



Appendix I

HCM Sensitivity Analysis – AM Peak



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Vistro File: Z:\...\Z0016285 PGA Sensitivity Analysis.vistro
Report File: Z:\...\AM Sensitivity Analysis +10% Volume.pdf

Scenario 6 +10% AM
2025-04-24

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
3	104 Avenue and 109 Street	Signalized	HCM 7th Edition	NB Left	0.840	88.0	F
17	Stony Plain Road and 149 Street	Signalized	HCM 7th Edition	EB Left	0.761	53.5	D
21	95 Avenue and 156 Street	Signalized	HCM 7th Edition	SB Left	0.619	49.7	D
26	109 Street and 87 Ave	Signalized	HCM 7th Edition	NB Left	0.568	98.0	F
29	114 Street and 82 Ave	Signalized	HCM 7th Edition	EB Left	0.764	47.9	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 3: 104 Avenue and 109 Street

Control Type:	Signalized	Delay (sec / veh):	88.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.840

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.66	3.60	3.60
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	0	0	1
Entry Pocket Length [m]	100.00	30.48	30.48	100.00	30.48	30.48	70.00	30.48	30.48	30.48	30.48	55.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	163	1319	33	159	1520	22	89	971	231	0	496	197
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	3	0	0	2	0	0	23	0	0	20
Total Hourly Volume [veh/h]	163	1319	33	159	1520	22	89	971	231	0	496	197
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	41	330	8	40	380	6	22	243	58	0	124	49
Total Analysis Volume [veh/h]	163	1319	33	159	1520	22	89	971	231	0	496	197
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	49			49			49			49		
v_di, Inbound Pedestrian Volume crossing m	49			49			49			49		
v_co, Outbound Pedestrian Volume crossing	50			50			50			50		
v_ci, Inbound Pedestrian Volume crossing mi	50			50			50			50		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	3	4	0	3	4	0	1	5	0	0	2	0
Auxiliary Signal Groups												
Maximum Green [s]	8	40	0	8	40	0	7	81	0	0	68	0
Amber [s]	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	3.0	3.0	0.0	3.0	3.0	0.0	2.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	25	0	0	25	0	0	25	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	5.0	5.0	0.0	5.0	5.0	0.0	4.0	5.0	0.0	0.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	23	61	0	23	61	0	18	66	0	0	48	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	0	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No			No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	5.00	5.00	5.00	5.00	5.00	5.00	4.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	16	49	49	16	49	49	12	54	54	36	36
g / C, Green / Cycle	0.11	0.33	0.33	0.11	0.33	0.33	0.08	0.36	0.36	0.24	0.24
(v / s)_i Volume / Saturation Flow Rate	0.11	0.30	0.30	0.11	0.34	0.35	0.06	0.37	0.38	0.17	0.16
s, saturation flow rate [veh/h]	1476	2951	1518	1476	2951	1531	1476	1683	1514	2951	1255
c, Capacity [veh/h]	157	964	496	157	964	500	118	606	545	708	301
d1, Uniform Delay [s]	67.00	48.69	48.87	67.00	50.50	50.50	67.55	48.00	48.00	52.07	50.24
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	81.29	15.52	26.47	74.28	43.39	56.00	35.34	42.24	58.32	5.70	10.57
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.04	0.92	0.93	1.01	1.05	1.06	0.75	1.02	1.07	0.70	0.65
d, Delay for Lane Group [s/veh]	148.29	64.21	75.34	141.28	93.89	106.50	102.89	90.24	106.32	57.77	60.81
Lane Group LOS	F	E	E	F	F	F	F	F	F	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	9.60	18.09	20.32	9.29	23.80	26.45	4.51	29.58	29.05	9.13	7.45
50th-Percentile Queue Length [m/ln]	73.15	137.85	154.82	70.82	181.33	201.52	34.38	225.39	221.34	69.54	56.76
95th-Percentile Queue Length [veh/ln]	14.89	25.07	27.71	14.35	32.88	36.20	8.00	39.11	39.69	14.08	11.93
95th-Percentile Queue Length [m/ln]	113.48	191.00	211.15	109.35	250.53	275.85	60.93	298.03	302.47	107.29	90.87

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	148.29	67.82	75.34	141.28	98.09	106.50	102.89	96.07	106.32	0.00	57.77	60.81
Movement LOS	F	E	E	F	F	F	F	F	F		E	E
d_A, Approach Delay [s/veh]	76.65			102.24			98.37			58.63		
Approach LOS	E			F			F			E		
d_I, Intersection Delay [s/veh]	88.01											
Intersection LOS	F											
Intersection V/C	0.840											

Emissions

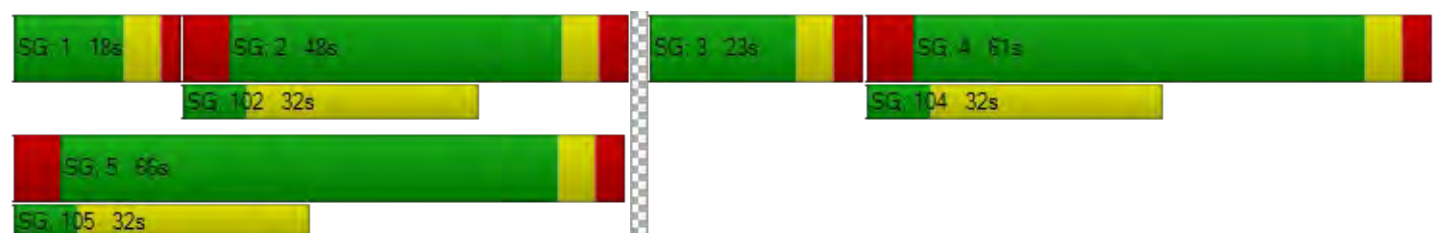
Vehicle Kilometers Traveled [km/h]	72.78	397.49	206.17	33.54	213.80	111.49	22.95	159.68	150.29	114.14	45.33
Stops [stops/h]	230.41	868.34	487.63	223.05	1142.24	634.70	108.29	709.88	697.15	438.04	178.78
Fuel consumption [L/h]	30.71	101.32	57.35	25.50	119.25	68.20	11.67	74.16	77.66	42.75	17.55
CO [g/h]	567.07	1871.00	1058.98	470.80	2202.08	1259.34	215.42	1369.33	1434.08	789.49	324.08
NOx [g/h]	110.33	364.03	206.04	91.60	428.45	245.02	41.91	266.42	279.02	153.61	63.05
VOC [g/h]	131.42	433.62	245.43	109.11	510.35	291.87	49.93	317.35	332.36	182.97	75.11

