

Memo

TO: Darrel DeHaan – Integrated Architecture

FROM: Jill Bauer, PE, PTOE and Alyssa Wambold, PE, PTOE

DATE: November 9, 2022 **PROJECT NO.:** 221757

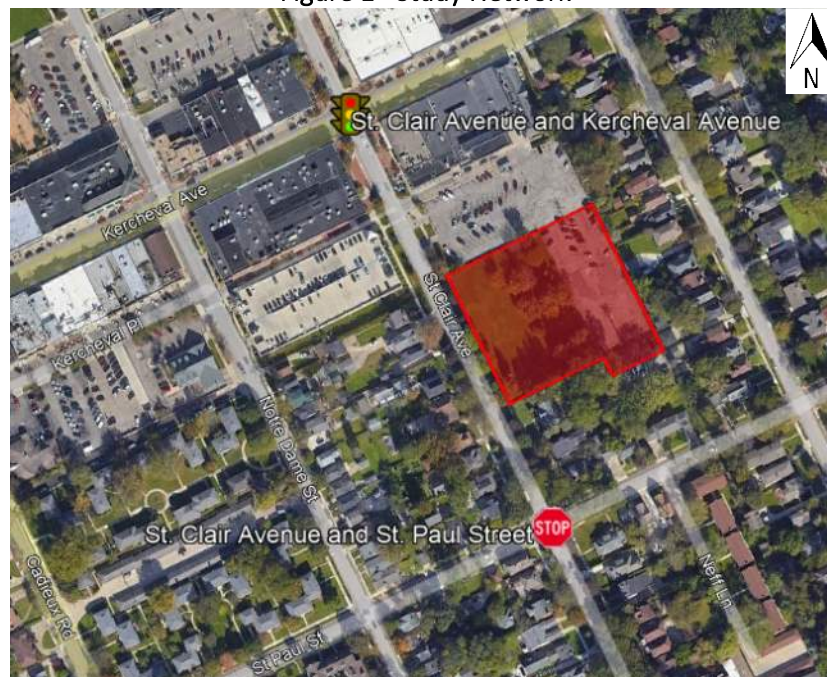
RE: City Center Apartments – Traffic Impact Study
City of Grosse Pointe, Michigan

Introduction

Project Overview

Fishbeck has completed a traffic impact study (TIS) for the proposed City Center Apartments located on St. Clair Avenue, south of Kercheval Avenue, in the City of Grosse Pointe, Wayne County, Michigan. The proposed development would consist of one four-story building, with 81 dwelling units (DU) and 2,825 square feet (SF) of commercial space. The proposed development will have access to St. Clair Avenue via three existing driveways and one proposed driveway, for a total of four driveways. Two of the driveways will allow inbound traffic only, one driveway will allow outbound traffic only, and the final driveway would allow inbound and outbound traffic. The development will be completed in one phase, assumed to be open and fully operational in 2024. The project location and study intersections are indicated in Figure 1 –Study Network.

Figure 1 –Study Network



Study Methodology

The objectives of this TIS were to determine what impacts, if any, the proposed project will have on adjacent roadway traffic operations. Study analyses were completed relative to typical weekday a.m. and p.m. peak periods. This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), the Michigan Department of Transportation (MDOT), and the City of Grosse Pointe.

Based on the type and size of the proposed development and the likely area of influence for the site trips, traffic operations were analyzed for the following intersections:

1. St. Clair Avenue and Kercheval Avenue (signalized).
2. St. Clair Avenue and St. Pail Street (unsignalized).

Existing Traffic Volumes

Vehicular TMCs were collected at the two study intersections listed above during the weekday a.m. (7 to 9 a.m.) and p.m. (4 to 6 p.m.) peak periods of the road network on Wednesday, November 2, 2022. Historical traffic data published on the Southeast Michigan Council of Governments (SEMCOG) Traffic Count Database System (TCDS) was reviewed to determine if there was an impact on the current traffic volume data due to COVID-19. Based on this review, there was no compelling evidence to apply an adjustment factor to the collected TMCS to account for the impact of COVID-19. Traffic volume information is attached to this memo.

Existing Conditions Analysis

Traffic Operations Analysis Methodology

Synchro was used to perform Highway Capacity Manual (HCM) operational analyses during the a.m. and p.m. peak hours for all intersections within this study. According to the most recent editions of the HCM, LOS is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D is generally considered acceptable for most areas. Table 1 – LOS Criteria presents the HCM criteria for various LOS for unsignalized and signalized intersections. The color coding in the table is used in the capacity analysis summary tables later in this report.

Table 1 – LOS Criteria

LOS	Average Stopped Vehicle Delay (seconds)	
	Unsignalized	Signalized
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

Existing Conditions Traffic Analysis

Synchro models for the existing network were created based on the existing roadway configurations and traffic controls. Where applicable, data concerning the existing intersection and roadway lane configurations, geometry, and traffic control that were observed in the field were entered in the models. The traffic signal timing permit for the signalized intersection was provided by the Wayne County Department of Public Services (WCDPS).

The resulting LOS and delay for the existing conditions are indicated in Table 2 – LOS Analysis for Existing Conditions.

Table 2 – LOS Analysis for Existing Conditions

Approach/Lane Group	LOS/Delay(s)			
	a.m. Peak Hour		p.m. Peak Hour	
St. Clair Avenue and Kercheval Avenue (Signalized)				
EB Kercheval Avenue	A	9.2	B	10.3
WB Kercheval Avenue	A	9.7	B	10.2
NB St. Clair Avenue	B	16.2	B	17.3
SB St. Clair Avenue	B	17.4	B	17.3
Overall	B	12.3	B	12.8
St. Clair Avenue and St. Paul Street (Stop-Controlled)				
EB St. Paul Street	A	0.7	A	1.4
WB St. Paul Street	A	0.0	A	0.3
NB St. Clair Avenue	B	13.9	B	12.4
SB St. Clair Avenue	B	13.2	B	12.2
Overall	A	4.7	A	6.8

Further analysis of the LOS results for existing conditions revealed that all movements, approaches, and intersections operate at a LOS A or B during the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For existing conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue length at the intersection of St. Clair Avenue and Kercheval Avenue exceeded 100' (four vehicles) and 114' (four-five vehicles) in the a.m. and p.m. peak hours, respectively. At the intersection of St. Clair Avenue and St. Paul Street, no 95th percentile queue length exceeded 54' (two vehicles) and 63' (two-three vehicles) in the a.m. and p.m. peak hours, respectively. The existing conditions LOS reports and queueing analysis reports are attached to this memo.

Background Conditions Analysis

Historical traffic data on the SEMCOG website was referenced in order to determine the applicable growth rate for the existing traffic volumes to the project build-out year in 2024. Based on this review, a background growth rate of 0.5% was utilized.

Background Conditions Traffic Analysis

The resulting LOS and delay for the background conditions are indicated in Table 3 – LOS Analysis for Background Conditions.

Table 3 – LOS Analysis for Background Conditions

Approach/Lane Group	LOS/Delay(s)	
	a.m. Peak Hour	p.m. Peak Hour
St. Clair Avenue and Kercheval Avenue (Signalized)		
EB Kercheval Avenue	A 9.2	B 10.3
WB Kercheval Avenue	A 9.7	B 10.2
NB St. Clair Avenue	B 16.2	B 17.3
SB St. Clair Avenue	B 17.4	B 17.3
Overall	B 12.3	B 12.8
St. Clair Avenue and St. Paul Street (Stop-Controlled)		
EB St. Paul Street	A 0.7	A 1.4
WB St. Paul Street	A 0.0	A 0.3
NB St. Clair Avenue	B 14.0	B 12.5
SB St. Clair Avenue	B 13.3	B 12.3
Overall	A 4.7	A 6.8

Further analysis of the LOS results for background conditions revealed that all movements, approaches, and intersections will continue to operate at an LOS A or B during both the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For background conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue length at the intersection of St. Clair Avenue and Kercheval Avenue exceeded 98' (four vehicles) and 112' (four-five vehicles) in the a.m. and p.m. peak hours, respectively. At the intersection of St. Clair Avenue and St. Paul Street, no 95th percentile queue length exceeded 55' (two vehicles) and 62' (two-three vehicles) in the a.m. and p.m. peak hours, respectively. The background conditions LOS reports and queuing analysis reports are attached to this memo.

Site Traffic Characteristics

A representation of the current conceptual site plan is provided in Figure 2 – Conceptual Site Plan below.

Figure 2 – Conceptual Site Plan



Trip Generation

Using the information and methodologies specified in the latest version of Trip Generation, Fishbeck forecast the weekday a.m. and p.m. peak hour trips associated with the proposed development. The type of tenant for the commercial space had not been determined at the time of this analysis but will likely be a café or specialty retail location. Review of several potential land uses including Land Use Code (LUC) 851 – Convenience Store, LUC 930 – Fast Casual Restaurant, LUC 931 – Fine Dining Restaurant, LUC 932 – High-Turnover (Sit-Down) Restaurant, and LUC 933 – Fast-Food Restaurant without Drive-Through revealed that (LUC 932 – High-Turnover (Sit-Down) Restaurant generates the highest number of a.m. peak hour trips, and a similar number of p.m. peak hour trips of the different land uses that were reviewed. Table 4 – Trip Generation for Proposed Development presents the resulting trip generation for the development.

Table 4 – Trip Generation for Proposed Development

ITE Land Use	LUC	Units	a.m. Peak Hour			p.m. Peak Hour			Weekday
			In	Out	Total	In	Out	Total	
Multifamily Housing (Mid-Rise)	221	81 DU	5	19	24	19	13	32	368
High-Turnover (Sit-Down) Restaurant	932	2,825 SF	15	12	27	16	10	26	303
Total			20	31	51	35	23	58	671

Trip Distribution

The directions that site traffic will travel to and from were based upon existing traffic patterns during the a.m. and p.m. peak hours. The existing traffic patterns reflect the gravity between origins and destinations in the study area, and therefore an accurate indication of where the proposed trips would be coming from and going to.

Table 5 – Trip Distribution provides the probable distribution based on the existing traffic patterns.

Table 5 – Trip Distribution

Direction	Via	a.m. Peak Hour		p.m. Peak Hour	
		To	From	To	From
North	St. Clair Avenue	12%	14%	18%	16%
South	St. Clair Avenue	6%	9%	9%	9%
East	Kercheval Avenue	22%	25%	24%	26%
	St. Paul Street	19%	13%	13%	8%
West	Kercheval Avenue	26%	21%	25%	28%
	St. Paul Street	15%	18%	11%	13%

Future Conditions Analysis

Future Conditions Traffic Analysis

The resulting LOS and delay for the future conditions are shown in Table 6 – LOS Analysis for Future Conditions.

