30-48 Chamberlain Avenue

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report - ZBA

Step 4 Strategy Report – SPA (revision #4)

Prepared for:

Quantum Project Management Services Inc.
56 Willard Street
Ottawa ON K1S 1T8

Prepared by:

CGH TRANSPORTATION
6 Plaza Court
Ottawa, ON K2H 7W1

April 2025

PN: 2022-117

Table of Contents

List of Figures

Table of Tables

List of Appendices

1 Screening

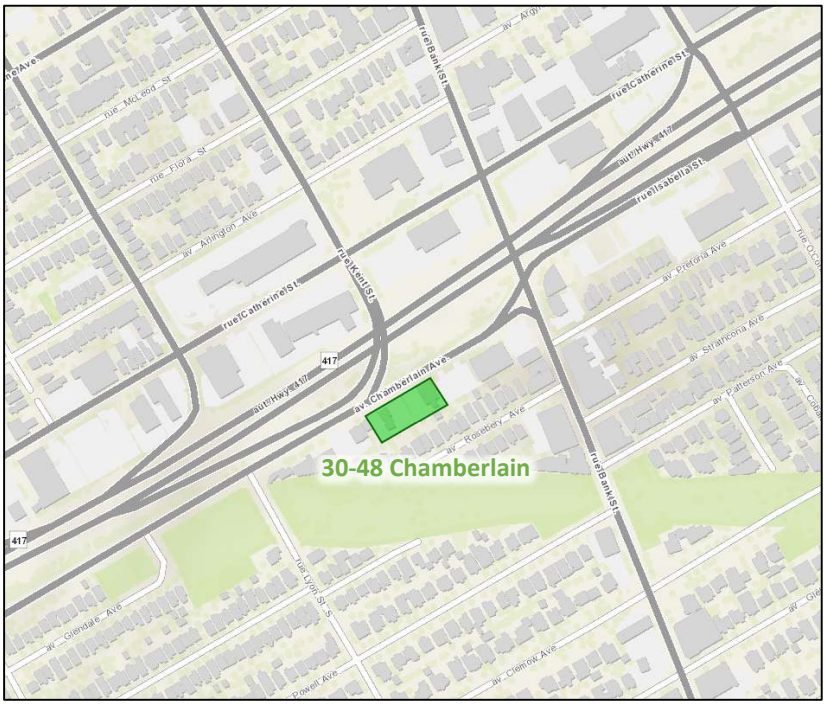
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required including the Design Review component and the Network Impact Component. This updated report supports a site plan application.

2 Existing and Planned Conditions

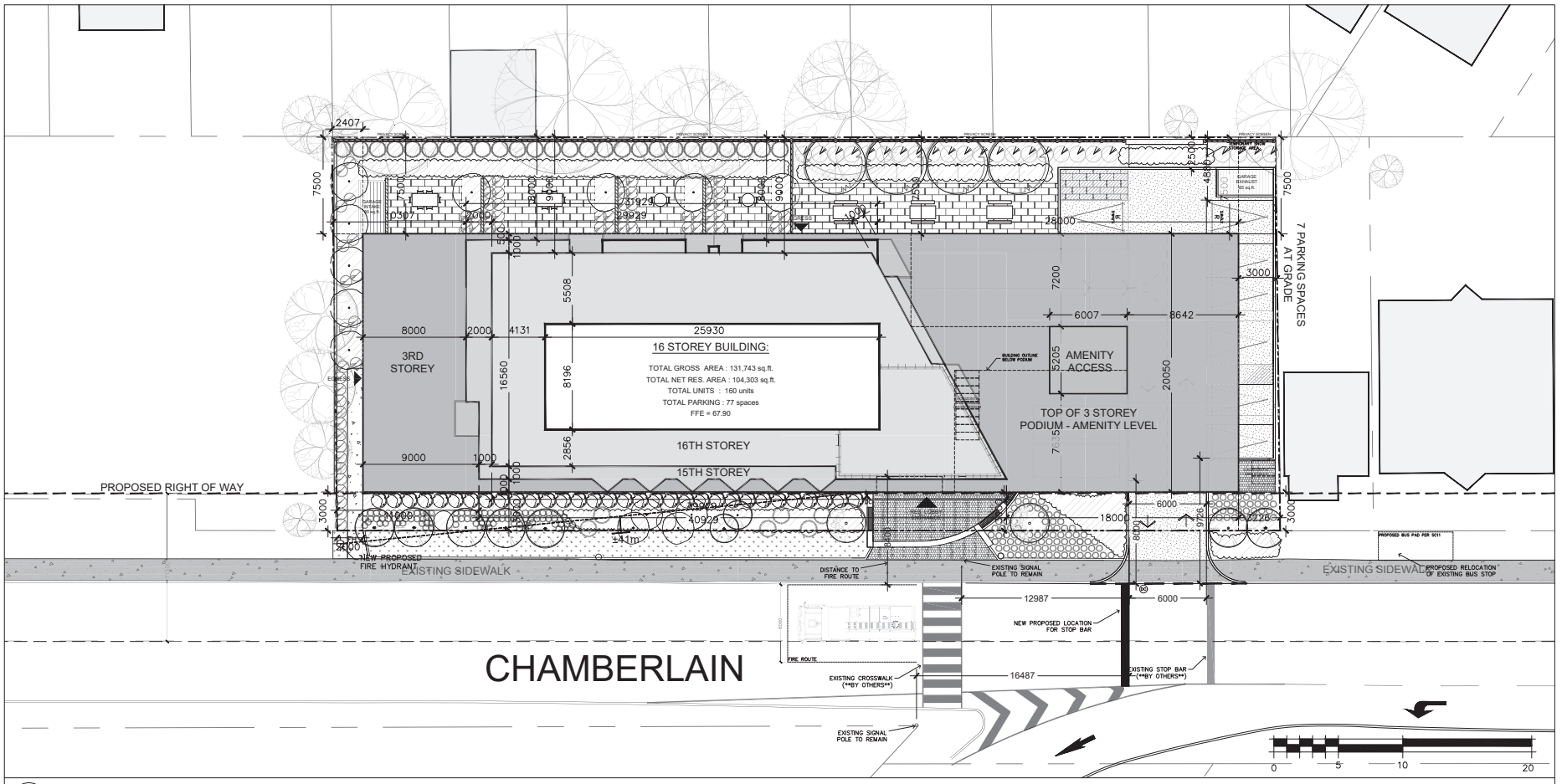
2.1 Proposed Development

The proposed development, located at 30-48 Chamberlain Avenue and zoned as General Mixed-Use (GM4[2735]S448), is planned to include a total of 160 apartment units, and approximately 3,370 sq ft of ground floor retail space. The proposed vehicle parking consists of 77 spaces. The existing site contains a dental clinic and an electrician's office, including approximately 54 parking stalls, both defined and undefined on a paved surface lot. The site will be accessed by a 6.0-metre right-in/right-out access west of a proposed relocation of the stop bar for the half signal serving the crosswalk. The anticipated full build-out and occupancy horizon is 2024. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan

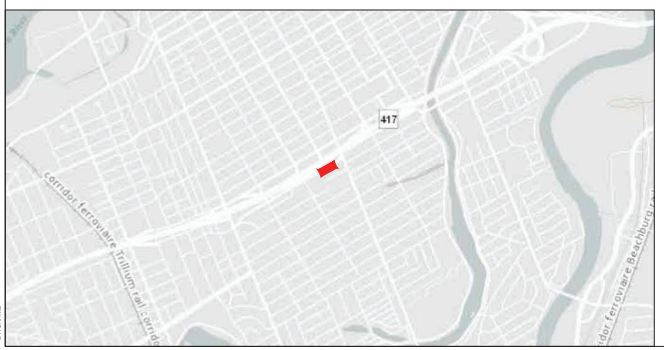


Source: http://maps.ottawa.ca/geoOttawa/ Accessed: January 19, 2023



1 SITE PLAN
A1.00 1 :100

LOCATION PLAN



ZONING NOTES:

CURRENT ZONING:	GM[2735]S448	LEGAL DESCRIPTION
CIVIL ADDRESS:	30,38,42,48 Chamberlain Ave, Ottawa	LOTS 8, 9, 10, 11, 12 & 13 (SOUTH CHAMBERLAND AVENUE) REGISTERED PLAN 71572 CITY OF OTTAWA
LOT AREA :	2,233 m^2	
LOT WIDTH :	73.15 m	
LOT DEPTH :	30.53 m	

DEVELOPMENT STATS	REQUIRED	PROPOSED
LOT OF AREA 'A'	NO MINIMUM	2,233 m^2
% OF LANDSCAPED AREA	30%	30.5%
TOTAL UNITS		160
SETBACK ALONG FRONT YARD (CHAMBERLAIN AVE.)	3 m	3 m
SETBACK ALONG SIDE YARD (FACING EAST)	2 m	2 m
SETBACK ALONG SIDE YARD (FACING WEST)	3 m	3 m
SETBACK ALONG REAR YARD	7.5 m	7.5 m
MAXIMUM HEIGHT	52 m	51.13 m
NUMBER OF STOREYS		16
BUILDING GFA		12,221 m^2
ZONING GFA (as per city zoning def.)		9,567 m^2

UNIT BREAKDOWN

UNIT TYPE	# OF UNITS	% OF UNITS	AREA (SQ.FT)
BACHELOR SUITES	60 UNITS	37.50%	25,536 SQ.FT.
1 BEDROOM SUITES	32 UNITS	20.00%	18,322 SQ.FT.
1 BED + DEN SUITES	8 UNITS	5.00%	5,386 SQ.FT.
2 BEDROOM SUITES	35 UNITS	21.88%	28,538 SQ.FT.
2 BED+ DEN SUITES	11 UNITS	6.88%	9,845 SQ.FT.
3 BEDROOM SUITES	14 UNITS	8.75%	16,676 SQ.FT.
TOTAL:	160 UNITS	100%	104,303 SQ.FT.

NOTE:
ALL EXISTING SITE INFORMATION AS PER SITE SURVEY PLAN DATED JUNE 18, 2020 AND PREPARED BY FARLEY, SMITH & DENIS SURVEYING LTD.

PARKING REQUIREMENTS

1. VEHICLE PARKING	REQUIRED PARKING	PROVIDED PARKING
RESIDENTIAL PARKING 160 UNITS (– 12UNITS) (X 0.37)	0.37 / UNIT 54.8 SPACES	1.0 / UNIT 56 SPACES
VISITOR PARKING 160 UNITS (– 12UNITS) (X 0.1)	0.1 / UNITS 14.8 SPACES	0.1 / UNITS 15 SPACES
COMMERCIAL PARKING 313m^2	2/100m^2 7 SPACES	7 SPACES
TOTAL PARKING	77 SPACES	77 SPACES
PARKING DISTRIBUTION AT GRADE LEVEL P2 LEVEL P1 TOTAL		7 SPACES 32 SPACES 38 SPACES 77 SPACES

2. BICYCLE PARKING
REQUIRED BICYCLE PARKING SPACES
RESIDENTIAL : 1 SPACE/UNIT – 160 SPACES REQUIRED FOR 160 UNITS
PROVIDED BICYCLE PARKING SPACES
160 TOTAL BIKE STALLS
(12 AT GRADE + 102 ON P1 + 46 ON P2)

AMENITY REQUIREMENTS

REQUIRED AMENITY SPACE REQUIRED = 6 m^2 PER UNIT
160 UNITS X 6 SQ.M. = 960 SQ.M. TOTAL AMENITY REQUIRED
REQUIRED AMENITY SPACE TO BE COMMON (50%) = 480 SQ.M.

PROVIDED AMENITY SPACE BREAKDOWN:

– INTERIOR COMMON AMENITY	170 m^2
– EXTERIOR COMMON AMENITY	350 m^2
– PRIVATE BALCONY & TERRACE AMENITY	500 m^2
TOTAL AMENITY SPACE PROVIDED	1,020 m^2

LEGEND

- PROPOSED FIRE ROUTE
- PROPOSED BUILDING
- BUILDING TO BE DEMOLISHED
- HMH EXISTING TRAFFIC MAN HOLE
- TMH EXISTING TRAFFIC MAN HOLE
- MH EXISTING MAN HOLE
- TSP EXISTING TRAFFIC LIGHT
- FH EXISTING FIRE HYDRANT
- CONC. CURB DETAIL, TO CITY OF OTTAWA STANDARDS
- BP BIKE PARKING SPACE
- EDGE OF SIDEWALK
- PROPERTY LINE
- SETBACK
- DC PROPOSED DEPRESSED CURB DETAIL TO CITY OF OTTAWA STANDARD SC-7
- EXTENT OF PRIVATELY OWNED PUBLIC SPACE
- CURB TO BE REBUILT
- ROLL CURB
- UP EXISTING UTILITY POLE
- FDC FIRE DEPARTMENT CONNECTION
- PTD PARKING TICKET DISPENCER
- PDS EXISTING PAY & DISPLAY
- BS EXISTING TRANSIT STOP
- CB EXISTING CATCH BASIN
- CB PROPOSED CATCH BASIN
- AS SIGNAGE FOR ACCESSIBLE PARKING SPACE
- FRS SIGNAGE FOR FIRE ROUTE ACCESS
- EXISTING SIGN
- EXISTING BOLLARD
- EXISTING LIGHT POLE
- NEW LIGHT POLE
- PROPOSED WALL MOUNTED LIGHT
- SL EXISTING STREET LIGHTING BOX
- TB EXISTING TRAFFIC SIGNAL BOX

PROJECT TEAM

ARCHITECT
HOBIN ARCHITECTURE
Barry Hobin
bjhobin@hobinarc.com

David Anderson
danderson@hobinarc.com
613.238.7200 x122

OWNERSHIP
SCARABELLI REALTIES

PLANING
FOTENN
Timothy Beed
beed@fotenn.com

CIVIL
IBI
Terry Brule
tbrule@IBIGroup.com

MECHANICAL & ELECTRICAL
Smith & Andersen
Elaine Guenette
elaine.guenette@smithandandersen.com

Andre Drouin
andre.drouin@smithandandersen.com

LANDSCAPE ARCHITECT
Lashley+Associates
David Lashley
dlashley@lashleyla.com

TRANSPORTATION
CGH
Andrew Harte
andrew.harte@cghtransportation.com

ENVIRONMENTAL
PATERSONS
Scott Dennis
SDennis@patersongroup.ca

no.	date	revision
3	240913	RE-ISSUED FOR SPC
2	240516	RE-ISSUED FOR SPC
1	230505	ISSUED FOR SPC

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the architect.

All contractors must comply with all pertinent codes and by-laws.

Do not scale drawings.

This drawing may not be used for construction until signed.

HOBIN ARCHITECTURE

PROJECT/LOCATION:
30-48 CHAMBERLAIN AVE.

DRAWING TITLE:
SITE PLAN

DRAWN BY: DA | DATE: 2024-09-13 | SCALE: 1:100

PROJECT: 1928

DRAWING NO.: A1-00

REVISION NO.:

DWG 19000

ONTARIO ASSOCIATION OF ARCHITECTS
BARRY J. HOBIN
LICENCE 3049

DATE/PLOT
DWGNAME

2.2 Existing Conditions

2.2.1 Area Road Network

Bank Street: Bank Street is a City of Ottawa arterial road with a four-lane urban cross-section, sidewalks on both sides of the road, and on-street parking permitted on the east side of the road south of Pretoria Avenue and on both sides of the road south of Strathcona Avenue (no stopping peak hours in peak directions). The posted speed limit transitions at Chamberlain Avenue/Isabella Street from 40km/h to the south, to 50km/h to the north. The City-protected right-of-way is 20.0 metres and Bank Street is a truck route.

Kent Street: Kent Street is a City of Ottawa one-way arterial road (northbound) with a three-lane urban cross-section, sidewalks on both sides of the road, and on-street parking permitted on the east side south of Arlington Avenue in a layby and on the west side in laybys and on the east side in the travel lane (no stopping during AM peak) north of Flora Street. The unposted speed limit is 50 km/h and the City-protected right-of-way is 20.0 metres. Kent Street is a truck route.

Lyon Street: Lyon Street is a City of Ottawa one-way arterial road (southbound) with a two-lane urban cross-section, sidewalks on both sides of the road, a bike lane on the west side of the road, and on-street parking permitted on the east side north of Arlington Avenue in the travel lane (no stopping during PM peak). The unposted speed limit is 50 km/h and the City-protected right-of-way is 20.0 metres.

Catherine Street: Catherine Street is a City of Ottawa arterial road with a three-lane urban cross-section, sidewalks on both sides of the road, and on-street parking permitted on the north side of the road west of Lyon Street. The posted speed limit is 50 km/h and the City-protected right-of-way is 23.0 metres. Catherine Street is a truck route.

Chamberlain Avenue: Chamberlain Avenue is a City of Ottawa arterial road with a two-lane urban cross section, and a bike lane and sidewalk on the south side of the road. The posted speed limit is 50 km/h and the City-protected right-of-way is 23.0 metres. Chamberlain Avenue is a truck route.

Isabella Street: Isabella Street is a City of Ottawa arterial road with a two-lane urban cross section, and a bike lane and sidewalk on the south side of the road. The posted speed limit is 50 km/h and the City-protected right-of-way is 23.0 metres. Isabella Street is a truck route.

2.2.2 Existing Intersections

The key existing signalized intersections within 400 metres of the site have been summarized below:

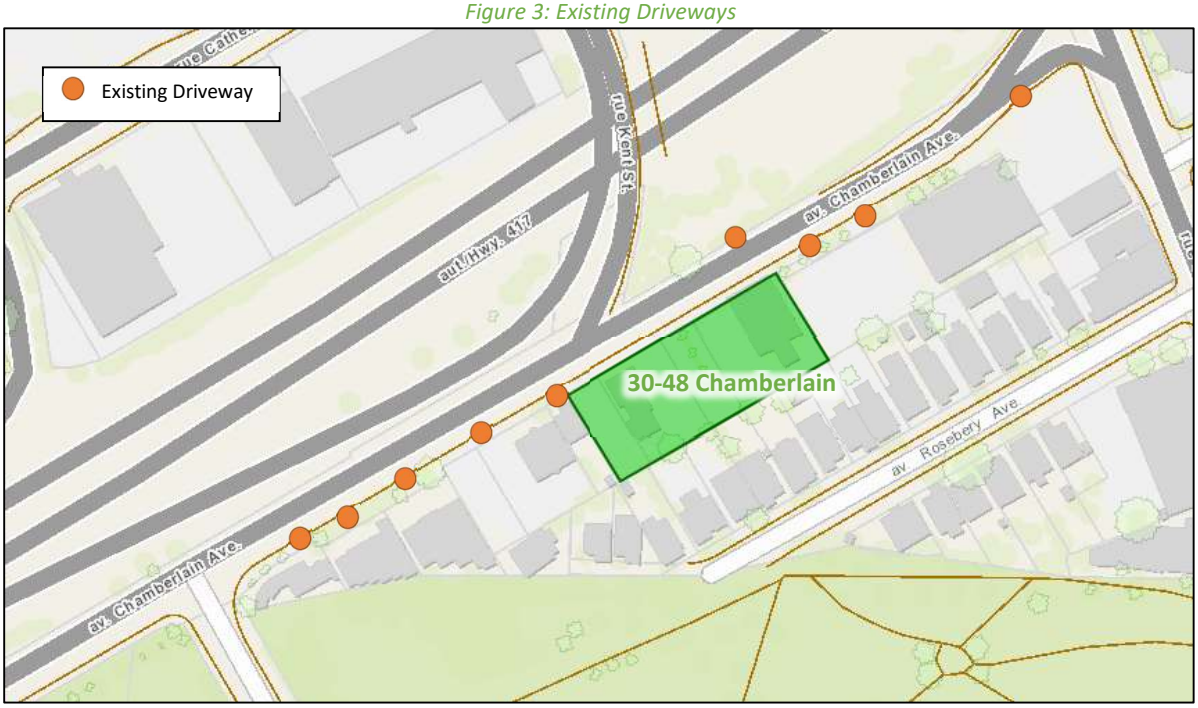
Lyon Street/Highway 417 On-Ramp & Catherine Street	The intersection of Lyon Street and Bank Street is a signalized intersection. The southbound approach consists of a through lane and a right-turn lane, and the westbound approach consists of a shared left-turn/through lane and two through lanes. As both streets are one-way roadways, the west and south legs are inbound only. It is noted that the south leg of the intersection is an on-ramp to westbound Highway 417. No turn restrictions are noted.
Kent Street & Catherine Street	The intersection of Kent Street and Catherine Street is a signalized intersection. The northbound approach consists of a shared left-turn/through lane, a through lane, and an additional through lane separated by a concrete median. The westbound approach consists of a through lane, a shared through/right-turn lane, and a right-turn lane. Northbound left or right turns are prohibited in the east lane and westbound right turns on red are restricted.

Kent Street & Chamberlain Avenue	The intersection of Kent Street and Chamberlain Avenue is a pedestrian crossing location with a half-signal. The signal only stops eastbound through movements when triggered by a pedestrian crossing. No turn restrictions are noted.
Bank Street & Catherine Street	The intersection of Bank Street and Catherine Street is a signalized intersection. The northbound approach consists of a shared left-turn/through lane and a through lane and the southbound approach consists of a through lane and a shared through/right-turn lane. The westbound approach consists of a shared left-turn/through lane, a through lane, and a shared through/right-turn lane. As Catherine Street is a one-way roadway, the west leg is inbound only. No turn restrictions are noted.
Bank Street & Chamberlain Avenue/Isabella Street	The intersection of Bank Street and Chamberlain Avenue/Isabella Street is a signalized intersection. The northbound approach consists of a through lane and a shared through/right-turn lane, and the southbound approach consists of a shared left-turn/through lane and a through lane. The eastbound approach consists of a shared left-turn/through lane, a through lane, and an auxiliary channelized right-turn lane. Functionally, driver behaviour results in the southbound approach operating as a left-turn land and a through lane with drivers shifting to the curb lane in expectation of vehicles queuing for a left turn. No turn restrictions are noted.

2.2.3 Existing Driveways

Within 200 metres of the proposed site access, eight driveways exist on the south side of Chamberlain Avenue providing access to various commercial land uses. Additionally, a service entrance is present on the north side of Chamberlain Avenue to the east of the proposed site. Figure 3 illustrates the boundary street driveways within 200 metres of the proposed site access.

Figure 3: Existing Driveways

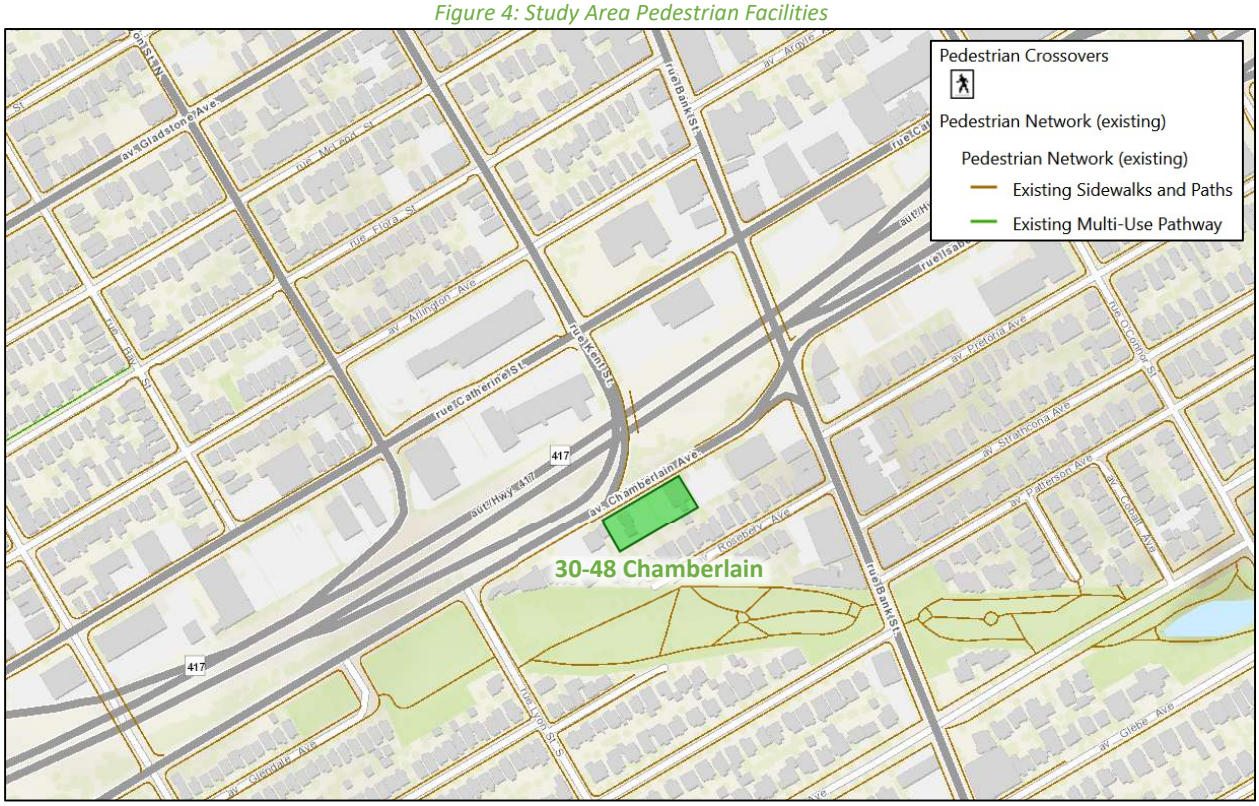


2.2.4 Cycling and Pedestrian Facilities

Figure 4 illustrates the pedestrian facilities in the study area and Figure 5 illustrates the cycling facilities.

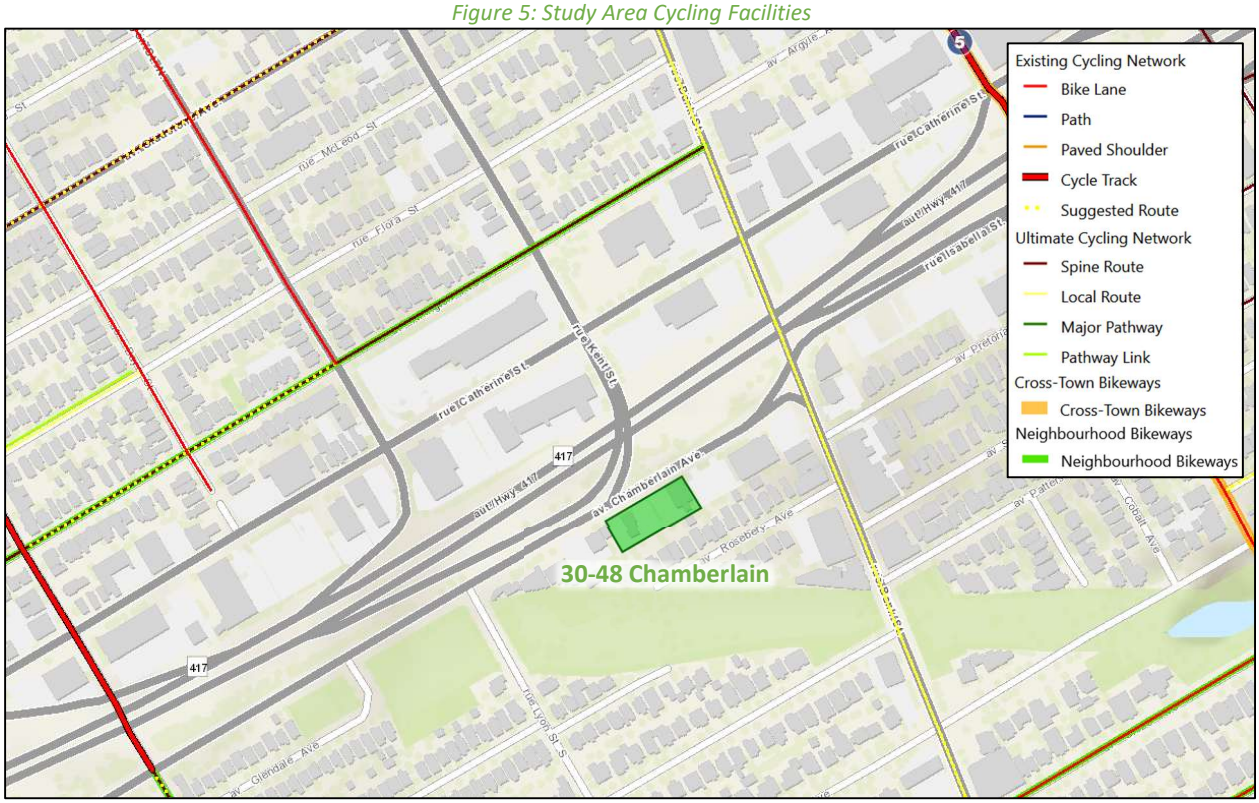
Sidewalks are provided along the south side of Chamberlain Street, the east side of Kent Street between Catherine Street and Chamberlain Street, and along both sides of all other study area roads. A southbound curbside bike lane is provided on the Lyon Street, which is a spine route (with a northbound bike lane found one block to the west along Bay Street, also a spine route). Catherine Street is a spine route, and Bank Street is a local cycling route.

Figure 4: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: January 19, 2023

Figure 5: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: January 19, 2023

Pedestrian and cyclist volumes included in study area intersection counts, presented in Section 2.2.7, have been compiled and are illustrated in Figure 6 and Figure 7, respectively.

Figure 6: Existing Pedestrian Volumes

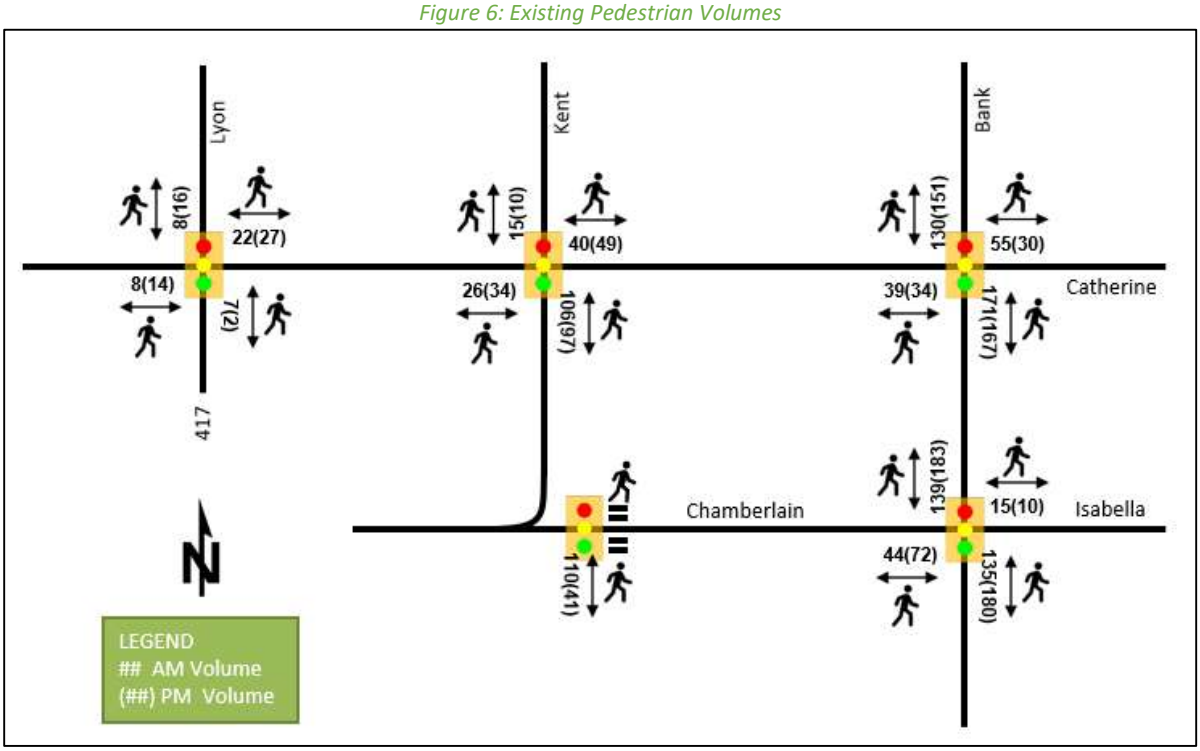
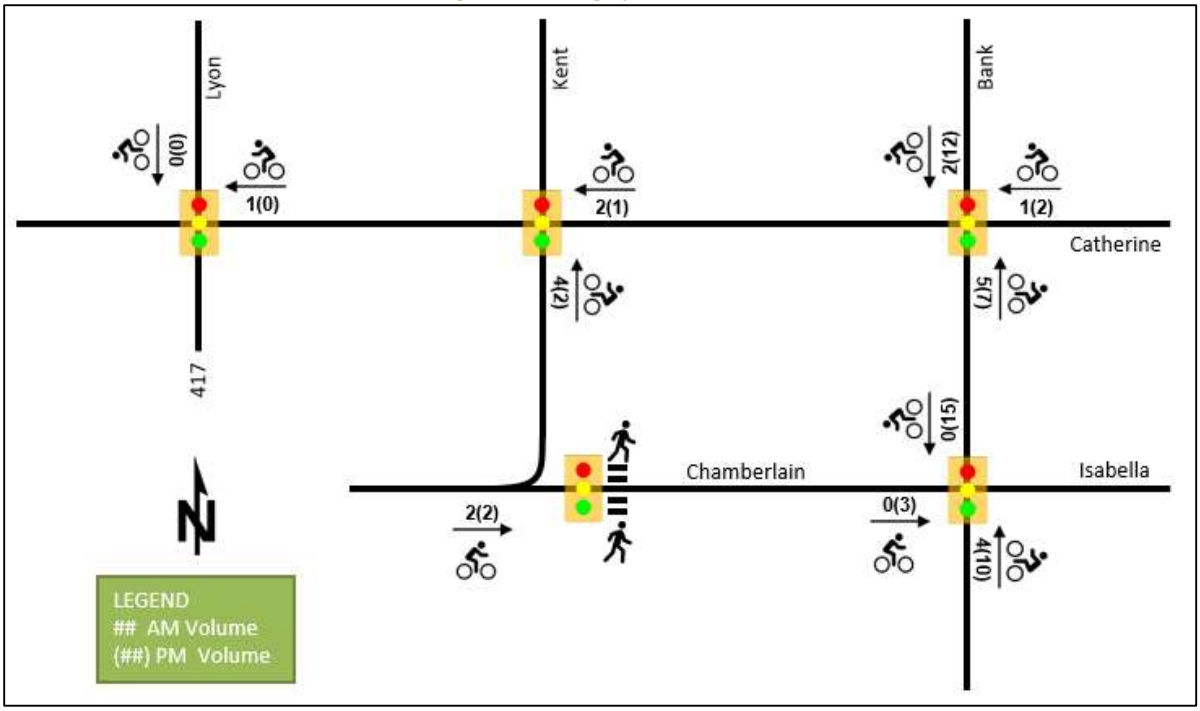


Figure 7: Existing Cyclist Volumes



2.2.5 Existing Transit

Figure 8 illustrates the transit system map in the study area and Figure 9 illustrates nearby transit stops, including bus stop #6850 is located on the site frontage. All transit information is from March 15, 2023, and is included for general information purposes and context to the surrounding area.

Within the study area, the routes #6 and #7 travel along Bank Street, #55 travels eastbound along Chamberlain Avenue and westbound along Catherine Street. Stops are located at the intersection of Kent Street and Chamberlain Street, and Bank Street and Chamberlain Avenue/Isabella Street. The frequency of these routes within proximity of the proposed site based on March 15, 2023 service levels are:

- Route #6 – 5-minute service all day, 10-minute nighttime service
- Route #7 – 15-minute service all day, 30-minute service during the evening/nighttime
- Route #55 – 15-minute service all day, 30-minute service during the evening

Figure 8: Existing Study Area Transit Service

Source: http://www.octranspo.com/ Accessed: March 15, 2023

Figure 9: Existing Study Area Transit Stops

Source: http://www.octranspo.com/ Accessed: March 15, 2023

2.2.6 Existing Area Traffic Management Measures

The study area traffic calming measures consist of narrowings of local roads where they intersect arterials, speed humps along Lyon Street, Flora Street, Arlington Avenue, and on-street parking and bulb-outs/planters to delineate the start and end of the parking areas on local roads and Kent Street.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from City counts for the existing Study Area intersections. Table 1 summarizes the intersection count dates. The counts are all from 2018 and considered acceptable for this area of the City. Typical growth in central and downtown Ottawa is limited and it is not expected to have increased to any significant degree since 2018 beyond the application of typical background growth presented in Section 6.

Table 1: Intersection Count Date

Intersection	Count Date
Lyon Street/Highway 417 On-Ramp & Catherine Street	Wednesday, April 18, 2018
Kent Street & Catherine Street	Wednesday, April 18, 2018
Kent Street & Chamberlain Avenue	Wednesday, April 18, 2018
Bank Street & Catherine Street	Wednesday, April 18, 2018
Bank Street & Chamberlain Avenue/Isabella Street	Wednesday, April 18, 2018

Figure 10 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for the lane movements and HCM average delay for the overall intersection. The southbound approach has been modeled as a left-turn lane and a through lane during the AM peak hour at all study horizons, in line with the in-situ operation. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 10: Existing Traffic Volumes

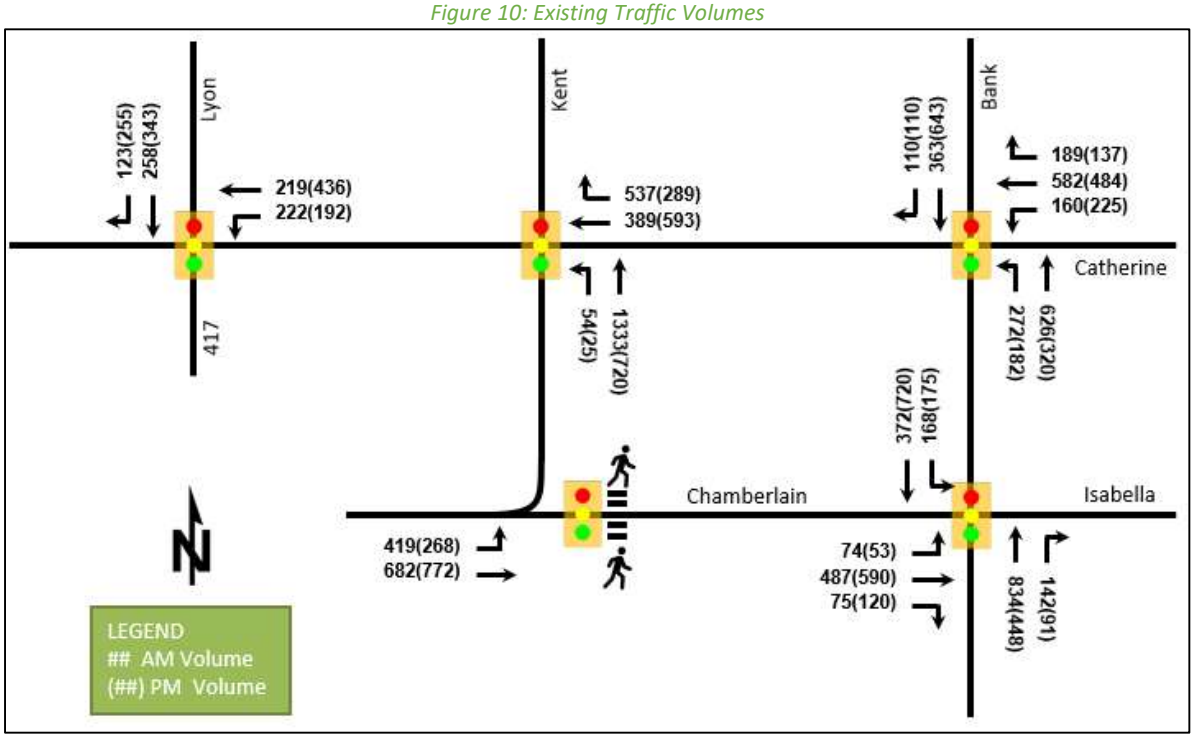


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Lyon St/Highway 417 On-Ramp & Catherine St *Signalized*	WBL/T	A	0.22	10.0	m25.8	A	0.46	15.4	11.3
	SBT	A	0.42	18.7	47.7	A	0.39	11.0	45.5
	SBR	A	0.21	3.9	9.5	A	0.33	6.8	24.7
	Overall	**A**	**0.28**	**11.8**	-	**A**	**0.40**	**12.4**	-
Kent St & Catherine St *Signalized*	WBT/R	B	0.69	26.9	m61.0	A	0.51	14.1	m42.9
	WBR	C	0.73	31.7	m57.3	A	0.54	16.6	m38.9
	NB	C	0.74	19.7	77.9	A	0.49	18.5	40.6
	Overall	**B**	**0.70**	**23.2**	-	**A**	**0.48**	**16.5**	-
Kent St & Chamberlain Ave *Pedestrian Signal*	EBT	A	0.36	7.5	31.6	A	0.31	4.3	36.3
	Overall	**A**	**0.28**	**7.5**	-	**A**	**0.32**	**4.3**	-
Bank St & Catherine St *Signalized*	WB	D	0.86	33.3	**#69.1**	D	0.83	33.0	**#60.2**
	NBL/T	E	0.91	18.0	**m#34.1**	A	0.54	12.0	19.1
	SBT/R	B	0.64	26.4	46.7	E	0.92	**88.3**	**#92.8**
	Overall	**D**	**0.86**	**25.9**	-	**C**	**0.74**	**47.8**	-
Bank St & Chamberlain Ave /Isabella St *Signalized*	EBL/T	C	0.74	30.9	55.7	C	0.76	29.6	62.4
	EBR	A	0.19	2.3	3.4	A	0.28	5.3	10.5
	NBT/R	D	0.90	34.6	**#122.9**	A	0.35	10.2	34.8
	SBL(/T)	A	0.60	27.1	m31.4	C	0.79	26.8	m92.5
	(SBT)	A	0.41	9.5	m28.4				
	Overall	**C**	**0.80**	**27.6**	-	**D**	**0.87**	**22.4**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 0.90
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The existing intersections operate adequately during both peak hours.

At the intersection of Bank Street and Catherine Street during the AM peak hour the westbound movement and northbound shared left-turn/through movement may exhibit extended queues. During the PM peak hour at this intersection, the southbound through/right movement may be subject to high delays and extended queues, and the westbound movement may exhibit extended queues.

At the intersection of Bank Street at Chamberlain Avenue/Isabella Street during the AM peak hour, the northbound through/right movement may exhibit extended queues.

2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study are road network. Table 3 summarizes the collisions types and conditions in the study area, Figure 11 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data is included in Appendix D.