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	6.01			6.72			9.81			9.62		
d_p, Pedestrian Delay [s]	64.40			64.40			64.40			64.40		
I_p,int, Pedestrian LOS Score for Intersectio	3.097			3.101			2.760			2.732		
Crosswalk LOS	C			C			C			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	653			653			720			480		
d_b, Bicycle Delay [s]	34.00			34.00			30.72			43.32		
I_b,int, Bicycle LOS Score for Intersection	2.395			2.496			2.644			2.148		
Bicycle LOS	B			B			B			B		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 17: Stony Plain Road and 149 Street

Control Type:	Signalized	Delay (sec / veh):	53.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.761

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
No. of Lanes in Entry Pocket	1	0	0	1	0	1	1	0	1	1	0	1
Entry Pocket Length [m]	90.00	30.48	30.48	65.00	30.48	75.00	50.00	30.48	15.00	110.00	30.48	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	60.00			60.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	45	1217	436	19	644	65	100	472	54	64	602	264
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	44	0	0	7	0	0	5	0	0	26
Total Hourly Volume [veh/h]	45	1217	436	19	644	65	100	472	54	64	602	264
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	11	304	109	5	161	16	25	118	14	16	151	66
Total Analysis Volume [veh/h]	45	1217	436	19	644	65	100	472	54	64	602	264
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			10			10			10		
v_di, Inbound Pedestrian Volume crossing m	10			10			10			10		
v_co, Outbound Pedestrian Volume crossing	10			10			10			10		
v_ci, Inbound Pedestrian Volume crossing mi	10			10			10			10		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	44.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	7	0	5	6	0	1	3	0	1	3	0
Auxiliary Signal Groups												
Maximum Green [s]	0	40	0	8	51	0	11	37	0	11	37	0
Amber [s]	0.0	4.0	0.0	3.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	30	0	0	30	0	0	30	0	0	30	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	5.0	0.0	1.0	5.0	0.0	5.0	5.0	0.0	5.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	51	0	8	59	0	15	46	0	15	46	0
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall		No		No	No		No	No		No	No	
Maximum Recall		Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall		Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	5.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	44	44	44	52	52	52	8	39	39	8	39	39
g / C, Green / Cycle	0.37	0.37	0.37	0.43	0.43	0.43	0.07	0.33	0.33	0.07	0.33	0.33
(v / s)_i Volume / Saturation Flow Rate	0.06	0.37	0.27	0.04	0.20	0.04	0.06	0.25	0.03	0.02	0.32	0.17
s, saturation flow rate [veh/h]	734	3279	1589	456	3279	1553	1640	1870	1589	3186	1870	1589
c, Capacity [veh/h]	215	1202	583	174	1421	673	109	608	517	212	608	517
d1, Uniform Delay [s]	39.74	38.00	33.16	28.04	23.97	20.09	55.66	36.57	28.30	53.34	40.32	32.78
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.20	28.98	8.53	1.26	1.05	0.29	65.27	9.42	0.41	3.61	34.27	3.58
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.21	1.01	0.75	0.11	0.45	0.10	0.91	0.78	0.10	0.30	0.99	0.51
d, Delay for Lane Group [s/veh]	41.93	66.98	41.69	29.30	25.02	20.37	120.93	45.98	28.71	56.95	74.59	36.37
Lane Group LOS	D	F	D	C	C	C	F	D	C	E	E	D
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.24	21.83	12.13	0.36	6.49	1.12	4.98	13.94	1.15	1.03	23.16	6.71
50th-Percentile Queue Length [m/ln]	9.43	166.34	92.46	2.76	49.43	8.50	37.97	106.25	8.78	7.82	176.46	51.12
95th-Percentile Queue Length [veh/ln]	2.23	29.74	17.85	0.65	10.66	2.01	8.64	20.07	2.07	1.85	31.05	10.96
95th-Percentile Queue Length [m/ln]	16.97	226.66	135.99	4.97	81.26	15.30	65.87	152.92	15.80	14.08	236.60	83.49

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	41.93	66.98	41.69	29.30	25.02	20.37	120.93	45.98	28.71	56.95	74.59	36.37
Movement LOS	D	F	D	C	C	C	F	D	C	E	E	D
d_A, Approach Delay [s/veh]	59.82			24.72			56.47			62.52		
Approach LOS	E			C			E			E		
d_I, Intersection Delay [s/veh]	53.51											
Intersection LOS	D											
Intersection V/C	0.761											

Emissions

Vehicle Kilometers Traveled [km/h]	11.30	305.67	109.51	3.97	134.50	13.58	23.80	112.35	12.85	23.06	216.93	95.13
Stops [stops/h]	37.12	1309.74	364.00	10.87	389.22	33.47	149.51	418.31	34.56	61.61	694.73	201.27
Fuel consumption [L/h]	3.64	131.68	35.29	1.13	36.68	3.28	14.93	36.79	3.19	6.38	70.81	20.96
CO [g/h]	67.13	2431.55	651.57	20.77	677.38	60.61	275.74	679.38	58.95	117.88	1307.51	387.06
NOx [g/h]	13.06	473.09	126.77	4.04	131.79	11.79	53.65	132.18	11.47	22.94	254.39	75.31
VOC [g/h]	15.56	563.54	151.01	4.81	156.99	14.05	63.91	157.45	13.66	27.32	303.03	89.71

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			92.53			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	56.70			32.22			53.57			25.21		
d_p, Pedestrian Delay [s]	49.50			49.50			49.50			49.50		
I_p,int, Pedestrian LOS Score for Intersectio	2.948			2.950			2.524			2.685		
Crosswalk LOS	C			C			B			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	733			867			650			650		
d_b, Bicycle Delay [s]	24.07			19.27			27.34			27.34		
I_b,int, Bicycle LOS Score for Intersection	2.997			2.166			2.601			3.137		
Bicycle LOS	C			B			B			C		

Sequence

Ring 1	1	3	5	7	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 21: 95 Avenue and 156 Street

Control Type:	Signalized	Delay (sec / veh):	49.7
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.619