Table 6 – LOS Analysis for Background Conditions

Approach/Lane Group	LOS/Delay(s)			
	a.m. Peak Hour		p.m. Peak Hour	
St. Clair Avenue and Kercheval Avenue (Signalized)				
EB Kercheval Avenue	A	9.2	B	10.5
WB Kercheval Avenue	A	9.7	B	10.4
NB St. Clair Avenue	B	16.6	B	17.7
SB St. Clair Avenue	B	17.5	B	17.4
Overall	B	12.5	B	13.1
St. Clair Avenue and St. Paul Street (Stop-Controlled)				
EB St. Paul Street	A	0.9	A	1.6
WB St. Paul Street	A	0.0	A	0.3
NB St. Clair Avenue	B	14.4	B	12.8
SB St. Clair Avenue	B	14.0	B	12.6
Overall	A	5.2	A	7.0

Further analysis of the LOS results for future conditions revealed that all movements, approaches, and intersections will continue to operate at an LOS A or B during both the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue length at the intersection of St. Clair Avenue and Kercheval Avenue exceeded 96’ (four vehicles) and 112’ (four-five vehicles) in the a.m. and p.m. peak hours, respectively. At the intersection of St. Clair Avenue and St. Paul Street, no 95th percentile queue length exceeded 59’ (two vehicles) and 60’ (two-three vehicles) in the a.m. and p.m. peak hours, respectively. The future conditions LOS reports and queueing analysis reports are attached to this memo.

Findings and Recommendations

The analyses conducted for this TIS indicate the proposed development will not result in any significant impact to the adjacent road network.

Based on the findings of the HCM operational analyses and site traffic generation, no improvements are required to mitigate traffic impacts.

Attachments: Traffic Volume Data
 LOS Output Reports

By email

Attachment 1

Traffic Volume Data

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#1 - St. Clair Avenue and Kercheval Avenue	AM Peak 11/02/22		PHF	0.89			0.77			0.82			0.67		
			% Heavy	2%			3%			1%			2%		
	2022	Existing	17	137	23	29	156	22	14	60	15	19	64	34	
	2022	Existing Adj.	17	137	23	29	156	22	14	60	15	19	64	34	
	2024	Background	17	138	23	29	158	22	14	61	15	19	65	34	
		Bckgrd. Dev. A													
		Bckgrd. Dev. B													
		Bckgrd. Dev. C													
		Total Background	17	138	23	29	158	22	14	61	15	19	65	34	
		Site Generated			4	5			8	4	6		3		
		Pass By													
		Total Site Gen	0	0	4	5	0	0	8	4	6	0	3	0	
		Total Future	17	138	27	34	158	22	22	65	21	19	68	34	

Count Date: 11/2/2022
Count Year: 2022
Existing Adj. Year: 2022

Existing Adjustment Rate: 1.00
Growth Rate: 0.5%
Buildout Year: 2024
Scenario: AM Peak

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#2 - St. Clair Avenue and St. Paul Street	AM Peak 11/02/22		PHF	0.60			0.60			0.70			0.61		
			% Heavy	1%			0%			0%			0%		
	2022	Existing	14	134	8	0	102	5	2	66	8	8	38	17	
	2022	Existing Adj.	14	134	8	0	102	5	2	66	8	8	38	17	
	2024	Background	14	135	8	0	103	5	2	67	8	8	38	17	
		Bckgrd. Dev. A													
		Bckgrd. Dev. B													
		Bckgrd. Dev. C													
		Total Background	14	135	8	0	103	5	2	67	8	8	38	17	
		Site Generated	4					2		2		6	2	5	
		Pass By													
		Total Site Gen	4	0	0	0	0	2	0	2	0	6	2	5	
		Total Future	18	135	8	0	103	7	2	69	8	14	40	22	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
#1 - St. Clair Avenue and Kercheval Avenue	PM Peak 11/02/22		PHF	0.85			0.86			0.91			0.92			
			% Heavy	0%			1%			1%			0%			
		2022	Existing	37	171	63	58	161	40	34	92	31	25	99	38	
		2022	Existing Adj.	37	171	63	58	161	40	34	92	31	25	99	38	
		2024	Background	37	173	64	59	163	40	34	93	31	25	100	38	
			Bckgrd. Dev. A													
			Bckgrd. Dev. B													
			Bckgrd. Dev. C													
			Total Background		37	173	64	59	163	40	34	93	31	25	100	38
			Site Generated				10	9			6	4	6		6	
			Pass By													
			Total Site Gen		0	0	10	9	0	0	6	4	6	0	6	0
			Total Future		37	173	74	68	163	40	40	97	37	25	106	38

Count Date: 11/2/2022
Count Year: 2022
Existing Adj. Year: 2022

Existing Adjustment Rate: 1.00
Growth Rate: 0.5%
Buildout Year: 2024
Scenario: PM Peak

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
#2 - St. Clair Avenue and St. Paul Street	PM Peak 11/02/22		PHF	0.79			0.79			0.71			0.86			
			% Heavy	0%			0%			0%			1%			
		2022	Existing	24	96	7	3	63	16	5	79	4	21	77	33	
		2022	Existing Adj.	24	96	7	3	63	16	5	79	4	21	77	33	
		2024	Background	24	97	7	3	64	16	5	80	4	21	78	33	
			Bckgrd. Dev. A													
			Bckgrd. Dev. B													
			Bckgrd. Dev. C													
			Total Background		24	97	7	3	64	16	5	80	4	21	78	33
			Site Generated		4					3		3		3	2	2
			Pass By													
			Total Site Gen		4	0	0	0	0	3	0	3	0	3	2	2
			Total Future		28	97	7	3	64	19	5	83	4	24	80	35

Kercheval Ave & St Clair Ave - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1008920, Location: 42.390341, -82.915652, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

Leg Direction	West Leg Eastbound					East Leg Westbound					South Leg Northbound					North Leg Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-11-02 7:00AM	3	12	5	0	20	0	17	2	0	19	4	4	1	0	9	5	5	11	0	21	69
7:15AM	0	17	0	0	17	2	22	5	0	29	1	5	1	0	7	1	3	2	0	6	59
7:30AM	0	30	4	0	34	1	18	4	0	23	4	6	2	0	12	4	8	5	0	17	86
7:45AM	3	42	5	0	50	7	53	7	0	67	4	9	1	0	14	6	11	3	0	20	151
Hourly Total	6	101	14	0	121	10	110	18	0	138	13	24	5	0	42	16	27	21	0	64	365
8:00AM	7	35	4	0	46	3	35	3	0	41	4	15	4	0	23	3	13	10	0	26	136
8:15AM	7	24	5	0	36	8	37	5	0	50	3	13	9	0	25	5	24	15	0	44	155
8:30AM	0	36	9	0	45	11	31	7	0	49	3	23	1	0	27	5	16	6	0	27	148
8:45AM	4	22	9	0	35	4	26	10	0	40	4	18	5	0	27	5	19	7	0	31	133
Hourly Total	18	117	27	0	162	26	129	25	0	180	14	69	19	0	102	18	72	38	0	128	572
4:00PM	12	54	8	0	74	13	44	6	0	63	9	30	7	0	46	7	32	5	0	44	227
4:15PM	5	51	10	0	66	14	39	8	0	61	9	20	5	0	34	7	21	9	0	37	198
4:30PM	8	43	18	0	69	12	38	12	0	62	4	21	10	0	35	9	25	6	0	40	206
4:45PM	7	50	11	0	68	11	29	7	0	47	8	20	4	0	32	4	22	9	0	35	182
Hourly Total	32	198	47	0	277	50	150	33	0	233	30	91	26	0	147	27	100	29	0	156	813
5:00PM	9	45	14	0	68	18	33	6	1	58	15	19	9	0	43	7	21	10	0	38	207
5:15PM	8	40	19	0	67	14	51	10	0	75	7	20	9	0	36	5	23	10	0	38	216
5:30PM	13	48	19	0	80	8	37	16	0	61	4	30	4	0	38	8	28	8	0	44	223
5:45PM	7	38	11	0	56	17	40	8	0	65	8	23	9	0	40	5	27	10	0	42	203
Hourly Total	37	171	63	0	271	57	161	40	1	259	34	92	31	0	157	25	99	38	0	162	849
Total	93	587	151	0	831	143	550	116	1	810	91	276	81	0	448	86	298	126	0	510	2599
% Approach	11.2%	70.6%	18.2%	0%	-	17.7%	67.9%	14.3%	0.1%	-	20.3%	61.6%	18.1%	0%	-	16.9%	58.4%	24.7%	0%	-	-
% Total	3.6%	22.6%	5.8%	0%	32.0%	5.5%	21.2%	4.5%	0%	31.2%	3.5%	10.6%	3.1%	0%	17.2%	3.3%	11.5%	4.8%	0%	19.6%	-
Lights and Motorcycles	91	579	151	0	821	143	540	115	1	799	90	273	80	0	443	86	296	122	0	504	2567
% Lights and Motorcycles	97.8%	98.6%	100%	0%	98.8%	100%	98.2%	99.1%	100%	98.6%	98.9%	98.9%	98.8%	0%	98.9%	100%	99.3%	96.8%	0%	98.8%	98.8%
Heavy	2	8	0	0	10	0	10	1	0	11	1	3	1	0	5	0	2	4	0	6	32
% Heavy	2.2%	1.4%	0%	0%	1.2%	0%	1.8%	0.9%	0%	1.4%	1.1%	1.1%	1.2%	0%	1.1%	0%	0.7%	3.2%	0%	1.2%	1.2%

* L: Left, R: Right, T: Thru, U: U-Turn

Kercheval Ave & St Clair Ave - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