Table 3: Study Area Collision Summary, 2016-2020

		Number	%
Total Collisions		**62**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	10	16%
	Property Damage Only	52	84%
Initial Impact Type	**Angle**	17	27%
	Rear end	15	24%
	Sideswipe	19	31%
	Turning Movement	8	13%
	SMV Other	3	5%
Road Surface Condition	**Dry**	48	77%
	Wet	9	15%
	Loose Snow	3	5%
	Slush	1	2%
	Packed Snow	1	2%
Pedestrian Involved		1	2%
Cyclists Involved		1	2%

Figure 11: Study Area Collision Records

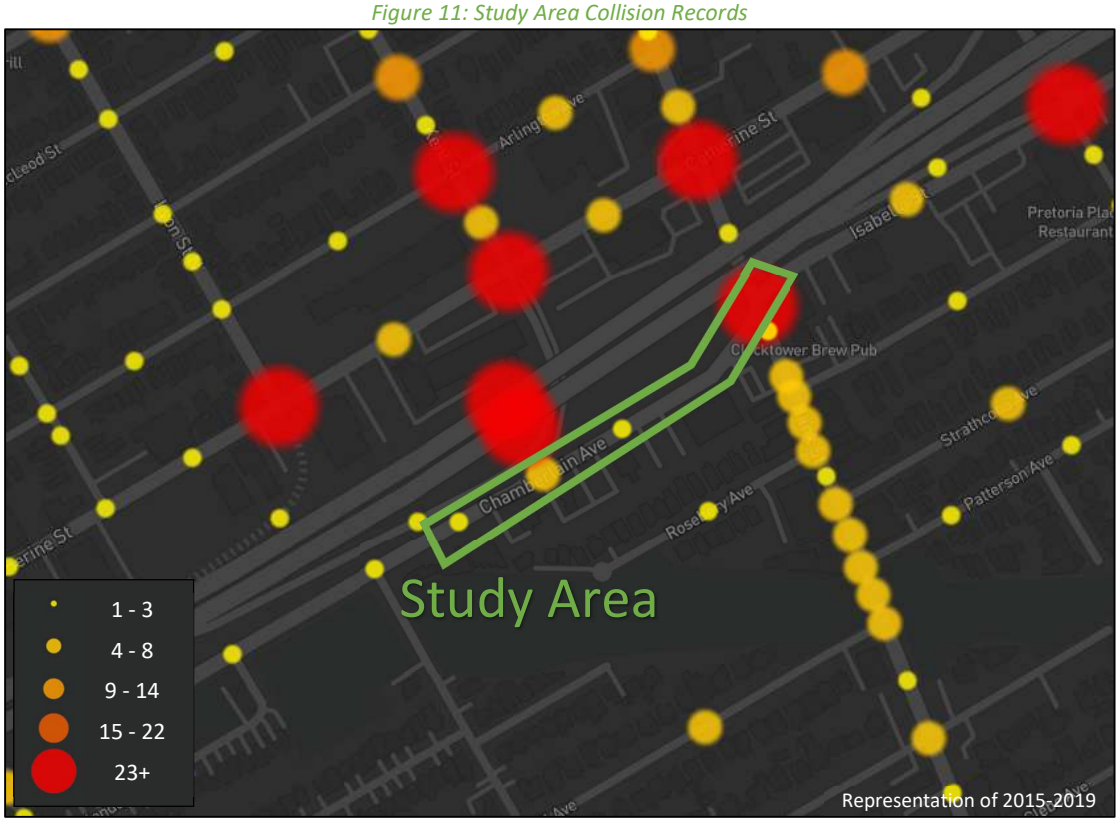


Table 4: Summary of Collision Locations, 2016-2020

	Number	%
Intersections / Segments	**62**	**100%**
Bank Street at Chamberlain Avenue N/Isabella Street	54	87%
Chamberlain Avenue at Kent Street	3	5%
Chamberlain Avenue btwn Kent Street & Bank Street	3	5%
Chamberlain Avenue btwn Lyon Street S & Kent Street	2	3%

Within the study area, the intersection of Bank Street at Chamberlain Avenue/Isabella is noted to show higher collision incidences relative to other area locations. Table 5 summarize the collision types and conditions for the Bank Street at Chamberlain Avenue/Isabella Street intersection.

Table 5: Bank Street at Chamberlain Avenue/Isabella Street Collision Summary

		Number	%
Total Collisions		**54**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	9	17%
	Property Damage Only	45	83%
Initial Impact Type	**Angle**	17	31%
	Rear end	13	24%
	Sideswipe	15	28%
	Turning Movement	8	15%
	SMV Other	1	2%
Road Surface Condition	**Dry**	42	78%
	Wet	8	15%
	Loose Snow	2	4%

		Number	%
Total Collisions		**54**	**100%**
	Slush	1	2%
	Packed Snow	1	2%
Pedestrian Involved		1	2%
Cyclists Involved		1	2%

The intersection of Bank Street and Chamberlain Avenue/Isabella Street had a total of 54 collisions during the 2016-2020 time period, with 45 involving property damage only, and the remaining nine having non-fatal injuries. The collision types are most represented by angle, with 17 collisions, followed by sideswipe with 15 collisions, rear end with 13, turning movement with eight, and SMV (other) with one.

Historically at this intersection, angle collisions have been primarily represented by southbound through vehicles failing to comply with traffic control colliding with eastbound through vehicles. The lagging left-turn phase in the southbound direction may contribute to this trend as drivers are habituated to continue to drive through after the protected left-turn phase terminates. Sideswipe collisions may partially be a result of southbound traffic switching lanes to get around left-turning vehicles in queue and have historically been mostly due to eastbound drivers making improper lane changes possibly due to the skewed crossing of Bank Street. Turning movement collisions have historically been due to the eastbound drivers turning left into eastbound drivers continuing through. Overall, it is recommended that the City explore the possible addition of “chicken tracking” through the intersection to ensure proper lane use and potentially reduce collisions in the eastbound direction.

Weather conditions do not impact collisions at this location and no mitigation or further review of collisions is required as part of this study.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

No roadway improvements are included within the Ottawa TMP for the study area road network. Isolated transit priority measures are identified as part of the Affordable Network along Bank Street.

The Chamberlain Avenue, Catherine Street, and Isabella Street Functional Design Study, conducted in 2019, is currently planned for implementation. The plan recommends several improvements on the subject streets including:

- Wider sidewalks and boulevards where feasible
- Cycling connections between the Rideau Canal and the O’Connor Bikeway
- Increased pedestrian queueing area at traffic signals
- Transit priority lane on part of Catherine Street
- Narrower vehicle lane widths
- Reduction in the number of vehicle lanes, where appropriate, including

This Functional Design is currently in the MTO Construction phase through 2027 seeing associated Highway 417 infrastructure under construction, where the design and construction of the plan recommendations will follow. As such, the implementation of these treatments will occur beyond the horizons considered within this TIA.

From the Draft Transportation Master Plan, anticipated for release in 2025, the Glebe Avenue to Percy Street to Chamberlain Avenue, splitting out to Isabella Street, Pretoria Avenue corridor and the O’Connor Street corridor are presently considered for future crosstown bikeways. Also from this draft document, a feasibility study is planned for cycling facilities within the Bank Street corridor south of Highway 417.

2.3.2 Other Study Area Developments

443-447 Kent Street & 423-425 McLeod Street

The proposed development includes a site plan for a four-storey residential building, with 31 apartment units. This application has been approved. A TIA is not available as part of the submission package for this site.

488, 500 Bank Street

The application includes a site plan for a nine-storey mixed use building, which includes 151 residential units and approximately 4350 sq. ft. of ground floor commercial. The development is expected to generate 24 new two-way AM peak hour auto trips and 25 new two-way PM peak hour auto trips (Parsons, 2014).

143-153 Arlington Avenue

The application includes a site plan for four-storey residential building, demolishing a previous building, representing a net increase of four units. A TIA is not available as part of the submission package for this site.

170 Pretoria Avenue

The application includes a site plan for a four-storey, six-unit residential building. A TIA is not available as part of the submission package for this site.

667 Bank Street

The application includes a site plan for a five-storey mixed-use building with 14 residential units, ground floor retail, and eight parking spaces. A TIA is not available as part of the submission package for this site.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of:

- Lyon Street/Highway 417 On-Ramp & Catherine Street
- Kent Street at:
    - Catherine Street
    - Chamberlain Avenue (pedestrian signal)
- Bank Street at:
    - Catherine Street
    - Chamberlain Avenue/Isabella Street

The boundary road is Chamberlain Avenue. No screenlines are present near the development site and none will be reviewed as part of this study.

The site access will not be explicitly modeled in the Synchro analysis, as it is to be located west of the proposed relocated stop bar of the half-signal on Chamberlain Avenue. The volumes projected at the site access will be added to the eastbound through volumes at the Kent Street at Chamberlain Avenue intersection.

3.2 Time Periods

The weekday AM and PM peak hours will be examined for the proposed development.

3.3 Horizon Years

The anticipated build-out year is 2024. As a result, the full build-out plus five years horizon year is 2029.

4 Exemption Review

Table 6 summarizes the exemptions for this TIA.

Table 6: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Required
	4.2.3 New Street Networks	Only required for plans of subdivision	Exempt
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Required
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Exempt
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Exempt
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Exempt

5 Development-Generated Travel Demand

5.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the existing average district mode shares by land use for Ottawa Inner Area have been summarized in Table 7.

Table 7: TRANS Trip Generation Manual Recommended Mode Shares – Ottawa Inner Area

Travel Mode	Multi-Unit (High-Rise)		Commercial Generator	
	AM	PM	AM	PM
Auto Driver	26%	25%	45%	45%
Auto Passenger	6%	8%	7%	7%
Transit	28%	21%	29%	29%
Cycling	5%	6%	8%	8%
Walking	35%	40%	11%	11%
Total	**100%**	**100%**	**100%**	**100%**

5.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020) and the vehicle trip rates and derived person trip rates for the retail component from the ITE Trip Generation Manual 11th Edition (2021) using the City-prescribed conversion factor of 1.28. Table

8 summarizes the person trip rates for the proposed residential land use for each peak period and the person trip rates for the retail land use by peak hour.

Table 8: Trip Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak	Peak Period		Peak Hour	
			Vehicle Trip Rate	Person Trip Rates	Vehicle Trip Rate	Person Trip Rates
Multi-Unit High-Rise	221 & 222 (TRANS)	AM	-	0.80	-	-
		PM	-	0.90	-	-
Retail <40k sq. ft.	822 (ITE)	AM	-	-	2.36	3.02
		PM	-	-	6.59	8.44

Using the above person trip rates, the total person trip generation has been estimated. Table 9 summarizes the total person trip generation for the residential land use and for the retail land use.

Table 9: Total Residential Person Trip Generation by Peak Period

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Multi-Unit High-Rise	160	40	88	128	84	60	144
Land Use	**GFA**	**AM Peak Hour**			**PM Peak Hour**		
		In	**Out**	**Total**	**In**	**Out**	**Total**
Retail <40k sq. ft.	3,370	6	4	10	14	14	28

Internal capture rates from the ITE Trip Generation Handbook 3rd Edition have been assigned to the development's retail component for mixed-use developments. The rates summarized in Table 10 represent the percentage of trips to/from the retail use based on the residential component.

Table 10: Internal Capture Rates

Land Use	AM		PM	
	In	Out	In	Out
Residential to/from Shopping Centre	17%	14%	10%	26%

Pass-by reductions applied to the retail trip generation at a rate of 40% have been included using the recommended value presented in the ITE Trip Generation Manual 11th Edition (2021) for the most similar land use with a recommended rate, "Retail (40k – 150k sq. ft.)".

Using the above mode share targets, the internal capture and pass-by rates, and the person trip rates, the person trips by mode have been projected. Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020) for the residential component. Table 11 summarizes the residential trip generation and the retail trip generation by mode and peak hour.

Table 11: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Multi-Unit (High-Rise)	Auto Driver	**26%**	5	11	16	**25%**	9	7	16
	Auto Passenger	**6%**	1	2	3	**8%**	3	2	5
	Transit	**28%**	6	14	20	**21%**	8	6	14
	Cycling	**5%**	1	2	3	**6%**	2	2	4
	Walking	**35%**	8	18	26	**40%**	18	12	30
	Total	**100%**	**21**	**47**	**68**	**100%**	**40**	**29**	**69**
Shopping Centre	Auto Driver	**45%**	0	0	0	**45%**	0	0	0
	Auto Passenger	**7%**	0	0	0	**7%**	1	1	2
	Transit	**29%**	1	1	2	**29%**	4	3	7
	Cycling	**8%**	0	0	0	**8%**	1	1	2
	Walking	**11%**	1	0	1	**11%**	1	1	2
	Pass-by	*40%*	*-2*	*-2*	*-4*	*40%*	*-6*	*-6*	*-12*
	Internal Capture	*varies*	*-1*	*0*	*-1*	*varies*	*-1*	*-2*	*-3*
	Total	**100%**	**2**	**1**	**3**	**100%**	**7**	**6**	**13**
Total	Auto Driver	-	5	11	16	-	9	7	16
	Auto Passenger	-	1	2	3	-	4	3	7
	Transit	-	7	15	22	-	12	9	21
	Cycling	-	1	2	3	-	3	3	6
	Walking	-	9	18	27	-	19	13	32
	Total	-	**23**	**48**	**71**	-	**47**	**35**	**82**

As shown above, a total of 16 AM and 16 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.3 Trip Distribution

To understand the travel patterns of the subject development the OD Survey has been reviewed to determine the travel for the residential component patterns were applied based on the build-out of Ottawa Inner. Table 12 below summarizes the distributions.

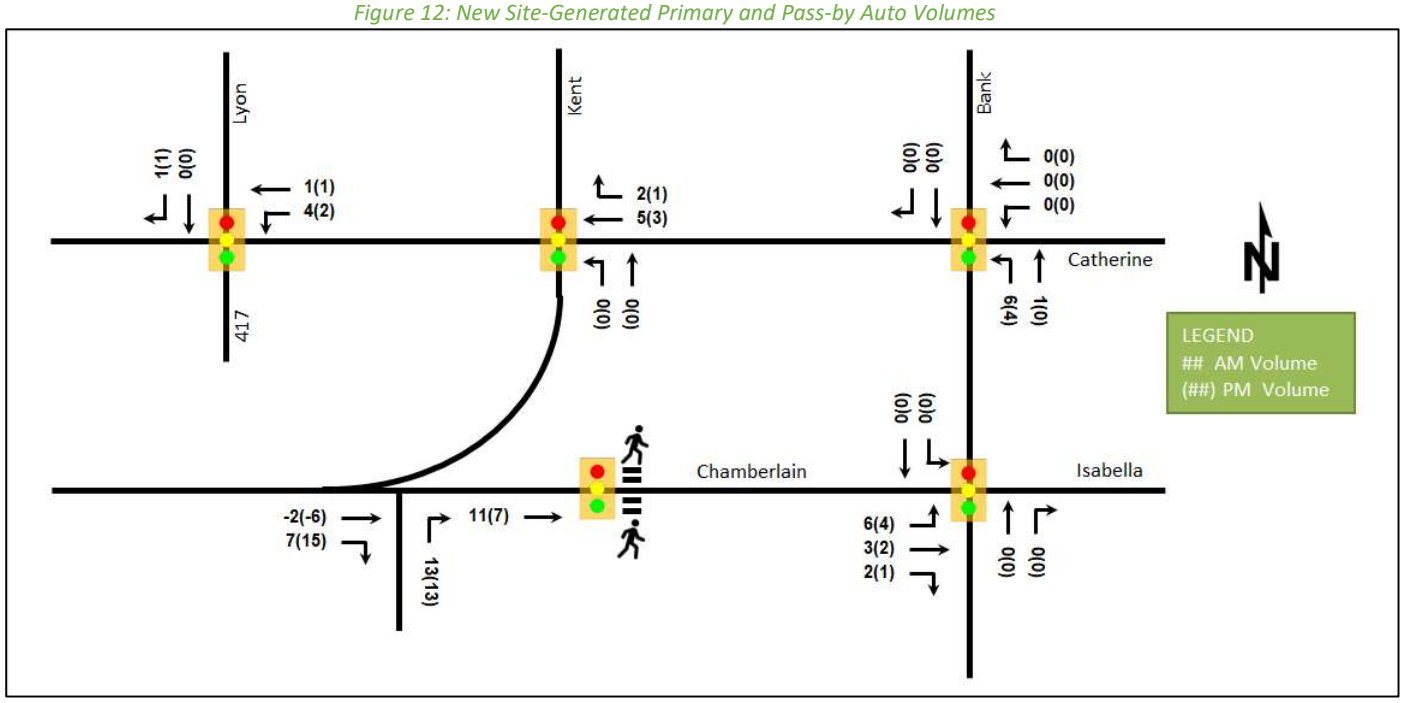
Table 12: OD Survey Distribution – Ottawa Inner

To/From	% of Trips	Via (Outbound/Inbound)
North	25%	15% Kent St/Lyon St, 5 % Bank St, 5% Metcalfe St/O'Connor St
South	35%	15% 417 W, 20% Bank St
East	20%	417 E
West	20%	417 W
Total	100%	-

5.4 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the study area road network. Figure 12 illustrates the new site generated volumes.

Figure 12: New Site-Generated Primary and Pass-by Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. No substantial changes are planned for the study area within the study horizons of this TIA.

6.2 Background Growth

A review of the background projections from the City's TRANS Regional Model for the 2011 and 2031 horizons was completed to determine the background growth for each of the study area roadways. Table 13 summarizes the results of the model, and the projections are provided in Appendix E.

Table 13: TRANS Regional Model Projections – Study Area Growth Rates

Street	Direction Growth Percentage	
	Eastbound	**Westbound**
Catherine (E of Bank)	N/A	-0.04%
Catherine (W of Bank)	N/A	-0.22%
Chamberlain	1.43%	N/A
Isabella	2.16%	N/A
	Northbound	**Southbound**
Lyon	N/A	0.56%
Hwy 417 Ramp	2.19%	-0.16%
Kent	0.54%	-
Bank	-0.02%	0.88%

In general, the TRANS projections identify a growth rate range of -0.22% and 2.19%. Appropriate growth rates rounded to the nearest 0.25% will be peak-directionally applied to the identified links with negative growth rates being applied at zero. In the case of one-way streets, the peak direction reversal will be applied to the

corresponding opposite-direction one-way street (e.g. the Lyon Street AM growth rate will be applied as the Kent Street PM growth rate). The resultant growth rates applied to the study area roads are summarized in Table 14.

Table 14: Applied Study Area Annual Growth Rates

Street	AM Peak Hour		PM Peak Hour	
	Eastbound	Westbound	Eastbound	Westbound
Catherine (E of Bank)	N/A	-	N/A	2.25%
Catherine (W of Bank)	N/A	-	N/A	1.50%
Chamberlain	1.50%	N/A	-	N/A
Isabella	2.25%	N/A	-	N/A
	Northbound	**Southbound**	**Northbound**	**Southbound**
Lyon	N/A	0.50%	N/A	0.50%
Hwy 417 Ramp	N/A	-	N/A	2.25%
Kent	0.50%	N/A	0.50%	N/A
Bank	-	1.00%	1.00%	-

6.3 Other Developments

The background developments were discussed in Section 6.2. The 488, 500 Bank Street development's 2014 Transportation Memo concluded that the development-generated traffic would be insignificant and thus it will be assumed to be accounted for by the background traffic growth, along with the other study area developments for which there were no traffic studies.

7 Demand Rationalization

7.1 2024 Future Background Operations

Figure 13 illustrates the 2024 background volumes and Table 15 summarizes the 2024 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets for the 2024 future background horizon are provided in Appendix F.

Figure 13: 2024 Future Background Volumes

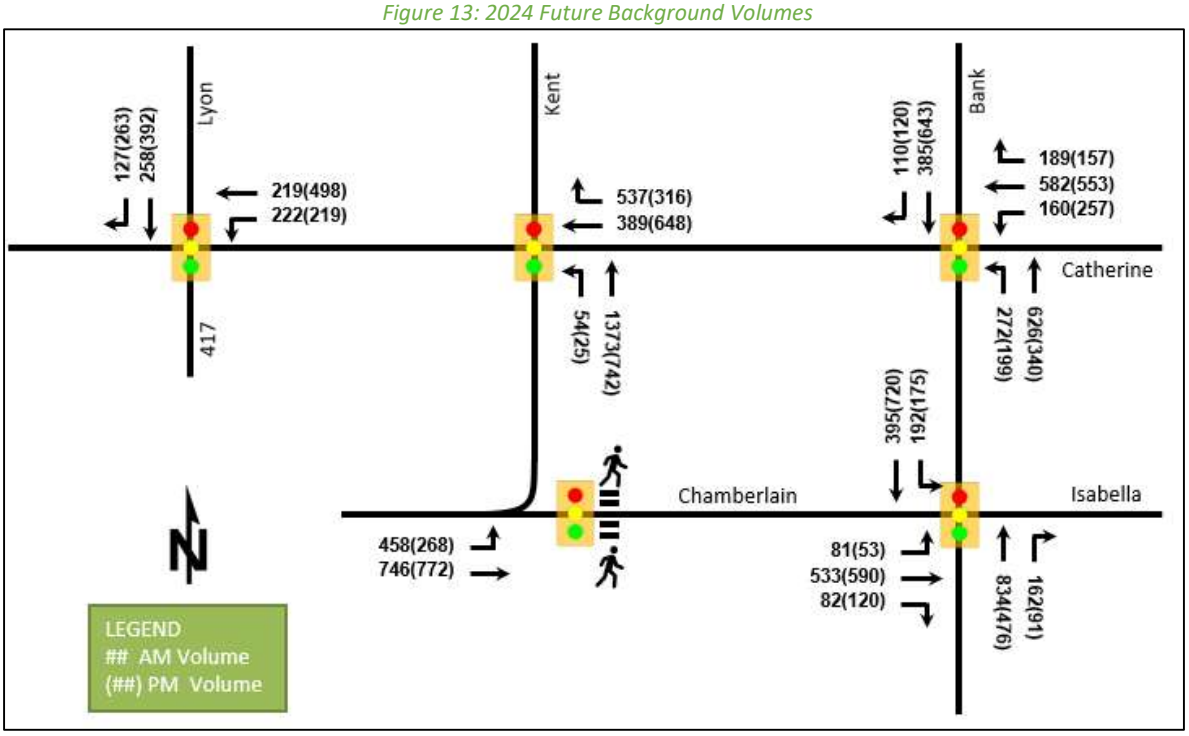


Table 15: 2024 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Lyon St/Highway 417 On-Ramp & Catherine St ***Signalized***	WBL/T	A	0.20	10.5	26.1	A	0.47	16.1	12.0
	SBT	A	0.37	18.1	42.7	A	0.40	11.1	47.0
	SBR	A	0.19	3.9	9.2	A	0.31	6.5	22.7
	Overall	**A**	**0.25**	**11.9**	-	**A**	**0.41**	**12.8**	-
Kent St & Catherine St ***Signalized***	WBT/R	B	0.62	26.3	m60.6	A	0.50	14.3	m41.1
	WBR	B	0.66	30.1	m57.1	A	0.53	16.6	m37.1
	NB	B	0.69	18.5	69.8	A	0.45	18.0	37.2
	Overall	**B**	**0.64**	**22.0**	-	**A**	**0.46**	**16.3**	-
Kent St & Chamberlain Ave ***Pedestrian Signal***	EBT	A	0.36	7.5	31.0	A	0.28	4.3	32.2
	Overall	**A**	**0.27**	**7.5**	-	**A**	**0.29**	**4.3**	-
Bank St & Catherine St ***Signalized***	WB	C	0.77	28.6	54.9	D	0.85	34.4	**#66.1**
	NBL/T	D	0.81	12.0	m28.8	A	0.53	12.2	18.9
	SBT/R	A	0.60	25.6	43.9	D	0.84	37.4	**#80.1**
	Overall	**C**	**0.77**	**21.5**	-	**C**	**0.71**	**30.1**	-
Bank St & Chamberlain Ave /Isabella St ***Signalized***	EBL/T	C	0.73	30.7	54.8	C	0.71	29.0	55.3
	EBR	A	0.19	2.2	3.3	A	0.26	4.7	8.7
	NBT/R	D	0.82	28.8	**#107.6**	A	0.32	9.4	32.7
	SBL(/T)	A	0.57	24.6	m33.3	B	0.68	16.2	m88.0
	(SBT)	A	0.39	9.1	m27.6				
	Overall	**C**	**0.75**	**24.6**	-	**C**	**0.77**	**17.6**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

During both the AM and PM peak hours, the study area intersections operate well at the 2024 future background conditions with operational improvements from existing at all intersections due to the peak hour factor moving from 0.90 to 1.00 for forecasted conditions. No new capacity issues are noted.

7.2 2029 Future Background Operations

Figure 14 illustrates the 2029 background volumes and Table 16 summarizes the 2029 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets for the 2029 future background horizon are provided in Appendix G.

Figure 14: 2029 Future Background Volumes

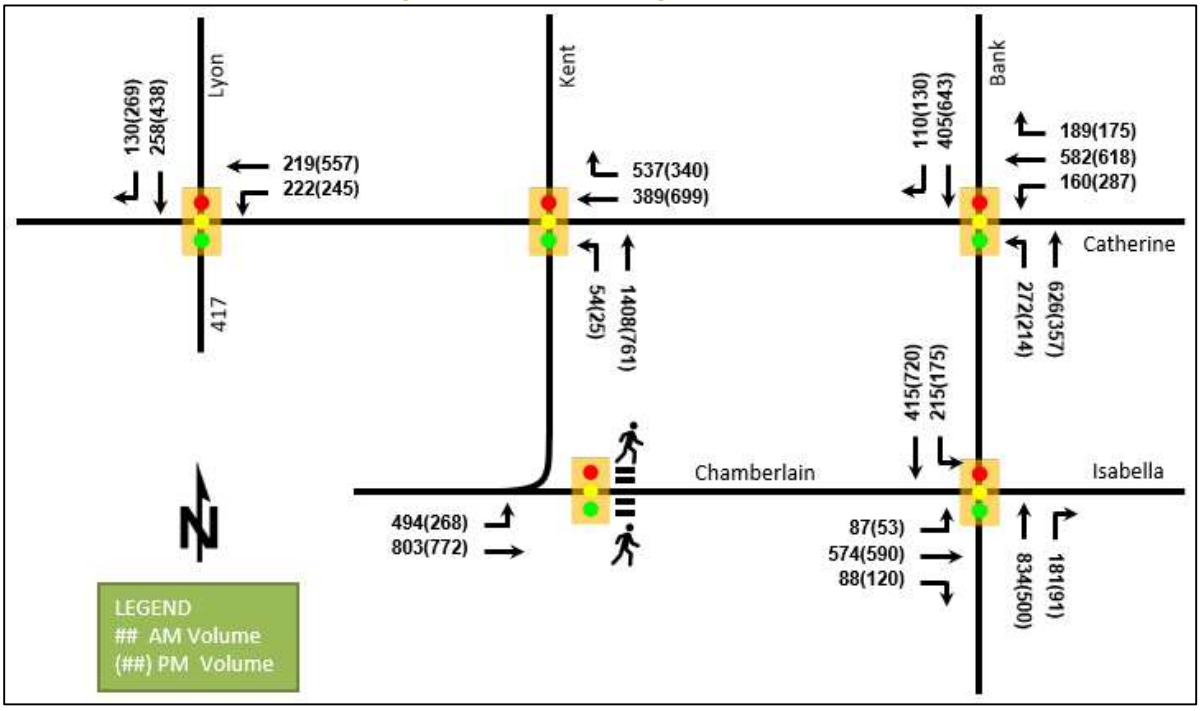


Table 16: 2029 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Lyon St/Highway 417 On-Ramp & Catherine St ***Signalized***	WBL/T	A	0.20	10.5	26.1	A	0.53	16.7	15.2
	SBT	A	0.37	18.1	42.7	A	0.45	11.8	53.9
	SBR	A	0.20	3.9	9.3	A	0.32	7.6	25.7
	Overall	**A**	**0.25**	**11.8**	-	**A**	**0.47**	**13.6**	-
Kent St & Catherine St ***Signalized***	WBT/R	B	0.62	26.2	m60.3	A	0.54	15.4	m40.3
	WBR	B	0.66	30.0	m56.8	A	0.57	17.8	m36.9
	NB	B	0.70	18.8	72.3	A	0.46	18.2	38.3
	Overall	**B**	**0.65**	**22.1**	-	**A**	**0.49**	**17.0**	-
Kent St & Chamberlain Ave ***Pedestrian Signal***	EBT	A	0.38	7.5	33.7	A	0.28	4.3	32.2
	Overall	**A**	**0.29**	**7.5**	-	**A**	**0.29**	**4.3**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Bank St & Catherine St *Signalized*	WB	C	0.77	28.6	54.9	E	0.95	45.5	**#79.9**
	NBL/T	D	0.82	12.0	m24.2	A	0.57	12.6	20.0
	SBT/R	B	0.63	26.4	46.2	D	0.86	39.1	**#81.8**
	Overall	**C**	**0.77**	**21.7**	-	**C**	**0.76**	**35.7**	-
Bank St & Chamberlain Ave /Isabella St *Signalized*	EBL/T	C	0.76	31.1	59.6	C	0.71	29.0	55.3
	EBR	A	0.19	2.5	4.2	A	0.26	4.7	8.7
	NBT/R	D	0.86	31.9	**#110.8**	A	0.33	9.6	34.4
	SBL(/T)	B	0.66	30.0	**m#41.0**	B	0.69	16.7	m84.2
	(SBT)	A	0.42	9.9	m28.6				
	Overall	**C**	**0.80**	**26.6**	-	**B**	-	**17.7**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

During both the AM and PM peak hours, the study area intersections operate well at the 2029 future background conditions and similarly to the 2024 background conditions.

At the intersection of Bank Street at Chamberlain Avenue/Isabella Street, the southbound left lane may exhibit extended queues.

7.3 2024 Future Total Operations

Figure 15 illustrates the 2024 total volumes and Table 17 summarizes the 2024 total intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection The synchro worksheets for the 2024 total horizon are provided in Appendix H.

Figure 15: 2024 Future Total Volumes

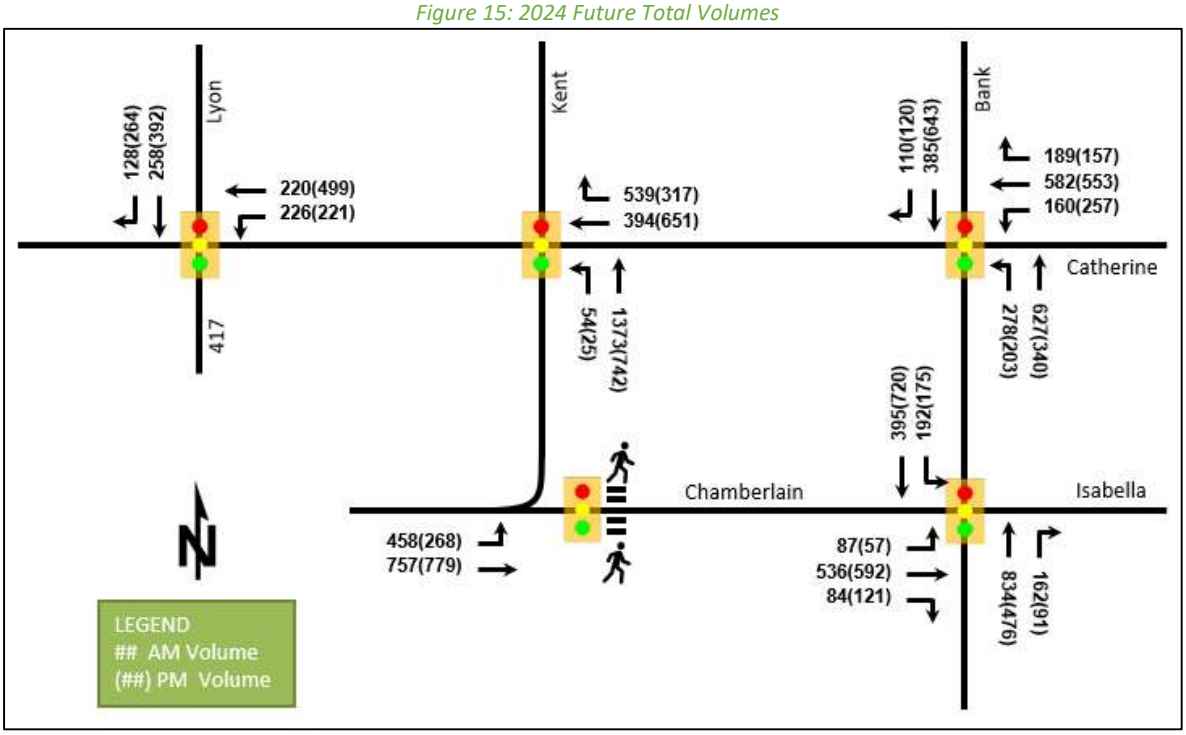


Table 17: 2024 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Lyon St/Highway 417 On-Ramp & Catherine St ***Signalized***	WBL/T	A	0.20	10.5	26.4	A	0.47	16.0	11.9
	SBT	A	0.37	18.1	42.7	A	0.40	11.1	47.0
	SBR	A	0.20	3.9	9.2	A	0.31	6.6	22.8
	Overall	**A**	**0.25**	**11.8**	-	**A**	**0.41**	**12.8**	-
Kent St & Catherine St ***Signalized***	WBT/R	B	0.63	26.2	m60.7	A	0.51	14.4	m41.5
	WBR	B	0.66	30.0	m56.8	A	0.53	16.7	m37.4
	NB	B	0.69	18.5	69.8	A	0.45	18.0	37.2
	Overall	**B**	**0.64**	**22.0**	-	**A**	**0.46**	**16.4**	-
Kent St & Chamberlain Ave ***Pedestrian Signal***	EBT	A	0.36	7.5	31.6	A	0.28	4.3	32.5
	Overall	**A**	**0.28**	**7.5**	-	**A**	**0.29**	**4.3**	-
Bank St & Catherine St ***Signalized***	WB	C	0.77	28.6	54.9	D	0.85	34.4	**#66.1**
	NBL/T	D	0.82	12.3	m29.3	A	0.54	12.2	19.2
	SBT/R	A	0.60	25.6	43.9	D	0.84	37.4	**#80.1**
	Overall	**C**	**0.77**	**21.6**	-	**C**	**0.71**	**30.1**	-
Bank St & Chamberlain Ave /Isabella St ***Signalized***	EBL/T	C	0.74	30.9	55.7	C	0.72	29.1	55.7
	EBR	A	0.19	2.3	3.5	A	0.26	4.7	8.7
	NBT/R	D	0.83	29.0	**#107.6**	A	0.32	9.5	32.7
	SBL(/T)	A	0.57	24.8	m33.4	B	0.69	16.3	m88.0
	(SBT)	A	0.39	9.2	m27.6				
	Overall	**C**	**0.76**	**24.8**	-	**C**	**0.77**	**17.7**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The network intersection operations for the 2024 future total horizon operate similarly to the 2024 future background conditions. No capacity issues are noted, and no mitigation measures are required.

7.4 2029 Future Total Operations

Figure 16 illustrates the 2029 total volumes and Table 18 summarizes the 2029 total intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2029 future total horizon are provided in Appendix I.

Figure 16: 2029 Future Total Volumes

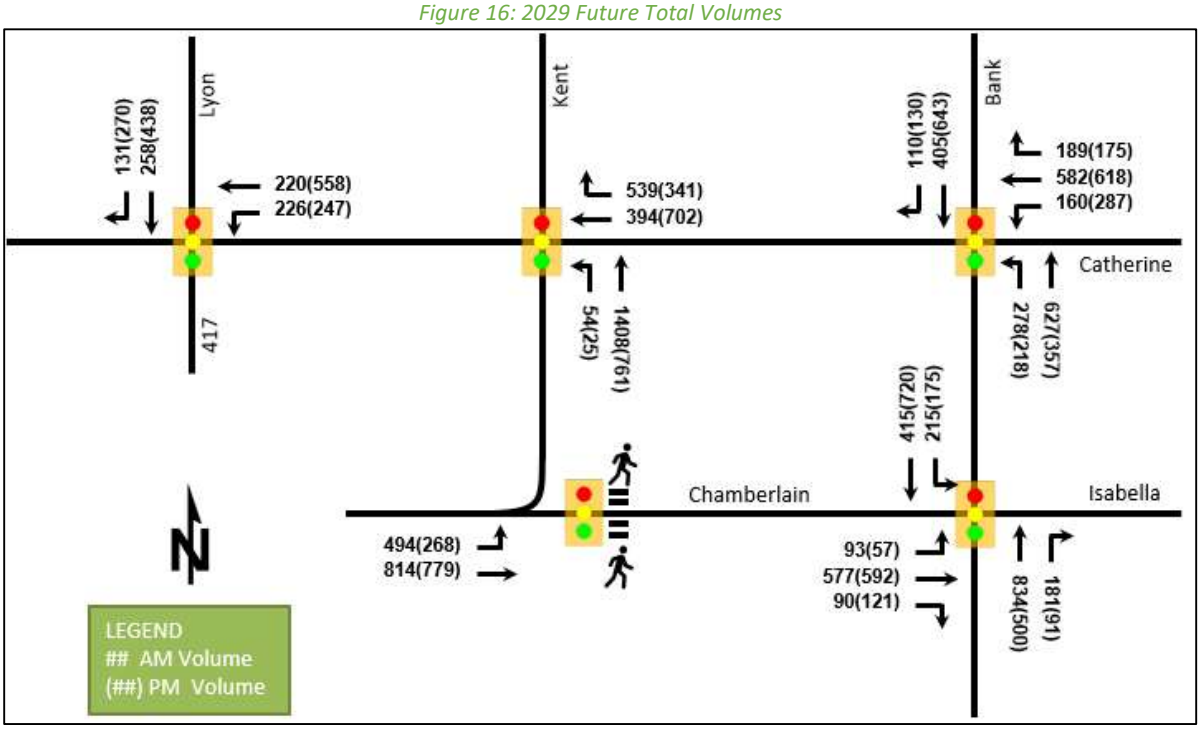


Table 18: 2029 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Lyon St/Highway 417 On-Ramp & Catherine St ***Signalized***	WBL/T	A	0.20	10.5	26.4	A	0.53	16.6	15.1
	SBT	A	0.37	18.1	42.7	A	0.45	11.8	53.9
	SBR	A	0.20	3.9	9.3	A	0.32	7.6	25.8
	Overall	**A**	**0.25**	**11.8**	-	**A**	**0.47**	**13.6**	-
Kent St & Catherine St ***Signalized***	WBT/R	B	0.63	26.1	m60.7	A	0.55	15.5	m40.7
	WBR	B	0.66	29.9	m56.7	A	0.57	17.8	m37.1
	NB	B	0.70	18.8	72.3	A	0.46	18.2	38.3
	Overall	**B**	**0.65**	**22.1**	-	**A**	**0.49**	**17.0**	-
Kent St & Chamberlain Ave ***Pedestrian Signal***	EBT	A	0.38	7.5	34.2	A	0.28	4.3	32.5
	Overall	**A**	**0.30**	**7.5**	-	**A**	**0.29**	**4.3**	-
Bank St & Catherine St ***Signalized***	WB	C	0.77	28.6	54.9	E	0.95	45.5	**#79.9**
	NBL/T	D	0.82	12.2	m24.6	A	0.57	12.6	20.3
	SBT/R	B	0.63	26.4	46.2	D	0.86	39.1	**#81.8**
	Overall	**C**	**0.78**	**21.8**	-	**C**	**0.76**	**35.7**	-
Bank St & Chamberlain Ave /Isabella St ***Signalized***	EBL/T	C	0.76	31.3	60.6	C	0.72	29.1	55.7
	EBR	A	0.20	2.6	4.4	A	0.26	4.7	8.7
	NBT/R	D	0.87	32.3	**#110.8**	A	0.34	9.6	34.4
	SBL(/T)	B	0.66	30.2	**m#41.1**	B	0.69	16.7	m84.2
	(SBT)	A	0.42	9.9	m28.6				
	Overall	**C**	**0.80**	**26.8**	-	**C**	**0.78**	**17.8**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The network intersection operations for the 2029 future total horizon operate similarly to the 2029 future background conditions. No capacity issues are noted, and no mitigation measures are required.

7.5 Modal Share Sensitivity and Demand Rationalization Conclusions

No capacity issues have been noted at the study area intersections. Given this residual capacity, no rationalization for network demand is required.

With respect to site travel demand, negligible impacts are forecast from the low number of auto trips using the unmodified district mode shares. Thus, no rationalization for site-generated travel is required.

8 Development Design

8.1 Design for Sustainable Modes

Bicycle parking within secure rooms and auto parking are both located within the underground parking garage, and hard surface connections are provided from the building entrance to existing area pedestrian facilities. Bicycle parking is also provided via surface racks at the rear of the building and surface vehicle parking accesses the drive aisle.

All area transit stops for routes discussed in Section 2.2.5 are within 400 metres walk of the building entrance. The existing bus stop, partially located within the site driveway, is envisioned to shift westerly to the 54 Chamberlain Avenue frontage. The site plan can accommodate a shift of the bus stop east of the site where no frontage conflicts exist access should future improvements to Chamberlain Avenue by the City of Ottawa require the flexibility to relocate the stop for the ultimate condition.

The infrastructure TDM checklist is provided in Appendix J.

8.2 Circulation and Access

Vehicular and cycling access is provided via a right-in-right-out access onto Chamberlain Avenue, adjacent to the relocated stop bar for the Chamberlain Avenue pedestrian signal. The stop bar is proposed to shift approximately 6.6 metres to the east. The access will maintain the minimum offset requirements for the signals to stop bar distance.

Emergency and services are anticipated to access the site along the Chamberlain Avenue frontage. The site does not support a turn-around, either loop or hammerhead, therefore the garbage collection will take place within the drive aisle with the garbage truck entering the site in a forward direction and exiting the site in reverse with a two-person operation including the driver and a flag person outside of the truck. This operation is typical for urban sites and constrained lot dimensions.

9 Parking

9.1 Parking Supply

The site proposes 163 bicycle parking spaces including 15 at-grade, 76 on P1, and 72 on P2. The site will also provide 77 vehicle parking spaces in total, with seven vehicle spaces within the surface lot and the remaining 70 spaces underground.

The typical parking requirements from the zoning by-law indicate that 80 bicycle and 55 vehicle spaces are required for tenants, 15 vehicle spaces are required for visitors, and a minimum of seven vehicle spaces are required for the commercial space based upon the assumption of a retail store.

The total vehicle parking requirement of 77 spaces is therefore proposed as being met by the development, and the typical bicycle parking provision is proposed as being exceeded by a factor of two.

10 Boundary Street Design

Table 19 summarizes the MMLOS analysis for the boundary street of Chamberlain Avenue. The existing and future conditions for the segment will be considered in separate rows. The boundary street analysis is based on the policy area of "Within 200m of a school". The MMLOS worksheets has been provided in Appendix K.

Table 19: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Chamberlain Avenue (Existing)	F	A	E	D	D	D	A	E
Chamberlain Avenue (Future)	D	A	A	D	D	D	A	E

Chamberlain Avenue along the site frontage does not meet the pedestrian and cycling MMLOS targets. Pedestrian LOS is not met due to the lack of boulevard, the sidewalk width, and high operating speeds and volumes on the arterial road. If the sidewalk were increased from 1.8 metres to 2.0 metres with a 0.5 metre boulevard or more, the segment would score PLOS D, due to the nature of arterial roads. Bicycle LOS targets are not met in the existing conditions given the lack of dedicated cycling facilities along the site frontage. Mixed traffic conditions limit transit LOS.

Per the Chamberlain Avenue, Catherine Street and Isabella Street Functional Design Study, the currently planned future conditions for Chamberlain Avenue include a MUP to replace the sidewalk on the south side of the road separated from the road's edge by a 1.5 metre boulevard. This treatment will improve bicycle LOS to a score of A, meeting targets, and improve pedestrian LOS to a score of D, still failing to meet targets. This treatment is due to occur outside of the time horizons considered by this report.