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [m]	75.00	30.48	30.48	75.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	227	453	134	48	203	92	59	342	45	68	293	31
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	13	0	0	9	0	0	5	0	0	3
Total Hourly Volume [veh/h]	227	453	134	48	203	92	59	342	45	68	293	31
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	57	113	34	12	51	23	15	86	11	17	73	8
Total Analysis Volume [veh/h]	227	453	134	48	203	92	59	342	45	68	293	31
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			20			20			20		
v_di, Inbound Pedestrian Volume crossing m	20			20			20			20		
v_co, Outbound Pedestrian Volume crossing	20			20			20			20		
v_ci, Inbound Pedestrian Volume crossing mi	20			20			20			20		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	40.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	2	3	0	1	5	0	7	9	0	7	9	0
Auxiliary Signal Groups												
Maximum Green [s]	22	42	0	12	32	0	7	31	0	7	31	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	30	0	0	30	0	0	30	0	0	30	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	3.0	0.0	1.0	3.0	0.0	1.0	3.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	26	56	0	12	42	0	8	44	0	8	44	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	3.00	3.00	0.00	3.00	0.00	3.00
g_i, Effective Green Time [s]	21	46	7	32	47	34	47	34
g / C, Green / Cycle	0.18	0.38	0.06	0.27	0.39	0.28	0.39	0.28
(v / s)_i Volume / Saturation Flow Rate	0.14	0.33	0.03	0.17	0.05	0.23	0.06	0.19
s, saturation flow rate [veh/h]	1640	1783	1640	1744	1192	1671	1147	1680
c, Capacity [veh/h]	287	683	96	465	374	473	321	476
d1, Uniform Delay [s]	47.40	34.02	54.81	38.84	24.90	40.11	26.17	38.18
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	19.61	13.27	17.56	6.46	0.90	14.48	1.50	7.66
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.79	0.86	0.50	0.63	0.16	0.82	0.21	0.68
d, Delay for Lane Group [s/veh]	67.01	47.29	72.37	45.30	25.80	54.59	27.67	45.84
Lane Group LOS	E	D	E	D	C	D	C	D
Critical Lane Group	No	Yes	Yes	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	8.04	17.94	1.87	8.47	1.16	12.46	1.36	9.43
50th-Percentile Queue Length [m/ln]	61.24	136.72	14.28	64.56	8.80	94.94	10.39	71.82
95th-Percentile Queue Length [veh/ln]	12.69	24.89	3.37	13.25	2.08	18.25	2.46	14.46
95th-Percentile Queue Length [m/ln]	96.67	189.65	25.70	100.94	15.84	139.05	18.71	110.19

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	67.01	47.29	47.29	72.37	45.30	45.30	25.80	54.59	54.59	27.67	45.84	45.84
Movement LOS	E	D	D	E	D	D	C	D	D	C	D	D
d_A, Approach Delay [s/veh]	52.79			49.09			50.78			42.69		
Approach LOS	D			D			D			D		
d_I, Intersection Delay [s/veh]	49.72											
Intersection LOS	D											
Intersection V/C	0.619											

Emissions

Vehicle Kilometers Traveled [km/h]	57.37	148.34	16.31	100.24	16.88	110.71	23.38	111.41
Stops [stops/h]	241.10	538.26	56.21	254.18	34.65	373.79	40.92	282.76
Fuel consumption [L/h]	22.58	47.57	5.49	25.53	3.56	35.19	4.59	28.38
CO [g/h]	417.00	878.40	101.35	471.46	65.66	649.83	84.79	524.11
NOx [g/h]	81.13	170.90	19.72	91.73	12.77	126.43	16.50	101.97
VOC [g/h]	96.64	203.58	23.49	109.27	15.22	150.60	19.65	121.47

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	27.17	28.10	21.79	18.60
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
I_p,int, Pedestrian LOS Score for Intersectio	2.388	2.294	2.423	2.384
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	767	533	567	567
d_b, Bicycle Delay [s]	22.82	32.27	30.82	30.82
I_b,int, Bicycle LOS Score for Intersection	2.924	2.140	2.304	2.211
Bicycle LOS	C	B	B	B

Sequence

Ring 1	1	3	7	9	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 26: 109 Street and 87 Ave

Control Type:	Signalized	Delay (sec / veh):	98.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.568

Intersection Setup

Name	109 Street				109 Street				87 Ave			
Approach	Northbound				Southbound				Eastbound			
Lane Configuration												
Turning Movement	Left	Thru	Thru	Right	Left	Left	Thru	Right	Left	Left	Thru	Right
Lane Width [m]	3.20	3.66	3.20	4.00	3.66	3.66	3.60	4.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [m]	80.00	30.48	30.48	35.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	45.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00				50.00				50.00			
Grade [%]	0.00				0.00				0.00			
Curb Present	Yes				Yes				Yes			
Crosswalk	Yes				Yes				Yes			

Volumes

Name	109 Street				109 Street				87 Ave			
Base Volume Input [veh/h]	686	1432	0	10	0	0	833	413	329	0	1	212
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	1	0	0	0	41	0	0	0	21
Total Hourly Volume [veh/h]	686	1432	0	9	0	0	833	372	329	0	1	191
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	172	358	0	2	0	0	208	93	82	0	0	48
Total Analysis Volume [veh/h]	686	1432	0	9	0	0	833	372	329	0	1	191
Presence of On-Street Parking	No			No	No			No	No			No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	53				0				13			
v_di, Inbound Pedestrian Volume crossing th	52				0				14			
v_co, Outbound Pedestrian Volume along th	16				14				52			
v_ci, Inbound Pedestrian Volume along the l	16				13				53			
v_ab, Corner Pedestrian Volume [ped/h]	0				0				0			
Bicycle Volume [bicycles/h]	25				6				5			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	200
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	85.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Overlap	Overlap	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	1	0	3	0	0	1	0	0	0	3	2
Auxiliary Signal Groups	1,2	1,2		1,3								
Maximum Green [s]	30	59	0	26	0	0	59	0	0	0	26	30
Amber [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
All red [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
Walk [s]	0	8	0	7	0	0	8	0	0	0	7	0
Pedestrian Clearance [s]	0	16	0	19	0	0	16	0	0	0	19	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk												
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	63	77	0	30	0	0	77	0	0	0	30	63
Lead / Lag	Lag	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	24	0	7	0	0	24	0	0	0	7	5
Vehicle Extension [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Minimum Recall	No	Yes		No			Yes				No	
Maximum Recall	Yes	No		No			No				No	
Pedestrian Recall	No	No		Yes			No				Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	200	200	200	200	200	200	200	200
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	135	135	132	72	72	25	25	25
g / C, Green / Cycle	0.68	0.68	0.66	0.36	0.36	0.13	0.13	0.13
(v / s)_i Volume / Saturation Flow Rate	0.69	0.45	0.01	0.36	0.39	0.12	0.17	0.14
s, saturation flow rate [veh/h]	987	3204	1440	1683	1551	1210	1106	1401
c, Capacity [veh/h]	548	2166	951	608	560	175	174	175
d1, Uniform Delay [s]	64.04	18.97	11.63	63.59	63.89	89.05	90.87	87.24
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.37	0.50	0.45
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	128.14	1.60	0.02	34.48	60.03	27.80	83.64	91.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.25	0.66	0.01	0.99	1.08	0.83	1.06	1.09
d, Delay for Lane Group [s/veh]	192.17	20.57	11.65	98.07	123.92	116.85	174.51	178.37
Lane Group LOS	F	C	B	F	F	F	F	F
Critical Lane Group	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	32.02	19.97	0.15	36.37	37.87	9.04	13.21	13.54
50th-Percentile Queue Length [m/ln]	243.96	152.16	1.14	277.14	288.59	68.87	100.68	103.21
95th-Percentile Queue Length [veh/ln]	48.84	27.30	0.27	46.26	50.54	13.97	19.65	20.35
95th-Percentile Queue Length [m/ln]	372.12	208.00	2.05	352.51	385.10	106.44	149.70	155.04