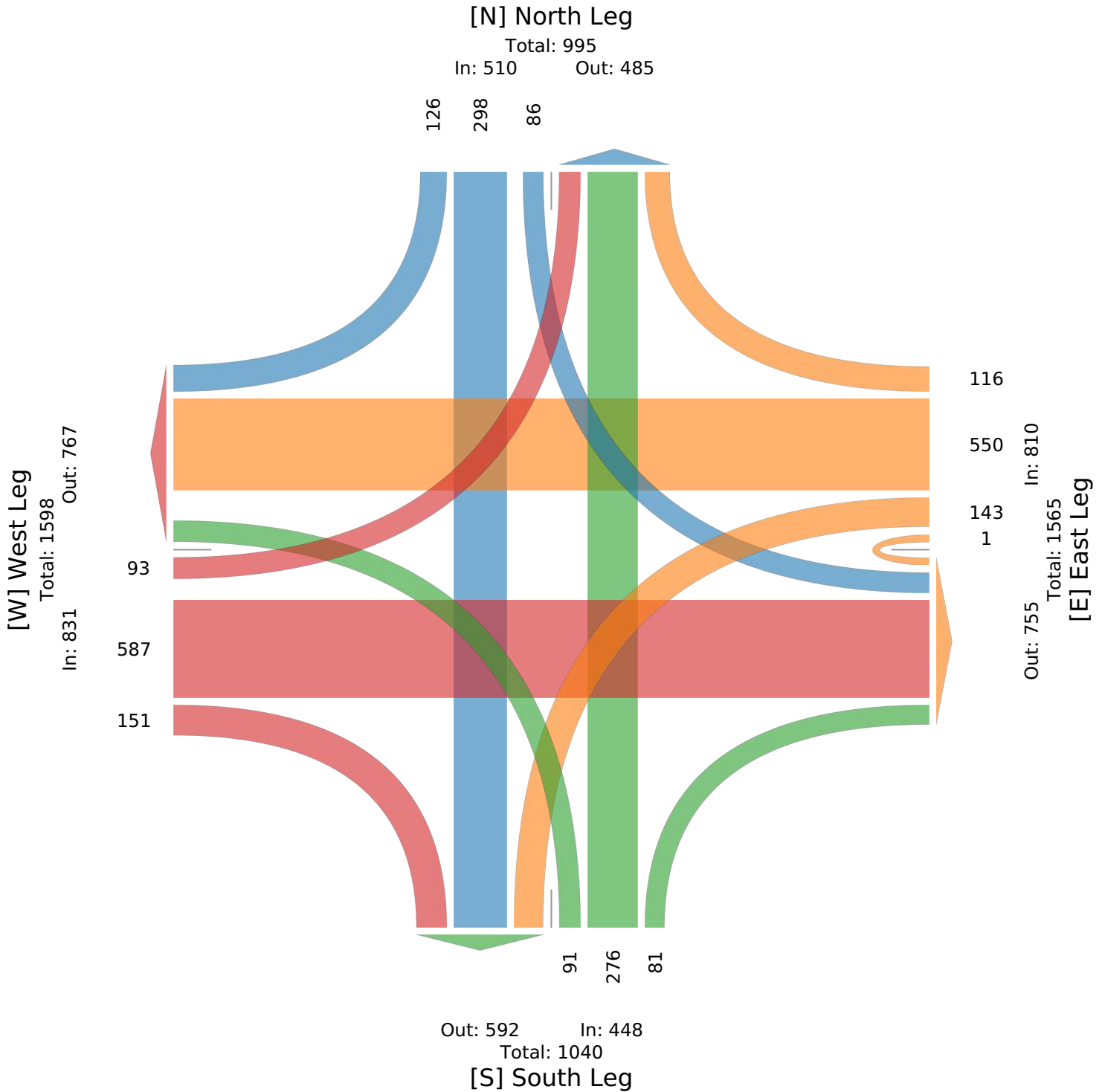
All Movements

ID: 1008920, Location: 42.390341, -82.915652, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US



Kercheval Ave & St Clair Ave - TMC

Wed Nov 2, 2022

AM Peak (7:45 AM - 8:45 AM)

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1008920, Location: 42.390341, -82.915652, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

Leg Direction	West Leg Eastbound					East Leg Westbound					South Leg Northbound					North Leg Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-11-02 7:45AM	3	42	5	0	50	7	53	7	0	67	4	9	1	0	14	6	11	3	0	20	151
8:00AM	7	35	4	0	46	3	35	3	0	41	4	15	4	0	23	3	13	10	0	26	136
8:15AM	7	24	5	0	36	8	37	5	0	50	3	13	9	0	25	5	24	15	0	44	155
8:30AM	0	36	9	0	45	11	31	7	0	49	3	23	1	0	27	5	16	6	0	27	148
Total	17	137	23	0	177	29	156	22	0	207	14	60	15	0	89	19	64	34	0	117	590
% Approach	9.6%	77.4%	13.0%	0%	-	14.0%	75.4%	10.6%	0%	-	15.7%	67.4%	16.9%	0%	-	16.2%	54.7%	29.1%	0%	-	-
% Total	2.9%	23.2%	3.9%	0%	30.0%	4.9%	26.4%	3.7%	0%	35.1%	2.4%	10.2%	2.5%	0%	15.1%	3.2%	10.8%	5.8%	0%	19.8%	-
PHF	0.607	0.815	0.639	-	0.885	0.659	0.736	0.786	-	0.772	0.875	0.652	0.417	-	0.824	0.792	0.667	0.567	-	0.665	0.952
Lights and Motorcycles	17	133	23	0	173	29	150	21	0	200	13	60	15	0	88	19	63	33	0	115	576
% Lights and Motorcycles	100%	97.1%	100%	0%	97.7%	100%	96.2%	95.5%	0%	96.6%	92.9%	100%	100%	0%	98.9%	100%	98.4%	97.1%	0%	98.3%	97.6%
Heavy	0	4	0	0	4	0	6	1	0	7	1	0	0	0	1	0	1	1	0	2	14
% Heavy	0%	2.9%	0%	0%	2.3%	0%	3.8%	4.5%	0%	3.4%	7.1%	0%	0%	0%	1.1%	0%	1.6%	2.9%	0%	1.7%	2.4%

*L: Left, R: Right, T: Thru, U: U-Turn

Kercheval Ave & St Clair Ave - TMC

Wed Nov 2, 2022

AM Peak (7:45 AM - 8:45 AM)

All Classes (Lights and Motorcycles, Heavy)

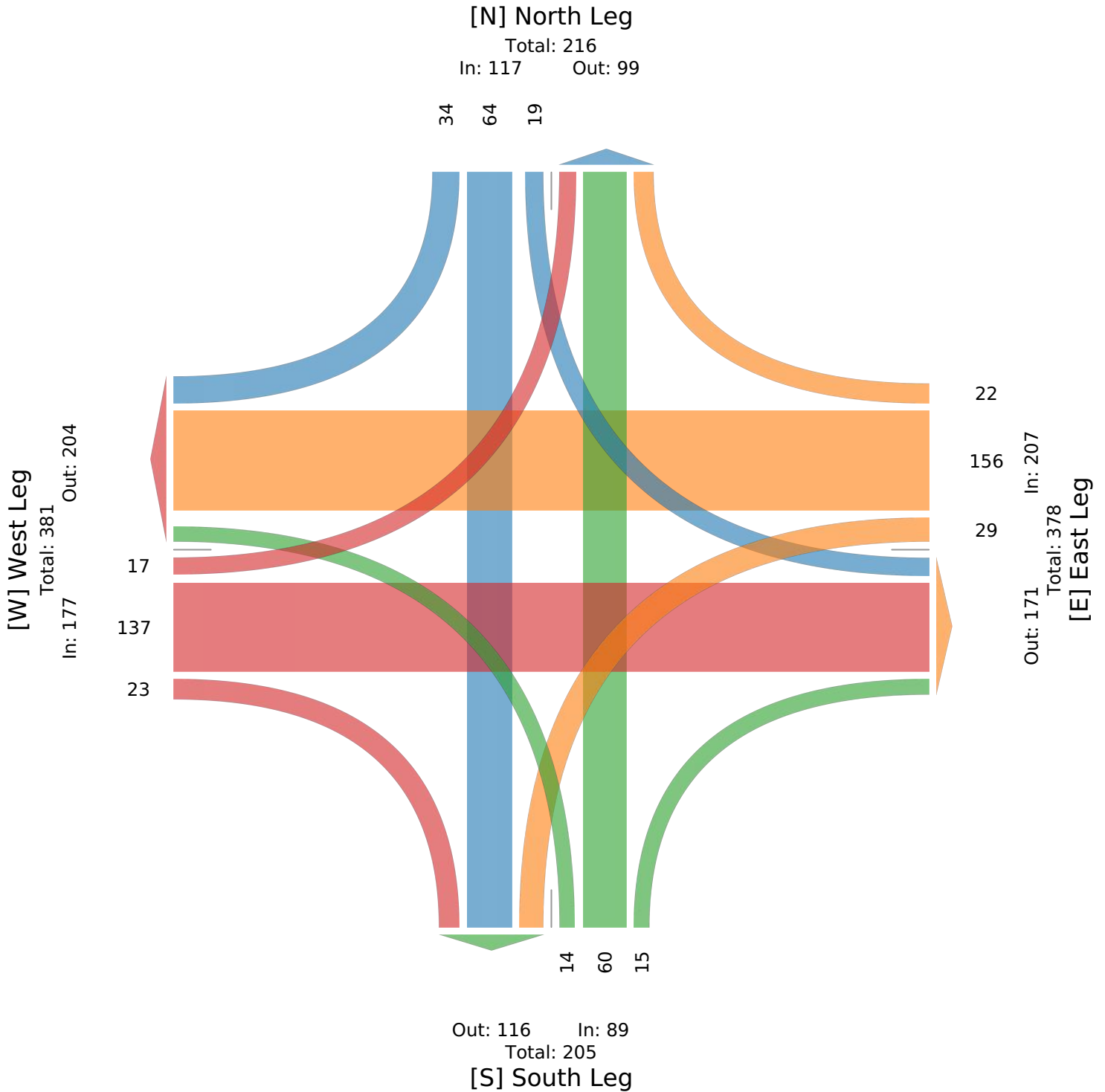
All Movements

ID: 1008920, Location: 42.390341, -82.915652, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US



Kercheval Ave & St Clair Ave - TMC

Wed Nov 2, 2022

PM Peak (5 PM - 6 PM) - Overall Peak Hour

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1008920, Location: 42.390341, -82.915652, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

