0	161	0	159	4	0	163	0	324
8:00AM	0	0	0	0	0	0	40	0	40	0	43	2	0	45	0	85
8:15AM	0	0	0	0	0	0	46	0	46	0	53	0	0	53	0	99
8:30AM	0	0	0	0	0	0	39	0	39	0	37	0	0	37	0	76
8:45AM	0	0	0	0	0	0	53	0	53	0	57	0	0	57	0	110
Hourly Total	0	0	0	0	0	0	178	0	178	0	190	2	0	192	0	370
4:00PM	0	0	0	0	0	0	73	0	73	0	59	0	0	59	0	132
4:15PM	0	0	0	0	1	0	50	0	50	0	79	0	0	79	0	129
4:30PM	0	0	0	0	0	0	55	0	55	0	73	0	0	73	0	128
4:45PM	0	0	0	0	0	0	78	0	78	0	90	0	0	90	0	168
Hourly Total	0	0	0	0	1	0	256	0	256	0	301	0	0	301	0	557
5:00PM	0	0	0	0	0	0	82	0	82	0	87	0	0	87	0	169
5:15PM	0	0	0	0	0	0	80	0	80	0	77	0	0	77	0	157
5:30PM	4	4	0	8	0	0	55	0	55	0	80	0	0	80	0	143
5:45PM	0	3	0	3	1	0	63	1	64	0	82	1	0	83	0	150
Hourly Total	4	7	0	11	1	0	280	1	281	0	326	1	0	327	0	619
Total	4	7	0	11	2	1	874	1	876	0	976	7	0	983	0	1870
% Approach	36.4%	63.6%	0%	-	-	0.1%	99.8%	0.1%	-	-	99.3%	0.7%	0%	-	-	-
% Total	0.2%	0.4%	0%	0.6%	-	0.1%	46.7%	0.1%	46.8%	-	52.2%	0.4%	0%	52.6%	-	-
Lights	4	7	0	11	-	1	869	1	871	-	966	5	0	971	-	1853
% Lights	100%	100%	0%	100%	-	100%	99.4%	100%	99.4%	-	99.0%	71.4%	0%	98.8%	-	99.1%
Articulated Trucks	0	0	0	0	-	0	1	0	1	-	1	0	0	1	-	2
% Articulated Trucks	0%	0%	0%	0%	-	0%	0.1%	0%	0.1%	-	0.1%	0%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	0	0	0	0	-	0	4	0	4	-	9	2	0	11	-	15
% Buses and Single-Unit Trucks	0%	0%	0%	0%	-	0%	0.5%	0%	0.5%	-	0.9%	28.6%	0%	1.1%	-	0.8%
Pedestrians	-	-	-	-	2	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NW Main Street & Tudor Road - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

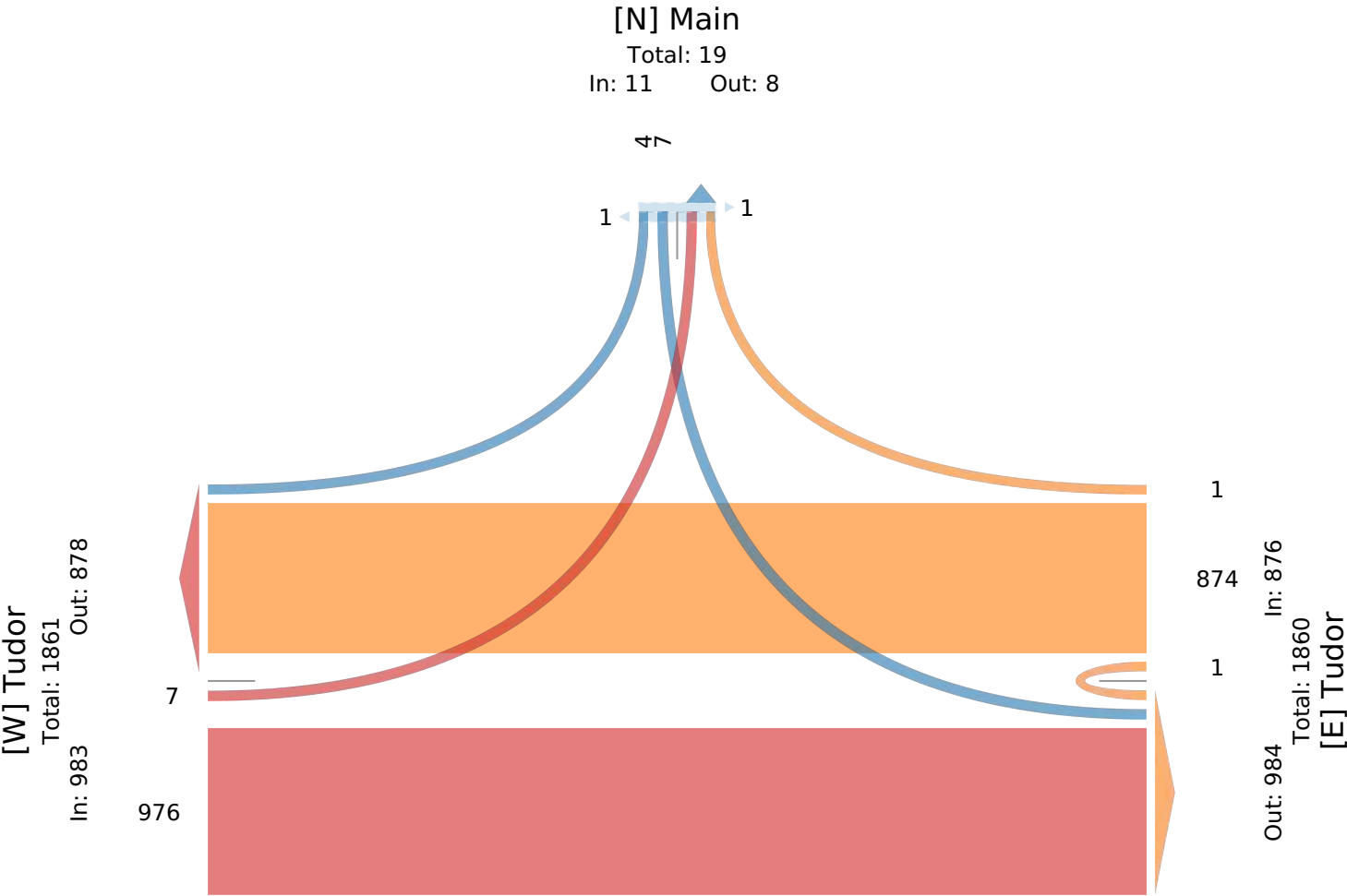
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959802, Location: 38.93072, -94.385379



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



NW Main Street & Tudor Road - TMC

Tue Jun 7, 2022

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959802, Location: 38.93072, -94.385379



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Main Southbound					Tudor Westbound					Tudor Eastbound					
Time	R	L	U	App	Ped*	R	T	U	App	Ped*	T	L	U	App	Ped*	Int
2022-06-07 7:30AM	0	0	0	0	0	1	53	0	54	0	36	0	0	36	0	90
7:45AM	0	0	0	0	0	0	51	0	51	0	53	0	0	53	0	104
8:00AM	0	0	0	0	0	0	40	0	40	0	43	2	0	45	0	85
8:15AM	0	0	0	0	0	0	46	0	46	0	53	0	0	53	0	99
Total	0	0	0	0	0	1	190	0	191	0	185	2	0	187	0	378
% Approach	0%	0%	0%	-	-	0.5%	99.5%	0%	-	-	98.9%	1.1%	0%	-	-	-
% Total	0%	0%	0%	0%	-	0.3%	50.3%	0%	50.5%	-	48.9%	0.5%	0%	49.5%	-	-
PHF	-	-	-	-	-	0.250	0.896	-	0.884	-	0.873	0.250	-	0.882	-	0.909
Lights	0	0	0	0	-	1	188	0	189	-	181	0	0	181	-	370
% Lights	0%	0%	0%	-	-	100%	98.9%	0%	99.0%	-	97.8%	0%	0%	96.8%	-	97.9%
Articulated Trucks	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	-	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%
Buses and Single-Unit Trucks	0	0	0	0	-	0	2	0	2	-	4	2	0	6	-	8
% Buses and Single-Unit Trucks	0%	0%	0%	-	-	0%	1.1%	0%	1.0%	-	2.2%	100%	0%	3.2%	-	2.1%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NW Main Street & Tudor Road - TMC

Tue Jun 7, 2022

AM Peak (7:30 AM - 8:30 AM)

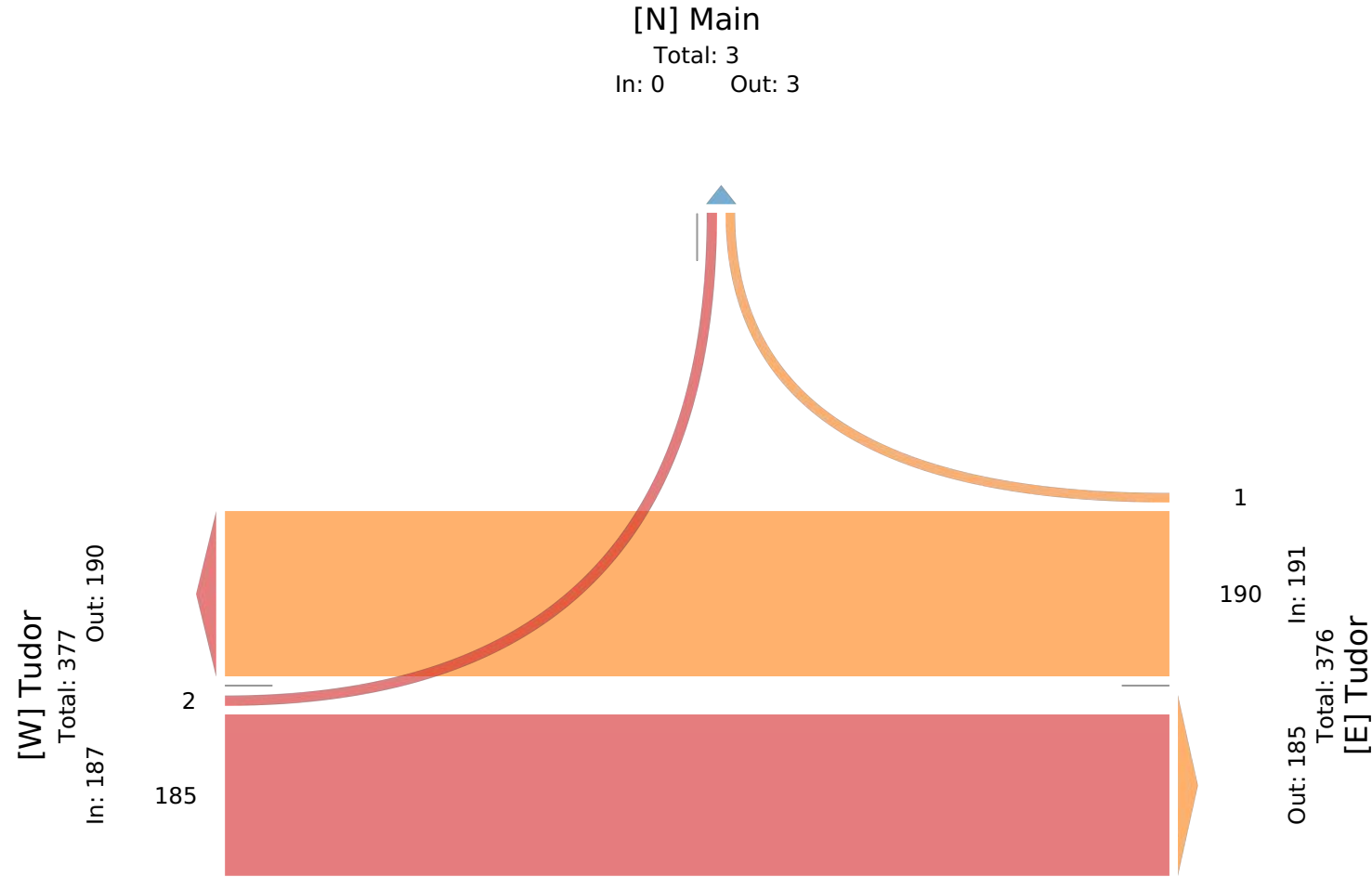
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959802, Location: 38.93072, -94.385379



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



NW Main Street & Tudor Road - TMC

Tue Jun 7, 2022

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959802, Location: 38.93072, -94.385379



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Main Southbound					Tudor Westbound					Tudor Eastbound					
Time	R	L	U	App	Ped*	R	T	U	App	Ped*	T	L	U	App	Ped*	Int
2022-06-07 4:45PM	0	0	0	0	0	0	78	0	78	0	90	0	0	90	0	168
5:00PM	0	0	0	0	0	0	82	0	82	0	87	0	0	87	0	169
5:15PM	0	0	0	0	0	0	80	0	80	0	77	0	0	77	0	157
5:30PM	4	4	0	8	0	0	55	0	55	0	80	0	0	80	0	143
Total	4	4	0	8	0	0	295	0	295	0	334	0	0	334	0	637
% Approach	50.0%	50.0%	0%	-	-	0%	100%	0%	-	-	100%	0%	0%	-	-	-
% Total	0.6%	0.6%	0%	1.3%	-	0%	46.3%	0%	46.3%	-	52.4%	0%	0%	52.4%	-	-
PHF	0.250	0.250	-	0.250	-	-	0.899	-	0.899	-	0.928	-	-	0.928	-	0.942
Lights	4	4	0	8	-	0	293	0	293	-	334	0	0	334	-	635
% Lights	100%	100%	0%	100%	-	0%	99.3%	0%	99.3%	-	100%	0%	0%	100%	-	99.7%
Articulated Trucks	0	0	0	0	-	0	1	0	1	-	0	0	0	0	-	1
% Articulated Trucks	0%	0%	0%	0%	-	0%	0.3%	0%	0.3%	-	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	0	0	0	0	-	0	1	0	1	-	0	0	0	0	-	1
% Buses and Single-Unit Trucks	0%	0%	0%	0%	-	0%	0.3%	0%	0.3%	-	0%	0%	0%	0%	-	0.2%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NW Main Street & Tudor Road - TMC

Tue Jun 7, 2022

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959802, Location: 38.93072, -94.385379



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Main

Total: 8

In: 8 Out: 0

44

[W] Tudor

Total: 633

Out: 299

In: 334

334

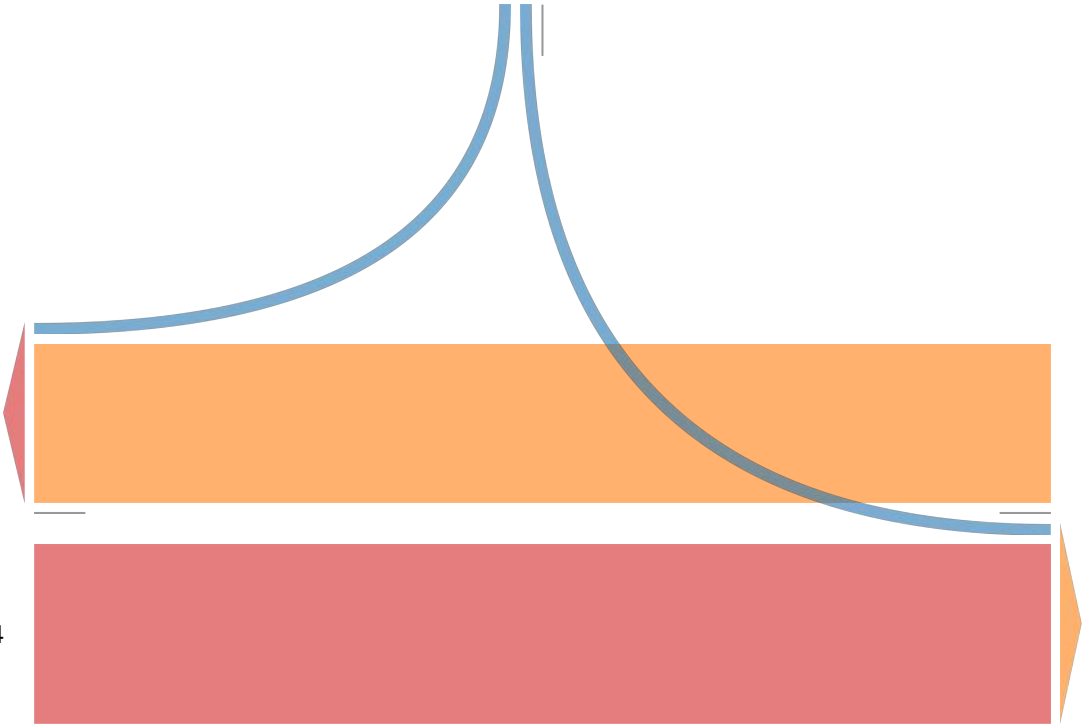
295

In: 295

Total: 633

[E] Tudor

Out: 338



Tudor Road & NE Douglas Street - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959803, Location: 38.930614, -94.379523



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Douglas Southbound						Tudor Westbound						Douglas Northbound						Tudor Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-07 7:00AM	18	39	36	0	93	0	44	16	2	0	62	0	10	67	3	0	80	1	3	13	6	0	22	0	257
7:15AM	17	55	62	0	134	0	70	33	12	0	115	0	19	79	6	0	104	0	1	24	12	0	37	0	390
7:30AM	23	69	47	0	139	0	68	32	17	0	117	0	12	95	7	0	114	0	3	11	15	0	29	0	399
7:45AM	27	65	47	0	139	0	54	40	10	0	104	0	15	99	13	0	127	0	4	14	16	0	34	0	404
Hourly Total	85	228	192	0	505	0	236	121	41	0	398	0	56	340	29	0	425	1	11	62	49	0	122	0	1450
8:00AM	26	70	47	0	143	0	52	27	10	0	89	0	10	59	3	0	72	0	5	14	17	0	36	0	340
8:15AM	23	66	56	0	145	0	47	28	16	0	91	0	9	78	2	0	89	0	5	30	19	0	54	0	379
8:30AM	21	93	46	0	160	0	36	20	11	0	67	0	12	84	7	0	103	0	1	20	7	0	28	0	358
8:45AM	21	104	49	0	174	0	38	32	18	0	88	1	32	75	6	1	114	1	8	30	21	0	59	0	435
Hourly Total	91	333	198	0	622	0	173	107	55	0	335	1	63	296	18	1	378	1	19	94	64	0	177	0	1512
4:00PM	21	141	69	1	232	0	45	39	17	0	101	0	17	97	2	0	116	0	9	54	33	0	96	0	545
4:15PM	19	141	64	0	224	0	46	29	9	0	84	0	17	79	0	0	96	2	11	50	27	0	88	0	492
4:30PM	20	165	82	0	267	0	37	29	23	0	89	0	20	115	4	0	139	1	8	54	33	0	95	0	590
4:45PM	34	144	99	1	278	0	31	53	20	0	104	0	27	92	3	0	122	0	15	63	24	0	102	0	606
Hourly Total	94	591	314	2	1001	0	159	150	69	0	378	0	81	383	9	0	473	3	43	221	117	0	381	0	2233
5:00PM	22	167	80	0	269	0	84	41	33	0	158	1	27	108	8	0	143	0	17	63	26	0	106	0	676
5:15PM	20	124	100	0	244	0	30	56	18	0	104	0	17	83	8	0	108	0	9	58	23	0	90	0	546
5:30PM	18	148	62	0	228	0	41	35	12	0	88	0	12	86	5	0	103	1	6	48	33	0	87	0	506
5:45PM	21	122	65	0	208	0	35	38	16	0	89	0	7	87	5	0	99	0	11	53	30	0	94	0	490
Hourly Total	81	561	307	0	949	0	190	170	79	0	439	1	63	364	26	0	453	1	43	222	112	0	377	0	2218
Total	351	1713	1011	2	3077	0	758	548	244	0	1550	2	263	1383	82	1	1729	6	116	599	342	0	1057	0	7413
% Approach	11.4%	55.7%	32.9%	0.1%	-	-	48.9%	35.4%	15.7%	0%	-	-	15.2%	80.0%	4.7%	0.1%	-	-	11.0%	56.7%	32.4%	0%	-	-	-
% Total	4.7%	23.1%	13.6%	0%	41.5%	-	10.2%	7.4%	3.3%	0%	20.9%	-	3.5%	18.7%	1.1%	0%	23.3%	-	1.6%	8.1%	4.6%	0%	14.3%	-	-
Lights	350	1695	989	2	3036	-	744	546	242	0	1532	-	259	1353	80	1	1693	-	115	595	340	0	1050	-	7311
% Lights	99.7%	98.9%	97.8%	100%	98.7%	-	98.2%	99.6%	99.2%	0%	98.8%	-	98.5%	97.8%	97.6%	100%	97.9%	-	99.1%	99.3%	99.4%	0%	99.3%	-	98.6%
Articulated Trucks	0	2	3	0	5	-	1	0	1	0	2	-	2	7	0	0	9	-	0	0	0	0	0	-	16
% Articulated Trucks	0%	0.1%	0.3%	0%	0.2%	-	0.1%	0%	0.4%	0%	0.1%	-	0.8%	0.5%	0%	0%	0.5%	-	0%	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	1	16	19	0	36	-	13	2	1	0	16	-	2	23	2	0	27	-	1	4	2	0	7	-	86
% Buses and Single-Unit Trucks	0.3%	0.9%	1.9%	0%	1.2%	-	1.7%	0.4%	0.4%	0%	1.0%	-	0.8%	1.7%	2.4%	0%	1.6%	-	0.9%	0.7%	0.6%	0%	0.7%	-	1.2%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	5	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	83.3%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	0%	-	-	-	-	-	16.7%	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Tudor Road & NE Douglas Street - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959803, Location: 38.930614, -94.379523



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Douglas

Total: 5562

In: 3077

Out: 2485

351

1713

1011

2

[W] Tudor

Total: 2038

In: 1057 Out: 981

342
599
116

758
548
244

Out: 1873 In: 1550

Total: 3423

[E] Tudor

[S] Douglas

Out: 2074

In: 1729

Total: 3803

1

1

82

1383

263

5

Tudor Road & NE Douglas Street - TMC

Tue Jun 7, 2022

AM Peak (7:15 AM - 8:15 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959803, Location: 38.930614, -94.379523



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Douglas Southbound						Tudor Westbound						Douglas Northbound						Tudor Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-07 7:15AM	17	55	62	0	134	0	70	33	12	0	115	0	19	79	6	0	104	0	1	24	12	0	37	0	390
7:30AM	23	69	47	0	139	0	68	32	17	0	117	0	12	95	7	0	114	0	3	11	15	0	29	0	399
7:45AM	27	65	47	0	139	0	54	40	10	0	104	0	15	99	13	0	127	0	4	14	16	0	34	0	404
8:00AM	26	70	47	0	143	0	52	27	10	0	89	0	10	59	3	0	72	0	5	14	17	0	36	0	340
Total	93	259	203	0	555	0	244	132	49	0	425	0	56	332	29	0	417	0	13	63	60	0	136	0	1533
% Approach	16.8%	46.7%	36.6%	0%	-	-	57.4%	31.1%	11.5%	0%	-	-	13.4%	79.6%	7.0%	0%	-	-	9.6%	46.3%	44.1%	0%	-	-	-
% Total	6.1%	16.9%	13.2%	0%	36.2%	-	15.9%	8.6%	3.2%	0%	27.7%	-	3.7%	21.7%	1.9%	0%	27.2%	-	0.8%	4.1%	3.9%	0%	8.9%	-	-
PHF	0.861	0.925	0.819	-	0.970	-	0.871	0.825	0.721	-	0.908	-	0.737	0.838	0.558	-	0.821	-	0.650	0.656	0.882	-	0.919	-	0.949
Lights	92	253	201	0	546	-	240	131	47	0	418	-	54	326	29	0	409	-	13	62	58	0	133	-	1506
% Lights	98.9%	97.7%	99.0%	0%	98.4%	-	98.4%	99.2%	95.9%	0%	98.4%	-	96.4%	98.2%	100%	0%	98.1%	-	100%	98.4%	96.7%	0%	97.8%	-	98.2%
Articulated Trucks	0	1	1	0	2	-	0	0	1	0	1	-	1	2	0	0	3	-	0	0	0	0	0	-	6
% Articulated Trucks	0%	0.4%	0.5%	0%	0.4%	-	0%	0%	2.0%	0%	0.2%	-	1.8%	0.6%	0%	0%	0.7%	-	0%	0%	0%	0%	0%	-	0.4%
Buses and Single-Unit Trucks	1	5	1	0	7	-	4	1	1	0	6	-	1	4	0	0	5	-	0	1	2	0	3	-	21
% Buses and Single-Unit Trucks	1.1%	1.9%	0.5%	0%	1.3%	-	1.6%	0.8%	2.0%	0%	1.4%	-	1.8%	1.2%	0%	0%	1.2%	-	0%	1.6%	3.3%	0%	2.2%	-	1.4%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Tudor Road & NE Douglas Street - TMC

Tue Jun 7, 2022

AM Peak (7:15 AM - 8:15 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959803, Location: 38.930614, -94.379523



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Douglas

Total: 1191

In: 555

Out: 636

93 259 203

[W] Tudor

Total: 390

In: 136 Out: 254

60 63 13

244 132 49

Out: 322 In: 425

Total: 747

[E] Tudor

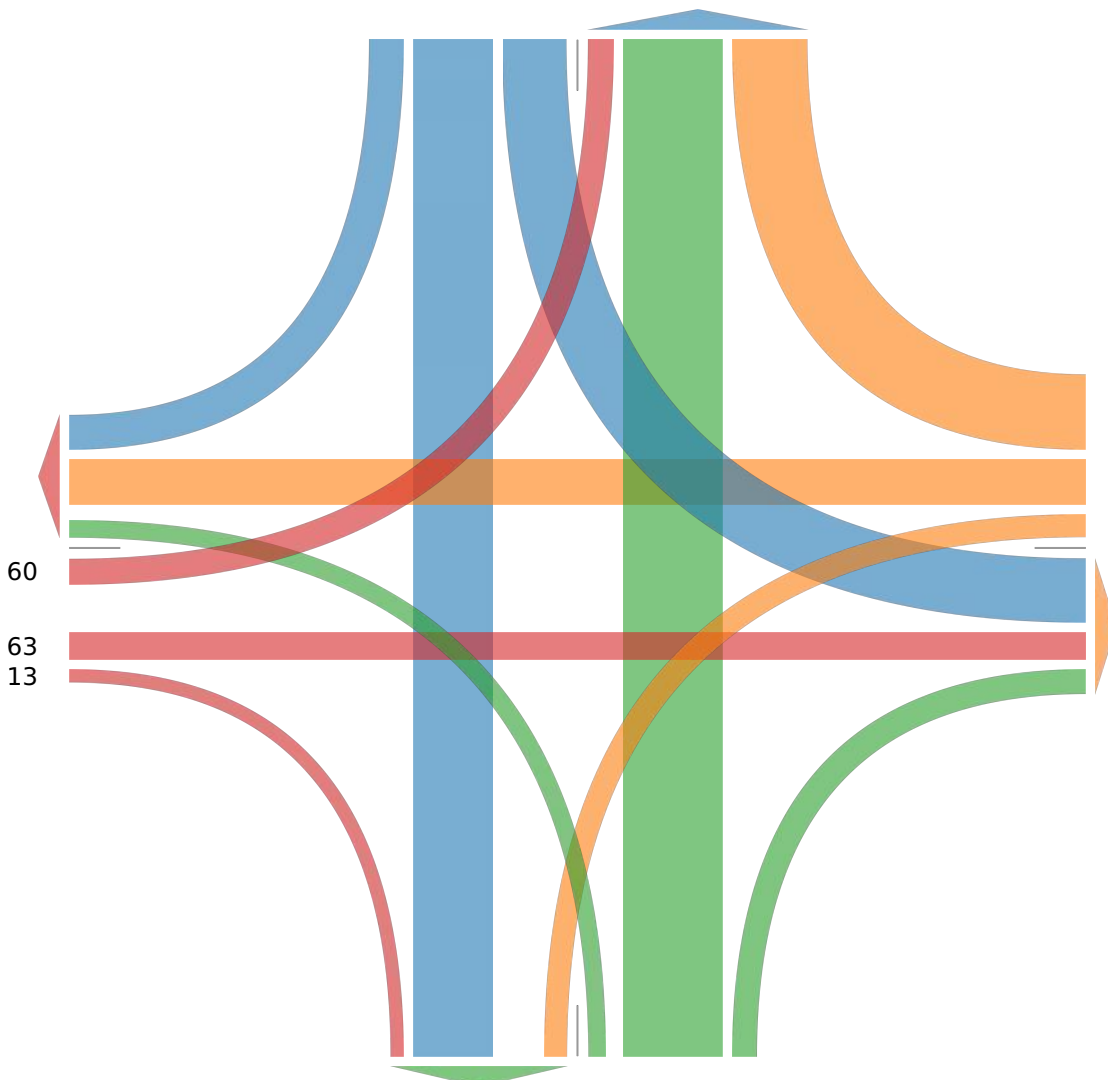
Out: 321

In: 417

Total: 738

[S] Douglas

29 332 56



Tudor Road & NE Douglas Street - TMC

Tue Jun 7, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959803, Location: 38.930614, -94.379523



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Douglas Southbound							Tudor Westbound							Douglas Northbound							Tudor Eastbound							
Time	R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		Int
2022-06-07 4:30PM	20	165	82	0	267	0		37	29	23	0	89	0		20	115	4	0	139	1		8	54	33	0	95	0		590
4:45PM	34	144	99	1	278	0		31	53	20	0	104	0		27	92	3	0	122	0		15	63	24	0	102	0		606
5:00PM	22	167	80	0	269	0		84	41	33	0	158	1		27	108	8	0	143	0		17	63	26	0	106	0		676
5:15PM	20	124	100	0	244	0		30	56	18	0	104	0		17	83	8	0	108	0		9	58	23	0	90	0		546
Total	96	600	361	1	1058	0		182	179	94	0	455	1		91	398	23	0	512	1		49	238	106	0	393	0		2418
% Approach	9.1%	56.7%	34.1%	0.1%	-	-		40.0%	39.3%	20.7%	0%	-	-		17.8%	77.7%	4.5%	0%	-	-		12.5%	60.6%	27.0%	0%	-	-		-
% Total	4.0%	24.8%	14.9%	0%	43.8%	-		7.5%	7.4%	3.9%	0%	18.8%	-		3.8%	16.5%	1.0%	0%	21.2%	-		2.0%	9.8%	4.4%	0%	16.3%	-		-
PHF	0.706	0.898	0.903	0.250	0.951	-		0.542	0.799	0.712	-	0.720	-		0.843	0.865	0.719	-	0.895	-		0.721	0.944	0.803	-	0.927	-		0.894
Lights	96	597	352	1	1046	-		175	179	94	0	448	-		91	393	22	0	506	-		49	236	106	0	391	-		2391
% Lights	100%	99.5%	97.5%	100%	98.9%	-		96.2%	100%	100%	0%	98.5%	-		100%	98.7%	95.7%	0%	98.8%	-		100%	99.2%	100%	0%	99.5%	-		98.9%
Articulated Trucks	0	0	0	0	0	-		0	0	0	0	0	-		0	0	0	0	0	-		0	0	0	0	0	-		0
% Articulated Trucks	0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	-		0%
Buses and Single-Unit Trucks	0	3	9	0	12	-		7	0	0	0	7	-		0	5	1	0	6	-		0	2	0	0	2	-		27
% Buses and Single-Unit Trucks	0%	0.5%	2.5%	0%	1.1%	-		3.8%	0%	0%	0%	1.5%	-		0%	1.3%	4.3%	0%	1.2%	-		0%	0.8%	0%	0%	0.5%	-		1.1%
Pedestrians	-	-	-	-	-	0		-	-	-	-	-	1		-	-	-	-	-	1		-	-	-	-	-	0		-
% Pedestrians	-	-	-	-	-	-		-	-	-	-	-	100%		-	-	-	-	-	100%		-	-	-	-	-	-		-
Bicycles on Crosswalk	-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		-
% Bicycles on Crosswalk	-	-	-	-	-	-		-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	-		-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Tudor Road & NE Douglas Street - TMC

Tue Jun 7, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

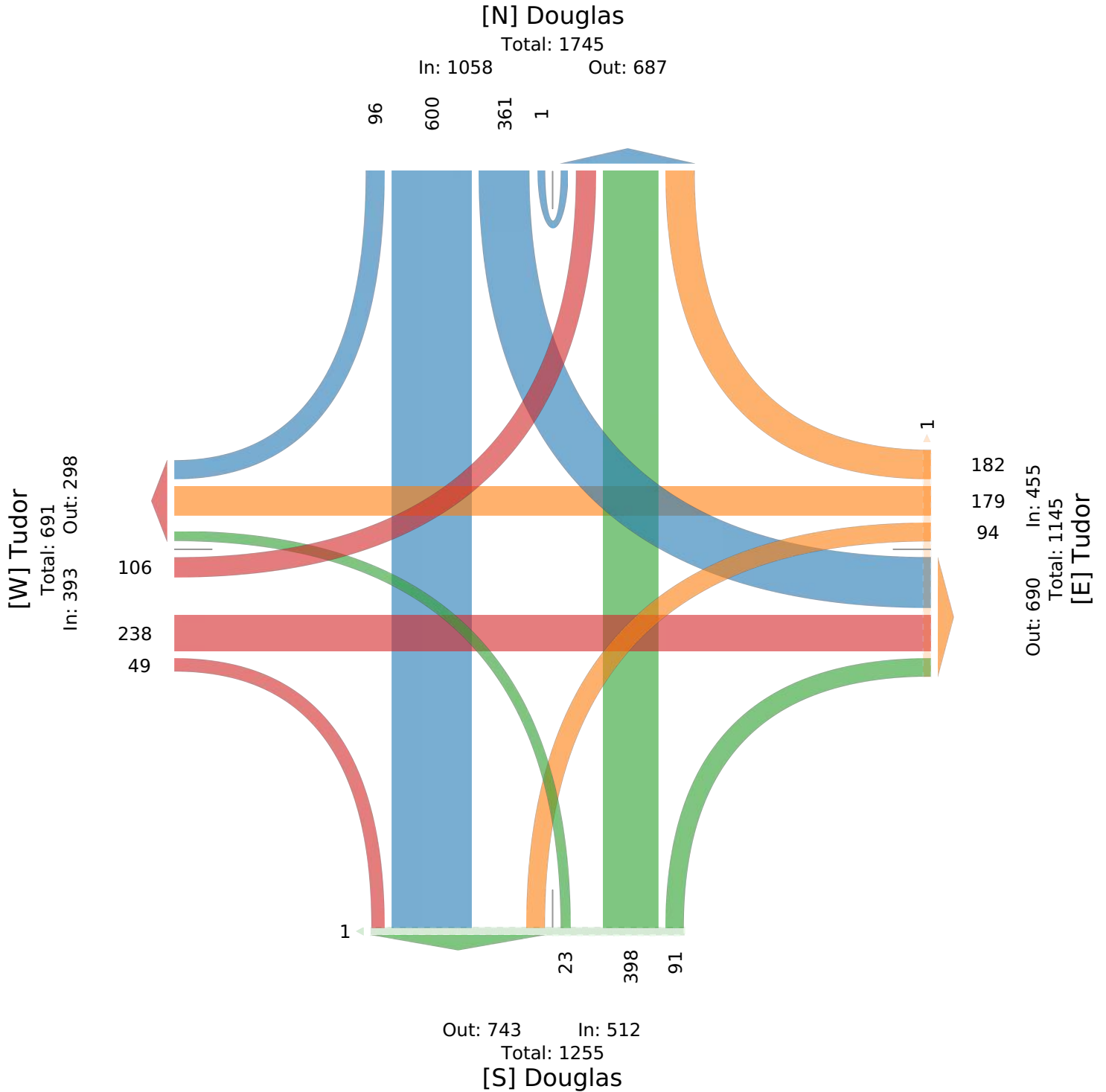
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959803, Location: 38.930614, -94.379523