11 Access Intersections Design

11.1 Location and Design of Access

The proposed site access intersects Chamberlain Avenue just east of Kent Street and just west of a relocated stop line of the half-signal which controls though-movements to permit pedestrian crossings of its crosswalk.

The right-in/right-out access is proposed as being 6.0 metres-wide and right-in/right-out with a throat length between the back of sidewalk and the first point of conflict of 6.4-metres and a distance between the roadway edge and first point of conflict of 8.2 metres. In the ultimate conditions with the proposed Chamberlain Avenue, Catherine Street, and Isabella Street Functional Design Study geometry, the roadway edge is expected to be located approximately 3.1 metres further from the first on-site conflict.

The clear throat length for the access is below the suggested minimum value of 25 metres from Table 8.9.3 of the Geometric Design Guide for Canadian Roadways (Transportation Association of Canada (TAC), 2017) for a residential development of between 100-200 units accessing an arterial road. It is notable that the parcel is only 30.6 metres deep, and the referenced suggestion could not be met in any condition given required setbacks and aisle widths. While it cannot be met, the throat length has been balanced for the site depth, parking requirements and access design. Additionally, the existing properties includes three two-way accesses on Chamberlain Avenue, each with no clear throat length. Ultimately, during the PM peak hour when the highest number of trips are forecast, the inbound trips are anticipated to be 15 vehicles and outbound trips are anticipated to be 13 vehicles. These volumes average out to one vehicle entering or exiting every four-to-five minutes. Overall, spillback onto

Chamberlain Avenue is not anticipated from the site, and space is provided for a vehicle to queue within the driveway without conflict. Therefore, the proposed throat is considered adequate to permit expected site operations without impacts to the arterial roadway.

11.2 Intersection Control

Given the access is a private approach driveway, minor stop control is proposed on the site access approach.

11.3 Access Intersection Design

11.3.1 2024 & 2029 Future Total Access Intersection Operations

The access intersection is anticipated to operate well at both future horizons being right-in/right-out and having 15 or fewer forecasted inbound or outbound movement during a peak hour. No further analysis is required.

11.3.2 Access Intersection MMLOS

As the access intersection is not signalized, no access intersection MMLOS analysis is required.

11.3.3 Recommended Design Elements

The private approach driveway will require a depressed curb and sidewalk through the access, the relocation of the existing bus stop, and reinstatement of any accesses removed to full curb height. No further modifications are required from a transportation perspective.

Notwithstanding the analysis above, the City of Ottawa has proposed two possible changes to Chamberlain Avenue along the site frontage.

1. As a traffic calming measure on the arterial road, the City has identified a concrete median extension on the corner of the free-flow lane from Chamberlain Avenue to northbound to Kent Street. This effectively changes a portion of the existing painted gore area to a raised concrete median. This will have no change for site entry or egress and would be removed once Chamberlain Avenue improvements are made in the future.
2. To provide more space between the stop bar and the signal heads for the midblock pedestrian crossing, the City has identified the relocation of the existing signals eastward on Chamberlain Avenue. The stop bar would be shifted to a 1 metre offset from the existing crosswalk, the existing crosswalk remain in the current location and new poles would be at a 15-metre spacing from the new stop bar location. It is unknown if the signal locations will be retained in the future.

The concept sketch for the new median is provided in Appendix J and the concept sketch of the signal pole relocation is provided in Appendix K.

12 Transportation Demand Management

12.1 Context for TDM

The existing area modal shares have been applied without modification, with the district of Ottawa Inner already relying heavily on active modes and transit. As such, modal shares are likely to be achieved. However additional TDM measures could be employed to help ensure this outcome, and to support a further shift from auto mode selection.

Total bedrooms across the 150 proposed units within the development is subject to the final unit count and layout selections by purchasers. No age restrictions are noted.

12.2 Need and Opportunity

As stated previously, existing area modal shares have been applied to site generated trips, and therefore, modal share targets should be achieved. Additionally, given the capacity of the study area intersections, deviation from target modal shares will not unduly impact network operations.

12.3 TDM Program

The "suite of post occupancy TDM measures" has been summarized in the TDM checklists for the residential land uses. The checklist is provided in Appendix L. The key TDM measures recommended include:

- Display relevant transit schedules and route maps at entrances
- Provide a multimodal travel option information package to new employees/residents
- Inclusion of a 1-month Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
- Unbundle parking cost from purchase or rental costs

13 Transit

13.1 Route Capacity

In Section 5.1 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 20 summarizes the transit trip generation.

Table 20: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Transit	varies	7	15	22	12	9	21

The proposed development is anticipated to generate an additional 22 two-way AM peak hour transit trips and 21 two-way PM peak hour transit trips. From the trip distribution found in section 5.2, these values can be further broken down. Table 21 summarizes forecasted site-generated transit ridership trips by direction, the routes that are impacted, and the equivalent bus loads.

Table 21: Forecasted Site-Generated Transit Ridership

Direction	AM Peak Hour		PM Peak Hour		Service Type	Approximate Equivalent Peak Hour/Direction Bus Loads
	In	Out	In	Out		
North	2	4	3	2	Bus	Negligible
South	2	5	4	3	Bus	Negligible
East	1	3	2	2	Bus	Negligible
West	1	3	2	2	Bus	Negligible

13.2 Transit Priority

Negligible impacts on area transit are forecast due to site-generated vehicle traffic or site-generated transit ridership. No change in transit LOS is forecast on any approach between the future background and the future total conditions.

14 Network Intersection Design

14.1 Network Intersection Control

No change to the existing signalized control is recommended for the network intersections.

14.2 Network Intersection Design

14.2.1 Future Total Network Intersection Operations

The operations are noted in Section 7.4 and the network intersections at both the 2024 and 2029 future total are anticipated to operate similarly to the background conditions. Negligible impacts from site auto volumes are anticipated.

14.2.2 Network Intersection MMLOS

Table 22 summarizes the MMLOS analysis for the network intersections of Lyon Street/Highway 417 On-Ramp at Catherine Street, Kent Street at Catherine Street, Bank Street at Catherine Street, and Bank Street at Chamberlain Avenue/Isabella Street. The future conditions include the improvements from the Chamberlain Avenue, Catherine Street and Isabella Street Functional Design Study and where the intersections score differently from the existing conditions, they are considered in separate rows. The intersection analysis is based on the policy area of "Within 300m of a school". The MMLOS worksheets have been provided in Appendix M.

Table 22: Study Area Intersection MMLOS Analysis

Intersection		Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
		PLOS	Target	BLOS	Target	TLOS	Target	TkLOS	Target	ALOS	Target
Lyon St & Catherine St	Ex.	B	A	A	D	C	D	-	-	A	E
	Fut.	A	A	A	D	C	D	-	-	A	E
Kent St & Catherine St	Ex.	D	A	F	D	D	D	D	D	B	E
	Fut.	B	A	F	D	D	D	D	D	B	E
Kent St & Chamberlain Ave	Ex.	A	A	F	D	B	D	-	-	A	E
	Fut.	A	A	E	D	B	D	-	-	A	E
Bank St & Catherine St	Ex.	C	A	E	B	F	D	D	D	D	E
	Fut.	C	A	E	B	F	D	D	D	C	E
Bank St & Chamberlain Ave/ Isabella St	Ex.	C	A	D	B	E	D	D	D	D	E
	Fut.	C	A	B	B	E	D	D	D	C	E

The MMLOS targets will only be met for pedestrian LOS at Kent Street at Chamberlain Avenue for both the existing and future upgrade conditions and at Lyon Street at Catherine Street once the future upgrades are complete. The bicycle LOS targets will only be met at the intersections of Lyon Street at Catherine Street for both the existing and future upgrade conditions, and Bank Street at Chamberlain Avenue/Isabella Street once future upgrades are in place. Transit LOS targets will not be met at the intersection of Bank Street at Catherine Street and Bank Street and Chamberlain Avenue/Isabella Street for both the existing and future upgrade conditions.

Given the functional design study, the ultimate pedestrian and bicycle LOS at the study area intersections are assumed to be in line with City objectives and balancing of objectives to achieve the overall MMLOS goals of the area. To meet transit LOS, all movements associated with transit routes would require a delay of less than 30 seconds. No changes to network intersections are proposed as part of this study.

14.2.3 Recommended Design Elements

No study area intersection design elements are proposed as part of this study.

15 Summary of Improvements Indicated and Modifications Options

The following summarizes the analysis and results presented in this TIA report:

Proposed Site and Screening

- The proposed site includes 160 apartment units and 3,370 sq. ft. of ground floor retail
- A two-way access will be provided onto Chamberlain Avenue
- The development is proposed to be completed as a single phase by 2024
- The Trip Generation, Location, and Safety triggers were met for the TIA Screening
- This report supports a site plan application

Existing Conditions

- Bank Street, Kent Street, Lyon Street, Catherine Street, Chamberlain Avenue, and Isabella Street are arterial roads in the study area
- Sidewalks are generally provided on both sides of the study area roadways, and on-street bike lanes on Lyon Street and Chamberlain Avenue until Kent Street, Lyon Street and Catherine Street are spine routes, and Bank Street is a local route
- The high volumes roadways have produced a high number of collisions at the study area intersections, primarily at the Bank Street at Chamberlain Avenue/Isabella Street intersection
- The collisions are predominantly angled and sideswipe collisions and have historically been the result of failure to comply with traffic control for angled collisions, and improper lane changes for sideswipe collisions
- Some extended queuing is noted in the peak north-south direction at the Bank Street and Catherine Street intersection in the AM peak hour and Bank Street and Chamberlain Avenue intersection in the PM peak hour, but generally the intersections operate adequately

Development Generated Travel Demand

- The proposed development is forecasted produce 71 two-way people trips during the AM peak hour and 82 two-way people trips during the PM peak hour
- Of the forecasted people trips, 16 two-way trips will be vehicle trips during the AM peak hour and 16 two-way trips will be vehicle trips during the PM peak hour based on a 25-26% residential auto mode share target
- Of the forecasted trips, 25% are anticipated to travel north, 35% to travel south, and 20% to travel each east and west

Background Conditions

- No background developments were explicitly included in the background conditions due to insignificant traffic generation, and volumes were grown along mainline and major turning movements commensurate with growth shown on the appropriate links from the TRANS model projections
- The operations at all study area intersections are expected to be similar to the existing conditions at both future background horizons

Development Design

- Parking for bicycles and autos are each proposed within an underground garage, with limited spaces also present on the surface
- Pedestrian connections will be made from the building entrance to the sidewalk along the site frontage via a hard surface treatment and all area transit routes are within 400 m walk of the building entrance
- A bus stop on the site frontage is recommended to be relocated approximately 3 metres to the west

- The stop bar for the half-signal on Chamberlain Avenue is proposed to shift approximately 6.6 metres to the east and maintain the minimum offset of 12 metres from the nearest signal head
- Garbage collection is anticipated via the site drive aisle with the garbage truck entering in a forward manner and exiting in a reverse manner with a two-person operation including a driver and a flag person, and emergency services are anticipated to access the site via the public road frontage

Parking

- The proposed vehicle parking provision is 77 spaces, and the proposed bicycle parking provision is 160 spaces
- The typical minimum parking provision from the zoning by-law for the site is 77 vehicle spaces and 80 bicycle spaces, and these minimums are each being met

Boundary Street Design

- The boundary street does not currently meet pedestrian MMLOS targets due to sidewalk and boulevard widths along Chamberlain Avenue as well as auto volumes and posted speed limits
- Bicycle MMLOS does not currently meet targets
- Improvements from the Chamberlain Avenue, Catherine Street and Isabella Street Functional Design Study will not meet pedestrian LOS target but will meet bicycle LOS

Access Intersections Design

- A two-way right-in/right-out access is proposed on the west side of the relocated pedestrian signal stop bar at the pedestrian signal on Chamberlain Avenue
- The access is assumed to be stop controlled on its approach
- The access is considered to have adequate throat length with spillback not anticipated onto Chamberlain Avenue
- Intersection operations at the site access are anticipated to perform well given the low volumes and right-in/right-out operation

TDM

- Supportive TDM measures to be included within the proposed development should include:
  - Display relevant transit schedules and route maps at entrances
  - Provide a multimodal travel option information package to new employees/residents
  - Inclusion of a 1-month Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
  - Unbundle parking cost from purchase or rental costs

Transit

- Negligible impacts are forecast on the area transit routes from site-generated ridership increases or site-generated auto traffic delays

Network Intersection Design

- Generally, the network intersections at both future total horizons will operate similarly to the network intersections at the future background horizons
- Pedestrian LOS targets will only be met at Kent Street at Chamberlain Avenue for both the existing and future upgrade conditions and at Lyon Street at Catherine Street once the future upgrades are complete

- Bicycle LOS targets will only be met at the intersections of Lyon Street at Catherine Street for both the existing and future upgrade conditions, and Bank Street at Chamberlain Avenue/Isabella Street once future upgrades are in place
- Transit LOS targets will not be met at the intersection of Bank Street at Catherine Street and Bank Street and Chamberlain Avenue/Isabella Street for both the existing and future upgrade conditions
- Given the functional design study for the network intersections, it is assumed that the future conditions will mee the City's desired balance of MMLOS trade-offs

16 Conclusion

It is recommended that, from a transportation perspective, the proposed development application proceed.

Prepared By:

John Kingsley
Transportation Engineering-Intern

Reviewed By:

Andrew Harte, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

13 Markham Avenue
Ottawa ON K2G 3Z1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 29-Apr-20
Project Number: 2020-40
Project Reference: 30-48 Chamberlain Avenue

1.1 Description of Proposed Development	
Municipal Address	30-48 Chamberlain Avenue
Description of Location	Existing medical and business buildings, predominantly parking lot area (>60% of surface)
Land Use Classification	General Mixed-Use - GM4
Development Size	148 residential units, 4,184 sq.ft. commercial/resident, 96 parking spaces
Accesses	Two access loop, existing locations
Phase of Development	Single phase
Buildout Year	2024
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	148	Units
Trip Generation Trigger	Yes	

1.3 Location Triggers	
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	No
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No
Location Trigger	No

1.4. Safety Triggers		
Are posted speed limits on a boundary street 80 km/hr or greater?	No	
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No	
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?	Yes	
Is the proposed driveway within auxiliary lanes of an intersection?	No	
Does the proposed driveway make use of an existing median break that serves an existing site?	No	
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	No	High area collisions noted along the Bank St and Catherine St corridors.
Does the development include a drive-thru facility?	No	
Safety Trigger	Yes	

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering √ or transportation planning □.

[1,2] License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.

City Of Ottawa
Infrastructure Services and Community Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Ville d'Ottawa
Services d 'infrastructure et Viabilité des collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

Dated at ___Ottawa_____ this __20__ day of _____September_____, 2018.
(City)

Name: _____Andrew Harte_____
(Please Print)

Professional Title: _____Professional Engineer_____

_____
Signature of Individual certifier that s/he meets the above four criteria

Office Contact Information (Please Print)
Address: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com

Appendix B

Turning Movement Counts

Transportation Services - Traffic Services

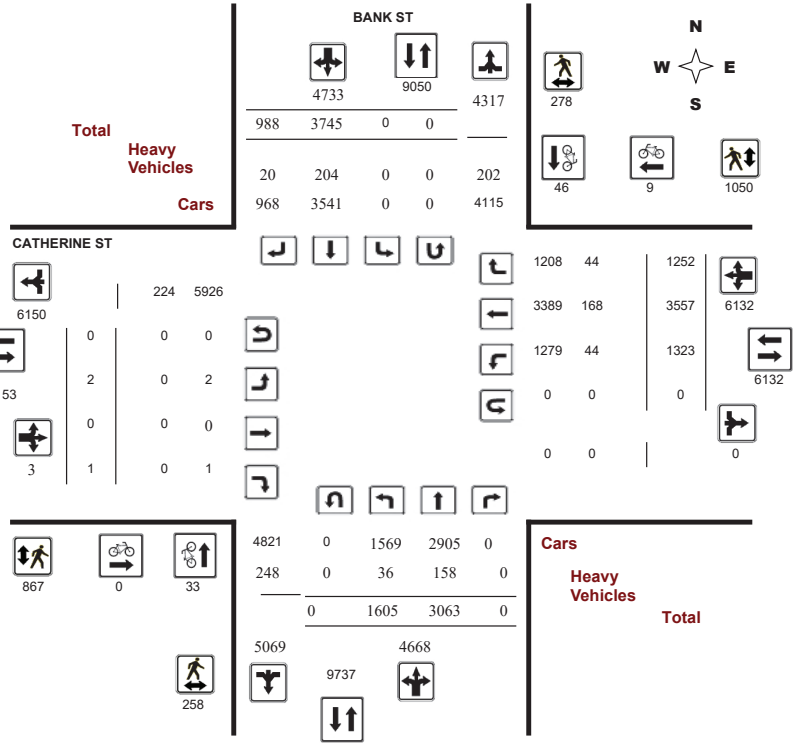
Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

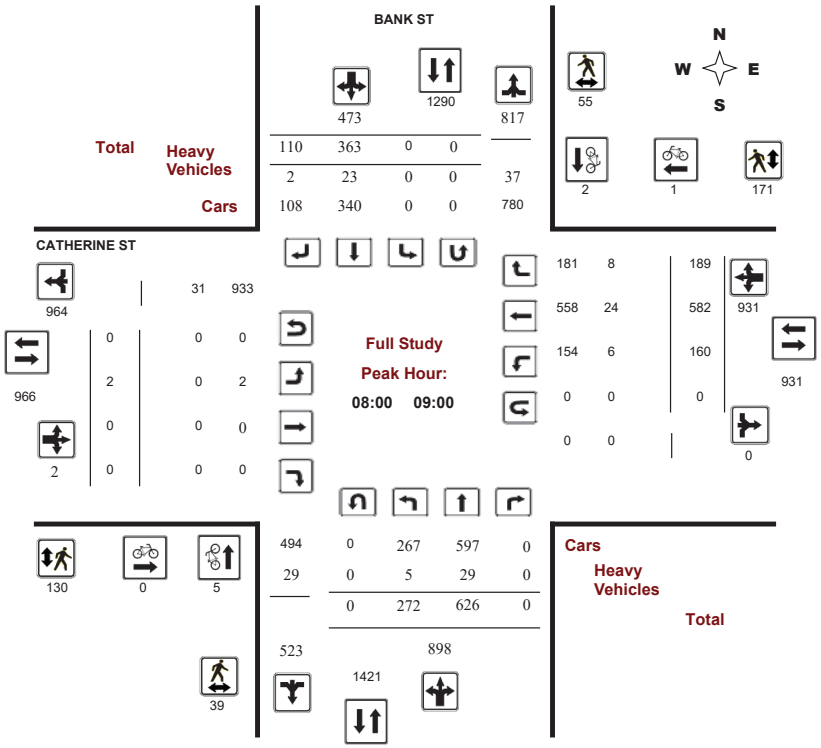
Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



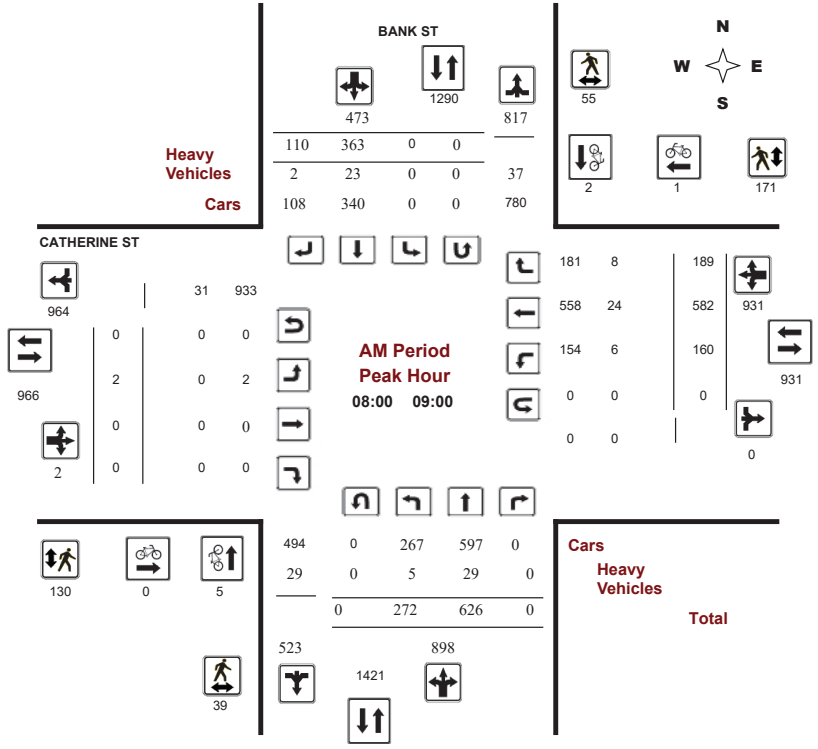
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision



Comments

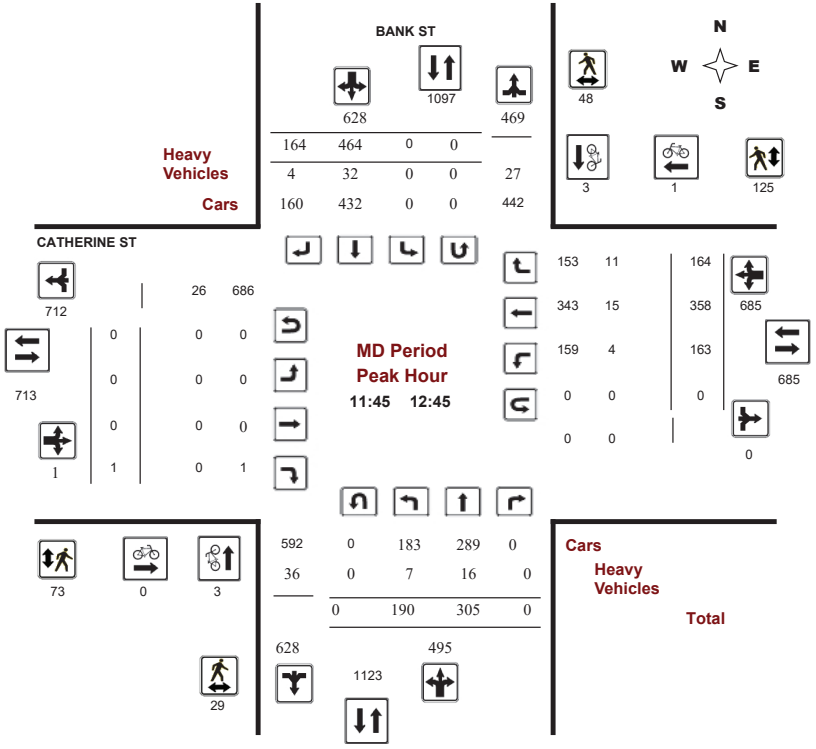
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision



Comments

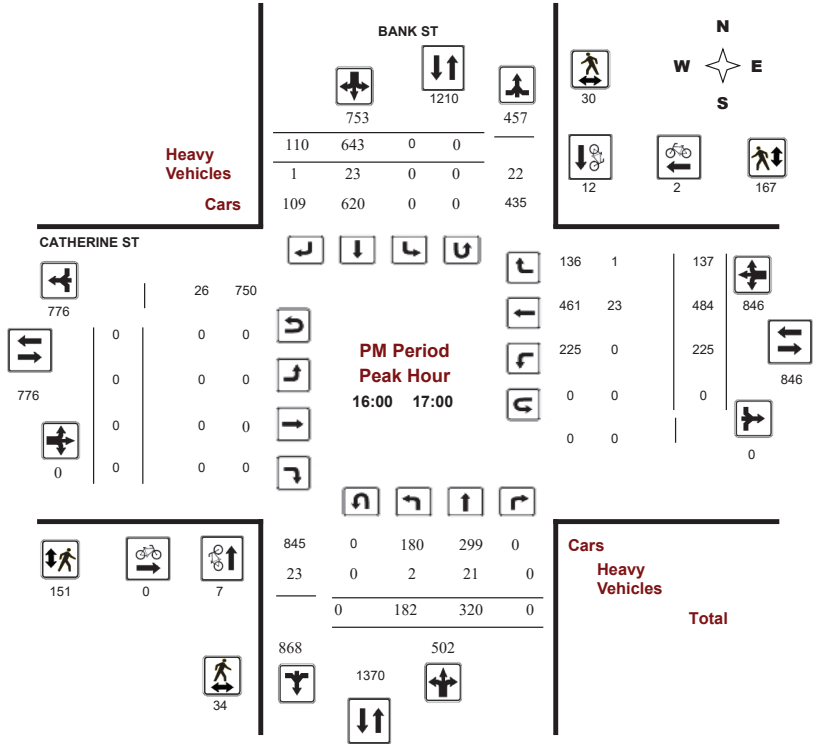
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, April 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor .90

	BANK ST								CATHERINE ST								
	Northbound				Southbound				Eastbound				Westbound				
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	215	508	0	**723**	0	270	82	**352**	**1075**	0	0	0	**0**	96	544	162	**802**	**802**	**1877**
08:00 09:00	272	626	0	**898**	0	363	110	**473**	**1371**	2	0	0	**2**	160	582	189	**931**	**933**	**2304**
09:00 10:00	207	341	0	**548**	0	387	127	**514**	**1062**	0	0	0	**0**	154	441	176	**771**	**771**	**1833**
11:30 12:30	190	316	0	**506**	0	474	129	**603**	**1109**	0	0	1	**1**	179	343	149	**671**	**672**	**1781**
12:30 13:30	185	305	0	**490**	0	433	179	**612**	**1102**	0	0	0	**0**	124	306	176	**606**	**606**	**1708**
15:00 16:00	181	321	0	**502**	0	523	132	**655**	**1157**	0	0	0	**0**	166	509	126	**801**	**801**	**1958**
16:00 17:00	182	320	0	**502**	0	643	110	**753**	**1255**	0	0	0	**0**	225	484	137	**846**	**846**	**2101**
17:00 18:00	173	326	0	**499**	0	652	119	**771**	**1270**	0	0	0	**0**	219	348	137	**704**	**704**	**1974**
Sub Total	1605	3063	0	**4668**	0	3745	988	**4733**	**9401**	2	0	1	**3**	1323	3557	1252	**6132**	**6135**	**15536**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	1605	3063	0	**4668**	0	3745	988	**4733**	**9401**	2	0	1	**3**	1323	3557	1252	**6132**	**6135**	**15536**
EQ 12Hr	2231	4258	0	**6489**	0	5206	1373	**6579**	**13067**	3	0	1	**4**	1839	4944	1740	**8523**	**8528**	**21595**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	2008	3832	0	**5840**	0	6137	1619	**5921**	**11760**	3	0	1	**4**	1655	4450	1566	**7671**	**7675**	**19436**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**.90**					
AVG 24Hr	2630	5020	0	**7650**	0	8039	2121	**7757**	**15406**	4	0	1	**5**	2168	5830	2051	**10049**	**10054**	**25461**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		BANK ST									CATHERINE ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	44	88	0	132	0	54	21	75	207	0	0	0	0	25	134	36	195	195	402
07:15	07:30	38	98	0	136	0	56	15	71	207	0	0	0	0	24	127	46	197	197	404
07:30	07:45	63	161	0	224	0	81	31	112	336	0	0	0	0	23	128	36	187	187	523
07:45	08:00	70	161	0	231	0	79	15	94	325	0	0	0	0	24	155	44	223	223	548
08:00	08:15	65	156	0	221	0	86	31	117	338	0	0	0	0	46	151	50	247	247	585
08:15	08:30	74	165	0	239	0	82	28	110	349	0	0	0	0	31	134	54	219	219	568
08:30	08:45	72	158	0	230	0	99	31	130	360	0	0	0	0	47	149	42	238	238	598
08:45	09:00	61	147	0	208	0	96	20	116	324	2	0	0	2	36	148	43	227	229	553
09:00	09:15	59	105	0	164	0	94	30	124	288	0	0	0	0	37	123	34	194	194	482
09:15	09:30	53	78	0	131	0	110	27	137	268	0	0	0	0	31	119	61	211	211	479
09:30	09:45	49	83	0	132	0	102	34	136	268	0	0	0	0	45	102	34	181	181	449
09:45	10:00	46	75	0	121	0	81	36	117	238	0	0	0	0	41	97	47	185	185	423
11:30	11:45	46	81	0	127	0	119	18	137	264	0	0	0	0	45	77	33	155	155	419
11:45	12:00	50	87	0	137	0	98	36	134	271	0	0	0	0	49	91	36	176	176	447
12:00	12:15	44	79	0	123	0	121	41	162	285	0	0	0	0	37	77	49	163	163	448
12:15	12:30	50	69	0	119	0	136	34	170	289	0	0	1	1	48	98	31	177	178	467
12:30	12:45	46	70	0	116	0	109	53	162	278	0	0	0	0	29	92	48	169	169	447
12:45	13:00	52	82	0	134	0	105	48	153	287	0	0	0	0	29	67	44	140	140	427
13:00	13:15	40	80	0	120	0	109	38	147	267	0	0	0	0	33	66	36	135	135	402
13:15	13:30	47	73	0	120	0	110	40	150	270	0	0	0	0	33	81	48	162	162	432
15:00	15:15	51	89	0	140	0	101	41	142	282	0	0	0	0	51	111	30	192	192	474
15:15	15:30	48	83	0	131	0	143	40	183	314	0	0	0	0	32	127	29	188	188	502
15:30	15:45	34	76	0	110	0	134	27	161	271	0	0	0	0	38	146	36	220	220	491
15:45	16:00	48	73	0	121	0	145	24	169	290	0	0	0	0	45	125	31	201	201	491
16:00	16:15	58	92	0	150	0	150	28	178	328	0	0	0	0	56	144	32	232	232	560
16:15	16:30	44	73	0	117	0	177	32	209	326	0	0	0	0	48	149	31	228	228	554
16:30	16:45	40	75	0	115	0	164	23	187	302	0	0	0	0	52	108	31	191	191	493
16:45	17:00	40	80	0	120	0	152	27	179	299	0	0	0	0	69	83	43	195	195	494
17:00	17:15	40	86	0	126	0	174	31	205	331	0	0	0	0	49	85	37	171	171	502
17:15	17:30	47	90	0	137	0	169	33	202	339	0	0	0	0	59	94	30	183	183	522
17:30	17:45	46	71	0	117	0	148	30	178	295	0	0	0	0	54	91	36	181	181	476
17:45	18:00	40	79	0	119	0	161	25	186	305	0	0	0	0	57	78	34	169	169	474
Total:		1605	3063	0	4668	0	3745	988	4733	9401	2	0	1	3	1323	3557	1252	6132	6135	15,536

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

		BANK ST			CATHERINE ST			
Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	1	1	0	0	0	1
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	2	0	2	0	0	0	2
07:45	08:00	0	1	1	0	0	0	1
08:00	08:15	1	0	1	0	0	0	1
08:15	08:30	0	1	1	0	1	1	2
08:30	08:45	1	0	1	0	0	0	1
08:45	09:00	3	1	4	0	0	0	4
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	1	1	0	0	0	1
09:30	09:45	1	0	1	0	0	0	1
09:45	10:00	0	1	1	0	0	0	1
11:30	11:45	1	1	2	0	0	0	2
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	2	0	2	0	1	1	3
12:15	12:30	1	3	4	0	0	0	4
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	0	1	1	0	0	0	1
13:00	13:15	0	1	1	0	0	0	1
13:15	13:30	1	1	2	0	0	0	2
15:00	15:15	1	4	5	0	1	1	6
15:15	15:30	2	3	5	0	2	2	7
15:30	15:45	2	1	3	0	0	0	3
15:45	16:00	2	2	4	0	0	0	4
16:00	16:15	2	4	6	0	1	1	7
16:15	16:30	0	0	0	0	1	1	1
16:30	16:45	3	5	8	0	0	0	8
16:45	17:00	2	3	5	0	0	0	5
17:00	17:15	1	2	3	0	1	1	4
17:15	17:30	1	4	5	0	0	0	5
17:30	17:45	3	4	7	0	1	1	8
17:45	18:00	1	1	2	0	0	0	2
Total		33	46	**79**	0	9	9	88

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period	BANK ST NB Approach (E or W Crossing)	BANK ST SB Approach (E or W Crossing)	BANK ST Total	CATHERINE ST EB Approach (N or S Crossing)	CATHERINE ST WB Approach (N or S Crossing)	CATHERINE ST Total	Grand Total
07:00 07:15	3	2	**5**	7	14	**21**	**26**
07:15 07:30	7	6	**13**	8	18	**26**	**39**
07:30 07:45	2	4	**6**	19	21	**40**	**46**
07:45 08:00	5	6	**11**	23	19	**42**	**53**
08:00 08:15	6	8	**14**	21	38	**59**	**73**
08:15 08:30	10	24	**34**	23	44	**67**	**101**
08:30 08:45	13	18	**31**	53	51	**104**	**135**
08:45 09:00	10	5	**15**	33	38	**71**	**86**
09:00 09:15	14	6	**20**	13	21	**34**	**54**
09:15 09:30	4	7	**11**	12	22	**34**	**45**
09:30 09:45	4	13	**17**	16	16	**32**	**49**
09:45 10:00	6	11	**17**	31	18	**49**	**66**
11:30 11:45	8	0	**8**	11	25	**36**	**44**
11:45 12:00	6	10	**16**	11	35	**46**	**62**
12:00 12:15	7	14	**21**	24	40	**64**	**85**
12:15 12:30	8	14	**22**	19	15	**34**	**56**
12:30 12:45	8	10	**18**	19	35	**54**	**72**
12:45 13:00	12	8	**20**	23	30	**53**	**73**
13:00 13:15	7	4	**11**	29	32	**61**	**72**
13:15 13:30	10	8	**18**	20	30	**50**	**68**
15:00 15:15	6	10	**16**	20	26	**46**	**62**
15:15 15:30	12	18	**30**	80	28	**108**	**138**
15:30 15:45	6	9	**15**	20	32	**52**	**67**
15:45 16:00	6	2	**8**	21	33	**54**	**62**
16:00 16:15	6	4	**10**	22	33	**55**	**65**
16:15 16:30	10	6	**16**	40	50	**90**	**106**
16:30 16:45	9	10	**19**	36	47	**83**	**102**
16:45 17:00	9	10	**19**	53	37	**90**	**109**
17:00 17:15	14	9	**23**	34	47	**81**	**104**
17:15 17:30	14	7	**21**	41	63	**104**	**125**
17:30 17:45	10	13	**23**	45	54	**99**	**122**
17:45 18:00	6	2	**8**	40	38	**78**	**86**
Total	258	278	**536**	867	1050	**1917**	**2453**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

Time Period		BANK ST Northbound LT	ST	RT	N TOT	BANK ST Southbound LT	ST	RT	S TOT	STR TOT	CATHERINE ST Eastbound LT	ST	RT	E TOT	CATHERINE ST Westbound LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	1	6	0	**16**	0	6	1	**14**	**30**	0	0	0	**11**	3	9	1	**13**	**24**	**27**
07:15	07:30	1	7	0	**15**	0	5	0	**12**	**27**	0	0	0	**6**	2	5	0	**7**	**13**	**20**
07:30	07:45	3	4	0	**12**	0	4	1	**9**	**21**	0	0	0	**10**	1	6	0	**7**	**17**	**19**
07:45	08:00	0	6	0	**12**	0	6	0	**13**	**25**	0	0	0	**5**	0	5	1	**6**	**11**	**18**
08:00	08:15	4	3	0	**15**	0	7	1	**15**	**30**	0	0	0	**13**	1	8	4	**13**	**26**	**28**
08:15	08:30	1	5	0	**13**	0	6	0	**12**	**25**	0	0	0	**5**	1	4	1	**6**	**11**	**18**
08:30	08:45	0	8	0	**17**	0	5	1	**15**	**32**	0	0	0	**8**	4	7	1	**12**	**20**	**26**
08:45	09:00	0	13	0	**18**	0	5	0	**20**	**38**	0	0	0	**5**	0	5	2	**7**	**12**	**25**
09:00	09:15	2	7	0	**21**	0	9	0	**17**	**38**	0	0	0	**7**	3	5	1	**9**	**16**	**27**
09:15	09:30	5	5	0	**21**	0	9	3	**21**	**42**	0	0	0	**13**	2	5	4	**11**	**24**	**33**
09:30	09:45	1	6	0	**20**	0	10	1	**19**	**39**	0	0	0	**6**	3	4	2	**9**	**15**	**27**
09:45	10:00	2	2	0	**21**	0	13	0	**16**	**37**	0	0	0	**8**	4	6	1	**11**	**19**	**28**
11:30	11:45	0	3	0	**14**	0	7	1	**13**	**27**	0	0	0	**6**	4	5	2	**11**	**17**	**22**
11:45	12:00	4	4	0	**18**	0	8	1	**14**	**32**	0	0	0	**6**	2	1	1	**4**	**10**	**21**
12:00	12:15	0	7	0	**13**	0	5	0	**17**	**30**	0	0	0	**3**	1	3	5	**9**	**12**	**21**
12:15	12:30	3	2	0	**19**	0	13	1	**18**	**37**	0	0	0	**11**	1	7	2	**10**	**21**	**29**
12:30	12:45	0	3	0	**9**	0	6	2	**14**	**23**	0	0	0	**6**	0	4	3	**7**	**13**	**18**
12:45	13:00	1	5	0	**13**	0	4	1	**12**	**25**	0	0	0	**2**	3	0	2	**5**	**7**	**16**
13:00	13:15	3	3	0	**13**	0	6	1	**10**	**23**	0	0	0	**7**	1	3	0	**4**	**11**	**17**
13:15	13:30	1	5	0	**14**	0	6	0	**13**	**27**	0	0	0	**5**	2	4	2	**8**	**13**	**20**
15:00	15:15	1	4	0	**12**	0	5	3	**14**	**26**	0	0	0	**15**	2	11	2	**15**	**30**	**28**
15:15	15:30	1	3	0	**13**	0	8	1	**14**	**27**	0	0	0	**11**	1	9	2	**12**	**23**	**25**
15:30	15:45	0	2	0	**4**	0	2	0	**5**	**9**	0	0	0	**12**	0	12	1	**13**	**25**	**17**
15:45	16:00	0	8	0	**17**	0	8	0	**17**	**34**	0	0	0	**6**	1	6	1	**8**	**14**	**24**
16:00	16:15	0	6	0	**10**	0	4	0	**10**	**20**	0	0	0	**9**	0	9	0	**9**	**18**	**19**
16:15	16:30	1	5	0	**12**	0	6	1	**13**	**25**	0	0	0	**9**	0	7	1	**8**	**17**	**21**
16:30	16:45	1	6	0	**16**	0	9	0	**15**	**31**	0	0	0	**6**	0	5	0	**5**	**11**	**21**
16:45	17:00	0	4	0	**8**	0	4	0	**8**	**16**	0	0	0	**2**	0	2	0	**2**	**4**	**10**
17:00	17:15	0	4	0	**9**	0	5	0	**9**	**18**	0	0	0	**4**	0	4	0	**4**	**8**	**13**
17:15	17:30	0	2	0	**9**	0	5	0	**8**	**17**	0	0	0	**1**	2	1	1	**4**	**5**	**11**
17:30	17:45	0	7	0	**13**	0	6	0	**13**	**26**	0	0	0	**4**	0	4	0	**4**	**8**	**17**
17:45	18:00	0	3	0	**5**	0	2	0	**6**	**11**	0	0	0	**2**	0	2	1	**3**	**5**	**8**
Total:	None	36	158	0	**442**	0	204	20	**426**	**868**	0	0	0	**224**	44	168	44	**256**	**480**	**674**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CATHERINE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40743

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		BANK ST Northbound U-Turn Total	BANK ST Southbound U-Turn Total	CATHERINE ST Eastbound U-Turn Total	CATHERINE ST Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0

Transportation Services - Traffic Services

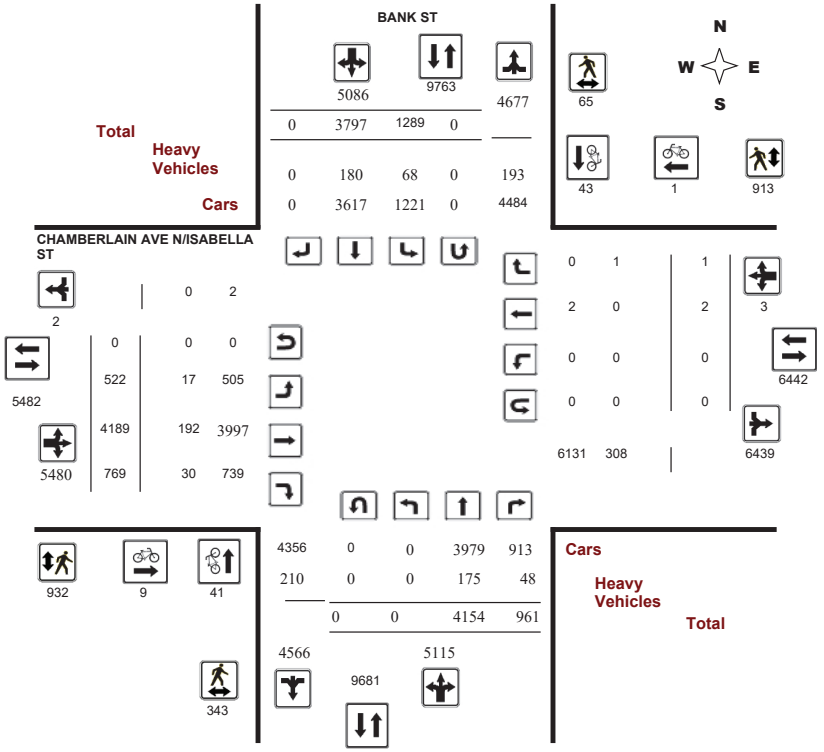
Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

Transportation Services - Traffic Services

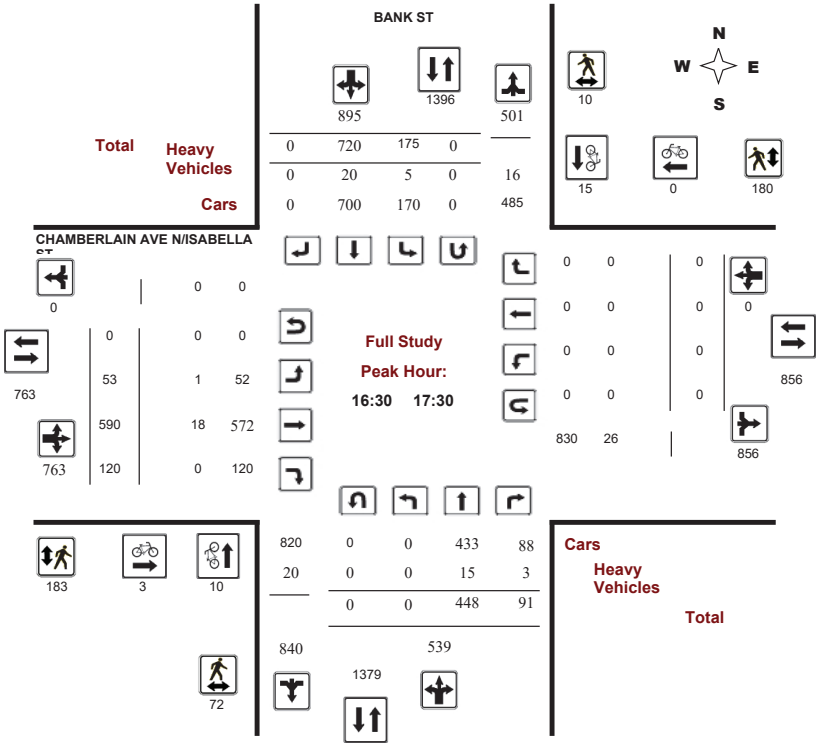
Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