Leg Direction	West Leg Eastbound					East Leg Westbound					South Leg Northbound					North Leg Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-11-02 5:00PM	9	45	14	0	68	18	33	6	1	58	15	19	9	0	43	7	21	10	0	38	207
5:15PM	8	40	19	0	67	14	51	10	0	75	7	20	9	0	36	5	23	10	0	38	216
5:30PM	13	48	19	0	80	8	37	16	0	61	4	30	4	0	38	8	28	8	0	44	223
5:45PM	7	38	11	0	56	17	40	8	0	65	8	23	9	0	40	5	27	10	0	42	203
Total	37	171	63	0	271	57	161	40	1	259	34	92	31	0	157	25	99	38	0	162	849
% Approach	13.7%	63.1%	23.2%	0%	-	22.0%	62.2%	15.4%	0.4%	-	21.7%	58.6%	19.7%	0%	-	15.4%	61.1%	23.5%	0%	-	-
% Total	4.4%	20.1%	7.4%	0%	31.9%	6.7%	19.0%	4.7%	0.1%	30.5%	4.0%	10.8%	3.7%	0%	18.5%	2.9%	11.7%	4.5%	0%	19.1%	-
PHF	0.712	0.891	0.829	-	0.847	0.792	0.789	0.625	0.250	0.863	0.567	0.767	0.861	-	0.913	0.781	0.884	0.950	-	0.920	0.952
Lights and Motorcycles	36	171	63	0	270	57	159	40	1	257	34	91	31	0	156	25	99	38	0	162	845
% Lights and Motorcycles	97.3%	100%	100%	0%	99.6%	100%	98.8%	100%	100%	99.2%	100%	98.9%	100%	0%	99.4%	100%	100%	100%	0%	100%	99.5%
Heavy	1	0	0	0	1	0	2	0	0	2	0	1	0	0	1	0	0	0	0	0	4
% Heavy	2.7%	0%	0%	0%	0.4%	0%	1.2%	0%	0%	0.8%	0%	1.1%	0%	0%	0.6%	0%	0%	0%	0%	0%	0.5%

*L: Left, R: Right, T: Thru, U: U-Turn

Kercheval Ave & St Clair Ave - TMC

Wed Nov 2, 2022

PM Peak (5 PM - 6 PM) - Overall Peak Hour

All Classes (Lights and Motorcycles, Heavy)

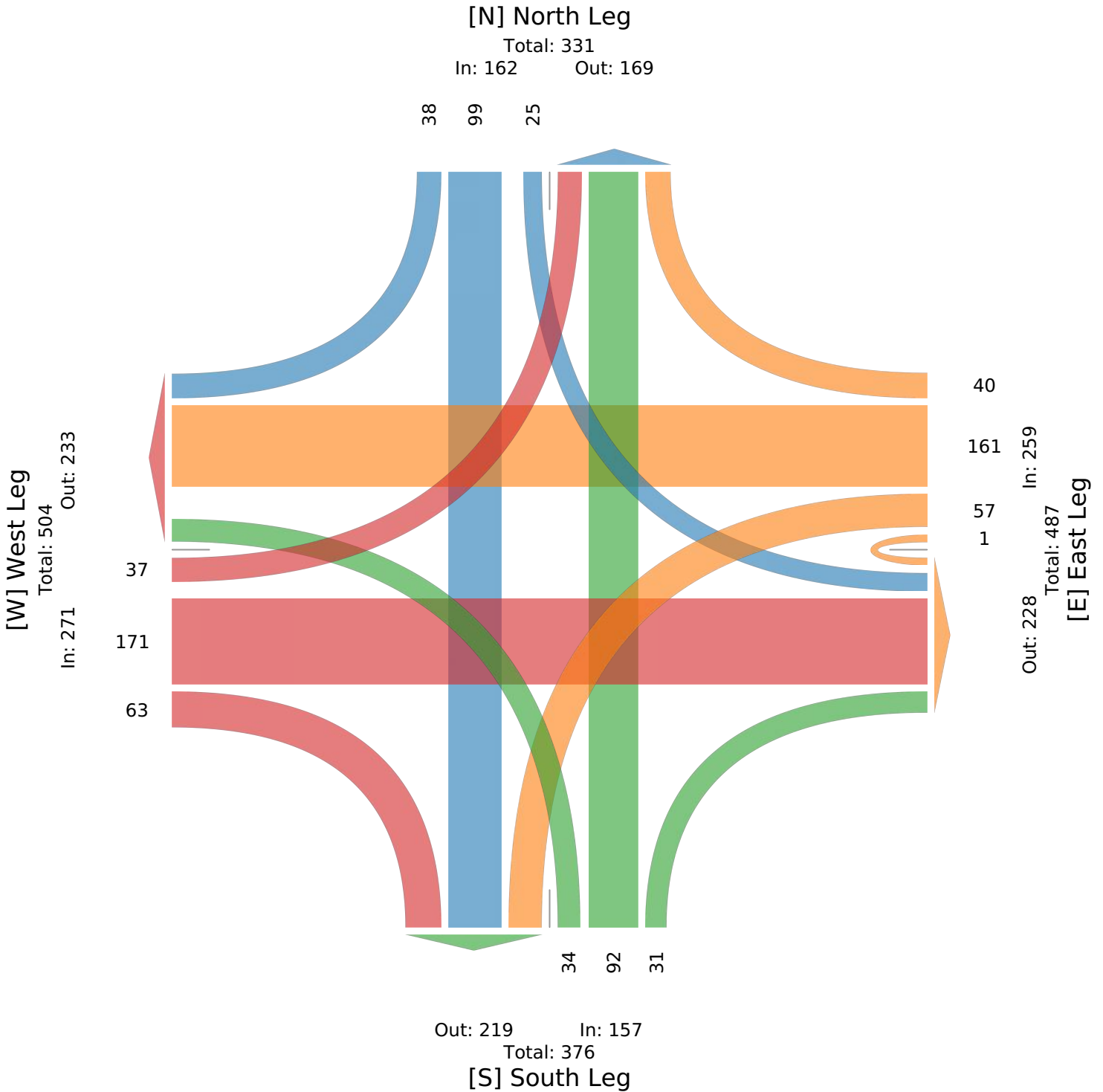
All Movements

ID: 1008920, Location: 42.390341, -82.915652, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US



St Clair Ave & St Paul St - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1008923, Location: 42.388196, -82.914226, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

Leg Direction	West Eastbound					East Leg Westbound					South Leg Northbound					North Leg Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-11-02 7:00AM	2	14	1	0	17	0	7	1	0	8	1	7	0	0	8	0	7	4	0	11	44
7:15AM	1	14	0	0	15	0	4	1	0	5	1	5	0	0	6	0	4	0	0	4	30
7:30AM	0	35	2	0	37	0	16	0	0	16	0	14	1	0	15	4	3	2	0	9	77
7:45AM	3	69	2	0	74	0	43	2	0	45	0	13	4	0	17	0	8	5	0	13	149
Hourly Total	6	132	5	0	143	0	70	4	0	74	2	39	5	0	46	4	22	11	0	37	300
8:00AM	5	23	3	0	31	0	33	2	0	35	0	17	0	0	17	1	9	5	0	15	98
8:15AM	6	7	1	0	14	0	10	1	0	11	2	22	3	0	27	3	18	5	0	26	78
8:30AM	5	13	0	0	18	1	6	1	0	8	1	22	0	0	23	3	8	1	0	12	61
8:45AM	3	17	1	0	21	1	9	4	0	14	1	23	0	0	24	2	12	8	0	22	81
Hourly Total	19	60	5	0	84	2	58	8	0	68	4	84	3	0	91	9	47	19	0	75	318
4:00PM	4	15	0	0	19	1	13	2	0	16	0	31	0	0	31	4	18	7	0	29	95
4:15PM	4	17	0	0	21	0	9	6	0	15	0	28	0	0	28	4	19	2	0	25	89
4:30PM	5	23	2	0	30	1	22	3	0	26	0	15	1	0	16	7	23	5	0	35	107
4:45PM	7	22	0	0	29	2	9	1	0	12	2	28	1	0	31	2	15	8	0	25	97
Hourly Total	20	77	2	0	99	4	53	12	0	69	2	102	2	0	106	17	75	22	0	114	388
5:00PM	6	30	4	0	40	0	13	5	0	18	1	25	1	0	27	6	21	6	0	33	118
5:15PM	6	21	1	0	28	0	19	7	0	26	2	11	1	0	14	5	18	14	1	38	106
5:30PM	6	9	2	0	17	0	8	15	0	23	0	26	0	0	26	4	18	11	0	33	99
5:45PM	6	15	1	0	22	0	12	1	0	13	0	22	1	0	23	3	23	5	0	31	89
Hourly Total	24	75	8	0	107	0	52	28	0	80	3	84	3	0	90	18	80	36	1	135	412
Total	69	344	20	0	433	6	233	52	0	291	11	309	13	0	333	48	224	88	1	361	1418
% Approach	15.9%	79.4%	4.6%	0%	-	2.1%	80.1%	17.9%	0%	-	3.3%	92.8%	3.9%	0%	-	13.3%	62.0%	24.4%	0.3%	-	-
% Total	4.9%	24.3%	1.4%	0%	30.5%	0.4%	16.4%	3.7%	0%	20.5%	0.8%	21.8%	0.9%	0%	23.5%	3.4%	15.8%	6.2%	0.1%	25.5%	-
Lights and Motorcycles	69	343	20	0	432	6	233	52	0	291	11	307	13	0	331	48	224	87	1	360	1414
% Lights and Motorcycles	100%	99.7%	100%	0%	99.8%	100%	100%	100%	0%	100%	100%	99.4%	100%	0%	99.4%	100%	100%	98.9%	100%	99.7%	99.7%
Heavy	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	4
% Heavy	0%	0.3%	0%	0%	0.2%	0%	0%	0%	0%	0%	0%	0.6%	0%	0%	0.6%	0%	0%	1.1%	0%	0.3%	0.3%