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	192.17	20.57	0.00	11.65	0.00	0.00	105.22	123.92	148.89	0.00	174.51	178.37
Movement LOS	F	C		B			F	F	F		F	F
d_A, Approach Delay [s/veh]	75.88				110.99				159.75			
Approach LOS	E				F				F			
d_I, Intersection Delay [s/veh]	98.02											
Intersection LOS	F											
Intersection V/C	0.568											

Emissions

Vehicle Kilometers Traveled [km/h]	72.47	151.29	0.95	62.38	62.38	28.85	36.28	37.70
Stops [stops/h]	576.28	718.86	2.69	654.67	681.72	162.69	237.83	243.80
Fuel consumption [L/h]	121.35	53.21	0.23	66.13	78.73	19.55	33.50	35.29
CO [g/h]	2240.80	982.61	4.27	1221.10	1453.81	360.94	618.54	651.72
NOx [g/h]	435.98	191.18	0.83	237.58	282.86	70.23	120.34	126.80
VOC [g/h]	519.33	227.73	0.99	283.00	336.94	83.65	143.35	151.04

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	18.16	210.96	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	3.30	0.00	0.00
d_p, Pedestrian Delay [s]	89.30	89.30	89.30
I_p,int, Pedestrian LOS Score for Intersectio	3.058	2.440	2.673
Crosswalk LOS	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1350	720	250
d_b, Bicycle Delay [s]	10.70	41.08	76.75
I_b,int, Bicycle LOS Score for Intersection	3.315	2.588	2.454
Bicycle LOS	C	B	B

Intersection Setup

Name	87 Ave							
Approach	Westbound				Southwestbound			
Lane Configuration								
Turning Movement	Left	Thru	Right	Right	Left	Thru	Right	Right
Lane Width [m]	3.50	3.66	3.50	3.66	3.66	3.66	3.66	3.66
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0
Entry Pocket Length [m]	30.48	30.48	30.48	10.00	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	30.00				50.00			
Grade [%]	0.00				0.00			
Curb Present	Yes							
Crosswalk	Yes				Yes			

Volumes

Name	87 Ave							
Base Volume Input [veh/h]	20	0	0	65	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00							
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	7	0	0	0	0
Total Hourly Volume [veh/h]	20	0	0	58	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	0	0	15	0	0	0	0
Total Analysis Volume [veh/h]	20	0	0	58	0	0	0	0
Presence of On-Street Parking	No			No				
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	16				0			
v_di, Inbound Pedestrian Volume crossing th	16				0			
v_co, Outbound Pedestrian Volume along th	0				0			
v_ci, Inbound Pedestrian Volume along the l	0				0			
v_ab, Corner Pedestrian Volume [ped/h]	0				0			
Bicycle Volume [bicycles/h]	0				0			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	200
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	85.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	3	0	0	0	0	0	0	0
Auxiliary Signal Groups								
Maximum Green [s]	26	0	0	0	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All red [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk [s]	7	0	0	0	0	0	0	0
Pedestrian Clearance [s]	19	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk								
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	30	0	0	0	0	0	0	0
Lead / Lag	Lag	-	-	-	-	-	-	-
Minimum Green [s]	7	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	No							
Maximum Recall	No							
Pedestrian Recall	Yes							

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	R	
C, Calculated Cycle Length [s]	200	200	
L, Total Lost Time per Cycle [s]	5.00	5.00	
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	
l2, Clearance Lost Time [s]	3.00	3.00	
g_i, Effective Green Time [s]	25	25	
g / C, Green / Cycle	0.13	0.13	
(v / s)_i Volume / Saturation Flow Rate	0.02	0.04	
s, saturation flow rate [veh/h]	1072	1431	
c, Capacity [veh/h]	36	179	
d1, Uniform Delay [s]	100.00	79.80	
k, delay calibration	0.11	0.11	
l, Upstream Filtering Factor	1.00	1.00	
d2, Incremental Delay [s]	12.70	1.04	
d3, Initial Queue Delay [s]	0.00	0.00	
Rp, platoon ratio	1.00	1.00	
PF, progression factor	1.00	1.00	

Lane Group Results

X, volume / capacity	0.56	0.32	
d, Delay for Lane Group [s/veh]	112.70	80.84	
Lane Group LOS	F	F	
Critical Lane Group	No	No	
50th-Percentile Queue Length [veh/ln]	1.19	2.85	
50th-Percentile Queue Length [m/ln]	9.07	21.69	
95th-Percentile Queue Length [veh/ln]	2.14	5.12	
95th-Percentile Queue Length [m/ln]	16.33	39.05	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	112.70	0.00	0.00	80.84	0.00	0.00	0.00	0.00
Movement LOS	F			F				
d_A, Approach Delay [s/veh]	89.01				0.00			
Approach LOS	F				A			
d_I, Intersection Delay [s/veh]	98.02							
Intersection LOS	F							
Intersection V/C	0.568							

Emissions

Vehicle Kilometers Traveled [km/h]	0.73	2.11	
Stops [stops/h]	21.43	51.24	
Fuel consumption [L/h]	2.00	4.28	
CO [g/h]	36.86	78.98	
NOx [g/h]	7.17	15.37	
VOC [g/h]	8.54	18.30	