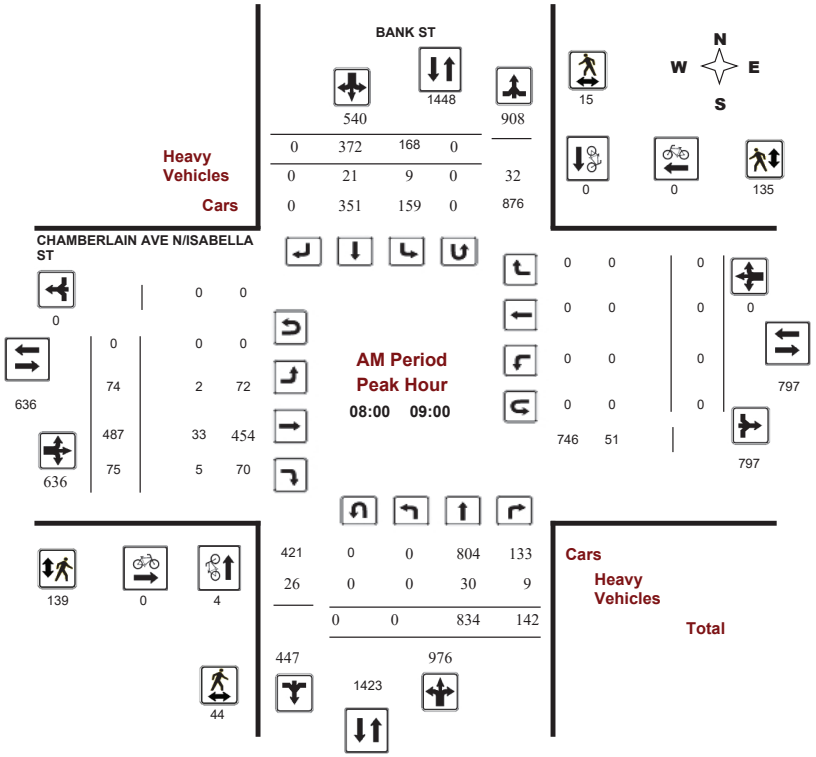
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

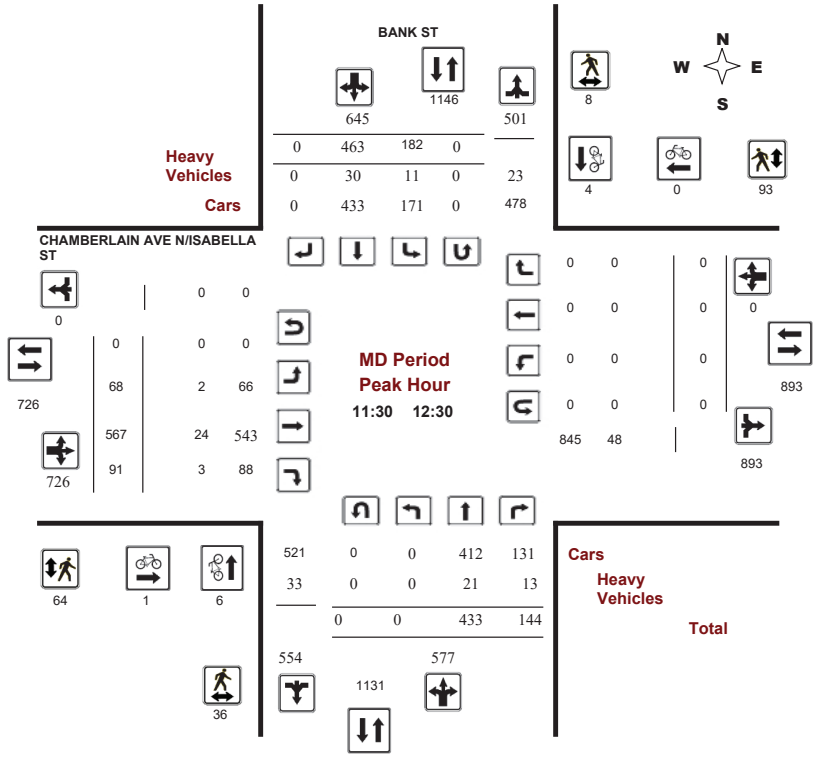
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

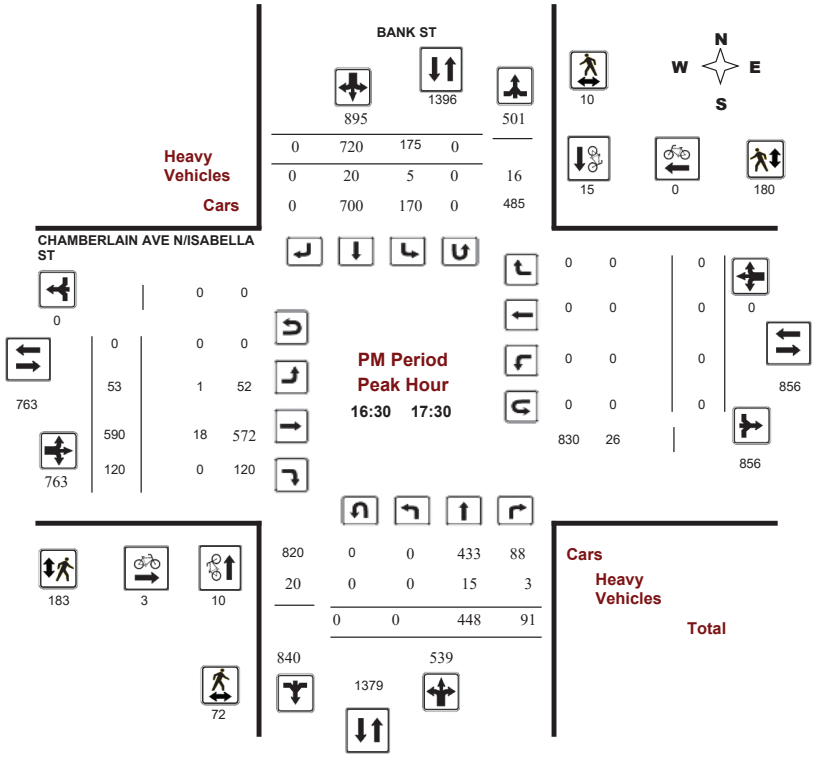
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, April 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor

.90

	BANK ST								CHAMBERLAIN AVE N/ISABELLA ST									
	Northbound				Southbound				Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	0	655	83	**738**	105	264	0	**369**	**1107**	58	391	56	**505**	0	2	0	**2**	**507**	**1614**
08:00 09:00	0	834	142	**976**	168	372	0	**540**	**1516**	74	487	75	**636**	0	0	0	**0**	**636**	**2152**
09:00 10:00	0	471	111	**582**	158	380	0	**538**	**1120**	84	499	68	**651**	0	0	1	**1**	**652**	**1772**
11:30 12:30	0	433	144	**577**	182	463	0	**645**	**1222**	68	567	91	**726**	0	0	0	**0**	**726**	**1948**
12:30 13:30	0	429	139	**568**	135	432	0	**567**	**1135**	67	518	115	**700**	0	0	0	**0**	**700**	**1835**
15:00 16:00	0	441	139	**580**	185	523	0	**708**	**1288**	63	582	126	**771**	0	0	0	**0**	**771**	**2059**
16:00 17:00	0	442	102	**544**	174	686	0	**860**	**1404**	54	565	99	**718**	0	0	0	**0**	**718**	**2122**
17:00 18:00	0	449	101	**550**	182	677	0	**859**	**1409**	54	580	139	**773**	0	0	0	**0**	**773**	**2182**
Sub Total	0	4154	961	**5115**	1289	3797	0	**5086**	**10201**	522	4189	769	**5480**	0	2	1	**3**	**5483**	**15684**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	0	4154	961	**5115**	1289	3797	0	**5086**	**10201**	522	4189	769	**5480**	0	2	1	**3**	**5483**	**15684**
EQ 12Hr	0	5774	1336	**7110**	1792	5278	0	**7070**	**14179**	726	5823	1069	**7617**	0	3	1	**4**	**7621**	**21801**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	0	4898	1133	**6031**	1520	4477	0	**5996**	**12761**	615	4939	907	**6461**	0	2	1	**4**	**6859**	**19621**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**0.9**					
AVG 24Hr	0	6416	1484	**7900**	1991	5864	0	**7855**	**15755**	806	6470	1188	**8464**	0	3	2	**5**	**8469**	**24224**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

BANK ST **CHAMBERLAIN AVE N/ISABELLA S**

		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	118	15	133	24	54	0	78	16	10	74	16	100	0	2	0	2	16	313
07:15	07:30	0	128	15	143	26	54	0	80	18	15	94	22	131	0	0	0	0	18	354
07:30	07:45	0	196	21	217	25	78	0	103	11	20	102	10	132	0	0	0	0	11	452
07:45	08:00	0	213	32	245	30	78	0	108	15	13	121	8	142	0	0	0	0	15	495
08:00	08:15	0	215	37	252	43	81	0	124	18	21	102	20	143	0	0	0	0	18	519
08:15	08:30	0	210	31	241	41	83	0	124	16	23	121	15	159	0	0	0	0	16	524
08:30	08:45	0	214	37	251	41	95	0	136	15	13	118	18	149	0	0	0	0	15	536
08:45	09:00	0	195	37	232	43	113	0	156	20	17	146	22	185	0	0	0	0	20	573
09:00	09:15	0	143	45	188	34	87	0	121	22	21	142	16	179	0	0	0	0	22	488
09:15	09:30	0	113	27	140	37	98	0	135	20	23	141	11	175	0	0	1	1	20	451
09:30	09:45	0	109	14	123	59	94	0	153	22	15	109	19	143	0	0	0	0	22	419
09:45	10:00	0	106	25	131	28	101	0	129	20	25	107	22	154	0	0	0	0	20	414
11:30	11:45	0	110	30	140	36	124	0	160	19	21	137	18	176	0	0	0	0	19	476
11:45	12:00	0	117	27	144	50	106	0	156	16	12	144	28	184	0	0	0	0	16	484
12:00	12:15	0	111	38	149	50	104	0	154	19	20	151	21	192	0	0	0	0	19	495
12:15	12:30	0	95	49	144	46	129	0	175	21	15	135	24	174	0	0	0	0	21	493
12:30	12:45	0	100	31	131	39	109	0	148	12	18	139	20	177	0	0	0	0	12	456
12:45	13:00	0	117	37	154	28	105	0	133	14	17	120	30	167	0	0	0	0	14	454
13:00	13:15	0	98	40	138	34	112	0	146	12	21	141	22	184	0	0	0	0	12	468
13:15	13:30	0	114	31	145	34	106	0	140	15	11	118	43	172	0	0	0	0	15	457
15:00	15:15	0	120	38	158	45	114	0	159	12	16	148	28	192	0	0	0	0	12	509
15:15	15:30	0	114	33	147	51	120	0	171	14	17	141	32	190	0	0	0	0	14	508
15:30	15:45	0	98	38	136	40	131	0	171	6	13	137	41	191	0	0	0	0	6	498
15:45	16:00	0	109	30	139	49	158	0	207	13	17	156	25	198	0	0	0	0	13	544
16:00	16:15	0	132	27	159	35	163	0	198	10	13	133	34	180	0	0	0	0	10	537
16:15	16:30	0	102	28	130	50	165	0	215	12	14	137	22	173	0	0	0	0	12	518
16:30	16:45	0	98	25	123	46	179	0	225	15	17	153	26	196	0	0	0	0	15	544
16:45	17:00	0	110	22	132	43	179	0	222	9	10	142	17	169	0	0	0	0	9	523
17:00	17:15	0	117	24	141	43	174	0	217	10	12	156	35	203	0	0	0	0	10	561
17:15	17:30	0	123	20	143	43	188	0	231	9	14	139	42	195	0	0	0	0	9	569
17:30	17:45	0	100	24	124	50	148	0	198	12	18	141	40	199	0	0	0	0	12	521
17:45	18:00	0	109	33	142	46	167	0	213	8	10	144	22	176	0	0	0	0	8	531
Total:		0	4154	961	5115	1289	3797	0	5086	471	522	4189	769	5480	0	2	1	3	471	15,684

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		BANK ST			CHAMBERLAIN AVE N/ISABELLA ST			
		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	1	1	0	0	0	1
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	2	0	2	0	0	0	2
07:45	08:00	0	1	1	0	0	0	1
08:00	08:15	1	0	1	0	0	0	1
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	3	0	3	0	0	0	3
09:00	09:15	1	0	1	0	0	0	1
09:15	09:30	0	2	2	1	0	1	3
09:30	09:45	1	0	1	0	1	1	2
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	2	1	3	0	0	0	3
11:45	12:00	1	1	2	1	0	1	3
12:00	12:15	2	0	2	0	0	0	2
12:15	12:30	1	2	3	0	0	0	3
12:30	12:45	0	1	1	0	0	0	1
12:45	13:00	2	0	2	0	0	0	2
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	1	1	2	0	0	0	2
15:00	15:15	2	2	4	2	0	2	6
15:15	15:30	2	3	5	0	0	0	5
15:30	15:45	3	1	4	0	0	0	4
15:45	16:00	0	2	2	0	0	0	2
16:00	16:15	3	5	8	0	0	0	8
16:15	16:30	0	1	1	0	0	0	1
16:30	16:45	3	4	7	2	0	2	9
16:45	17:00	4	4	8	0	0	0	8
17:00	17:15	1	2	3	1	0	1	4
17:15	17:30	2	5	7	0	0	0	7
17:30	17:45	2	1	3	1	0	1	4
17:45	18:00	2	3	5	1	0	1	6
Total		41	43	**84**	9	1	10	94

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period		BANK ST			CHAMBERLAIN AVE N/ISABELLA S			
		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	6	1	**7**	11	7	**18**	**25**
07:15	07:30	5	2	**7**	8	14	**22**	**29**
07:30	07:45	5	0	**5**	18	15	**33**	**38**
07:45	08:00	4	2	**6**	19	17	**36**	**42**
08:00	08:15	5	2	**7**	17	32	**49**	**56**
08:15	08:30	18	3	**21**	29	28	**57**	**78**
08:30	08:45	12	5	**17**	60	43	**103**	**120**
08:45	09:00	9	5	**14**	33	32	**65**	**79**
09:00	09:15	7	1	**8**	19	23	**42**	**50**
09:15	09:30	7	5	**12**	13	24	**37**	**49**
09:30	09:45	0	1	**1**	16	12	**28**	**29**
09:45	10:00	23	0	**23**	31	16	**47**	**70**
11:30	11:45	8	1	**9**	13	19	**32**	**41**
11:45	12:00	5	2	**7**	15	25	**40**	**47**
12:00	12:15	17	2	**19**	15	30	**45**	**64**
12:15	12:30	6	3	**9**	21	19	**40**	**49**
12:30	12:45	8	2	**10**	16	29	**45**	**55**
12:45	13:00	9	1	**10**	18	20	**38**	**48**
13:00	13:15	3	1	**4**	22	21	**43**	**47**
13:15	13:30	6	0	**6**	20	31	**51**	**57**
15:00	15:15	12	1	**13**	24	24	**48**	**61**
15:15	15:30	21	0	**21**	95	28	**123**	**144**
15:30	15:45	7	1	**8**	26	31	**57**	**65**
15:45	16:00	10	2	**12**	27	32	**59**	**71**
16:00	16:15	15	1	**16**	23	29	**52**	**68**
16:15	16:30	13	5	**18**	49	41	**90**	**108**
16:30	16:45	16	2	**18**	39	49	**88**	**106**
16:45	17:00	19	2	**21**	46	34	**80**	**101**
17:00	17:15	21	3	**24**	43	43	**86**	**110**
17:15	17:30	16	3	**19**	55	54	**109**	**128**
17:30	17:45	19	5	**24**	50	50	**100**	**124**
17:45	18:00	11	1	**12**	41	41	**82**	**94**
Total	.....	343	65	**408**	932	913	**1845**	**2253**

W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		BANK ST									CHAMBERLAIN AVE N/ISABELLA S									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	7	0	**7**	0	9	0	**9**	**16**	0	5	1	**6**	0	0	0	**0**	**6**	**22**
07:15	07:30	0	9	1	**10**	1	7	0	**8**	**18**	0	6	1	**7**	0	0	0	**0**	**7**	**25**
07:30	07:45	0	6	0	**6**	1	4	0	**5**	**11**	1	4	1	**6**	0	0	0	**0**	**6**	**17**
07:45	08:00	0	6	3	**9**	3	3	0	**6**	**15**	0	2	0	**2**	0	0	0	**0**	**2**	**17**
08:00	08:15	0	8	1	**9**	4	5	0	**9**	**18**	0	8	1	**9**	0	0	0	**0**	**9**	**27**
08:15	08:30	0	6	3	**9**	0	7	0	**7**	**16**	0	4	0	**4**	0	0	0	**0**	**4**	**20**
08:30	08:45	0	6	1	**7**	4	4	0	**8**	**15**	1	8	3	**12**	0	0	0	**0**	**12**	**27**
08:45	09:00	0	10	4	**14**	1	5	0	**6**	**20**	1	13	1	**15**	0	0	0	**0**	**15**	**35**
09:00	09:15	0	5	6	**11**	5	6	0	**11**	**22**	2	7	1	**10**	0	0	0	**0**	**10**	**32**
09:15	09:30	0	8	3	**11**	1	8	0	**9**	**20**	3	11	0	**14**	0	0	1	**1**	**15**	**35**
09:30	09:45	0	6	1	**7**	6	9	0	**15**	**22**	1	7	3	**11**	0	0	0	**0**	**11**	**33**
09:45	10:00	0	4	1	**5**	5	10	0	**15**	**20**	0	3	3	**6**	0	0	0	**0**	**6**	**26**
11:30	11:45	0	2	6	**8**	1	10	0	**11**	**19**	1	7	1	**9**	0	0	0	**0**	**9**	**28**
11:45	12:00	0	6	2	**8**	1	7	0	**8**	**16**	0	5	0	**5**	0	0	0	**0**	**5**	**21**
12:00	12:15	0	9	1	**10**	4	5	0	**9**	**19**	0	4	0	**4**	0	0	0	**0**	**4**	**23**
12:15	12:30	0	4	4	**8**	5	8	0	**13**	**21**	1	8	2	**11**	0	0	0	**0**	**11**	**32**
12:30	12:45	0	3	2	**5**	1	6	0	**7**	**12**	0	4	1	**5**	0	0	0	**0**	**5**	**17**
12:45	13:00	0	6	1	**7**	2	5	0	**7**	**14**	0	5	3	**8**	0	0	0	**0**	**8**	**22**
13:00	13:15	0	4	1	**5**	3	4	0	**7**	**12**	1	9	0	**10**	0	0	0	**0**	**10**	**22**
13:15	13:30	0	7	1	**8**	2	5	0	**7**	**15**	0	7	2	**9**	0	0	0	**0**	**9**	**24**
15:00	15:15	0	6	0	**6**	0	6	0	**6**	**12**	0	8	0	**8**	0	0	0	**0**	**8**	**20**
15:15	15:30	0	3	1	**4**	1	9	0	**10**	**14**	1	4	1	**6**	0	0	0	**0**	**6**	**20**
15:30	15:45	0	3	0	**3**	2	1	0	**3**	**6**	0	4	1	**5**	0	0	0	**0**	**5**	**11**
15:45	16:00	0	6	0	**6**	3	4	0	**7**	**13**	1	4	1	**6**	0	0	0	**0**	**6**	**19**
16:00	16:15	0	5	1	**6**	0	4	0	**4**	**10**	1	8	2	**11**	0	0	0	**0**	**11**	**21**
16:15	16:30	0	5	0	**5**	5	2	0	**7**	**12**	1	6	0	**7**	0	0	0	**0**	**7**	**19**
16:30	16:45	0	6	1	**7**	2	6	0	**8**	**15**	1	1	0	**2**	0	0	0	**0**	**2**	**17**
16:45	17:00	0	4	1	**5**	2	2	0	**4**	**9**	0	5	0	**5**	0	0	0	**0**	**5**	**14**
17:00	17:15	0	4	0	**4**	0	6	0	**6**	**10**	0	6	0	**6**	0	0	0	**0**	**6**	**16**
17:15	17:30	0	1	1	**2**	1	6	0	**7**	**9**	0	6	0	**6**	0	0	0	**0**	**6**	**15**
17:30	17:45	0	5	1	**6**	1	5	0	**6**	**12**	0	6	1	**7**	0	0	0	**0**	**7**	**19**
17:45	18:00	0	5	0	**5**	1	2	0	**3**	**8**	0	7	0	**7**	0	0	0	**0**	**7**	**15**
Total:	None	0	175	48	**223**	68	180	0	**248**	**471**	17	192	30	**239**	0	0	1	**1**	**240**	**711**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

		BANK ST		CHAMBERLAIN AVE N/ISABELLA S		
Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0

Transportation Services - Traffic Services

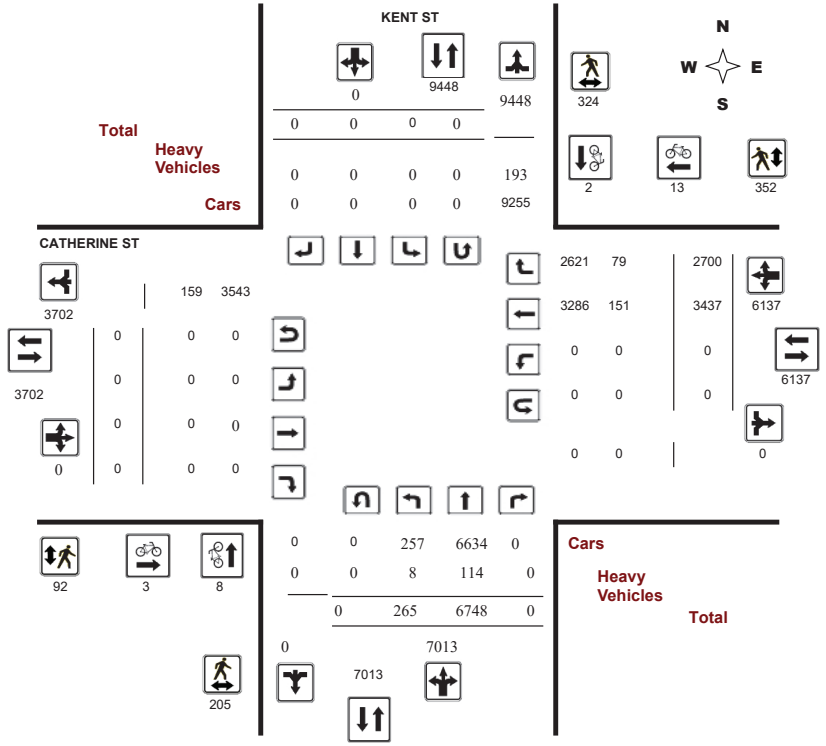
Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

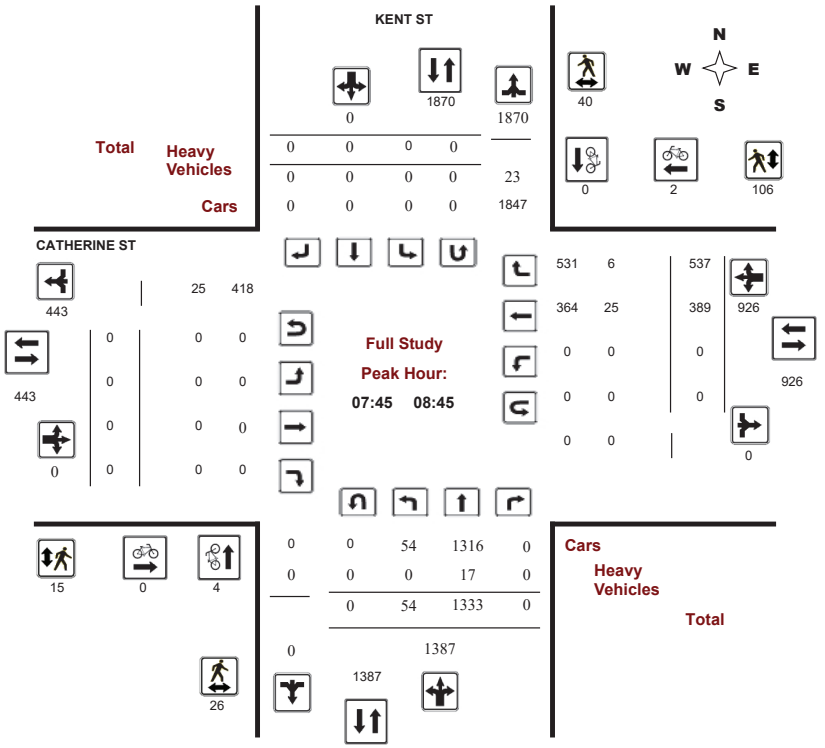
Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



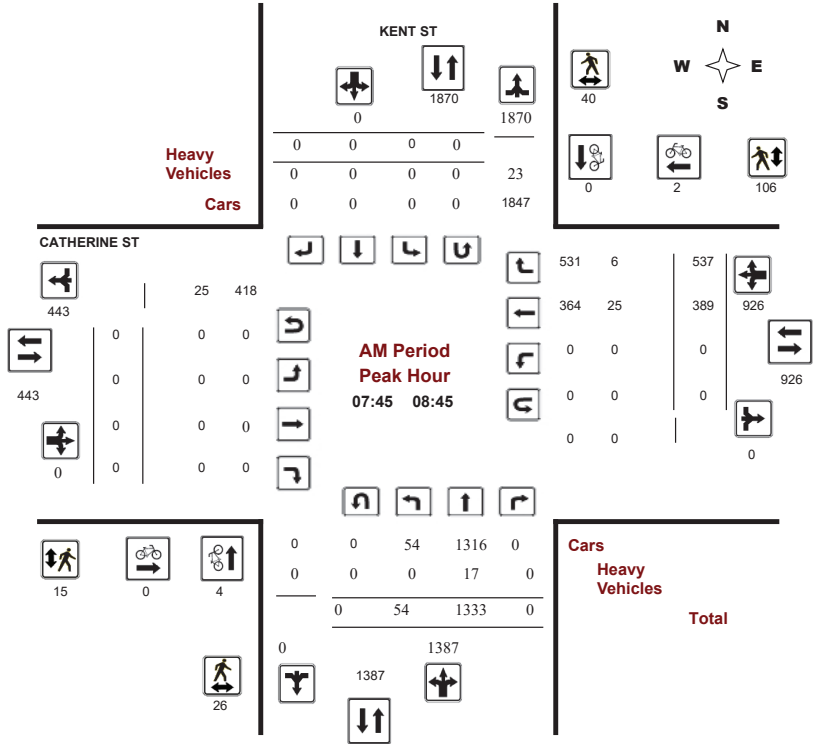
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision



Comments

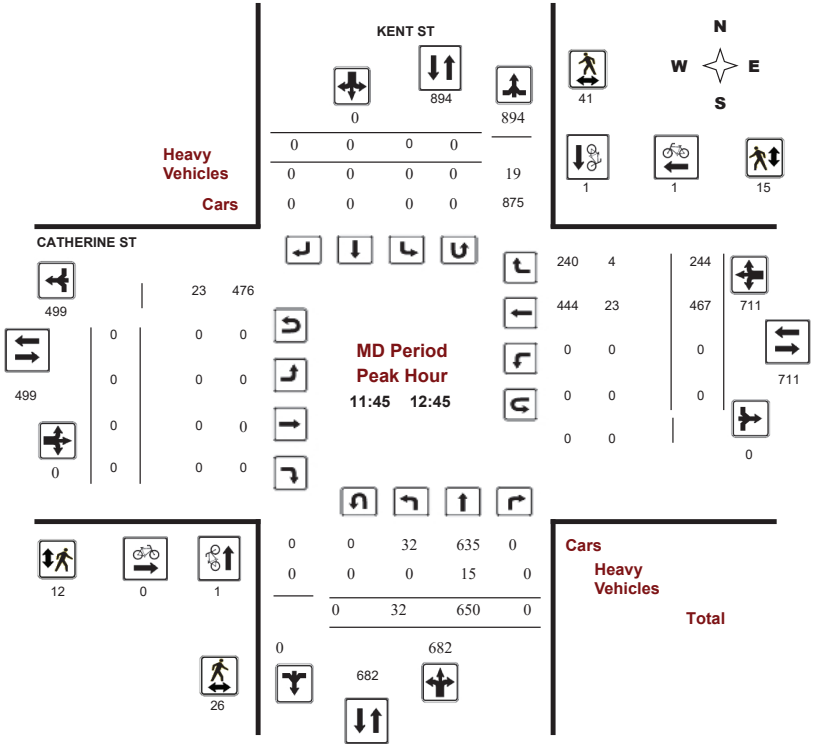
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision



Comments

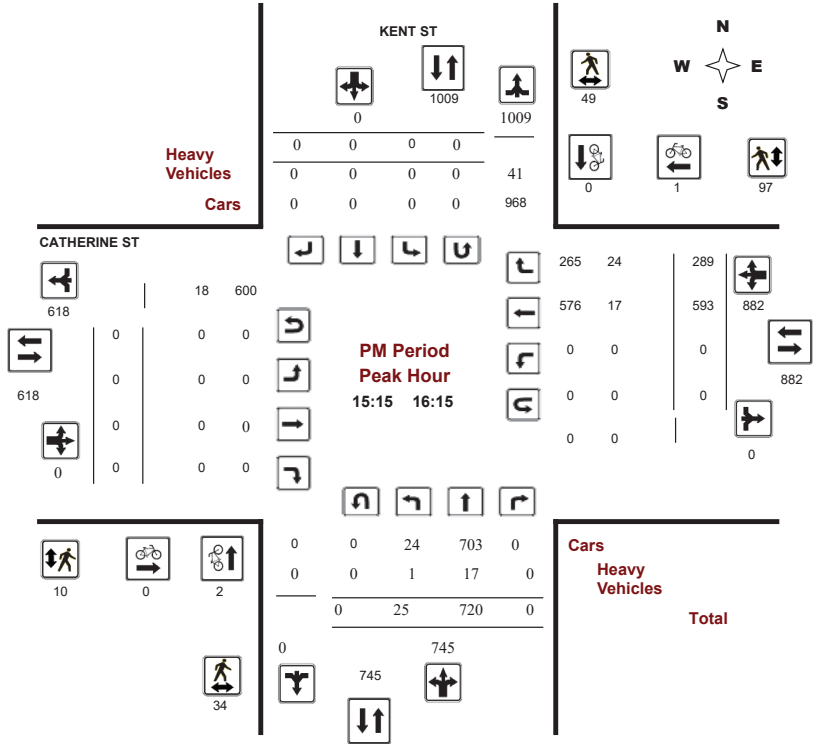
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, April 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor .90

	KENT ST								CATHERINE ST								
	Northbound				Southbound				Eastbound				Westbound				
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	36	1225	0	**1261**	0	0	0	**0**	**1261**	0	0	0	**0**	0	304	504	**808**	**808**	**2069**
08:00 09:00	54	1326	0	**1380**	0	0	0	**0**	**1380**	0	0	0	**0**	0	392	530	**922**	**922**	**2302**
09:00 10:00	41	968	0	**1009**	0	0	0	**0**	**1009**	0	0	0	**0**	0	411	342	**753**	**753**	**1762**
11:30 12:30	36	626	0	**662**	0	0	0	**0**	**662**	0	0	0	**0**	0	452	231	**683**	**683**	**1345**
12:30 13:30	40	631	0	**671**	0	0	0	**0**	**671**	0	0	0	**0**	0	477	174	**651**	**651**	**1322**
15:00 16:00	29	652	0	**681**	0	0	0	**0**	**681**	0	0	0	**0**	0	556	302	**858**	**858**	**1539**
16:00 17:00	18	590	0	**608**	0	0	0	**0**	**608**	0	0	0	**0**	0	479	311	**790**	**790**	**1398**
17:00 18:00	11	730	0	**741**	0	0	0	**0**	**741**	0	0	0	**0**	0	366	306	**672**	**672**	**1413**
Sub Total	265	6748	0	**7013**	0	0	0	**0**	**7013**	0	0	0	**0**	0	3437	2700	**6137**	**6137**	**13150**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	265	6748	0	**7013**	0	0	0	**0**	**7013**	0	0	0	**0**	0	3437	2700	**6137**	**6137**	**13150**
EQ 12Hr	368	9380	0	**9748**	0	0	0	**0**	**9748**	0	0	0	**0**	0	4777	3753	**8530**	**8530**	**18278**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.																**1.39**			
AVG 12Hr	331	8442	0	**8773**	0	0	0	**0**	**8773**	0	0	0	**0**	0	4299	3378	**7677**	**7677**	**16450**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.																**.90**			
AVG 24Hr	434	11059	0	**11493**	0	0	0	**0**	**11493**	0	0	0	**0**	0	5632	4425	**10057**	**10057**	**21550**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.																**1.31**			

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		KENT ST									CATHERINE ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	7	277	0	284	0	0	0	0	284	0	0	0	0	0	72	116	188	188	472
07:15	07:30	8	293	0	301	0	0	0	0	301	0	0	0	0	0	58	123	181	181	482
07:30	07:45	9	312	0	321	0	0	0	0	321	0	0	0	0	0	90	117	207	207	528
07:45	08:00	12	343	0	355	0	0	0	0	355	0	0	0	0	0	84	148	232	232	587
08:00	08:15	12	314	0	326	0	0	0	0	326	0	0	0	0	0	100	134	234	234	560
08:15	08:30	13	347	0	360	0	0	0	0	360	0	0	0	0	0	98	127	225	225	585
08:30	08:45	17	329	0	346	0	0	0	0	346	0	0	0	0	0	107	128	235	235	581
08:45	09:00	12	336	0	348	0	0	0	0	348	0	0	0	0	0	87	141	228	228	576
09:00	09:15	8	293	0	301	0	0	0	0	301	0	0	0	0	0	95	97	192	192	493
09:15	09:30	12	229	0	241	0	0	0	0	241	0	0	0	0	0	104	91	195	195	436
09:30	09:45	8	225	0	233	0	0	0	0	233	0	0	0	0	0	112	76	188	188	421
09:45	10:00	13	221	0	234	0	0	0	0	234	0	0	0	0	0	100	78	178	178	412
11:30	11:45	13	169	0	182	0	0	0	0	182	0	0	0	0	0	105	52	157	157	339
11:45	12:00	7	150	0	157	0	0	0	0	157	0	0	0	0	0	105	68	173	173	330
12:00	12:15	6	133	0	139	0	0	0	0	139	0	0	0	0	0	125	50	175	175	314
12:15	12:30	10	174	0	184	0	0	0	0	184	0	0	0	0	0	117	61	178	178	362
12:30	12:45	9	193	0	202	0	0	0	0	202	0	0	0	0	0	120	65	185	185	387
12:45	13:00	9	160	0	169	0	0	0	0	169	0	0	0	0	0	125	31	156	156	325
13:00	13:15	8	134	0	142	0	0	0	0	142	0	0	0	0	0	108	34	142	142	284
13:15	13:30	14	144	0	158	0	0	0	0	158	0	0	0	0	0	124	44	168	168	326
15:00	15:15	8	151	0	159	0	0	0	0	159	0	0	0	0	0	120	90	210	210	369
15:15	15:30	10	148	0	158	0	0	0	0	158	0	0	0	0	0	154	67	221	221	379
15:30	15:45	3	180	0	183	0	0	0	0	183	0	0	0	0	0	156	69	225	225	408
15:45	16:00	8	173	0	181	0	0	0	0	181	0	0	0	0	0	126	76	202	202	383
16:00	16:15	4	219	0	223	0	0	0	0	223	0	0	0	0	0	157	77	234	234	457
16:15	16:30	0	102	0	102	0	0	0	0	102	0	0	0	0	0	144	92	236	236	338
16:30	16:45	5	113	0	118	0	0	0	0	118	0	0	0	0	0	100	79	179	179	297
16:45	17:00	9	156	0	165	0	0	0	0	165	0	0	0	0	0	78	63	141	141	306
17:00	17:15	4	193	0	197	0	0	0	0	197	0	0	0	0	0	100	70	170	170	367
17:15	17:30	1	193	0	194	0	0	0	0	194	0	0	0	0	0	95	88	183	183	377
17:30	17:45	4	158	0	162	0	0	0	0	162	0	0	0	0	0	86	90	176	176	338
17:45	18:00	2	186	0	188	0	0	0	0	188	0	0	0	0	0	85	58	143	143	331
Total:		265	6748	0	7013	0	0	0	0	7013	0	0	0	0	0	3437	2700	6137	6137	13,150

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

		KENT ST			CATHERINE ST			
Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	1	0	1	0	0	0	1
08:00	08:15	1	0	1	0	0	0	1
08:15	08:30	1	0	1	0	2	2	3
08:30	08:45	1	0	1	0	0	0	1
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	2	2	2
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	1	1	1
12:15	12:30	0	1	1	0	0	0	1
12:30	12:45	1	0	1	0	0	0	1
12:45	13:00	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	1	0	1	1
15:00	15:15	0	0	0	0	1	1	1
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	1	1	1
16:00	16:15	2	0	2	0	0	0	2
16:15	16:30	0	0	0	0	3	3	3
16:30	16:45	0	0	0	0	1	1	1
16:45	17:00	0	1	1	1	0	1	2
17:00	17:15	0	0	0	0	1	1	1
17:15	17:30	0	0	0	1	0	1	1
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	1	0	1	0	1	1	2
Total		8	2	**10**	3	13	16	26

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

		KENT ST			CATHERINE ST			
Time Period		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	2	9	**11**	3	0	**3**	**14**
07:15	07:30	0	4	**4**	0	3	**3**	**7**
07:30	07:45	4	9	**13**	5	9	**14**	**27**
07:45	08:00	7	8	**15**	4	6	**10**	**25**
08:00	08:15	8	12	**20**	5	8	**13**	**33**
08:15	08:30	8	9	**17**	6	20	**26**	**43**
08:30	08:45	3	11	**14**	0	72	**72**	**86**
08:45	09:00	10	10	**20**	3	15	**18**	**38**
09:00	09:15	8	6	**14**	2	5	**7**	**21**
09:15	09:30	4	7	**11**	4	5	**9**	**20**
09:30	09:45	8	15	**23**	2	2	**4**	**27**
09:45	10:00	6	8	**14**	8	2	**10**	**24**
11:30	11:45	8	10	**18**	2	6	**8**	**26**
11:45	12:00	4	12	**16**	2	6	**8**	**24**
12:00	12:15	12	12	**24**	5	3	**8**	**32**
12:15	12:30	5	11	**16**	3	6	**9**	**25**
12:30	12:45	5	6	**11**	2	0	**2**	**13**
12:45	13:00	9	15	**24**	9	2	**11**	**35**
13:00	13:15	7	8	**15**	0	3	**3**	**18**
13:15	13:30	6	11	**17**	0	7	**7**	**24**
15:00	15:15	5	13	**18**	3	9	**12**	**30**
15:15	15:30	8	15	**23**	4	77	**81**	**104**
15:30	15:45	10	12	**22**	2	2	**4**	**26**
15:45	16:00	8	8	**16**	3	9	**12**	**28**
16:00	16:15	8	14	**22**	1	9	**10**	**32**
16:15	16:30	10	12	**22**	5	11	**16**	**38**
16:30	16:45	8	4	**12**	1	2	**3**	**15**
16:45	17:00	4	15	**19**	0	12	**12**	**31**
17:00	17:15	8	10	**18**	3	13	**16**	**34**
17:15	17:30	7	9	**16**	3	12	**15**	**31**
17:30	17:45	4	14	**18**	2	8	**10**	**28**
17:45	18:00	1	5	**6**	0	8	**8**	**14**
Total	.....	205	324	**529**	92	352	**444**	**973**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		KENT ST									CATHERINE ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	1	0	**1**	0	0	0	**2**	**3**	0	0	0	**11**	0	11	1	**12**	**23**	**13**
07:15	07:30	0	2	0	**2**	0	0	0	**4**	**6**	0	0	0	**5**	0	5	2	**7**	**12**	**9**
07:30	07:45	1	1	0	**2**	0	0	0	**6**	**8**	0	0	0	**6**	0	5	5	**10**	**16**	**12**
07:45	08:00	0	4	0	**4**	0	0	0	**7**	**11**	0	0	0	**4**	0	4	3	**7**	**11**	**11**
08:00	08:15	0	3	0	**3**	0	0	0	**5**	**8**	0	0	0	**10**	0	10	2	**12**	**22**	**15**
08:15	08:30	0	3	0	**3**	0	0	0	**4**	**7**	0	0	0	**4**	0	4	1	**5**	**9**	**8**
08:30	08:45	0	7	0	**7**	0	0	0	**7**	**14**	0	0	0	**7**	0	7	0	**7**	**14**	**14**
08:45	09:00	0	5	0	**5**	0	0	0	**7**	**12**	0	0	0	**4**	0	4	2	**6**	**10**	**11**
09:00	09:15	0	6	0	**6**	0	0	0	**8**	**14**	0	0	0	**4**	0	4	2	**6**	**10**	**12**
09:15	09:30	0	4	0	**4**	0	0	0	**6**	**10**	0	0	0	**10**	0	10	2	**12**	**22**	**16**
09:30	09:45	0	4	0	**4**	0	0	0	**5**	**9**	0	0	0	**7**	0	7	1	**8**	**15**	**12**
09:45	10:00	0	7	0	**7**	0	0	0	**12**	**19**	0	0	0	**4**	0	4	5	**9**	**13**	**16**
11:30	11:45	1	4	0	**5**	0	0	0	**6**	**11**	0	0	0	**2**	0	1	2	**3**	**5**	**8**
11:45	12:00	0	2	0	**2**	0	0	0	**2**	**4**	0	0	0	**5**	0	5	0	**5**	**10**	**7**
12:00	12:15	0	3	0	**3**	0	0	0	**3**	**6**	0	0	0	**3**	0	3	0	**3**	**6**	**6**
12:15	12:30	0	6	0	**6**	0	0	0	**10**	**16**	0	0	0	**8**	0	8	4	**12**	**20**	**18**
12:30	12:45	0	4	0	**4**	0	0	0	**4**	**8**	0	0	0	**7**	0	7	0	**7**	**14**	**11**
12:45	13:00	0	4	0	**4**	0	0	0	**5**	**9**	0	0	0	**2**	0	2	1	**3**	**5**	**7**
13:00	13:15	0	4	0	**4**	0	0	0	**6**	**10**	0	0	0	**5**	0	5	2	**7**	**12**	**11**
13:15	13:30	2	1	0	**3**	0	0	0	**3**	**6**	0	0	0	**5**	0	3	2	**5**	**10**	**8**
15:00	15:15	1	1	0	**2**	0	0	0	**10**	**12**	0	0	0	**8**	0	7	9	**16**	**24**	**18**
15:15	15:30	0	2	0	**2**	0	0	0	**10**	**12**	0	0	0	**4**	0	4	8	**12**	**16**	**14**
15:30	15:45	0	4	0	**4**	0	0	0	**12**	**16**	0	0	0	**7**	0	7	8	**15**	**22**	**19**
15:45	16:00	0	5	0	**5**	0	0	0	**6**	**11**	0	0	0	**5**	0	5	1	**6**	**11**	**11**
16:00	16:15	1	6	0	**7**	0	0	0	**13**	**20**	0	0	0	**2**	0	1	7	**8**	**10**	**15**
16:15	16:30	0	2	0	**2**	0	0	0	**3**	**5**	0	0	0	**7**	0	7	1	**8**	**15**	**10**
16:30	16:45	0	2	0	**2**	0	0	0	**5**	**7**	0	0	0	**3**	0	3	3	**6**	**9**	**8**
16:45	17:00	2	3	0	**5**	0	0	0	**3**	**8**	0	0	0	**4**	0	2	0	**2**	**6**	**7**
17:00	17:15	0	4	0	**4**	0	0	0	**7**	**11**	0	0	0	**1**	0	1	3	**4**	**5**	**8**
17:15	17:30	0	4	0	**4**	0	0	0	**4**	**8**	0	0	0	**2**	0	2	0	**2**	**4**	**6**
17:30	17:45	0	3	0	**3**	0	0	0	**4**	**7**	0	0	0	**2**	0	2	1	**3**	**5**	**6**
17:45	18:00	0	3	0	**3**	0	0	0	**4**	**7**	0	0	0	**1**	0	1	1	**2**	**3**	**5**
Total:	None	8	114	0	**122**	0	0	0	**193**	**315**	0	0	0	**159**	0	151	79	**230**	**389**	**352**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40741