* L: Left, R: Right, T: Thru, U: U-Turn

St Clair Ave & St Paul St - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

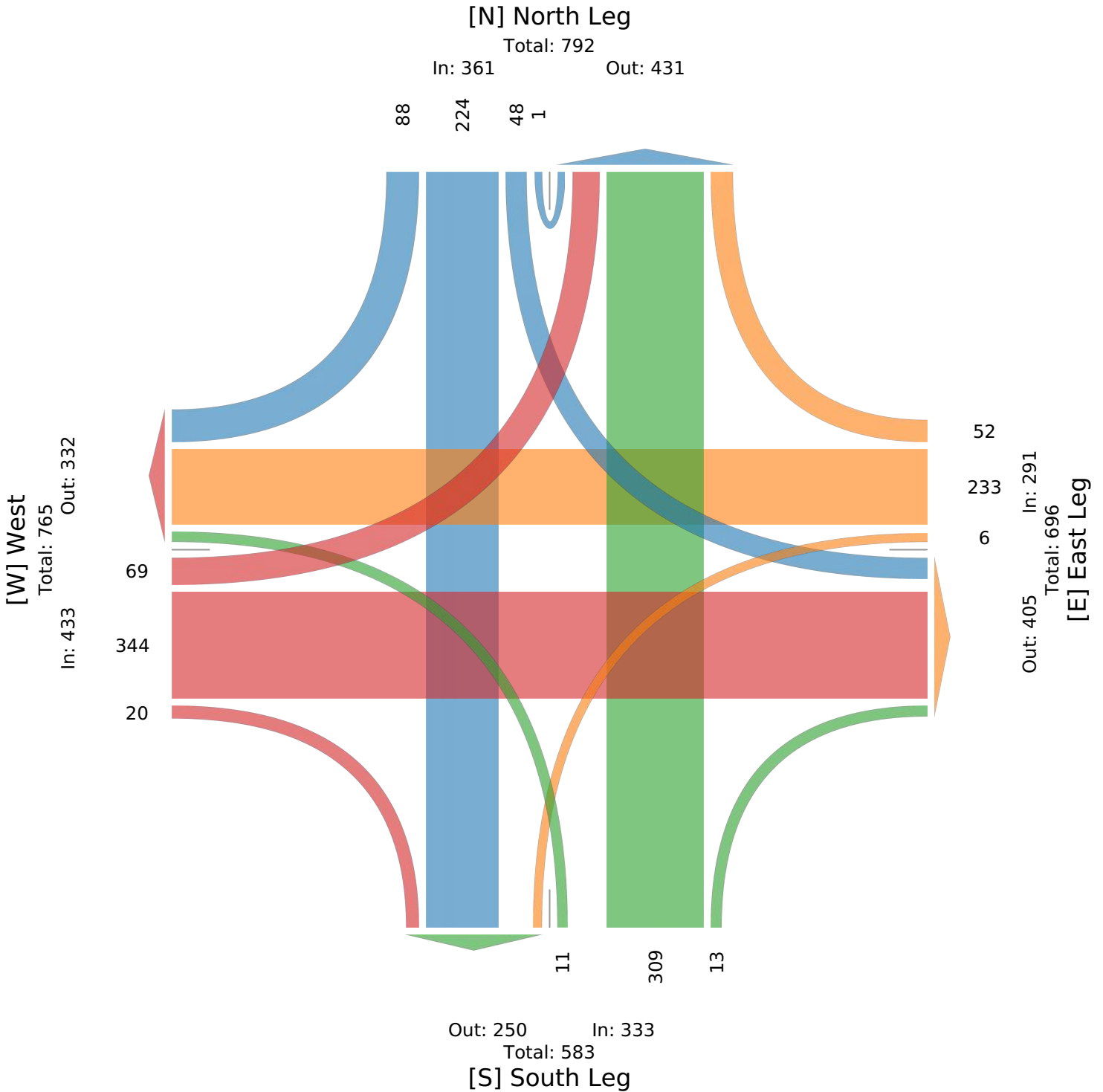
All Movements

ID: 1008923, Location: 42.388196, -82.914226, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US



St Clair Ave & St Paul St - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1008923, Location: 42.388196, -82.914226, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

Leg Direction	West Eastbound					East Leg Westbound					South Leg Northbound					North Leg Southbound						
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int	
2022-11-02 7:30AM	0	35	2	0	37	0	16	0	0	16	0	14	1	0	15	4	3	2	0	9	77	
7:45AM	3	69	2	0	74	0	43	2	0	45	0	13	4	0	17	0	8	5	0	13	149	
8:00AM	5	23	3	0	31	0	33	2	0	35	0	17	0	0	17	1	9	5	0	15	98	
8:15AM	6	7	1	0	14	0	10	1	0	11	2	22	3	0	27	3	18	5	0	26	78	
Total	14	134	8	0	156	0	102	5	0	107	2	66	8	0	76	8	38	17	0	63	402	
% Approach	9.0%	85.9%	5.1%	0%	-	0%	95.3%	4.7%	0%	-	2.6%	86.8%	10.5%	0%	-	12.7%	60.3%	27.0%	0%	-	-	
% Total	3.5%	33.3%	2.0%	0%	38.8%	0%	25.4%	1.2%	0%	26.6%	0.5%	16.4%	2.0%	0%	18.9%	2.0%	9.5%	4.2%	0%	15.7%	-	
PHF	0.583	0.486	0.667	-	0.527	-	0.593	0.625	-	0.594	0.250	0.750	0.500	-	0.704	0.500	0.528	0.850	-	0.606	0.674	
Lights and Motorcycles	14	133	8	0	155	0	102	5	0	107	2	66	8	0	76	8	38	17	0	63	401	
% Lights and Motorcycles	100%	99.3%	100%	0%	99.4%	0%	100%	100%	0%	100%	100%	100%	100%	0%	100%	100%	100%	100%	0%	100%	99.8%	
Heavy	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Heavy	0%	0.7%	0%	0%	0.6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.2%

*L: Left, R: Right, T: Thru, U: U-Turn

St Clair Ave & St Paul St - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1008923, Location: 42.388196, -82.914226, Site Code: 221757



Provided by: Fishbeck-Main Account

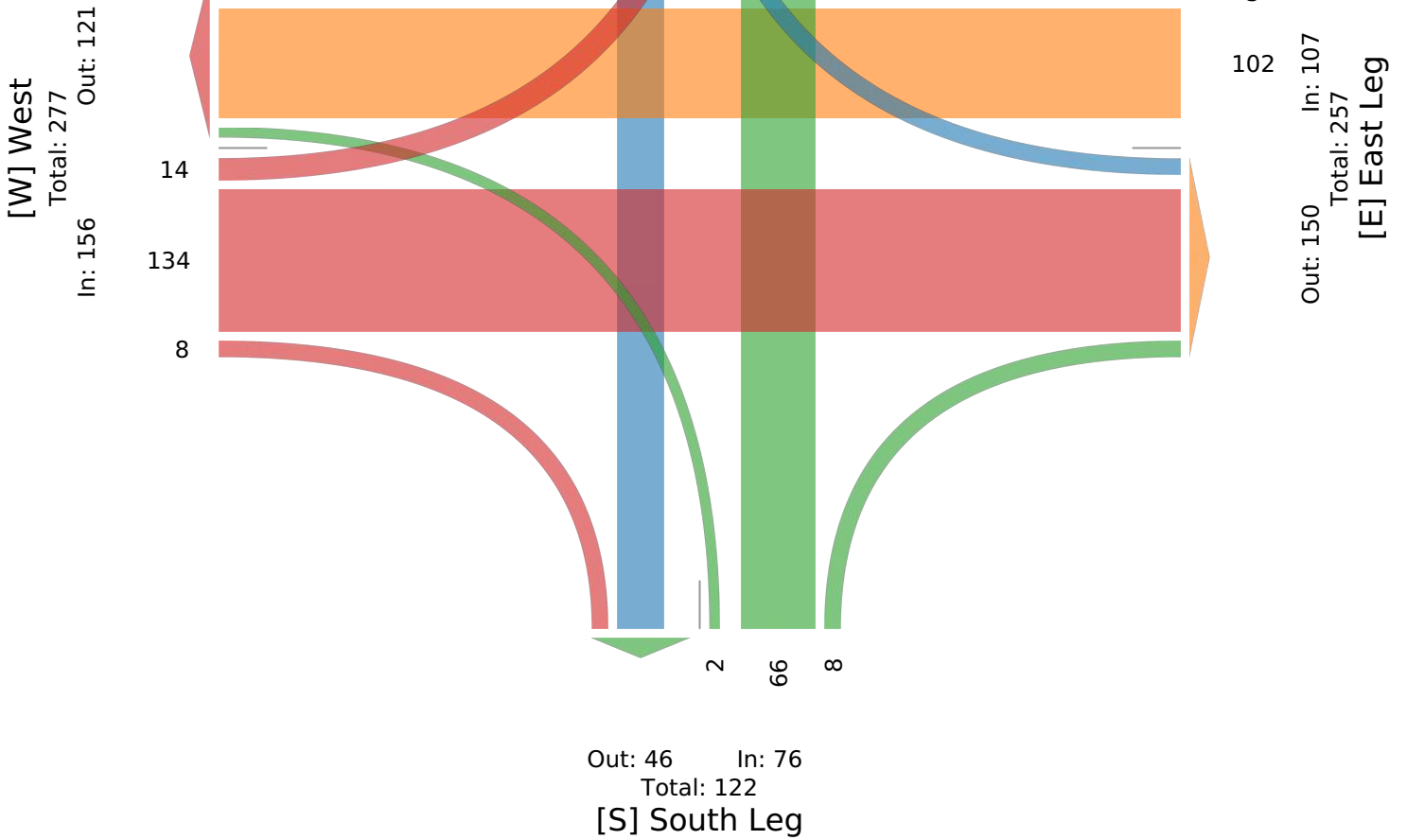
1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

[N] North Leg

Total: 148

In: 63 Out: 85

17 38 8



St Clair Ave & St Paul St - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1008923, Location: 42.388196, -82.914226, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

Leg Direction	West Eastbound					East Leg Westbound					South Leg Northbound					North Leg Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-11-02 4:30PM	5	23	2	0	30	1	22	3	0	26	0	15	1	0	16	7	23	5	0	35	107
4:45PM	7	22	0	0	29	2	9	1	0	12	2	28	1	0	31	2	15	8	0	25	97
5:00PM	6	30	4	0	40	0	13	5	0	18	1	25	1	0	27	6	21	6	0	33	118
5:15PM	6	21	1	0	28	0	19	7	0	26	2	11	1	0	14	5	18	14	1	38	106
Total	24	96	7	0	127	3	63	16	0	82	5	79	4	0	88	20	77	33	1	131	428
% Approach	18.9%	75.6%	5.5%	0%	-	3.7%	76.8%	19.5%	0%	-	5.7%	89.8%	4.5%	0%	-	15.3%	58.8%	25.2%	0.8%	-	-
% Total	5.6%	22.4%	1.6%	0%	29.7%	0.7%	14.7%	3.7%	0%	19.2%	1.2%	18.5%	0.9%	0%	20.6%	4.7%	18.0%	7.7%	0.2%	30.6%	-
PHF	0.857	0.800	0.438	-	0.794	0.375	0.716	0.571	-	0.788	0.625	0.705	1.000	-	0.710	0.714	0.837	0.589	0.250	0.862	0.907
Lights and Motorcycles	24	96	7	0	127	3	63	16	0	82	5	79	4	0	88	20	77	32	1	130	427
% Lights and Motorcycles	100%	100%	100%	0%	100%	100%	100%	100%	0%	100%	100%	100%	100%	0%	100%	100%	100%	97.0%	100%	99.2%	99.8%
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
% Heavy	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.0%	0%	0.8%	0.2%