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



NE Douglas Street & NW Chipman Road - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959804, Location: 38.925031, -94.379845



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Douglas Southbound						Chipman Westbound						Douglas Northbound						Chipman Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-07 7:00AM	9	28	6	0	43	0	21	31	2	0	54	0	5	57	8	0	70	0	1	18	10	0	29	0	196
7:15AM	24	35	8	0	67	0	25	39	1	0	65	0	3	70	13	0	86	0	2	11	21	0	34	0	252
7:30AM	19	54	10	0	83	0	27	37	3	0	67	0	5	83	8	0	96	0	3	21	15	0	39	0	285
7:45AM	27	45	13	0	85	0	19	40	4	0	63	0	5	85	19	0	109	0	5	29	23	0	57	0	314
Hourly Total	79	162	37	0	278	0	92	147	10	0	249	0	18	295	48	0	361	0	11	79	69	0	159	0	1047
8:00AM	20	48	14	0	82	0	15	34	1	0	50	0	10	47	11	0	68	0	4	26	13	0	43	0	243
8:15AM	19	48	17	0	84	0	18	26	2	0	46	0	4	58	14	0	76	0	4	33	23	2	62	0	268
8:30AM	27	58	23	0	108	0	18	30	6	0	54	0	7	59	15	0	81	0	6	34	24	2	66	0	309
8:45AM	35	70	24	0	129	0	18	36	7	0	61	0	9	60	8	0	77	0	5	35	33	1	74	0	341
Hourly Total	101	224	78	0	403	0	69	126	16	0	211	0	30	224	48	0	302	0	19	128	93	5	245	0	1161
4:00PM	32	90	43	0	165	0	25	46	16	0	87	1	7	48	10	0	65	0	13	84	31	0	128	0	445
4:15PM	31	86	48	0	165	1	23	55	10	0	88	0	11	56	11	0	78	0	20	70	21	0	111	0	442
4:30PM	33	95	54	0	182	0	33	58	11	0	102	0	16	74	21	0	111	1	18	79	39	0	136	0	531
4:45PM	42	101	50	0	193	0	15	77	10	0	102	2	11	62	21	0	94	5	18	81	40	0	139	0	528
Hourly Total	138	372	195	0	705	1	96	236	47	0	379	3	45	240	63	0	348	6	69	314	131	0	514	0	1946
5:00PM	52	110	57	0	219	0	26	60	9	1	96	2	10	70	13	0	93	0	24	95	28	0	147	0	555
5:15PM	35	76	47	0	158	0	27	60	13	0	100	1	17	63	18	0	98	1	17	79	19	0	115	0	471
5:30PM	28	89	42	0	159	0	21	61	12	0	94	0	5	57	8	0	70	1	11	74	24	0	109	0	432
5:45PM	30	80	39	0	149	0	21	48	10	0	79	0	10	51	19	0	80	0	21	82	21	0	124	0	432
Hourly Total	145	355	185	0	685	0	95	229	44	1	369	3	42	241	58	0	341	2	73	330	92	0	495	0	1890
Total	463	1113	495	0	2071	1	352	738	117	1	1208	6	135	1000	217	0	1352	8	172	851	385	5	1413	0	6044
% Approach	22.4%	53.7%	23.9%	0%	-	-	29.1%	61.1%	9.7%	0.1%	-	-	10.0%	74.0%	16.1%	0%	-	-	12.2%	60.2%	27.2%	0.4%	-	-	-
% Total	7.7%	18.4%	8.2%	0%	34.3%	-	5.8%	12.2%	1.9%	0%	20.0%	-	2.2%	16.5%	3.6%	0%	22.4%	-	2.8%	14.1%	6.4%	0.1%	23.4%	-	-
Lights	459	1098	492	0	2049	-	347	731	114	1	1193	-	135	980	214	0	1329	-	166	842	375	5	1388	-	5959
% Lights	99.1%	98.7%	99.4%	0%	98.9%	-	98.6%	99.1%	97.4%	100%	98.8%	-	100%	98.0%	98.6%	0%	98.3%	-	96.5%	98.9%	97.4%	100%	98.2%	-	98.6%
Articulated Trucks	1	2	0	0	3	-	1	0	0	0	1	-	0	5	1	0	6	-	1	2	3	0	6	-	16
% Articulated Trucks	0.2%	0.2%	0%	0%	0.1%	-	0.3%	0%	0%	0%	0.1%	-	0%	0.5%	0.5%	0%	0.4%	-	0.6%	0.2%	0.8%	0%	0.4%	-	0.3%
Buses and Single-Unit Trucks	3	13	3	0	19	-	4	7	3	0	14	-	0	15	2	0	17	-	5	7	7	0	19	-	69
% Buses and Single-Unit Trucks	0.6%	1.2%	0.6%	0%	0.9%	-	1.1%	0.9%	2.6%	0%	1.2%	-	0%	1.5%	0.9%	0%	1.3%	-	2.9%	0.8%	1.8%	0%	1.3%	-	1.1%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	6	-	-	-	-	-	6	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	75.0%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	25.0%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NE Douglas Street & NW Chipman Road - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959804, Location: 38.925031, -94.379845



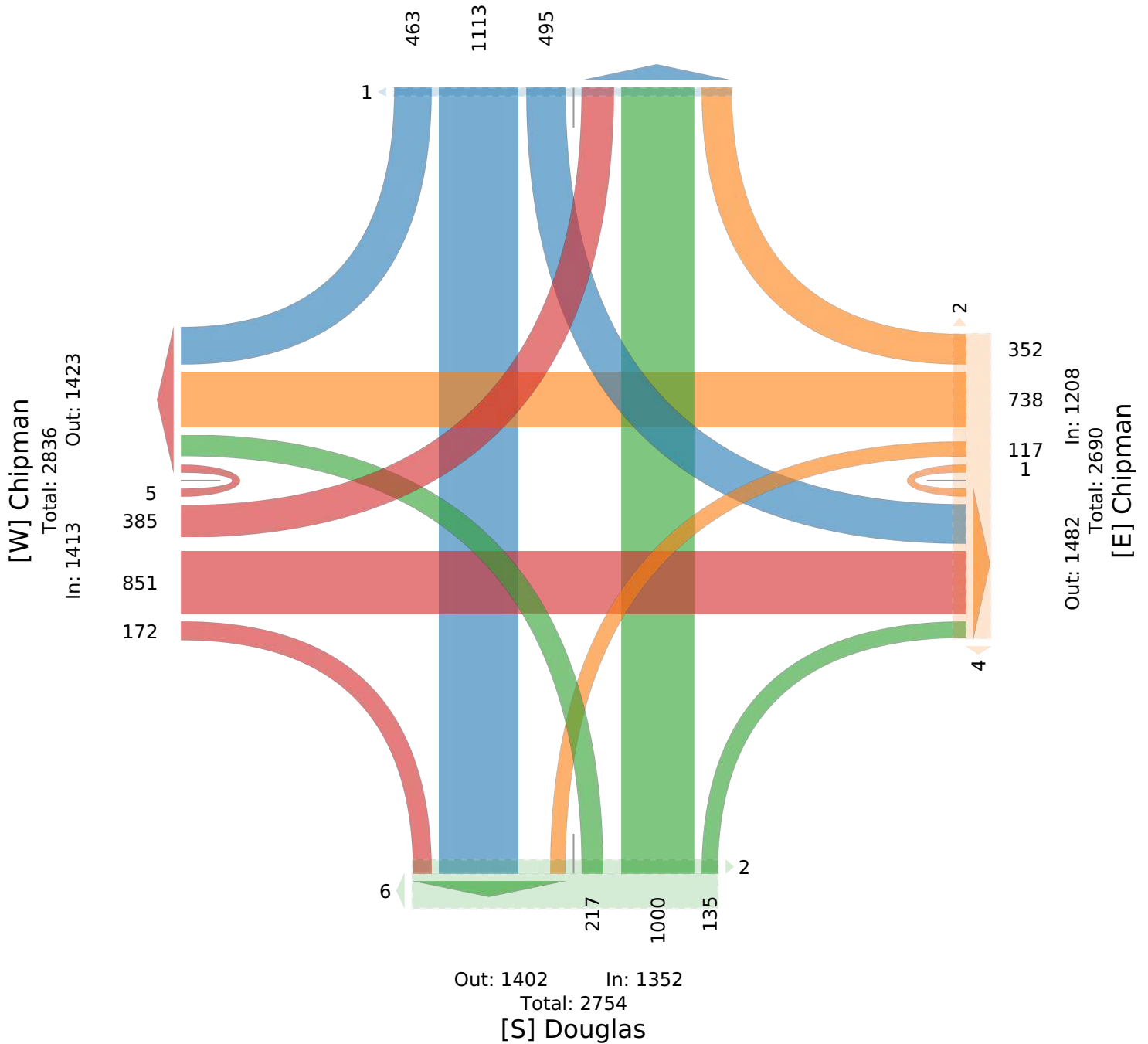
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Douglas

Total: 3808

In: 2071

Out: 1737



NE Douglas Street & NW Chipman Road - TMC

Tue Jun 7, 2022

AM Peak (8 AM - 9 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959804, Location: 38.925031, -94.379845



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Douglas Southbound						Chipman Westbound						Douglas Northbound						Chipman Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-07 8:00AM	20	48	14	0	82	0	15	34	1	0	50	0	10	47	11	0	68	0	4	26	13	0	43	0	243
8:15AM	19	48	17	0	84	0	18	26	2	0	46	0	4	58	14	0	76	0	4	33	23	2	62	0	268
8:30AM	27	58	23	0	108	0	18	30	6	0	54	0	7	59	15	0	81	0	6	34	24	2	66	0	309
8:45AM	35	70	24	0	129	0	18	36	7	0	61	0	9	60	8	0	77	0	5	35	33	1	74	0	341
Total	101	224	78	0	403	0	69	126	16	0	211	0	30	224	48	0	302	0	19	128	93	5	245	0	1161
% Approach	25.1%	55.6%	19.4%	0%	-	-	32.7%	59.7%	7.6%	0%	-	-	9.9%	74.2%	15.9%	0%	-	-	7.8%	52.2%	38.0%	2.0%	-	-	-
% Total	8.7%	19.3%	6.7%	0%	34.7%	-	5.9%	10.9%	1.4%	0%	18.2%	-	2.6%	19.3%	4.1%	0%	26.0%	-	1.6%	11.0%	8.0%	0.4%	21.1%	-	-
PHF	0.721	0.800	0.813	-	0.781	-	0.958	0.875	0.571	-	0.865	-	0.750	0.933	0.800	-	0.932	-	0.792	0.914	0.705	0.625	0.828	-	0.851
Lights	99	220	78	0	397	-	67	121	15	0	203	-	30	215	46	0	291	-	16	125	89	5	235	-	1126
% Lights	98.0%	98.2%	100%	0%	98.5%	-	97.1%	96.0%	93.8%	0%	96.2%	-	100%	96.0%	95.8%	0%	96.4%	-	84.2%	97.7%	95.7%	100%	95.9%	-	97.0%
Articulated Trucks	1	1	0	0	2	-	0	0	0	0	0	-	0	3	0	0	3	-	1	0	1	0	2	-	7
% Articulated Trucks	1.0%	0.4%	0%	0%	0.5%	-	0%	0%	0%	0%	0%	-	0%	1.3%	0%	0%	1.0%	-	5.3%	0%	1.1%	0%	0.8%	-	0.6%
Buses and Single-Unit Trucks	1	3	0	0	4	-	2	5	1	0	8	-	0	6	2	0	8	-	2	3	3	0	8	-	28
% Buses and Single-Unit Trucks	1.0%	1.3%	0%	0%	1.0%	-	2.9%	4.0%	6.3%	0%	3.8%	-	0%	2.7%	4.2%	0%	2.6%	-	10.5%	2.3%	3.2%	0%	3.3%	-	2.4%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NE Douglas Street & NW Chipman Road - TMC

Tue Jun 7, 2022

AM Peak (8 AM - 9 AM)

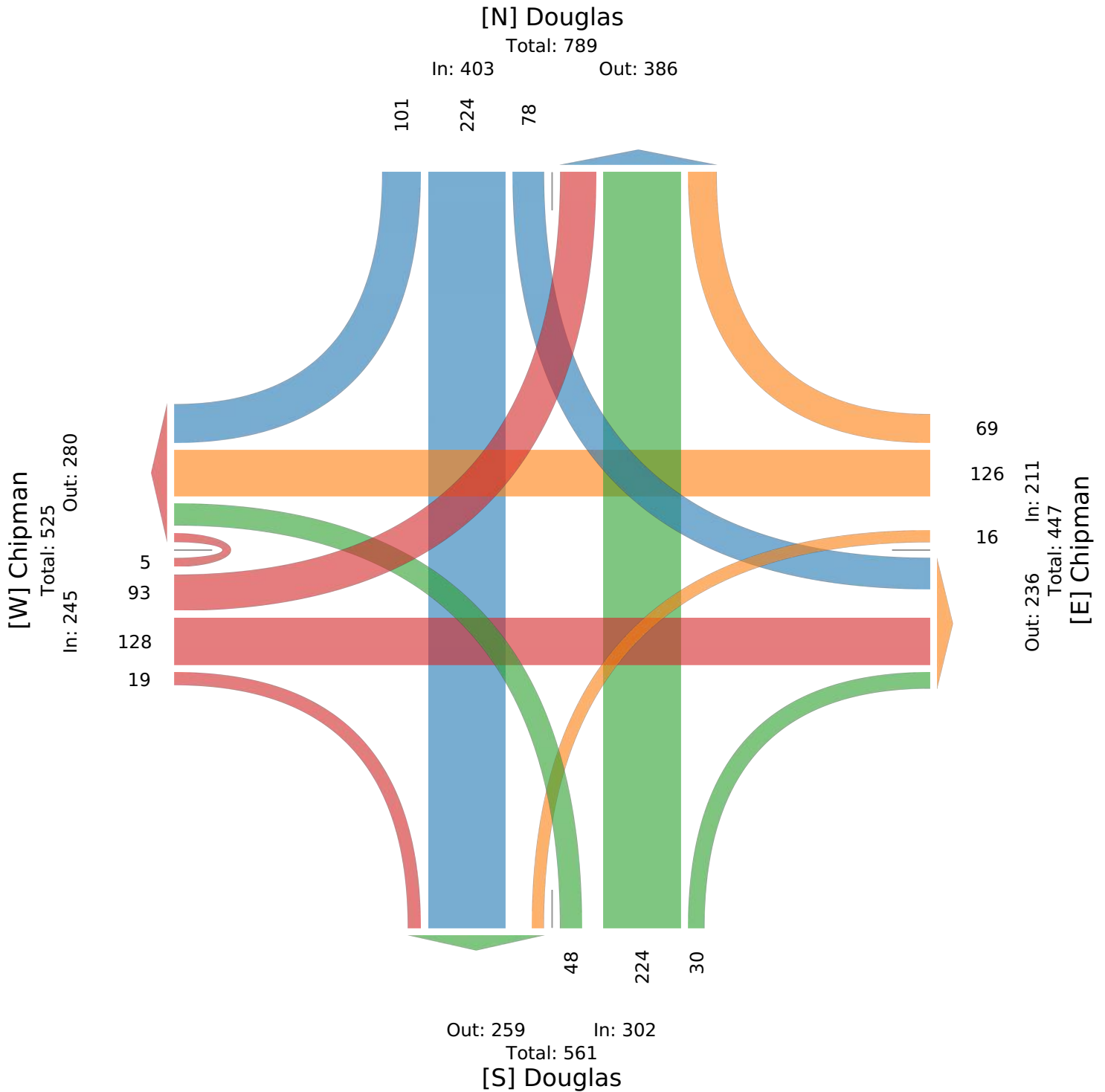
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959804, Location: 38.925031, -94.379845



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



NE Douglas Street & NW Chipman Road - TMC

Tue Jun 7, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959804, Location: 38.925031, -94.379845



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Douglas Southbound						Chipman Westbound						Douglas Northbound						Chipman Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-07 4:30PM	33	95	54	0	182	0	33	58	11	0	102	0	16	74	21	0	111	1	18	79	39	0	136	0	531
4:45PM	42	101	50	0	193	0	15	77	10	0	102	2	11	62	21	0	94	5	18	81	40	0	139	0	528
5:00PM	52	110	57	0	219	0	26	60	9	1	96	2	10	70	13	0	93	0	24	95	28	0	147	0	555
5:15PM	35	76	47	0	158	0	27	60	13	0	100	1	17	63	18	0	98	1	17	79	19	0	115	0	471
Total	162	382	208	0	752	0	101	255	43	1	400	5	54	269	73	0	396	7	77	334	126	0	537	0	2085
% Approach	21.5%	50.8%	27.7%	0%	-	-	25.3%	63.8%	10.8%	0.3%	-	-	13.6%	67.9%	18.4%	0%	-	-	14.3%	62.2%	23.5%	0%	-	-	-
% Total	7.8%	18.3%	10.0%	0%	36.1%	-	4.8%	12.2%	2.1%	0%	19.2%	-	2.6%	12.9%	3.5%	0%	19.0%	-	3.7%	16.0%	6.0%	0%	25.8%	-	-
PHF	0.779	0.868	0.912	-	0.858	-	0.765	0.828	0.827	0.250	0.980	-	0.794	0.909	0.869	-	0.892	-	0.802	0.879	0.788	-	0.913	-	0.939
Lights	161	380	208	0	749	-	100	254	41	1	396	-	54	266	73	0	393	-	76	333	126	0	535	-	2073
% Lights	99.4%	99.5%	100%	0%	99.6%	-	99.0%	99.6%	95.3%	100%	99.0%	-	100%	98.9%	100%	0%	99.2%	-	98.7%	99.7%	100%	0%	99.6%	-	99.4%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Buses and Single-Unit Trucks	1	2	0	0	3	-	1	1	2	0	4	-	0	3	0	0	3	-	1	1	0	0	2	-	12
% Buses and Single-Unit Trucks	0.6%	0.5%	0%	0%	0.4%	-	1.0%	0.4%	4.7%	0%	1.0%	-	0%	1.1%	0%	0%	0.8%	-	1.3%	0.3%	0%	0%	0.4%	-	0.6%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	5	-	-	-	-	-	5	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	71.4%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	0%	-	-	-	-	-	28.6%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NE Douglas Street & NW Chipman Road - TMC

Tue Jun 7, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959804, Location: 38.925031, -94.379845



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Douglas

Total: 1248

In: 752

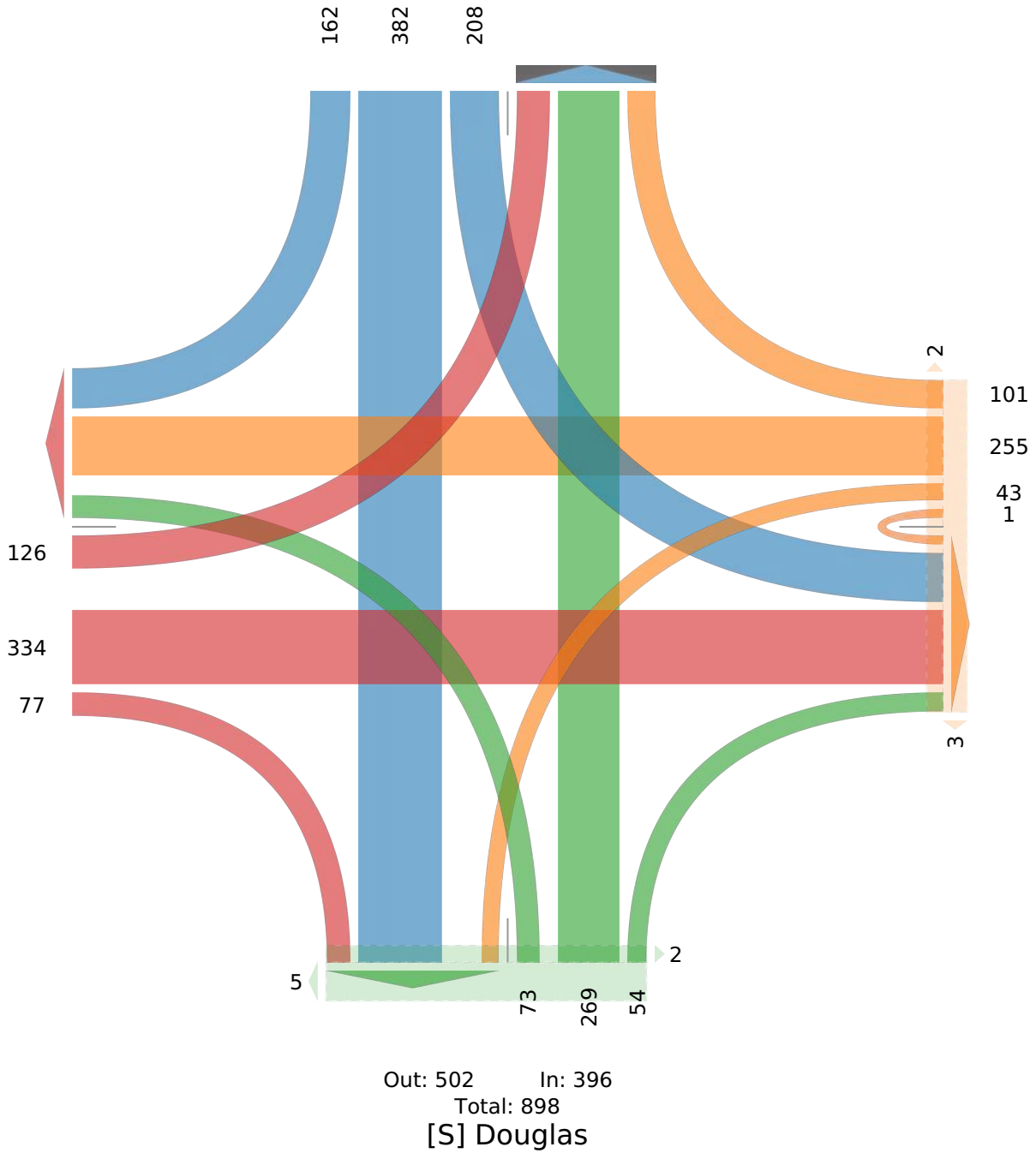
Out: 496

[W] Chipman

Total: 1027

In: 537

Out: 490



NW Chipman Road & NW Commerce Drive - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959805, Location: 38.925148, -94.384619



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Commerce Southbound						Chipman Westbound						Commerce Northbound						Chipman Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-07 7:00AM	0	2	1	0	3	0	9	31	6	0	46	0	2	0	2	0	4	0	2	26	6	0	34	0	87
7:15AM	6	1	4	0	11	0	10	57	0	0	67	0	2	0	1	0	3	0	3	38	8	0	49	0	130
7:30AM	10	1	4	0	15	0	16	42	5	0	63	0	2	2	1	0	5	0	1	34	6	0	41	0	124
7:45AM	5	0	7	0	12	0	33	42	7	1	83	0	0	1	1	0	2	0	2	47	13	0	62	0	159
Hourly Total	21	4	16	0	41	0	68	172	18	1	259	0	6	3	5	0	14	0	8	145	33	0	186	0	500
8:00AM	9	2	8	0	19	0	18	41	2	1	62	0	4	1	6	0	11	0	0	31	10	0	41	0	133
8:15AM	8	1	11	0	20	0	14	36	5	2	57	0	0	1	5	0	6	0	1	53	9	0	63	0	146
8:30AM	10	2	6	0	18	0	15	52	3	4	74	0	2	1	2	0	5	0	1	53	14	0	68	0	165
8:45AM	11	0	4	0	15	0	13	50	6	3	72	0	2	0	1	0	3	0	2	64	19	0	85	0	175
Hourly Total	38	5	29	0	72	0	60	179	16	10	265	0	8	3	14	0	25	0	4	201	52	0	257	0	619
4:00PM	18	1	24	0	43	0	9	78	6	3	96	0	3	0	2	0	5	0	0	103	6	0	109	0	253
4:15PM	4	2	17	0	23	0	7	91	0	0	98	0	2	0	3	0	5	1	0	94	5	1	100	0	226
4:30PM	9	2	21	0	32	0	11	96	6	1	114	0	1	1	2	0	4	2	0	113	13	0	126	0	276
4:45PM	12	2	22	0	36	0	22	94	5	1	122	0	0	1	2	0	3	2	2	118	24	0	144	0	305
Hourly Total	43	7	84	0	134	0	49	359	17	5	430	0	6	2	9	0	17	5	2	428	48	1	479	0	1060
5:00PM	18	6	32	0	56	0	11	111	1	0	123	0	7	0	8	0	15	0	2	114	4	0	120	0	314
5:15PM	10	2	12	0	24	0	8	93	4	1	106	0	4	0	3	0	7	0	2	114	6	0	122	0	259
5:30PM	17	0	15	0	32	0	5	92	0	0	97	0	2	0	2	0	4	2	1	104	9	0	114	0	247
5:45PM	15	3	15	0	33	0	21	76	0	1	98	0	1	0	4	0	5	0	3	111	22	0	136	0	272
Hourly Total	60	11	74	0	145	0	45	372	5	2	424	0	14	0	17	0	31	2	8	443	41	0	492	0	1092
Total	162	27	203	0	392	0	222	1082	56	18	1378	0	34	8	45	0	87	7	22	1217	174	1	1414	0	3271
% Approach	41.3%	6.9%	51.8%	0%	-	-	16.1%	78.5%	4.1%	1.3%	-	-	39.1%	9.2%	51.7%	0%	-	-	1.6%	86.1%	12.3%	0.1%	-	-	-
% Total	5.0%	0.8%	6.2%	0%	12.0%	-	6.8%	33.1%	1.7%	0.6%	42.1%	-	1.0%	0.2%	1.4%	0%	2.7%	-	0.7%	37.2%	5.3%	0%	43.2%	-	-
Lights	157	27	199	0	383	-	221	1070	55	18	1364	-	29	8	44	0	81	-	21	1198	172	1	1392	-	3220
% Lights	96.9%	100%	98.0%	0%	97.7%	-	99.5%	98.9%	98.2%	100%	99.0%	-	85.3%	100%	97.8%	0%	93.1%	-	95.5%	98.4%	98.9%	100%	98.4%	-	98.4%
Articulated Trucks	0	0	0	0	0	-	0	1	1	0	2	-	4	0	0	0	4	-	0	1	1	0	2	-	8
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0.1%	1.8%	0%	0.1%	-	11.8%	0%	0%	0%	4.6%	-	0%	0.1%	0.6%	0%	0.1%	-	0.2%
Buses and Single-Unit Trucks	5	0	4	0	9	-	1	11	0	0	12	-	1	0	1	0	2	-	1	18	1	0	20	-	43
% Buses and Single-Unit Trucks	3.1%	0%	2.0%	0%	2.3%	-	0.5%	1.0%	0%	0%	0.9%	-	2.9%	0%	2.2%	0%	2.3%	-	4.5%	1.5%	0.6%	0%	1.4%	-	1.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	4	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57.1%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42.9%	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NW Chipman Road & NW Commerce Drive - TMC

Tue Jun 7, 2022

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959805, Location: 38.925148, -94.384619



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

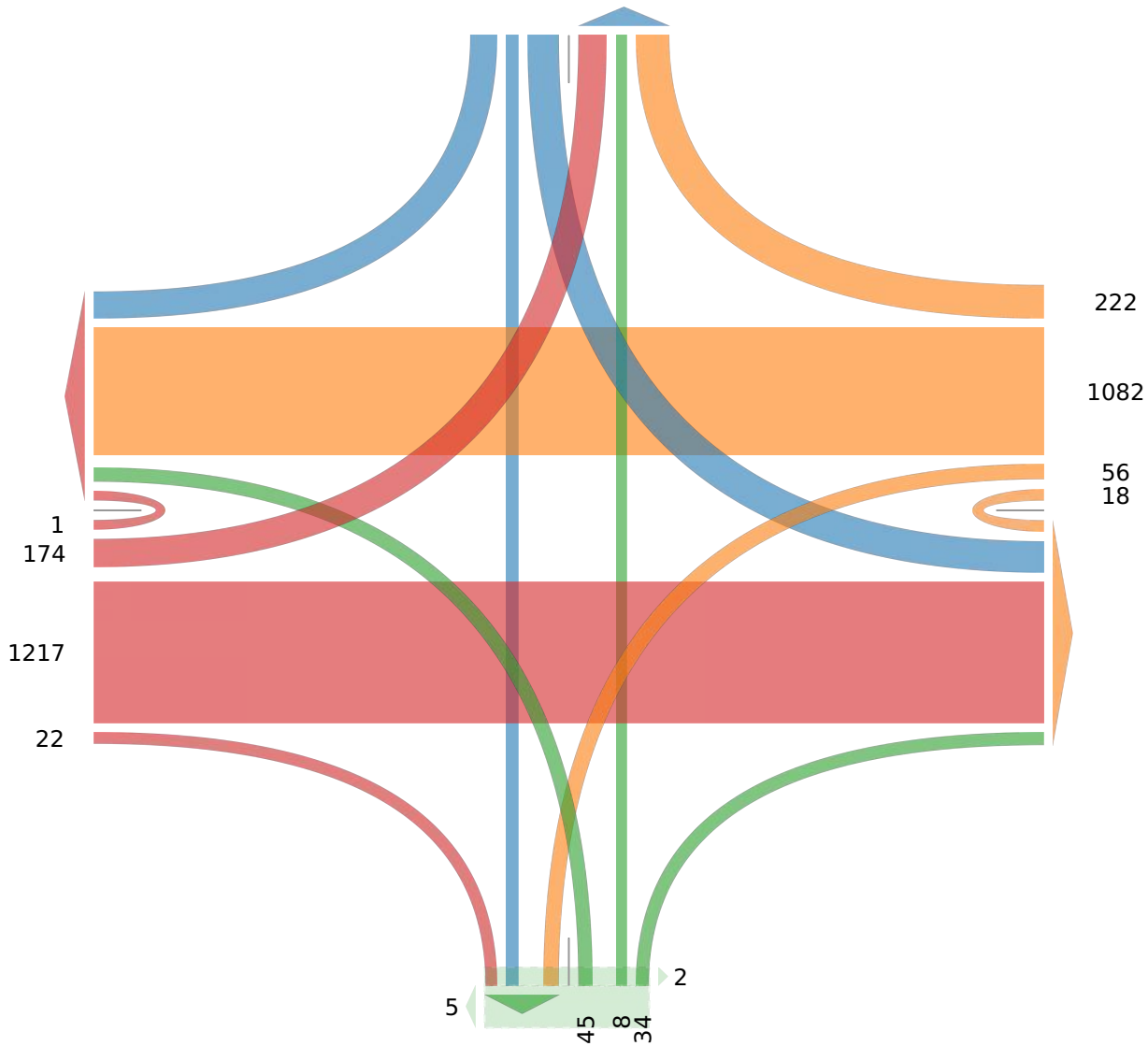
[N] Commerce

Total: 796

In: 392 Out: 404

162
27
203

[W] Chipman
Total: 2704
In: 1414 Out: 1290



Out: 105 In: 87
Total: 192
[S] Commerce

Out: 1472 In: 1378
Total: 2850
[E] Chipman

NW Chipman Road & NW Commerce Drive - TMC

Tue Jun 7, 2022

AM Peak (8 AM - 9 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959805, Location: 38.925148, -94.384619



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Commerce Southbound							Chipman Westbound							Commerce Northbound							Chipman Eastbound							
Time	R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		Int
2022-06-07 8:00AM	9	2	8	0	19	0		18	41	2	1	62	0		4	1	6	0	11	0		0	31	10	0	41	0		133
8:15AM	8	1	11	0	20	0		14	36	5	2	57	0		0	1	5	0	6	0		1	53	9	0	63	0		146
8:30AM	10	2	6	0	18	0		15	52	3	4	74	0		2	1	2	0	5	0		1	53	14	0	68	0		165
8:45AM	11	0	4	0	15	0		13	50	6	3	72	0		2	0	1	0	3	0		2	64	19	0	85	0		175
Total	38	5	29	0	72	0		60	179	16	10	265	0		8	3	14	0	25	0		4	201	52	0	257	0		619
% Approach	52.8%	6.9%	40.3%	0%	-	-		22.6%	67.5%	6.0%	3.8%	-	-		32.0%	12.0%	56.0%	0%	-	-		1.6%	78.2%	20.2%	0%	-	-		-
% Total	6.1%	0.8%	4.7%	0%	11.6%	-		9.7%	28.9%	2.6%	1.6%	42.8%	-		1.3%	0.5%	2.3%	0%	4.0%	-		0.6%	32.5%	8.4%	0%	41.5%	-		-
PHF	0.864	0.625	0.659	-	0.900	-		0.833	0.861	0.667	0.625	0.895	-		0.500	0.750	0.583	-	0.568	-		0.500	0.785	0.684	-	0.756	-		0.884
Lights	34	5	29	0	68	-		59	172	15	10	256	-		7	3	13	0	23	-		4	191	52	0	247	-		594
% Lights	89.5%	100%	100%	0%	94.4%	-		98.3%	96.1%	93.8%	100%	96.6%	-		87.5%	100%	92.9%	0%	92.0%	-		100%	95.0%	100%	0%	96.1%	-		96.0%
Articulated Trucks	0	0	0	0	0	-		0	0	1	0	1	-		0	0	0	0	0	-		0	1	0	0	1	-		2
% Articulated Trucks	0%	0%	0%	0%	0%	-		0%	0%	6.3%	0%	0.4%	-		0%	0%	0%	0%	0%	-		0%	0.5%	0%	0%	0.4%	-		0.3%
Buses and Single-Unit Trucks	4	0	0	0	4	-		1	7	0	0	8	-		1	0	1	0	2	-		0	9	0	0	9	-		23
% Buses and Single-Unit Trucks	10.5%	0%	0%	0%	5.6%	-		1.7%	3.9%	0%	0%	3.0%	-		12.5%	0%	7.1%	0%	8.0%	-		0%	4.5%	0%	0%	3.5%	-		3.7%
Pedestrians	-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		
% Pedestrians	-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-
Bicycles on Crosswalk	-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		
% Bicycles on Crosswalk	-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NW Chipman Road & NW Commerce Drive - TMC

Tue Jun 7, 2022

AM Peak (8 AM - 9 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959805, Location: 38.925148, -94.384619