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		KENT ST Northbound U-Turn Total	KENT ST Southbound U-Turn Total	CATHERINE ST Eastbound U-Turn Total	CATHERINE ST Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0

Transportation Services - Traffic Services

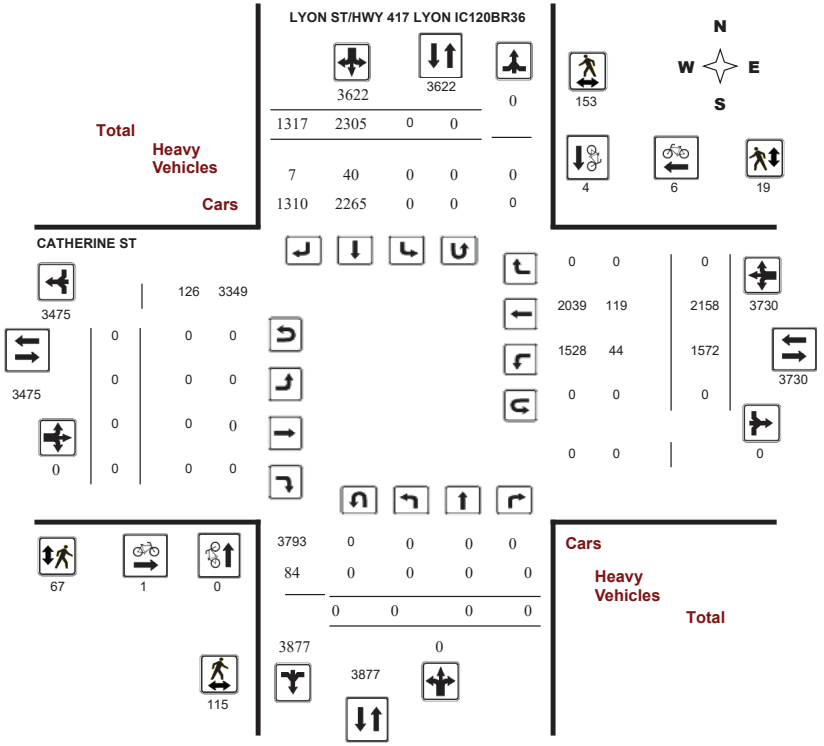
Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

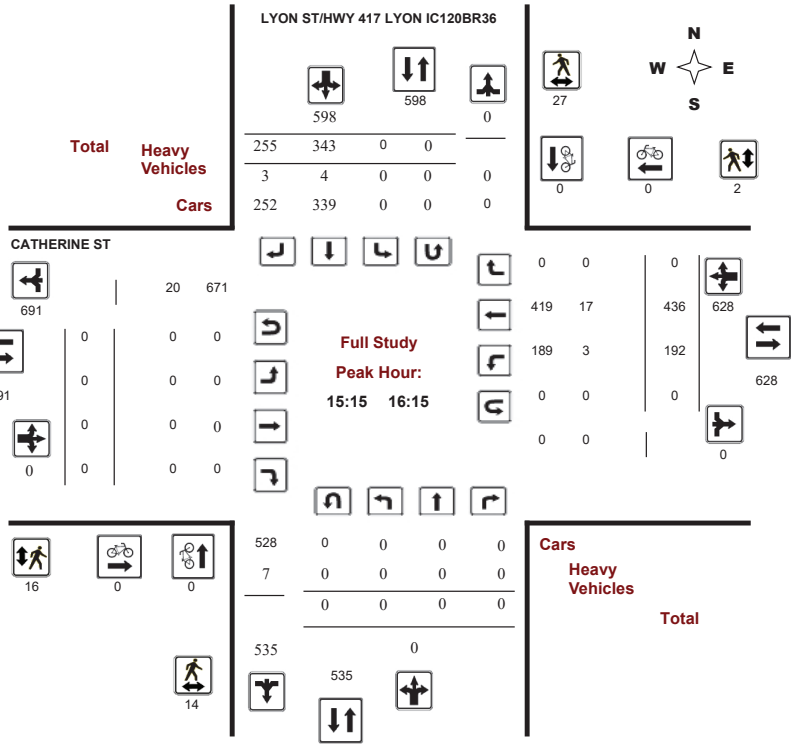
Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



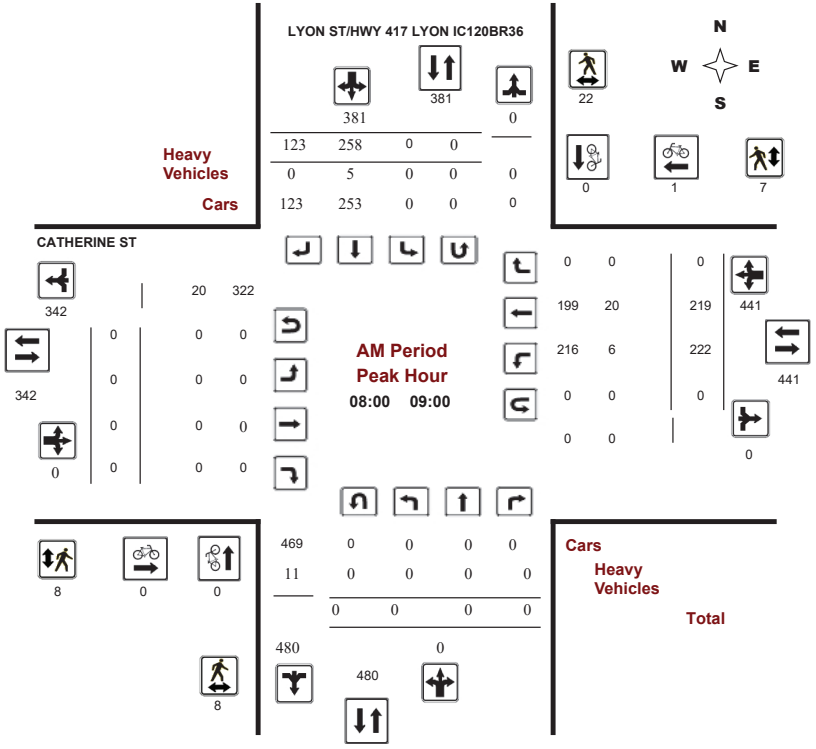
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision



Comments

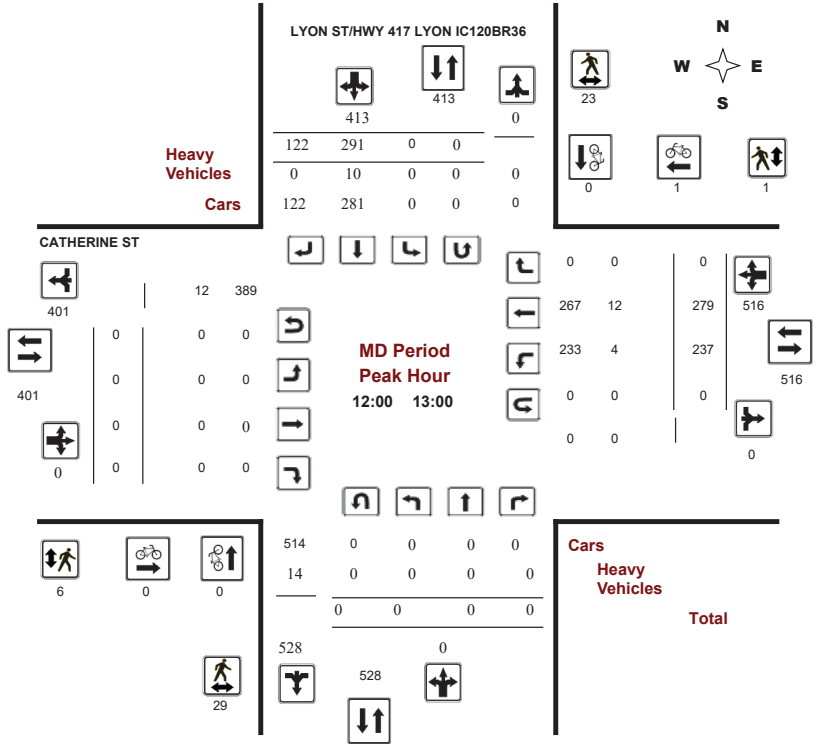
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision



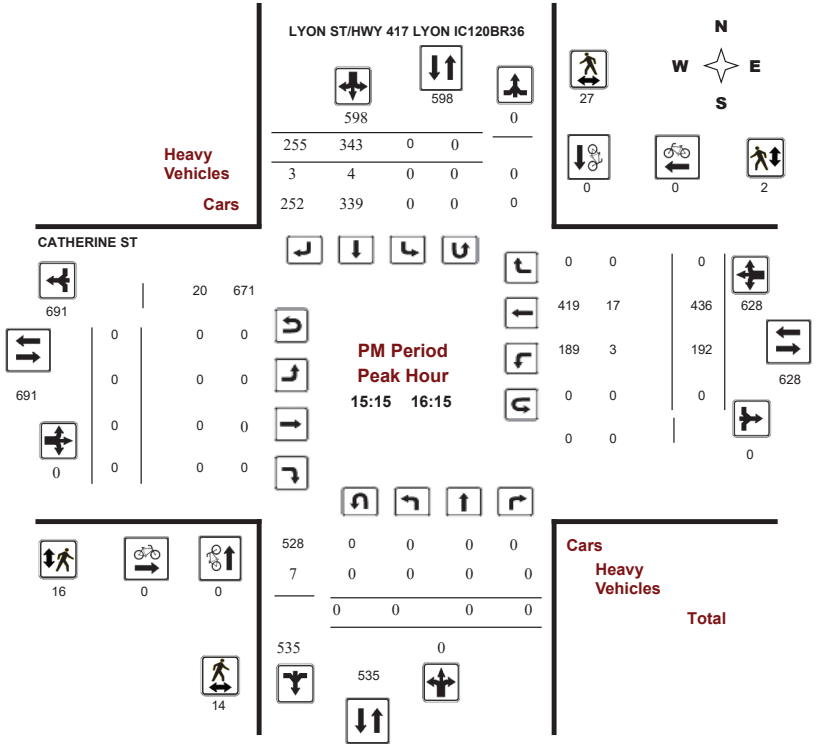
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision



Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, April 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor .90

	LYON ST/HWY 417 LYON IC120BR36									CATHERINE ST									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	0	0	0	0	0	223	94	317	317	0	0	0	0	150	192	0	342	342	659
08:00 09:00	0	0	0	0	0	258	123	381	381	0	0	0	0	222	219	0	441	441	822
09:00 10:00	0	0	0	0	0	213	108	321	321	0	0	0	0	183	244	0	427	427	748
11:30 12:30	0	0	0	0	0	279	122	401	401	0	0	0	0	236	265	0	501	501	902
12:30 13:30	0	0	0	0	0	267	110	377	377	0	0	0	0	241	269	0	510	510	887
15:00 16:00	0	0	0	0	0	402	213	615	615	0	0	0	0	200	407	0	607	607	1222
16:00 17:00	0	0	0	0	0	297	301	598	598	0	0	0	0	169	344	0	513	513	1111
17:00 18:00	0	0	0	0	0	366	246	612	612	0	0	0	0	171	218	0	389	389	1001
Sub Total	0	0	0	0	0	2305	1317	3622	3622	0	0	0	0	1572	2158	0	3730	3730	7352
U Turns				0				0	0				0				0	0	0
Total	0	0	0	0	0	2305	1317	3622	3622	0	0	0	0	1572	2158	0	3730	3730	7352
EQ 12Hr	0	0	0	0	0	3204	1831	5035	5035	0	0	0	0	2185	3000	0	5185	5185	10219
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	0	0	0	0	0	3777	2158	4532	4532	0	0	0	0	1966	2700	0	4666	4666	9197
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**.90**					
AVG 24Hr	0	0	0	0	0	4948	2827	5937	5937	0	0	0	0	2575	3537	0	6112	6112	12048
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		LYON ST/HWY 417 LYON IC120BR36									CATHERINE ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	0	0	44	20	64	64	0	0	0	0	37	51	0	88	88	152
07:15	07:30	0	0	0	0	0	58	19	77	77	0	0	0	0	24	38	0	62	62	139
07:30	07:45	0	0	0	0	0	64	30	94	94	0	0	0	0	45	50	0	95	95	189
07:45	08:00	0	0	0	0	0	57	25	82	82	0	0	0	0	44	53	0	97	97	179
08:00	08:15	0	0	0	0	0	62	27	89	89	0	0	0	0	57	57	0	114	114	203
08:15	08:30	0	0	0	0	0	66	29	95	95	0	0	0	0	59	53	0	112	112	207
08:30	08:45	0	0	0	0	0	74	38	112	112	0	0	0	0	56	57	0	113	113	225
08:45	09:00	0	0	0	0	0	56	29	85	85	0	0	0	0	50	52	0	102	102	187
09:00	09:15	0	0	0	0	0	57	34	91	91	0	0	0	0	46	56	0	102	102	193
09:15	09:30	0	0	0	0	0	61	28	89	89	0	0	0	0	53	56	0	109	109	198
09:30	09:45	0	0	0	0	0	64	26	90	90	0	0	0	0	50	61	0	111	111	201
09:45	10:00	0	0	0	0	0	31	20	51	51	0	0	0	0	34	71	0	105	105	156
11:30	11:45	0	0	0	0	0	56	31	87	87	0	0	0	0	62	74	0	136	136	223
11:45	12:00	0	0	0	0	0	68	28	96	96	0	0	0	0	53	58	0	111	111	207
12:00	12:15	0	0	0	0	0	73	31	104	104	0	0	0	0	53	72	0	125	125	229
12:15	12:30	0	0	0	0	0	82	32	114	114	0	0	0	0	68	61	0	129	129	243
12:30	12:45	0	0	0	0	0	65	29	94	94	0	0	0	0	54	72	0	126	126	220
12:45	13:00	0	0	0	0	0	71	30	101	101	0	0	0	0	62	74	0	136	136	237
13:00	13:15	0	0	0	0	0	80	25	105	105	0	0	0	0	62	51	0	113	113	218
13:15	13:30	0	0	0	0	0	51	26	77	77	0	0	0	0	63	72	0	135	135	212
15:00	15:15	0	0	0	0	0	132	47	179	179	0	0	0	0	61	72	0	133	133	312
15:15	15:30	0	0	0	0	0	100	62	162	162	0	0	0	0	50	114	0	164	164	326
15:30	15:45	0	0	0	0	0	92	52	144	144	0	0	0	0	43	131	0	174	174	318
15:45	16:00	0	0	0	0	0	78	52	130	130	0	0	0	0	46	90	0	136	136	266
16:00	16:15	0	0	0	0	0	73	89	162	162	0	0	0	0	53	101	0	154	154	316
16:15	16:30	0	0	0	0	0	88	76	164	164	0	0	0	0	46	115	0	161	161	325
16:30	16:45	0	0	0	0	0	69	62	131	131	0	0	0	0	36	63	0	99	99	230
16:45	17:00	0	0	0	0	0	67	74	141	141	0	0	0	0	34	65	0	99	99	240
17:00	17:15	0	0	0	0	0	93	77	170	170	0	0	0	0	48	57	0	105	105	275
17:15	17:30	0	0	0	0	0	110	60	170	170	0	0	0	0	50	61	0	111	111	281
17:30	17:45	0	0	0	0	0	84	68	152	152	0	0	0	0	35	52	0	87	87	239
17:45	18:00	0	0	0	0	0	79	41	120	120	0	0	0	0	38	48	0	86	86	206
Total:		0	0	0	0	0	2305	1317	3622	3622	0	0	0	0	1572	2158	0	3730	3730	7,352

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		LYON ST/HWY 417 LYON IC120BR36			CATHERINE ST			
		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	1	1	1
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	1	1	1
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	1	1	0	0	0	1
11:45	12:00	0	1	1	0	0	0	1
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	1	1	1
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	2	2	2
16:30	16:45	0	0	0	0	1	1	1
16:45	17:00	0	0	0	1	0	1	1
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	1	1	0	0	0	1
17:45	18:00	0	1	1	0	0	0	1
Total		0	4	**4**	1	6	7	11

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period		LYON ST/HWY 417 LYON IC120BR36			CATHERINE ST			
		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	1	4	**5**	0	0	**0**	**5**
07:15	07:30	0	0	**0**	1	0	**1**	**1**
07:30	07:45	1	3	**4**	0	0	**0**	**4**
07:45	08:00	1	3	**4**	0	0	**0**	**4**
08:00	08:15	1	8	**9**	0	3	**3**	**12**
08:15	08:30	2	5	**7**	3	1	**4**	**11**
08:30	08:45	4	2	**6**	4	1	**5**	**11**
08:45	09:00	1	7	**8**	1	2	**3**	**11**
09:00	09:15	3	6	**9**	1	1	**2**	**11**
09:15	09:30	1	1	**2**	0	0	**0**	**2**
09:30	09:45	7	2	**9**	5	0	**5**	**14**
09:45	10:00	8	2	**10**	2	0	**2**	**12**
11:30	11:45	6	2	**8**	0	2	**2**	**10**
11:45	12:00	5	7	**12**	0	1	**1**	**13**
12:00	12:15	14	7	**21**	3	0	**3**	**24**
12:15	12:30	5	6	**11**	1	1	**2**	**13**
12:30	12:45	7	5	**12**	1	0	**1**	**13**
12:45	13:00	3	5	**8**	1	0	**1**	**9**
13:00	13:15	1	4	**5**	4	1	**5**	**10**
13:15	13:30	7	7	**14**	3	2	**5**	**19**
15:00	15:15	9	11	**20**	6	0	**6**	**26**
15:15	15:30	4	6	**10**	5	1	**6**	**16**
15:30	15:45	0	11	**11**	6	1	**7**	**18**
15:45	16:00	7	5	**12**	3	0	**3**	**15**
16:00	16:15	3	5	**8**	2	0	**2**	**10**
16:15	16:30	4	6	**10**	5	2	**7**	**17**
16:30	16:45	1	1	**2**	1	0	**1**	**3**
16:45	17:00	3	3	**6**	3	0	**3**	**9**
17:00	17:15	3	9	**12**	4	0	**4**	**16**
17:15	17:30	1	7	**8**	2	0	**2**	**10**
17:30	17:45	1	2	**3**	0	0	**0**	**3**
17:45	18:00	1	1	**2**	0	0	**0**	**2**
Total		115	153	**268**	67	19	**86**	**354**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

Time Period		LYON ST/HWY 417 LYON IC120BR36 Northbound				LYON ST/HWY 417 LYON IC120BR36 Southbound					CATHERINE ST Eastbound				CATHERINE ST Westbound					
		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	**8**	0	4	0	**4**	**12**	0	0	0	**9**	4	9	0	**13**	**22**	**17**
07:15	07:30	0	0	0	**7**	0	5	0	**5**	**12**	0	0	0	**3**	2	3	0	**5**	**8**	**10**
07:30	07:45	0	0	0	**3**	0	2	0	**2**	**5**	0	0	0	**3**	1	3	0	**4**	**7**	**6**
07:45	08:00	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**5**	0	5	0	**5**	**10**	**5**
08:00	08:15	0	0	0	**4**	0	0	0	**0**	**4**	0	0	0	**7**	4	7	0	**11**	**18**	**11**
08:15	08:30	0	0	0	**2**	0	1	0	**1**	**3**	0	0	0	**5**	1	5	0	**6**	**11**	**7**
08:30	08:45	0	0	0	**3**	0	2	0	**2**	**5**	0	0	0	**4**	1	4	0	**5**	**9**	**7**
08:45	09:00	0	0	0	**2**	0	2	0	**2**	**4**	0	0	0	**4**	0	4	0	**4**	**8**	**6**
09:00	09:15	0	0	0	**1**	0	0	0	**0**	**1**	0	0	0	**3**	1	3	0	**4**	**7**	**4**
09:15	09:30	0	0	0	**5**	0	0	0	**0**	**5**	0	0	0	**4**	5	4	0	**9**	**13**	**9**
09:30	09:45	0	0	0	**5**	0	3	0	**3**	**8**	0	0	0	**2**	2	2	0	**4**	**6**	**7**
09:45	10:00	0	0	0	**1**	0	1	0	**1**	**2**	0	0	0	**6**	0	6	0	**6**	**12**	**7**
11:30	11:45	0	0	0	**1**	0	0	2	**2**	**3**	0	0	0	**4**	1	2	0	**3**	**7**	**5**
11:45	12:00	0	0	0	**6**	0	3	1	**4**	**10**	0	0	0	**6**	3	5	0	**8**	**14**	**12**
12:00	12:15	0	0	0	**2**	0	2	0	**2**	**4**	0	0	0	**4**	0	4	0	**4**	**8**	**6**
12:15	12:30	0	0	0	**5**	0	4	0	**4**	**9**	0	0	0	**4**	1	4	0	**5**	**9**	**9**
12:30	12:45	0	0	0	**3**	0	1	0	**1**	**4**	0	0	0	**4**	2	4	0	**6**	**10**	**7**
12:45	13:00	0	0	0	**4**	0	3	0	**3**	**7**	0	0	0	**0**	1	0	0	**1**	**1**	**4**
13:00	13:15	0	0	0	**3**	0	1	0	**1**	**4**	0	0	0	**3**	2	3	0	**5**	**8**	**6**
13:15	13:30	0	0	0	**1**	0	0	1	**1**	**2**	0	0	0	**3**	1	2	0	**3**	**6**	**4**
15:00	15:15	0	0	0	**5**	0	1	0	**1**	**6**	0	0	0	**6**	4	6	0	**10**	**16**	**11**
15:15	15:30	0	0	0	**2**	0	1	0	**1**	**3**	0	0	0	**2**	1	2	0	**3**	**5**	**4**
15:30	15:45	0	0	0	**3**	0	1	1	**2**	**5**	0	0	0	**6**	2	5	0	**7**	**13**	**9**
15:45	16:00	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**4**	0	4	0	**4**	**8**	**4**
16:00	16:15	0	0	0	**2**	0	2	2	**4**	**6**	0	0	0	**8**	0	6	0	**6**	**14**	**10**
16:15	16:30	0	0	0	**2**	0	0	0	**0**	**2**	0	0	0	**6**	2	6	0	**8**	**14**	**8**
16:30	16:45	0	0	0	**1**	0	0	0	**0**	**1**	0	0	0	**2**	1	2	0	**3**	**5**	**3**
16:45	17:00	0	0	0	**1**	0	1	0	**1**	**2**	0	0	0	**4**	0	4	0	**4**	**8**	**5**
17:00	17:15	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**2**	0	2	0	**2**	**4**	**2**
17:15	17:30	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**1**	0	1	0	**1**	**2**	**1**
17:30	17:45	0	0	0	**2**	0	0	0	**0**	**2**	0	0	0	**2**	2	2	0	**4**	**6**	**4**
17:45	18:00	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**
Total:	None	0	0	0	**84**	0	40	7	**47**	**131**	0	0	0	**126**	44	119	0	**163**	**289**	**210**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CATHERINE ST @ LYON ST/HWY 417 LYON IC120BR36

Survey Date: Wednesday, April 18, 2018 **WO No:** 40740

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		LYON ST/HWY 417 LYON IC120BR36 Northbound U-Turn Total	LYON ST/HWY 417 LYON IC120BR36 Southbound U-Turn Total	CATHERINE ST Eastbound U-Turn Total	CATHERINE ST Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0

Transportation Services - Traffic Services

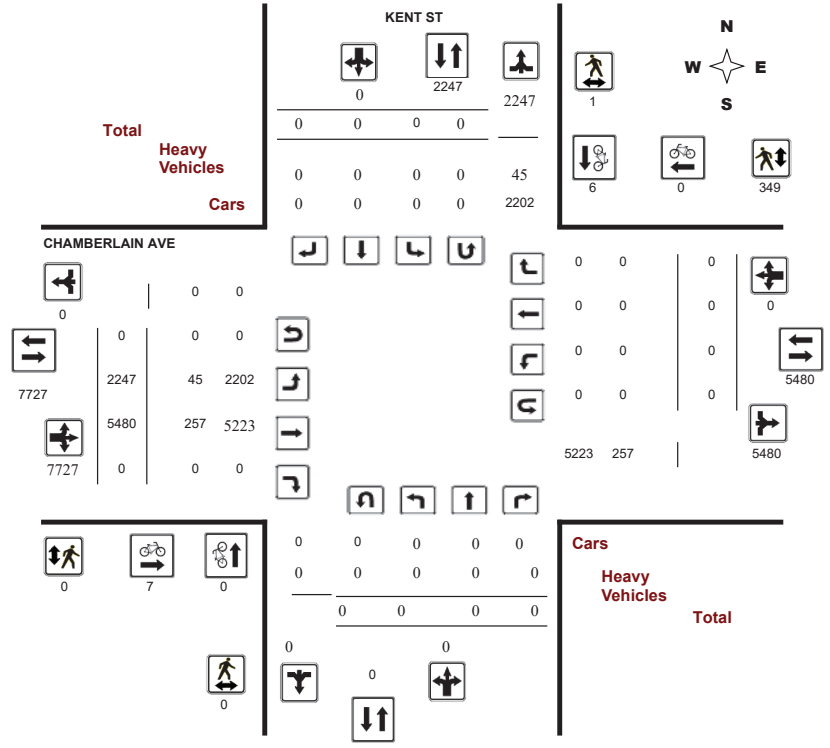
Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

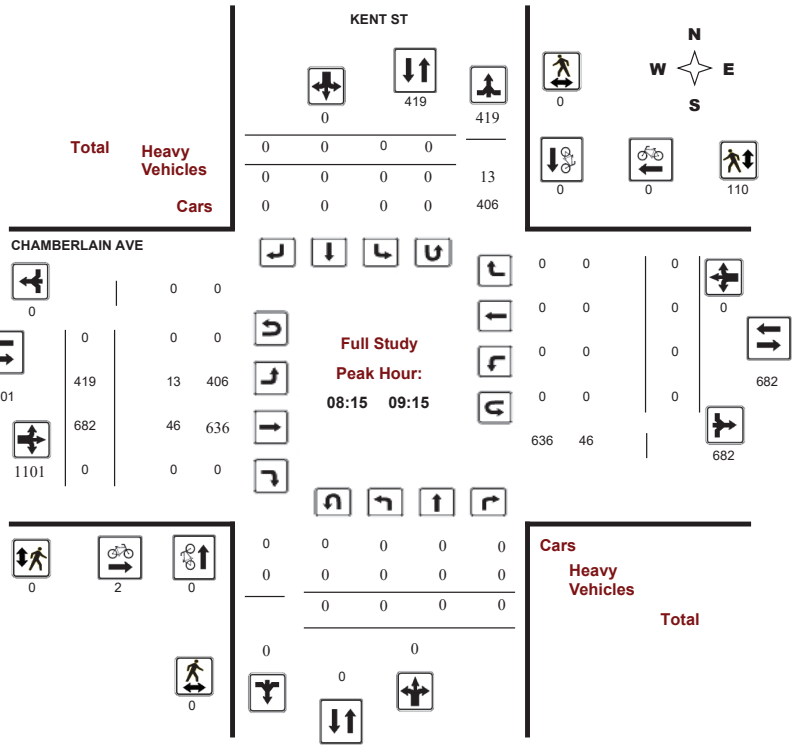
Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



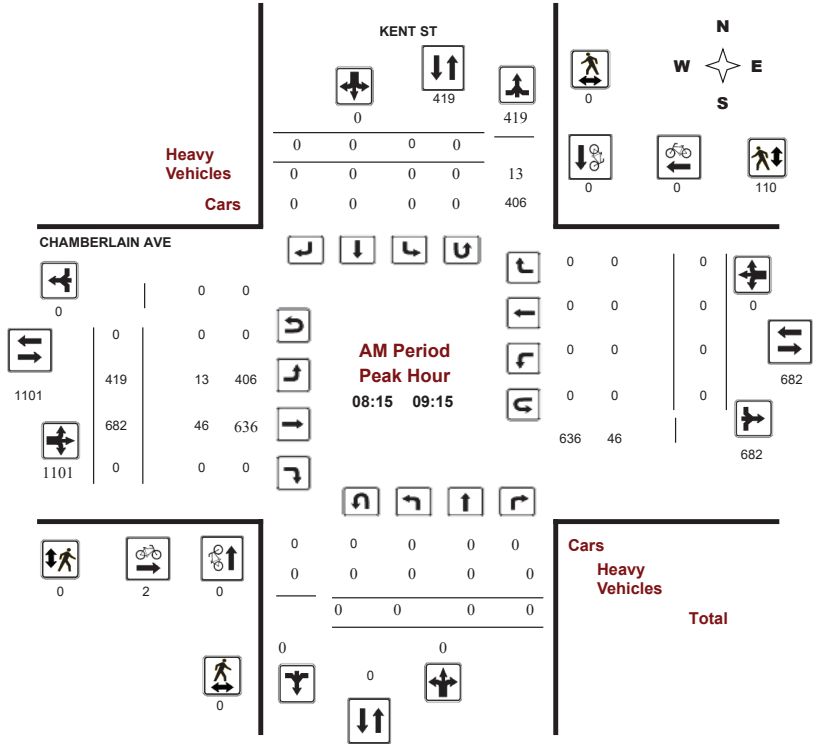
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision



Comments

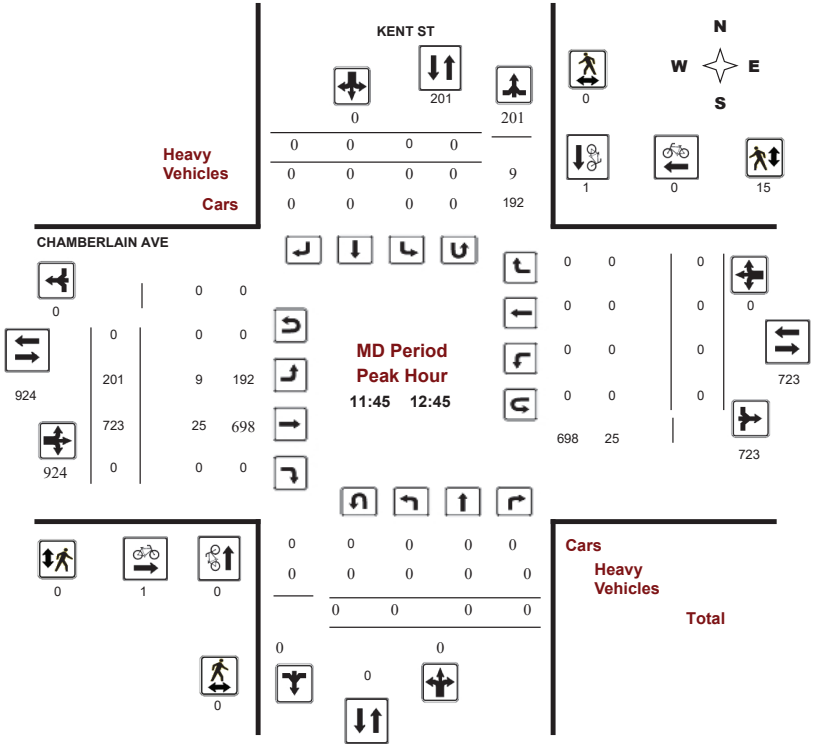
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision



Comments

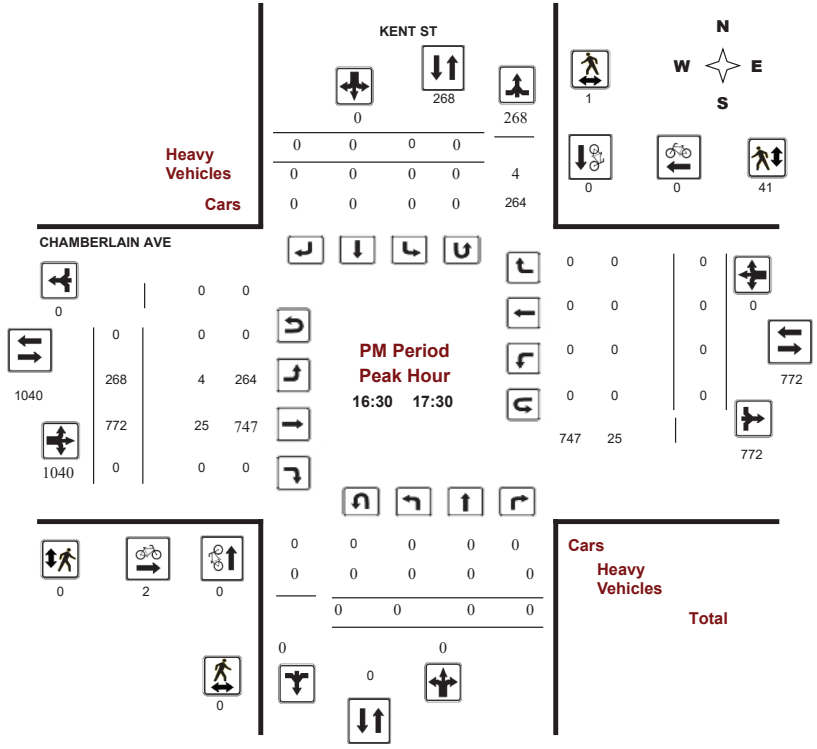
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, April 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor .90

	KENT ST								CHAMBERLAIN AVE									
	Northbound				Southbound				Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	0	0	0	**0**	0	0	0	**0**	**0**	346	537	0	**883**	0	0	0	**0**	**883**	**883**
08:00 09:00	0	0	0	**0**	0	0	0	**0**	**0**	438	652	0	**1090**	0	0	0	**0**	**1090**	**1090**
09:00 10:00	0	0	0	**0**	0	0	0	**0**	**0**	291	656	0	**947**	0	0	0	**0**	**947**	**947**
11:30 12:30	0	0	0	**0**	0	0	0	**0**	**0**	196	716	0	**912**	0	0	0	**0**	**912**	**912**
12:30 13:30	0	0	0	**0**	0	0	0	**0**	**0**	197	714	0	**911**	0	0	0	**0**	**911**	**911**
15:00 16:00	0	0	0	**0**	0	0	0	**0**	**0**	255	761	0	**1016**	0	0	0	**0**	**1016**	**1016**
16:00 17:00	0	0	0	**0**	0	0	0	**0**	**0**	265	686	0	**951**	0	0	0	**0**	**951**	**951**
17:00 18:00	0	0	0	**0**	0	0	0	**0**	**0**	259	758	0	**1017**	0	0	0	**0**	**1017**	**1017**
Sub Total	0	0	0	**0**	0	0	0	**0**	**0**	2247	5480	0	**7727**	0	0	0	**0**	**7727**	**7727**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	0	0	0	**0**	0	0	0	**0**	**0**	2247	5480	0	**7727**	0	0	0	**0**	**7727**	**7727**
EQ 12Hr	0	0	0	**0**	0	0	0	**0**	**0**	3123	7617	0	**10741**	0	0	0	**0**	**10741**	**10741**

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

AVG 12Hr	0	0	0	**0**	0	0	0	**0**	**0**	2811	6855	0	**9667**	0	0	0	**0**	**9667**	**9667**

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **.90**

AVG 24Hr	0	0	0	**0**	0	0	0	**0**	**0**	3682	8980	0	**12664**	0	0	0	**0**	**12664**	**12664**

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		KENT ST									CHAMBERLAIN AVE									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	0	0	0	0	0	0	64	103	0	167	0	0	0	0	167	167
07:15	07:30	0	0	0	0	0	0	0	0	0	82	146	0	228	0	0	0	0	228	228
07:30	07:45	0	0	0	0	0	0	0	0	0	86	137	0	223	0	0	0	0	223	223
07:45	08:00	0	0	0	0	0	0	0	0	0	114	151	0	265	0	0	0	0	265	265
08:00	08:15	0	0	0	0	0	0	0	0	0	109	147	0	256	0	0	0	0	256	256
08:15	08:30	0	0	0	0	0	0	0	0	0	99	163	0	262	0	0	0	0	262	262
08:30	08:45	0	0	0	0	0	0	0	0	0	126	150	0	276	0	0	0	0	276	276
08:45	09:00	0	0	0	0	0	0	0	0	0	104	192	0	296	0	0	0	0	296	296
09:00	09:15	0	0	0	0	0	0	0	0	0	90	177	0	267	0	0	0	0	267	267
09:15	09:30	0	0	0	0	0	0	0	0	0	73	172	0	245	0	0	0	0	245	245
09:30	09:45	0	0	0	0	0	0	0	0	0	61	151	0	212	0	0	0	0	212	212
09:45	10:00	0	0	0	0	0	0	0	0	0	67	156	0	223	0	0	0	0	223	223
11:30	11:45	0	0	0	0	0	0	0	0	0	47	171	0	218	0	0	0	0	218	218
11:45	12:00	0	0	0	0	0	0	0	0	0	56	182	0	238	0	0	0	0	238	238
12:00	12:15	0	0	0	0	0	0	0	0	0	41	195	0	236	0	0	0	0	236	236
12:15	12:30	0	0	0	0	0	0	0	0	0	52	168	0	220	0	0	0	0	220	220
12:30	12:45	0	0	0	0	0	0	0	0	0	52	178	0	230	0	0	0	0	230	230
12:45	13:00	0	0	0	0	0	0	0	0	0	46	171	0	217	0	0	0	0	217	217
13:00	13:15	0	0	0	0	0	0	0	0	0	46	194	0	240	0	0	0	0	240	240
13:15	13:30	0	0	0	0	0	0	0	0	0	53	171	0	224	0	0	0	0	224	224
15:00	15:15	0	0	0	0	0	0	0	0	0	73	178	0	251	0	0	0	0	251	251
15:15	15:30	0	0	0	0	0	0	0	0	0	56	199	0	255	0	0	0	0	255	255
15:30	15:45	0	0	0	0	0	0	0	0	0	64	204	0	268	0	0	0	0	268	268
15:45	16:00	0	0	0	0	0	0	0	0	0	62	180	0	242	0	0	0	0	242	242
16:00	16:15	0	0	0	0	0	0	0	0	0	62	168	0	230	0	0	0	0	230	230
16:15	16:30	0	0	0	0	0	0	0	0	0	75	154	0	229	0	0	0	0	229	229
16:30	16:45	0	0	0	0	0	0	0	0	0	65	187	0	252	0	0	0	0	252	252
16:45	17:00	0	0	0	0	0	0	0	0	0	63	177	0	240	0	0	0	0	240	240
17:00	17:15	0	0	0	0	0	0	0	0	0	65	222	0	287	0	0	0	0	287	287
17:15	17:30	0	0	0	0	0	0	0	0	0	75	186	0	261	0	0	0	0	261	261
17:30	17:45	0	0	0	0	0	0	0	0	0	56	177	0	233	0	0	0	0	233	233
17:45	18:00	0	0	0	0	0	0	0	0	0	63	173	0	236	0	0	0	0	236	236
Total:		0	0	0	0	0	0	0	0	0	2247	5480	0	7727	0	0	0	0	7727	7,727

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

		KENT ST			CHAMBERLAIN AVE			
Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	1	0	1	1
08:30	08:45	0	0	0	1	0	1	1
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	1	1	1	0	1	2
12:45	13:00	0	0	0	0	0	0	0
13:00	13:15	0	1	1	0	0	0	1
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	1	0	1	1
15:15	15:30	0	3	3	0	0	0	3
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	1	1	1	0	1	2
16:30	16:45	0	0	0	2	0	2	2
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
Total		0	6	**6**	7	0	7	13