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	19.20	0.00
d_p, Pedestrian Delay [s]	89.30	89.30
I_p,int, Pedestrian LOS Score for Intersectio	2.007	3.169
Crosswalk LOS	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	250	0
d_b, Bicycle Delay [s]	76.56	100.00
I_b,int, Bicycle LOS Score for Intersection	1.560	4.132
Bicycle LOS	A	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 29: 114 Street and 82 Ave

Control Type: Signalized
Analysis Method: HCM 7th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 47.9
Level Of Service: D
Volume to Capacity (v/c): 0.764

Intersection Setup

Name	114 Street			114 Street			University Ave			82 Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	↵↵↵			↵↵			↵↵↵			↵↵↵		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.70	3.60	3.66	3.60	3.60	4.00	3.60	3.60	3.66	3.66	3.66
No. of Lanes in Entry Pocket	2	0	1	0	0	1	1	0	1	2	0	0
Entry Pocket Length [m]	170.00	30.48	2.00	30.48	30.48	105.00	95.00	30.48	95.00	100.00	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	114 Street			114 Street			University Ave			82 Ave		
Base Volume Input [veh/h]	870	1125	232	0	294	57	46	347	566	153	423	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	23	0	0	6	0	0	0	0	0	2
Total Hourly Volume [veh/h]	870	1125	209	0	294	57	46	347	566	153	423	18
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	218	281	52	0	74	14	12	87	142	38	106	5
Total Analysis Volume [veh/h]	870	1125	209	0	294	57	46	347	566	153	423	18
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			2			2			2		
v_di, Inbound Pedestrian Volume crossing m	2			2			2			2		
v_co, Outbound Pedestrian Volume crossing	18			0			0			18		
v_ci, Inbound Pedestrian Volume crossing mi	18			0			0			18		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	190
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Overlap	Permiss	Permiss	Permiss	Overlap	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss
Signal Group	2	1	0	0	1	2	3	6	2	5	4	0
Auxiliary Signal Groups		1,2				1,2			2,6			
Maximum Green [s]	60	33	0	0	33	60	15	38	60	16	38	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
All red [s]	3.0	3.0	0.0	0.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0	0.0
Walk [s]	0	9	0	0	9	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	24	0	0	24	0	0	22	0	0	22	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.0	4.0	0.0	0.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0	0.0
Detector Location [m]	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	0.0
Detector Length [m]	5.0	5.0	0.0	0.0	5.0	5.0	5.0	0.0	0.0	5.0	5.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	70	33	0	0	33	70	46	36	70	51	41	0
Lead / Lag	Lag	-	-	-	-	-	Lead	-	-	Lag	-	-
Minimum Green [s]	10	27	0	0	27	10	7	29	10	7	29	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
Minimum Recall	No	Yes			Yes	No	No	No	No	No	No	
Maximum Recall	No	No			No	No	No	Yes	No	No	Yes	
Pedestrian Recall	No	No			No	No	No	No	No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	C	R	L	C	R	L	C	C
C, Calculated Cycle Length [s]	167	167	167	167	167	167	167	167	167	167	167
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	0.00	4.00	4.00	0.00	5.00	5.00	0.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	60	99	33	33	99	6	38	104	10	42	42
g / C, Green / Cycle	0.36	0.59	0.20	0.20	0.59	0.04	0.23	0.62	0.06	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.37	0.35	0.15	0.09	0.04	0.03	0.12	0.24	0.05	0.14	0.14
s, saturation flow rate [veh/h]	2353	3204	1431	3204	1318	1535	2951	2329	3113	1550	1527
c, Capacity [veh/h]	859	1895	282	632	779	58	670	1447	193	390	384
d1, Uniform Delay [s]	56.12	21.53	63.18	59.40	14.60	79.88	56.67	15.85	77.43	54.75	54.77
k, delay calibration	0.11	0.34	0.23	0.11	0.11	0.11	0.50	0.11	0.11	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	17.51	0.93	8.01	0.53	0.04	20.96	2.85	0.17	7.11	5.93	6.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.01	0.59	0.74	0.47	0.07	0.79	0.52	0.39	0.79	0.57	0.57
d, Delay for Lane Group [s/veh]	73.63	22.47	71.19	59.93	14.64	100.84	59.52	16.02	84.54	60.68	60.83
Lane Group LOS	F	C	E	E	B	F	E	B	F	E	E
Critical Lane Group	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	20.65	14.16	9.04	5.61	0.97	2.32	6.75	5.52	3.46	8.89	8.80
50th-Percentile Queue Length [m/ln]	157.32	107.92	68.92	42.77	7.35	17.68	51.46	42.02	26.39	67.74	67.04
95th-Percentile Queue Length [veh/ln]	28.35	20.33	13.98	9.50	1.74	4.18	11.02	9.37	6.23	13.78	13.66
95th-Percentile Queue Length [m/ln]	216.00	154.95	106.50	72.37	13.24	31.83	83.93	71.37	47.51	105.01	104.10

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	73.63	22.47	71.19	0.00	59.93	14.64	100.84	59.52	16.02	84.54	60.75	60.83
Movement LOS	F	C	E		E	B	F	E	B	F	E	E
d_A, Approach Delay [s/veh]	47.28			52.58			35.83			66.88		
Approach LOS	D			D			D			E		
d_I, Intersection Delay [s/veh]	47.90											
Intersection LOS	D											
Intersection V/C	0.764											

Emissions

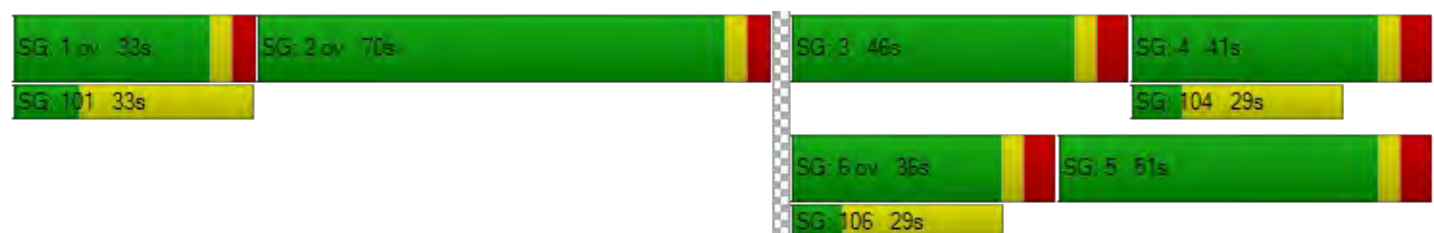
Vehicle Kilometers Traveled [km/h]	246.27	318.45	59.16	67.96	13.18	15.12	114.09	186.10	25.38	36.81	36.36
Stops [stops/h]	888.21	609.31	194.55	241.47	20.76	49.92	290.54	237.27	149.01	191.25	189.24
Fuel consumption [L/h]	92.69	63.44	21.45	25.45	2.36	6.13	33.28	30.02	15.72	18.16	17.97
CO [g/h]	1711.63	1171.38	396.13	470.02	43.62	113.22	614.55	554.25	290.28	335.34	331.85
NOx [g/h]	333.02	227.91	77.07	91.45	8.49	22.03	119.57	107.84	56.48	65.25	64.57
VOC [g/h]	396.69	271.48	91.81	108.93	10.11	26.24	142.43	128.45	67.27	77.72	76.91