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

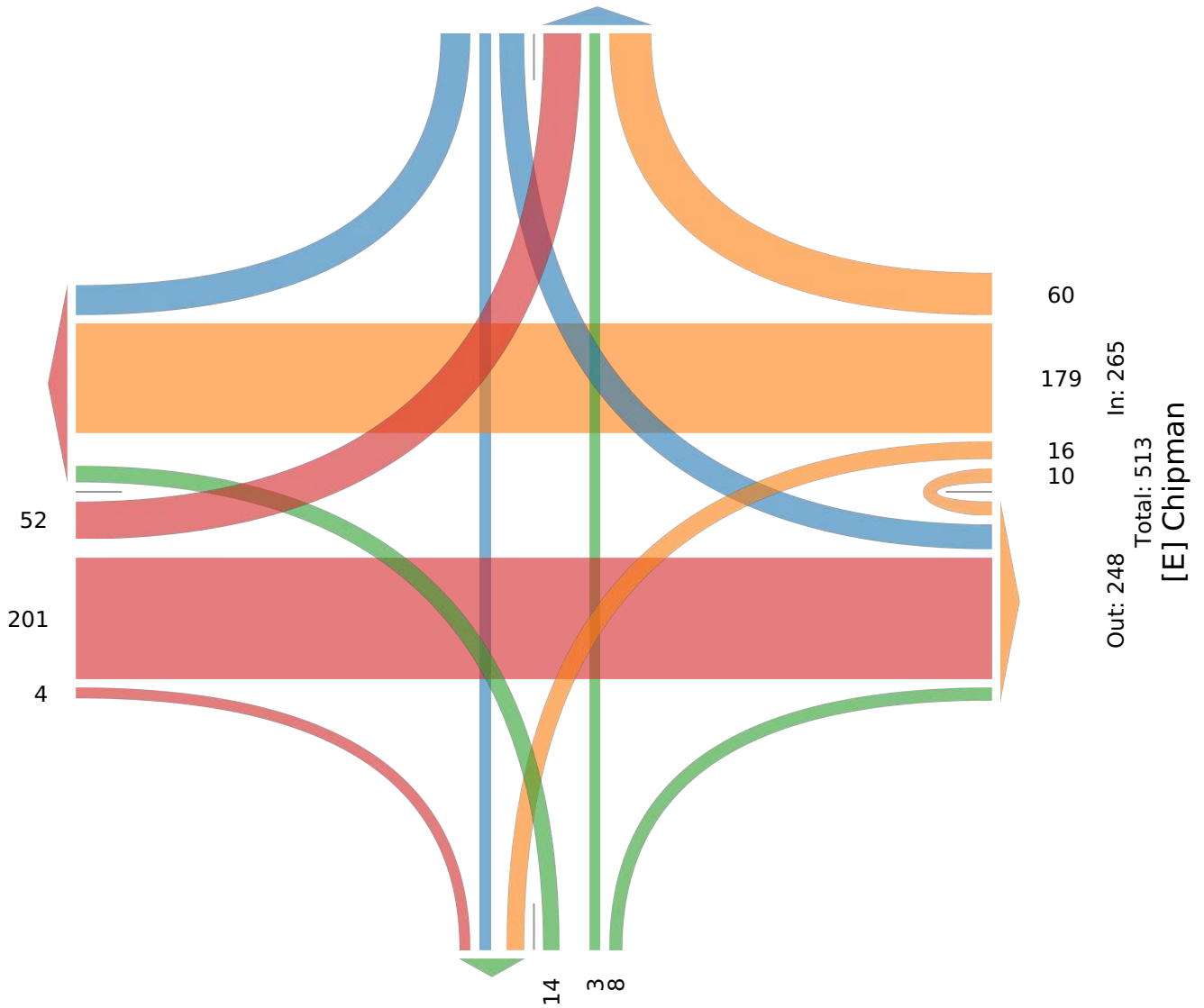
[N] Commerce

Total: 187

In: 72 Out: 115

38 5 29

[W] Chipman
Total: 488
In: 257 Out: 231



Out: 25 In: 25

Total: 50

[S] Commerce

NW Chipman Road & NW Commerce Drive - TMC

Tue Jun 7, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959805, Location: 38.925148, -94.384619



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Commerce Southbound						Chipman Westbound						Commerce Northbound						Chipman Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-07 4:30PM	9	2	21	0	32	0	11	96	6	1	114	0	1	1	2	0	4	2	0	113	13	0	126	0	276
4:45PM	12	2	22	0	36	0	22	94	5	1	122	0	0	1	2	0	3	2	2	118	24	0	144	0	305
5:00PM	18	6	32	0	56	0	11	111	1	0	123	0	7	0	8	0	15	0	2	114	4	0	120	0	314
5:15PM	10	2	12	0	24	0	8	93	4	1	106	0	4	0	3	0	7	0	2	114	6	0	122	0	259
Total	49	12	87	0	148	0	52	394	16	3	465	0	12	2	15	0	29	4	6	459	47	0	512	0	1154
% Approach	33.1%	8.1%	58.8%	0%	-	-	11.2%	84.7%	3.4%	0.6%	-	-	41.4%	6.9%	51.7%	0%	-	-	1.2%	89.6%	9.2%	0%	-	-	-
% Total	4.2%	1.0%	7.5%	0%	12.8%	-	4.5%	34.1%	1.4%	0.3%	40.3%	-	1.0%	0.2%	1.3%	0%	2.5%	-	0.5%	39.8%	4.1%	0%	44.4%	-	-
PHF	0.681	0.500	0.680	-	0.661	-	0.591	0.887	0.667	0.750	0.945	-	0.429	0.500	0.469	-	0.483	-	0.750	0.972	0.490	-	0.889	-	0.919
Lights	49	12	85	0	146	-	52	392	16	3	463	-	12	2	15	0	29	-	6	457	45	0	508	-	1146
% Lights	100%	100%	97.7%	0%	98.6%	-	100%	99.5%	100%	100%	99.6%	-	100%	100%	100%	0%	100%	-	100%	99.6%	95.7%	0%	99.2%	-	99.3%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	1	-	1
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	2.1%	0%	0.2%	-	0.1%
Buses and Single-Unit Trucks	0	0	2	0	2	-	0	2	0	0	2	-	0	0	0	0	0	-	0	2	1	0	3	-	7
% Buses and Single-Unit Trucks	0%	0%	2.3%	0%	1.4%	-	0%	0.5%	0%	0%	0.4%	-	0%	0%	0%	0%	0%	-	0%	0.4%	2.1%	0%	0.6%	-	0.6%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.0%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.0%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

NW Chipman Road & NW Commerce Drive - TMC

Tue Jun 7, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks,
Pedestrians, Bicycles on Crosswalk)

All Movements

ID: 959805, Location: 38.925148, -94.384619



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

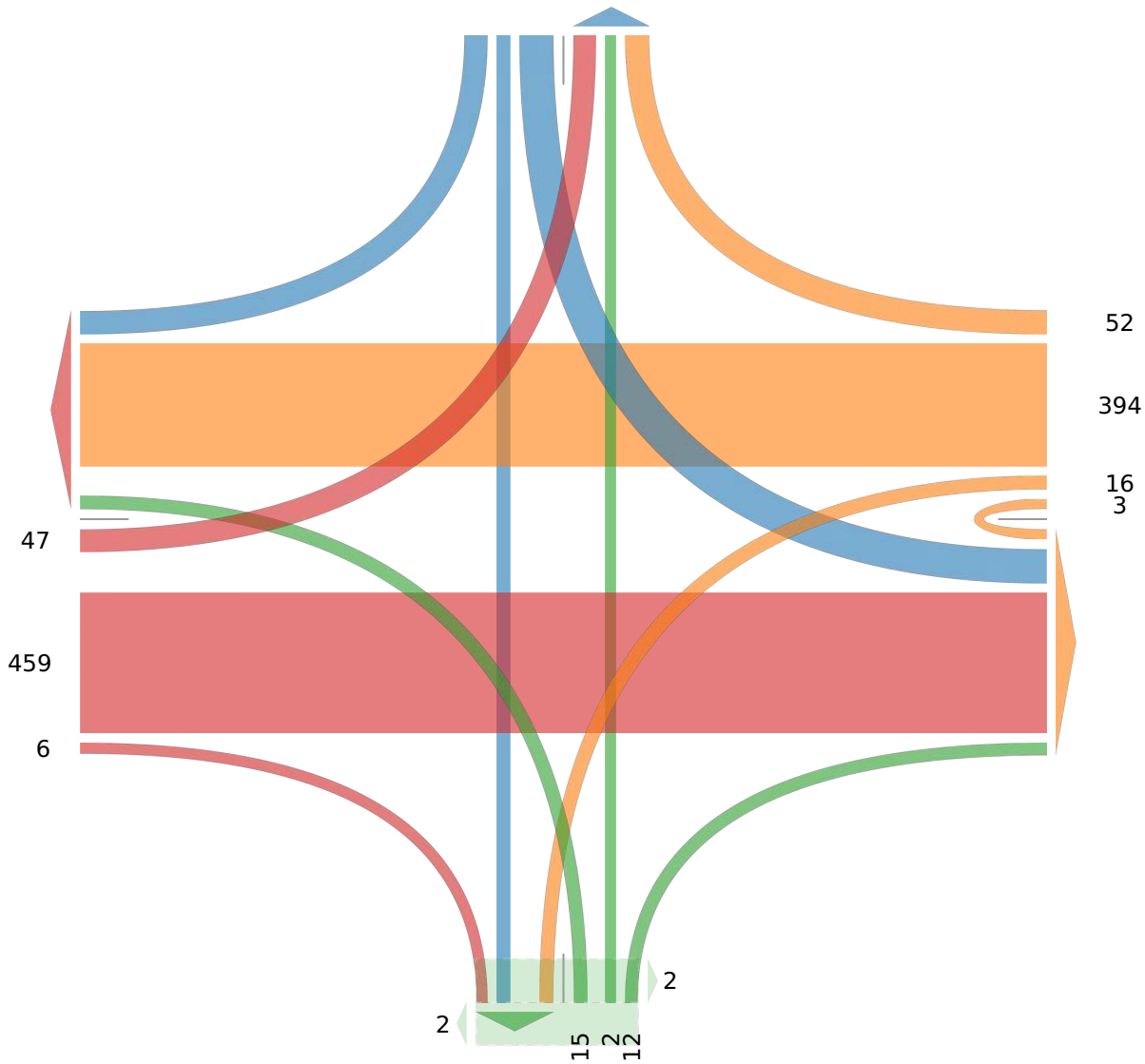
[N] Commerce

Total: 249

In: 148 Out: 101

49 12 87

[W] Chipman
Total: 970
In: 512 Out: 458



Out: 34 In: 29
Total: 63
[S] Commerce

FIGURE 2

Existing plus Approved Development Conditions
Peak Hour Volumes
Tudor Road Development
Lee's Summit, MO



olsson

LEGEND

AM (PM) Peak Hour Volume

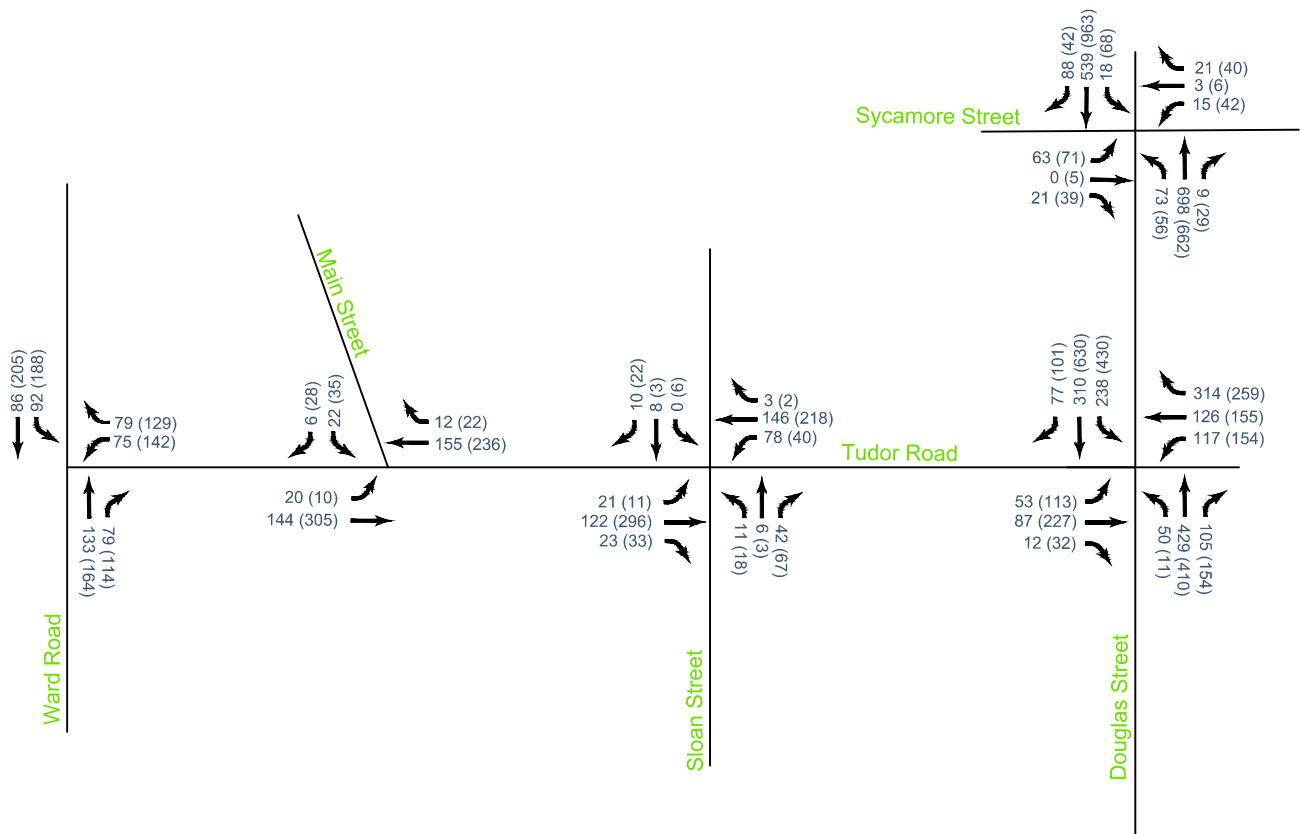


FIGURE 6

Phase 1
Trip Distribution
Tudor Road Development
Lee's Summit, MO



olsson

LEGEND

AM (PM) Peak Hour Vehicle Trips (Car)

[AM (PM)] Peak Hour Vehicle Trips (Truck)

XX% AM/PM Car Trip Distribution Percentages

XX% AM/PM Truck Trip Distribution Percentages

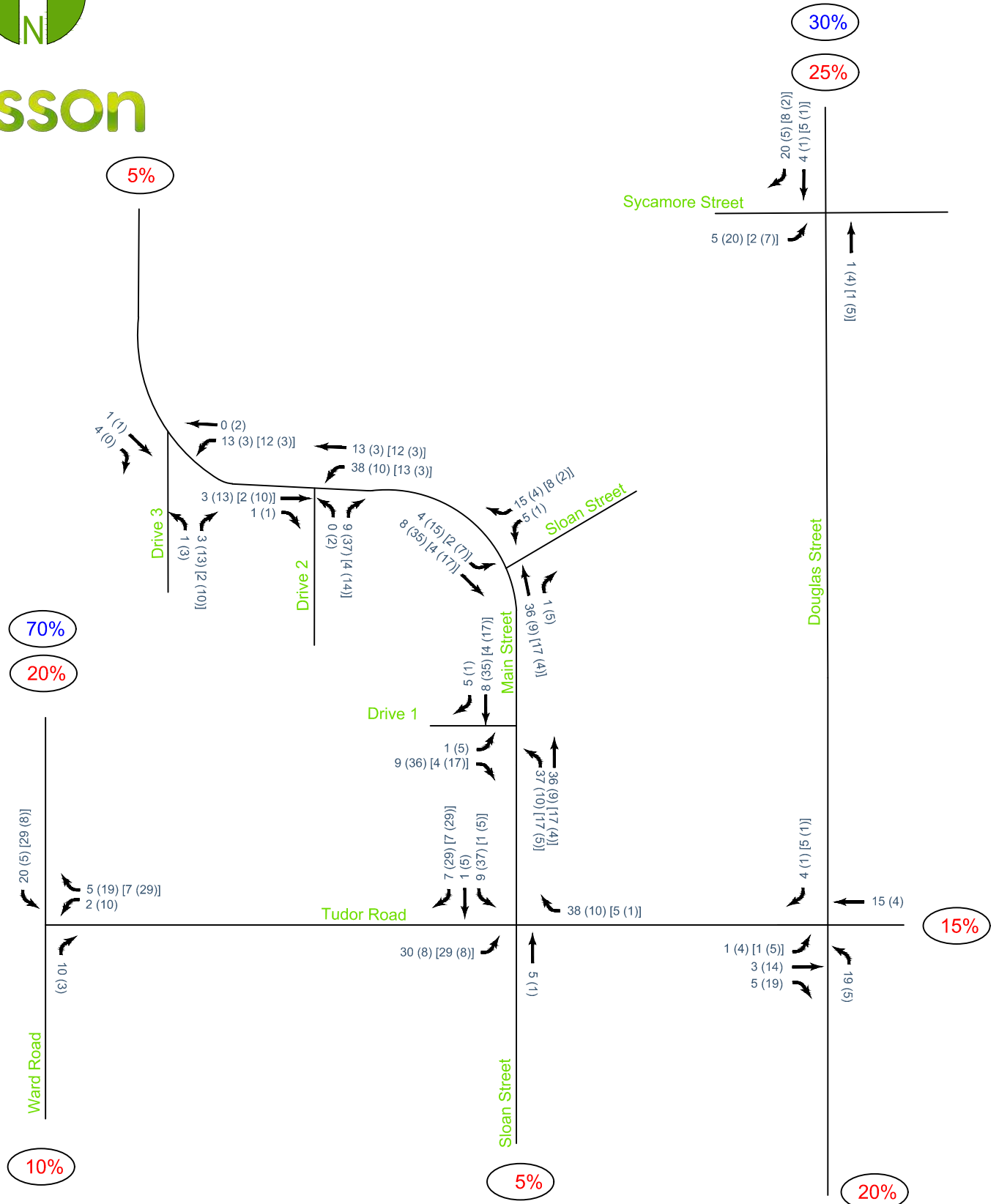


FIGURE 10

Phase 2
Trip Distribution
Tudor Road Development
Lee's Summit, MO



LEGEND

AM (PM) AM (PM) Peak Hour Car Trips

[AM (PM)] AM (PM) Peak Hour Truck Trips

XX% AM/PM Car Trip Distribution Percentages

XX% AM/PM Truck Trip Distribution Percentages



FIGURE 10

Phase 2
Trip Distribution
Tudor Road Development
Lee's Summit, MO



LEGEND

AM (PM) AM (PM) Peak Hour Car Trips

[AM (PM)] AM (PM) Peak Hour Truck Trips

XX% AM/PM Car Trip Distribution Percentages

XX% AM/PM Truck Trip Distribution Percentages



FIGURE 11

Build Year 2026 plus Approved plus Full Build Development
Peak Hour Volumes

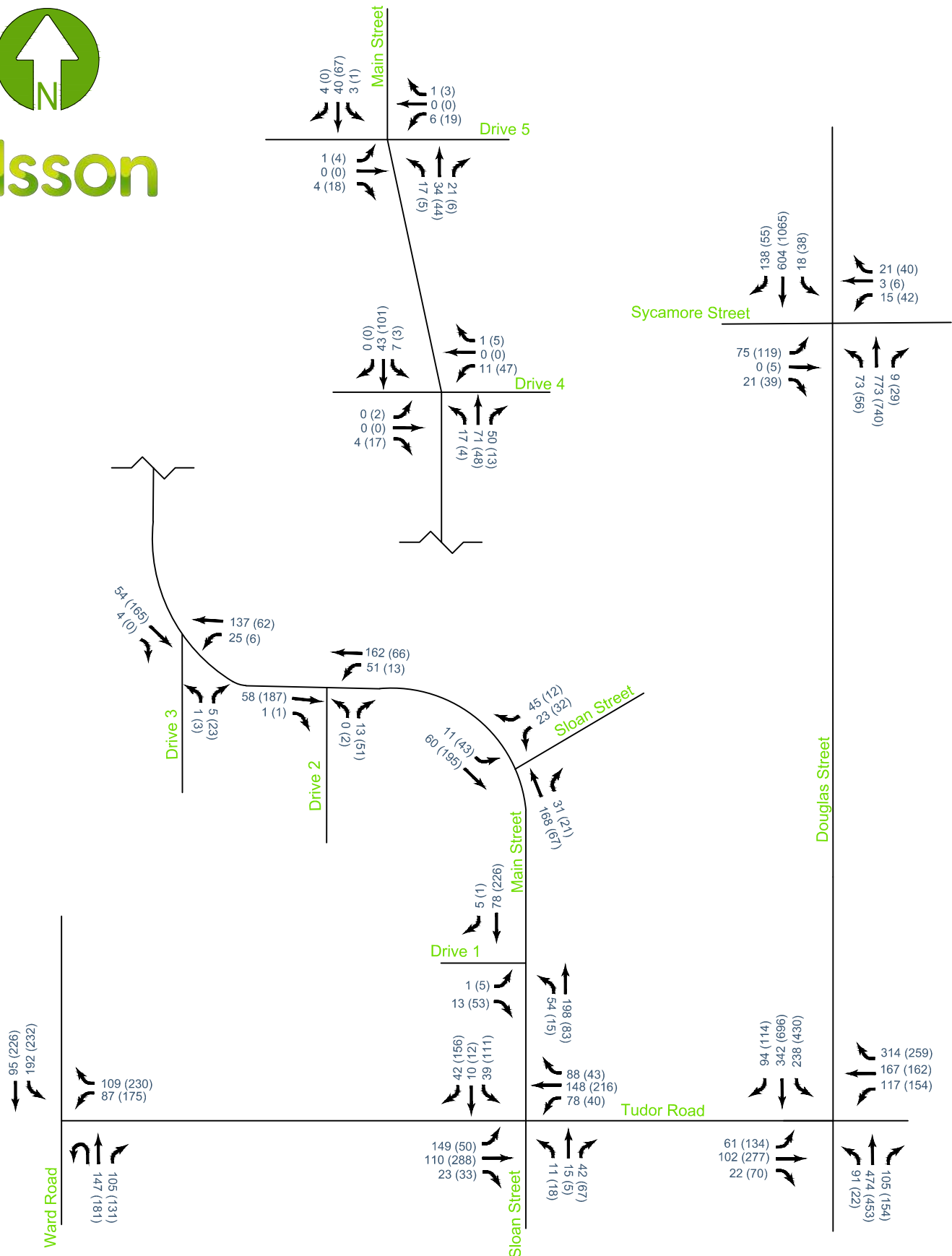
Tudor Road Development
Lee's Summit, MO



olsson

LEGEND

AM (PM) Peak Hour Volume



Trip Generation

Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

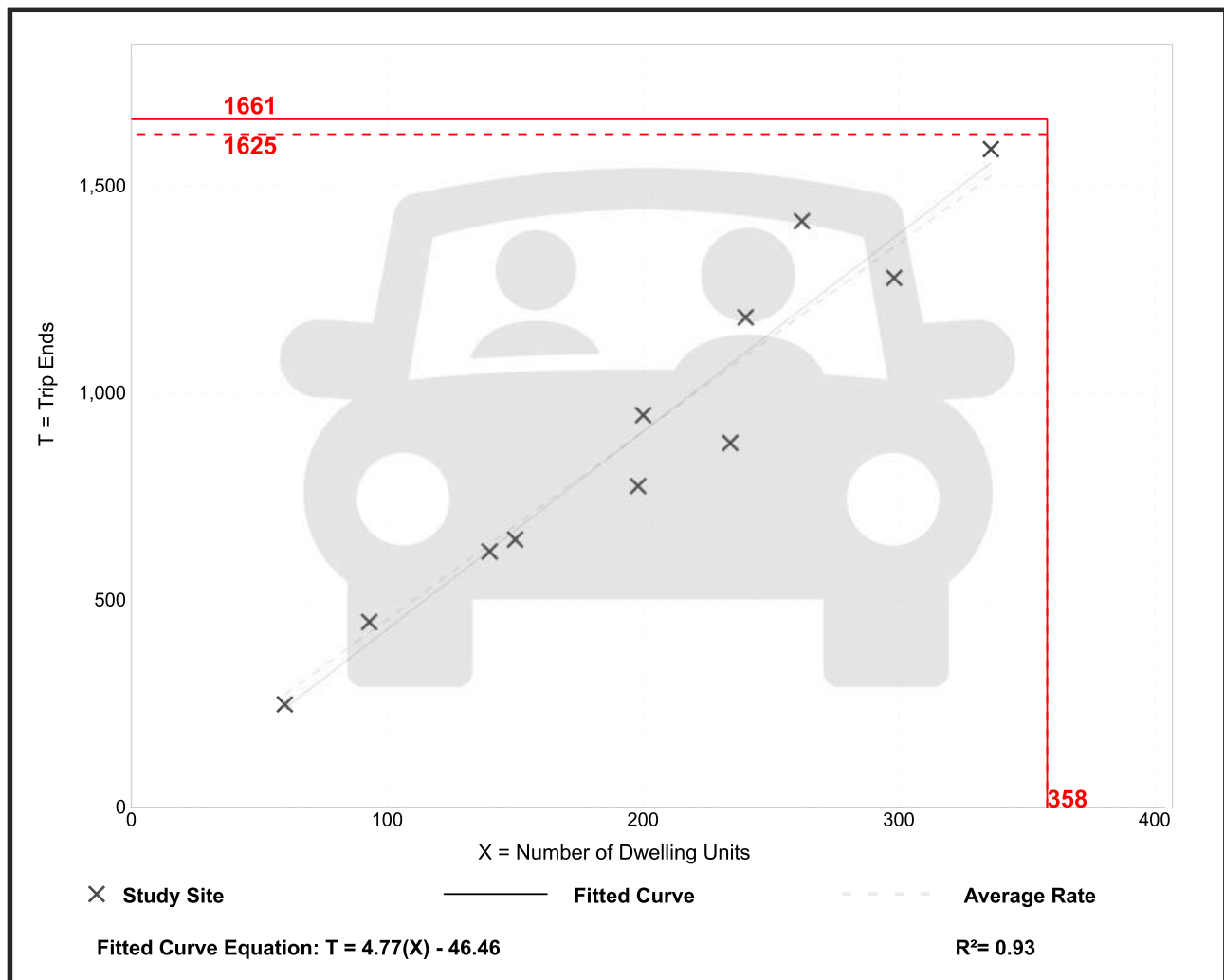
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 11
Avg. Num. of Dwelling Units: 201
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
4.54	3.76 - 5.40	0.51

Data Plot and Equation



Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 30

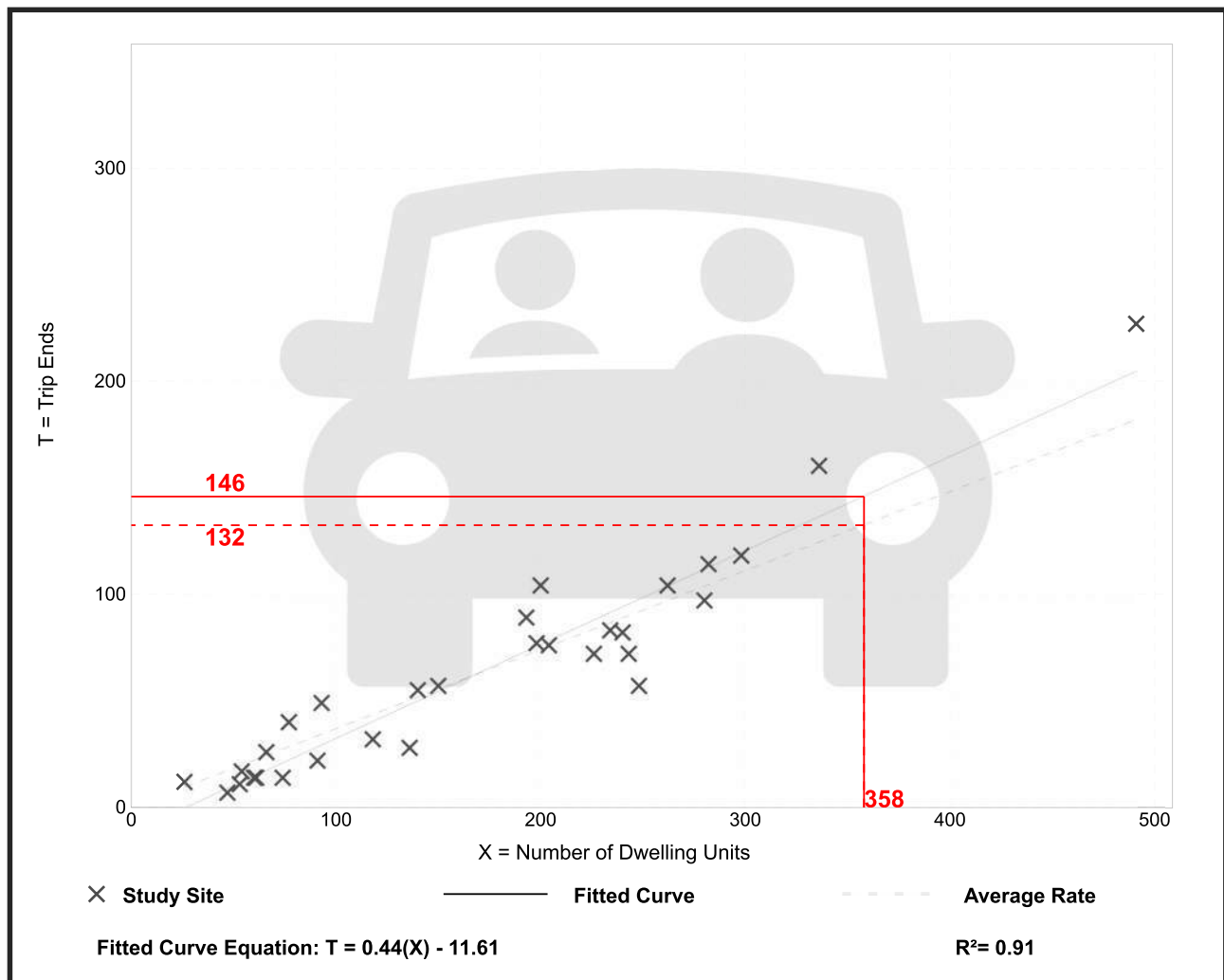
Avg. Num. of Dwelling Units: 173

Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.37	0.15 - 0.53	0.09

Data Plot and Equation



Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 31

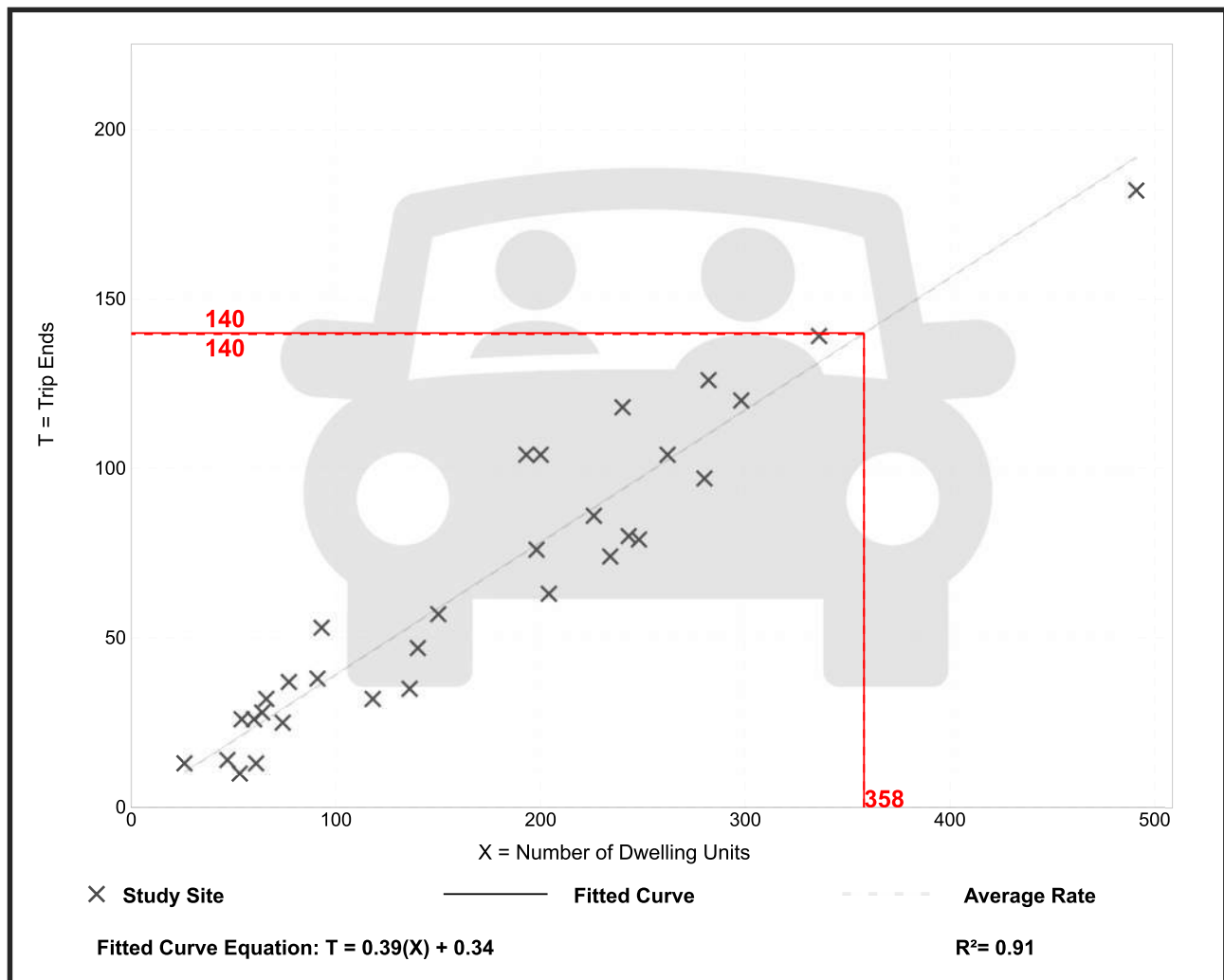
Avg. Num. of Dwelling Units: 169

Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.39	0.19 - 0.57	0.08

Data Plot and Equation



Calculated Trip Ends:

Average Rate: 140 (Total), 85 (Entry), 55 (Exit)

Fitted Curve: 140 (Total), 85 (Entry), 55 (Exit)



Synchro Reports

HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing AM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	75	126	2	138	79	119	86
Future Volume (veh/h)	75	126	2	138	79	119	86
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1870
Adj Flow Rate, veh/h	77	130		142	81	123	89
Peak Hour Factor	0.97	0.97		0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2		2	2	2	2
Cap, veh/h	337	300		762	640	678	1834
Arrive On Green	0.19	0.19		0.21	0.21	0.15	0.52
Sat Flow, veh/h	1781	1585		3647	1585	1781	3647
Grp Volume(v), veh/h	77	130		142	81	123	89
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1777
Q Serve(g_s), s	1.4	2.7		1.2	1.2	1.7	0.5
Cycle Q Clear(g_c), s	1.4	2.7		1.2	1.2	1.7	0.5
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	337	300		762	640	678	1834
V/C Ratio(X)	0.23	0.43		0.19	0.13	0.18	0.05
Avail Cap(c_a), veh/h	1217	1083		4712	2402	809	4712
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.8	13.4		12.0	7.0	8.0	4.5
Incr Delay (d2), s/veh	0.1	0.4		0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.8		0.4	0.3	0.5	0.1
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	12.9	13.7		12.0	7.0	8.1	4.5
LnGrp LOS	B	B		B	A	A	A
Approach Vol, veh/h	207			223			212
Approach Delay, s/veh	13.4			10.2			6.6
Approach LOS	B			B			A
Timer - Assigned Phs	2				5	6	8
Phs Duration (G+Y+Rc), s	24.8				11.3	13.5	12.6
Change Period (Y+Rc), s	5.5				5.5	5.5	5.5
Max Green Setting (Gmax), s	49.5				8.5	49.5	25.5
Max Q Clear Time (g_c+I1), s	2.5				3.7	3.2	4.7
Green Ext Time (p_c), s	0.4				0.1	0.7	0.3
Intersection Summary							
HCM 6th Ctrl Delay			10.1				
HCM 6th LOS			B				