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

		KENT ST			CHAMBERLAIN AVE			
Time Period		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	0	0	**0**	0	4	**4**	**4**
07:15	07:30	0	0	**0**	0	3	**3**	**3**
07:30	07:45	0	0	**0**	0	9	**9**	**9**
07:45	08:00	0	0	**0**	0	12	**12**	**12**
08:00	08:15	0	0	**0**	0	12	**12**	**12**
08:15	08:30	0	0	**0**	0	21	**21**	**21**
08:30	08:45	0	0	**0**	0	65	**65**	**65**
08:45	09:00	0	0	**0**	0	16	**16**	**16**
09:00	09:15	0	0	**0**	0	8	**8**	**8**
09:15	09:30	0	0	**0**	0	3	**3**	**3**
09:30	09:45	0	0	**0**	0	4	**4**	**4**
09:45	10:00	0	0	**0**	0	4	**4**	**4**
11:30	11:45	0	0	**0**	0	5	**5**	**5**
11:45	12:00	0	0	**0**	0	1	**1**	**1**
12:00	12:15	0	0	**0**	0	8	**8**	**8**
12:15	12:30	0	0	**0**	0	4	**4**	**4**
12:30	12:45	0	0	**0**	0	2	**2**	**2**
12:45	13:00	0	0	**0**	0	2	**2**	**2**
13:00	13:15	0	0	**0**	0	4	**4**	**4**
13:15	13:30	0	0	**0**	0	4	**4**	**4**
15:00	15:15	0	0	**0**	0	6	**6**	**6**
15:15	15:30	0	0	**0**	0	58	**58**	**58**
15:30	15:45	0	0	**0**	0	11	**11**	**11**
15:45	16:00	0	0	**0**	0	4	**4**	**4**
16:00	16:15	0	0	**0**	0	14	**14**	**14**
16:15	16:30	0	0	**0**	0	7	**7**	**7**
16:30	16:45	0	0	**0**	0	8	**8**	**8**
16:45	17:00	0	0	**0**	0	10	**10**	**10**
17:00	17:15	0	1	**1**	0	9	**9**	**10**
17:15	17:30	0	0	**0**	0	14	**14**	**14**
17:30	17:45	0	0	**0**	0	8	**8**	**8**
17:45	18:00	0	0	**0**	0	9	**9**	**9**
Total	.....	0	1	**1**	0	349	**349**	**350**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		KENT ST									CHAMBERLAIN AVE									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	**0**	0	0	0	**1**	**1**	1	6	0	**7**	0	0	0	**6**	**13**	**7**
07:15	07:30	0	0	0	**0**	0	0	0	**0**	**0**	0	7	0	**7**	0	0	0	**7**	**14**	**7**
07:30	07:45	0	0	0	**0**	0	0	0	**0**	**0**	0	6	0	**6**	0	0	0	**6**	**12**	**6**
07:45	08:00	0	0	0	**0**	0	0	0	**0**	**0**	0	5	0	**5**	0	0	0	**5**	**10**	**5**
08:00	08:15	0	0	0	**0**	0	0	0	**1**	**1**	1	8	0	**9**	0	0	0	**8**	**17**	**9**
08:15	08:30	0	0	0	**0**	0	0	0	**1**	**1**	1	5	0	**6**	0	0	0	**5**	**11**	**6**
08:30	08:45	0	0	0	**0**	0	0	0	**5**	**5**	5	14	0	**19**	0	0	0	**14**	**33**	**19**
08:45	09:00	0	0	0	**0**	0	0	0	**3**	**3**	3	16	0	**19**	0	0	0	**16**	**35**	**19**
09:00	09:15	0	0	0	**0**	0	0	0	**4**	**4**	4	11	0	**15**	0	0	0	**11**	**26**	**15**
09:15	09:30	0	0	0	**0**	0	0	0	**3**	**3**	3	12	0	**15**	0	0	0	**12**	**27**	**15**
09:30	09:45	0	0	0	**0**	0	0	0	**0**	**0**	0	13	0	**13**	0	0	0	**13**	**26**	**13**
09:45	10:00	0	0	0	**0**	0	0	0	**2**	**2**	2	8	0	**10**	0	0	0	**8**	**18**	**10**
11:30	11:45	0	0	0	**0**	0	0	0	**1**	**1**	1	8	0	**9**	0	0	0	**8**	**17**	**9**
11:45	12:00	0	0	0	**0**	0	0	0	**2**	**2**	2	3	0	**5**	0	0	0	**3**	**8**	**5**
12:00	12:15	0	0	0	**0**	0	0	0	**0**	**0**	0	5	0	**5**	0	0	0	**5**	**10**	**5**
12:15	12:30	0	0	0	**0**	0	0	0	**4**	**4**	4	11	0	**15**	0	0	0	**11**	**26**	**15**
12:30	12:45	0	0	0	**0**	0	0	0	**3**	**3**	3	6	0	**9**	0	0	0	**6**	**15**	**9**
12:45	13:00	0	0	0	**0**	0	0	0	**1**	**1**	1	8	0	**9**	0	0	0	**8**	**17**	**9**
13:00	13:15	0	0	0	**0**	0	0	0	**0**	**0**	0	12	0	**12**	0	0	0	**12**	**24**	**12**
13:15	13:30	0	0	0	**0**	0	0	0	**1**	**1**	1	9	0	**10**	0	0	0	**9**	**19**	**10**
15:00	15:15	0	0	0	**0**	0	0	0	**2**	**2**	2	6	0	**8**	0	0	0	**6**	**14**	**8**
15:15	15:30	0	0	0	**0**	0	0	0	**0**	**0**	0	6	0	**6**	0	0	0	**6**	**12**	**6**
15:30	15:45	0	0	0	**0**	0	0	0	**1**	**1**	1	6	0	**7**	0	0	0	**6**	**13**	**7**
15:45	16:00	0	0	0	**0**	0	0	0	**2**	**2**	2	4	0	**6**	0	0	0	**4**	**10**	**6**
16:00	16:15	0	0	0	**0**	0	0	0	**1**	**1**	1	13	0	**14**	0	0	0	**13**	**27**	**14**
16:15	16:30	0	0	0	**0**	0	0	0	**2**	**2**	2	8	0	**10**	0	0	0	**8**	**18**	**10**
16:30	16:45	0	0	0	**0**	0	0	0	**1**	**1**	1	2	0	**3**	0	0	0	**2**	**5**	**3**
16:45	17:00	0	0	0	**0**	0	0	0	**1**	**1**	1	5	0	**6**	0	0	0	**5**	**11**	**6**
17:00	17:15	0	0	0	**0**	0	0	0	**1**	**1**	1	12	0	**13**	0	0	0	**12**	**25**	**13**
17:15	17:30	0	0	0	**0**	0	0	0	**1**	**1**	1	6	0	**7**	0	0	0	**6**	**13**	**7**
17:30	17:45	0	0	0	**0**	0	0	0	**0**	**0**	0	7	0	**7**	0	0	0	**7**	**14**	**7**
17:45	18:00	0	0	0	**0**	0	0	0	**1**	**1**	1	9	0	**10**	0	0	0	**9**	**19**	**10**
Total:	None	0	0	0	**0**	0	0	0	**45**	**45**	45	257	0	**302**	0	0	0	**257**	**559**	**302**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMBERLAIN AVE @ KENT ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 40742

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		KENT ST Northbound U-Turn Total	KENT ST Southbound U-Turn Total	CHAMBERLAIN AVE Eastbound U-Turn Total	CHAMBERLAIN AVE Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	222	219	0	0	0	0	0	258	123
Future Volume (vph)	0	0	0	222	219	0	0	0	0	0	258	123
Satd. Flow (prot)	0	0	0	0	4645	0	0	0	0	0	1745	1483
Flt Permitted					0.975							
Satd. Flow (perm)	0	0	0	0	4612	0	0	0	0	0	1745	1454
Satd. Flow (RTOR)					247							137
Lane Group Flow (vph)	0	0	0	0	490	0	0	0	0	0	287	137
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				40.0	40.0						35.0	35.0
Total Split (%)				53.3%	53.3%						46.7%	46.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					34.8						29.7	29.7
Actuated g/C Ratio					0.46						0.40	0.40
v/c Ratio					0.22						0.42	0.21
Control Delay					10.0						18.7	3.9
Queue Delay					0.0						0.0	0.0
Total Delay					10.0						18.7	3.9
LOS					B						B	A
Approach Delay					10.0						13.9	
Approach LOS					B						B	
Queue Length 50th (m)					19.1						28.5	0.0
Queue Length 95th (m)					m25.8						47.7	9.5
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					2272						691	658
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.22						0.42	0.21

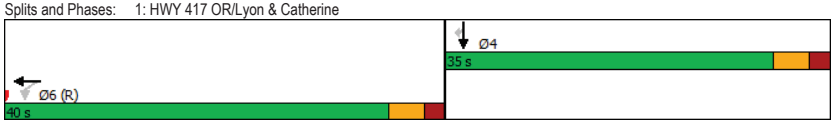
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 48 (64%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 11.8	Intersection LOS: B
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: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	389	537	54	1333	0	0	0	0
Future Volume (vph)	0	0	0	0	389	537	54	1333	0	0	0	0
Satd. Flow (prot)	0	0	0	0	2916	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	2916	1262	0	4749	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	707	322	0	1541	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					32.0	32.0	38.0	38.0				
Total Split (%)					42.7%	42.7%	50.7%	50.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					26.2	26.2		32.2				
Actuated g/C Ratio					0.35	0.35		0.43				
v/c Ratio					0.69	0.73		0.74				
Control Delay					26.9	31.7		19.7				
Queue Delay					0.0	0.0		0.0				
Total Delay					26.9	31.7		19.7				
LOS					C	C		B				
Approach Delay					28.4			19.7				
Approach LOS					C			B				
Queue Length 50th (m)					49.8	45.9		61.5				
Queue Length 95th (m)					m61.0	m57.3		77.9				
Internal Link Dist (m)		157.8			130.6			47.0			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1018	440		2078				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.69	0.73		0.74				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 15 (20%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

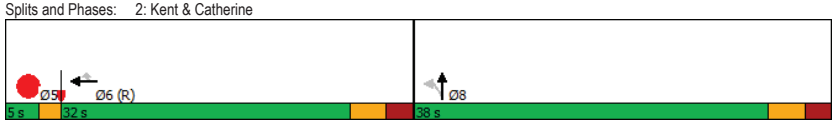
Intersection Summary

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 23.2	Intersection LOS: C
Intersection Capacity Utilization 64.8%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	682	0	0	0	0	
Future Volume (vph)	0	682	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	758	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		32.8					
Actuated g/C Ratio		0.63					
v/c Ratio		0.36					
Control Delay		7.5					
Queue Delay		0.0					
Total Delay		7.5					
LOS		A					
Approach Delay		7.5					
Approach LOS		A					
Queue Length 50th (m)		21.9					
Queue Length 95th (m)		31.6					
Internal Link Dist (m)		270.2	176.4		31.3		
Turn Bay Length (m)							
Base Capacity (vph)		2163					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.35					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 51.7
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.36

Intersection Signal Delay: 7.5 | Intersection LOS: A
Intersection Capacity Utilization 24.1% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	160	582	189	272	626	0	0	363	110
Future Volume (vph)	0	0	0	160	582	189	272	626	0	0	363	110
Satd. Flow (prot)	0	0	0	0	4481	0	0	3266	0	0	2996	0
Flt Permitted					0.991			0.633				
Satd. Flow (perm)	0	0	0	0	4429	0	0	2035	0	0	2996	0
Satd. Flow (RTOR)					80						51	
Lane Group Flow (vph)	0	0	0	0	1035	0	0	998	0	0	525	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				25.0	25.0		15.0	40.0			25.0	
Total Split (%)				33.3%	33.3%		20.0%	53.3%			33.3%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?				Yes	Yes						Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					19.4			34.6			19.6	
Actuated g/C Ratio					0.26			0.46			0.26	
v/c Ratio					0.86			0.91			0.64	
Control Delay					33.3			18.0			26.3	
Queue Delay					0.0			0.0			0.2	
Total Delay					33.3			18.0			26.4	
LOS					C			B			C	
Approach Delay					33.3			18.0			26.4	
Approach LOS					C			B			C	
Queue Length 50th (m)					47.3			15.1			31.1	
Queue Length 95th (m)					#69.1			m#34.1			46.7	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1204			1096			820	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			29	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.86			0.91			0.66	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 70 (93%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?	Yes		Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

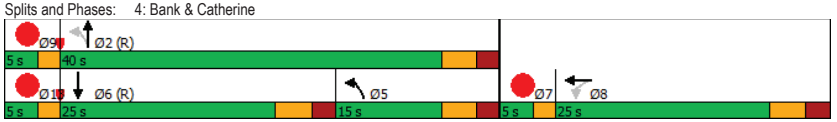
Intersection Summary

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 25.9	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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Bank & Catherine



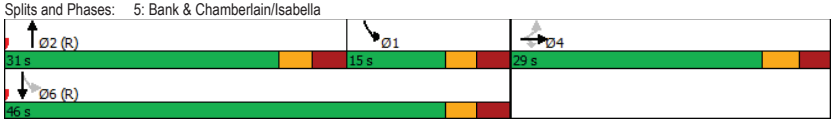
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	487	75	0	0	0	0	834	142	168	372	0
Future Volume (vph)	74	487	75	0	0	0	0	834	142	168	372	0
Satd. Flow (prot)	0	3292	1483	0	0	0	0	3154	0	1658	1745	0
Flt Permitted		0.993								0.145		
Satd. Flow (perm)	0	3285	1394	0	0	0	0	3154	0	253	1745	0
Satd. Flow (RTOR)			134					27				
Lane Group Flow (vph)	0	623	83	0	0	0	0	1085	0	187	413	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	29.0	29.0	29.0					31.0		15.0	46.0	
Total Split (%)	38.7%	38.7%	38.7%					41.3%		20.0%	61.3%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		6.2	6.2					6.1		6.1	6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		19.3	19.3					28.4		43.4	43.4	
Actuated g/C Ratio		0.26	0.26					0.38		0.58	0.58	
v/c Ratio		0.74	0.18					0.90		0.60	0.41	
Control Delay		30.9	2.2					34.6		27.1	8.2	
Queue Delay		0.0	0.0					0.0		0.0	1.3	
Total Delay		30.9	2.2					34.6		27.1	9.5	
LOS		C	A					C		C	A	
Approach Delay		27.5						34.6			15.0	
Approach LOS		C						C			B	
Queue Length 50th (m)		41.8	0.0					73.7		14.1	21.3	
Queue Length 95th (m)		55.7	3.4					#122.9		m31.4	m28.4	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		998	517					1211		313	1009	
Starvation Cap Reductn		0	0					0		0	389	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.62	0.16					0.90		0.60	0.67	

Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90
Intersection Signal Delay: 27.6 — Intersection LOS: C
Intersection Capacity Utilization 75.1% — 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Bank & Chamberlain/Isabella



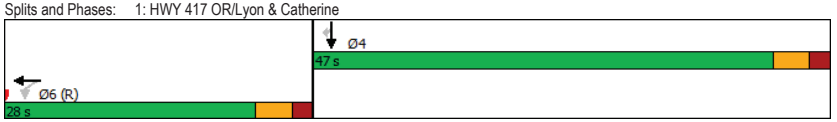
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	192	436	0	0	0	0	0	343	255
Future Volume (vph)	0	0	0	192	436	0	0	0	0	0	343	255
Satd. Flow (prot)	0	0	0	0	4693	0	0	0	0	0	1745	1483
Flt Permitted					0.985							
Satd. Flow (perm)	0	0	0	0	4657	0	0	0	0	0	1745	1443
Satd. Flow (RTOR)					153							104
Lane Group Flow (vph)	0	0	0	0	697	0	0	0	0	0	381	283
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				28.0	28.0						47.0	47.0
Total Split (%)				37.3%	37.3%						62.7%	62.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					22.8						41.7	41.7
Actuated g/C Ratio					0.30						0.56	0.56
v/c Ratio					0.46						0.39	0.33
Control Delay					15.4						11.0	6.8
Queue Delay					0.0						0.0	0.0
Total Delay					15.4						11.0	6.8
LOS					B						B	A
Approach Delay					15.4						9.2	
Approach LOS					B						A	
Queue Length 50th (m)					9.1						28.1	11.8
Queue Length 95th (m)					11.3						45.5	24.7
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					1522						970	848
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.46						0.39	0.33

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 24 (32%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 45.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	593	289	25	720	0	0	0	0
Future Volume (vph)	0	0	0	0	593	289	25	720	0	0	0	0
Satd. Flow (prot)	0	0	0	0	3143	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	3143	1247	0	4752	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	691	289	0	828	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					38.0	38.0	32.0	32.0				
Total Split (%)					50.7%	50.7%	42.7%	42.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					32.2	32.2		26.2				
Actuated g/C Ratio					0.43	0.43		0.35				
v/c Ratio					0.51	0.54		0.49				
Control Delay					14.1	16.6		18.5				
Queue Delay					0.0	0.0		0.0				
Total Delay					14.1	16.6		18.5				
LOS					B	B		B				
Approach Delay					14.8			18.5				
Approach LOS					B			B				
Queue Length 50th (m)					30.2	25.3		30.0				
Queue Length 95th (m)					m42.9	m38.9		40.6				
Internal Link Dist (m)		157.8			130.6			43.8			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1349	535		1705				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.51	0.54		0.49				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 12 (16%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 16.5	Intersection LOS: B
Intersection Capacity Utilization 48.2%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	772	0	0	0	0	
Future Volume (vph)	0	772	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	858	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		35.8					
Actuated g/C Ratio		0.83					
v/c Ratio		0.31					
Control Delay		4.3					
Queue Delay		0.0					
Total Delay		4.3					
LOS		A					
Approach Delay		4.3					
Approach LOS		A					
Queue Length 50th (m)		0.0					
Queue Length 95th (m)		36.3					
Internal Link Dist (m)		270.2	176.4		23.7		
Turn Bay Length (m)							
Base Capacity (vph)		2764					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.31					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 43
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.31

Intersection Signal Delay: 4.3 | Intersection LOS: A
Intersection Capacity Utilization 26.7% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	225	484	137	182	320	0	0	643	110
Future Volume (vph)	0	0	0	225	484	137	182	320	0	0	643	110
Satd. Flow (prot)	0	0	0	0	4536	0	0	3256	0	0	3095	0
Flt Permitted					0.987			0.547				
Satd. Flow (perm)	0	0	0	0	4474	0	0	1814	0	0	3095	0
Satd. Flow (RTOR)					50						26	
Lane Group Flow (vph)	0	0	0	0	940	0	0	558	0	0	836	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				24.0	24.0		14.0	41.0			27.0	
Total Split (%)				32.0%	32.0%		18.7%	54.7%			36.0%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?											Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					18.4			35.6			21.6	
Actuated g/C Ratio					0.25			0.47			0.29	
v/c Ratio					0.83			0.54			0.92	
Control Delay					33.0			12.0			42.4	
Queue Delay					0.0			0.0			46.0	
Total Delay					33.0			12.0			88.3	
LOS					C			B			F	
Approach Delay					33.0			12.0			88.3	
Approach LOS					C			B			F	
Queue Length 50th (m)					43.8			15.1			58.2	
Queue Length 95th (m)					#60.2			19.1			#92.8	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1135			1026			909	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					2			0			151	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.83			0.54			1.10	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 50 (67%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?			Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

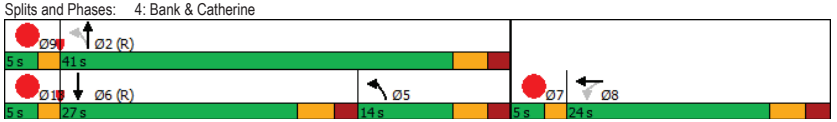
Intersection Summary

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 47.8	Intersection LOS: D
Intersection Capacity Utilization 72.7%	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: 4: Bank & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	590	120	0	0	0	0	448	91	175	720	0
Future Volume (vph)	53	590	120	0	0	0	0	448	91	175	720	0
Satd. Flow (prot)	0	3302	1483	0	0	0	0	3097	0	0	3283	0
Flt Permitted		0.996									0.701	
Satd. Flow (perm)	0	3299	1345	0	0	0	0	3097	0	0	2284	0
Satd. Flow (RTOR)			134					33				
Lane Group Flow (vph)	0	715	133	0	0	0	0	599	0	0	994	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.2	6.2					6.1			6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		21.5	21.5					41.2			41.2	
Actuated g/C Ratio		0.29	0.29					0.55			0.55	
v/c Ratio		0.76	0.28					0.35			0.79	
Control Delay		29.6	5.3					10.2			16.4	
Queue Delay		0.0	0.0					0.0			10.4	
Total Delay		29.6	5.3					10.2			26.8	
LOS		C	A					B			C	
Approach Delay		25.8						10.2			26.8	
Approach LOS		C						B			C	
Queue Length 50th (m)		47.6	0.0					21.8			81.8	
Queue Length 95th (m)		62.4	10.5					34.8			m92.5	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1090	534					1714			1253	
Starvation Cap Reductn		0	0					0			242	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.66	0.25					0.35			0.98	

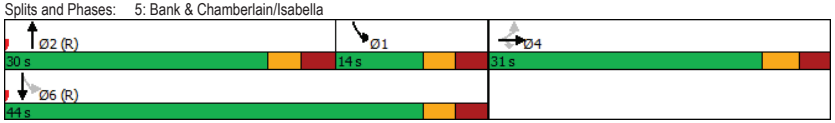
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 60 (80%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 22.4	Intersection LOS: C
Intersection Capacity Utilization 81.3%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 5: Bank & Chamberlain/Isabella



Appendix D

Collision Data

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition	# Vehicles	# Motorcycles	# Bicycles	# Pedestrians
2016-10-13	2016	10:56	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2016-10-10	2016	19:17	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2016-10-30	2016	15:08	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2016-11-05	2016	13:49	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2016-12-31	2016	15:23	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	03 - Snow	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	03 - Loose snow	2	0	0	0
2016-03-21	2016	11:12	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	01 - Dry	2	0	0	0
2016-03-04	2016	14:55	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2016-01-11	2016	1:39	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	03 - Snow	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	03 - Loose snow	2	0	0	0
2016-01-11	2016	21:08	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	07 - SMV other	02 - Wet	1	0	0	1
2016-01-03	2016	22:14	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	02 - Wet	2	0	0	0
2016-04-21	2016	15:40	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2016-05-31	2016	8:32	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	1	0
2016-06-20	2016	2:12	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2016-06-25	2016	10:38	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2016-07-04	2016	0:24	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2016-08-26	2016	13:33	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	3	0	0	0
2016-09-20	2016	18:46	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2017-12-15	2017	16:39	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	03 - Snow	05 - Dusk	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	02 - Wet	3	0	0	0
2017-02-27	2017	14:49	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2017-04-08	2017	15:02	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	01 - Dry	2	0	0	0
2017-04-29	2017	13:25	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2017-07-16	2017	10:56	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2017-07-16	2017	8:49	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2017-07-11	2017	17:16	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	02 - Rain	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	02 - Wet	2	0	0	0
2017-08-24	2017	20:58	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	05 - Dusk	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2017-09-13	2017	5:30	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2017-09-23	2017	14:50	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2018-10-18	2018	14:13	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2018-02-06	2018	20:50	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	02 - Wet	2	0	0	0
2018-05-26	2018	11:40	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	01 - Dry	1	0	0	0
2018-05-14	2018	10:32	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2018-05-11	2018	15:08	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2018-07-27	2018	14:15	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2018-08-30	2018	13:20	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	01 - Dry	2	0	0	0
2018-01-16	2018	20:05	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	04 - Slush	1	0	0	0
2019-08-21	2019	16:00	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	00 - Unknown	02 - Non-fatal injury	03 - Rear end	01 - Dry	2	0	0	0
2019-09-18	2019	0:37	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2019-02-11	2019	8:44	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	3	0	0	0
2019-02-24	2019	17:05	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	02 - Rain	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	02 - Wet	2	0	0	0
2019-02-16	2019	22:13	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	00 - Unknown	03 - P.D. only	05 - Turning movement	02 - Wet	2	0	0	0
2019-04-13	2019	17:26	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	01 - Dry	2	0	0	0
2019-05-05	2019	13:20	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2019-04-30	2019	22:56	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2019-04-30	2019	18:09	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	03 - Rear end	01 - Dry	2	0	0	0
2019-07-08	2019	21:37	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	01 - Dry	2	0	0	0
2019-07-25	2019	12:16	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2019-08-13	2019	23:31	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2019-08-11	2019	20:50	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2019-08-16	2019	1:01	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2020-03-10	2020	10:55	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	02 - Wet	3	0	0	0
2020-02-29	2020	15:57	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2020-09-18	2020	16:30	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2020-09-07	2020	21:29	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2020-11-03	2020	9:42	BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST (0002132)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	05 - Packed snow	2	0	0	0
2016-05-20	2016	15:50	CHAMBERLAIN AVE @ KENT ST (0002131)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2018-03-13	2018	2:58	CHAMBERLAIN AVE @ KENT ST (0002131)	03 - Snow	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	07 - SMV other	03 - Loose snow	2	0	0	0
2020-07-04	2020	12:45	CHAMBERLAIN AVE @ KENT ST (0002131)	01 - Clear	01 - Daylight	12 - IPS	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2017-08-22	2017	16:28	CHAMBERLAIN AVE btwn KENT ST & TO BE DETERMINED (__3ZA25A)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	04 - Sideswipe	02 - Wet	2	0	0	0
2017-09-13	2017	9:12	CHAMBERLAIN AVE btwn KENT ST & TO BE DETERMINED (__3ZA25A)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	2	0	0	0
2018-10-12	2018	16:01	CHAMBERLAIN AVE btwn KENT ST & TO BE DETERMINED (__3ZA25A)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2016-08-30	2016	14:54	CHAMBERLAIN AVE btwn LYON ST S & KENT ST (__3ZA25C)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2019-04-05	2019	15:49	CHAMBERLAIN AVE btwn LYON ST S & KENT ST (__3ZA25C)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0

From: January 1, 2014 **To:** December 31, 2018

Location: BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Traffic Control: Traffic signal **Total Collisions:** 56

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Mar-13, Thu,01:00	Snow	Angle	P.D. only	Loose snow	South	Unknown	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Jul-18, Fri,22:25	Clear	SMV other	P.D. only	Dry	South	Turning left	Automobile, station wagon	Pedestrian	1
2014-Jul-19, Sat,21:01	Clear	Rear end	P.D. only	Dry	South	Going ahead	Passenger van	Other motor vehicle	0
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2014-Jul-31, Thu,11:45	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Aug-10, Sun,21:41	Clear	Rear end	Non-fatal injury	Dry	South	Unknown	Unknown	Cyclist	0
					South	Turning left	Bicycle	Other motor vehicle	
2014-Oct-08, Wed,13:59	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Oct-11, Sat,06:51	Clear	Turning movement	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Motorcycle	Other motor vehicle	
2014-Oct-14, Tue,06:30	Clear	Angle	Non-fatal injury	Dry	East	Slowing or stopping	Truck - dump	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Oct-23, Thu,20:20	Clear	SMV other	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Pedestrian	1
2015-Feb-08, Sun,08:48	Snow	Rear end	P.D. only	Loose snow	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Apr-29, Wed,10:54	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-May-09, Sat,20:05	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2015-Aug-06, Thu,20:59	Clear	SMV other	P.D. only	Dry	North	Turning left	Automobile, station wagon	Ran off road	0

Transportation Services - Traffic Services
Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2018

Location: BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Traffic Control: Traffic signal **Total Collisions:** 56

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Sep-08, Tue,19:37	Clear	Angle	P.D. only	Dry	South	Turning left	Bicycle	Other motor vehicle	0
					East	Turning left	Automobile, station wagon	Cyclist	
2015-Sep-12, Sat,16:42	Rain	Turning movement	P.D. only	Wet	East	Turning left	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Passenger van	Other motor vehicle	
2015-Sep-13, Sun,15:43	Clear	Turning movement	P.D. only	Wet	East	Turning left	Delivery van	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2015-Oct-12, Mon,14:45	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Oct-12, Mon,17:00	Clear	Sideswipe	P.D. only	Dry	East	Unknown	Unknown	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Oct-14, Wed,17:01	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Oct-27, Tue,15:22	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Pick-up truck	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Dec-18, Fri,15:42	Clear	Sideswipe	P.D. only	Dry	South	Stopped	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Truck - dump	Other motor vehicle	
2016-Jan-03, Sun,22:14	Clear	Angle	P.D. only	Wet	South	Going ahead	Pick-up truck	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-Jan-11, Mon,01:39	Snow	Angle	P.D. only	Loose snow	East	Turning right	Pick-up truck	Other motor vehicle	0
					South	Going ahead	Municipal transit bus	Other motor vehicle	
2016-Jan-11, Mon,21:08	Clear	SMV other	Non-fatal injury	Wet	North	Turning right	Automobile, station wagon	Pedestrian	1
2016-Mar-04, Fri,14:55	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Turning left	Pick-up truck	Other motor vehicle	

From: January 1, 2014 **To:** December 31, 2018

Location: BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Traffic Control: Traffic signal **Total Collisions:** 56

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Mar-21, Mon,11:12	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-Apr-21, Thu,15:40	Clear	Rear end	P.D. only	Dry	East	Going ahead	Police vehicle	Other motor vehicle	0
					East	Slowing or stopping	Passenger van	Other motor vehicle	
2016-May-31, Tue,08:32	Clear	Sideswipe	P.D. only	Dry	North	Unknown	Bicycle	Other motor vehicle	0
					North	Stopped	Automobile, station wagon	Cyclist	
2016-Jun-20, Mon,02:12	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-Jun-25, Sat,10:38	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Jul-04, Mon,00:24	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Pick-up truck	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Aug-26, Fri,13:33	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Pick-up truck	Other motor vehicle	0
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2016-Sep-20, Tue,18:46	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-Oct-10, Mon,19:17	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Oct-13, Thu,10:56	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-Oct-30, Sun,15:08	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Transportation Services - Traffic Services
Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2018

Location: BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Traffic Control: Traffic signal **Total Collisions:** 56

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Nov-05, Sat,13:49	Clear	Angle	P.D. only	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Dec-31, Sat,15:23	Snow	Rear end	P.D. only	Loose snow	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					North	Stopped	Pick-up truck	Other motor vehicle	
2017-Feb-27, Mon,14:49	Clear	Angle	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Apr-08, Sat,15:02	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Apr-29, Sat,13:25	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Automobile, station wagon	Other motor vehicle	0
					South	Changing lanes	Automobile, station wagon	Other motor vehicle	
2017-Jul-11, Tue,17:16	Rain	Rear end	P.D. only	Wet	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					East	Stopped	Pick-up truck	Other motor vehicle	
2017-Jul-16, Sun,08:49	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Jul-16, Sun,10:56	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Aug-24, Thu,20:58	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Sep-13, Wed,05:30	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Pick-up truck	Other motor vehicle	
2017-Sep-23, Sat,14:50	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Dec-15, Fri,16:39	Snow	Sideswipe	P.D. only	Wet	East	Changing lanes	Pick-up truck	Other motor vehicle	0
					East	Turning left	Truck and trailer	Other motor vehicle	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2018

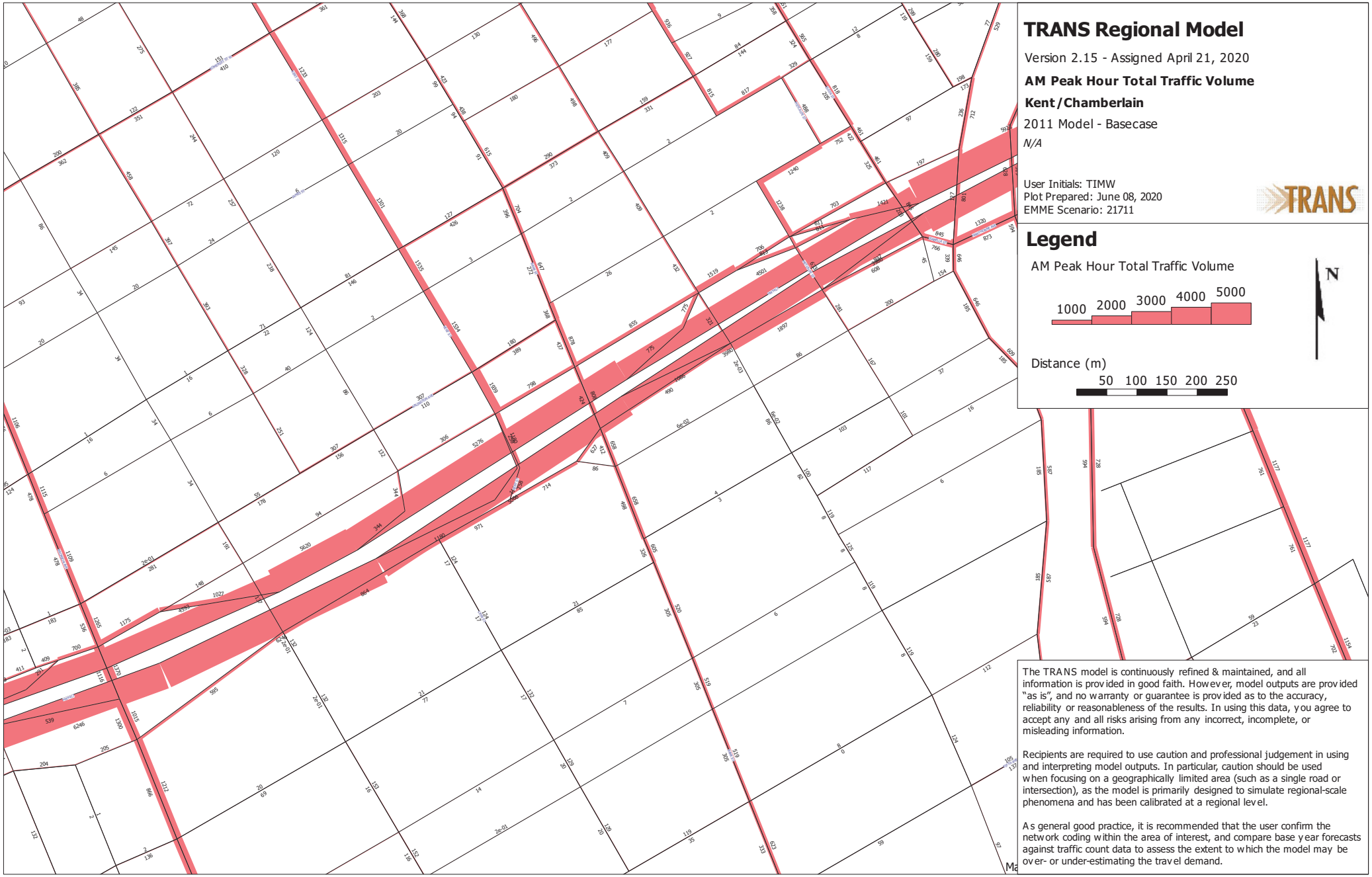
Location: BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Traffic Control: Traffic signal **Total Collisions:** 56

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Jan-16, Tue,20:05	Clear	Turning movement	P.D. only	Slush	South	Turning left	Pick-up truck	Other motor vehicle	0
					North	Going ahead	Pick-up truck	Other motor vehicle	
2018-Feb-06, Tue,20:50	Clear	Turning movement	P.D. only	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-May-11, Fri,15:08	Clear	Sideswipe	P.D. only	Dry	East	Overtaking	Automobile, station wagon	Other motor vehicle	0
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2018-May-14, Mon,10:32	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-May-26, Sat,11:40	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Jul-27, Fri,14:15	Clear	Rear end	P.D. only	Dry	North	Unknown	Unknown	Other motor vehicle	0
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Aug-30, Thu,13:20	Clear	Turning movement	P.D. only	Dry	East	Turning left	Delivery van	Other motor vehicle	0
					East	Turning left	Passenger van	Other motor vehicle	
2018-Oct-18, Thu,14:13	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	0
					East	Stopped	Automobile, station wagon	Other motor vehicle	

Appendix E

TRANS Model Plots



TRANS Regional Model

Version 2.15 - Assigned April 21, 2020

AM Peak Hour Total Traffic Volume

Kent/Chamberlain

2011 Model - Basecase

N/A

User Initials: TIMW
Plot Prepared: June 08, 2020
EMME Scenario: 21711

TRANS

Legend

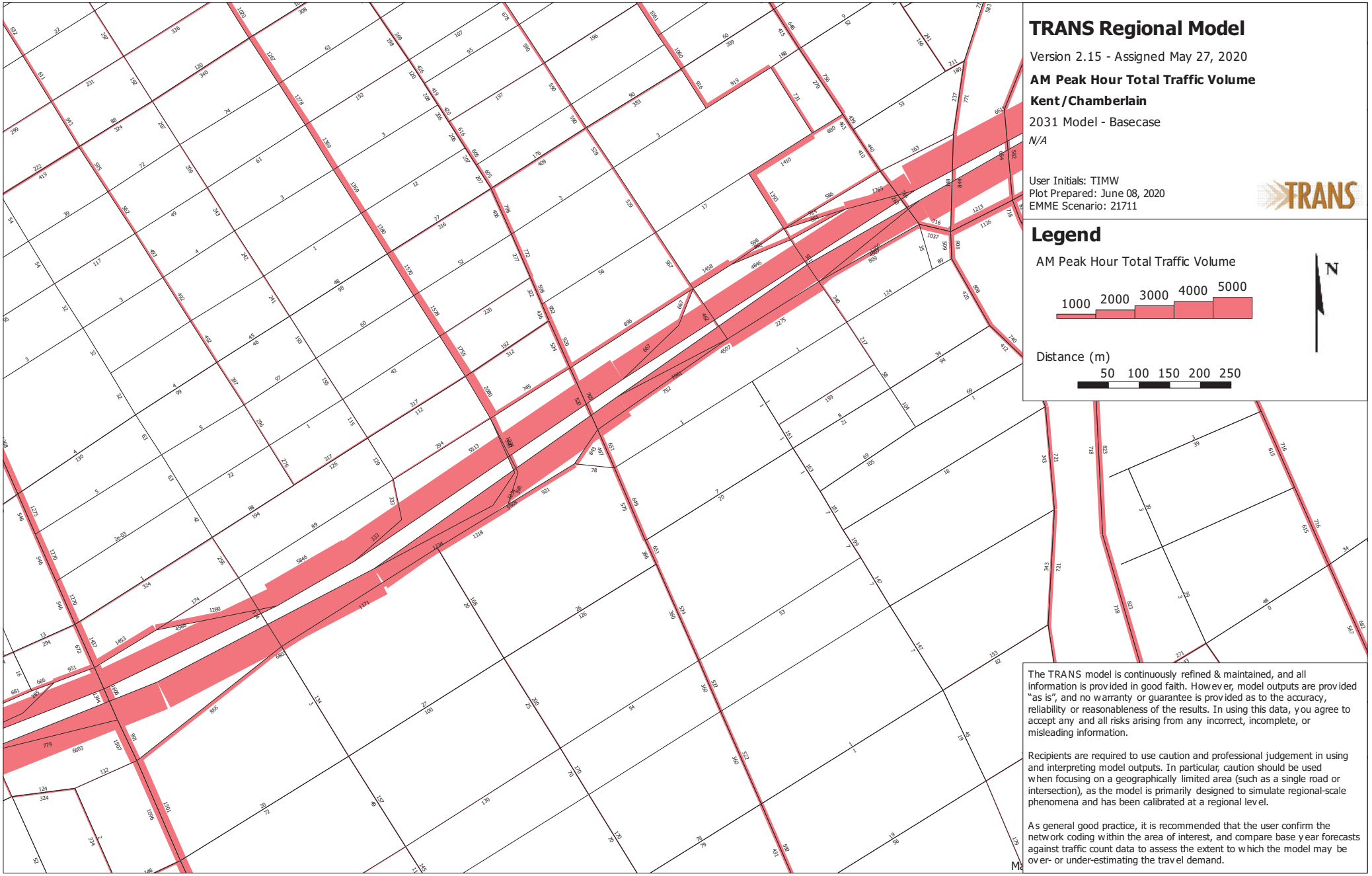
AM Peak Hour Total Traffic Volume

1000 2000 3000 4000 5000

N

Distance (m)

50 100 150 200 250



TRANS Regional Model

Version 2.15 - Assigned May 27, 2020

AM Peak Hour Total Traffic Volume

Kent/Chamberlain

2031 Model - Basecase

N/A

User Initials: TIMW
Plot Prepared: June 08, 2020
EMME Scenario: 21711

Legend

AM Peak Hour Total Traffic Volume

1000 2000 3000 4000 5000

Distance (m)

50 100 150 200 250

N

The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.

Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.

As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.