*L: Left, R: Right, T: Thru, U: U-Turn

St Clair Ave & St Paul St - TMC

Wed Nov 2, 2022

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

All Classes (Lights and Motorcycles, Heavy)

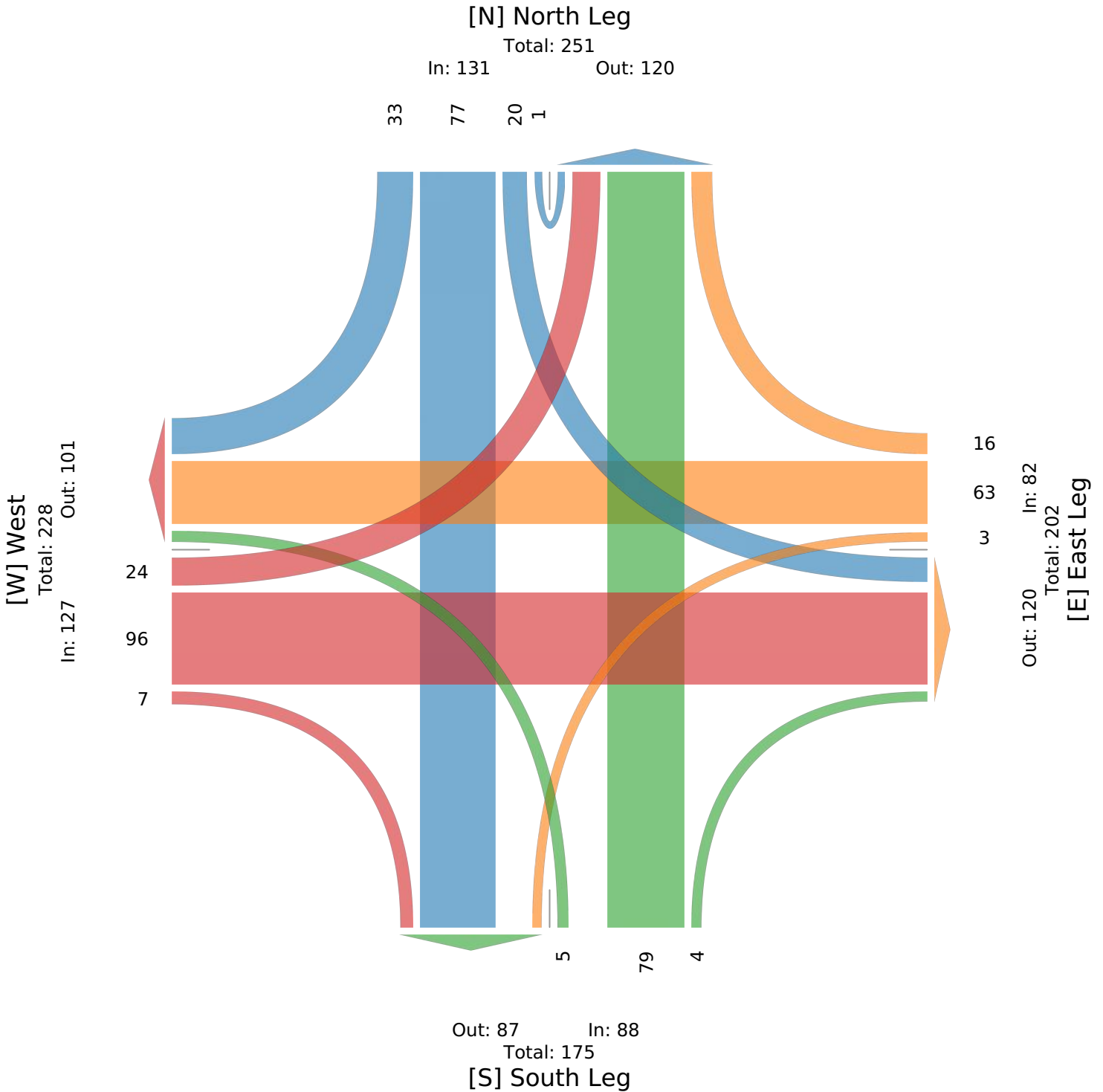
All Movements

ID: 1008923, Location: 42.388196, -82.914226, Site Code: 221757



Provided by: Fishbeck-Main Account

1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US



Attachment 2

LOS Output Reports

HCM 6th Signalized Intersection Summary

1: St. Clair Avenue & Kercheval Avenue

2022 Existing Conditions
a.m. Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	137	23	29	156	22	14	60	15	19	64	34
Future Volume (veh/h)	17	137	23	29	156	22	14	60	15	19	64	34
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	0.85	1.00	1.00	0.85	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	1969	1969	1969	1953	1953	1953	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	19	154	26	38	203	29	17	73	18	28	96	51
Peak Hour Factor	0.89	0.89	0.89	0.77	0.77	0.77	0.82	0.82	0.82	0.67	0.67	0.67
Percent Heavy Veh, %	2	2	2	3	3	3	1	1	1	2	2	2
Cap, veh/h	598	698	118	643	710	101	114	416	92	114	337	157
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1148	1395	236	1195	1421	203	148	1387	307	150	1125	524
Grp Volume(v), veh/h	19	0	180	38	0	232	108	0	0	175	0	0
Grp Sat Flow(s),veh/h/ln	1148	0	1631	1195	0	1624	1842	0	0	1798	0	0
Q Serve(g_s), s	0.6	0.0	3.7	1.1	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.6	0.0	3.7	4.8	0.0	5.0	2.5	0.0	0.0	4.3	0.0	0.0
Prop In Lane	1.00		0.14	1.00		0.13	0.16		0.17	0.16		0.29
Lane Grp Cap(c), veh/h	598	0	816	643	0	812	622	0	0	609	0	0
V/C Ratio(X)	0.03	0.00	0.22	0.06	0.00	0.29	0.17	0.00	0.00	0.29	0.00	0.00
Avail Cap(c_a), veh/h	598	0	816	643	0	812	622	0	0	609	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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.4	0.0	8.4	9.8	0.0	8.8	15.6	0.0	0.0	16.2	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.6	0.2	0.0	0.9	0.6	0.0	0.0	1.2	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	0.2	0.0	1.3	0.3	0.0	1.7	1.1	0.0	0.0	1.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.5	0.0	9.1	10.0	0.0	9.6	16.2	0.0	0.0	17.4	0.0	0.0
LnGrp LOS	B	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		199			270			108			175	
Approach Delay, s/veh		9.2			9.7			16.2			17.4	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		18.0		30.0		18.0		30.0				
Max Q Clear Time (g_c+I1), s		4.5		7.6		6.3		7.0				
Green Ext Time (p_c), s		0.4		1.1		0.7		1.5				

Intersection Summary

HCM 6th Ctrl Delay	12.3
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	14	134	8	0	102	5	2	66	8	8	38	17
Future Vol, veh/h	14	134	8	0	102	5	2	66	8	8	38	17
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	70	70	70	61	61	61
Heavy Vehicles, %	1	1	1	0	0	0	0	0	0	0	0	0
Mvmt Flow	23	223	13	0	170	8	3	94	11	13	62	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	178	0	0	236	0	0	495	454	230	502	456	174
Stage 1	-	-	-	-	-	-	276	276	-	174	174	-
Stage 2	-	-	-	-	-	-	219	178	-	328	282	-
Critical Hdwy	4.11	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1404	-	-	1343	-	-	488	505	814	483	504	875
Stage 1	-	-	-	-	-	-	735	685	-	833	759	-
Stage 2	-	-	-	-	-	-	788	756	-	689	681	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1404	-	-	1343	-	-	421	495	814	401	494	875
Mov Cap-2 Maneuver	-	-	-	-	-	-	421	495	-	401	494	-
Stage 1	-	-	-	-	-	-	721	672	-	817	759	-
Stage 2	-	-	-	-	-	-	700	756	-	573	668	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0			13.9			13.2		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	514	1404	-	-	1343	-	-	542
HCM Lane V/C Ratio	0.211	0.017	-	-	-	-	-	0.191
HCM Control Delay (s)	13.9	7.6	0	-	0	-	-	13.2
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.7

Intersection: 1: St. Clair Avenue & Kercheval Avenue

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	37	112	48	113	87	105
Average Queue (ft)	9	47	18	57	39	46
95th Queue (ft)	33	90	46	100	76	91
Link Distance (ft)		579		621	175	546
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		75			
Storage Blk Time (%)	0	2		3		
Queuing Penalty (veh)	0	0		1		

Intersection: 2: St. Clair Avenue & St. Paul Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	38	59	55
Average Queue (ft)	3	33	28
95th Queue (ft)	23	54	51
Link Distance (ft)	555	720	562
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 1