Other Modes

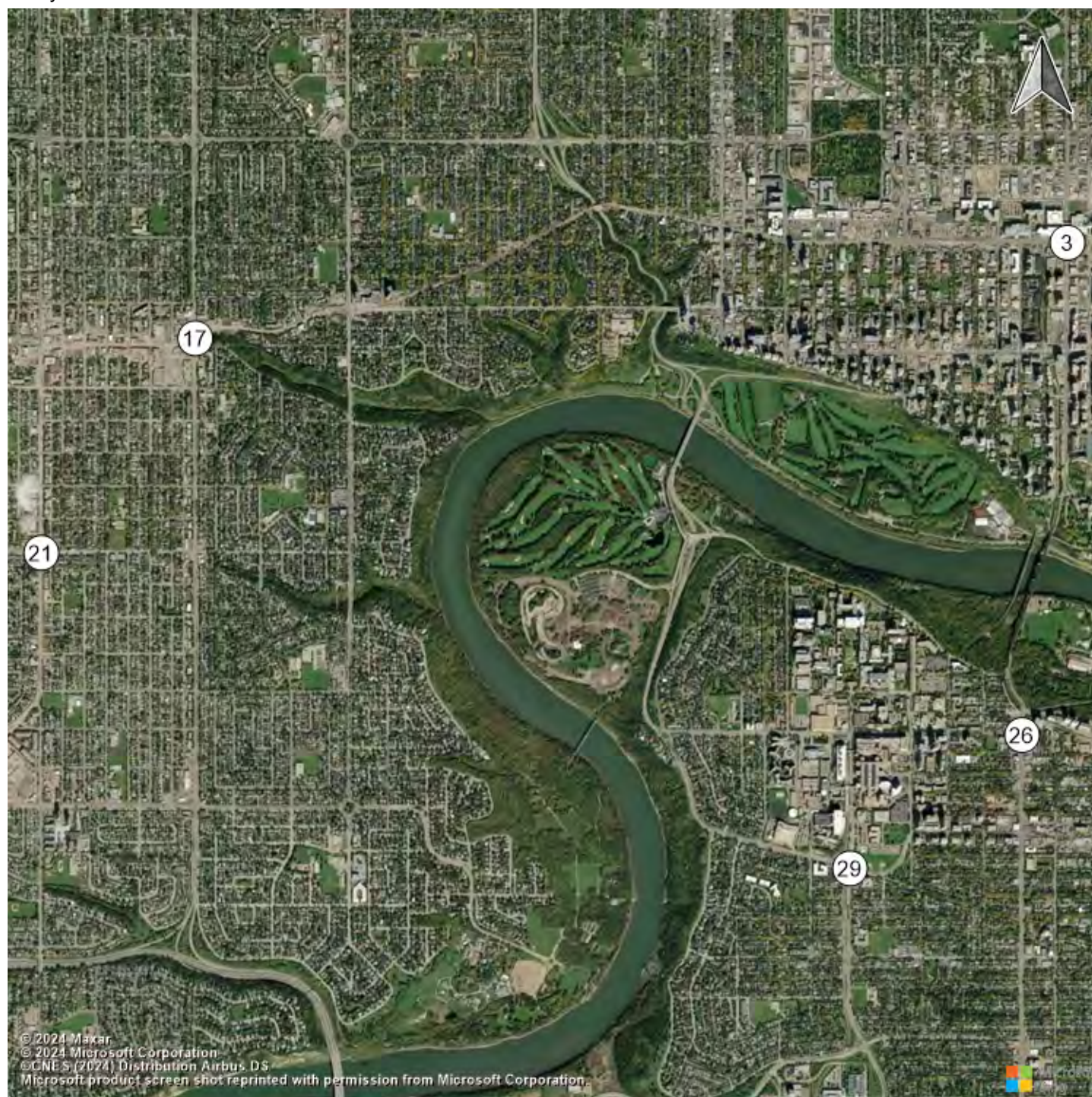
g_Walk,mi, Effective Walk Time [s]	11.0			11.0			13.0			13.0		
M_corner, Corner Circulation Area [m²/ped]	19.71			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	0.00			220.01			0.00			17.68		
d_p, Pedestrian Delay [s]	73.04			73.04			71.18			71.18		
I_p,int, Pedestrian LOS Score for Intersectio	3.006			2.650			4.194			2.682		
Crosswalk LOS	C			B			D			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1159			323			347			406		
d_b, Bicycle Delay [s]	14.79			58.85			57.19			53.13		
I_b,int, Bicycle LOS Score for Intersection	3.397			1.854			2.351			2.051		
Bicycle LOS	C			A			B			B		