Appendix F

Synchro Intersection Worksheets – 2024 Future Background Conditions

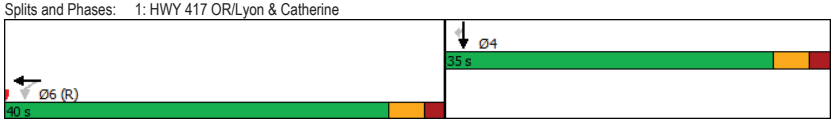
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	222	219	0	0	0	0	0	258	127
Future Volume (vph)	0	0	0	222	219	0	0	0	0	0	258	127
Satd. Flow (prot)	0	0	0	0	4645	0	0	0	0	0	1745	1483
Flt Permitted					0.975							
Satd. Flow (perm)	0	0	0	0	4612	0	0	0	0	0	1745	1454
Satd. Flow (RTOR)					222							127
Lane Group Flow (vph)	0	0	0	0	441	0	0	0	0	0	258	127
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				40.0	40.0						35.0	35.0
Total Split (%)				53.3%	53.3%						46.7%	46.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					34.8						29.7	29.7
Actuated g/C Ratio					0.46						0.40	0.40
v/c Ratio					0.20						0.37	0.19
Control Delay					10.5						18.1	3.9
Queue Delay					0.0						0.0	0.0
Total Delay					10.5						18.1	3.9
LOS					B						B	A
Approach Delay					10.5						13.4	
Approach LOS					B						B	
Queue Length 50th (m)					17.3						25.1	0.0
Queue Length 95th (m)					26.1						42.7	9.2
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					2258						691	652
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.20						0.37	0.19

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 48 (64%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 11.9	Intersection LOS: B
Intersection Capacity Utilization 47.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	389	537	54	1373	0	0	0	0
Future Volume (vph)	0	0	0	0	389	537	54	1373	0	0	0	0
Satd. Flow (prot)	0	0	0	0	2916	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	2916	1262	0	4750	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	636	290	0	1427	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					32.0	32.0	38.0	38.0				
Total Split (%)					42.7%	42.7%	50.7%	50.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					26.2	26.2		32.2				
Actuated g/C Ratio					0.35	0.35		0.43				
v/c Ratio					0.62	0.66		0.69				
Control Delay					26.3	30.1		18.5				
Queue Delay					0.0	0.0		0.0				
Total Delay					26.3	30.1		18.5				
LOS					C	C		B				
Approach Delay					27.5			18.5				
Approach LOS					C			B				
Queue Length 50th (m)					43.3	40.0		54.6				
Queue Length 95th (m)					m60.6	m57.1		69.8				
Internal Link Dist (m)		157.8			130.6			47.0			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1018	440		2079				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.62	0.66		0.69				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 15 (20%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

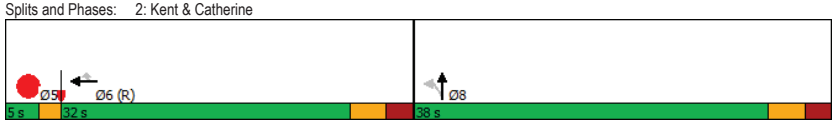
Intersection Summary

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 65.6%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	746	0	0	0	0	
Future Volume (vph)	0	746	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	746	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		32.6					
Actuated g/C Ratio		0.63					
v/c Ratio		0.36					
Control Delay		7.5					
Queue Delay		0.0					
Total Delay		7.5					
LOS		A					
Approach Delay		7.5					
Approach LOS		A					
Queue Length 50th (m)		21.4					
Queue Length 95th (m)		31.0					
Internal Link Dist (m)		270.2	176.4		31.3		
Turn Bay Length (m)							
Base Capacity (vph)		2163					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.34					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 51.5
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.36

Intersection Signal Delay: 7.5 | Intersection LOS: A
Intersection Capacity Utilization 25.9% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	160	582	189	272	626	0	0	385	110
Future Volume (vph)	0	0	0	160	582	189	272	626	0	0	385	110
Satd. Flow (prot)	0	0	0	0	4481	0	0	3266	0	0	3011	0
Flt Permitted					0.991			0.648				
Satd. Flow (perm)	0	0	0	0	4429	0	0	2077	0	0	3011	0
Satd. Flow (RTOR)					81						47	
Lane Group Flow (vph)	0	0	0	0	931	0	0	898	0	0	495	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				25.0	25.0		15.0	40.0			25.0	
Total Split (%)				33.3%	33.3%		20.0%	53.3%			33.3%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?				Yes	Yes						Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					19.4			34.6			19.6	
Actuated g/C Ratio					0.26			0.46			0.26	
v/c Ratio					0.77			0.81			0.60	
Control Delay					28.6			12.0			25.5	
Queue Delay					0.0			0.0			0.1	
Total Delay					28.6			12.0			25.6	
LOS					C			B			C	
Approach Delay					28.6			12.0			25.6	
Approach LOS					C			B			C	
Queue Length 50th (m)					40.8			10.3			29.0	
Queue Length 95th (m)					54.9			m28.8			43.9	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1205			1110			821	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			27	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.77			0.81			0.62	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 70 (93%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?	Yes		Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

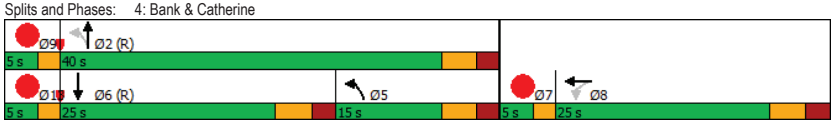
Intersection Summary

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 21.5	Intersection LOS: C
Intersection Capacity Utilization 79.5%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 4: Bank & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	533	82	0	0	0	0	834	162	192	395	0
Future Volume (vph)	81	533	82	0	0	0	0	834	162	192	395	0
Satd. Flow (prot)	0	3292	1483	0	0	0	0	3137	0	1658	1745	0
Flt Permitted		0.993								0.180		
Satd. Flow (perm)	0	3285	1334	0	0	0	0	3137	0	306	1745	0
Satd. Flow (RTOR)			134					32				
Lane Group Flow (vph)	0	614	82	0	0	0	0	996	0	192	395	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	29.0	29.0	29.0					31.0		15.0	46.0	
Total Split (%)	38.7%	38.7%	38.7%					41.3%		20.0%	61.3%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		6.2	6.2					6.1		6.1	6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		19.2	19.2					28.5		43.5	43.5	
Actuated g/C Ratio		0.26	0.26					0.38		0.58	0.58	
v/c Ratio		0.73	0.19					0.82		0.57	0.39	
Control Delay		30.7	2.2					28.8		24.6	8.0	
Queue Delay		0.0	0.0					0.0		0.0	1.1	
Total Delay		30.7	2.2					28.8		24.6	9.1	
LOS		C	A					C		C	A	
Approach Delay		27.3						28.8			14.1	
Approach LOS		C						C			B	
Queue Length 50th (m)		41.1	0.0					64.5		11.9	19.7	
Queue Length 95th (m)		54.8	3.3					#107.6		m33.3	m27.6	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		998	498					1210		337	1011	
Starvation Cap Reductn		0	0					0		0	385	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.62	0.16					0.82		0.57	0.63	

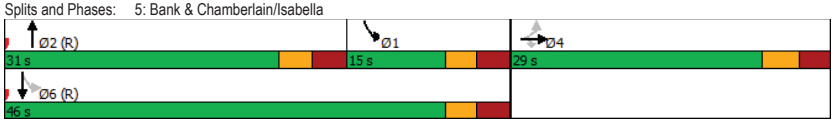
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 24.6	Intersection LOS: C
Intersection Capacity Utilization 78.8%	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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Bank & Chamberlain/Isabella



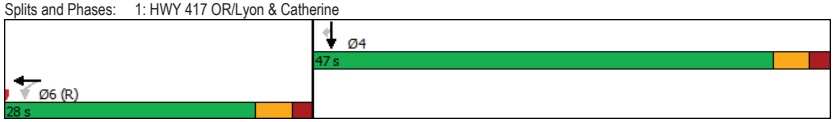
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	219	498	0	0	0	0	0	392	263
Future Volume (vph)	0	0	0	219	498	0	0	0	0	0	392	263
Satd. Flow (prot)	0	0	0	0	4693	0	0	0	0	0	1745	1483
Flt Permitted					0.985							
Satd. Flow (perm)	0	0	0	0	4657	0	0	0	0	0	1745	1443
Satd. Flow (RTOR)					153							98
Lane Group Flow (vph)	0	0	0	0	717	0	0	0	0	0	392	263
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				28.0	28.0						47.0	47.0
Total Split (%)				37.3%	37.3%						62.7%	62.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					22.8						41.7	41.7
Actuated g/C Ratio					0.30						0.56	0.56
v/c Ratio					0.47						0.40	0.31
Control Delay					16.1						11.1	6.5
Queue Delay					0.0						0.0	0.0
Total Delay					16.1						11.1	6.5
LOS					B						B	A
Approach Delay					16.1						9.3	
Approach LOS					B						A	
Queue Length 50th (m)					9.3						29.2	10.8
Queue Length 95th (m)					12.0						47.0	22.7
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					1522						970	845
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.47						0.40	0.31

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 24 (32%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 12.8	Intersection LOS: B
Intersection Capacity Utilization 50.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	648	316	25	742	0	0	0	0
Future Volume (vph)	0	0	0	0	648	316	25	742	0	0	0	0
Satd. Flow (prot)	0	0	0	0	3143	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	3143	1247	0	4752	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	680	284	0	767	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					38.0	38.0	32.0	32.0				
Total Split (%)					50.7%	50.7%	42.7%	42.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					32.2	32.2		26.2				
Actuated g/C Ratio					0.43	0.43		0.35				
v/c Ratio					0.50	0.53		0.45				
Control Delay					14.3	16.6		18.0				
Queue Delay					0.0	0.0		0.0				
Total Delay					14.3	16.6		18.0				
LOS					B	B		B				
Approach Delay					15.0			18.0				
Approach LOS					B			B				
Queue Length 50th (m)					29.8	25.0		27.1				
Queue Length 95th (m)					m41.1	m37.1		37.2				
Internal Link Dist (m)		157.8			130.6			43.8			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1349	535		1705				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.50	0.53		0.45				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 12 (16%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 16.3	Intersection LOS: B
Intersection Capacity Utilization 50.5%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	772	0	0	0	0	
Future Volume (vph)	0	772	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	772	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		34.6					
Actuated g/C Ratio		0.83					
v/c Ratio		0.28					
Control Delay		4.3					
Queue Delay		0.0					
Total Delay		4.3					
LOS		A					
Approach Delay		4.3					
Approach LOS		A					
Queue Length 50th (m)		0.0					
Queue Length 95th (m)		32.2					
Internal Link Dist (m)		270.2	176.4		23.7		
Turn Bay Length (m)							
Base Capacity (vph)		2738					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.28					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 41.9
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.28

Intersection Signal Delay: 4.3 | Intersection LOS: A
Intersection Capacity Utilization 26.7% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	257	553	157	199	340	0	0	643	120
Future Volume (vph)	0	0	0	257	553	157	199	340	0	0	643	120
Satd. Flow (prot)	0	0	0	0	4536	0	0	3256	0	0	3077	0
Flt Permitted					0.987			0.544				
Satd. Flow (perm)	0	0	0	0	4474	0	0	1766	0	0	3077	0
Satd. Flow (RTOR)					51						29	
Lane Group Flow (vph)	0	0	0	0	967	0	0	539	0	0	763	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				24.0	24.0		14.0	41.0			27.0	
Total Split (%)				32.0%	32.0%		18.7%	54.7%			36.0%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?											Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					18.4			35.6			21.6	
Actuated g/C Ratio					0.25			0.47			0.29	
v/c Ratio					0.85			0.53			0.84	
Control Delay					34.4			12.2			34.5	
Queue Delay					0.0			0.0			2.9	
Total Delay					34.4			12.2			37.4	
LOS					C			B			D	
Approach Delay					34.4			12.2			37.4	
Approach LOS					C			B			D	
Queue Length 50th (m)					45.4			14.9			51.2	
Queue Length 95th (m)					#66.1			18.9			#80.1	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1136			1009			906	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					1			0			71	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.85			0.53			0.91	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 50 (67%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?			Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

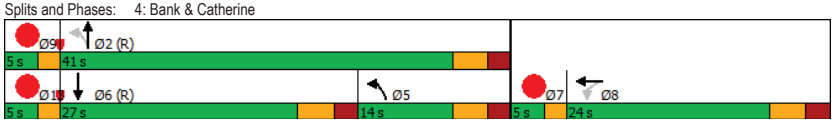
Intersection Summary

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 30.1	Intersection LOS: C
Intersection Capacity Utilization 76.8%	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: Bank & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	590	120	0	0	0	0	476	91	175	720	0
Future Volume (vph)	53	590	120	0	0	0	0	476	91	175	720	0
Satd. Flow (prot)	0	3302	1483	0	0	0	0	3106	0	0	3283	0
Flt Permitted		0.996									0.715	
Satd. Flow (perm)	0	3299	1345	0	0	0	0	3106	0	0	2326	0
Satd. Flow (RTOR)			134					31				
Lane Group Flow (vph)	0	643	120	0	0	0	0	567	0	0	895	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.2	6.2					6.1			6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		20.5	20.5					42.2			42.2	
Actuated g/C Ratio		0.27	0.27					0.56			0.56	
v/c Ratio		0.71	0.26					0.32			0.68	
Control Delay		29.0	4.7					9.4			13.2	
Queue Delay		0.0	0.0					0.0			3.0	
Total Delay		29.0	4.7					9.4			16.2	
LOS		C	A					A			B	
Approach Delay		25.2						9.4			16.2	
Approach LOS		C						A			B	
Queue Length 50th (m)		43.2	0.0					19.2			71.1	
Queue Length 95th (m)		55.3	8.7					32.7			m88.0	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1090	534					1761			1308	
Starvation Cap Reductn		0	0					0			300	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.59	0.22					0.32			0.89	

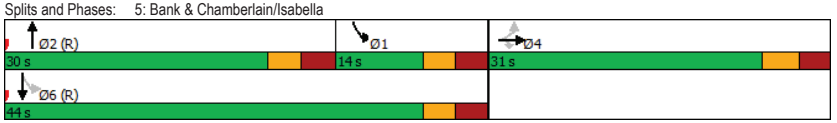
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 60 (80%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 17.6	Intersection LOS: B
Intersection Capacity Utilization 82.0%	ICU Level of Service E
Analysis Period (min) 15	

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

Splits and Phases: 5: Bank & Chamberlain/Isabella



Appendix G

Synchro Intersection Worksheets – 2029 Future Background Conditions

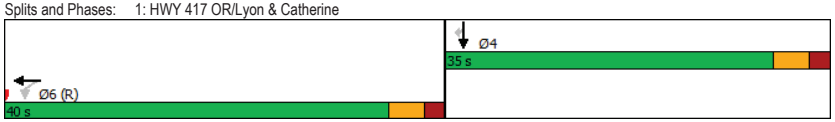
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	222	219	0	0	0	0	0	258	130
Future Volume (vph)	0	0	0	222	219	0	0	0	0	0	258	130
Satd. Flow (prot)	0	0	0	0	4645	0	0	0	0	0	1745	1483
Flt Permitted					0.975							
Satd. Flow (perm)	0	0	0	0	4612	0	0	0	0	0	1745	1454
Satd. Flow (RTOR)					222							130
Lane Group Flow (vph)	0	0	0	0	441	0	0	0	0	0	258	130
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				40.0	40.0						35.0	35.0
Total Split (%)				53.3%	53.3%						46.7%	46.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					34.8						29.7	29.7
Actuated g/C Ratio					0.46						0.40	0.40
v/c Ratio					0.20						0.37	0.20
Control Delay					10.5						18.1	3.9
Queue Delay					0.0						0.0	0.0
Total Delay					10.5						18.1	3.9
LOS					B						B	A
Approach Delay					10.5						13.3	
Approach LOS					B						B	
Queue Length 50th (m)					17.2						25.1	0.0
Queue Length 95th (m)					26.1						42.7	9.3
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					2258						691	654
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.20						0.37	0.20

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 48 (64%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 11.8	Intersection LOS: B
Intersection Capacity Utilization 47.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	389	537	54	1408	0	0	0	0
Future Volume (vph)	0	0	0	0	389	537	54	1408	0	0	0	0
Satd. Flow (prot)	0	0	0	0	2916	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	2916	1262	0	4750	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	636	290	0	1462	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					32.0	32.0	38.0	38.0				
Total Split (%)					42.7%	42.7%	50.7%	50.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					26.2	26.2		32.2				
Actuated g/C Ratio					0.35	0.35		0.43				
v/c Ratio					0.62	0.66		0.70				
Control Delay					26.2	30.0		18.8				
Queue Delay					0.0	0.0		0.0				
Total Delay					26.2	30.0		18.8				
LOS					C	C		B				
Approach Delay					27.4			18.8				
Approach LOS					C			B				
Queue Length 50th (m)					42.9	39.6		56.7				
Queue Length 95th (m)					m60.3	m56.8		72.3				
Internal Link Dist (m)		157.8			130.6			47.0			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1018	440		2079				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.62	0.66		0.70				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 15 (20%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

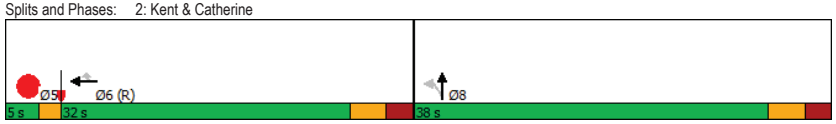
Intersection Summary

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 22.1	Intersection LOS: C
Intersection Capacity Utilization 66.3%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	803	0	0	0	0	
Future Volume (vph)	0	803	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	803	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		33.7					
Actuated g/C Ratio		0.64					
v/c Ratio		0.38					
Control Delay		7.5					
Queue Delay		0.0					
Total Delay		7.5					
LOS		A					
Approach Delay		7.5					
Approach LOS		A					
Queue Length 50th (m)		23.5					
Queue Length 95th (m)		33.7					
Internal Link Dist (m)		270.2	176.4		31.3		
Turn Bay Length (m)							
Base Capacity (vph)		2155					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.37					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 52.5
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.38

Intersection Signal Delay: 7.5 | Intersection LOS: A
Intersection Capacity Utilization 27.6% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	160	582	189	272	626	0	0	405	110
Future Volume (vph)	0	0	0	160	582	189	272	626	0	0	405	110
Satd. Flow (prot)	0	0	0	0	4481	0	0	3266	0	0	3022	0
Flt Permitted					0.991			0.638				
Satd. Flow (perm)	0	0	0	0	4429	0	0	2049	0	0	3022	0
Satd. Flow (RTOR)					81						44	
Lane Group Flow (vph)	0	0	0	0	931	0	0	898	0	0	515	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				25.0	25.0		15.0	40.0			25.0	
Total Split (%)				33.3%	33.3%		20.0%	53.3%			33.3%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?				Yes	Yes						Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					19.4			34.6			19.6	
Actuated g/C Ratio					0.26			0.46			0.26	
v/c Ratio					0.77			0.82			0.63	
Control Delay					28.6			12.0			26.2	
Queue Delay					0.0			0.0			0.2	
Total Delay					28.6			12.0			26.4	
LOS					C			B			C	
Approach Delay					28.6			12.0			26.4	
Approach LOS					C			B			C	
Queue Length 50th (m)					40.8			10.3			30.8	
Queue Length 95th (m)					54.9			m24.2			46.2	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1205			1101			822	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			29	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.77			0.82			0.65	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 70 (93%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?	Yes		Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

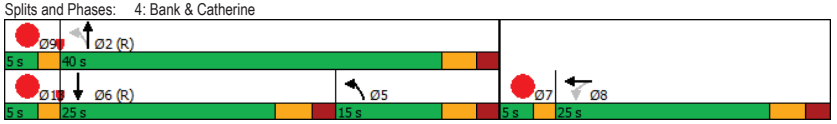
Intersection Summary

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 21.7	Intersection LOS: C
Intersection Capacity Utilization 80.1%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 4: Bank & Catherine



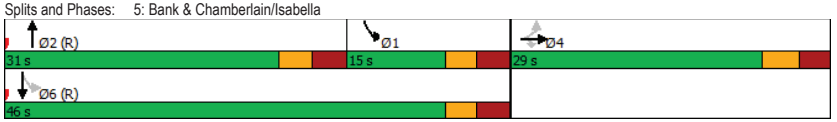
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	574	88	0	0	0	0	834	181	215	415	0
Future Volume (vph)	87	574	88	0	0	0	0	834	181	215	415	0
Satd. Flow (prot)	0	3292	1483	0	0	0	0	3117	0	1658	1745	0
Flt Permitted		0.993								0.167		
Satd. Flow (perm)	0	3285	1334	0	0	0	0	3117	0	284	1745	0
Satd. Flow (RTOR)			134					37				
Lane Group Flow (vph)	0	661	88	0	0	0	0	1015	0	215	415	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	29.0	29.0	29.0					31.0		15.0	46.0	
Total Split (%)	38.7%	38.7%	38.7%					41.3%		20.0%	61.3%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		6.2	6.2					6.1		6.1	6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		19.9	19.9					27.8		42.8	42.8	
Actuated g/C Ratio		0.27	0.27					0.37		0.57	0.57	
v/c Ratio		0.76	0.19					0.86		0.66	0.42	
Control Delay		31.1	2.5					31.9		30.0	8.4	
Queue Delay		0.0	0.0					0.0		0.0	1.4	
Total Delay		31.1	2.5					31.9		30.0	9.9	
LOS		C	A					C		C	A	
Approach Delay		27.8						31.9			16.7	
Approach LOS		C						C			B	
Queue Length 50th (m)		44.2	0.0					67.6		18.8	20.5	
Queue Length 95th (m)		59.6	4.2					#110.8		m#41.0	m28.6	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		998	498					1176		325	994	
Starvation Cap Reductn		0	0					0		0	380	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.66	0.18					0.86		0.66	0.68	

Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86
Intersection Signal Delay: 26.6 — Intersection LOS: C
Intersection Capacity Utilization 82.3% — ICU Level of Service E
Analysis Period (min) 15
\# 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: Bank & Chamberlain/Isabella



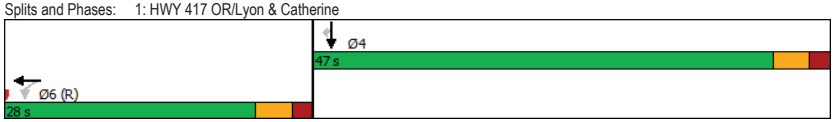
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	245	557	0	0	0	0	0	438	269
Future Volume (vph)	0	0	0	245	557	0	0	0	0	0	438	269
Satd. Flow (prot)	0	0	0	0	4693	0	0	0	0	0	1745	1483
Flt Permitted					0.985							
Satd. Flow (perm)	0	0	0	0	4657	0	0	0	0	0	1745	1443
Satd. Flow (RTOR)					152							75
Lane Group Flow (vph)	0	0	0	0	802	0	0	0	0	0	438	269
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				28.0	28.0						47.0	47.0
Total Split (%)				37.3%	37.3%						62.7%	62.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					22.8						41.7	41.7
Actuated g/C Ratio					0.30						0.56	0.56
v/c Ratio					0.53						0.45	0.32
Control Delay					16.7						11.8	7.6
Queue Delay					0.0						0.0	0.0
Total Delay					16.7						11.8	7.6
LOS					B						B	A
Approach Delay					16.7						10.2	
Approach LOS					B						B	
Queue Length 50th (m)					9.4						33.7	13.0
Queue Length 95th (m)					15.2						53.9	25.7
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					1521						970	835
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.53						0.45	0.32

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 24 (32%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 13.6	Intersection LOS: B
Intersection Capacity Utilization 54.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	699	340	25	761	0	0	0	0
Future Volume (vph)	0	0	0	0	699	340	25	761	0	0	0	0
Satd. Flow (prot)	0	0	0	0	3143	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	3143	1247	0	4752	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	733	306	0	786	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					38.0	38.0	32.0	32.0				
Total Split (%)					50.7%	50.7%	42.7%	42.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					32.2	32.2		26.2				
Actuated g/C Ratio					0.43	0.43		0.35				
v/c Ratio					0.54	0.57		0.46				
Control Delay					15.5	17.8		18.2				
Queue Delay					0.0	0.0		0.0				
Total Delay					15.5	17.8		18.2				
LOS					B	B		B				
Approach Delay					16.1			18.2				
Approach LOS					B			B				
Queue Length 50th (m)					35.1	29.3		28.0				
Queue Length 95th (m)					m40.3	m36.9		38.3				
Internal Link Dist (m)		157.8			130.6			43.8			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1349	535		1705				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.54	0.57		0.46				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 12 (16%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 17.0	Intersection LOS: B
Intersection Capacity Utilization 52.7%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	772	0	0	0	0	
Future Volume (vph)	0	772	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	772	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		34.6					
Actuated g/C Ratio		0.83					
v/c Ratio		0.28					
Control Delay		4.3					
Queue Delay		0.0					
Total Delay		4.3					
LOS		A					
Approach Delay		4.3					
Approach LOS		A					
Queue Length 50th (m)		0.0					
Queue Length 95th (m)		32.2					
Internal Link Dist (m)		270.2	176.4		23.7		
Turn Bay Length (m)							
Base Capacity (vph)		2738					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.28					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 41.9
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.28

Intersection Signal Delay: 4.3 | Intersection LOS: A
Intersection Capacity Utilization 26.7% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	287	618	175	214	357	0	0	643	130
Future Volume (vph)	0	0	0	287	618	175	214	357	0	0	643	130
Satd. Flow (prot)	0	0	0	0	4536	0	0	3256	0	0	3063	0
Flt Permitted					0.987			0.545				
Satd. Flow (perm)	0	0	0	0	4474	0	0	1770	0	0	3063	0
Satd. Flow (RTOR)					50						32	
Lane Group Flow (vph)	0	0	0	0	1080	0	0	571	0	0	773	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				24.0	24.0		14.0	41.0			27.0	
Total Split (%)				32.0%	32.0%		18.7%	54.7%			36.0%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?											Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					18.4			35.6			21.6	
Actuated g/C Ratio					0.25			0.47			0.29	
v/c Ratio					0.95			0.57			0.86	
Control Delay					45.4			12.6			35.4	
Queue Delay					0.1			0.0			3.7	
Total Delay					45.5			12.6			39.1	
LOS					D			B			D	
Approach Delay					45.5			12.6			39.1	
Approach LOS					D			B			D	
Queue Length 50th (m)					52.8			15.8			51.8	
Queue Length 95th (m)					#79.9			20.0			#81.8	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1135			1010			904	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					1			0			73	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.95			0.57			0.93	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 50 (67%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?			Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

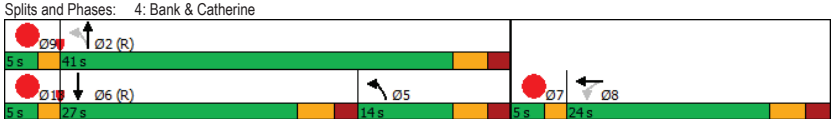
Intersection Summary

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 35.7	Intersection LOS: D
Intersection Capacity Utilization 80.5%	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: 4: Bank & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	590	120	0	0	0	0	500	91	175	720	0
Future Volume (vph)	53	590	120	0	0	0	0	500	91	175	720	0
Satd. Flow (prot)	0	3302	1483	0	0	0	0	3115	0	0	3283	0
Flt Permitted		0.996									0.705	
Satd. Flow (perm)	0	3299	1345	0	0	0	0	3115	0	0	2296	0
Satd. Flow (RTOR)			134					29				
Lane Group Flow (vph)	0	643	120	0	0	0	0	591	0	0	895	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.2	6.2					6.1			6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		20.5	20.5					42.2			42.2	
Actuated g/C Ratio		0.27	0.27					0.56			0.56	
v/c Ratio		0.71	0.26					0.33			0.69	
Control Delay		29.0	4.7					9.6			13.7	
Queue Delay		0.0	0.0					0.0			3.0	
Total Delay		29.0	4.7					9.6			16.7	
LOS		C	A					A			B	
Approach Delay		25.2						9.6			16.7	
Approach LOS		C						A			B	
Queue Length 50th (m)		43.2	0.0					20.3			71.5	
Queue Length 95th (m)		55.3	8.7					34.4			m84.2	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1090	534					1765			1291	
Starvation Cap Reductn		0	0					0			283	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.59	0.22					0.33			0.89	

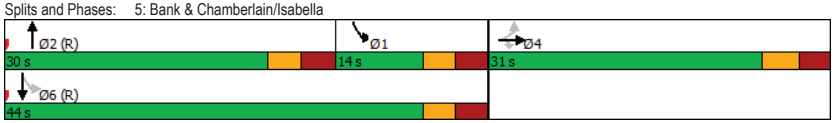
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 60 (80%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 17.7	Intersection LOS: B
Intersection Capacity Utilization 82.7%	ICU Level of Service E
Analysis Period (min) 15	

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

Splits and Phases: 5: Bank & Chamberlain/Isabella



Appendix H

2024 Future Total Conditions

CGH TRANSPORTATION

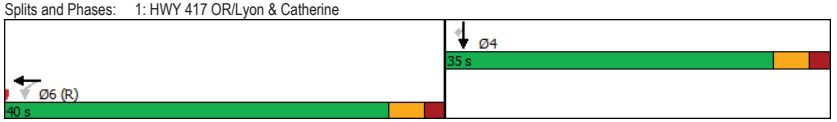
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	226	220	0	0	0	0	0	258	128
Future Volume (vph)	0	0	0	226	220	0	0	0	0	0	258	128
Satd. Flow (prot)	0	0	0	0	4645	0	0	0	0	0	1745	1483
Flt Permitted					0.975							
Satd. Flow (perm)	0	0	0	0	4611	0	0	0	0	0	1745	1454
Satd. Flow (RTOR)					226							128
Lane Group Flow (vph)	0	0	0	0	446	0	0	0	0	0	258	128
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				40.0	40.0						35.0	35.0
Total Split (%)				53.3%	53.3%						46.7%	46.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					34.8						29.7	29.7
Actuated g/C Ratio					0.46						0.40	0.40
v/c Ratio					0.20						0.37	0.20
Control Delay					10.5						18.1	3.9
Queue Delay					0.0						0.0	0.0
Total Delay					10.5						18.1	3.9
LOS					B						B	A
Approach Delay					10.5						13.4	
Approach LOS					B						B	
Queue Length 50th (m)					17.6						25.1	0.0
Queue Length 95th (m)					26.4						42.7	9.2
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					2260						691	653
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.20						0.37	0.20

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 48 (64%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 11.8	Intersection LOS: B
Intersection Capacity Utilization 47.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	394	539	54	1373	0	0	0	0
Future Volume (vph)	0	0	0	0	394	539	54	1373	0	0	0	0
Satd. Flow (prot)	0	0	0	0	2917	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	2917	1262	0	4750	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	642	291	0	1427	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					32.0	32.0	38.0	38.0				
Total Split (%)					42.7%	42.7%	50.7%	50.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					26.2	26.2		32.2				
Actuated g/C Ratio					0.35	0.35		0.43				
v/c Ratio					0.63	0.66		0.69				
Control Delay					26.2	30.0		18.5				
Queue Delay					0.0	0.0		0.0				
Total Delay					26.2	30.0		18.5				
LOS					C	C		B				
Approach Delay					27.4			18.5				
Approach LOS					C			B				
Queue Length 50th (m)					43.7	40.0		54.6				
Queue Length 95th (m)					m60.7	m56.8		69.8				
Internal Link Dist (m)		157.8			130.6			47.0			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1019	440		2079				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.63	0.66		0.69				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 15 (20%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

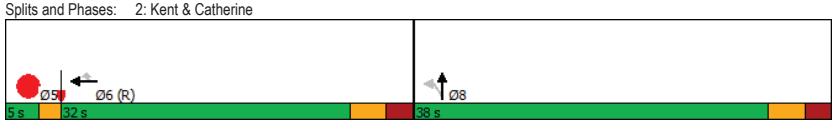
Intersection Summary

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 65.7%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	757	0	0	0	0	
Future Volume (vph)	0	757	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	757	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		32.7					
Actuated g/C Ratio		0.63					
v/c Ratio		0.36					
Control Delay		7.5					
Queue Delay		0.0					
Total Delay		7.5					
LOS		A					
Approach Delay		7.5					
Approach LOS		A					
Queue Length 50th (m)		21.8					
Queue Length 95th (m)		31.6					
Internal Link Dist (m)		270.2	176.4		31.3		
Turn Bay Length (m)							
Base Capacity (vph)		2162					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.35					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 51.6
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.36

Intersection Signal Delay: 7.5 | Intersection LOS: A
Intersection Capacity Utilization 26.3% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	160	582	189	278	627	0	0	385	110
Future Volume (vph)	0	0	0	160	582	189	278	627	0	0	385	110
Satd. Flow (prot)	0	0	0	0	4481	0	0	3266	0	0	3011	0
Flt Permitted					0.991			0.646				
Satd. Flow (perm)	0	0	0	0	4429	0	0	2070	0	0	3011	0
Satd. Flow (RTOR)					81						47	
Lane Group Flow (vph)	0	0	0	0	931	0	0	905	0	0	495	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				25.0	25.0		15.0	40.0			25.0	
Total Split (%)				33.3%	33.3%		20.0%	53.3%			33.3%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?				Yes	Yes						Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					19.4			34.6			19.6	
Actuated g/C Ratio					0.26			0.46			0.26	
v/c Ratio					0.77			0.82			0.60	
Control Delay					28.6			12.3			25.5	
Queue Delay					0.0			0.0			0.1	
Total Delay					28.6			12.3			25.6	
LOS					C			B			C	
Approach Delay					28.6			12.3			25.6	
Approach LOS					C			B			C	
Queue Length 50th (m)					40.8			10.7			29.0	
Queue Length 95th (m)					54.9			m29.3			43.9	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1205			1108			821	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			27	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.77			0.82			0.62	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 70 (93%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?	Yes		Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

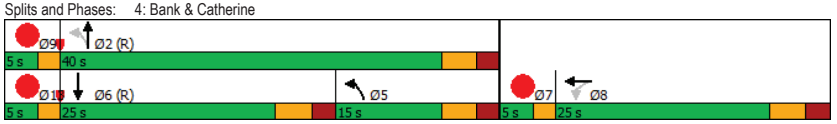
Intersection Summary

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 21.6	Intersection LOS: C
Intersection Capacity Utilization 79.7%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 4: Bank & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	536	84	0	0	0	0	834	162	192	395	0
Future Volume (vph)	87	536	84	0	0	0	0	834	162	192	395	0
Satd. Flow (prot)	0	3292	1483	0	0	0	0	3137	0	1658	1745	0
Flt Permitted		0.993								0.179		
Satd. Flow (perm)	0	3285	1334	0	0	0	0	3137	0	304	1745	0
Satd. Flow (RTOR)			134					32				
Lane Group Flow (vph)	0	623	84	0	0	0	0	996	0	192	395	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	29.0	29.0	29.0					31.0		15.0	46.0	
Total Split (%)	38.7%	38.7%	38.7%					41.3%		20.0%	61.3%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		6.2	6.2					6.1		6.1	6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		19.3	19.3					28.4		43.4	43.4	
Actuated g/C Ratio		0.26	0.26					0.38		0.58	0.58	
v/c Ratio		0.74	0.19					0.83		0.57	0.39	
Control Delay		30.9	2.3					29.0		24.8	8.0	
Queue Delay		0.0	0.0					0.0		0.0	1.1	
Total Delay		30.9	2.3					29.0		24.8	9.2	
LOS		C	A					C		C	A	
Approach Delay		27.5						29.0			14.3	
Approach LOS		C						C			B	
Queue Length 50th (m)		41.8	0.0					64.5		12.0	19.7	
Queue Length 95th (m)		55.7	3.5					#107.6		m33.4	m27.6	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		998	498					1207		336	1009	
Starvation Cap Reductn		0	0					0		0	385	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.62	0.17					0.83		0.57	0.63	

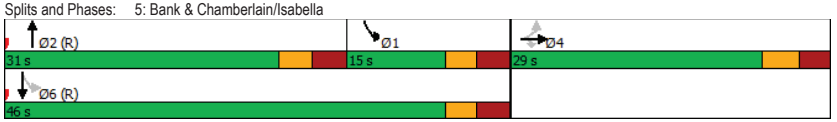
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 24.8	Intersection LOS: C
Intersection Capacity Utilization 79.1%	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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Bank & Chamberlain/Isabella



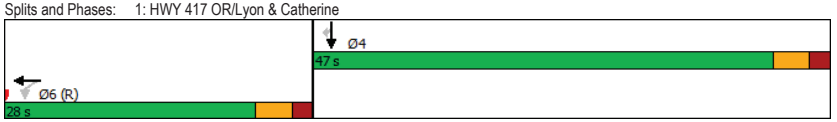
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	221	499	0	0	0	0	0	392	264
Future Volume (vph)	0	0	0	221	499	0	0	0	0	0	392	264
Satd. Flow (prot)	0	0	0	0	4693	0	0	0	0	0	1745	1483
Flt Permitted					0.985							
Satd. Flow (perm)	0	0	0	0	4657	0	0	0	0	0	1745	1443
Satd. Flow (RTOR)					154							98
Lane Group Flow (vph)	0	0	0	0	720	0	0	0	0	0	392	264
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				28.0	28.0						47.0	47.0
Total Split (%)				37.3%	37.3%						62.7%	62.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					22.8						41.7	41.7
Actuated g/C Ratio					0.30						0.56	0.56
v/c Ratio					0.47						0.40	0.31
Control Delay					16.0						11.1	6.6
Queue Delay					0.0						0.0	0.0
Total Delay					16.0						11.1	6.6
LOS					B						B	A
Approach Delay					16.0						9.3	
Approach LOS					B						A	
Queue Length 50th (m)					9.3						29.2	10.8
Queue Length 95th (m)					11.9						47.0	22.8
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					1522						970	845
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.47						0.40	0.31

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 24 (32%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 12.8	Intersection LOS: B
Intersection Capacity Utilization 50.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	651	317	25	742	0	0	0	0
Future Volume (vph)	0	0	0	0	651	317	25	742	0	0	0	0
Satd. Flow (prot)	0	0	0	0	3143	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	3143	1247	0	4752	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	683	285	0	767	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					38.0	38.0	32.0	32.0				
Total Split (%)					50.7%	50.7%	42.7%	42.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					32.2	32.2		26.2				
Actuated g/C Ratio					0.43	0.43		0.35				
v/c Ratio					0.51	0.53		0.45				
Control Delay					14.4	16.7		18.0				
Queue Delay					0.0	0.0		0.0				
Total Delay					14.4	16.7		18.0				
LOS					B	B		B				
Approach Delay					15.0			18.0				
Approach LOS					B			B				
Queue Length 50th (m)					30.1	25.1		27.1				
Queue Length 95th (m)					m41.5	m37.4		37.2				
Internal Link Dist (m)		157.8			130.6			43.8			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1349	535		1705				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.51	0.53		0.45				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 12 (16%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 16.4	Intersection LOS: B
Intersection Capacity Utilization 50.6%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	779	0	0	0	0	
Future Volume (vph)	0	779	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	779	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		34.7					
Actuated g/C Ratio		0.83					
v/c Ratio		0.28					
Control Delay		4.3					
Queue Delay		0.0					
Total Delay		4.3					
LOS		A					
Approach Delay		4.3					
Approach LOS		A					
Queue Length 50th (m)		0.0					
Queue Length 95th (m)		32.5					
Internal Link Dist (m)		270.2	176.4		23.7		
Turn Bay Length (m)							
Base Capacity (vph)		2740					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.28					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 42
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.28

Intersection Signal Delay: 4.3 | Intersection LOS: A
Intersection Capacity Utilization 26.9% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	257	553	157	203	340	0	0	643	120
Future Volume (vph)	0	0	0	257	553	157	203	340	0	0	643	120
Satd. Flow (prot)	0	0	0	0	4536	0	0	3256	0	0	3077	0
Flt Permitted					0.987			0.544				
Satd. Flow (perm)	0	0	0	0	4474	0	0	1765	0	0	3077	0
Satd. Flow (RTOR)					51						29	
Lane Group Flow (vph)	0	0	0	0	967	0	0	543	0	0	763	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				24.0	24.0		14.0	41.0			27.0	
Total Split (%)				32.0%	32.0%		18.7%	54.7%			36.0%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?											Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					18.4			35.6			21.6	
Actuated g/C Ratio					0.25			0.47			0.29	
v/c Ratio					0.85			0.54			0.84	
Control Delay					34.4			12.2			34.5	
Queue Delay					0.0			0.0			2.9	
Total Delay					34.4			12.2			37.4	
LOS					C			B			D	
Approach Delay					34.4			12.2			37.4	
Approach LOS					C			B			D	
Queue Length 50th (m)					45.4			15.2			51.2	
Queue Length 95th (m)					#66.1			19.2			#80.1	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1136			1008			906	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					1			0			71	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.85			0.54			0.91	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 50 (67%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?			Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

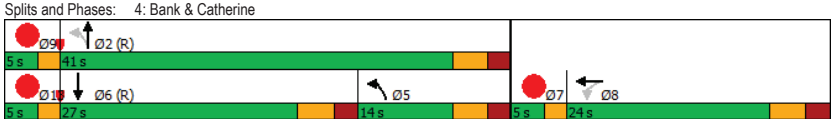
Intersection Summary

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 30.1	Intersection LOS: C
Intersection Capacity Utilization 76.9%	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: Bank & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	592	121	0	0	0	0	476	91	175	720	0
Future Volume (vph)	57	592	121	0	0	0	0	476	91	175	720	0
Satd. Flow (prot)	0	3302	1483	0	0	0	0	3106	0	0	3283	0
Flt Permitted		0.996									0.714	
Satd. Flow (perm)	0	3299	1345	0	0	0	0	3106	0	0	2323	0
Satd. Flow (RTOR)			134					31				
Lane Group Flow (vph)	0	649	121	0	0	0	0	567	0	0	895	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.2	6.2					6.1			6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		20.6	20.6					42.1			42.1	
Actuated g/C Ratio		0.27	0.27					0.56			0.56	
v/c Ratio		0.72	0.26					0.32			0.69	
Control Delay		29.1	4.7					9.5			13.3	
Queue Delay		0.0	0.0					0.0			3.0	
Total Delay		29.1	4.7					9.5			16.3	
LOS		C	A					A			B	
Approach Delay		25.3						9.5			16.3	
Approach LOS		C						A			B	
Queue Length 50th (m)		43.5	0.0					19.3			71.3	
Queue Length 95th (m)		55.7	8.7					32.7			m88.0	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1090	534					1758			1305	
Starvation Cap Reductn		0	0					0			297	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.60	0.23					0.32			0.89	

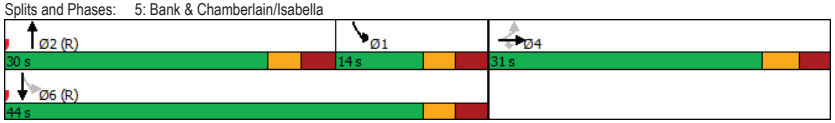
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 60 (80%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 17.7	Intersection LOS: B
Intersection Capacity Utilization 82.2%	ICU Level of Service E
Analysis Period (min) 15	

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

Splits and Phases: 5: Bank & Chamberlain/Isabella



Appendix I

2029 Future Total Conditions

CGH TRANSPORTATION

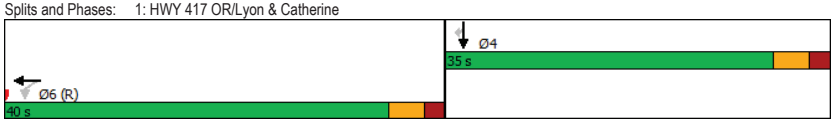
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	226	220	0	0	0	0	0	258	131
Future Volume (vph)	0	0	0	226	220	0	0	0	0	0	258	131
Satd. Flow (prot)	0	0	0	0	4645	0	0	0	0	0	1745	1483
Flt Permitted					0.975							
Satd. Flow (perm)	0	0	0	0	4611	0	0	0	0	0	1745	1454
Satd. Flow (RTOR)					226							131
Lane Group Flow (vph)	0	0	0	0	446	0	0	0	0	0	258	131
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				40.0	40.0						35.0	35.0
Total Split (%)				53.3%	53.3%						46.7%	46.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					34.8						29.7	29.7
Actuated g/C Ratio					0.46						0.40	0.40
v/c Ratio					0.20						0.37	0.20
Control Delay					10.5						18.1	3.9
Queue Delay					0.0						0.0	0.0
Total Delay					10.5						18.1	3.9
LOS					B						B	A
Approach Delay					10.5						13.3	
Approach LOS					B						B	
Queue Length 50th (m)					17.3						25.1	0.0
Queue Length 95th (m)					26.4						42.7	9.3
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					2260						691	654
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.20						0.37	0.20

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 48 (64%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 11.8	Intersection LOS: B
Intersection Capacity Utilization 47.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	394	539	54	1408	0	0	0	0
Future Volume (vph)	0	0	0	0	394	539	54	1408	0	0	0	0
Satd. Flow (prot)	0	0	0	0	2917	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	2917	1262	0	4750	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	642	291	0	1462	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					32.0	32.0	38.0	38.0				
Total Split (%)					42.7%	42.7%	50.7%	50.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					26.2	26.2		32.2				
Actuated g/C Ratio					0.35	0.35		0.43				
v/c Ratio					0.63	0.66		0.70				
Control Delay					26.1	29.9		18.8				
Queue Delay					0.0	0.0		0.0				
Total Delay					26.1	29.9		18.8				
LOS					C	C		B				
Approach Delay					27.3			18.8				
Approach LOS					C			B				
Queue Length 50th (m)					43.1	39.6		56.7				
Queue Length 95th (m)					m60.7	m56.7		72.3				
Internal Link Dist (m)		157.8			130.6			47.0			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1019	440		2079				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.63	0.66		0.70				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 15 (20%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

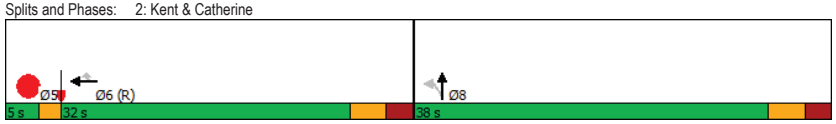
Intersection Summary

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 22.1	Intersection LOS: C
Intersection Capacity Utilization 66.4%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	814	0	0	0	0	
Future Volume (vph)	0	814	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	814	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		34.0					
Actuated g/C Ratio		0.64					
v/c Ratio		0.38					
Control Delay		7.5					
Queue Delay		0.0					
Total Delay		7.5					
LOS		A					
Approach Delay		7.5					
Approach LOS		A					
Queue Length 50th (m)		24.0					
Queue Length 95th (m)		34.2					
Internal Link Dist (m)		270.2	176.4		31.3		
Turn Bay Length (m)							
Base Capacity (vph)		2161					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.38					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 52.8
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.38

Intersection Signal Delay: 7.5 | Intersection LOS: A
Intersection Capacity Utilization 27.9% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	160	582	189	278	627	0	0	405	110
Future Volume (vph)	0	0	0	160	582	189	278	627	0	0	405	110
Satd. Flow (prot)	0	0	0	0	4481	0	0	3266	0	0	3022	0
Flt Permitted					0.991			0.637				
Satd. Flow (perm)	0	0	0	0	4429	0	0	2045	0	0	3022	0
Satd. Flow (RTOR)					81						44	
Lane Group Flow (vph)	0	0	0	0	931	0	0	905	0	0	515	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				25.0	25.0		15.0	40.0			25.0	
Total Split (%)				33.3%	33.3%		20.0%	53.3%			33.3%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?				Yes	Yes						Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					19.4			34.6			19.6	
Actuated g/C Ratio					0.26			0.46			0.26	
v/c Ratio					0.77			0.82			0.63	
Control Delay					28.6			12.2			26.2	
Queue Delay					0.0			0.0			0.2	
Total Delay					28.6			12.2			26.4	
LOS					C			B			C	
Approach Delay					28.6			12.2			26.4	
Approach LOS					C			B			C	
Queue Length 50th (m)					40.8			10.7			30.8	
Queue Length 95th (m)					54.9			m24.6			46.2	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1205			1099			822	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			29	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.77			0.82			0.65	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 70 (93%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?	Yes		Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