HCM 6th Signalized Intersection Summary
 1: St. Clair Avenue & Kercheval Avenue

2022 Existing Conditions
 p.m. Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	171	63	58	161	40	34	92	31	25	99	38
Future Volume (veh/h)	37	171	63	58	161	40	34	92	31	25	99	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	0.85	1.00	1.00	0.85	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	2000	2000	2000	1984	1984	1984	1984	1984	1984	2000	2000	2000
Adj Flow Rate, veh/h	44	201	74	67	187	47	37	101	34	27	108	41
Peak Hour Factor	0.85	0.85	0.85	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	1	0	0	0
Cap, veh/h	605	593	218	563	650	163	143	358	106	112	381	129
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1165	1185	436	1113	1301	327	235	1195	352	142	1270	429
Grp Volume(v), veh/h	44	0	275	67	0	234	172	0	0	176	0	0
Grp Sat Flow(s),veh/h/ln	1165	0	1621	1113	0	1628	1782	0	0	1842	0	0
Q Serve(g_s), s	1.4	0.0	6.1	2.3	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.4	0.0	6.1	8.4	0.0	5.0	4.1	0.0	0.0	4.2	0.0	0.0
Prop In Lane	1.00		0.27	1.00		0.20	0.22		0.20	0.15		0.23
Lane Grp Cap(c), veh/h	605	0	811	563	0	814	608	0	0	622	0	0
V/C Ratio(X)	0.07	0.00	0.34	0.12	0.00	0.29	0.28	0.00	0.00	0.28	0.00	0.00
Avail Cap(c_a), veh/h	605	0	811	563	0	814	608	0	0	622	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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.6	0.0	9.0	11.6	0.0	8.8	16.1	0.0	0.0	16.2	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.1	0.4	0.0	0.9	1.2	0.0	0.0	1.1	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	0.4	0.0	2.1	0.6	0.0	1.7	1.9	0.0	0.0	1.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.9	0.0	10.2	12.0	0.0	9.6	17.3	0.0	0.0	17.3	0.0	0.0
LnGrp LOS	B	A	B	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		319			301			172			176	
Approach Delay, s/veh		10.3			10.2			17.3			17.3	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		18.0		30.0		18.0		30.0				
Max Q Clear Time (g_c+I1), s		6.1		8.4		6.2		10.4				
Green Ext Time (p_c), s		0.7		1.9		0.7		1.6				

Intersection Summary

HCM 6th Ctrl Delay	12.8
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	6.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	24	96	7	3	63	16	5	79	4	21	77	33
Future Vol, veh/h	24	96	7	3	63	16	5	79	4	21	77	33
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	79	79	79	79	79	71	71	71	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	1	1
Mvmt Flow	30	122	9	4	80	20	7	111	6	24	90	38

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	100	0	0	131	0	0	349	295	127	343	289	90
Stage 1	-	-	-	-	-	-	187	187	-	98	98	-
Stage 2	-	-	-	-	-	-	162	108	-	245	191	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.509	4.009	3.309
Pot Cap-1 Maneuver	1505	-	-	1467	-	-	609	620	929	613	623	971
Stage 1	-	-	-	-	-	-	819	749	-	911	816	-
Stage 2	-	-	-	-	-	-	845	810	-	761	744	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1505	-	-	1467	-	-	509	605	929	514	607	971
Mov Cap-2 Maneuver	-	-	-	-	-	-	509	605	-	514	607	-
Stage 1	-	-	-	-	-	-	801	733	-	891	814	-
Stage 2	-	-	-	-	-	-	720	808	-	627	728	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.4			0.3			12.4			12.2		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	608	1505	-	-	1467	-	-	649
HCM Lane V/C Ratio	0.204	0.02	-	-	0.003	-	-	0.235
HCM Control Delay (s)	12.4	7.4	0	-	7.5	0	-	12.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.9

Intersection: 1: St. Clair Avenue & Kercheval Avenue

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	53	124	79	130	133	134
Average Queue (ft)	24	64	31	61	58	62
95th Queue (ft)	51	111	65	113	108	114
Link Distance (ft)		579		621	175	546
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)	75		75			
Storage Blk Time (%)		5	1	4		
Queuing Penalty (veh)		2	2	2		

Intersection: 2: St. Clair Avenue & St. Paul Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	38	6	63	71
Average Queue (ft)	2	0	33	40
95th Queue (ft)	19	6	52	63
Link Distance (ft)	555	544	720	562
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 5

HCM 6th Signalized Intersection Summary
 1: St. Clair Avenue & Kercheval Avenue

2024 Background Conditions
 a.m. Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	138	23	29	158	22	14	61	15	19	65	34
Future Volume (veh/h)	17	138	23	29	158	22	14	61	15	19	65	34
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	0.85	1.00	1.00	0.85	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	1969	1969	1969	1953	1953	1953	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	19	155	26	38	205	29	17	74	18	28	97	51
Peak Hour Factor	0.89	0.89	0.89	0.77	0.77	0.77	0.82	0.82	0.82	0.67	0.67	0.67
Percent Heavy Veh, %	2	2	2	3	3	3	1	1	1	2	2	2
Cap, veh/h	597	698	117	642	711	101	113	418	91	114	339	156
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1146	1397	234	1194	1423	201	146	1393	304	148	1130	521
Grp Volume(v), veh/h	19	0	181	38	0	234	109	0	0	176	0	0
Grp Sat Flow(s),veh/h/ln	1146	0	1631	1194	0	1624	1844	0	0	1799	0	0
Q Serve(g_s), s	0.6	0.0	3.7	1.1	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.6	0.0	3.7	4.9	0.0	5.1	2.5	0.0	0.0	4.4	0.0	0.0
Prop In Lane	1.00		0.14	1.00		0.12	0.16		0.17	0.16		0.29
Lane Grp Cap(c), veh/h	597	0	816	642	0	812	622	0	0	609	0	0
V/C Ratio(X)	0.03	0.00	0.22	0.06	0.00	0.29	0.18	0.00	0.00	0.29	0.00	0.00
Avail Cap(c_a), veh/h	597	0	816	642	0	812	622	0	0	609	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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.4	0.0	8.4	9.8	0.0	8.8	15.6	0.0	0.0	16.2	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.6	0.2	0.0	0.9	0.6	0.0	0.0	1.2	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	0.2	0.0	1.3	0.3	0.0	1.7	1.1	0.0	0.0	1.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.5	0.0	9.1	10.0	0.0	9.7	16.2	0.0	0.0	17.4	0.0	0.0
LnGrp LOS	B	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		200			272			109			176	
Approach Delay, s/veh		9.2			9.7			16.2			17.4	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		18.0		30.0		18.0		30.0				
Max Q Clear Time (g_c+I1), s		4.5		7.6		6.4		7.1				
Green Ext Time (p_c), s		0.4		1.1		0.7		1.5				

Intersection Summary

HCM 6th Ctrl Delay	12.3
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	14	135	8	0	103	5	2	67	8	8	38	17
Future Vol, veh/h	14	135	8	0	103	5	2	67	8	8	38	17
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	70	70	70	61	61	61
Heavy Vehicles, %	1	1	1	0	0	0	0	0	0	0	0	0
Mvmt Flow	23	225	13	0	172	8	3	96	11	13	62	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	180	0	0	238	0	0	499	458	232	507	460	176
Stage 1	-	-	-	-	-	-	278	278	-	176	176	-
Stage 2	-	-	-	-	-	-	221	180	-	331	284	-
Critical Hdwy	4.11	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1402	-	-	1341	-	-	485	502	812	479	501	872
Stage 1	-	-	-	-	-	-	733	684	-	831	757	-
Stage 2	-	-	-	-	-	-	786	754	-	687	680	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1402	-	-	1341	-	-	418	492	812	396	491	872
Mov Cap-2 Maneuver	-	-	-	-	-	-	418	492	-	396	491	-
Stage 1	-	-	-	-	-	-	719	671	-	815	757	-
Stage 2	-	-	-	-	-	-	698	754	-	570	667	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0			14			13.3		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	511	1402	-	-	1341	-	-	538
HCM Lane V/C Ratio	0.215	0.017	-	-	-	-	-	0.192
HCM Control Delay (s)	14	7.6	0	-	0	-	-	13.3
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.7

Intersection: 1: St. Clair Avenue & Kercheval Avenue

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	42	104	48	113	95	101
Average Queue (ft)	9	46	19	56	39	48
95th Queue (ft)	34	85	47	98	79	90
Link Distance (ft)		579		621	175	546
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		75			
Storage Blk Time (%)	0	1		3		
Queuing Penalty (veh)	0	0		1		

Intersection: 2: St. Clair Avenue & St. Paul Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	38	62	55
Average Queue (ft)	3	33	29
95th Queue (ft)	21	55	53
Link Distance (ft)	555	720	562
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 1

HCM 6th Signalized Intersection Summary
 1: St. Clair Avenue & Kercheval Avenue

2024 Background Conditions
 p.m. Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	173	64	59	163	40	34	93	31	25	100	38
Future Volume (veh/h)	37	173	64	59	163	40	34	93	31	25	100	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	0.85	1.00	1.00	0.85	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	2000	2000	2000	1984	1984	1984	1984	1984	1984	2000	2000	2000
Adj Flow Rate, veh/h	44	204	75	69	190	47	37	102	34	27	109	41
Peak Hour Factor	0.85	0.85	0.85	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	1	0	0	0
Cap, veh/h	602	593	218	559	653	161	143	360	105	111	382	128
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1161	1186	436	1109	1306	323	233	1200	351	141	1275	427
Grp Volume(v), veh/h	44	0	279	69	0	237	173	0	0	177	0	0
Grp Sat Flow(s),veh/h/ln	1161	0	1622	1109	0	1629	1783	0	0	1843	0	0
Q Serve(g_s), s	1.4	0.0	6.2	2.4	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.5	0.0	6.2	8.6	0.0	5.1	4.2	0.0	0.0	4.3	0.0	0.0
Prop In Lane	1.00		0.27	1.00		0.20	0.21		0.20	0.15		0.23
Lane Grp Cap(c), veh/h	602	0	811	559	0	814	608	0	0	622	0	0
V/C Ratio(X)	0.07	0.00	0.34	0.12	0.00	0.29	0.28	0.00	0.00	0.28	0.00	0.00
Avail Cap(c_a), veh/h	602	0	811	559	0	814	608	0	0	622	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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.7	0.0	9.1	11.7	0.0	8.8	16.2	0.0	0.0	16.2	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.2	0.5	0.0	0.9	1.2	0.0	0.0	1.1	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	0.4	0.0	2.2	0.6	0.0	1.8	1.9	0.0	0.0	1.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.9	0.0	10.2	12.1	0.0	9.7	17.3	0.0	0.0	17.3	0.0	0.0
LnGrp LOS	B	A	B	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		323			306			173			177	
Approach Delay, s/veh		10.3			10.2			17.3			17.3	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		18.0		30.0		18.0		30.0				
Max Q Clear Time (g_c+I1), s		6.2		8.5		6.3		10.6				
Green Ext Time (p_c), s		0.7		1.9		0.7		1.6				

Intersection Summary

HCM 6th Ctrl Delay	12.8
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	6.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	24	97	7	3	64	16	5	80	4	21	78	33
Future Vol, veh/h	24	97	7	3	64	16	5	80	4	21	78	33
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	79	79	79	79	79	71	71	71	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	1	1
Mvmt Flow	30	123	9	4	81	20	7	113	6	24	91	38