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	75	126	2	138	79	119	86
Future Volume (vph)	75	126	2	138	79	119	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3539
Flt Permitted	0.950		0.950			0.662	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1233	3539
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		130			81		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	77	130	2	142	81	123	89
Shared Lane Traffic (%)							
Lane Group Flow (vph)	77	130	2	142	81	123	89
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	14.0	55.0	31.0	14.0	55.0
Total Split (%)	31.0%	31.0%	14.0%	55.0%	31.0%	14.0%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	8.2	8.2	8.2	13.6	23.8	18.2	21.3
Actuated g/C Ratio	0.22	0.22	0.22	0.36	0.62	0.48	0.56
v/c Ratio	0.20	0.29	0.01	0.11	0.08	0.17	0.05
Control Delay	15.3	5.9	13.0	14.0	1.8	6.0	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.3	5.9	13.0	14.0	1.8	6.0	8.6
LOS	B	A	B	B	A	A	A
Approach Delay	9.4			9.6			7.1
Approach LOS	A			A			A
Queue Length 50th (ft)	15	0	0	14	0	12	4
Queue Length 95th (ft)	40	30	4	31	12	28	21

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	1208	1121	402	3539	1506	723	3539
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.12	0.00	0.04	0.05	0.17	0.03

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 38.1

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.29

Intersection Signal Delay: 8.7

Intersection LOS: A

Intersection Capacity Utilization 33.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
14 s	55 s	31 s
 Ø5	 Ø6	
14 s	55 s	

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	41	141	23	78	169	15	11	6	42	22	8	16
Future Vol, veh/h	41	141	23	78	169	15	11	6	42	22	8	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	45	155	25	86	186	16	12	7	46	24	9	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	202	0	0	180	0	0	528	632	90	529	628	93
Stage 1	-	-	-	-	-	-	258	258	-	358	358	-
Stage 2	-	-	-	-	-	-	270	374	-	171	270	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1367	-	-	1393	-	-	433	396	950	433	398	946
Stage 1	-	-	-	-	-	-	724	693	-	633	626	-
Stage 2	-	-	-	-	-	-	713	616	-	814	685	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1367	-	-	1393	-	-	388	359	950	378	361	946
Mov Cap-2 Maneuver	-	-	-	-	-	-	388	359	-	378	361	-
Stage 1	-	-	-	-	-	-	700	670	-	612	587	-
Stage 2	-	-	-	-	-	-	647	578	-	742	662	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.5	2.3	10.8	13.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	388	788	1367	-	-	1393	-	-	378	614
HCM Lane V/C Ratio	0.031	0.067	0.033	-	-	0.062	-	-	0.064	0.043
HCM Control Delay (s)	14.6	9.9	7.7	-	-	7.8	-	-	15.2	11.1
HCM Lane LOS	B	A	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	0.2	0.1	-	-	0.2	-	-	0.2	0.1

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	200	257	5	5	5
Future Vol, veh/h	5	200	257	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	80	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	217	279	5	5	5
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	284	0	-	0	401	142
Stage 1	-	-	-	-	282	-
Stage 2	-	-	-	-	119	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1275	-	-	-	577	880
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	893	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1275	-	-	-	575	880
Mov Cap-2 Maneuver	-	-	-	-	575	-
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	893	-
Approach	EB	WB		SB		
HCM Control Delay, s	0.2	0		10.3		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1275	-	-	-	696	
HCM Lane V/C Ratio	0.004	-	-	-	0.016	
HCM Control Delay (s)	7.8	-	-	-	10.3	
HCM Lane LOS	A	-	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0	

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	93	15	93	163	314	66	523	148	238	255	93
Future Volume (veh/h)	60	93	15	93	163	314	66	523	148	238	255	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1870	1870	1841	1870	1870	1870	1870	1841	1870	1870	1870
Adj Flow Rate, veh/h	63	98	16	98	172	331	69	551	156	251	268	98
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	2	2	4	2	2	2	2	4	2	2	2
Cap, veh/h	213	721	322	454	382	341	420	751	442	399	744	265
Arrive On Green	0.06	0.20	0.20	0.07	0.22	0.22	0.06	0.21	0.21	0.14	0.29	0.29
Sat Flow, veh/h	1767	3554	1585	1753	1777	1585	1781	3554	1560	1781	2566	916
Grp Volume(v), veh/h	63	98	16	98	172	331	69	551	156	251	184	182
Grp Sat Flow(s),veh/h/ln	1767	1777	1585	1753	1777	1585	1781	1777	1560	1781	1777	1705
Q Serve(g_s), s	1.9	1.6	0.6	3.1	6.0	14.8	1.9	10.4	5.7	7.6	5.9	6.1
Cycle Q Clear(g_c), s	1.9	1.6	0.6	3.1	6.0	14.8	1.9	10.4	5.7	7.6	5.9	6.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.54
Lane Grp Cap(c), veh/h	213	721	322	454	382	341	420	751	442	399	515	494
V/C Ratio(X)	0.30	0.14	0.05	0.22	0.45	0.97	0.16	0.73	0.35	0.63	0.36	0.37
Avail Cap(c_a), veh/h	339	863	385	509	382	341	465	1107	598	553	799	767
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.1	23.4	23.0	20.0	24.4	27.9	15.9	26.4	20.4	18.7	20.1	20.2
Incr Delay (d2), s/veh	0.8	0.1	0.1	0.2	0.8	40.9	0.2	1.4	0.5	1.6	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.7	0.2	1.2	2.5	9.1	0.7	4.1	2.0	2.9	2.2	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	23.5	23.0	20.2	25.3	68.8	16.1	27.8	20.9	20.3	20.6	20.7
LnGrp LOS	C	C	C	C	C	E	B	C	C	C	C	C
Approach Vol, veh/h		177			601			776			617	
Approach Delay, s/veh		22.9			48.4			25.4			20.5	
Approach LOS		C			D			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	27.6	10.9	22.0	16.8	21.9	11.7	21.1				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	32.2	9.4	15.4	16.2	* 22	7.4	17.4				
Max Q Clear Time (g_c+I1), s	3.9	8.1	3.9	16.8	9.6	12.4	5.1	3.6				
Green Ext Time (p_c), s	0.0	1.9	0.0	0.0	0.4	2.8	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			30.2									
HCM 6th LOS			C									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	93	15	93	163	314	66	523	148	238	255	93
Future Volume (vph)	60	93	15	93	163	314	66	523	148	238	255	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.901				0.850		0.960	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	3539	1583	1736	3189	0	1770	3539	1553	1770	3398	0
Flt Permitted	0.324			0.690			0.534			0.352		
Satd. Flow (perm)	598	3539	1583	1261	3189	0	995	3539	1553	656	3398	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		331				207		64	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	2%	2%	4%	2%	2%	2%	2%	4%	2%	2%	2%
Adj. Flow (vph)	63	98	16	98	172	331	69	551	156	251	268	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	63	98	16	98	503	0	69	551	156	251	366	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	16.0	24.0	24.0	14.0	22.0		13.0	29.0	14.0	23.0	39.0	
Total Split (%)	17.8%	26.7%	26.7%	15.6%	24.4%		14.4%	32.2%	15.6%	25.6%	43.3%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	17.4	10.5	10.5	15.9	13.0		30.5	16.6	31.1	28.1	25.7	
Actuated g/C Ratio	0.25	0.15	0.15	0.23	0.18		0.43	0.24	0.44	0.40	0.36	
v/c Ratio	0.23	0.19	0.03	0.29	0.58		0.14	0.66	0.19	0.56	0.29	
Control Delay	21.1	30.0	0.1	21.7	13.9		11.8	30.5	1.7	17.6	16.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	21.1	30.0	0.1	21.7	13.9		11.8	30.5	1.7	17.6	16.3	
LOS	C	C	A	C	B		B	C	A	B	B	
Approach Delay		24.1			15.2			23.1			16.8	
Approach LOS		C			B			C			B	
Queue Length 50th (ft)	19	20	0	31	37		16	117	0	63	53	

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	52	46	0	74	95		41	202	17	128	97	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	326	934	631	346	1043		504	1196	811	580	1692	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.19	0.10	0.03	0.28	0.48		0.14	0.46	0.19	0.43	0.22	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 70.5

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 19.2

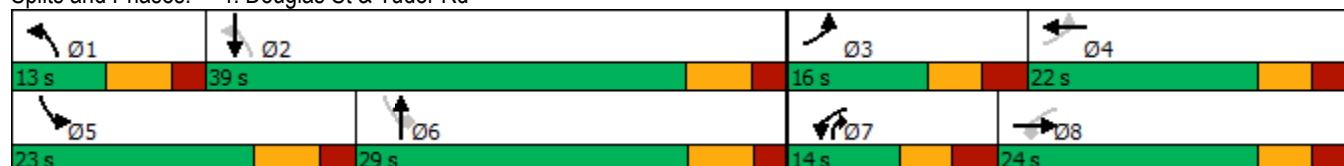
Intersection LOS: B

Intersection Capacity Utilization 69.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Douglas St & Tudor Rd



HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	193	156	40	24	361	172	99	341	37	78	224	143
Future Volume (veh/h)	193	156	40	24	361	172	99	341	37	78	224	143
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1841	1870	1663	1811	1841	1856	1841	1841	1870	1870	1870	1870
Adj Flow Rate, veh/h	227	184	47	28	425	202	116	401	44	92	264	168
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	4	2	16	6	4	3	4	4	2	2	2	2
Cap, veh/h	263	1097	273	80	1020	459	253	676	74	287	324	512
Arrive On Green	0.25	0.65	0.65	0.05	0.29	0.29	0.07	0.21	0.21	0.06	0.17	0.17
Sat Flow, veh/h	1753	2819	702	1725	3497	1572	1753	3180	347	1781	1870	1585
Grp Volume(v), veh/h	227	114	117	28	425	202	116	220	225	92	264	168
Grp Sat Flow(s),veh/h/ln	1753	1777	1744	1725	1749	1572	1753	1749	1778	1781	1870	1585
Q Serve(g_s), s	9.9	2.0	2.1	1.3	7.8	8.4	4.3	9.0	9.1	3.3	10.9	6.4
Cycle Q Clear(g_c), s	9.9	2.0	2.1	1.3	7.8	8.4	4.3	9.0	9.1	3.3	10.9	6.4
Prop In Lane	1.00		0.40	1.00		1.00	1.00		0.20	1.00		1.00
Lane Grp Cap(c), veh/h	263	691	679	80	1020	459	253	372	378	287	324	512
V/C Ratio(X)	0.86	0.17	0.17	0.35	0.42	0.44	0.46	0.59	0.60	0.32	0.82	0.33
Avail Cap(c_a), veh/h	289	691	679	274	1020	459	289	372	378	294	435	606
HCM Platoon Ratio	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97
Uniform Delay (d), s/veh	29.2	8.9	8.9	37.0	22.8	23.0	25.2	28.4	28.4	25.2	31.8	20.5
Incr Delay (d2), s/veh	20.8	0.5	0.5	2.6	1.3	3.1	1.3	2.5	2.5	0.6	8.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.8	0.8	0.6	3.1	0.4	1.7	3.8	3.9	1.4	5.3	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	9.4	9.5	39.6	24.1	26.1	26.5	30.8	30.9	25.8	40.2	20.9
LnGrp LOS	D	A	A	D	C	C	C	C	C	C	D	C
Approach Vol, veh/h	458			655			561			524		
Approach Delay, s/veh	29.6			25.4			30.0			31.5		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.0	37.4	12.3	20.2	17.8	29.6	9.2	23.4				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 13	* 16	7.5	* 19	* 13	* 16	5.0	* 16				
Max Q Clear Time (g_c+I1), s	3.3	4.1	6.3	12.9	11.9	10.4	5.3	11.1				
Green Ext Time (p_c), s	0.0	0.8	0.0	1.0	0.1	1.5	0.0	1.0				
Intersection Summary												
HCM 6th Ctrl Delay	28.9											
HCM 6th LOS	C											
Notes												

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	193	156	40	24	361	172	99	341	37	78	224	143
Future Volume (vph)	193	156	40	24	361	172	99	341	37	78	224	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.969				0.850		0.985				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	3336	0	1703	3471	1568	1736	3426	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.341			0.494		
Satd. Flow (perm)	1736	3336	0	1703	3471	1568	623	3426	0	920	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		35				202		15				168
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	4%	2%	16%	6%	4%	3%	4%	4%	2%	2%	2%	2%
Adj. Flow (vph)	227	184	47	28	425	202	116	401	44	92	264	168
Shared Lane Traffic (%)												
Lane Group Flow (vph)	227	231	0	28	425	202	116	445	0	92	264	168
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	19.0	22.0		19.0	22.0	22.0	14.0	22.0		9.5	25.0	19.0
Total Split (%)	23.8%	27.5%		23.8%	27.5%	27.5%	17.5%	27.5%		11.9%	31.3%	23.8%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	13.4	34.9		8.2	21.1	21.1	25.0	19.1		22.1	15.7	35.5
Actuated g/C Ratio	0.17	0.44		0.10	0.26	0.26	0.31	0.24		0.28	0.20	0.44
v/c Ratio	0.78	0.16		0.16	0.46	0.36	0.39	0.54		0.29	0.72	0.21
Control Delay	65.9	16.1		35.1	29.1	6.5	20.6	27.4		17.8	41.4	2.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	65.9	16.1		35.1	29.1	6.5	20.6	27.4		17.8	41.4	2.8
LOS	E	B		D	C	A	C	C		B	D	A
Approach Delay		40.8			22.4			26.0			24.9	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	124	13		13	103	0	38	95		28	123	0

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#211	56		35	140	45	65	124		51	182	25
Internal Link Dist (ft)		1280			1119			569			1961	
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	300	1475		270	916	562	299	1004		313	433	804
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.76	0.16		0.10	0.46	0.36	0.39	0.44		0.29	0.61	0.21

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 62 (78%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 27.7

Intersection LOS: C

Intersection Capacity Utilization 58.8%

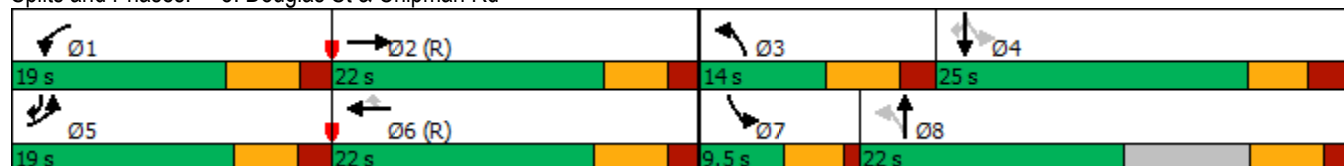
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Douglas St & Chipman Rd



HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	82	394	14	16	470	60	14	3	8	29	5	38
Future Volume (veh/h)	82	394	14	16	470	60	14	3	8	29	5	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1826	1870	1811	1841	1870	1796	1870	1707	1870	1870	1737
Adj Flow Rate, veh/h	93	448	16	18	534	68	16	3	9	33	6	43
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	5	2	6	4	2	7	2	13	2	2	11
Cap, veh/h	121	1496	53	43	1232	156	336	72	160	243	63	268
Arrive On Green	0.07	0.44	0.44	0.05	0.79	0.79	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1781	3417	122	1725	3122	396	800	218	482	544	190	809
Grp Volume(v), veh/h	93	227	237	18	298	304	28	0	0	82	0	0
Grp Sat Flow(s),veh/h/ln	1781	1735	1804	1725	1749	1769	1500	0	0	1543	0	0
Q Serve(g_s), s	4.1	6.8	6.8	0.8	4.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.1	6.8	6.8	0.8	4.4	4.4	0.9	0.0	0.0	2.7	0.0	0.0
Prop In Lane	1.00		0.07	1.00		0.22	0.57		0.32	0.40		0.52
Lane Grp Cap(c), veh/h	121	759	790	43	690	698	568	0	0	574	0	0
V/C Ratio(X)	0.77	0.30	0.30	0.42	0.43	0.43	0.05	0.00	0.00	0.14	0.00	0.00
Avail Cap(c_a), veh/h	234	759	790	140	690	698	568	0	0	574	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.93	0.93	0.93	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.7	14.5	14.6	37.5	5.6	5.6	18.2	0.0	0.0	18.8	0.0	0.0
Incr Delay (d2), s/veh	13.6	1.0	1.0	8.5	1.8	1.8	0.2	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	2.5	2.6	0.4	1.4	1.5	0.4	0.0	0.0	1.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.3	15.6	15.5	46.0	7.4	7.4	18.3	0.0	0.0	19.3	0.0	0.0
LnGrp LOS	D	B	B	D	A	A	B	A	A	B	A	A
Approach Vol, veh/h	557				620				28			
Approach Delay, s/veh	21.3				8.5				18.3			
Approach LOS	C				A				B			
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.5	40.5		32.0	10.9	37.1		32.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	30.5		26.5	10.5	26.5		26.5				
Max Q Clear Time (g_c+I1), s	2.8	8.8		4.7	6.1	6.4		2.9				
Green Ext Time (p_c), s	0.0	3.5		0.5	0.1	4.6		0.1				
Intersection Summary												
HCM 6th Ctrl Delay	15.0											
HCM 6th LOS	B											

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	394	14	16	470	60	14	3	8	29	5	38
Future Volume (vph)	82	394	14	16	470	60	14	3	8	29	5	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	90		0	95		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.983			0.957			0.929	
Flt Protected	0.950			0.950				0.972			0.980	
Satd. Flow (prot)	1770	3424	0	1703	3420	0	0	1631	0	0	1621	0
Flt Permitted	0.950			0.950				0.873			0.897	
Satd. Flow (perm)	1770	3424	0	1703	3420	0	0	1464	0	0	1484	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			18			9			43	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	5%	2%	6%	4%	2%	7%	2%	13%	2%	2%	11%
Adj. Flow (vph)	93	448	16	18	534	68	16	3	9	33	6	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	464	0	18	602	0	0	28	0	0	82	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	16.0	36.0		12.0	32.0		32.0	32.0		32.0	32.0	
Total Split (%)	20.0%	45.0%		15.0%	40.0%		40.0%	40.0%		40.0%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	9.5	40.1		6.5	30.0			26.5			26.5	
Actuated g/C Ratio	0.12	0.50		0.08	0.38			0.33			0.33	
v/c Ratio	0.44	0.27		0.13	0.47			0.06			0.16	
Control Delay	39.5	12.8		32.4	34.8			14.5			11.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	39.5	12.8		32.4	34.8			14.5			11.5	
LOS	D	B		C	C			B			B	
Approach Delay		17.2			34.7			14.5			11.5	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	43	61		9	162			6			13	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	86	118		m22	212			23			42	
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)	90			95								
Base Capacity (vph)	232	1718		138	1294			490			520	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.40	0.27		0.13	0.47			0.06			0.16	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 52 (65%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 25.2

Intersection LOS: C

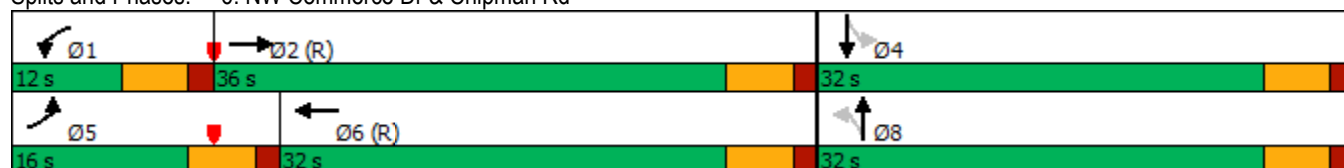
Intersection Capacity Utilization 38.7%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing PM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	142	207	1	164	114	247	233
Future Volume (veh/h)	142	207	1	164	114	247	233
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1856
Adj Flow Rate, veh/h	151	220		174	121	263	248
Peak Hour Factor	0.94	0.94		0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2		2	2	2	3
Cap, veh/h	351	312		712	630	690	1860
Arrive On Green	0.20	0.20		0.20	0.20	0.19	0.53
Sat Flow, veh/h	1781	1585		3647	1585	1781	3618
Grp Volume(v), veh/h	151	220		174	121	263	248
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1763
Q Serve(g_s), s	3.0	5.2		1.6	2.0	4.2	1.4
Cycle Q Clear(g_c), s	3.0	5.2		1.6	2.0	4.2	1.4
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	351	312		712	630	690	1860
V/C Ratio(X)	0.43	0.70		0.24	0.19	0.38	0.13
Avail Cap(c_a), veh/h	1137	1012		4316	2237	777	4370
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	14.9		13.4	7.9	8.8	4.8
Incr Delay (d2), s/veh	0.3	1.1		0.1	0.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	1.6		0.5	0.5	1.1	0.3
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	14.4	16.0		13.5	7.9	8.9	4.8
LnGrp LOS	B	B		B	A	A	A
Approach Vol, veh/h	371			295			511
Approach Delay, s/veh	15.4			11.2			6.9
Approach LOS	B			B			A
Timer - Assigned Phs	2			5		6	8
Phs Duration (G+Y+Rc), s	26.6			13.1		13.5	13.4
Change Period (Y+Rc), s	5.5			5.5		5.5	5.5
Max Green Setting (Gmax), s	49.5			9.5		48.5	25.5
Max Q Clear Time (g_c+I1), s	3.4			6.2		4.0	7.2
Green Ext Time (p_c), s	1.1			0.1		0.9	0.5
Intersection Summary							
HCM 6th Ctrl Delay			10.7				
HCM 6th LOS			B				

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	142	207	1	164	114	247	233
Future Volume (vph)	142	207	1	164	114	247	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3505
Flt Permitted	0.950		0.950			0.642	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1196	3505
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		220			121		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%
Adj. Flow (vph)	151	220	1	174	121	263	248
Shared Lane Traffic (%)							
Lane Group Flow (vph)	151	220	1	174	121	263	248
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	14.0	54.0	31.0	15.0	55.0
Total Split (%)	31.0%	31.0%	14.0%	54.0%	31.0%	15.0%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	8.6	8.6	8.0	8.1	22.2	16.7	19.7
Actuated g/C Ratio	0.21	0.21	0.19	0.19	0.53	0.40	0.47
v/c Ratio	0.41	0.44	0.00	0.26	0.14	0.44	0.15
Control Delay	18.5	6.1	15.0	16.0	1.8	8.7	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	6.1	15.0	16.0	1.8	8.7	8.8
LOS	B	A	B	B	A	A	A
Approach Delay	11.1			10.2			8.7
Approach LOS	B			B			A
Queue Length 50th (ft)	31	0	0	17	0	28	12

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Queue Length 95th (ft)	71	39	3	41	15	65	52
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	1078	1050	359	3539	1521	632	3505
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.21	0.00	0.05	0.08	0.42	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 41.9

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 9.9

Intersection LOS: A

Intersection Capacity Utilization 42.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
14 s	55 s	31 s
 Ø5	 Ø6	
15 s	54 s	

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	290	33	40	255	24	18	3	67	41	3	50
Future Vol, veh/h	21	290	33	40	255	24	18	3	67	41	3	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	309	35	43	271	26	19	3	71	44	3	53
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	297	0	0	344	0	0	594	754	172	557	745	136
Stage 1	-	-	-	-	-	-	371	371	-	357	357	-
Stage 2	-	-	-	-	-	-	223	383	-	200	388	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1261	-	-	1212	-	-	389	337	842	413	341	888
Stage 1	-	-	-	-	-	-	622	618	-	633	627	-
Stage 2	-	-	-	-	-	-	759	610	-	783	607	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1261	-	-	1212	-	-	349	320	842	360	324	888
Mov Cap-2 Maneuver	-	-	-	-	-	-	349	320	-	360	324	-
Stage 1	-	-	-	-	-	-	611	607	-	622	605	-
Stage 2	-	-	-	-	-	-	685	589	-	701	597	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			1			11.3			12.7		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	349	787	1261	-	-	1212	-	-	360	808		
HCM Lane V/C Ratio	0.055	0.095	0.018	-	-	0.035	-	-	0.121	0.07		
HCM Control Delay (s)	15.9	10.1	7.9	-	-	8.1	-	-	16.4	9.8		
HCM Lane LOS	C	B	A	-	-	A	-	-	C	A		
HCM 95th %tile Q(veh)	0.2	0.3	0.1	-	-	0.1	-	-	0.4	0.2		

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	393	314	5	5	5
Future Vol, veh/h	5	393	314	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	80	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	427	341	5	5	5
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	346	0	-	0	568	173
Stage 1	-	-	-	-	344	-
Stage 2	-	-	-	-	224	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1210	-	-	-	453	840
Stage 1	-	-	-	-	689	-
Stage 2	-	-	-	-	792	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1210	-	-	-	451	840
Mov Cap-2 Maneuver	-	-	-	-	451	-
Stage 1	-	-	-	-	686	-
Stage 2	-	-	-	-	792	-
Approach	EB	WB		SB		
HCM Control Delay, s	0.1	0		11.2		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1210	-	-	-	587	
HCM Lane V/C Ratio	0.004	-	-	-	0.019	
HCM Control Delay (s)	8	-	-	-	11.2	
HCM Lane LOS	A	-	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	238	49	154	179	259	23	419	140	430	630	101
Future Volume (veh/h)	113	238	49	154	179	259	23	419	140	430	630	101
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1841	1870	1870	1870	1841	1870	1870	1870	1870	1856
Adj Flow Rate, veh/h	127	267	55	173	201	291	26	471	157	483	708	113
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	4	2	2	2	4	2	2	2	2	3
Cap, veh/h	232	465	204	342	279	249	288	627	446	575	1208	193
Arrive On Green	0.08	0.13	0.13	0.11	0.16	0.16	0.03	0.18	0.18	0.25	0.39	0.39
Sat Flow, veh/h	1781	3554	1560	1781	1777	1585	1753	3554	1585	1781	3069	490
Grp Volume(v), veh/h	127	267	55	173	201	291	26	471	157	483	410	411
Grp Sat Flow(s),veh/h/ln	1781	1777	1560	1781	1777	1585	1753	1777	1585	1781	1777	1782
Q Serve(g_s), s	4.6	5.6	2.5	6.5	8.5	12.4	0.7	10.0	6.2	16.9	14.4	14.4
Cycle Q Clear(g_c), s	4.6	5.6	2.5	6.5	8.5	12.4	0.7	10.0	6.2	16.9	14.4	14.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.27
Lane Grp Cap(c), veh/h	232	465	204	342	279	249	288	627	446	575	699	701
V/C Ratio(X)	0.55	0.57	0.27	0.51	0.72	1.17	0.09	0.75	0.35	0.84	0.59	0.59
Avail Cap(c_a), veh/h	258	512	225	344	279	249	369	867	553	676	836	838
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.8	32.3	31.0	25.8	31.7	33.3	14.6	30.9	22.7	19.0	18.9	18.9
Incr Delay (d2), s/veh	2.0	1.3	0.7	1.2	8.8	111.2	0.1	2.4	0.5	8.2	0.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	2.4	1.0	2.7	4.2	12.2	0.2	4.2	2.3	7.3	5.4	5.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.8	33.6	31.7	27.0	40.5	144.6	14.7	33.3	23.1	27.1	19.7	19.7
LnGrp LOS	C	C	C	C	D	F	B	C	C	C	B	B
Approach Vol, veh/h	449		665				654			1304		
Approach Delay, s/veh	31.7		82.5				30.2			22.4		
Approach LOS	C		F				C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.3	37.9	12.9	19.0	26.5	20.7	14.9	16.9				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	37.2	7.4	12.4	24.2	* 19	8.4	11.4				
Max Q Clear Time (g_c+I1), s	2.7	16.4	6.6	14.4	18.9	12.0	8.5	7.6				
Green Ext Time (p_c), s	0.0	4.7	0.0	0.0	0.8	2.0	0.0	0.6				
Intersection Summary												
HCM 6th Ctrl Delay			38.5									
HCM 6th LOS			D									
Notes												

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	238	49	154	179	259	23	419	140	430	630	101
Future Volume (vph)	113	238	49	154	179	259	23	419	140	430	630	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.911				0.850		0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1553	1770	3224	0	1736	3539	1583	1770	3460	0
Flt Permitted	0.291			0.587			0.263			0.385		
Satd. Flow (perm)	542	3539	1553	1093	3224	0	480	3539	1583	717	3460	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		291				207		24	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	4%	2%	2%	2%	4%	2%	2%	2%	2%	3%
Adj. Flow (vph)	127	267	55	173	201	291	26	471	157	483	708	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	267	55	173	492	0	26	471	157	483	821	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	14.0	18.0	18.0	15.0	19.0		13.0	26.0	15.0	31.0	44.0	
Total Split (%)	15.6%	20.0%	20.0%	16.7%	21.1%		14.4%	28.9%	16.7%	34.4%	48.9%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	20.2	10.4	10.4	18.6	14.6		40.3	15.7	30.7	35.7	37.9	
Actuated g/C Ratio	0.25	0.13	0.13	0.23	0.18		0.49	0.19	0.38	0.44	0.47	
v/c Ratio	0.52	0.59	0.12	0.55	0.60		0.08	0.69	0.22	0.84	0.51	
Control Delay	31.9	40.8	0.6	31.3	17.7		9.8	37.2	1.9	29.3	17.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	31.9	40.8	0.6	31.3	17.7		9.8	37.2	1.9	29.3	17.2	
LOS	C	D	A	C	B		A	D	A	C	B	
Approach Delay		33.3			21.3			27.6			21.7	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	50	71	0	70	52		6	124	0	156	128	

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	99	116	0	131	106		17	177	17	#262	233	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	247	501	469	324	825		335	849	729	661	1688	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.51	0.53	0.12	0.53	0.60		0.08	0.55	0.22	0.73	0.49	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 81.5

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 24.6

Intersection LOS: C

Intersection Capacity Utilization 77.2%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Douglas St & Tudor Rd

 Ø1	 Ø2	 Ø3	 Ø4
13 s	44 s	14 s	19 s
 Ø5	 Ø6	 Ø7	 Ø8
31 s	26 s	15 s	18 s

HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	196	570	125	55	495	101	92	269	54	209	382	251
Future Volume (veh/h)	196	570	125	55	495	101	92	269	54	209	382	251
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	209	606	133	59	527	107	98	286	57	222	406	267
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	1100	241	115	1111	496	202	608	120	401	452	599
Arrive On Green	0.14	0.38	0.38	0.06	0.31	0.31	0.06	0.21	0.21	0.12	0.24	0.24
Sat Flow, veh/h	1781	2898	635	1781	3554	1585	1781	2961	582	1781	1870	1585
Grp Volume(v), veh/h	209	371	368	59	527	107	98	170	173	222	406	267
Grp Sat Flow(s),veh/h/ln	1781	1777	1756	1781	1777	1585	1781	1777	1766	1781	1870	1585
Q Serve(g_s), s	11.5	16.4	16.4	3.2	12.0	5.0	4.3	8.4	8.6	9.5	21.0	12.6
Cycle Q Clear(g_c), s	11.5	16.4	16.4	3.2	12.0	5.0	4.3	8.4	8.6	9.5	21.0	12.6
Prop In Lane	1.00		0.36	1.00		1.00	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	243	674	667	115	1111	496	202	365	363	401	452	599
V/C Ratio(X)	0.86	0.55	0.55	0.51	0.47	0.22	0.49	0.47	0.48	0.55	0.90	0.45
Avail Cap(c_a), veh/h	289	674	667	191	1111	496	283	474	471	418	498	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.86	0.86
Uniform Delay (d), s/veh	42.3	24.3	24.4	45.3	27.7	25.3	30.3	34.9	35.0	26.1	36.7	23.3
Incr Delay (d2), s/veh	17.9	2.8	2.9	3.5	1.5	1.0	1.8	0.9	1.0	1.3	15.9	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	7.0	6.9	1.5	5.0	1.9	1.8	3.6	3.6	3.9	11.1	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.1	27.2	27.2	48.8	29.2	26.3	32.1	35.8	36.0	27.3	52.7	23.7
LnGrp LOS	E	C	C	D	C	C	C	D	D	C	D	C
Approach Vol, veh/h		948			693			441			895	
Approach Delay, s/veh		34.5			30.4			35.1			37.7	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.7	44.3	12.4	30.6	19.4	37.6	16.0	27.0				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 11	* 27	10.5	* 27	* 16	* 22	12.5	* 27				
Max Q Clear Time (g_c+I1), s	5.2	18.4	6.3	23.0	13.5	14.0	11.5	10.6				
Green Ext Time (p_c), s	0.0	2.8	0.1	1.1	0.1	2.2	0.1	1.6				

Intersection Summary

HCM 6th Ctrl Delay	34.6
HCM 6th LOS	C

Notes

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

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	196	570	125	55	495	101	92	269	54	209	382	251
Future Volume (vph)	196	570	125	55	495	101	92	269	54	209	382	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.973				0.850		0.975				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3444	0	1770	3539	1583	1770	3451	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.250			0.441		
Satd. Flow (perm)	1770	3444	0	1770	3539	1583	466	3451	0	821	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26				177		23				201
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	209	606	133	59	527	107	98	286	57	222	406	267
Shared Lane Traffic (%)												
Lane Group Flow (vph)	209	739	0	59	527	107	98	343	0	222	406	267
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	22.0	33.0		17.0	28.0	28.0	17.0	33.0		17.0	33.0	22.0
Total Split (%)	22.0%	33.0%		17.0%	28.0%	28.0%	17.0%	33.0%		17.0%	33.0%	22.0%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	15.2	36.5		9.1	27.5	27.5	30.7	22.2		38.2	26.2	47.8
Actuated g/C Ratio	0.15	0.36		0.09	0.28	0.28	0.31	0.22		0.38	0.26	0.48
v/c Ratio	0.78	0.58		0.37	0.54	0.19	0.38	0.44		0.52	0.83	0.31
Control Delay	61.2	46.6		49.2	35.4	1.3	23.0	32.0		23.7	51.0	5.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	61.2	46.6		49.2	35.4	1.3	23.0	32.0		23.7	51.0	5.1
LOS	E	D		D	D	A	C	C		C	D	A
Approach Delay		49.8			31.3			30.0			30.5	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	141	160		36	164	0	37	89		87	240	20
Queue Length 95th (ft)	#238	324		76	222	6	69	127		138	#397	65

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)	1280			1119			569			1961		
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	290	1273		189	975	564	288	938		434	500	878
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.72	0.58		0.31	0.54	0.19	0.34	0.37		0.51	0.81	0.30

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 36.8

Intersection LOS: D

Intersection Capacity Utilization 72.4%

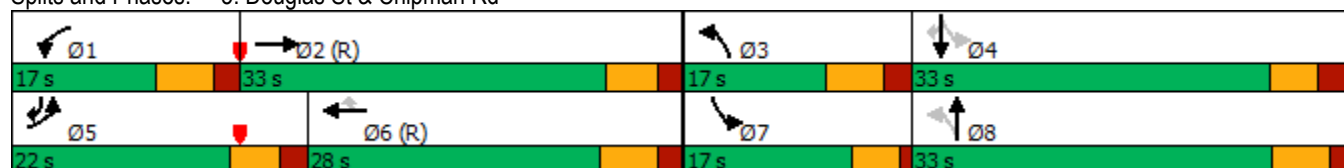
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Douglas St & Chipman Rd



HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	811	14	16	745	52	15	2	17	87	12	110
Future Volume (veh/h)	73	811	14	16	745	52	15	2	17	87	12	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	79	882	15	17	810	57	16	2	18	95	13	120
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	103	1814	31	40	1591	112	228	43	219	225	47	245
Arrive On Green	0.06	0.51	0.51	0.05	0.94	0.94	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1781	3575	61	1781	3368	237	576	142	718	572	153	805
Grp Volume(v), veh/h	79	438	459	17	427	440	36	0	0	228	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1859	1781	1777	1828	1437	0	0	1529	0	0
Q Serve(g_s), s	4.4	16.1	16.1	0.9	2.6	2.6	0.0	0.0	0.0	9.1	0.0	0.0
Cycle Q Clear(g_c), s	4.4	16.1	16.1	0.9	2.6	2.6	1.5	0.0	0.0	11.9	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.13	0.44		0.50	0.42		0.53
Lane Grp Cap(c), veh/h	103	902	943	40	839	863	490	0	0	517	0	0
V/C Ratio(X)	0.77	0.49	0.49	0.42	0.51	0.51	0.07	0.00	0.00	0.44	0.00	0.00
Avail Cap(c_a), veh/h	223	902	943	116	839	863	490	0	0	517	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.89	0.89	0.89	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	46.5	16.1	16.1	47.1	1.5	1.5	24.7	0.0	0.0	28.2	0.0	0.0
Incr Delay (d2), s/veh	15.7	1.9	1.8	8.7	2.0	1.9	0.3	0.0	0.0	2.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	6.4	6.6	0.5	1.0	1.0	0.7	0.0	0.0	4.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.2	18.0	17.9	55.8	3.5	3.4	25.0	0.0	0.0	30.9	0.0	0.0
LnGrp LOS	E	B	B	E	A	A	C	A	A	C	A	A
Approach Vol, veh/h	976			884			36			228		
Approach Delay, s/veh	21.5			4.5			25.0			30.9		
Approach LOS	C			A			C			C		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.8	56.2		36.0	11.3	52.7		36.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	46.5		30.5	12.5	40.5		30.5				
Max Q Clear Time (g_c+I1), s	2.9	18.1		13.9	6.4	4.6		3.5				
Green Ext Time (p_c), s	0.0	8.3		1.7	0.1	8.5		0.2				
Intersection Summary												
HCM 6th Ctrl Delay				15.5								
HCM 6th LOS				B								

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	811	14	16	745	52	15	2	17	87	12	110
Future Volume (vph)	73	811	14	16	745	52	15	2	17	87	12	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr't		0.997			0.990			0.932			0.929	
Flt Protected	0.950			0.950				0.978			0.980	
Satd. Flow (prot)	1770	3529	0	1770	3504	0	0	1698	0	0	1696	0
Flt Permitted	0.950			0.950				0.854			0.852	
Satd. Flow (perm)	1770	3529	0	1770	3504	0	0	1483	0	0	1474	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			9			18			58	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	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)	79	882	15	17	810	57	16	2	18	95	13	120
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	897	0	17	867	0	0	36	0	0	228	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	18.0	52.0		12.0	46.0		36.0	36.0		36.0	36.0	
Total Split (%)	18.0%	52.0%		12.0%	46.0%		36.0%	36.0%		36.0%	36.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	10.3	53.7		6.5	45.2			30.5			30.5	
Actuated g/C Ratio	0.10	0.54		0.06	0.45			0.30			0.30	
v/c Ratio	0.43	0.47		0.15	0.55			0.08			0.47	
Control Delay	49.0	16.4		54.9	12.1			16.0			24.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	49.0	16.4		54.9	12.1			16.0			24.3	
LOS	D	B		D	B			B			C	
Approach Delay		19.0			12.9			16.0			24.3	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	48	155		11	91			8			86	
Queue Length 95th (ft)	93	267		m27	132			31			158	
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)												
Base Capacity (vph)	221	1896		115	1587			464			489	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.36	0.47		0.15	0.55			0.08			0.47	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 71 (71%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 56.9%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	83	148	2	138	81	126	86
Future Volume (veh/h)	83	148	2	138	81	126	86
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1870
Adj Flow Rate, veh/h	86	153		142	84	130	89
Peak Hour Factor	0.97	0.97		0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2		2	2	2	2
Cap, veh/h	346	308		752	644	678	1829
Arrive On Green	0.19	0.19		0.21	0.21	0.16	0.51
Sat Flow, veh/h	1781	1585		3647	1585	1781	3647
Grp Volume(v), veh/h	86	153		142	84	130	89
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1777
Q Serve(g_s), s	1.5	3.3		1.2	1.3	1.9	0.5
Cycle Q Clear(g_c), s	1.5	3.3		1.2	1.3	1.9	0.5
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	346	308		752	644	678	1829
V/C Ratio(X)	0.25	0.50		0.19	0.13	0.19	0.05
Avail Cap(c_a), veh/h	1201	1069		4653	2383	797	4653
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.9	13.6		12.2	7.0	8.1	4.6
Incr Delay (d2), s/veh	0.1	0.5		0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.9		0.4	0.3	0.5	0.1
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	13.0	14.0		12.3	7.1	8.2	4.6
LnGrp LOS	B	B		B	A	A	A
Approach Vol, veh/h	239			226			219
Approach Delay, s/veh	13.7			10.3			6.7
Approach LOS	B			B			A
Timer - Assigned Phs	2			5		6	8
Phs Duration (G+Y+Rc), s	25.0			11.5		13.5	12.8
Change Period (Y+Rc), s	5.5			5.5		5.5	5.5
Max Green Setting (Gmax), s	49.5			8.5		49.5	25.5
Max Q Clear Time (g_c+I1), s	2.5			3.9		3.3	5.3
Green Ext Time (p_c), s	0.4			0.1		0.7	0.3
Intersection Summary							
HCM 6th Ctrl Delay			10.3				
HCM 6th LOS			B				

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS

Existing + Site AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	83	148	2	138	81	126	86
Future Volume (vph)	83	148	2	138	81	126	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3539
Flt Permitted	0.950		0.950			0.662	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1233	3539
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		153			84		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	86	153	2	142	84	130	89
Shared Lane Traffic (%)							
Lane Group Flow (vph)	86	153	2	142	84	130	89
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	14.0	55.0	31.0	14.0	55.0
Total Split (%)	31.0%	31.0%	14.0%	55.0%	31.0%	14.0%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	8.0	8.0	8.0	9.7	24.5	15.9	17.5
Actuated g/C Ratio	0.20	0.20	0.20	0.25	0.62	0.41	0.45
v/c Ratio	0.24	0.34	0.01	0.16	0.08	0.21	0.06
Control Delay	15.7	6.0	13.0	14.2	1.8	6.3	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.7	6.0	13.0	14.2	1.8	6.3	8.6
LOS	B	A	B	B	A	A	A
Approach Delay	9.5			9.7			7.2
Approach LOS	A			A			A
Queue Length 50th (ft)	17	0	0	14	0	13	4
Queue Length 95th (ft)	43	32	4	31	12	30	21

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	1156	1087	385	3539	1538	628	3539
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.14	0.01	0.04	0.05	0.21	0.03

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 39.2

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.34

Intersection Signal Delay: 8.8

Intersection LOS: A

Intersection Capacity Utilization 34.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
14 s	55 s	31 s
 Ø5	 Ø6	
14 s	55 s	

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	41	147	26	80	189	19	21	8	48	23	9	16
Future Vol, veh/h	41	147	26	80	189	19	21	8	48	23	9	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	45	162	29	88	208	21	23	9	53	25	10	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	229	0	0	191	0	0	552	672	96	560	665	104
Stage 1	-	-	-	-	-	-	267	267	-	384	384	-
Stage 2	-	-	-	-	-	-	285	405	-	176	281	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1336	-	-	1380	-	-	416	376	942	411	379	931
Stage 1	-	-	-	-	-	-	715	687	-	611	610	-
Stage 2	-	-	-	-	-	-	698	597	-	809	677	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1336	-	-	1380	-	-	370	340	942	353	343	931
Mov Cap-2 Maneuver	-	-	-	-	-	-	370	340	-	353	343	-
Stage 1	-	-	-	-	-	-	691	664	-	590	571	-
Stage 2	-	-	-	-	-	-	630	559	-	728	654	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.5			2.2			11.6			13.7		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	370	752	1336	-	-	1380	-	-	353	576
HCM Lane V/C Ratio	0.062	0.082	0.034	-	-	0.064	-	-	0.072	0.048
HCM Control Delay (s)	15.4	10.2	7.8	-	-	7.8	-	-	16	11.6
HCM Lane LOS	C	B	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.2	0.3	0.1	-	-	0.2	-	-	0.2	0.1

Intersection												
Int Delay, s/veh	1.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	206	7	15	259	5	24	0	50	5	0	5
Future Vol, veh/h	5	206	7	15	259	5	24	0	50	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	80	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	224	8	16	282	5	26	0	54	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	287	0	0	232	0	0	411	557	116	439	559	144
Stage 1	-	-	-	-	-	-	238	238	-	317	317	-
Stage 2	-	-	-	-	-	-	173	319	-	122	242	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1272	-	-	1333	-	-	525	437	914	502	436	877
Stage 1	-	-	-	-	-	-	744	707	-	669	653	-
Stage 2	-	-	-	-	-	-	812	652	-	869	704	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1272	-	-	1333	-	-	516	430	914	466	429	877
Mov Cap-2 Maneuver	-	-	-	-	-	-	516	430	-	466	429	-
Stage 1	-	-	-	-	-	-	741	704	-	666	645	-
Stage 2	-	-	-	-	-	-	797	644	-	814	701	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.4			10.5			11		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	731	1272	-	-	1333	-	-	609
HCM Lane V/C Ratio	0.11	0.004	-	-	0.012	-	-	0.018
HCM Control Delay (s)	10.5	7.8	-	-	7.7	-	-	11
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.1

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	110	26	93	168	314	69	523	148	238	255	102
Future Volume (veh/h)	88	110	26	93	168	314	69	523	148	238	255	102
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1870	1870	1841	1870	1870	1870	1870	1841	1870	1870	1870
Adj Flow Rate, veh/h	93	116	27	98	177	331	73	551	156	251	268	107
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	2	2	4	2	2	2	2	4	2	2	2
Cap, veh/h	226	749	334	449	376	336	413	747	439	396	718	279
Arrive On Green	0.07	0.21	0.21	0.07	0.21	0.21	0.06	0.21	0.21	0.14	0.29	0.29
Sat Flow, veh/h	1767	3554	1585	1753	1777	1585	1781	3554	1560	1781	2499	973
Grp Volume(v), veh/h	93	116	27	98	177	331	73	551	156	251	189	186
Grp Sat Flow(s),veh/h/ln	1767	1777	1585	1753	1777	1585	1781	1777	1560	1781	1777	1695
Q Serve(g_s), s	2.9	1.9	1.0	3.1	6.3	15.1	2.0	10.5	5.8	7.8	6.1	6.4
Cycle Q Clear(g_c), s	2.9	1.9	1.0	3.1	6.3	15.1	2.0	10.5	5.8	7.8	6.1	6.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.57
Lane Grp Cap(c), veh/h	226	749	334	449	376	336	413	747	439	396	510	487
V/C Ratio(X)	0.41	0.15	0.08	0.22	0.47	0.99	0.18	0.74	0.36	0.63	0.37	0.38
Avail Cap(c_a), veh/h	331	851	379	503	376	336	454	1090	590	544	787	751
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.4	23.4	23.0	19.9	25.1	28.5	16.3	26.8	20.9	19.1	20.7	20.7
Incr Delay (d2), s/veh	1.2	0.1	0.1	0.2	0.9	45.1	0.2	1.5	0.5	1.7	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.8	0.4	1.2	2.6	9.6	0.7	4.2	2.0	3.0	2.4	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.6	23.5	23.1	20.1	26.0	73.6	16.5	28.3	21.3	20.7	21.1	21.2
LnGrp LOS	C	C	C	C	C	E	B	C	C	C	C	C
Approach Vol, veh/h	236			606			780			626		
Approach Delay, s/veh	23.1			51.0			25.8			21.0		
Approach LOS	C			D			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.3	27.7	11.7	22.0	16.9	22.1	11.8	21.9				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	32.2	9.4	15.4	16.2	* 22	7.4	17.4				
Max Q Clear Time (g_c+I1), s	4.0	8.4	4.9	17.1	9.8	12.5	5.1	3.9				
Green Ext Time (p_c), s	0.0	2.0	0.1	0.0	0.4	2.7	0.0	0.5				
Intersection Summary												
HCM 6th Ctrl Delay	31.0											
HCM 6th LOS	C											
Notes												

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	110	26	93	168	314	69	523	148	238	255	102
Future Volume (vph)	88	110	26	93	168	314	69	523	148	238	255	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.902				0.850		0.957	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	3539	1583	1736	3192	0	1770	3539	1553	1770	3387	0
Flt Permitted	0.377			0.679			0.529			0.354		
Satd. Flow (perm)	695	3539	1583	1240	3192	0	985	3539	1553	659	3387	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		331				207		74	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	2%	2%	4%	2%	2%	2%	2%	4%	2%	2%	2%
Adj. Flow (vph)	93	116	27	98	177	331	73	551	156	251	268	107
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	116	27	98	508	0	73	551	156	251	375	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	16.0	24.0	24.0	14.0	22.0		13.0	29.0	14.0	23.0	39.0	
Total Split (%)	17.8%	26.7%	26.7%	15.6%	24.4%		14.4%	32.2%	15.6%	25.6%	43.3%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	16.8	11.3	11.3	16.8	10.6		30.9	16.7	31.4	28.4	26.1	
Actuated g/C Ratio	0.23	0.16	0.16	0.23	0.15		0.43	0.23	0.44	0.40	0.36	
v/c Ratio	0.33	0.21	0.05	0.29	0.67		0.15	0.67	0.20	0.57	0.29	
Control Delay	22.5	30.0	0.2	21.5	16.5		12.2	31.1	1.7	18.0	16.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	22.5	30.0	0.2	21.5	16.5		12.2	31.1	1.7	18.0	16.2	
LOS	C	C	A	C	B		B	C	A	B	B	
Approach Delay		23.6			17.3			23.5			16.9	
Approach LOS		C			B			C			B	
Queue Length 50th (ft)	29	25	0	31	39		18	123	0	67	55	

Lanes, Volumes, Timings

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	71	53	0	74	97		43	202	17	128	97	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	329	920	626	353	989		497	1179	805	574	1668	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.28	0.13	0.04	0.28	0.51		0.15	0.47	0.19	0.44	0.22	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 71.7

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 20.0

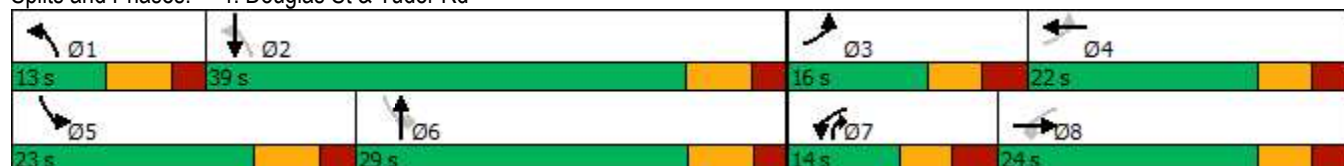
Intersection LOS: B

Intersection Capacity Utilization 69.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Douglas St & Tudor Rd



HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	193	162	45	24	363	173	100	343	37	84	229	143
Future Volume (veh/h)	193	162	45	24	363	173	100	343	37	84	229	143
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1841	1870	1663	1811	1841	1856	1841	1841	1870	1870	1870	1870
Adj Flow Rate, veh/h	227	191	53	28	427	204	118	404	44	99	269	168
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	4	2	16	6	4	3	4	4	2	2	2	2
Cap, veh/h	263	1066	288	80	1008	453	254	675	73	292	328	516
Arrive On Green	0.25	0.64	0.64	0.05	0.29	0.29	0.07	0.21	0.21	0.06	0.18	0.18
Sat Flow, veh/h	1753	2765	747	1725	3497	1572	1753	3183	345	1781	1870	1585
Grp Volume(v), veh/h	227	121	123	28	427	204	118	221	227	99	269	168
Grp Sat Flow(s),veh/h/ln	1753	1777	1736	1725	1749	1572	1753	1749	1779	1781	1870	1585
Q Serve(g_s), s	9.9	2.2	2.3	1.3	7.9	8.5	4.3	9.1	9.2	3.6	11.1	6.4
Cycle Q Clear(g_c), s	9.9	2.2	2.3	1.3	7.9	8.5	4.3	9.1	9.2	3.6	11.1	6.4
Prop In Lane	1.00		0.43	1.00		1.00	1.00		0.19	1.00		1.00
Lane Grp Cap(c), veh/h	263	685	669	80	1008	453	254	371	377	292	328	516
V/C Ratio(X)	0.86	0.18	0.18	0.35	0.42	0.45	0.46	0.60	0.60	0.34	0.82	0.33
Avail Cap(c_a), veh/h	289	685	669	274	1008	453	289	371	377	293	435	606
HCM Platoon Ratio	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97
Uniform Delay (d), s/veh	29.2	9.1	9.2	37.0	23.1	23.3	25.0	28.4	28.5	24.9	31.8	20.4
Incr Delay (d2), s/veh	20.8	0.5	0.6	2.6	1.3	3.2	1.3	2.6	2.7	0.7	8.8	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.8	0.9	0.6	3.2	3.3	1.8	3.8	3.9	1.5	5.4	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	9.7	9.7	39.6	24.4	26.5	26.4	31.0	31.1	25.6	40.5	20.7
LnGrp LOS	D	A	A	D	C	C	C	C	C	C	D	C
Approach Vol, veh/h	471			659			566			536		
Approach Delay, s/veh	29.1			25.7			30.1			31.5		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.0	37.2	12.4	20.4	17.8	29.4	9.5	23.4				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 13	* 16	7.5	* 19	* 13	* 16	5.0	* 16				
Max Q Clear Time (g_c+I1), s	3.3	4.3	6.3	13.1	11.9	10.5	5.6	11.2				
Green Ext Time (p_c), s	0.0	0.9	0.0	1.0	0.1	1.5	0.0	1.0				

Intersection Summary

HCM 6th Ctrl Delay	28.9
HCM 6th LOS	C

Notes

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

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	193	162	45	24	363	173	100	343	37	84	229	143
Future Volume (vph)	193	162	45	24	363	173	100	343	37	84	229	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.967				0.850		0.985				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	3323	0	1703	3471	1568	1736	3426	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.335			0.493		
Satd. Flow (perm)	1736	3323	0	1703	3471	1568	612	3426	0	918	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		40				204		15				166
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	4%	2%	16%	6%	4%	3%	4%	4%	2%	2%	2%	2%
Adj. Flow (vph)	227	191	53	28	427	204	118	404	44	99	269	168
Shared Lane Traffic (%)												
Lane Group Flow (vph)	227	244	0	28	427	204	118	448	0	99	269	168
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	19.0	22.0		19.0	22.0	22.0	14.0	22.0		9.5	25.0	19.0
Total Split (%)	23.8%	27.5%		23.8%	27.5%	27.5%	17.5%	27.5%		11.9%	31.3%	23.8%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	13.3	34.8		8.2	21.1	21.1	25.1	19.2		22.2	15.8	35.5
Actuated g/C Ratio	0.17	0.44		0.10	0.26	0.26	0.31	0.24		0.28	0.20	0.44
v/c Ratio	0.79	0.17		0.16	0.47	0.36	0.40	0.54		0.32	0.73	0.21
Control Delay	65.7	15.9		35.1	29.2	6.5	20.8	27.4		18.3	41.9	2.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	65.7	15.9		35.1	29.2	6.5	20.8	27.4		18.3	41.9	2.9
LOS	E	B		D	C	A	C	C		B	D	A
Approach Delay		39.9			22.4			26.0			25.3	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	124	13		13	103	0	38	95		30	125	1

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#211	60		35	141	45	66	125		54	186	26
Internal Link Dist (ft)		1280			1119			569			1961	
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	299	1467		270	913	562	298	1004		314	433	804
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.76	0.17		0.10	0.47	0.36	0.40	0.45		0.32	0.62	0.21

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 62 (78%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 27.7

Intersection LOS: C

Intersection Capacity Utilization 59.2%

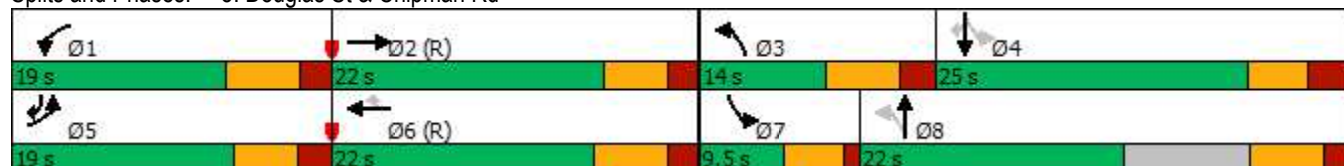
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Douglas St & Chipman Rd



HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	394	14	16	470	63	14	3	8	40	5	47
Future Volume (veh/h)	85	394	14	16	470	63	14	3	8	40	5	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1826	1870	1811	1841	1870	1796	1870	1707	1870	1870	1737
Adj Flow Rate, veh/h	97	448	16	18	534	72	16	3	9	45	6	53
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	5	2	6	4	2	7	2	13	2	2	11
Cap, veh/h	126	1496	53	43	1214	163	337	72	160	260	54	259
Arrive On Green	0.07	0.44	0.44	0.05	0.78	0.78	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1781	3417	122	1725	3098	416	803	218	484	590	162	781
Grp Volume(v), veh/h	97	227	237	18	301	305	28	0	0	104	0	0
Grp Sat Flow(s),veh/h/ln	1781	1735	1804	1725	1749	1766	1505	0	0	1533	0	0
Q Serve(g_s), s	4.3	6.8	6.8	0.8	4.5	4.6	0.0	0.0	0.0	1.0	0.0	0.0
Cycle Q Clear(g_c), s	4.3	6.8	6.8	0.8	4.5	4.6	0.9	0.0	0.0	3.6	0.0	0.0
Prop In Lane	1.00		0.07	1.00		0.24	0.57		0.32	0.43		0.51
Lane Grp Cap(c), veh/h	126	759	790	43	685	692	569	0	0	572	0	0
V/C Ratio(X)	0.77	0.30	0.30	0.42	0.44	0.44	0.05	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	234	759	790	140	685	692	569	0	0	572	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.92	0.92	0.92	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.5	14.5	14.6	37.5	5.7	5.8	18.2	0.0	0.0	19.1	0.0	0.0
Incr Delay (d2), s/veh	13.2	1.0	1.0	8.5	1.9	1.9	0.2	0.0	0.0	0.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	2.5	2.6	0.4	1.5	1.5	0.4	0.0	0.0	1.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.7	15.6	15.5	45.9	7.6	7.6	18.3	0.0	0.0	19.8	0.0	0.0
LnGrp LOS	D	B	B	D	A	A	B	A	A	B	A	A
Approach Vol, veh/h	561			624			28			104		
Approach Delay, s/veh	21.5			8.7			18.3			19.8		
Approach LOS	C			A			B			B		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.5	40.5		32.0	11.1	36.9		32.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	30.5		26.5	10.5	26.5		26.5				
Max Q Clear Time (g_c+I1), s	2.8	8.8		5.6	6.3	6.6		2.9				
Green Ext Time (p_c), s	0.0	3.5		0.7	0.1	4.6		0.1				
Intersection Summary												
HCM 6th Ctrl Delay				15.2								
HCM 6th LOS				B								

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	394	14	16	470	63	14	3	8	40	5	47
Future Volume (vph)	85	394	14	16	470	63	14	3	8	40	5	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	90		0	95		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.982			0.957			0.931	
Flt Protected	0.950			0.950				0.972			0.979	
Satd. Flow (prot)	1770	3424	0	1703	3416	0	0	1631	0	0	1625	0
Flt Permitted	0.950			0.950				0.867			0.880	
Satd. Flow (perm)	1770	3424	0	1703	3416	0	0	1454	0	0	1460	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			20			9			53	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	5%	2%	6%	4%	2%	7%	2%	13%	2%	2%	11%
Adj. Flow (vph)	97	448	16	18	534	72	16	3	9	45	6	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	464	0	18	606	0	0	28	0	0	104	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	16.0	36.0		12.0	32.0		32.0	32.0		32.0	32.0	
Total Split (%)	20.0%	45.0%		15.0%	40.0%		40.0%	40.0%		40.0%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	9.5	40.1		6.5	30.0			26.5			26.5	
Actuated g/C Ratio	0.12	0.50		0.08	0.38			0.33			0.33	
v/c Ratio	0.46	0.27		0.13	0.47			0.06			0.20	
Control Delay	40.0	12.8		32.1	35.0			14.5			11.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	40.0	12.8		32.1	35.0			14.5			11.7	
LOS	D	B		C	D			B			B	
Approach Delay		17.5			34.9			14.5			11.7	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	45	61		9	163			6			17	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	89	118		m22	213			23			50	
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)	90			95								
Base Capacity (vph)	232	1718		138	1292			487			519	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.42	0.27		0.13	0.47			0.06			0.20	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 52 (65%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 25.2

Intersection LOS: C

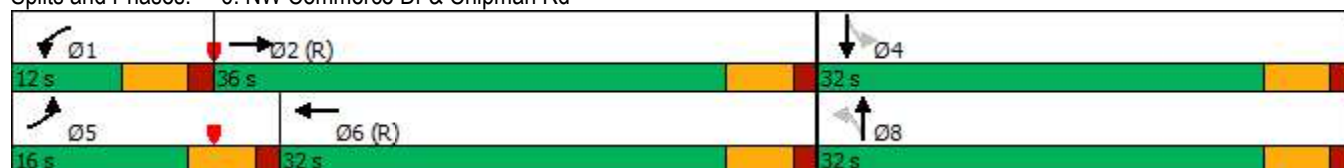
Intersection Capacity Utilization 39.8%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



Intersection						
Int Delay, s/veh	1.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	18	59	6	6	109
Future Vol, veh/h	20	18	59	6	6	109
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	21	69	7	7	128
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	215	73	0	0	76	0
Stage 1	73	-	-	-	-	-
Stage 2	142	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	773	989	-	-	1523	-
Stage 1	950	-	-	-	-	-
Stage 2	885	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	769	989	-	-	1523	-
Mov Cap-2 Maneuver	769	-	-	-	-	-
Stage 1	950	-	-	-	-	-
Stage 2	881	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	9.4	0		0.4		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	860	1523	-	
HCM Lane V/C Ratio	-	-	0.052	0.005	-	
HCM Control Delay (s)	-	-	9.4	7.4	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	0.2	0	-	

HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	146	217	1	164	120	264	233
Future Volume (veh/h)	146	217	1	164	120	264	233
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1856
Adj Flow Rate, veh/h	155	231		174	128	281	248
Peak Hour Factor	0.94	0.94		0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2		2	2	2	3
Cap, veh/h	353	314		709	630	690	1860
Arrive On Green	0.20	0.20		0.20	0.20	0.19	0.53
Sat Flow, veh/h	1781	1585		3647	1585	1781	3618
Grp Volume(v), veh/h	155	231		174	128	281	248
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1763
Q Serve(g_s), s	3.1	5.5		1.7	2.1	4.6	1.4
Cycle Q Clear(g_c), s	3.1	5.5		1.7	2.1	4.6	1.4
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	353	314		709	630	690	1860
V/C Ratio(X)	0.44	0.74		0.25	0.20	0.41	0.13
Avail Cap(c_a), veh/h	1133	1008		4298	2231	772	4440
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	15.1		13.5	7.9	8.9	4.8
Incr Delay (d2), s/veh	0.3	1.3		0.1	0.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	1.7		0.5	0.5	1.2	0.3
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	14.4	16.4		13.6	8.0	9.0	4.8
LnGrp LOS	B	B		B	A	A	A
Approach Vol, veh/h	386			302			529
Approach Delay, s/veh	15.6			11.2			7.1
Approach LOS	B			B			A
Timer - Assigned Phs	2				5	6	8
Phs Duration (G+Y+Rc), s	26.7				13.2	13.5	13.4
Change Period (Y+Rc), s	5.5				5.5	5.5	5.5
Max Green Setting (Gmax), s	50.5				9.5	48.5	25.5
Max Q Clear Time (g_c+I1), s	3.4				6.6	4.1	7.5
Green Ext Time (p_c), s	1.1				0.1	0.9	0.6
Intersection Summary							
HCM 6th Ctrl Delay			10.8				
HCM 6th LOS			B				

Notes

User approved ignoring U-Turning movement.

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	146	217	1	164	120	264	233
Future Volume (vph)	146	217	1	164	120	264	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3505
Flt Permitted	0.950		0.950			0.642	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1196	3505
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		231			128		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%
Adj. Flow (vph)	155	231	1	174	128	281	248
Shared Lane Traffic (%)							
Lane Group Flow (vph)	155	231	1	174	128	281	248
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	13.0	54.0	31.0	15.0	56.0
Total Split (%)	31.0%	31.0%	13.0%	54.0%	31.0%	15.0%	56.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	8.7	8.7	7.5	8.1	22.2	16.8	19.9
Actuated g/C Ratio	0.21	0.21	0.18	0.19	0.53	0.40	0.47
v/c Ratio	0.42	0.45	0.00	0.26	0.14	0.47	0.15
Control Delay	18.7	6.1	15.0	16.1	1.8	9.1	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	6.1	15.0	16.1	1.8	9.1	8.6
LOS	B	A	B	B	A	A	A
Approach Delay	11.2			10.1			8.9
Approach LOS	B			B			A
Queue Length 50th (ft)	32	0	0	18	0	30	12

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Queue Length 95th (ft)	72	40	3	41	15	70	51
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	1075	1052	316	3539	1482	630	3505
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.22	0.00	0.05	0.09	0.45	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 42

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 9.9

Intersection LOS: A

Intersection Capacity Utilization 43.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
13 s	56 s	31 s
 Ø5	 Ø6	
15 s	54 s	

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	305	41	44	264	27	23	4	70	44	5	50
Future Vol, veh/h	21	305	41	44	264	27	23	4	70	44	5	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	324	44	47	281	29	24	4	74	47	5	53

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	310	0	0	368	0	0	627	794	184	583	787	141
Stage 1	-	-	-	-	-	-	390	390	-	375	375	-
Stage 2	-	-	-	-	-	-	237	404	-	208	412	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1247	-	-	1187	-	-	368	319	827	396	322	881
Stage 1	-	-	-	-	-	-	606	606	-	618	615	-
Stage 2	-	-	-	-	-	-	745	598	-	775	593	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1247	-	-	1187	-	-	326	301	827	341	304	881
Mov Cap-2 Maneuver	-	-	-	-	-	-	326	301	-	341	304	-
Stage 1	-	-	-	-	-	-	595	595	-	607	590	-
Stage 2	-	-	-	-	-	-	666	574	-	688	582	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			1.1			11.9			13.3		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	326	756	1247	-	-	1187	-	-	341	751
HCM Lane V/C Ratio	0.075	0.104	0.018	-	-	0.039	-	-	0.137	0.078
HCM Control Delay (s)	16.9	10.3	7.9	-	-	8.2	-	-	17.2	10.2
HCM Lane LOS	C	B	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.2	0.3	0.1	-	-	0.1	-	-	0.5	0.3

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	396	18	38	318	5	12	0	24	5	0	5
Future Vol, veh/h	5	396	18	38	318	5	12	0	24	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	80	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	430	20	41	346	5	13	0	26	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	351	0	0	450	0	0	705	883	225	656	891	176
Stage 1	-	-	-	-	-	-	450	450	-	431	431	-
Stage 2	-	-	-	-	-	-	255	433	-	225	460	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1204	-	-	1107	-	-	323	283	778	351	280	837
Stage 1	-	-	-	-	-	-	558	570	-	573	581	-
Stage 2	-	-	-	-	-	-	727	580	-	757	564	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1204	-	-	1107	-	-	311	271	778	329	269	837
Mov Cap-2 Maneuver	-	-	-	-	-	-	311	271	-	329	269	-
Stage 1	-	-	-	-	-	-	556	568	-	571	560	-
Stage 2	-	-	-	-	-	-	696	559	-	729	562	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.9			12.5			12.8		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	518	1204	-	-	1107	-	-	472
HCM Lane V/C Ratio	0.076	0.005	-	-	0.037	-	-	0.023
HCM Control Delay (s)	12.5	8	-	-	8.4	-	-	12.8
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.1

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	126	246	55	154	192	259	32	419	140	430	630	121
Future Volume (veh/h)	126	246	55	154	192	259	32	419	140	430	630	121
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1841	1870	1870	1870	1841	1870	1870	1870	1870	1856
Adj Flow Rate, veh/h	142	276	62	173	216	291	36	471	157	483	708	136
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	4	2	2	2	4	2	2	2	2	3
Cap, veh/h	245	532	234	336	275	246	284	616	422	572	1138	218
Arrive On Green	0.09	0.15	0.15	0.09	0.16	0.16	0.04	0.17	0.17	0.25	0.38	0.38
Sat Flow, veh/h	1781	3554	1560	1781	1777	1585	1753	3554	1585	1781	2974	571
Grp Volume(v), veh/h	142	276	62	173	216	291	36	471	157	483	423	421
Grp Sat Flow(s),veh/h/ln	1781	1777	1560	1781	1777	1585	1753	1777	1585	1781	1777	1768
Q Serve(g_s), s	5.3	5.7	2.8	6.5	9.4	12.4	1.0	10.1	6.5	17.2	15.4	15.4
Cycle Q Clear(g_c), s	5.3	5.7	2.8	6.5	9.4	12.4	1.0	10.1	6.5	17.2	15.4	15.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.32
Lane Grp Cap(c), veh/h	245	532	234	336	275	246	284	616	422	572	680	676
V/C Ratio(X)	0.58	0.52	0.27	0.51	0.78	1.18	0.13	0.76	0.37	0.84	0.62	0.62
Avail Cap(c_a), veh/h	277	595	261	336	275	246	350	813	509	667	804	800
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.9	31.3	30.1	25.7	32.5	33.8	15.1	31.5	23.9	19.3	20.0	20.0
Incr Delay (d2), s/veh	2.3	0.8	0.6	1.3	13.8	116.4	0.2	3.1	0.5	8.7	1.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	2.4	1.1	2.7	4.9	12.5	0.4	4.3	2.4	7.5	5.8	5.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.3	32.1	30.7	27.0	46.3	150.2	15.3	34.6	24.5	28.0	21.1	21.1
LnGrp LOS	C	C	C	C	D	F	B	C	C	C	C	C
Approach Vol, veh/h	480			680			664			1327		
Approach Delay, s/veh	30.8			85.9			31.2			23.6		
Approach LOS	C			F			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.0	37.4	13.6	19.0	26.7	20.7	14.0	18.6				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	36.2	8.4	12.4	24.2	* 18	7.4	13.4				
Max Q Clear Time (g_c+I1), s	3.0	17.4	7.3	14.4	19.2	12.1	8.5	7.7				
Green Ext Time (p_c), s	0.0	4.7	0.0	0.0	0.8	1.8	0.0	0.9				

Intersection Summary

HCM 6th Ctrl Delay	39.7
HCM 6th LOS	D

Notes

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

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	126	246	55	154	192	259	32	419	140	430	630	121
Future Volume (vph)	126	246	55	154	192	259	32	419	140	430	630	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.914				0.850		0.976	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1553	1770	3235	0	1736	3539	1583	1770	3449	0
Flt Permitted	0.364			0.582			0.246			0.382		
Satd. Flow (perm)	678	3539	1553	1084	3235	0	449	3539	1583	712	3449	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		291				207		30	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	4%	2%	2%	2%	4%	2%	2%	2%	2%	3%
Adj. Flow (vph)	142	276	62	173	216	291	36	471	157	483	708	136
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	276	62	173	507	0	36	471	157	483	844	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	15.0	20.0	20.0	14.0	19.0		13.0	25.0	14.0	31.0	43.0	
Total Split (%)	16.7%	22.2%	22.2%	15.6%	21.1%		14.4%	27.8%	15.6%	34.4%	47.8%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	19.0	11.6	11.6	19.0	11.0		39.0	15.5	29.7	35.7	35.4	
Actuated g/C Ratio	0.23	0.14	0.14	0.23	0.13		0.48	0.19	0.36	0.44	0.43	
v/c Ratio	0.54	0.55	0.13	0.55	0.74		0.12	0.71	0.22	0.84	0.56	
Control Delay	31.3	38.4	0.6	31.6	22.3		10.6	38.2	2.0	30.1	19.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	31.3	38.4	0.6	31.6	22.3		10.6	38.2	2.0	30.1	19.8	
LOS	C	D	A	C	C		B	D	A	C	B	
Approach Delay		31.4			24.6			28.1			23.5	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	57	73	0	71	57		9	127	0	161	187	