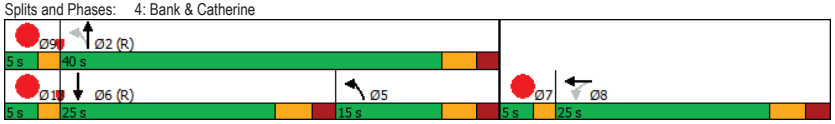
Intersection Summary

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 21.8	Intersection LOS: C
Intersection Capacity Utilization 80.3%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 4: Bank & Catherine

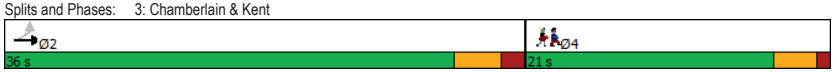


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	494	814	0	0	0	0	
Future Volume (vph)	494	814	0	0	0	0	
Satd. Flow (prot)	1658	3316	0	0	0	0	
Flt Permitted	0.950						
Satd. Flow (perm)	1658	3316	0	0	0	0	
Satd. Flow (RTOR)	494						
Lane Group Flow (vph)	494	814	0	0	0	0	
Turn Type	Perm	NA					
Protected Phases		2					4
Permitted Phases	2						
Detector Phase	2	2					
Switch Phase							
Minimum Initial (s)	10.0	10.0					10.0
Minimum Split (s)	36.0	36.0					21.0
Total Split (s)	36.0	36.0					21.0
Total Split (%)	63.2%	63.2%					37%
Yellow Time (s)	3.3	3.3					3.0
All-Red Time (s)	1.7	1.7					1.0
Lost Time Adjust (s)	0.0	0.0					
Total Lost Time (s)	5.0	5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min	Min					None
Act Effct Green (s)	36.2	36.2					
Actuated g/C Ratio	0.66	0.66					
v/c Ratio	0.39	0.37					
Control Delay	1.7	7.1					
Queue Delay	0.0	0.0					
Total Delay	1.7	7.1					
LOS	A	A					
Approach Delay		5.1					
Approach LOS		A					
Queue Length 50th (m)	0.0	24.0					
Queue Length 95th (m)	9.1	33.6					
Internal Link Dist (m)		270.2	176.4		31.3		
Turn Bay Length (m)							
Base Capacity (vph)	1264	2196					
Starvation Cap Reductn	0	0					
Spillback Cap Reductn	0	0					
Storage Cap Reductn	0	0					
Reduced v/c Ratio	0.39	0.37					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 55
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.39

Intersection Signal Delay: 5.1 — Intersection LOS: A
Intersection Capacity Utilization 33.1% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent



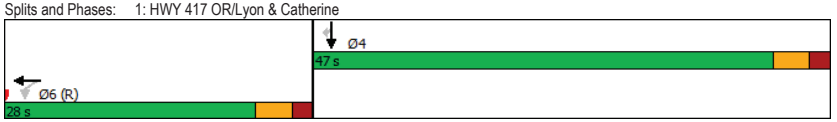
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	247	558	0	0	0	0	0	438	270
Future Volume (vph)	0	0	0	247	558	0	0	0	0	0	438	270
Satd. Flow (prot)	0	0	0	0	4693	0	0	0	0	0	1745	1483
Flt Permitted					0.985							
Satd. Flow (perm)	0	0	0	0	4657	0	0	0	0	0	1745	1443
Satd. Flow (RTOR)					153							75
Lane Group Flow (vph)	0	0	0	0	805	0	0	0	0	0	438	270
Turn Type				Perm	NA						NA	Perm
Protected Phases					6						4	
Permitted Phases				6								4
Detector Phase				6	6						4	4
Switch Phase												
Minimum Initial (s)				10.0	10.0						10.0	10.0
Minimum Split (s)				26.2	26.2						28.3	28.3
Total Split (s)				28.0	28.0						47.0	47.0
Total Split (%)				37.3%	37.3%						62.7%	62.7%
Yellow Time (s)				3.3	3.3						3.3	3.3
All-Red Time (s)				1.9	1.9						2.0	2.0
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.2						5.3	5.3
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				C-Max	C-Max						Max	Max
Act Effct Green (s)					22.8						41.7	41.7
Actuated g/C Ratio					0.30						0.56	0.56
v/c Ratio					0.53						0.45	0.32
Control Delay					16.6						11.8	7.6
Queue Delay					0.0						0.0	0.0
Total Delay					16.6						11.8	7.6
LOS					B						B	A
Approach Delay					16.6						10.2	
Approach LOS					B						B	
Queue Length 50th (m)					9.4						33.7	13.0
Queue Length 95th (m)					15.1						53.9	25.8
Internal Link Dist (m)		117.8			157.8			120.4			277.6	
Turn Bay Length (m)												
Base Capacity (vph)					1522						970	835
Starvation Cap Reductn					0						0	0
Spillback Cap Reductn					0						0	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.53						0.45	0.32

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 24 (32%), Referenced to phase 2: and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 13.6	Intersection LOS: B
Intersection Capacity Utilization 54.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: HWY 417 OR/Lyon & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	702	341	25	761	0	0	0	0
Future Volume (vph)	0	0	0	0	702	341	25	761	0	0	0	0
Satd. Flow (prot)	0	0	0	0	3143	1350	0	4755	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	3143	1247	0	4752	0	0	0	0
Satd. Flow (RTOR)								70				
Lane Group Flow (vph)	0	0	0	0	736	307	0	786	0	0	0	0
Turn Type					NA	Perm	Perm	NA				
Protected Phases					6			8				
Permitted Phases						6	8					
Detector Phase					6	6	8	8				
Switch Phase												
Minimum Initial (s)					10.0	10.0	10.0	10.0				
Minimum Split (s)					27.8	27.8	17.8	17.8				
Total Split (s)					38.0	38.0	32.0	32.0				
Total Split (%)					50.7%	50.7%	42.7%	42.7%				
Yellow Time (s)					3.3	3.3	3.3	3.3				
All-Red Time (s)					2.5	2.5	2.5	2.5				
Lost Time Adjust (s)					0.0	0.0		0.0				
Total Lost Time (s)					5.8	5.8		5.8				
Lead/Lag					Lag	Lag						
Lead-Lag Optimize?												
Recall Mode					C-Max	C-Max	Max	Max				
Act Effct Green (s)					32.2	32.2		26.2				
Actuated g/C Ratio					0.43	0.43		0.35				
v/c Ratio					0.55	0.57		0.46				
Control Delay					15.5	17.8		18.2				
Queue Delay					0.0	0.0		0.0				
Total Delay					15.5	17.8		18.2				
LOS					B	B		B				
Approach Delay					16.2			18.2				
Approach LOS					B			B				
Queue Length 50th (m)					35.3	29.5		28.0				
Queue Length 95th (m)					m40.7	m37.1		38.3				
Internal Link Dist (m)		157.8			130.6			43.8			56.6	
Turn Bay Length (m)												
Base Capacity (vph)					1349	535		1705				
Starvation Cap Reductn					0	0		0				
Spillback Cap Reductn					0	0		0				
Storage Cap Reductn					0	0		0				
Reduced v/c Ratio					0.55	0.57		0.46				

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 12 (16%), Referenced to phase 2: and 6:WBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Lane Group	Ø5
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	5
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	7%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 17.0	Intersection LOS: B
Intersection Capacity Utilization 52.8%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 2: Kent & Catherine

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	0	779	0	0	0	0	
Future Volume (vph)	0	779	0	0	0	0	
Satd. Flow (prot)	0	3316	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	0	3316	0	0	0	0	
Satd. Flow (RTOR)							
Lane Group Flow (vph)	0	779	0	0	0	0	
Turn Type		NA					
Protected Phases		2					4
Permitted Phases							
Detector Phase		2					
Switch Phase							
Minimum Initial (s)		10.0					10.0
Minimum Split (s)		36.0					21.0
Total Split (s)		36.0					21.0
Total Split (%)		63.2%					37%
Yellow Time (s)		3.3					3.0
All-Red Time (s)		1.7					1.0
Lost Time Adjust (s)		0.0					
Total Lost Time (s)		5.0					
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode		Min					None
Act Effct Green (s)		34.7					
Actuated g/C Ratio		0.83					
v/c Ratio		0.28					
Control Delay		4.3					
Queue Delay		0.0					
Total Delay		4.3					
LOS		A					
Approach Delay		4.3					
Approach LOS		A					
Queue Length 50th (m)		0.0					
Queue Length 95th (m)		32.5					
Internal Link Dist (m)		270.2	176.4		23.7		
Turn Bay Length (m)							
Base Capacity (vph)		2740					
Starvation Cap Reductn		0					
Spillback Cap Reductn		0					
Storage Cap Reductn		0					
Reduced v/c Ratio		0.28					

Intersection Summary
Cycle Length: 57
Actuated Cycle Length: 42
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.28

Intersection Signal Delay: 4.3 | Intersection LOS: A
Intersection Capacity Utilization 26.9% | ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Chamberlain & Kent

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	287	618	175	218	357	0	0	643	130
Future Volume (vph)	0	0	0	287	618	175	218	357	0	0	643	130
Satd. Flow (prot)	0	0	0	0	4536	0	0	3253	0	0	3063	0
Flt Permitted					0.987			0.545				
Satd. Flow (perm)	0	0	0	0	4474	0	0	1769	0	0	3063	0
Satd. Flow (RTOR)					50						32	
Lane Group Flow (vph)	0	0	0	0	1080	0	0	575	0	0	773	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Detector Phase				8	8		5	2			6	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	10.0			10.0	
Minimum Split (s)				23.6	23.6		10.4	21.4			21.4	
Total Split (s)				24.0	24.0		14.0	41.0			27.0	
Total Split (%)				32.0%	32.0%		18.7%	54.7%			36.0%	
Yellow Time (s)				3.3	3.3		3.3	3.3			3.3	
All-Red Time (s)				2.3	2.3		2.1	2.1			2.1	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.6			5.4			5.4	
Lead/Lag				Lag	Lag						Lag	
Lead-Lag Optimize?											Yes	
Recall Mode				Max	Max		Max	C-Max			C-Max	
Act Effct Green (s)					18.4			35.6			21.6	
Actuated g/C Ratio					0.25			0.47			0.29	
v/c Ratio					0.95			0.57			0.86	
Control Delay					45.4			12.6			35.4	
Queue Delay					0.1			0.0			3.7	
Total Delay					45.5			12.6			39.1	
LOS					D			B			D	
Approach Delay					45.5			12.6			39.1	
Approach LOS					D			B			D	
Queue Length 50th (m)					52.8			16.1			51.8	
Queue Length 95th (m)					#79.9			20.3			#81.8	
Internal Link Dist (m)		130.6			383.3			80.8			138.4	
Turn Bay Length (m)												
Base Capacity (vph)					1135			1009			904	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					1			0			73	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.95			0.57			0.93	

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 50 (67%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Lane Group	Ø7	Ø9	Ø13
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	7	9	13
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	7%	7%	7%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead		Lead
Lead-Lag Optimize?			Yes
Recall Mode	Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

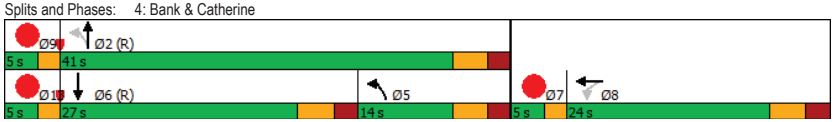
Intersection Summary

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 35.7	Intersection LOS: D
Intersection Capacity Utilization 80.7%	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: Bank & Catherine



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	592	121	0	0	0	0	500	91	175	720	0
Future Volume (vph)	57	592	121	0	0	0	0	500	91	175	720	0
Satd. Flow (prot)	0	3302	1483	0	0	0	0	3115	0	0	3283	0
Flt Permitted		0.996									0.705	
Satd. Flow (perm)	0	3299	1345	0	0	0	0	3115	0	0	2296	0
Satd. Flow (RTOR)			134					29				
Lane Group Flow (vph)	0	649	121	0	0	0	0	591	0	0	895	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					10.0		5.0	10.0	
Minimum Split (s)	26.2	26.2	26.2					23.1		11.1	23.1	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Yellow Time (s)	3.3	3.3	3.3					3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9	2.9					3.1		3.1	3.1	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.2	6.2					6.1			6.1	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None	None					C-Max		None	C-Max	
Act Effct Green (s)		20.6	20.6					42.1			42.1	
Actuated g/C Ratio		0.27	0.27					0.56			0.56	
v/c Ratio		0.72	0.26					0.34			0.69	
Control Delay		29.1	4.7					9.6			13.8	
Queue Delay		0.0	0.0					0.0			3.0	
Total Delay		29.1	4.7					9.6			16.7	
LOS		C	A					A			B	
Approach Delay		25.3						9.6			16.7	
Approach LOS		C						A			B	
Queue Length 50th (m)		43.5	0.0					20.4			71.6	
Queue Length 95th (m)		55.7	8.7					34.4			m84.2	
Internal Link Dist (m)		176.4			219.4			129.7			80.8	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1090	534					1762			1290	
Starvation Cap Reductn		0	0					0			281	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.60	0.23					0.34			0.89	

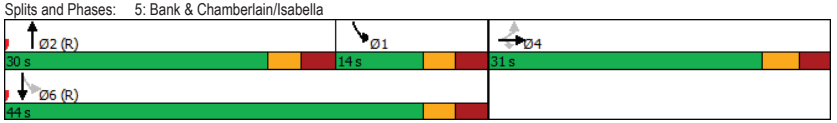
Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 60 (80%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 82.9%	ICU Level of Service E
Analysis Period (min) 15	

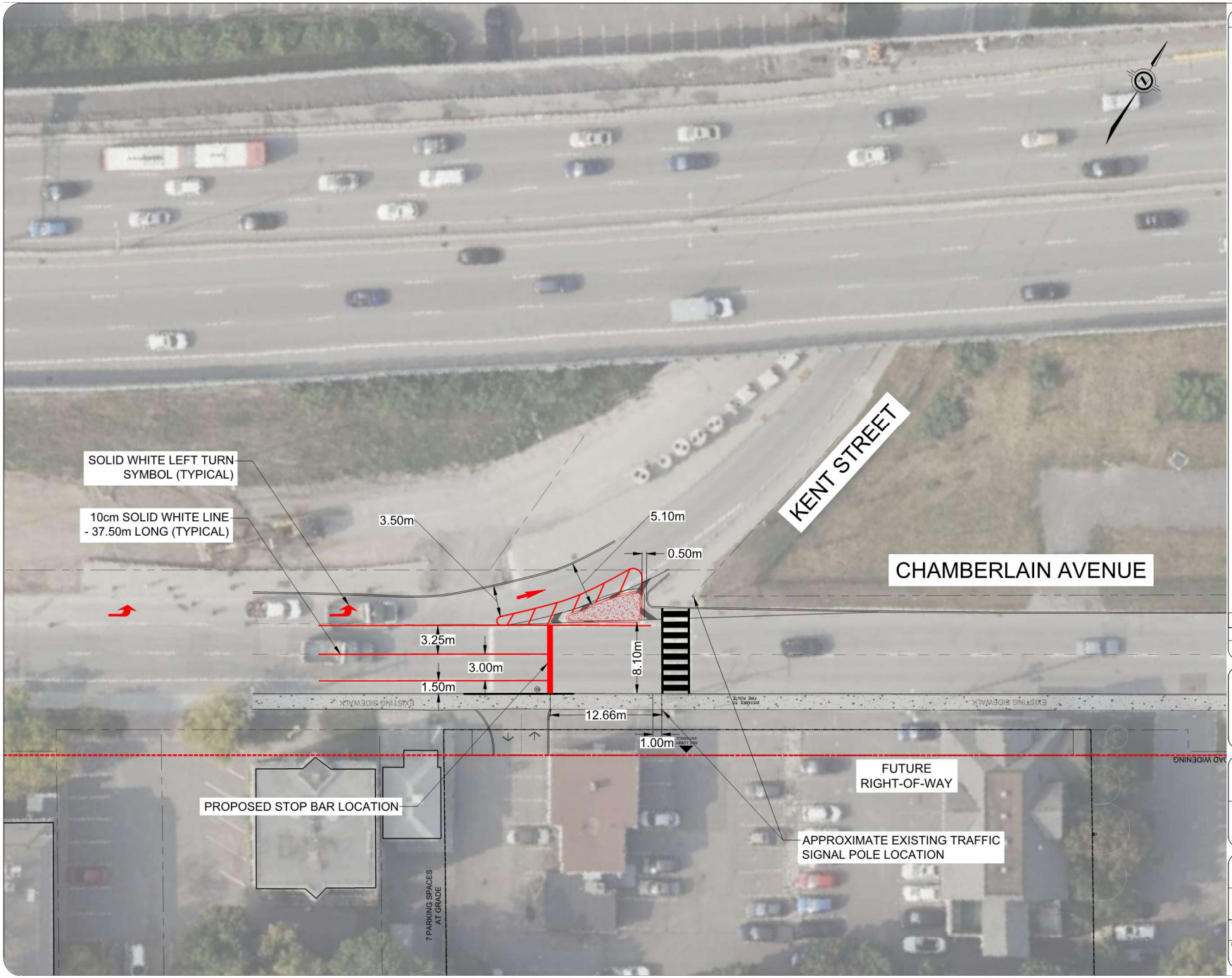
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Bank & Chamberlain/Isabella



Appendix J

Chamberlain Avenue Concrete Median Sketch



Notes:

REV.	DESCRIPTION:	BY:	DATE:
01	Issued for Information	BB	2025-03-31

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT:

ARCHITECT:

SITE: 30-48 Chamberlain Avenue

TITLE: Concrete Bullnose Layout Sketch

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:400	2025-03-31	BB	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-117	001	02

Notes:

REV.	DESCRIPTION:	BY:	DATE:
01	Issued for Information	BB	2025-03-31

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT:

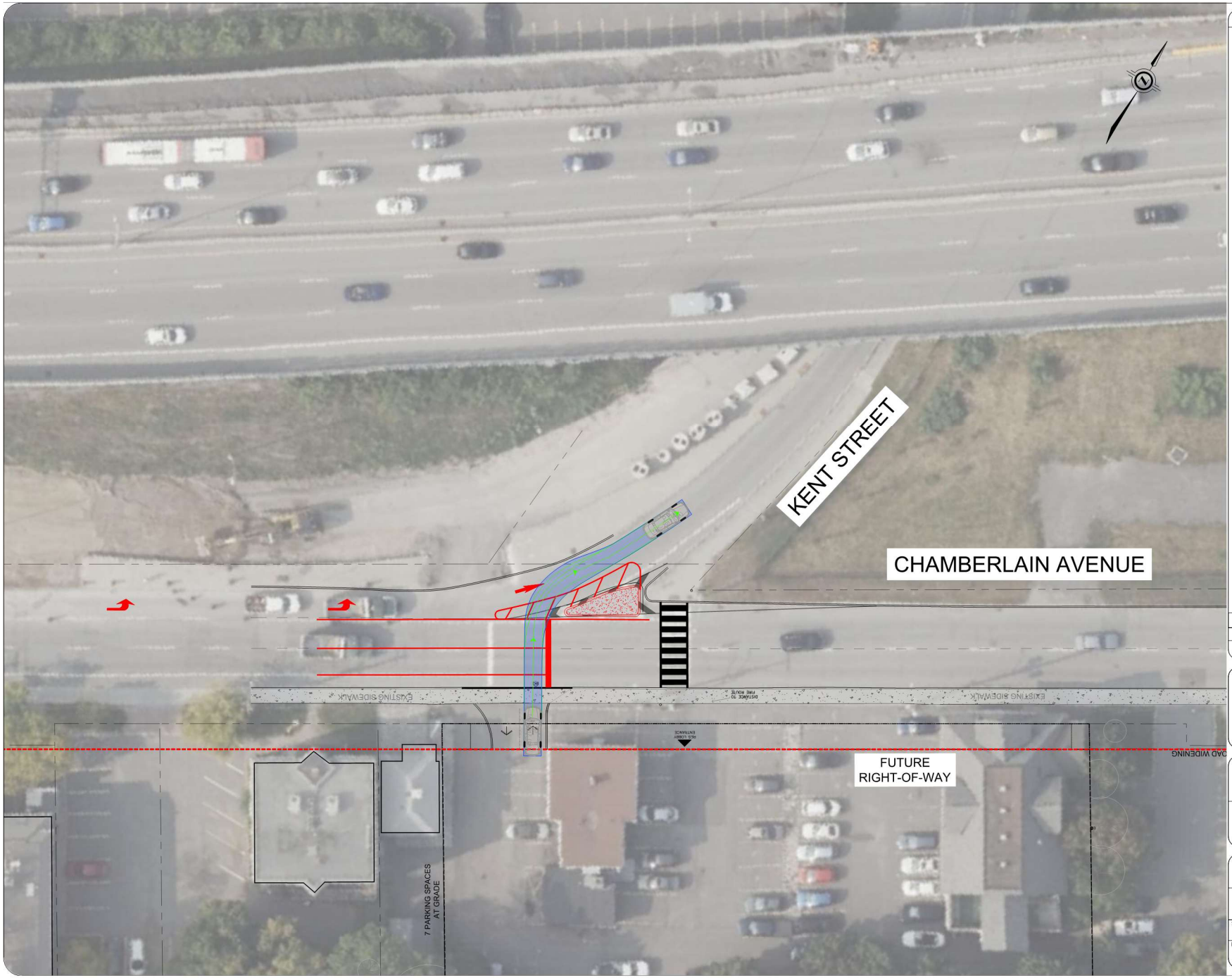
ARCHITECT:

SITE: 30-48 Chamberlain Avenue

TITLE: Kent Street Truck Movement

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:400	2025-03-31	BB	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-117	002	02



Notes:

REV.	DESCRIPTION:	BY:	DATE:
01	Issued for Information	BB	2025-03-31

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT:

ARCHITECT:

SITE: 30-48 Chamberlain Avenue

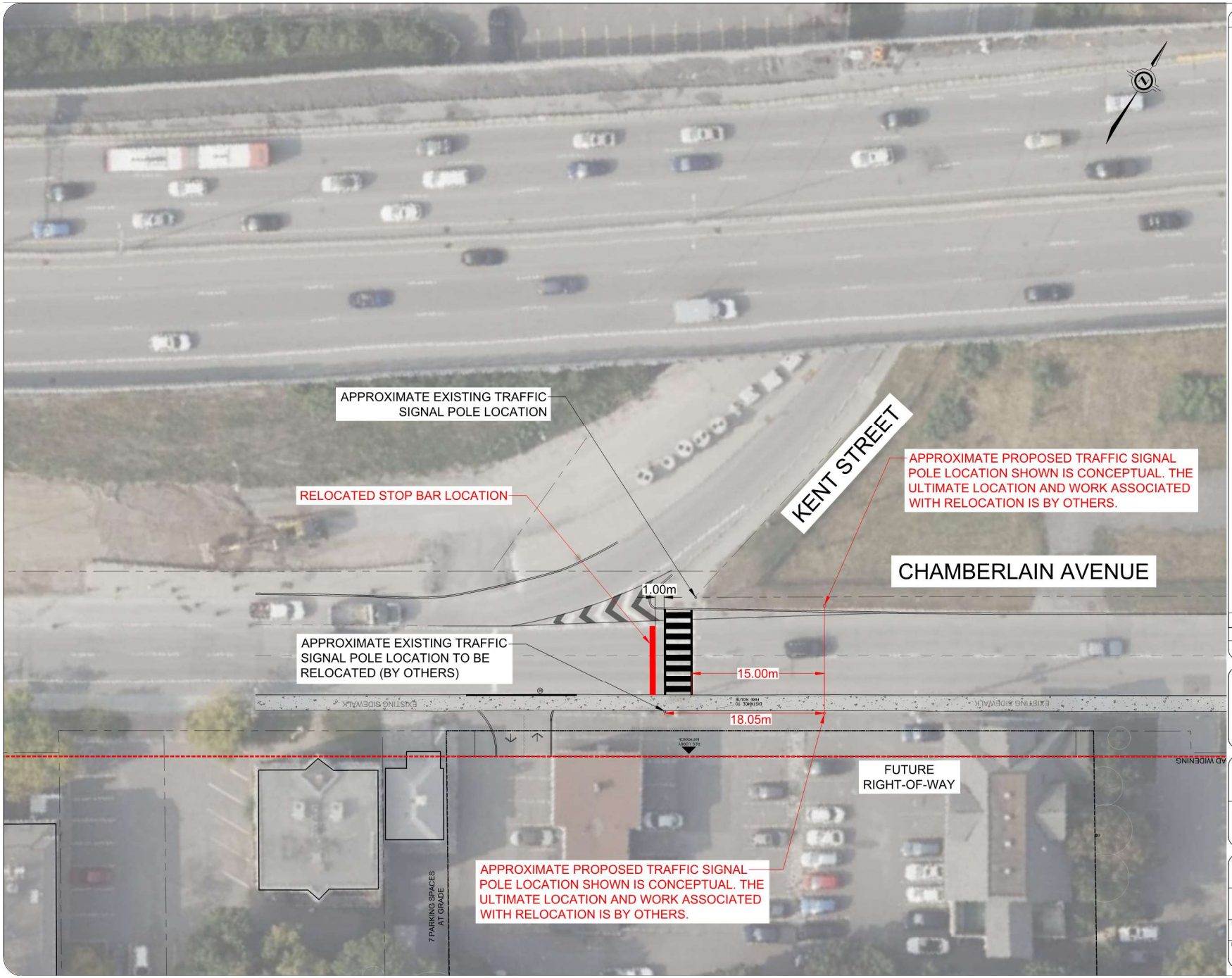
TITLE: Passenger Vehicle Movements

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:400	2025-03-31	BB	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-117	003	02

Appendix K

Chamberlain Avenue Midblock Pedestrian Signal Pole Relocation Sketch



Notes:

REV.	DESCRIPTION:	BY:	DATE:
01	Issued for Information	BB	2025-03-31

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT:

ARCHITECT:

SITE: 30-48 Chamberlain Avenue

TITLE: City Signal Relocation Sketch

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:400	2025-03-31	BB	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-117	001	02

Appendix L

TDM Checklist

CGH TRANSPORTATION

TDM Measures Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		1. TDM PROGRAM MANAGEMENT	
		1.1 Program coordinator	
BASIC	★	1.1.1 Designate an internal coordinator, or contract with an external coordinator	☐
		1.2 Travel surveys	
BETTER		1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
		2. WALKING AND CYCLING	
		2.1 Information on walking/cycling routes & destinations	
BASIC		2.1.1 Display local area maps with walking/cycling access routes and key destinations at major entrances	☑
		2.2 Bicycle skills training	
		Commuter travel	
BETTER	★	2.2.1 Offer on-site cycling courses for commuters, or subsidize off-site courses	☐
		2.3 Valet bike parking	
		Visitor travel	
BETTER		2.3.1 Offer secure valet bike parking during public events when demand exceeds fixed supply (e.g. for festivals, concerts, games)	☐

		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		3. TRANSIT	
		3.1 Transit information	
BASIC		3.1.1 Display relevant transit schedules and route maps at entrances	☑
BASIC		3.1.2 Provide online links to OC Transpo and STO information	☐
BETTER		3.1.3 Provide real-time arrival information display at entrances	☐
		3.2 Transit fare incentives	
		Commuter travel	
BETTER		3.2.1 Offer preloaded PRESTO cards to encourage commuters to use transit	☐
BETTER	★	3.2.2 Subsidize or reimburse monthly transit pass purchases by employees	☐
		Visitor travel	
BETTER		3.2.3 Arrange inclusion of same-day transit fare in price of tickets (e.g. for festivals, concerts, games)	☐
		3.3 Enhanced public transit service	
		Commuter travel	
BETTER		3.3.1 Contract with OC Transpo to provide enhanced transit services (e.g. for shift changes, weekends)	☐
		Visitor travel	
BETTER		3.3.2 Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	☐
		3.4 Private transit service	
		Commuter travel	
BETTER		3.4.1 Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for shift changes, weekends)	☐
		Visitor travel	
BETTER		3.4.2 Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for festivals, concerts, games)	☐

			TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		4.	**RIDESHARING**	
		4.1	**Ridematching service**	
			Commuter travel	
BASIC	★	4.1.1	Provide a dedicated ridematching portal at OttawaRideMatch.com	☐
		4.2	**Carpool parking price incentives**	
			Commuter travel	
BETTER		4.2.1	Provide discounts on parking costs for registered carpools	☐
		4.3	**Vanpool service**	
			Commuter travel	
BETTER		4.3.1	Provide a vanpooling service for long-distance commuters	☐
		5.	**CARSHARING & BIKESHARING**	
		5.1	**Bikeshare stations & memberships**	
BETTER		5.1.1	Contract with provider to install on-site bikeshare station for use by commuters and visitors	☐
			Commuter travel	
BETTER		5.1.2	Provide employees with bikeshare memberships for local business travel	☐
		5.2	**Carshare vehicles & memberships**	
			Commuter travel	
BETTER		5.2.1	Contract with provider to install on-site carshare vehicles and promote their use by tenants	☐
BETTER		5.2.2	Provide employees with carshare memberships for local business travel	☐
		6.	**PARKING**	
		6.1	**Priced parking**	
			Commuter travel	
BASIC	★	6.1.1	Charge for long-term parking (daily, weekly, monthly)	☑
BASIC		6.1.2	Unbundle parking cost from lease rates at multi-tenant sites	☑
			Visitor travel	
BETTER		6.1.3	Charge for short-term parking (hourly)	☐

			TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		7.	**TDM MARKETING & COMMUNICATIONS**	
		7.1	**Multimodal travel information**	
			Commuter travel	
BASIC	★	7.1.1	Provide a multimodal travel option information package to new/relocating employees and students	☑
			Visitor travel	
BETTER	★	7.1.2	Include multimodal travel option information in invitations or advertising that attract visitors or customers (e.g. for festivals, concerts, games)	☐
		7.2	**Personalized trip planning**	
			Commuter travel	
BETTER	★	7.2.1	Offer personalized trip planning to new/relocating employees	☐
		7.3	**Promotions**	
			Commuter travel	
BETTER		7.3.1	Deliver promotions and incentives to maintain awareness, build understanding, and encourage trial of sustainable modes	☐
		8.	**OTHER INCENTIVES & AMENITIES**	
		8.1	**Emergency ride home**	
			Commuter travel	
BETTER	★	8.1.1	Provide emergency ride home service to non-driving commuters	☐
		8.2	**Alternative work arrangements**	
			Commuter travel	
BASIC	★	8.2.1	Encourage flexible work hours	☐
BETTER		8.2.2	Encourage compressed workweeks	☐
BETTER	★	8.2.3	Encourage telework	☐
		8.3	**Local business travel options**	
			Commuter travel	
BASIC	★	8.3.1	Provide local business travel options that minimize the need for employees to bring a personal car to work	☐
		8.4	**Commuter incentives**	
			Commuter travel	
BETTER		8.4.1	Offer employees a taxable, mode-neutral commuting allowance	☐
		8.5	**On-site amenities**	
			Commuter travel	
BETTER		8.5.1	Provide on-site amenities/services to minimize mid-day or mid-commute errands	☐

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

	TDM measures: *Residential developments*		Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☑
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

	TDM measures: *Residential developments*		Check if proposed & add descriptions
	3.	**TRANSIT**	
	3.1	**Transit information**	
BASIC	3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☑
BETTER	3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐
	3.2	**Transit fare incentives**	
BASIC ★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☑
BETTER	3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
	3.3	**Enhanced public transit service**	
BETTER ★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☐
	3.4	**Private transit service**	
BETTER	3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐
	4.	**CARSHARING & BIKESHARING**	
	4.1	**Bikeshare stations & memberships**	
BETTER	4.1.1	Contract with provider to install on-site bikeshare station *(multi-family)*	☐
BETTER	4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
	4.2	**Carshare vehicles & memberships**	
BETTER	4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER	4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
	5.	**PARKING**	
	5.1	**Priced parking**	
BASIC ★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☑
BASIC ★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☑

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

TDM-Supportive Development Design and Infrastructure Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☑
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☑
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☐
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☐
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☐
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☑
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	☐
BETTER	2.1.5	Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☐
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	☐
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☐
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☐
	2.4	**Bicycle repair station**	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
	4.2	**Carpool parking**	
BASIC	4.2.1	Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	☐
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☐
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	☐
	7.	**OTHER**	
	7.1	**On-site amenities to minimize off-site trips**	
BETTER	7.1.1	Provide on-site amenities to minimize mid-day or mid-commute errands	☐

TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☑
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☑
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☐
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☐
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☐
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☑
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

	TDM-supportive design & infrastructure measures: *Residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☐
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	2.3	**Bicycle repair station**	
BETTER	2.3.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

TDM-Supportive Development Design and Infrastructure Checklist **City of Ottawa**
Version 1.0 (30 June 2017)

	TDM-supportive design & infrastructure measures: *Residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☑
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	☐

Appendix M

MMLOS Analysis

CGH TRANSPORTATION

Multi-Modal Level of Service - Segments Form

Consultant	**CGH Transportation**	**Project**	**2022-117**
Scenario	**Present/Future**	**Date**	**2023-04-28**
Comments			

SEGMENTS		Street A	Chamberlain EB (Existing)	Chamberlain EB (Future)	
Pedestrian	Sidewalk Width Boulevard Width	F	1.8 m < 0.5 m	≥ 2 m 0.5 - 2 m	
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	
	Operating Speed On-Street Parking		> 50 to 60 km/h no	> 50 to 60 km/h no	
	Exposure to Traffic PLoS		**F**	**D**	**-**
	Effective Sidewalk Width		1.5 m	3.0 m	
	Pedestrian Volume		250 ped/hr	250 ped/hr	
	Crowding PLoS		**B**	**A**	**-**
	Level of Service		**F**	**D**	**-**
Bicycle	Type of Cycling Facility	E	Mixed Traffic	Physically Separated	
	Number of Travel Lanes		2-3 lanes total		
	Operating Speed		≥ 50 to 60 km/h		
	# of Lanes & Operating Speed LoS		**E**	**-**	**-**
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS		**-**	**-**	**-**
	Bike Lane Blockages				
	Blockage LoS		**-**	**-**	**-**
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge		
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes		
	Sidestreet Operating Speed		≤ 40 km/h		
	Unsignalized Crossing - Lowest LoS		**A**	**A**	**-**
	Level of Service		**E**	**A**	**-**
Transit	Facility Type	D	Mixed Traffic	Mixed Traffic	
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	
	Level of Service		**D**	**D**	**-**
Truck	Truck Lane Width	A	> 3.7 m	> 3.7 m	
	Travel Lanes per Direction		> 1	> 1	
	Level of Service		**A**	**A**	**-**
Auto	**Level of Service**	**Not Applicable**			

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation**	**Project**	**2022-117**
Scenario	**Existing**	**Date**	**2023-04-28**
Comments			

Unlocked Rows for Replicating

INTERSECTIONS		Lyon/Ramp/Catherine				Kent/Catherine				Bank/Catherine				Bank/Chamberlain/Isabella			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	0 - 2	3	4	3	5	4	3	3	4	4	3	4	4	4	3	3
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	No left turn / Prohib.	Permissive	No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.	Permissive	No left turn / Prohib.	Permissive	No left turn / Prohib.	Protected/ Permissive	Permissive	No left turn / Prohib.	Protected/ Permissive	No left turn / Prohib.
	Conflicting Right Turns	Permissive or yield control	No right turn	No right turn	Permissive or yield control	Permissive or yield control	No right turn	No right turn	No right turn	Permissive or yield control	No right turn	No right turn	Permissive or yield control	No right turn	No right turn	Permissive or yield control	No right turn
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No	No
	Right Turn Channel	No Channel	No Right Turn	No Right Turn	No Right Turn	No Channel	No Right Turn	No Right Turn	No Right Turn	No Channel	No Right Turn	No Right Turn	No Channel	No Right Turn	No Right Turn	No Channel	Smart Channel
	Corner Radius	0-3m	No Right Turn	No Right Turn	No Right Turn	3-5m	No Right Turn	No Right Turn	No Right Turn	3-5m	No Right Turn	No Right Turn	3-5m	No Right Turn	No Right Turn	5-10m	5-10m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Textured/coloured pavement	Textured/coloured pavement	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**96**	**88**	**79**	**91**	**55**	**84**	**99**	**91**	**65**	**73**	**95**	**60**	**71**	**76**	**74**	**90**
	Ped. Exposure to Traffic LoS	**A**	**B**	**B**	**A**	**D**	**B**	**A**	**A**	**C**	**C**	**A**	**C**	**C**	**B**	**C**	**A**
	Cycle Length																
	Effective Walk Time																
	Average Pedestrian Delay																
	Pedestrian Delay LoS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level of Service	**A**	**B**	**B**	**A**	**D**	**B**	**A**	**A**	**C**	**C**	**A**	**C**	**C**	**B**	**C**	**A**
		B				**D**				**C**				**C**			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach							Mixed Traffic									Mixed Traffic
	Right Turn Lane Configuration							> 50 m									≤ 50 m
	Right Turning Speed							>25 km/h									≤ 25 km/h
	Cyclist relative to RT motorists	-	-	-	-	-	-	**F**	-	-	-	**A**	-	**A**	-	-	**D**
	Separated or Mixed Traffic	-	-	-	-	-	-	**Mixed Traffic**	-	-	-	-	-	-	-	-	**Mixed Traffic**
	Left Turn Approach											One lane crossed		One lane crossed			
	Operating Speed											> 50 to < 60 km/h		> 40 to ≤ 50 km/h			
	Left Turning Cyclist	-	-	-	-	-	-	**A**	-	**A**	-	**E**	-	**D**	**A**	-	**A**
	Level of Service	-	-	-	-	-	-	**F**	-	-	-	**E**	-	**D**	-	-	**D**
		A				**F**				**E**				**D**			
Transit	Average Signal Delay	≤ 20 sec				≤ 30 sec				> 40 sec	≤ 30 sec	≤ 40 sec		≤ 30 sec	≤ 40 sec		≤ 40 sec
	Level of Service	-	-	**C**	-	-	-	**D**	-	**F**	**D**	**E**	-	**D**	**E**	-	**E**
		C				**D**				**F**				**E**			
Truck	Effective Corner Radius							< 10 m		< 10 m		< 10 m			10 - 15 m		< 10 m
	Number of Receiving Lanes on Departure from Intersection							≥ 2		≥ 2		≥ 2			≥ 2		≥ 2
	Level of Service	-	-	-	-	-	-	**D**	-	**D**	-	**D**	-	-	**B**	-	**D**
		-				**D**				**D**				**D**			
Auto	Volume to Capacity Ratio	0.0 - 0.60				0.61 - 0.70				0.81 - 0.90				0.81 - 0.90			
	Level of Service	**A**				**B**				**D**				**D**			

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation**	**Project**	**2022-117**
Scenario	**Future**	**Date**	**2023-04-28**
Comments			

INTERSECTIONS		Lyon/Ramp/Catherine				Kent/Catherine				Bank/Catherine				Bank/Chamberlain/Isabella			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	0 - 2	3	3	3	3	4	4	0 - 2	4	4	3	3	4	4	0 - 2	3
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	No left turn / Prohib.	Permissive	No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.	Permissive	No left turn / Prohib.	Permissive	No left turn / Prohib.	Protected/ Permissive	Permissive	No left turn / Prohib.	Protected/ Permissive	No left turn / Prohib.
	Conflicting Right Turns	Permissive or yield control	No right turn	No right turn	Permissive or yield control	Permissive or yield control	No right turn	No right turn	No right turn	Permissive or yield control	No right turn	No right turn	Permissive or yield control	No right turn	No right turn	Permissive or yield control	No right turn
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No	No
	Right Turn Channel	No Channel	No Right Turn	No Right Turn	No Right Turn	No Channel	No Right Turn	No Right Turn	No Right Turn	No Channel	No Right Turn	No Right Turn	No Channel	No Right Turn	No Right Turn	No Channel	Smart Channel
	Corner Radius	0-3m	No Right Turn	No Right Turn	No Right Turn	3-5m	No Right Turn	No Right Turn	No Right Turn	3-5m	No Right Turn	No Right Turn	3-5m	No Right Turn	No Right Turn	5-10m	5-10m
	Crosswalk Type	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Std transverse markings	Std transverse markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings
	PETSI Score	**99**	**91**	**96**	**91**	**88**	**84**	**82**	**106**	**68**	**76**	**98**	**80**	**74**	**79**	**92**	**93**
	Ped. Exposure to Traffic LoS	**A**	**A**	**A**	**A**	**B**	**B**	**B**	**A**	**C**	**B**	**A**	**B**	**C**	**B**	**A**	**A**
	Cycle Length																
	Effective Walk Time																
	Average Pedestrian Delay																
	Pedestrian Delay LoS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level of Service	**A**	**A**	**A**	**A**	**B**	**B**	**B**	**A**	**C**	**B**	**A**	**B**	**C**	**B**	**A**	**A**
		A				**B**				**C**				**C**			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach							Mixed Traffic									Curb Bike Lane, Cycletrack or MUP
	Right Turn Lane Configuration							> 50 m									Not Applicable
	Right Turning Speed							>25 km/h									Not Applicable
	Cyclist relative to RT motorists	-	-	-	-	-	-	**F**	-	-	-	**A**	-	**A**	-	-	**Not Applicable**
	Separated or Mixed Traffic	-	-	-	-	-	-	**Mixed Traffic**	-	-	-	-	-	-	-	-	**Separated**
	Left Turn Approach											One lane crossed		No lane crossed			2-stage, LT box
	Operating Speed											> 50 to < 60 km/h		> 40 to ≤ 50 km/h			> 50 to < 60 km/h
	Left Turning Cyclist	-	-	-	-	-	-	**A**	-	**A**	-	**E**	-	**B**	**A**	-	**A**
	Level of Service	-	-	-	-	-	-	**F**	-	-	-	**E**	-	**B**	-	-	**A**
		-				**F**				**E**				**B**			
Transit	Average Signal Delay	≤ 20 sec				≤ 30 sec				≤ 40 sec	≤ 20 sec	> 40 sec		≤ 20 sec	≤ 20 sec		≤ 40 sec
	Level of Service	-	-	**C**	-	-	-	**D**	-	**E**	**C**	**F**	-	**C**	**C**	-	**E**
		C				**D**				**F**				**E**			
Truck	Effective Corner Radius							< 10 m		< 10 m		< 10 m			10 - 15 m		< 10 m
	Number of Receiving Lanes on Departure from Intersection							≥ 2		≥ 2		≥ 2			≥ 2		≥ 2
	Level of Service	-	-	-	-	-	-	**D**	-	**D**	-	**D**	-	-	**B**	-	**D**
		-				**D**				**D**				**D**			
Auto	Volume to Capacity Ratio	0.0 - 0.60				0.61 - 0.70				0.71 - 0.80				0.71 - 0.80			
	Level of Service	**A**				**B**				**C**				**C**			