Sequence

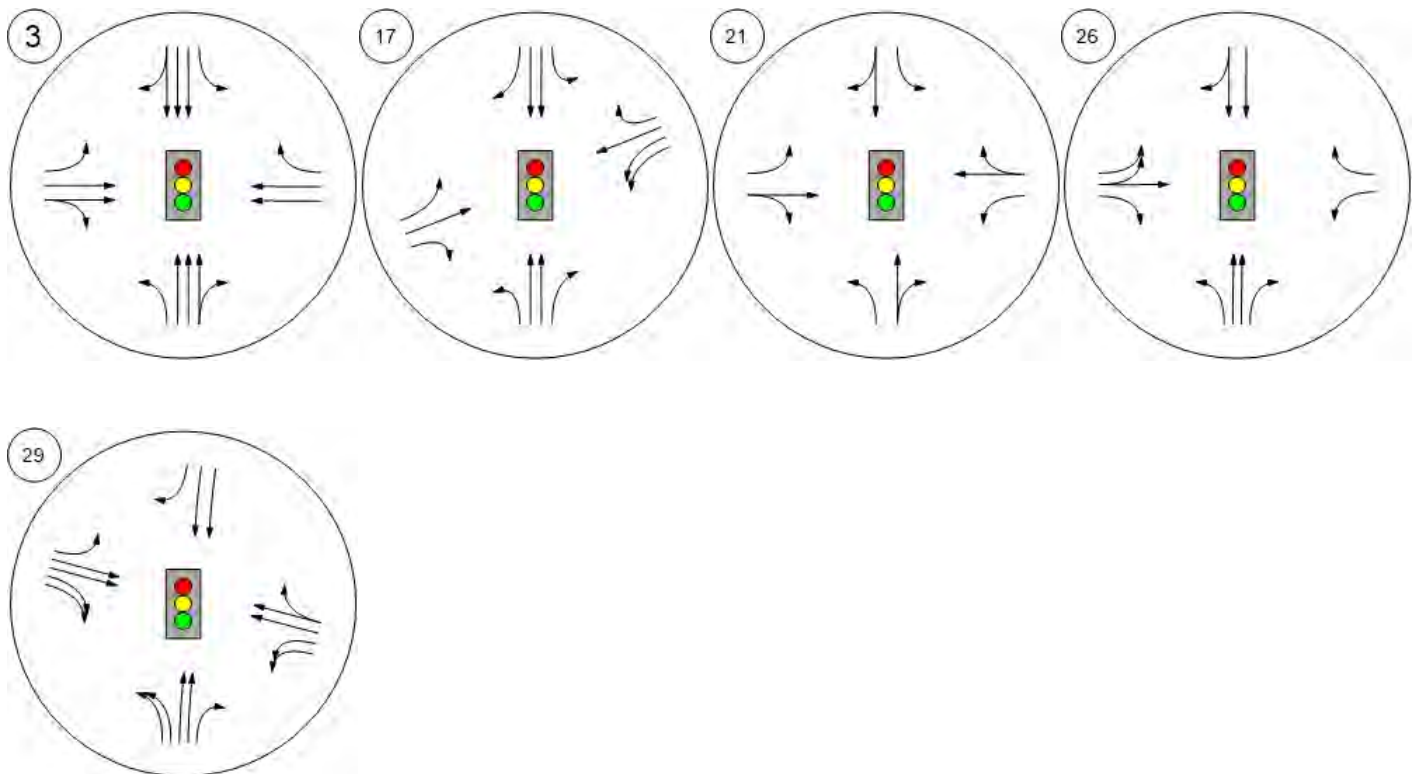
Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	5	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