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	108	116	0	129	113		22	180	18	#279	244	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	274	587	499	315	743		314	802	707	656	1582	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.52	0.47	0.12	0.55	0.68		0.11	0.59	0.22	0.74	0.53	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 81.9

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 25.9

Intersection LOS: C

Intersection Capacity Utilization 78.3%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Douglas St & Tudor Rd

 Ø1	 Ø2	 Ø3	 Ø4
13 s	43 s	15 s	19 s
 Ø5	 Ø6	 Ø7	 Ø8
31 s	25 s	14 s	20 s

HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS

Existing + Site PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	196	573	128	55	499	106	96	273	54	212	385	251
Future Volume (veh/h)	196	573	128	55	499	106	96	273	54	212	385	251
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	209	610	136	59	531	113	102	290	57	226	410	267
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	1086	242	115	1098	490	205	617	120	405	455	602
Arrive On Green	0.14	0.38	0.38	0.06	0.31	0.31	0.06	0.21	0.21	0.12	0.24	0.24
Sat Flow, veh/h	1781	2889	643	1781	3554	1585	1781	2968	575	1781	1870	1585
Grp Volume(v), veh/h	209	375	371	59	531	113	102	172	175	226	410	267
Grp Sat Flow(s),veh/h/ln	1781	1777	1755	1781	1777	1585	1781	1777	1767	1781	1870	1585
Q Serve(g_s), s	11.5	16.7	16.8	3.2	12.1	5.3	4.4	8.5	8.7	9.7	21.2	12.6
Cycle Q Clear(g_c), s	11.5	16.7	16.8	3.2	12.1	5.3	4.4	8.5	8.7	9.7	21.2	12.6
Prop In Lane	1.00		0.37	1.00		1.00	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	243	668	660	115	1098	490	205	369	367	405	455	602
V/C Ratio(X)	0.86	0.56	0.56	0.51	0.48	0.23	0.50	0.47	0.48	0.56	0.90	0.44
Avail Cap(c_a), veh/h	289	668	660	191	1098	490	283	474	472	419	498	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.83	0.83
Uniform Delay (d), s/veh	42.3	24.7	24.7	45.3	28.1	25.7	30.1	34.7	34.8	25.9	36.7	23.1
Incr Delay (d2), s/veh	17.9	3.0	3.0	3.5	1.5	1.1	1.9	0.9	1.0	1.3	15.9	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	7.1	7.0	1.5	5.1	2.0	1.9	3.6	3.7	4.0	11.2	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.1	27.7	27.7	48.8	29.6	26.8	32.0	35.7	35.8	27.2	52.6	23.6
LnGrp LOS	E	C	C	D	C	C	C	D	D	C	D	C
Approach Vol, veh/h	955			703			449			903		
Approach Delay, s/veh	34.8			30.7			34.9			37.6		
Approach LOS	C			C			C			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.7	43.9	12.6	30.7	19.4	37.2	16.2	27.2				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 11	* 27	10.5	* 27	* 16	* 22	12.5	* 27				
Max Q Clear Time (g_c+I1), s	5.2	18.8	6.4	23.2	13.5	14.1	11.7	10.7				
Green Ext Time (p_c), s	0.0	2.7	0.1	1.1	0.1	2.2	0.1	1.6				

Intersection Summary

HCM 6th Ctrl Delay	34.7
HCM 6th LOS	C

Notes

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

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS

Existing + Site PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	196	573	128	55	499	106	96	273	54	212	385	251
Future Volume (vph)	196	573	128	55	499	106	96	273	54	212	385	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.973				0.850		0.975				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3444	0	1770	3539	1583	1770	3451	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.243			0.440		
Satd. Flow (perm)	1770	3444	0	1770	3539	1583	453	3451	0	820	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26				177		22				193
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	209	610	136	59	531	113	102	290	57	226	410	267
Shared Lane Traffic (%)												
Lane Group Flow (vph)	209	746	0	59	531	113	102	347	0	226	410	267
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	22.0	33.0		17.0	28.0	28.0	17.0	33.0		17.0	33.0	22.0
Total Split (%)	22.0%	33.0%		17.0%	28.0%	28.0%	17.0%	33.0%		17.0%	33.0%	22.0%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	15.2	36.3		9.1	27.3	27.3	30.9	22.3		38.3	26.3	47.9
Actuated g/C Ratio	0.15	0.36		0.09	0.27	0.27	0.31	0.22		0.38	0.26	0.48
v/c Ratio	0.78	0.59		0.37	0.55	0.20	0.40	0.44		0.53	0.84	0.31
Control Delay	61.0	46.5		49.2	35.7	1.8	23.2	32.1		23.8	51.4	5.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	61.0	46.5		49.2	35.7	1.8	23.2	32.1		23.8	51.4	5.4
LOS	E	D		D	D	A	C	C		C	D	A
Approach Delay		49.7			31.4			30.1			30.9	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	141	161		36	166	0	38	90		88	242	23
Queue Length 95th (ft)	#238	326		76	223	10	71	129		140	#402	68

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)	1280			1119			569			1961		
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	291	1266		189	971	563	285	937		435	501	876
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.72	0.59		0.31	0.55	0.20	0.36	0.37		0.52	0.82	0.30

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 36.8

Intersection LOS: D

Intersection Capacity Utilization 73.0%

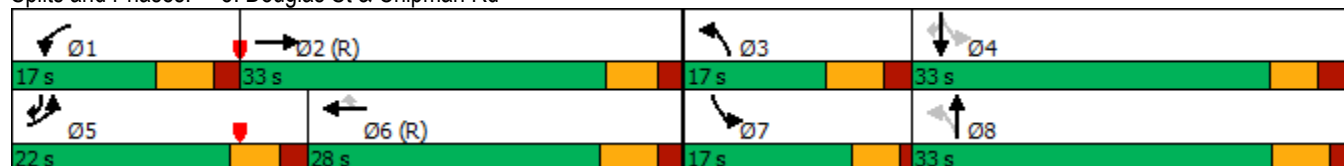
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Douglas St & Chipman Rd



HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	811	14	16	745	60	15	2	17	93	12	114
Future Volume (veh/h)	80	811	14	16	745	60	15	2	17	93	12	114
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	882	15	17	810	65	16	2	18	101	13	124
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	112	1814	31	40	1556	125	226	43	218	229	45	243
Arrive On Green	0.06	0.51	0.51	0.05	0.93	0.93	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1781	3575	61	1781	3332	267	572	142	714	583	148	795
Grp Volume(v), veh/h	87	438	459	17	432	443	36	0	0	238	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1859	1781	1777	1822	1428	0	0	1527	0	0
Q Serve(g_s), s	4.8	16.1	16.1	0.9	3.1	3.1	0.0	0.0	0.0	9.9	0.0	0.0
Cycle Q Clear(g_c), s	4.8	16.1	16.1	0.9	3.1	3.1	1.5	0.0	0.0	12.6	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.15	0.44		0.50	0.42		0.52
Lane Grp Cap(c), veh/h	112	902	943	40	830	851	487	0	0	517	0	0
V/C Ratio(X)	0.77	0.49	0.49	0.42	0.52	0.52	0.07	0.00	0.00	0.46	0.00	0.00
Avail Cap(c_a), veh/h	223	902	943	116	830	851	487	0	0	517	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.88	0.88	0.88	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	46.1	16.1	16.1	47.1	1.9	1.9	24.7	0.0	0.0	28.4	0.0	0.0
Incr Delay (d2), s/veh	14.8	1.9	1.8	8.6	2.1	2.0	0.3	0.0	0.0	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	6.4	6.6	0.5	1.1	1.1	0.7	0.0	0.0	5.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.9	18.0	17.9	55.7	3.9	3.9	25.0	0.0	0.0	31.3	0.0	0.0
LnGrp LOS	E	B	B	E	A	A	C	A	A	C	A	A
Approach Vol, veh/h	984				892				36			
Approach Delay, s/veh	21.7				4.9				25.0			
Approach LOS	C				A				C			
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.8	56.2		36.0	11.8	52.2		36.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	46.5		30.5	12.5	40.5		30.5				
Max Q Clear Time (g_c+I1), s	2.9	18.1		14.6	6.8	5.1		3.5				
Green Ext Time (p_c), s	0.0	8.3		1.8	0.1	8.6		0.2				
Intersection Summary												
HCM 6th Ctrl Delay	15.9											
HCM 6th LOS	B											

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS

Existing + Site PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	811	14	16	745	60	15	2	17	93	12	114
Future Volume (vph)	80	811	14	16	745	60	15	2	17	93	12	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	90		0	95		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.989			0.932			0.930	
Flt Protected	0.950			0.950				0.978			0.979	
Satd. Flow (prot)	1770	3529	0	1770	3500	0	0	1698	0	0	1696	0
Flt Permitted	0.950			0.950				0.852			0.848	
Satd. Flow (perm)	1770	3529	0	1770	3500	0	0	1479	0	0	1469	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			10			18			56	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	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	882	15	17	810	65	16	2	18	101	13	124
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	897	0	17	875	0	0	36	0	0	238	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	18.0	52.0		12.0	46.0		36.0	36.0		36.0	36.0	
Total Split (%)	18.0%	52.0%		12.0%	46.0%		36.0%	36.0%		36.0%	36.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	10.6	53.7		6.5	44.9			30.5			30.5	
Actuated g/C Ratio	0.11	0.54		0.06	0.45			0.30			0.30	
v/c Ratio	0.46	0.47		0.15	0.55			0.08			0.49	
Control Delay	49.7	16.4		54.9	12.4			16.0			25.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	49.7	16.4		54.9	12.4			16.0			25.4	
LOS	D	B		D	B			B			C	
Approach Delay		19.3			13.2			16.0			25.4	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	53	155		11	94			8			93	
Queue Length 95th (ft)	100	267		m26	134			31			168	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)	90			95								
Base Capacity (vph)	221	1896		115	1578			463			486	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.39	0.47		0.15	0.55			0.08			0.49	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 71 (71%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 17.4

Intersection LOS: B

Intersection Capacity Utilization 57.7%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	9	88	15	14	76
Future Vol, veh/h	10	9	88	15	14	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	11	104	18	16	89
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	234	113	0	0	122	0
Stage 1	113	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	754	940	-	-	1465	-
Stage 1	912	-	-	-	-	-
Stage 2	904	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	746	940	-	-	1465	-
Mov Cap-2 Maneuver	746	-	-	-	-	-
Stage 1	912	-	-	-	-	-
Stage 2	894	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	9.5	0		1.2		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	827	1465	-	
HCM Lane V/C Ratio	-	-	0.027	0.011	-	
HCM Control Delay (s)	-	-	9.5	7.5	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	0.1	0	-	

HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	87	170	2	138	99	217	86
Future Volume (veh/h)	87	170	2	138	99	217	86
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1870
Adj Flow Rate, veh/h	90	175		142	102	224	89
Peak Hour Factor	0.97	0.97		0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2		2	2	2	2
Cap, veh/h	342	304		722	626	707	1878
Arrive On Green	0.19	0.19		0.20	0.20	0.19	0.53
Sat Flow, veh/h	1781	1585		3647	1585	1781	3647
Grp Volume(v), veh/h	90	175		142	102	224	89
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1777
Q Serve(g_s), s	1.7	3.9		1.3	1.6	3.5	0.5
Cycle Q Clear(g_c), s	1.7	3.9		1.3	1.6	3.5	0.5
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	342	304		722	626	707	1878
V/C Ratio(X)	0.26	0.58		0.20	0.16	0.32	0.05
Avail Cap(c_a), veh/h	1154	1027		4468	2297	761	4468
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.5	14.4		13.0	7.7	8.4	4.5
Incr Delay (d2), s/veh	0.2	0.6		0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	1.2		0.4	0.4	0.9	0.1
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	13.7	15.1		13.1	7.7	8.5	4.5
LnGrp LOS	B	B		B	A	A	A
Approach Vol, veh/h	265			244			313
Approach Delay, s/veh	14.6			10.8			7.4
Approach LOS	B			B			A
Timer - Assigned Phs	2				5	6	8
Phs Duration (G+Y+Rc), s	26.3				12.8	13.5	13.1
Change Period (Y+Rc), s	5.5				5.5	5.5	5.5
Max Green Setting (Gmax), s	49.5				8.5	49.5	25.5
Max Q Clear Time (g_c+I1), s	2.5				5.5	3.6	5.9
Green Ext Time (p_c), s	0.4				0.1	0.7	0.4
Intersection Summary							
HCM 6th Ctrl Delay			10.7				
HCM 6th LOS			B				

Notes

User approved ignoring U-Turning movement.

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	87	170	2	138	99	217	86
Future Volume (vph)	87	170	2	138	99	217	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3539
Flt Permitted	0.950		0.950			0.662	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1233	3539
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		175			102		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	90	175	2	142	102	224	89
Shared Lane Traffic (%)							
Lane Group Flow (vph)	90	175	2	142	102	224	89
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	14.0	55.0	31.0	14.0	55.0
Total Split (%)	31.0%	31.0%	14.0%	55.0%	31.0%	14.0%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	8.0	8.0	8.0	8.0	21.5	16.2	19.0
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.53	0.40	0.47
v/c Ratio	0.26	0.39	0.01	0.20	0.12	0.38	0.05
Control Delay	16.2	6.2	13.5	14.7	1.9	7.6	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.2	6.2	13.5	14.7	1.9	7.6	8.6
LOS	B	A	B	B	A	A	A
Approach Delay	9.6			9.3			7.9
Approach LOS	A			A			A
Queue Length 50th (ft)	17	0	0	14	0	23	4
Queue Length 95th (ft)	45	35	4	31	13	48	21

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	1109	1057	369	3539	1522	612	3539
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.17	0.01	0.04	0.07	0.37	0.03

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 40.7

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 8.9

Intersection LOS: A

Intersection Capacity Utilization 39.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
14 s	55 s	31 s
 Ø5	 Ø6	
14 s	55 s	

HCM 6th TWSC
2: NW Commerce Dr/Sloan St / Main St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

Intersection												
Int Delay, s/veh	5.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	147	26	80	189	91	21	17	48	40	11	42
Future Vol, veh/h	150	147	26	80	189	91	21	17	48	40	11	42
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	165	162	29	88	208	100	23	19	53	44	12	46
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	308	0	0	191	0	0	793	991	96	805	905	104
Stage 1	-	-	-	-	-	-	507	507	-	384	384	-
Stage 2	-	-	-	-	-	-	286	484	-	421	521	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1249	-	-	1380	-	-	279	245	942	274	275	931
Stage 1	-	-	-	-	-	-	516	538	-	611	610	-
Stage 2	-	-	-	-	-	-	697	550	-	581	530	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1249	-	-	1380	-	-	218	199	942	206	223	931
Mov Cap-2 Maneuver	-	-	-	-	-	-	218	199	-	206	223	-
Stage 1	-	-	-	-	-	-	448	467	-	530	571	-
Stage 2	-	-	-	-	-	-	607	515	-	457	460	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.9			1.7			16.2			18.7		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1		NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	218		477	1249	-	-	1380	-	-	206	561	
HCM Lane V/C Ratio	0.106		0.15	0.132	-	-	0.064	-	-	0.213	0.104	
HCM Control Delay (s)	23.5		13.9	8.3	-	-	7.8	-	-	27.2	12.2	
HCM Lane LOS	C		B	A	-	-	A	-	-	D	B	
HCM 95th %tile Q(veh)	0.3		0.5	0.5	-	-	0.2	-	-	0.8	0.3	

HCM 6th TWSC
3: Drive 1/Gated Police Dr & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	223	7	15	331	5	24	0	50	5	0	5
Future Vol, veh/h	5	223	7	15	331	5	24	0	50	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	80	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	242	8	16	360	5	26	0	54	5	0	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	365	0	0	250	0	0	468	653	125	526	655	183
Stage 1	-	-	-	-	-	-	256	256	-	395	395	-
Stage 2	-	-	-	-	-	-	212	397	-	131	260	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1190	-	-	1313	-	-	478	385	902	435	384	828
Stage 1	-	-	-	-	-	-	726	694	-	602	603	-
Stage 2	-	-	-	-	-	-	770	602	-	859	692	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1190	-	-	1313	-	-	469	379	902	404	378	828
Mov Cap-2 Maneuver	-	-	-	-	-	-	469	379	-	404	378	-
Stage 1	-	-	-	-	-	-	723	691	-	600	596	-
Stage 2	-	-	-	-	-	-	756	595	-	804	689	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.3			10.9			11.8		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	694	1190	-	-	1313	-	-	543				
HCM Lane V/C Ratio	0.116	0.005	-	-	0.012	-	-	0.02				
HCM Control Delay (s)	10.9	8	-	-	7.8	-	-	11.8				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.1				

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	116	35	93	195	314	105	523	148	238	255	111
Future Volume (veh/h)	90	116	35	93	195	314	105	523	148	238	255	111
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1870	1870	1841	1870	1870	1870	1870	1841	1870	1870	1870
Adj Flow Rate, veh/h	95	122	37	98	205	331	111	551	156	251	268	117
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	2	2	4	2	2	2	2	4	2	2	2
Cap, veh/h	227	750	334	445	376	336	415	747	439	395	673	286
Arrive On Green	0.07	0.21	0.21	0.07	0.21	0.21	0.07	0.21	0.21	0.14	0.28	0.28
Sat Flow, veh/h	1767	3554	1585	1753	1777	1585	1781	3554	1560	1781	2429	1032
Grp Volume(v), veh/h	95	122	37	98	205	331	111	551	156	251	194	191
Grp Sat Flow(s),veh/h/ln	1767	1777	1585	1753	1777	1585	1781	1777	1560	1781	1777	1685
Q Serve(g_s), s	3.0	2.0	1.4	3.1	7.5	15.1	3.1	10.5	5.8	7.8	6.4	6.7
Cycle Q Clear(g_c), s	3.0	2.0	1.4	3.1	7.5	15.1	3.1	10.5	5.8	7.8	6.4	6.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.61
Lane Grp Cap(c), veh/h	227	750	334	445	376	336	415	747	439	395	492	467
V/C Ratio(X)	0.42	0.16	0.11	0.22	0.54	0.99	0.27	0.74	0.36	0.63	0.39	0.41
Avail Cap(c_a), veh/h	331	850	379	498	376	336	438	1090	589	544	787	746
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.4	23.4	23.2	19.9	25.5	28.6	16.7	26.9	20.9	19.1	21.3	21.4
Incr Delay (d2), s/veh	1.2	0.1	0.1	0.2	1.6	45.3	0.3	1.5	0.5	1.7	0.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.8	0.5	1.2	3.1	9.6	1.2	4.2	2.0	3.0	2.5	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.7	23.5	23.3	20.1	27.2	73.8	17.0	28.4	21.4	20.8	21.9	22.0
LnGrp LOS	C	C	C	C	C	E	B	C	C	C	C	C
Approach Vol, veh/h		254			634			818			636	
Approach Delay, s/veh		23.2			50.4			25.5			21.5	
Approach LOS		C			D			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.1	26.9	11.7	22.0	16.9	22.1	11.8	21.9				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	32.2	9.4	15.4	16.2	* 22	7.4	17.4				
Max Q Clear Time (g_c+I1), s	5.1	8.7	5.0	17.1	9.8	12.5	5.1	4.0				
Green Ext Time (p_c), s	0.0	2.0	0.1	0.0	0.4	2.7	0.0	0.6				
Intersection Summary												
HCM 6th Ctrl Delay			30.9									
HCM 6th LOS			C									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS

Existing + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	116	35	93	195	314	105	523	148	238	255	111
Future Volume (vph)	90	116	35	93	195	314	105	523	148	238	255	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.907				0.850		0.954	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	3539	1583	1736	3210	0	1770	3539	1553	1770	3376	0
Flt Permitted	0.364			0.675			0.524			0.352		
Satd. Flow (perm)	671	3539	1583	1233	3210	0	976	3539	1553	656	3376	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		331				207		85	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	2%	2%	4%	2%	2%	2%	2%	4%	2%	2%	2%
Adj. Flow (vph)	95	122	37	98	205	331	111	551	156	251	268	117
Shared Lane Traffic (%)												
Lane Group Flow (vph)	95	122	37	98	536	0	111	551	156	251	385	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	16.0	24.0	24.0	14.0	22.0		13.0	29.0	14.0	23.0	39.0	
Total Split (%)	17.8%	26.7%	26.7%	15.6%	24.4%		14.4%	32.2%	15.6%	25.6%	43.3%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	17.2	11.8	11.8	17.2	11.0		31.1	16.8	31.5	28.6	26.3	
Actuated g/C Ratio	0.24	0.16	0.16	0.24	0.15		0.43	0.23	0.44	0.40	0.36	
v/c Ratio	0.34	0.21	0.07	0.28	0.70		0.23	0.67	0.20	0.57	0.30	
Control Delay	22.6	30.0	0.3	21.5	17.8		13.1	31.5	1.7	18.3	15.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	22.6	30.0	0.3	21.5	17.8		13.1	31.5	1.7	18.3	15.9	
LOS	C	C	A	C	B		B	C	A	B	B	
Approach Delay		22.9			18.3			23.3			16.9	
Approach LOS		C			B			C			B	
Queue Length 50th (ft)	30	26	0	31	46		28	126	0	69	56	

Lanes, Volumes, Timings

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	71	55	0	74	108		60	202	17	128	97	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	327	913	623	357	988		493	1170	801	569	1656	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.29	0.13	0.06	0.27	0.54		0.23	0.47	0.19	0.44	0.23	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 72.4

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 20.2

Intersection LOS: C

Intersection Capacity Utilization 70.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Douglas St & Tudor Rd

 Ø1	 Ø2	 Ø3	 Ø4
13 s	39 s	16 s	22 s
 Ø5	 Ø6	 Ø7	 Ø8
23 s	29 s	14 s	24 s

HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	193	162	45	24	363	200	100	352	37	91	231	143
Future Volume (veh/h)	193	162	45	24	363	200	100	352	37	91	231	143
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1841	1870	1663	1811	1841	1856	1841	1841	1870	1870	1870	1870
Adj Flow Rate, veh/h	227	191	53	28	427	235	118	414	44	107	272	168
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	4	2	16	6	4	3	4	4	2	2	2	2
Cap, veh/h	263	1063	287	80	1004	451	254	680	72	290	331	518
Arrive On Green	0.25	0.64	0.64	0.05	0.29	0.29	0.07	0.21	0.21	0.06	0.18	0.18
Sat Flow, veh/h	1753	2765	747	1725	3497	1572	1753	3191	337	1781	1870	1585
Grp Volume(v), veh/h	227	121	123	28	427	235	118	226	232	107	272	168
Grp Sat Flow(s),veh/h/ln	1753	1777	1736	1725	1749	1572	1753	1749	1780	1781	1870	1585
Q Serve(g_s), s	9.9	2.2	2.3	1.3	7.9	10.0	4.3	9.3	9.4	3.9	11.2	6.4
Cycle Q Clear(g_c), s	9.9	2.2	2.3	1.3	7.9	10.0	4.3	9.3	9.4	3.9	11.2	6.4
Prop In Lane	1.00		0.43	1.00		1.00	1.00		0.19	1.00		1.00
Lane Grp Cap(c), veh/h	263	683	667	80	1004	451	254	373	379	290	331	518
V/C Ratio(X)	0.86	0.18	0.18	0.35	0.43	0.52	0.47	0.61	0.61	0.37	0.82	0.32
Avail Cap(c_a), veh/h	289	683	667	274	1004	451	289	373	379	290	435	606
HCM Platoon Ratio	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97
Uniform Delay (d), s/veh	29.2	9.2	9.2	37.0	23.2	23.9	25.0	28.4	28.5	24.9	31.7	20.3
Incr Delay (d2), s/veh	20.8	0.5	0.6	2.6	1.3	4.3	1.3	2.8	2.9	0.8	9.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.8	0.9	0.6	3.2	3.9	1.7	3.9	4.0	1.6	5.5	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	9.8	9.8	39.6	24.5	28.2	26.3	31.2	31.4	25.7	40.7	20.6
LnGrp LOS	D	A	A	D	C	C	C	C	C	C	D	C
Approach Vol, veh/h	471			690			576			547		
Approach Delay, s/veh	29.2			26.4			30.3			31.6		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.0	37.0	12.4	20.6	17.8	29.3	9.5	23.5				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 13	* 16	7.5	* 19	* 13	* 16	5.0	* 16				
Max Q Clear Time (g_c+I1), s	3.3	4.3	6.3	13.2	11.9	12.0	5.9	11.4				
Green Ext Time (p_c), s	0.0	0.9	0.0	1.0	0.1	1.2	0.0	1.0				

Intersection Summary

HCM 6th Ctrl Delay	29.2
HCM 6th LOS	C

Notes

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

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	193	162	45	24	363	200	100	352	37	91	231	143
Future Volume (vph)	193	162	45	24	363	200	100	352	37	91	231	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.967				0.850		0.986				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	3323	0	1703	3471	1568	1736	3429	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.332			0.488		
Satd. Flow (perm)	1736	3323	0	1703	3471	1568	607	3429	0	909	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		40				235		14				166
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	4%	2%	16%	6%	4%	3%	4%	4%	2%	2%	2%	2%
Adj. Flow (vph)	227	191	53	28	427	235	118	414	44	107	272	168
Shared Lane Traffic (%)												
Lane Group Flow (vph)	227	244	0	28	427	235	118	458	0	107	272	168
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	19.0	22.0		19.0	22.0	22.0	14.0	22.0		9.5	25.0	19.0
Total Split (%)	23.8%	27.5%		23.8%	27.5%	27.5%	17.5%	27.5%		11.9%	31.3%	23.8%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	13.3	34.7		8.2	21.0	21.0	25.1	19.2		22.3	15.9	35.6
Actuated g/C Ratio	0.17	0.43		0.10	0.26	0.26	0.31	0.24		0.28	0.20	0.44
v/c Ratio	0.79	0.17		0.16	0.47	0.40	0.40	0.55		0.34	0.74	0.21
Control Delay	66.0	15.9		35.1	29.2	6.5	20.7	27.6		18.9	42.0	2.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	66.0	15.9		35.1	29.2	6.5	20.7	27.6		18.9	42.0	2.9
LOS	E	B		D	C	A	C	C		B	D	A
Approach Delay		40.0			21.7			26.2			25.5	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	124	13		13	103	0	38	98		33	127	1

Lanes, Volumes, Timings 5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#211	60		35	141	47	66	128		58	187	26
Internal Link Dist (ft)		1280			1119			569			1961	
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	298	1463		270	911	584	298	1004		315	433	804
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.76	0.17		0.10	0.47	0.40	0.40	0.46		0.34	0.63	0.21

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 62 (78%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 27.5

Intersection LOS: C

Intersection Capacity Utilization 59.3%

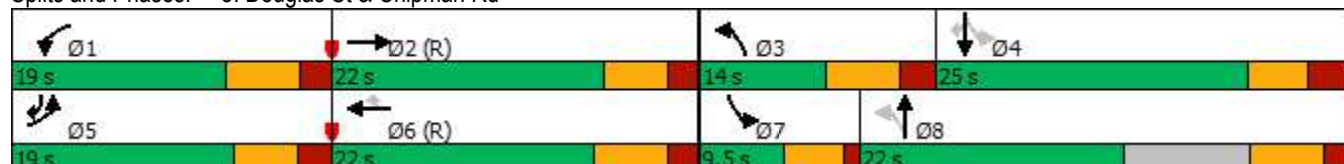
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

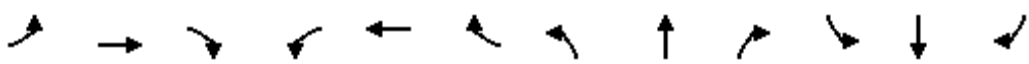
Queue shown is maximum after two cycles.

Splits and Phases: 5: Douglas St & Chipman Rd



HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	394	14	16	470	63	14	3	8	40	5	47
Future Volume (veh/h)	85	394	14	16	470	63	14	3	8	40	5	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1826	1870	1811	1841	1870	1796	1870	1707	1870	1870	1737
Adj Flow Rate, veh/h	97	448	16	18	534	72	16	3	9	45	6	53
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	5	2	6	4	2	7	2	13	2	2	11
Cap, veh/h	126	1496	53	43	1214	163	337	72	160	260	54	259
Arrive On Green	0.07	0.44	0.44	0.05	0.78	0.78	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1781	3417	122	1725	3098	416	803	218	484	590	162	781
Grp Volume(v), veh/h	97	227	237	18	301	305	28	0	0	104	0	0
Grp Sat Flow(s),veh/h/ln	1781	1735	1804	1725	1749	1766	1505	0	0	1533	0	0
Q Serve(g_s), s	4.3	6.8	6.8	0.8	4.5	4.6	0.0	0.0	0.0	1.0	0.0	0.0
Cycle Q Clear(g_c), s	4.3	6.8	6.8	0.8	4.5	4.6	0.9	0.0	0.0	3.6	0.0	0.0
Prop In Lane	1.00		0.07	1.00		0.24	0.57		0.32	0.43		0.51
Lane Grp Cap(c), veh/h	126	759	790	43	685	692	569	0	0	572	0	0
V/C Ratio(X)	0.77	0.30	0.30	0.42	0.44	0.44	0.05	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	234	759	790	140	685	692	569	0	0	572	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.92	0.92	0.92	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.5	14.5	14.6	37.5	5.7	5.8	18.2	0.0	0.0	19.1	0.0	0.0
Incr Delay (d2), s/veh	13.2	1.0	1.0	8.5	1.9	1.9	0.2	0.0	0.0	0.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	2.5	2.6	0.4	1.5	1.5	0.4	0.0	0.0	1.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.7	15.6	15.5	45.9	7.6	7.6	18.3	0.0	0.0	19.8	0.0	0.0
LnGrp LOS	D	B	B	D	A	A	B	A	A	B	A	A
Approach Vol, veh/h	561			624			28			104		
Approach Delay, s/veh	21.5			8.7			18.3			19.8		
Approach LOS	C			A			B			B		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.5	40.5		32.0	11.1	36.9		32.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	30.5		26.5	10.5	26.5		26.5				
Max Q Clear Time (g_c+I1), s	2.8	8.8		5.6	6.3	6.6		2.9				
Green Ext Time (p_c), s	0.0	3.5		0.7	0.1	4.6		0.1				
Intersection Summary												
HCM 6th Ctrl Delay	15.2											
HCM 6th LOS	B											

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	394	14	16	470	63	14	3	8	40	5	47
Future Volume (vph)	85	394	14	16	470	63	14	3	8	40	5	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	90		0	95		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.982			0.957			0.931	
Flt Protected	0.950			0.950				0.972			0.979	
Satd. Flow (prot)	1770	3424	0	1703	3416	0	0	1631	0	0	1625	0
Flt Permitted	0.950			0.950				0.867			0.880	
Satd. Flow (perm)	1770	3424	0	1703	3416	0	0	1454	0	0	1460	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			20			9			53	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	5%	2%	6%	4%	2%	7%	2%	13%	2%	2%	11%
Adj. Flow (vph)	97	448	16	18	534	72	16	3	9	45	6	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	464	0	18	606	0	0	28	0	0	104	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	16.0	36.0		12.0	32.0		32.0	32.0		32.0	32.0	
Total Split (%)	20.0%	45.0%		15.0%	40.0%		40.0%	40.0%		40.0%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	9.5	40.1		6.5	30.0			26.5			26.5	
Actuated g/C Ratio	0.12	0.50		0.08	0.38			0.33			0.33	
v/c Ratio	0.46	0.27		0.13	0.47			0.06			0.20	
Control Delay	40.0	12.8		32.1	35.1			14.5			11.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	40.0	12.8		32.1	35.1			14.5			11.7	
LOS	D	B		C	D			B			B	
Approach Delay		17.5			35.0			14.5			11.7	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	45	61		9	163			6			17	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	89	118		m22	213			23			50	
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)	90			95								
Base Capacity (vph)	232	1718		138	1292			487			519	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.42	0.27		0.13	0.47			0.06			0.20	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 52 (65%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 25.3

Intersection LOS: C

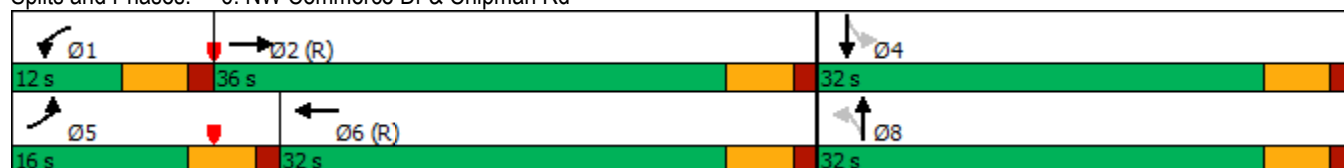
Intersection Capacity Utilization 39.8%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



Intersection						
Int Delay, s/veh	1.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	18	68	6	6	111
Future Vol, veh/h	20	18	68	6	6	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	21	80	7	7	131
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	229	84	0	0	87	0
Stage 1	84	-	-	-	-	-
Stage 2	145	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	759	975	-	-	1509	-
Stage 1	939	-	-	-	-	-
Stage 2	882	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	755	975	-	-	1509	-
Mov Cap-2 Maneuver	755	-	-	-	-	-
Stage 1	939	-	-	-	-	-
Stage 2	878	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	9.5	0		0.4		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-		845	1509	
HCM Lane V/C Ratio	-	-		0.053	0.005	
HCM Control Delay (s)	-	-		9.5	7.4	
HCM Lane LOS	-	-		A	A	
HCM 95th %tile Q(veh)	-	-		0.2	0	

HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	164	305	1	164	125	287	233
Future Volume (veh/h)	164	305	1	164	125	287	233
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1856
Adj Flow Rate, veh/h	174	324		174	133	305	248
Peak Hour Factor	0.94	0.94		0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2		2	2	2	3
Cap, veh/h	453	403		656	696	640	1733
Arrive On Green	0.25	0.25		0.18	0.18	0.18	0.49
Sat Flow, veh/h	1781	1585		3647	1585	1781	3618
Grp Volume(v), veh/h	174	324		174	133	305	248
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1763
Q Serve(g_s), s	3.5	8.3		1.8	2.2	5.7	1.7
Cycle Q Clear(g_c), s	3.5	8.3		1.8	2.2	5.7	1.7
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	453	403		656	696	640	1733
V/C Ratio(X)	0.38	0.80		0.27	0.19	0.48	0.14
Avail Cap(c_a), veh/h	1049	933		3979	2178	710	4029
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.3	15.1		15.1	7.4	10.6	6.0
Incr Delay (d2), s/veh	0.2	1.4		0.1	0.0	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	2.5		0.6	0.5	1.7	0.4
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	13.5	16.6		15.2	7.5	10.8	6.0
LnGrp LOS	B	B		B	A	B	A
Approach Vol, veh/h	498			307			553
Approach Delay, s/veh	15.5			11.9			8.7
Approach LOS	B			B			A
Timer - Assigned Phs	2				5	6	8
Phs Duration (G+Y+Rc), s	26.8				13.3	13.5	16.5
Change Period (Y+Rc), s	5.5				5.5	5.5	5.5
Max Green Setting (Gmax), s	49.5				9.5	48.5	25.5
Max Q Clear Time (g_c+I1), s	3.7				7.7	4.2	10.3
Green Ext Time (p_c), s	1.1				0.1	0.9	0.8
Intersection Summary							
HCM 6th Ctrl Delay			11.9				
HCM 6th LOS			B				

Notes

User approved ignoring U-Turning movement.