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	101	0	0	132	0	0	352	297	128	346	291	91
Stage 1	-	-	-	-	-	-	188	188	-	99	99	-
Stage 2	-	-	-	-	-	-	164	109	-	247	192	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.509	4.009	3.309
Pot Cap-1 Maneuver	1504	-	-	1466	-	-	607	618	927	610	621	969
Stage 1	-	-	-	-	-	-	818	748	-	910	815	-
Stage 2	-	-	-	-	-	-	843	809	-	759	743	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1504	-	-	1466	-	-	506	603	927	509	605	969
Mov Cap-2 Maneuver	-	-	-	-	-	-	506	603	-	509	605	-
Stage 1	-	-	-	-	-	-	800	732	-	890	813	-
Stage 2	-	-	-	-	-	-	717	807	-	624	727	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	1.4		0.3		12.5		12.3	
HCM LOS					B		B	

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	606	1504	-	-	1466	-	-	646
HCM Lane V/C Ratio	0.207	0.02	-	-	0.003	-	-	0.238
HCM Control Delay (s)	12.5	7.4	0	-	7.5	0	-	12.3
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.9

Intersection: 1: St. Clair Avenue & Kercheval Avenue

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	55	117	81	130	121	136
Average Queue (ft)	23	64	32	62	59	62
95th Queue (ft)	50	110	66	112	106	112
Link Distance (ft)		579		621	175	546
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		75			
Storage Blk Time (%)	0	4	1	4		
Queuing Penalty (veh)	0	2	1	2		

Intersection: 2: St. Clair Avenue & St. Paul Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	38	6	58	71
Average Queue (ft)	3	0	33	39
95th Queue (ft)	20	4	52	62
Link Distance (ft)	555	544	720	562
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 5

HCM 6th Signalized Intersection Summary
 1: St. Clair Avenue & Kercheval Avenue

2024 Future Conditions
 a.m. Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	138	27	34	158	22	22	65	21	19	68	34
Future Volume (veh/h)	17	138	27	34	158	22	22	65	21	19	68	34
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	0.85	1.00	1.00	0.85	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	1969	1969	1969	1953	1953	1953	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	19	155	30	44	205	29	27	79	26	28	101	51
Peak Hour Factor	0.89	0.89	0.89	0.77	0.77	0.77	0.82	0.82	0.82	0.67	0.67	0.67
Percent Heavy Veh, %	2	2	2	3	3	3	1	1	1	2	2	2
Cap, veh/h	597	681	132	638	711	101	138	366	106	112	344	153
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1146	1362	264	1189	1423	201	219	1220	353	143	1148	510
Grp Volume(v), veh/h	19	0	185	44	0	234	132	0	0	180	0	0
Grp Sat Flow(s),veh/h/ln	1146	0	1626	1189	0	1624	1791	0	0	1802	0	0
Q Serve(g_s), s	0.6	0.0	3.9	1.3	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.6	0.0	3.9	5.2	0.0	5.1	3.1	0.0	0.0	4.5	0.0	0.0
Prop In Lane	1.00		0.16	1.00		0.12	0.20		0.20	0.16		0.28
Lane Grp Cap(c), veh/h	597	0	813	638	0	812	610	0	0	610	0	0
V/C Ratio(X)	0.03	0.00	0.23	0.07	0.00	0.29	0.22	0.00	0.00	0.30	0.00	0.00
Avail Cap(c_a), veh/h	597	0	813	638	0	812	610	0	0	610	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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.4	0.0	8.5	9.9	0.0	8.8	15.8	0.0	0.0	16.3	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.7	0.2	0.0	0.9	0.8	0.0	0.0	1.2	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	0.2	0.0	1.3	0.3	0.0	1.7	1.4	0.0	0.0	2.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.5	0.0	9.1	10.1	0.0	9.7	16.6	0.0	0.0	17.5	0.0	0.0
LnGrp LOS	B	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		204			278			132			180	
Approach Delay, s/veh		9.2			9.7			16.6			17.5	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		18.0		30.0		18.0		30.0				
Max Q Clear Time (g_c+I1), s		5.1		7.6		6.5		7.2				
Green Ext Time (p_c), s		0.5		1.1		0.7		1.6				

Intersection Summary

HCM 6th Ctrl Delay	12.5
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	5.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	135	8	0	103	7	2	69	8	14	40	22
Future Vol, veh/h	18	135	8	0	103	7	2	69	8	14	40	22
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	70	70	70	61	61	61
Heavy Vehicles, %	1	1	1	0	0	0	0	0	0	0	0	0
Mvmt Flow	30	225	13	0	172	12	3	99	11	23	66	36

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	184	0	0	238	0	0	521	476	232	525	476	178
Stage 1	-	-	-	-	-	-	292	292	-	178	178	-
Stage 2	-	-	-	-	-	-	229	184	-	347	298	-
Critical Hdwy	4.11	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1397	-	-	1341	-	-	469	491	812	466	491	870
Stage 1	-	-	-	-	-	-	720	675	-	828	756	-
Stage 2	-	-	-	-	-	-	778	751	-	673	671	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1397	-	-	1341	-	-	395	479	812	380	479	870
Mov Cap-2 Maneuver	-	-	-	-	-	-	395	479	-	380	479	-
Stage 1	-	-	-	-	-	-	702	658	-	807	756	-
Stage 2	-	-	-	-	-	-	681	751	-	550	654	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0	14.4	14
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	497	1397	-	-	1341	-	-	522
HCM Lane V/C Ratio	0.227	0.021	-	-	-	-	-	0.239
HCM Control Delay (s)	14.4	7.6	0	-	0	-	-	14
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.9	0.1	-	-	0	-	-	0.9

Intersection: 1: St. Clair Avenue & Kercheval Avenue

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	40	112	56	124	123	126
Average Queue (ft)	11	51	20	52	46	47
95th Queue (ft)	34	95	50	96	94	93
Link Distance (ft)		579		621	175	546
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		75			
Storage Blk Time (%)		2	0	2		
Queuing Penalty (veh)		0	0	1		

Intersection: 2: St. Clair Avenue & St. Paul Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	35	72	67
Average Queue (ft)	2	34	32
95th Queue (ft)	16	59	58
Link Distance (ft)	555	720	460
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 1

HCM 6th Signalized Intersection Summary
 1: St. Clair Avenue & Kercheval Avenue

2024 Future Conditions
 p.m. Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	173	74	68	163	40	40	97	37	25	106	38
Future Volume (veh/h)	37	173	74	68	163	40	40	97	37	25	106	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	0.85	1.00	1.00	0.85	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	2000	2000	2000	1984	1984	1984	1984	1984	1984	2000	2000	2000
Adj Flow Rate, veh/h	44	204	87	79	190	47	44	107	41	27	115	41
Peak Hour Factor	0.85	0.85	0.85	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	1	0	0	0
Cap, veh/h	602	565	241	548	653	161	151	339	113	109	389	124
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1161	1131	482	1097	1306	323	256	1130	376	135	1297	414
Grp Volume(v), veh/h	44	0	291	79	0	237	192	0	0	183	0	0
Grp Sat Flow(s),veh/h/ln	1161	0	1613	1097	0	1629	1763	0	0	1846	0	0
Q Serve(g_s), s	1.4	0.0	6.6	2.8	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.5	0.0	6.6	9.4	0.0	5.1	4.7	0.0	0.0	4.4	0.0	0.0
Prop In Lane	1.00		0.30	1.00		0.20	0.23		0.21	0.15		0.22
Lane Grp Cap(c), veh/h	602	0	807	548	0	814	603	0	0	623	0	0
V/C Ratio(X)	0.07	0.00	0.36	0.14	0.00	0.29	0.32	0.00	0.00	0.29	0.00	0.00
Avail Cap(c_a), veh/h	602	0	807	548	0	814	603	0	0	623	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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.7	0.0	9.2	12.0	0.0	8.8	16.3	0.0	0.0	16.2	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.3	0.6	0.0	0.9	1.4	0.0	0.0	1.2	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	0.4	0.0	2.3	0.7	0.0	1.8	2.2	0.0	0.0	2.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.9	0.0	10.4	12.6	0.0	9.7	17.7	0.0	0.0	17.4	0.0	0.0
LnGrp LOS	B	A	B	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		335			316			192			183	
Approach Delay, s/veh		10.5			10.4			17.7			17.4	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		18.0		30.0		18.0		30.0				
Max Q Clear Time (g_c+I1), s		6.7		8.6		6.4		11.4				
Green Ext Time (p_c), s		0.8		2.0		0.8		1.7				

Intersection Summary

HCM 6th Ctrl Delay	13.1
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	28	97	7	3	64	19	5	83	4	24	80	35
Future Vol, veh/h	28	97	7	3	64	19	5	83	4	24	80	35
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	79	79	79	79	79	71	71	71	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	1	1
Mvmt Flow	35	123	9	4	81	24	7	117	6	28	93	41

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	105	0	0	132	0	0	366	311	128	360	303	93
Stage 1	-	-	-	-	-	-	198	198	-	101	101	-
Stage 2	-	-	-	-	-	-	168	113	-	259	202	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.11	5.51	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.509	4.009	3.309
Pot Cap-1 Maneuver	1499	-	-	1466	-	-	594	607	927	597	612	967
Stage 1	-	-	-	-	-	-	808	741	-	908	813	-
Stage 2	-	-	-	-	-	-	839	806	-	748	736	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1499	-	-	1466	-	-	490	590	927	493	595	967
Mov Cap-2 Maneuver	-	-	-	-	-	-	490	590	-	493	595	-
Stage 1	-	-	-	-	-	-	788	722	-	885	811	-
Stage 2	-	-	-	-	-	-	709	804	-	608	718	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.6			0.3			12.8			12.6		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	593	1499	-	-	1466	-	-	634
HCM Lane V/C Ratio	0.219	0.024	-	-	0.003	-	-	0.255
HCM Control Delay (s)	12.8	7.5	0	-	7.5	0	-	12.6
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	1

Intersection: 1: St. Clair Avenue & Kercheval Avenue

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	86	139	78	118	134	142
Average Queue (ft)	25	63	32	60	65	62
95th Queue (ft)	60	112	68	104	112	116
Link Distance (ft)		579		621	175	546
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)	75		75			
Storage Blk Time (%)	0	4	1	3		
Queuing Penalty (veh)	1	2	2	2		

Intersection: 2: St. Clair Avenue & St. Paul Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	12	63	70
Average Queue (ft)	2	1	32	39
95th Queue (ft)	15	8	53	60
Link Distance (ft)	555	544	720	460
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 6