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS

Existing + Site + Planned PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	164	305	1	164	125	287	233
Future Volume (vph)	164	305	1	164	125	287	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3505
Flt Permitted	0.950		0.950			0.642	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1196	3505
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		324			133		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%
Adj. Flow (vph)	174	324	1	174	133	305	248
Shared Lane Traffic (%)							
Lane Group Flow (vph)	174	324	1	174	133	305	248
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	14.0	54.0	31.0	15.0	55.0
Total Split (%)	31.0%	31.0%	14.0%	54.0%	31.0%	15.0%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	9.0	9.0	8.0	8.1	22.6	17.0	20.0
Actuated g/C Ratio	0.21	0.21	0.19	0.19	0.53	0.40	0.47
v/c Ratio	0.46	0.55	0.00	0.26	0.15	0.51	0.15
Control Delay	19.3	6.4	15.0	16.4	1.8	9.9	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	6.4	15.0	16.4	1.8	9.9	9.0
LOS	B	A	B	B	A	A	A
Approach Delay	10.9			10.1			9.5
Approach LOS	B			B			A
Queue Length 50th (ft)	37	0	0	18	0	34	13

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Queue Length 95th (ft)	80	46	3	41	15	80	53
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	1063	1080	354	3539	1468	623	3505
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.30	0.00	0.05	0.09	0.49	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 42.5

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 10.1

Intersection LOS: B

Intersection Capacity Utilization 45.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
14 s	55 s	31 s
 Ø5	 Ø6	
15 s	54 s	

HCM 6th TWSC
2: NW Commerce Dr/Sloan St / Main St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	49	305	41	44	264	45	23	6	70	114	14	156
Future Vol, veh/h	49	305	41	44	264	45	23	6	70	114	14	156
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	52	324	44	47	281	48	24	6	74	121	15	166
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	329	0	0	368	0	0	692	873	184	644	847	141
Stage 1	-	-	-	-	-	-	450	450	-	375	375	-
Stage 2	-	-	-	-	-	-	242	423	-	269	472	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1227	-	-	1187	-	-	330	287	827	358	297	881
Stage 1	-	-	-	-	-	-	558	570	-	618	615	-
Stage 2	-	-	-	-	-	-	740	586	-	713	557	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1227	-	-	1187	-	-	241	264	827	300	273	881
Mov Cap-2 Maneuver	-	-	-	-	-	-	241	264	-	300	273	-
Stage 1	-	-	-	-	-	-	535	546	-	592	590	-
Stage 2	-	-	-	-	-	-	562	563	-	614	534	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1			1			13.2			16.8		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	241	708	1227	-	-	1187	-	-	300	744		
HCM Lane V/C Ratio	0.102	0.114	0.042	-	-	0.039	-	-	0.404	0.243		
HCM Control Delay (s)	21.6	10.7	8.1	-	-	8.2	-	-	24.9	11.4		
HCM Lane LOS	C	B	A	-	-	A	-	-	C	B		
HCM 95th %tile Q(veh)	0.3	0.4	0.1	-	-	0.1	-	-	1.9	1		

HCM 6th TWSC
3: Drive 1/Gated Police Dr & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	466	18	38	336	5	12	0	24	5	0	5
Future Vol, veh/h	5	466	18	38	336	5	12	0	24	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	80	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	507	20	41	365	5	13	0	26	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	370	0	0	527	0	0	792	979	264	714	987	185
Stage 1	-	-	-	-	-	-	527	527	-	450	450	-
Stage 2	-	-	-	-	-	-	265	452	-	264	537	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1185	-	-	1036	-	-	280	249	734	319	246	826
Stage 1	-	-	-	-	-	-	502	527	-	558	570	-
Stage 2	-	-	-	-	-	-	717	569	-	718	521	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1185	-	-	1036	-	-	269	238	734	297	235	826
Mov Cap-2 Maneuver	-	-	-	-	-	-	269	238	-	297	235	-
Stage 1	-	-	-	-	-	-	500	525	-	556	547	-
Stage 2	-	-	-	-	-	-	684	546	-	690	519	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.9			13.4			13.4		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	466	1185	-	-	1036	-	-	437
HCM Lane V/C Ratio	0.084	0.005	-	-	0.04	-	-	0.025
HCM Control Delay (s)	13.4	8.1	-	-	8.6	-	-	13.4
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.1

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS

Existing + Site + Planned PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	272	90	154	199	259	41	419	140	430	630	123
Future Volume (veh/h)	135	272	90	154	199	259	41	419	140	430	630	123
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1841	1870	1870	1870	1841	1870	1870	1870	1870	1856
Adj Flow Rate, veh/h	152	306	101	173	224	291	46	471	157	483	708	138
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	4	2	2	2	4	2	2	2	2	3
Cap, veh/h	254	548	241	326	273	244	288	614	419	570	1113	217
Arrive On Green	0.09	0.15	0.15	0.09	0.15	0.15	0.05	0.17	0.17	0.25	0.38	0.38
Sat Flow, veh/h	1781	3554	1560	1781	1777	1585	1753	3554	1585	1781	2966	578
Grp Volume(v), veh/h	152	306	101	173	224	291	46	471	157	483	424	422
Grp Sat Flow(s),veh/h/ln	1781	1777	1560	1781	1777	1585	1753	1777	1585	1781	1777	1766
Q Serve(g_s), s	5.7	6.4	4.7	6.5	9.9	12.4	1.3	10.2	6.5	17.4	15.8	15.8
Cycle Q Clear(g_c), s	5.7	6.4	4.7	6.5	9.9	12.4	1.3	10.2	6.5	17.4	15.8	15.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.33
Lane Grp Cap(c), veh/h	254	548	241	326	273	244	288	614	419	570	667	663
V/C Ratio(X)	0.60	0.56	0.42	0.53	0.82	1.19	0.16	0.77	0.37	0.85	0.64	0.64
Avail Cap(c_a), veh/h	275	590	259	326	273	244	341	806	505	661	797	792
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.0	31.6	30.9	25.7	33.1	34.1	15.5	31.8	24.2	19.6	20.7	20.7
Incr Delay (d2), s/veh	3.1	1.0	1.2	1.7	17.7	120.6	0.3	3.3	0.6	9.0	1.2	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	2.7	1.8	2.8	5.4	12.7	0.5	4.3	2.4	7.6	6.1	6.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.2	32.6	32.0	27.4	50.8	154.7	15.7	35.1	24.8	28.5	21.9	21.9
LnGrp LOS	C	C	C	C	D	F	B	D	C	C	C	C
Approach Vol, veh/h	559			688			674			1329		
Approach Delay, s/veh	31.6			88.9			31.3			24.3		
Approach LOS	C			F			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.6	37.1	14.0	19.0	26.9	20.8	14.0	19.0				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	36.2	8.4	12.4	24.2	* 18	7.4	13.4				
Max Q Clear Time (g_c+I1), s	3.3	17.8	7.7	14.4	19.4	12.2	8.5	8.4				
Green Ext Time (p_c), s	0.0	4.7	0.0	0.0	0.7	1.8	0.0	1.0				

Intersection Summary

HCM 6th Ctrl Delay	40.7
HCM 6th LOS	D

Notes

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

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	272	90	154	199	259	41	419	140	430	630	123
Future Volume (vph)	135	272	90	154	199	259	41	419	140	430	630	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.915				0.850		0.976	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1553	1770	3238	0	1736	3539	1583	1770	3449	0
Flt Permitted	0.360			0.538			0.245			0.381		
Satd. Flow (perm)	671	3539	1553	1002	3238	0	448	3539	1583	710	3449	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		291				207		30	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	4%	2%	2%	2%	4%	2%	2%	2%	2%	3%
Adj. Flow (vph)	152	306	101	173	224	291	46	471	157	483	708	138
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	306	101	173	515	0	46	471	157	483	846	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	15.0	20.0	20.0	14.0	19.0		13.0	25.0	14.0	31.0	43.0	
Total Split (%)	16.7%	22.2%	22.2%	15.6%	21.1%		14.4%	27.8%	15.6%	34.4%	47.8%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	19.2	11.8	11.8	19.2	11.1		39.1	15.5	29.7	35.8	35.5	
Actuated g/C Ratio	0.23	0.14	0.14	0.23	0.14		0.48	0.19	0.36	0.44	0.43	
v/c Ratio	0.57	0.60	0.21	0.57	0.75		0.15	0.71	0.22	0.84	0.56	
Control Delay	32.7	39.5	1.0	32.4	22.8		11.0	38.3	2.0	30.2	19.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	32.7	39.5	1.0	32.4	22.8		11.0	38.3	2.0	30.2	19.9	
LOS	C	D	A	C	C		B	D	A	C	B	
Approach Delay		30.7			25.2			28.0			23.6	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	62	82	0	71	60		11	127	0	161	187	

Lanes, Volumes, Timings

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	114	127	0	129	116		27	180	18	#279	245	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	273	584	498	305	741		313	798	705	653	1577	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.56	0.52	0.20	0.57	0.70		0.15	0.59	0.22	0.74	0.54	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 82.2

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 26.1

Intersection LOS: C

Intersection Capacity Utilization 79.0%

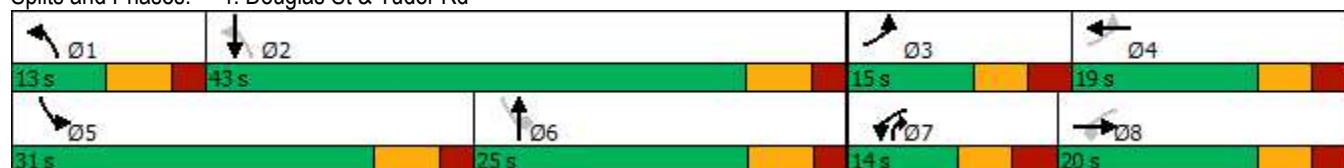
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Douglas St & Tudor Rd



HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	196	573	128	55	499	113	96	275	54	238	394	251
Future Volume (veh/h)	196	573	128	55	499	113	96	275	54	238	394	251
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	209	610	136	59	531	120	102	293	57	253	419	267
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	1074	239	115	1084	484	204	605	116	413	462	608
Arrive On Green	0.14	0.37	0.37	0.06	0.31	0.31	0.06	0.20	0.20	0.13	0.25	0.25
Sat Flow, veh/h	1781	2889	643	1781	3554	1585	1781	2974	571	1781	1870	1585
Grp Volume(v), veh/h	209	375	371	59	531	120	102	173	177	253	419	267
Grp Sat Flow(s),veh/h/ln	1781	1777	1755	1781	1777	1585	1781	1777	1768	1781	1870	1585
Q Serve(g_s), s	11.5	16.8	16.9	3.2	12.2	5.7	4.5	8.6	8.8	10.8	21.7	12.5
Cycle Q Clear(g_c), s	11.5	16.8	16.9	3.2	12.2	5.7	4.5	8.6	8.8	10.8	21.7	12.5
Prop In Lane	1.00		0.37	1.00		1.00	1.00		0.32	1.00		1.00
Lane Grp Cap(c), veh/h	243	661	653	115	1084	484	204	362	360	413	462	608
V/C Ratio(X)	0.86	0.57	0.57	0.51	0.49	0.25	0.50	0.48	0.49	0.61	0.91	0.44
Avail Cap(c_a), veh/h	289	661	653	191	1084	484	282	474	472	413	498	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.83	0.83
Uniform Delay (d), s/veh	42.3	25.0	25.0	45.3	28.4	26.1	30.4	35.1	35.2	25.6	36.5	22.9
Incr Delay (d2), s/veh	17.9	3.1	3.2	3.5	1.6	1.2	1.9	1.0	1.0	2.2	16.8	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	7.2	7.1	1.5	5.1	2.2	1.9	3.7	3.7	4.5	11.5	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.1	28.1	28.2	48.8	30.0	27.3	32.3	36.1	36.3	27.8	53.4	23.3
LnGrp LOS	E	C	C	D	C	C	C	D	D	C	D	C
Approach Vol, veh/h	955				710				452			
Approach Delay, s/veh	35.1				31.1				35.3			
Approach LOS	D				C				D			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.7	43.5	12.6	31.1	19.4	36.8	17.0	26.8				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 11	* 27	10.5	* 27	* 16	* 22	12.5	* 27				
Max Q Clear Time (g_c+I1), s	5.2	18.9	6.5	23.7	13.5	14.2	12.8	10.8				
Green Ext Time (p_c), s	0.0	2.7	0.1	1.0	0.1	2.2	0.0	1.6				

Intersection Summary

HCM 6th Ctrl Delay	35.1
HCM 6th LOS	D

Notes

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

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS

Existing + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	196	573	128	55	499	113	96	275	54	238	394	251
Future Volume (vph)	196	573	128	55	499	113	96	275	54	238	394	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.973				0.850		0.976				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3444	0	1770	3539	1583	1770	3454	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.241			0.431		
Satd. Flow (perm)	1770	3444	0	1770	3539	1583	449	3454	0	803	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26				177		22				193
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	209	610	136	59	531	120	102	293	57	253	419	267
Shared Lane Traffic (%)												
Lane Group Flow (vph)	209	746	0	59	531	120	102	350	0	253	419	267
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	22.0	33.0		17.0	28.0	28.0	17.0	33.0		17.0	33.0	22.0
Total Split (%)	22.0%	33.0%		17.0%	28.0%	28.0%	17.0%	33.0%		17.0%	33.0%	22.0%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	15.1	35.8		9.1	26.9	26.9	31.1	22.5		39.0	26.8	48.3
Actuated g/C Ratio	0.15	0.36		0.09	0.27	0.27	0.31	0.22		0.39	0.27	0.48
v/c Ratio	0.78	0.60		0.37	0.56	0.22	0.40	0.44		0.58	0.84	0.31
Control Delay	61.9	46.8		49.2	36.0	2.3	23.1	32.0		25.2	51.1	5.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	61.9	46.8		49.2	36.0	2.3	23.1	32.0		25.2	51.1	5.4
LOS	E	D		D	D	A	C	C		C	D	A
Approach Delay		50.1			31.4			30.0			31.1	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	142	161		36	167	0	38	90		99	246	23
Queue Length 95th (ft)	#238	326		76	223	14	71	131		157	#415	68

Lanes, Volumes, Timings 5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)	1280			1119			569			1961		
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	289	1248		189	957	558	285	938		436	504	881
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.72	0.60		0.31	0.55	0.22	0.36	0.37		0.58	0.83	0.30

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 37.0

Intersection LOS: D

Intersection Capacity Utilization 73.5%

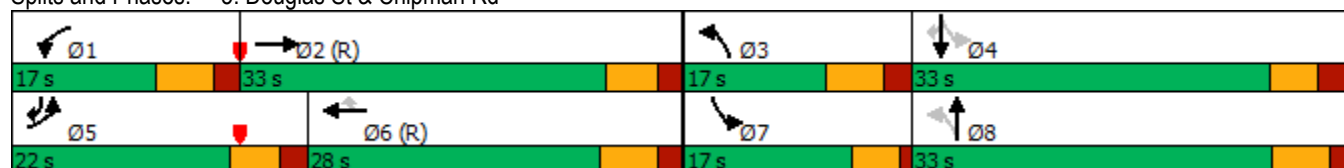
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

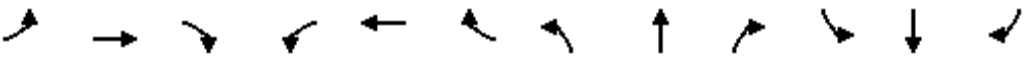
Queue shown is maximum after two cycles.

Splits and Phases: 5: Douglas St & Chipman Rd



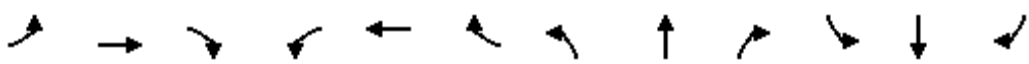
HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	811	14	16	745	60	15	2	17	93	12	114
Future Volume (veh/h)	80	811	14	16	745	60	15	2	17	93	12	114
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	882	15	17	810	65	16	2	18	101	13	124
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	112	1814	31	40	1556	125	226	43	218	229	45	243
Arrive On Green	0.06	0.51	0.51	0.05	0.93	0.93	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1781	3575	61	1781	3332	267	572	142	714	583	148	795
Grp Volume(v), veh/h	87	438	459	17	432	443	36	0	0	238	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1859	1781	1777	1822	1428	0	0	1527	0	0
Q Serve(g_s), s	4.8	16.1	16.1	0.9	3.1	3.1	0.0	0.0	0.0	9.9	0.0	0.0
Cycle Q Clear(g_c), s	4.8	16.1	16.1	0.9	3.1	3.1	1.5	0.0	0.0	12.6	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.15	0.44		0.50	0.42		0.52
Lane Grp Cap(c), veh/h	112	902	943	40	830	851	487	0	0	517	0	0
V/C Ratio(X)	0.77	0.49	0.49	0.42	0.52	0.52	0.07	0.00	0.00	0.46	0.00	0.00
Avail Cap(c_a), veh/h	223	902	943	116	830	851	487	0	0	517	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.88	0.88	0.88	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	46.1	16.1	16.1	47.1	1.9	1.9	24.7	0.0	0.0	28.4	0.0	0.0
Incr Delay (d2), s/veh	14.8	1.9	1.8	8.6	2.1	2.0	0.3	0.0	0.0	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	6.4	6.6	0.5	1.1	1.1	0.7	0.0	0.0	5.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.9	18.0	17.9	55.7	3.9	3.9	25.0	0.0	0.0	31.3	0.0	0.0
LnGrp LOS	E	B	B	E	A	A	C	A	A	C	A	A
Approach Vol, veh/h	984			892			36			238		
Approach Delay, s/veh	21.7			4.9			25.0			31.3		
Approach LOS	C			A			C			C		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.8	56.2		36.0	11.8	52.2		36.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	46.5		30.5	12.5	40.5		30.5				
Max Q Clear Time (g_c+I1), s	2.9	18.1		14.6	6.8	5.1		3.5				
Green Ext Time (p_c), s	0.0	8.3		1.8	0.1	8.6		0.2				
Intersection Summary												
HCM 6th Ctrl Delay	15.9											
HCM 6th LOS	B											

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	811	14	16	745	60	15	2	17	93	12	114
Future Volume (vph)	80	811	14	16	745	60	15	2	17	93	12	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	90		0	95		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.989			0.932			0.930	
Flt Protected	0.950			0.950				0.978			0.979	
Satd. Flow (prot)	1770	3529	0	1770	3500	0	0	1698	0	0	1696	0
Flt Permitted	0.950			0.950				0.852			0.848	
Satd. Flow (perm)	1770	3529	0	1770	3500	0	0	1479	0	0	1469	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			10			18			56	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	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	882	15	17	810	65	16	2	18	101	13	124
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	897	0	17	875	0	0	36	0	0	238	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	18.0	52.0		12.0	46.0		36.0	36.0		36.0	36.0	
Total Split (%)	18.0%	52.0%		12.0%	46.0%		36.0%	36.0%		36.0%	36.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	10.6	53.7		6.5	44.9			30.5			30.5	
Actuated g/C Ratio	0.11	0.54		0.06	0.45			0.30			0.30	
v/c Ratio	0.46	0.47		0.15	0.55			0.08			0.49	
Control Delay	49.7	16.4		54.8	12.2			16.0			25.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	49.7	16.4		54.8	12.2			16.0			25.4	
LOS	D	B		D	B			B			C	
Approach Delay		19.3			13.0			16.0			25.4	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	53	155		11	94			8			93	
Queue Length 95th (ft)	100	267		m26	134			31			168	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Existing + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)	90			95								
Base Capacity (vph)	221	1896		115	1578			463			486	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.39	0.47		0.15	0.55			0.08			0.49	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 71 (71%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 17.3

Intersection LOS: B

Intersection Capacity Utilization 57.7%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	9	90	15	14	85
Future Vol, veh/h	10	9	90	15	14	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	11	106	18	16	100
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	247	115	0	0	124	0
Stage 1	115	-	-	-	-	-
Stage 2	132	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	741	937	-	-	1463	-
Stage 1	910	-	-	-	-	-
Stage 2	894	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	732	937	-	-	1463	-
Mov Cap-2 Maneuver	732	-	-	-	-	-
Stage 1	910	-	-	-	-	-
Stage 2	883	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	9.5	0	1.1			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	817	1463	-	
HCM Lane V/C Ratio	-	-	0.027	0.011	-	
HCM Control Delay (s)	-	-	9.5	7.5	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	0.1	0	-	

HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	124	232	2	206	138	275	128
Future Volume (veh/h)	124	232	2	206	138	275	128
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1870
Adj Flow Rate, veh/h	128	239		212	142	284	132
Peak Hour Factor	0.97	0.97		0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2		2	2	2	2
Cap, veh/h	359	320		706	634	669	1867
Arrive On Green	0.20	0.20		0.20	0.20	0.19	0.53
Sat Flow, veh/h	1781	1585		3647	1585	1781	3647
Grp Volume(v), veh/h	128	239		212	142	284	132
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1777
Q Serve(g_s), s	2.5	5.7		2.0	2.4	4.7	0.7
Cycle Q Clear(g_c), s	2.5	5.7		2.0	2.4	4.7	0.7
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	359	320		706	634	669	1867
V/C Ratio(X)	0.36	0.75		0.30	0.22	0.42	0.07
Avail Cap(c_a), veh/h	1127	1003		4366	2267	706	4366
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.8	15.1		13.8	8.0	9.0	4.7
Incr Delay (d2), s/veh	0.2	1.3		0.1	0.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	1.8		0.7	0.6	1.3	0.2
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	14.1	16.4		13.8	8.0	9.2	4.7
LnGrp LOS	B	B		B	A	A	A
Approach Vol, veh/h	367			354			416
Approach Delay, s/veh	15.6			11.5			7.8
Approach LOS	B			B			A
Timer - Assigned Phs	2				5	6	8
Phs Duration (G+Y+Rc), s	26.7				13.2	13.5	13.6
Change Period (Y+Rc), s	5.5				5.5	5.5	5.5
Max Green Setting (Gmax), s	49.5				8.5	49.5	25.5
Max Q Clear Time (g_c+I1), s	2.7				6.7	4.4	7.7
Green Ext Time (p_c), s	0.5				0.1	1.1	0.5
Intersection Summary							
HCM 6th Ctrl Delay			11.5				
HCM 6th LOS			B				

Notes

User approved ignoring U-Turning movement.

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	124	232	2	206	138	275	128
Future Volume (vph)	124	232	2	206	138	275	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3539
Flt Permitted	0.950		0.950			0.619	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1153	3539
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		239			142		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	128	239	2	212	142	284	132
Shared Lane Traffic (%)							
Lane Group Flow (vph)	128	239	2	212	142	284	132
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	14.0	55.0	31.0	14.0	55.0
Total Split (%)	31.0%	31.0%	14.0%	55.0%	31.0%	14.0%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	8.3	8.3	8.0	8.1	22.0	16.4	19.4
Actuated g/C Ratio	0.20	0.20	0.19	0.20	0.53	0.40	0.47
v/c Ratio	0.36	0.47	0.01	0.30	0.16	0.49	0.08
Control Delay	17.6	6.3	14.0	15.7	1.7	9.2	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	6.3	14.0	15.7	1.7	9.2	8.7
LOS	B	A	B	B	A	A	A
Approach Delay	10.2			10.1			9.0
Approach LOS	B			B			A
Queue Length 50th (ft)	26	0	0	22	0	31	6
Queue Length 95th (ft)	61	40	4	45	15	68	30

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	1094	1069	364	3539	1508	592	3539
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.22	0.01	0.06	0.09	0.48	0.04

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 41.3

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 9.8

Intersection LOS: A

Intersection Capacity Utilization 42.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
14 s	55 s	31 s
 Ø5	 Ø6	
14 s	55 s	

HCM 6th TWSC
2: NW Commerce Dr/Sloan St / Main St & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

Intersection												
Int Delay, s/veh	5.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	244	26	80	288	91	21	17	48	40	11	42
Future Vol, veh/h	150	244	26	80	288	91	21	17	48	40	11	42
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	165	268	29	88	316	100	23	19	53	44	12	46
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	416	0	0	297	0	0	953	1205	149	966	1119	158
Stage 1	-	-	-	-	-	-	613	613	-	492	492	-
Stage 2	-	-	-	-	-	-	340	592	-	474	627	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1139	-	-	1261	-	-	214	183	871	209	205	859
Stage 1	-	-	-	-	-	-	446	481	-	527	546	-
Stage 2	-	-	-	-	-	-	648	492	-	540	474	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1139	-	-	1261	-	-	161	145	871	150	163	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	161	145	-	150	163	-
Stage 1	-	-	-	-	-	-	381	411	-	451	508	-
Stage 2	-	-	-	-	-	-	557	458	-	414	405	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.1			1.4			20.3			24.7		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1 NBLn2		EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	161	377	1139	-	-	1261	-	-	150	455		
HCM Lane V/C Ratio	0.143	0.189	0.145	-	-	0.07	-	-	0.293	0.128		
HCM Control Delay (s)	31.1	16.8	8.7	-	-	8.1	-	-	38.7	14.1		
HCM Lane LOS	D	C	A	-	-	A	-	-	E	B		
HCM 95th %tile Q(veh)	0.5	0.7	0.5	-	-	0.2	-	-	1.1	0.4		

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	320	7	15	430	5	24	0	50	5	0	5
Future Vol, veh/h	5	320	7	15	430	5	24	0	50	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	80	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	348	8	16	467	5	26	0	54	5	0	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	472	0	0	356	0	0	628	866	178	686	868	236
Stage 1	-	-	-	-	-	-	362	362	-	502	502	-
Stage 2	-	-	-	-	-	-	266	504	-	184	366	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1086	-	-	1199	-	-	367	290	834	334	289	766
Stage 1	-	-	-	-	-	-	629	624	-	520	540	-
Stage 2	-	-	-	-	-	-	716	539	-	800	621	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1086	-	-	1199	-	-	359	285	834	308	284	766
Mov Cap-2 Maneuver	-	-	-	-	-	-	359	285	-	308	284	-
Stage 1	-	-	-	-	-	-	626	621	-	517	533	-
Stage 2	-	-	-	-	-	-	701	532	-	744	618	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.3			12.1			13.4		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	584	1086	-	-	1199	-	-	439				
HCM Lane V/C Ratio	0.138	0.005	-	-	0.014	-	-	0.025				
HCM Control Delay (s)	12.1	8.3	-	-	8	-	-	13.4				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	0.1				

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	169	44	139	247	468	123	779	220	355	380	140
Future Volume (veh/h)	125	169	44	139	247	468	123	779	220	355	380	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1870	1870	1841	1870	1870	1870	1870	1841	1870	1870	1870
Adj Flow Rate, veh/h	132	178	46	146	260	493	129	820	232	374	400	147
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	2	2	4	2	2	2	2	4	2	2	2
Cap, veh/h	213	574	256	372	314	281	423	953	557	418	962	349
Arrive On Green	0.07	0.16	0.16	0.09	0.18	0.18	0.07	0.27	0.27	0.17	0.38	0.38
Sat Flow, veh/h	1767	3554	1585	1753	1777	1585	1781	3554	1560	1781	2553	927
Grp Volume(v), veh/h	132	178	46	146	260	493	129	820	232	374	277	270
Grp Sat Flow(s),veh/h/ln	1767	1777	1585	1753	1777	1585	1781	1777	1560	1781	1777	1703
Q Serve(g_s), s	5.3	3.8	2.2	5.9	12.3	15.4	3.8	19.1	9.8	12.9	10.0	10.2
Cycle Q Clear(g_c), s	5.3	3.8	2.2	5.9	12.3	15.4	3.8	19.1	9.8	12.9	10.0	10.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.54
Lane Grp Cap(c), veh/h	213	574	256	372	314	281	423	953	557	418	669	642
V/C Ratio(X)	0.62	0.31	0.18	0.39	0.83	1.76	0.30	0.86	0.42	0.90	0.41	0.42
Avail Cap(c_a), veh/h	213	574	256	406	314	281	435	1033	592	440	719	689
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.8	32.2	31.5	26.8	34.5	35.8	15.3	30.3	21.1	20.2	20.0	20.1
Incr Delay (d2), s/veh	5.4	0.3	0.3	0.7	16.4	355.2	0.4	7.1	0.5	19.8	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	1.6	0.8	2.5	6.5	33.4	1.4	8.5	3.5	7.0	3.8	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.2	32.5	31.8	27.4	51.0	391.0	15.7	37.4	21.6	40.0	20.4	20.5
LnGrp LOS	C	C	C	C	D	F	B	D	C	D	C	C
Approach Vol, veh/h		356			899			1181			921	
Approach Delay, s/veh		32.7			233.6			31.9			28.4	
Approach LOS		C			F			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.4	39.6	13.0	22.0	21.9	30.1	14.3	20.7				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	35.2	6.4	15.4	16.2	* 25	9.4	12.4				
Max Q Clear Time (g_c+I1), s	5.8	12.2	7.3	17.4	14.9	21.1	7.9	5.8				
Green Ext Time (p_c), s	0.0	3.0	0.0	0.0	0.2	2.2	0.1	0.6				
Intersection Summary												
HCM 6th Ctrl Delay			85.0									
HCM 6th LOS			F									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS

Future + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	169	44	139	247	468	123	779	220	355	380	140
Future Volume (vph)	125	169	44	139	247	468	123	779	220	355	380	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.902				0.850		0.960	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	3539	1583	1736	3192	0	1770	3539	1553	1770	3398	0
Flt Permitted	0.260			0.640			0.400			0.167		
Satd. Flow (perm)	480	3539	1583	1169	3192	0	745	3539	1553	311	3398	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		304				207		68	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	2%	2%	4%	2%	2%	2%	2%	4%	2%	2%	2%
Adj. Flow (vph)	132	178	46	146	260	493	129	820	232	374	400	147
Shared Lane Traffic (%)												
Lane Group Flow (vph)	132	178	46	146	753	0	129	820	232	374	547	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	13.0	19.0	19.0	16.0	22.0		13.0	32.0	16.0	23.0	42.0	
Total Split (%)	14.4%	21.1%	21.1%	17.8%	24.4%		14.4%	35.6%	17.8%	25.6%	46.7%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	21.8	12.9	12.9	21.8	15.4		40.2	24.0	39.6	40.0	33.8	
Actuated g/C Ratio	0.25	0.15	0.15	0.25	0.17		0.45	0.27	0.45	0.45	0.38	
v/c Ratio	0.63	0.35	0.10	0.42	0.93		0.31	0.86	0.29	0.92	0.41	
Control Delay	38.7	36.9	0.4	27.5	42.1		13.0	40.9	4.0	53.2	18.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	38.7	36.9	0.4	27.5	42.1		13.0	40.9	4.0	53.2	18.4	
LOS	D	D	A	C	D		B	D	A	D	B	
Approach Delay		32.9			39.7			30.6			32.5	
Approach LOS		C			D			C			C	
Queue Length 50th (ft)	55	48	0	62	138		34	228	8	154	100	

Lanes, Volumes, Timings

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#114	81	0	110	#255		63	#306	47	#325	143	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	209	515	478	354	806		411	1010	816	407	1391	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.63	0.35	0.10	0.41	0.93		0.31	0.81	0.28	0.92	0.39	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 88.6

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 33.8

Intersection LOS: C

Intersection Capacity Utilization 92.3%

ICU Level of Service F

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Douglas St & Tudor Rd

 Ø1	 Ø2	 Ø3	 Ø4
13 s	42 s	13 s	22 s
 Ø5	 Ø6	 Ø7	 Ø8
23 s	32 s	16 s	19 s

HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	288	238	65	36	540	284	149	519	55	125	320	200
Future Volume (veh/h)	288	238	65	36	540	284	149	519	55	125	320	200
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1841	1870	1663	1811	1841	1856	1841	1841	1870	1870	1870	1870
Adj Flow Rate, veh/h	339	280	76	42	635	334	175	611	65	147	376	235
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	4	2	16	6	4	3	4	4	2	2	2	2
Cap, veh/h	289	839	224	105	715	322	278	895	95	285	419	617
Arrive On Green	0.28	0.51	0.51	0.06	0.20	0.20	0.09	0.28	0.28	0.06	0.22	0.22
Sat Flow, veh/h	1753	2775	739	1725	3497	1572	1753	3190	339	1781	1870	1585
Grp Volume(v), veh/h	339	177	179	42	635	334	175	335	341	147	376	235
Grp Sat Flow(s),veh/h/ln	1753	1777	1737	1725	1749	1572	1753	1749	1780	1781	1870	1585
Q Serve(g_s), s	13.2	4.7	4.9	1.9	14.1	16.4	6.1	13.6	13.7	5.0	15.6	8.5
Cycle Q Clear(g_c), s	13.2	4.7	4.9	1.9	14.1	16.4	6.1	13.6	13.7	5.0	15.6	8.5
Prop In Lane	1.00		0.43	1.00		1.00	1.00		0.19	1.00		1.00
Lane Grp Cap(c), veh/h	289	538	526	105	715	322	278	491	499	285	419	617
V/C Ratio(X)	1.17	0.33	0.34	0.40	0.89	1.04	0.63	0.68	0.68	0.52	0.90	0.38
Avail Cap(c_a), veh/h	289	538	526	274	715	322	278	491	499	285	435	630
HCM Platoon Ratio	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.93	0.93
Uniform Delay (d), s/veh	29.0	15.0	15.0	36.2	30.9	31.8	22.5	25.6	25.6	23.0	30.1	17.5
Incr Delay (d2), s/veh	105.9	1.5	1.6	2.5	15.3	60.6	4.5	3.8	3.8	1.5	19.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.9	1.8	1.9	0.8	7.0	11.1	2.6	5.7	5.8	2.1	8.7	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	134.9	16.5	16.6	38.6	46.2	92.4	27.1	29.4	29.5	24.5	49.4	17.9
LnGrp LOS	F	B	B	D	D	F	C	C	C	C	D	B
Approach Vol, veh/h	695			1011			851			758		
Approach Delay, s/veh	74.3			61.2			29.0			34.8		
Approach LOS	E			E			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	30.5	14.0	24.3	19.0	22.7	9.5	28.8				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 13	* 16	7.5	* 19	* 13	* 16	5.0	* 16				
Max Q Clear Time (g_c+I1), s	3.9	6.9	8.1	17.6	15.2	18.4	7.0	15.7				
Green Ext Time (p_c), s	0.0	1.2	0.0	0.3	0.0	0.0	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	49.6
HCM 6th LOS	D

Notes

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

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	288	238	65	36	540	284	149	519	55	125	320	200
Future Volume (vph)	288	238	65	36	540	284	149	519	55	125	320	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.968				0.850		0.986				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	3328	0	1703	3471	1568	1736	3429	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.196			0.322		
Satd. Flow (perm)	1736	3328	0	1703	3471	1568	358	3429	0	600	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		39				208		14				106
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	4%	2%	16%	6%	4%	3%	4%	4%	2%	2%	2%	2%
Adj. Flow (vph)	339	280	76	42	635	334	175	611	65	147	376	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	339	356	0	42	635	334	175	676	0	147	376	235
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	19.0	22.0		19.0	22.0	22.0	14.0	22.0		9.5	25.0	19.0
Total Split (%)	23.8%	27.5%		23.8%	27.5%	27.5%	17.5%	27.5%		11.9%	31.3%	23.8%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	13.7	26.7		8.5	15.7	15.7	30.0	22.7		25.0	18.1	38.2
Actuated g/C Ratio	0.17	0.33		0.11	0.20	0.20	0.38	0.28		0.31	0.23	0.48
v/c Ratio	1.14	0.31		0.23	0.93	0.70	0.67	0.69		0.57	0.90	0.29
Control Delay	139.8	20.0		35.9	54.7	20.8	30.3	29.1		25.4	55.8	7.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	139.8	20.0		35.9	54.7	20.8	30.3	29.1		25.4	55.8	7.8
LOS	F	C		D	D	C	C	C		C	E	A
Approach Delay		78.4			42.7			29.4			35.0	
Approach LOS		E			D			C			D	
Queue Length 50th (ft)	~217	23		20	165	56	56	152		44	181	35

Lanes, Volumes, Timings

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#353	97		46	#242	129	#98	195		76	#302	70
Internal Link Dist (ft)		1280			1119			569			1961	
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	298	1136		270	681	474	263	1004		260	433	811
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	1.14	0.31		0.16	0.93	0.70	0.67	0.67		0.57	0.87	0.29

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 62 (78%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 45.0

Intersection LOS: D

Intersection Capacity Utilization 76.8%

ICU Level of Service D

Analysis Period (min) 15

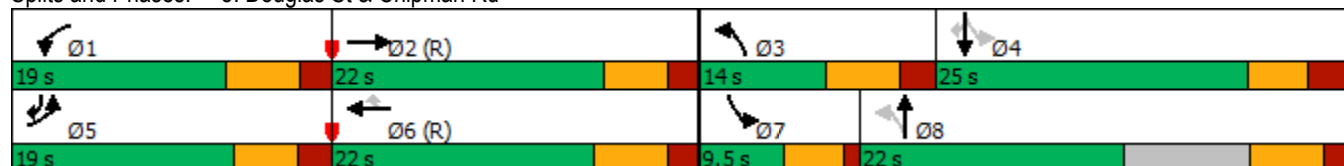
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

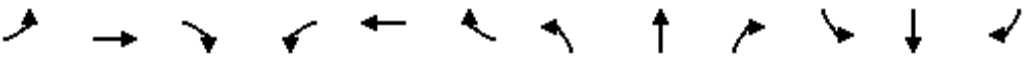
Queue shown is maximum after two cycles.

Splits and Phases: 5: Douglas St & Chipman Rd



HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	585	14	16	753	63	14	3	8	40	5	47
Future Volume (veh/h)	85	585	14	16	753	63	14	3	8	40	5	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1826	1870	1811	1841	1870	1796	1870	1707	1870	1870	1737
Adj Flow Rate, veh/h	97	665	16	18	856	72	16	3	9	45	6	53
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	5	2	6	4	2	7	2	13	2	2	11
Cap, veh/h	126	1516	36	43	1280	108	337	72	160	260	54	259
Arrive On Green	0.07	0.44	0.44	0.02	0.39	0.39	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1781	3462	83	1725	3265	275	803	218	484	590	162	781
Grp Volume(v), veh/h	97	333	348	18	458	470	28	0	0	104	0	0
Grp Sat Flow(s),veh/h/ln	1781	1735	1811	1725	1749	1791	1505	0	0	1533	0	0
Q Serve(g_s), s	4.3	10.7	10.7	0.8	17.3	17.3	0.0	0.0	0.0	1.0	0.0	0.0
Cycle Q Clear(g_c), s	4.3	10.7	10.7	0.8	17.3	17.3	0.9	0.0	0.0	3.6	0.0	0.0
Prop In Lane	1.00		0.05	1.00		0.15	0.57		0.32	0.43		0.51
Lane Grp Cap(c), veh/h	126	759	793	43	685	702	569	0	0	572	0	0
V/C Ratio(X)	0.77	0.44	0.44	0.42	0.67	0.67	0.05	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	234	759	793	140	685	702	569	0	0	572	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.59	0.59	0.59	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.5	15.6	15.7	38.4	20.0	20.0	18.2	0.0	0.0	19.1	0.0	0.0
Incr Delay (d2), s/veh	13.2	1.8	1.8	5.5	3.1	3.0	0.2	0.0	0.0	0.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	4.1	4.2	0.4	6.8	6.9	0.4	0.0	0.0	1.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.7	17.5	17.4	43.9	23.1	23.0	18.3	0.0	0.0	19.8	0.0	0.0
LnGrp LOS	D	B	B	D	C	C	B	A	A	B	A	A
Approach Vol, veh/h	778			946			28			104		
Approach Delay, s/veh	21.5			23.5			18.3			19.8		
Approach LOS	C			C			B			B		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.5	40.5		32.0	11.1	36.9		32.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	30.5		26.5	10.5	26.5		26.5				
Max Q Clear Time (g_c+I1), s	2.8	12.7		5.6	6.3	19.3		2.9				
Green Ext Time (p_c), s	0.0	5.0		0.7	0.1	3.9		0.1				
Intersection Summary												
HCM 6th Ctrl Delay				22.3								
HCM 6th LOS				C								

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	585	14	16	753	63	14	3	8	40	5	47
Future Volume (vph)	85	585	14	16	753	63	14	3	8	40	5	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	90		0	95		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.988			0.957			0.931	
Flt Protected	0.950			0.950				0.972			0.979	
Satd. Flow (prot)	1770	3427	0	1703	3435	0	0	1631	0	0	1625	0
Flt Permitted	0.950			0.950				0.867			0.880	
Satd. Flow (perm)	1770	3427	0	1703	3435	0	0	1454	0	0	1460	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			12			9			53	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	5%	2%	6%	4%	2%	7%	2%	13%	2%	2%	11%
Adj. Flow (vph)	97	665	16	18	856	72	16	3	9	45	6	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	681	0	18	928	0	0	28	0	0	104	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	16.0	36.0		12.0	32.0		32.0	32.0		32.0	32.0	
Total Split (%)	20.0%	45.0%		15.0%	40.0%		40.0%	40.0%		40.0%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	9.5	40.1		6.5	30.0			26.5			26.5	
Actuated g/C Ratio	0.12	0.50		0.08	0.38			0.33			0.33	
v/c Ratio	0.46	0.40		0.13	0.72			0.06			0.20	
Control Delay	40.0	14.1		29.6	45.0			14.5			11.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	40.0	14.1		29.6	45.0			14.5			11.7	
LOS	D	B		C	D			B			B	
Approach Delay		17.3			44.7			14.5			11.7	
Approach LOS		B			D			B			B	
Queue Length 50th (ft)	45	97		9	263			6			17	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	89	180		m15	m298			23			50	
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)	90			95								
Base Capacity (vph)	232	1719		138	1294			487			519	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.42	0.40		0.13	0.72			0.06			0.20	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 52 (65%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 30.9

Intersection LOS: C

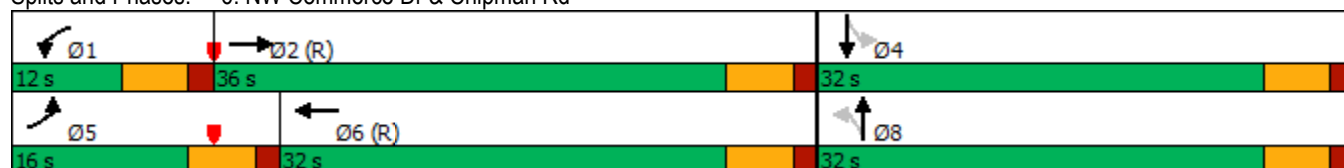
Intersection Capacity Utilization 47.6%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



Intersection						
Int Delay, s/veh	1.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	18	68	6	6	111
Future Vol, veh/h	20	18	68	6	6	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	21	80	7	7	131
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	229	84	0	0	87	0
Stage 1	84	-	-	-	-	-
Stage 2	145	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	759	975	-	-	1509	-
Stage 1	939	-	-	-	-	-
Stage 2	882	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	755	975	-	-	1509	-
Mov Cap-2 Maneuver	755	-	-	-	-	-
Stage 1	939	-	-	-	-	-
Stage 2	878	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	9.5	0		0.4		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	845		1509	-	
HCM Lane V/C Ratio	-	0.053		0.005	-	
HCM Control Delay (s)	-	9.5		7.4	0	
HCM Lane LOS	-	A		A	A	
HCM 95th %tile Q(veh)	-	0.2		0	-	

HCM 6th Signalized Intersection Summary

1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (veh/h)	234	406	1	244	181	408	347
Future Volume (veh/h)	234	406	1	244	181	408	347
Initial Q (Qb), veh	0	0		0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	1.00	
Parking Bus, Adj	1.00	1.00		1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870	1870	1856
Adj Flow Rate, veh/h	249	432		260	193	434	369
Peak Hour Factor	0.94	0.94		0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2		2	2	2	3
Cap, veh/h	563	501		572	756	574	1631
Arrive On Green	0.32	0.32		0.16	0.16	0.19	0.46
Sat Flow, veh/h	1781	1585		3647	1585	1781	3618
Grp Volume(v), veh/h	249	432		260	193	434	369
Grp Sat Flow(s),veh/h/ln	1781	1585		1777	1585	1781	1763
Q Serve(g_s), s	5.5	12.7		3.3	3.6	9.5	3.1
Cycle Q Clear(g_c), s	5.5	12.7		3.3	3.6	9.5	3.1
Prop In Lane	1.00	1.00			1.00	1.00	
Lane Grp Cap(c), veh/h	563	501		572	756	574	1631
V/C Ratio(X)	0.44	0.86		0.45	0.26	0.76	0.23
Avail Cap(c_a), veh/h	913	813		3466	2047	574	3509
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.5	16.0		18.9	7.7	14.4	8.0
Incr Delay (d2), s/veh	0.2	3.0		0.2	0.1	5.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	4.2		1.2	0.9	4.2	0.9
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	13.7	18.9		19.1	7.8	19.5	8.0
LnGrp LOS	B	B		B	A	B	A
Approach Vol, veh/h	681			453			803
Approach Delay, s/veh	17.0			14.3			14.2
Approach LOS	B			B			B
Timer - Assigned Phs	2			5		6	8
Phs Duration (G+Y+Rc), s	28.5			15.0		13.5	21.2
Change Period (Y+Rc), s	5.5			5.5		5.5	5.5
Max Green Setting (Gmax), s	49.5			9.5		48.5	25.5
Max Q Clear Time (g_c+I1), s	5.1			11.5		5.6	14.7
Green Ext Time (p_c), s	1.6			0.0		1.4	1.0
Intersection Summary							
HCM 6th Ctrl Delay			15.2				
HCM 6th LOS			B				

Notes

User approved ignoring U-Turning movement.

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	234	406	1	244	181	408	347
Future Volume (vph)	234	406	1	244	181	408	347
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	90		90	150	
Storage Lanes	1	1	1		1	1	
Taper Length (ft)	25		25			25	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850			0.850		
Flt Protected	0.950		0.950			0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3505
Flt Permitted	0.950		0.950			0.591	
Satd. Flow (perm)	1770	1583	1770	3539	1583	1101	3505
Right Turn on Red		Yes			Yes		
Satd. Flow (RTOR)		432			193		
Link Speed (mph)	35			35			35
Link Distance (ft)	2620			1884			949
Travel Time (s)	51.0			36.7			18.5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%
Adj. Flow (vph)	249	432	1	260	193	434	369
Shared Lane Traffic (%)							
Lane Group Flow (vph)	249	432	1	260	193	434	369
Turn Type	Prot	Prot	Prot	NA	pm+ov	D.P+P	NA
Protected Phases	3	3	1	6	3	5	2
Permitted Phases					6	6	
Detector Phase	3	3	1	6	3	5	2
Switch Phase							
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	30.5	30.5	13.5	53.5	30.5	13.5	23.5
Total Split (s)	31.0	31.0	14.0	54.0	31.0	15.0	55.0
Total Split (%)	31.0%	31.0%	14.0%	54.0%	31.0%	15.0%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag			Lead	Lag		Lead	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	Min	None	None	Min
Act Effct Green (s)	11.0	11.0	8.1	9.0	25.6	18.3	21.6
Actuated g/C Ratio	0.24	0.24	0.18	0.20	0.56	0.40	0.47
v/c Ratio	0.59	0.61	0.00	0.38	0.20	0.76	0.22
Control Delay	21.8	6.2	18.0	18.5	1.4	20.0	10.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	6.2	18.0	18.5	1.4	20.0	10.0
LOS	C	A	B	B	A	C	B
Approach Delay	11.9			11.2			15.4
Approach LOS	B			B			B
Queue Length 50th (ft)	56	0	0	31	0	62	23

Lanes, Volumes, Timings
1: Ward Rd & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

							
Lane Group	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Queue Length 95th (ft)	121	53	4	64	17	#163	85
Internal Link Dist (ft)	2540			1804			869
Turn Bay Length (ft)			90		90	150	
Base Capacity (vph)	989	1075	330	3464	1443	583	3444
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.40	0.00	0.08	0.13	0.74	0.11

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 46

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 13.2

Intersection LOS: B

Intersection Capacity Utilization 56.1%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Ward Rd & Tudor Rd

 Ø1	 Ø2	 Ø3
14 s	55 s	31 s
 Ø5	 Ø6	
15 s	54 s	

HCM 6th TWSC
2: NW Commerce Dr/Sloan St / Main St & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

Intersection												
Int Delay, s/veh	7.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	49	482	41	44	435	45	23	6	70	114	14	156
Future Vol, veh/h	49	482	41	44	435	45	23	6	70	114	14	156
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	-	110	-	150	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	52	513	44	47	463	48	24	6	74	121	15	166
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	511	0	0	557	0	0	972	1244	279	921	1218	232
Stage 1	-	-	-	-	-	-	639	639	-	557	557	-
Stage 2	-	-	-	-	-	-	333	605	-	364	661	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1050	-	-	1010	-	-	207	173	718	225	179	770
Stage 1	-	-	-	-	-	-	431	469	-	482	510	-
Stage 2	-	-	-	-	-	-	654	486	-	627	458	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1050	-	-	1010	-	-	140	157	718	182	162	770
Mov Cap-2 Maneuver	-	-	-	-	-	-	140	157	-	182	162	-
Stage 1	-	-	-	-	-	-	409	446	-	458	486	-
Stage 2	-	-	-	-	-	-	474	463	-	526	435	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.7			18			31.3		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	140	560	1050	-	-	1010	-	-	182	588		
HCM Lane V/C Ratio	0.175	0.144	0.05	-	-	0.046	-	-	0.666	0.308		
HCM Control Delay (s)	36.1	12.5	8.6	-	-	8.7	-	-	57.3	13.8		
HCM Lane LOS	E	B	A	-	-	A	-	-	F	B		
HCM 95th %tile Q(veh)	0.6	0.5	0.2	-	-	0.1	-	-	3.9	1.3		

HCM 6th TWSC
3: Drive 1/Gated Police Dr & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	643	18	38	507	5	12	0	24	5	0	5
Future Vol, veh/h	5	643	18	38	507	5	12	0	24	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	80	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	699	20	41	551	5	13	0	26	5	0	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	556	0	0	719	0	0	1077	1357	360	996	1365	278
Stage 1	-	-	-	-	-	-	719	719	-	636	636	-
Stage 2	-	-	-	-	-	-	358	638	-	360	729	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1011	-	-	878	-	-	173	148	637	199	146	719
Stage 1	-	-	-	-	-	-	386	431	-	433	470	-
Stage 2	-	-	-	-	-	-	633	469	-	631	426	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1011	-	-	878	-	-	165	140	637	183	138	719
Mov Cap-2 Maneuver	-	-	-	-	-	-	165	140	-	183	138	-
Stage 1	-	-	-	-	-	-	384	429	-	431	448	-
Stage 2	-	-	-	-	-	-	599	447	-	602	424	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.6			17.5			17.8		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	326	1011	-	-	878	-	-	292				
HCM Lane V/C Ratio	0.12	0.005	-	-	0.047	-	-	0.037				
HCM Control Delay (s)	17.5	8.6	-	-	9.3	-	-	17.8				
HCM Lane LOS	C	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.1				

HCM 6th Signalized Intersection Summary

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	184	380	110	229	300	386	56	624	209	641	939	178
Future Volume (veh/h)	184	380	110	229	300	386	56	624	209	641	939	178
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1841	1870	1870	1870	1841	1870	1870	1870	1870	1856
Adj Flow Rate, veh/h	207	427	124	257	337	434	63	701	235	720	1055	200
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	4	2	2	2	4	2	2	2	2	3
Cap, veh/h	206	410	180	246	245	218	232	722	470	602	1319	249
Arrive On Green	0.07	0.12	0.12	0.09	0.14	0.14	0.05	0.20	0.20	0.29	0.44	0.44
Sat Flow, veh/h	1781	3554	1560	1781	1777	1585	1753	3554	1585	1781	2982	564
Grp Volume(v), veh/h	207	427	124	257	337	434	63	701	235	720	627	628
Grp Sat Flow(s),veh/h/ln	1781	1777	1560	1781	1777	1585	1753	1777	1585	1781	1777	1769
Q Serve(g_s), s	6.4	10.4	6.9	8.4	12.4	12.4	1.7	17.6	11.0	26.2	27.4	27.6
Cycle Q Clear(g_c), s	6.4	10.4	6.9	8.4	12.4	12.4	1.7	17.6	11.0	26.2	27.4	27.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.32
Lane Grp Cap(c), veh/h	206	410	180	246	245	218	232	722	470	602	786	782
V/C Ratio(X)	1.00	1.04	0.69	1.04	1.38	1.99	0.27	0.97	0.50	1.20	0.80	0.80
Avail Cap(c_a), veh/h	206	410	180	246	245	218	261	722	470	602	786	782
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.5	39.8	38.3	35.2	38.8	38.9	16.9	35.6	26.2	23.7	21.7	21.7
Incr Delay (d2), s/veh	63.3	55.5	10.5	69.6	193.7	461.3	0.6	26.4	0.8	103.5	5.8	6.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	7.6	3.1	6.0	18.4	32.6	0.6	9.8	4.1	27.0	11.4	11.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	98.8	95.3	48.8	104.8	232.6	500.2	17.5	62.1	27.0	127.3	27.5	27.8
LnGrp LOS	F	F	D	F	F	F	B	E	C	F	C	C
Approach Vol, veh/h	758		1028				999				1975	
Approach Delay, s/veh	88.7		313.6				51.0				64.0	
Approach LOS	F		F				D				E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.5	46.6	13.0	19.0	33.0	25.1	15.0	17.0				
Change Period (Y+Rc), s	* 6.7	6.8	6.6	6.6	6.8	* 6.8	6.6	6.6				
Max Green Setting (Gmax), s	* 6.3	38.2	6.4	12.4	26.2	* 18	8.4	10.4				
Max Q Clear Time (g_c+I1), s	3.7	29.6	8.4	14.4	28.2	19.6	10.4	12.4				
Green Ext Time (p_c), s	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	119.1
HCM 6th LOS	F

Notes

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

Lanes, Volumes, Timings
4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	380	110	229	300	386	56	624	209	641	939	178
Future Volume (vph)	184	380	110	229	300	386	56	624	209	641	939	178
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		145	145		0	150		100	330		0
Storage Lanes	1		1	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850		0.916				0.850		0.976	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1553	1770	3242	0	1736	3539	1583	1770	3449	0
Flt Permitted	0.323			0.385			0.100			0.204		
Satd. Flow (perm)	602	3539	1553	717	3242	0	183	3539	1583	380	3449	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			290		301				207		30	
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		741			1490			2041			805	
Travel Time (s)		14.4			29.0			30.9			12.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	4%	2%	2%	2%	4%	2%	2%	2%	2%	3%
Adj. Flow (vph)	207	427	124	257	337	434	63	701	235	720	1055	200
Shared Lane Traffic (%)												
Lane Group Flow (vph)	207	427	124	257	771	0	63	701	235	720	1255	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	pm+ov	D.P+P	NA	
Protected Phases	3	8		7	4		1	6	7	5	2	
Permitted Phases	4		8	8			2		6	6		
Detector Phase	3	8	8	7	4		1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	10.0	6.0	6.0	10.0	
Minimum Split (s)	12.6	12.6	12.6	12.6	12.6		12.7	16.7	12.6	12.8	16.8	
Total Split (s)	13.0	17.0	17.0	15.0	19.0		13.0	25.0	15.0	33.0	45.0	
Total Split (%)	14.4%	18.9%	18.9%	16.7%	21.1%		14.4%	27.8%	16.7%	36.7%	50.0%	
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6		4.4	4.4	3.6	4.4	4.4	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		2.3	2.3	3.0	2.4	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.7	6.7	6.6	6.8	6.8	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None		None	Min	None	None	Min	
Act Effct Green (s)	18.8	10.4	10.4	18.8	12.4		45.9	18.3	33.4	44.4	40.8	
Actuated g/C Ratio	0.21	0.12	0.12	0.21	0.14		0.51	0.20	0.37	0.49	0.45	
v/c Ratio	1.00	1.05	0.29	1.04	1.09		0.31	0.97	0.33	1.22	0.79	
Control Delay	94.2	97.6	1.6	99.1	85.8		13.4	65.0	5.5	137.5	26.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	94.2	97.6	1.6	99.1	85.8		13.4	65.0	5.5	137.5	26.2	
LOS	F	F	A	F	F		B	E	A	F	C	
Approach Delay		81.0			89.1			47.8			66.7	
Approach LOS		F			F			D			E	
Queue Length 50th (ft)	95	~140	0	~129	~178		15	210	10	~462	321	

Lanes, Volumes, Timings

4: Douglas St & Tudor Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#203	#230	0	#250	#288		32	#320	56	#669	406	
Internal Link Dist (ft)		661			1410			1961			725	
Turn Bay Length (ft)	165		145	145			150		100	330		
Base Capacity (vph)	208	408	435	248	706		202	719	717	592	1580	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	1.00	1.05	0.29	1.04	1.09		0.31	0.97	0.33	1.22	0.79	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 130

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 69.9

Intersection LOS: E

Intersection Capacity Utilization 105.9%

ICU Level of Service G

Analysis Period (min) 15

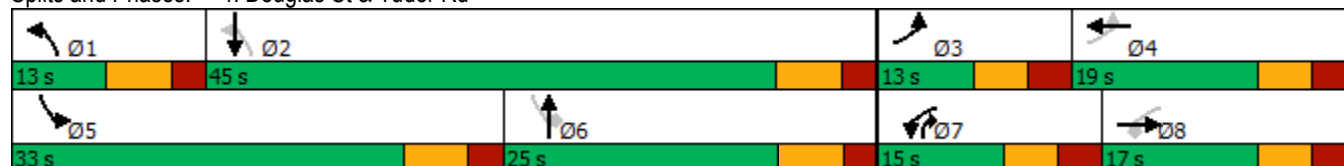
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Douglas St & Tudor Rd



HCM 6th Signalized Intersection Summary

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	299	852	189	82	742	166	141	408	80	340	573	374
Future Volume (veh/h)	299	852	189	82	742	166	141	408	80	340	573	374
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	318	906	201	87	789	177	150	434	85	362	610	398
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	289	938	208	130	854	381	217	720	140	393	498	678
Arrive On Green	0.05	0.11	0.11	0.07	0.24	0.24	0.08	0.24	0.24	0.13	0.27	0.27
Sat Flow, veh/h	1781	2891	641	1781	3554	1585	1781	2967	577	1781	1870	1585
Grp Volume(v), veh/h	318	557	550	87	789	177	150	259	260	362	610	398
Grp Sat Flow(s),veh/h/ln	1781	1777	1755	1781	1777	1585	1781	1777	1767	1781	1870	1585
Q Serve(g_s), s	16.2	31.2	31.2	4.8	21.7	9.5	6.2	12.9	13.1	12.5	26.6	19.2
Cycle Q Clear(g_c), s	16.2	31.2	31.2	4.8	21.7	9.5	6.2	12.9	13.1	12.5	26.6	19.2
Prop In Lane	1.00		0.37	1.00		1.00	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	289	577	570	130	854	381	217	431	429	393	498	678
V/C Ratio(X)	1.10	0.97	0.97	0.67	0.92	0.46	0.69	0.60	0.61	0.92	1.23	0.59
Avail Cap(c_a), veh/h	289	577	570	191	854	381	259	474	472	393	498	678
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.61	0.61	0.61	1.00	1.00	1.00	1.00	1.00	1.00	0.51	0.51	0.51
Uniform Delay (d), s/veh	47.3	44.1	44.1	45.2	37.1	32.5	27.9	33.6	33.6	29.7	36.7	21.8
Incr Delay (d2), s/veh	72.1	22.0	22.4	5.9	17.0	4.0	6.0	1.8	1.9	16.3	110.9	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.4	18.2	18.0	2.2	10.9	3.9	2.9	5.5	5.6	4.3	26.7	6.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	119.4	66.1	66.5	51.0	54.1	36.5	33.9	35.3	35.6	46.0	147.6	22.5
LnGrp LOS	F	E	E	D	D	D	C	D	D	D	F	C
Approach Vol, veh/h		1425			1053			669			1370	
Approach Delay, s/veh		78.1			50.9			35.1			84.4	
Approach LOS		E			D			D			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.6	38.8	14.7	33.0	22.0	30.3	17.0	30.7				
Change Period (Y+Rc), s	* 6.3	* 6.3	6.5	* 6.4	* 5.8	* 6.3	4.5	* 6.4				
Max Green Setting (Gmax), s	* 11	* 27	10.5	* 27	* 16	* 22	12.5	* 27				
Max Q Clear Time (g_c+I1), s	6.8	33.2	8.2	28.6	18.2	23.7	14.5	15.1				
Green Ext Time (p_c), s	0.1	0.0	0.1	0.0	0.0	0.0	0.0	2.2				
Intersection Summary												
HCM 6th Ctrl Delay				67.3								
HCM 6th LOS				E								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	299	852	189	82	742	166	141	408	80	340	573	374
Future Volume (vph)	299	852	189	82	742	166	141	408	80	340	573	374
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	335		0	200		200	90		0	180		180
Storage Lanes	1		0	1		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.973				0.850		0.975				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3444	0	1770	3539	1583	1770	3451	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.150			0.331		
Satd. Flow (perm)	1770	3444	0	1770	3539	1583	279	3451	0	617	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26				177		22				107
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1360			1199			649			2041	
Travel Time (s)		20.6			18.2			9.8			30.9	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	318	906	201	87	789	177	150	434	85	362	610	398
Shared Lane Traffic (%)												
Lane Group Flow (vph)	318	1107	0	87	789	177	150	519	0	362	610	398
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases						6	8			4		4
Detector Phase	5	2		1	6	6	3	8		7	4	5
Switch Phase												
Minimum Initial (s)	6.0	10.0		8.0	10.0	10.0	5.0	10.0		5.0	10.0	6.0
Minimum Split (s)	11.8	15.8		14.3	16.3	16.3	11.5	16.3		9.5	16.4	11.8
Total Split (s)	22.0	33.0		17.0	28.0	28.0	17.0	33.0		17.0	33.0	22.0
Total Split (%)	22.0%	33.0%		17.0%	28.0%	28.0%	17.0%	33.0%		17.0%	33.0%	22.0%
Yellow Time (s)	3.8	3.8		4.4	4.4	4.4	4.4	4.4		3.5	3.6	3.8
All-Red Time (s)	2.0	2.0		1.9	1.9	1.9	2.1	1.9		1.0	2.8	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8		6.3	6.3	6.3	6.5	6.3		4.5	6.4	5.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	C-Min		None	C-Min	C-Min	None	Min		None	None	None
Act Effct Green (s)	16.2	31.1		9.6	21.7	21.7	36.1	26.7		41.9	27.5	50.1
Actuated g/C Ratio	0.16	0.31		0.10	0.22	0.22	0.36	0.27		0.42	0.28	0.50
v/c Ratio	1.11	1.02		0.51	1.03	0.37	0.62	0.55		0.90	1.19	0.47
Control Delay	121.7	74.4		53.6	79.4	7.5	30.4	32.8		48.6	138.5	13.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	121.7	74.4		53.6	79.4	7.5	30.4	32.8		48.6	138.5	13.9
LOS	F	E		D	E	A	C	C		D	F	B
Approach Delay		85.0			65.2			32.2			78.6	
Approach LOS		F			E			C			E	
Queue Length 50th (ft)	~242	~408		53	~284	0	58	143		154	~483	115
Queue Length 95th (ft)	m#406	#591		102	#403	54	104	197		#273	#695	195

Lanes, Volumes, Timings

5: Douglas St & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)	1280			1119			569			1961		
Turn Bay Length (ft)	335			200		200	90			180		180
Base Capacity (vph)	286	1089		189	767	482	259	937		402	512	846
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	1.11	1.02		0.46	1.03	0.37	0.58	0.55		0.90	1.19	0.47

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.19

Intersection Signal Delay: 70.6

Intersection LOS: E

Intersection Capacity Utilization 95.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

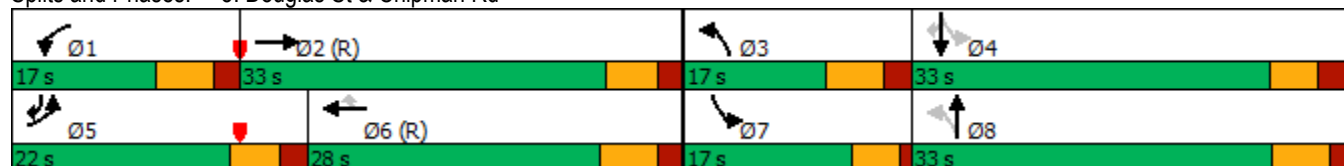
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

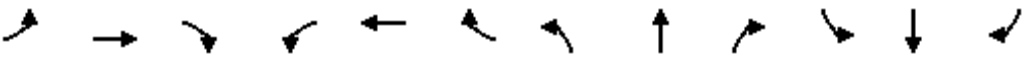
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Douglas St & Chipman Rd



HCM 6th Signalized Intersection Summary 6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	1254	14	16	1156	60	15	2	17	93	12	114
Future Volume (veh/h)	80	1254	14	16	1156	60	15	2	17	93	12	114
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	1363	15	17	1257	65	16	2	18	101	13	124
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	112	1827	20	40	1605	83	226	43	218	229	45	243
Arrive On Green	0.06	0.51	0.51	0.05	0.93	0.93	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1781	3600	40	1781	3438	178	572	142	714	583	148	795
Grp Volume(v), veh/h	87	672	706	17	649	673	36	0	0	238	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1863	1781	1777	1838	1428	0	0	1527	0	0
Q Serve(g_s), s	4.8	30.0	30.0	0.9	9.0	9.0	0.0	0.0	0.0	9.9	0.0	0.0
Cycle Q Clear(g_c), s	4.8	30.0	30.0	0.9	9.0	9.0	1.5	0.0	0.0	12.6	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.10	0.44		0.50	0.42		0.52
Lane Grp Cap(c), veh/h	112	902	945	40	830	858	487	0	0	517	0	0
V/C Ratio(X)	0.77	0.75	0.75	0.42	0.78	0.78	0.07	0.00	0.00	0.46	0.00	0.00
Avail Cap(c_a), veh/h	223	902	945	116	830	858	487	0	0	517	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.47	0.47	0.47	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	46.1	19.5	19.5	47.1	2.1	2.1	24.7	0.0	0.0	28.4	0.0	0.0
Incr Delay (d2), s/veh	14.8	5.6	5.3	4.7	3.5	3.5	0.3	0.0	0.0	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	12.4	12.9	0.4	1.8	1.8	0.7	0.0	0.0	5.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.9	25.1	24.9	51.8	5.6	5.5	25.0	0.0	0.0	31.3	0.0	0.0
LnGrp LOS	E	C	C	D	A	A	C	A	A	C	A	A
Approach Vol, veh/h	1465			1339			36			238		
Approach Delay, s/veh	27.1			6.1			25.0			31.3		
Approach LOS	C			A			C			C		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.8	56.2		36.0	11.8	52.2		36.0				
Change Period (Y+Rc), s	5.5	5.5		5.5	5.5	5.5		5.5				
Max Green Setting (Gmax), s	6.5	46.5		30.5	12.5	40.5		30.5				
Max Q Clear Time (g_c+I1), s	2.9	32.0		14.6	6.8	11.0		3.5				
Green Ext Time (p_c), s	0.0	9.5		1.8	0.1	14.3		0.2				
Intersection Summary												
HCM 6th Ctrl Delay				18.3								
HCM 6th LOS				B								

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS

Future + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	1254	14	16	1156	60	15	2	17	93	12	114
Future Volume (vph)	80	1254	14	16	1156	60	15	2	17	93	12	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	90		0	95		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.993			0.932			0.930	
Flt Protected	0.950			0.950				0.978			0.979	
Satd. Flow (prot)	1770	3532	0	1770	3514	0	0	1698	0	0	1696	0
Flt Permitted	0.950			0.950				0.852			0.848	
Satd. Flow (perm)	1770	3532	0	1770	3514	0	0	1479	0	0	1469	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			6			18			56	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2665			1360			926			1728	
Travel Time (s)		40.4			20.6			25.3			47.1	
Peak Hour Factor	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	1363	15	17	1257	65	16	2	18	101	13	124
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	1378	0	17	1322	0	0	36	0	0	238	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	32.5		11.5	25.5		11.5	11.5		31.5	31.5	
Total Split (s)	18.0	52.0		12.0	46.0		36.0	36.0		36.0	36.0	
Total Split (%)	18.0%	52.0%		12.0%	46.0%		36.0%	36.0%		36.0%	36.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	
Act Effct Green (s)	10.6	53.7		6.5	44.9			30.5			30.5	
Actuated g/C Ratio	0.11	0.54		0.06	0.45			0.30			0.30	
v/c Ratio	0.46	0.73		0.15	0.84			0.08			0.49	
Control Delay	49.7	21.6		50.1	19.8			16.0			25.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	49.7	21.6		50.1	19.8			16.0			25.4	
LOS	D	C		D	B			B			C	
Approach Delay		23.3			20.2			16.0			25.4	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	53	293		11	184			8			93	
Queue Length 95th (ft)	100	490		m16	m196			31			168	

Lanes, Volumes, Timings
6: NW Commerce Dr & Chipman Rd

Tudor Rd Multi-Family TIS
Future + Site + Planned PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		2585			1280			846			1648	
Turn Bay Length (ft)	90			95								
Base Capacity (vph)	221	1896		115	1582			463			486	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.39	0.73		0.15	0.84			0.08			0.49	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 71 (71%), Referenced to phase 2:EBT and 6:WBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 22.0

Intersection LOS: C

Intersection Capacity Utilization 69.9%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: NW Commerce Dr & Chipman Rd



Intersection

Int Delay, s/veh 1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	9	90	15	14	85
Future Vol, veh/h	10	9	90	15	14	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	11	106	18	16	100

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	247	115	0
Stage 1	115	-	-
Stage 2	132	-	-
Critical Hdwy	6.42	6.22	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	-
Pot Cap-1 Maneuver	741	937	-
Stage 1	910	-	-
Stage 2	894	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	732	937	-
Mov Cap-2 Maneuver	732	-	-
Stage 1	910	-	-
Stage 2	883	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	1.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	817	1463
HCM Lane V/C Ratio	-	-	0.027	0.011
HCM Control Delay (s)	-	-	9.5	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0



Signal Warrants

TUDOR RD & SLOAN/MAIN STREET

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Scenario	Major Vol	Minor Vol
AM EX+SITE (1)	502	48
PM EX+SITE (2)	702	99
AM EX+SITE+PLANNED (3)	683	93
PM EX+SITE+PLANNED (4)	748	284
AM FUT+SITE+PLANNED (5)	879	93
PM FUT+SITE+PLANNED (6)	1096	284