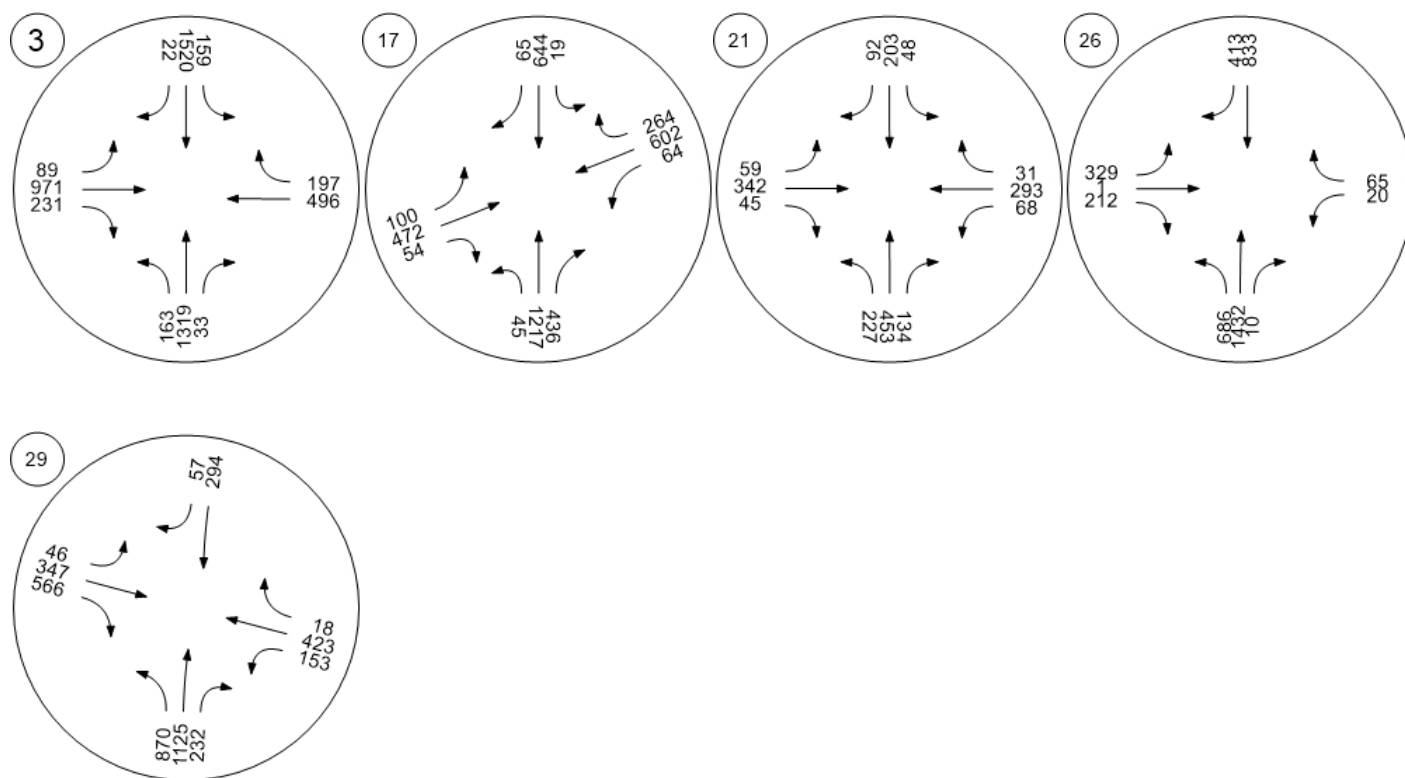
Study Intersections



Lane Configuration and Traffic Control



Traffic Volume - Base Volume



Traffic Conditions

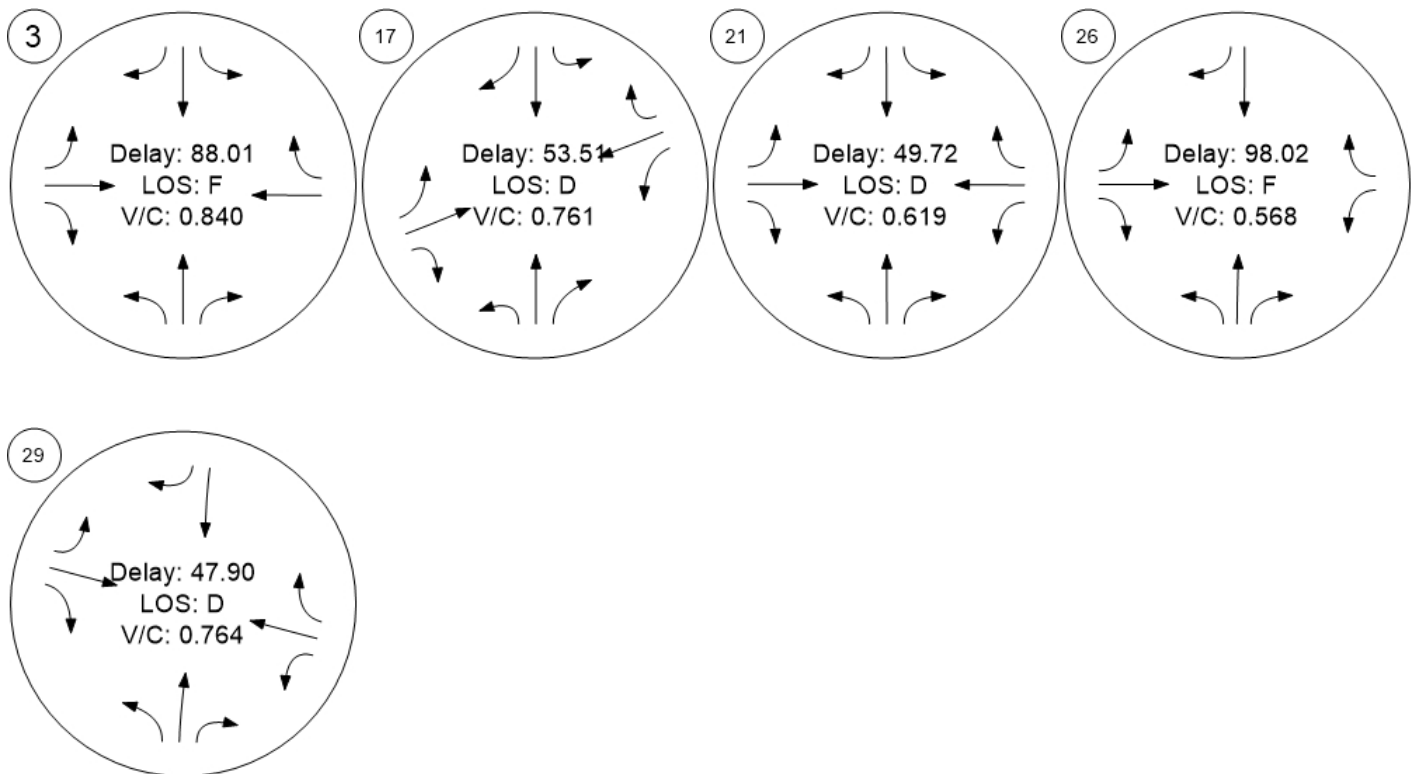


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Priority Growth Areas Mobility Study

Vistro File: Z:\...\Z0016285 PGA Sensitivity Analysis.vistro
Report File: Z:\...\AM Sensitivity Analysis +20% Volume.pdf

Scenario 8 +20% AM
2025-04-24

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
3	104 Avenue and 109 Street	Signalized	HCM 7th Edition	NB Left	0.899	105.4	F
17	Stony Plain Road and 149 Street	Signalized	HCM 7th Edition	EB Left	0.824	65.6	E
21	95 Avenue and 156 Street	Signalized	HCM 7th Edition	SB Left	0.644	51.9	D
26	109 Street and 87 Ave	Signalized	HCM 7th Edition	EB Right	0.991	110.1	F
29	114 Street and 82 Ave	Signalized	HCM 7th Edition	EB Left	0.778	48.4	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 3: 104 Avenue and 109 Street

Control Type:	Signalized	Delay (sec / veh):	105.4
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.899

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.66	3.60	3.60
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	0	0	1
Entry Pocket Length [m]	100.00	30.48	30.48	100.00	30.48	30.48	70.00	30.48	30.48	30.48	30.48	55.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	163	1439	33	159	1658	24	89	1060	231	0	541	197
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	3	0	0	2	0	0	23	0	0	20
Total Hourly Volume [veh/h]	163	1439	33	159	1658	24	89	1060	231	0	541	197
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	41	360	8	40	415	6	22	265	58	0	135	49
Total Analysis Volume [veh/h]	163	1439	33	159	1658	24	89	1060	231	0	541	197
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	49			49			49			49		
v_di, Inbound Pedestrian Volume crossing m	49			49			49			49		
v_co, Outbound Pedestrian Volume crossing	50			50			50			50		
v_ci, Inbound Pedestrian Volume crossing mi	50			50			50			50		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	3	4	0	3	4	0	1	5	0	0	2	0
Auxiliary Signal Groups												
Maximum Green [s]	8	40	0	8	40	0	7	81	0	0	68	0
Amber [s]	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	3.0	3.0	0.0	3.0	3.0	0.0	2.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	25	0	0	25	0	0	25	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	5.0	5.0	0.0	5.0	5.0	0.0	4.0	5.0	0.0	0.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	22	62	0	22	62	0	17	66	0	0	49	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	0	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No			No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	5.00	5.00	5.00	5.00	5.00	5.00	4.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	15	50	50	15	50	50	11	54	54	37	37
g / C, Green / Cycle	0.10	0.33	0.33	0.10	0.33	0.33	0.07	0.36	0.36	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.11	0.33	0.33	0.11	0.37	0.38	0.06	0.39	0.41	0.18	0.16
s, saturation flow rate [veh/h]	1476	2951	1521	1476	2951	1531	1476	1683	1525	2951	1260
c, Capacity [veh/h]	148	984	507	148	984	510	108	606	549	728	311
d1, Uniform Delay [s]	67.50	49.62	49.81	67.50	50.00	50.00	68.54	48.00	48.00	52.12	49.36
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	104.71	25.26	38.15	96.13	69.02	80.55	48.02	64.56	85.03	6.76	9.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.10	0.98	0.99	1.08	1.12	1.13	0.82	1.09	1.14	0.74	0.63
d, Delay for Lane Group [s/veh]	172.21	74.89	87.96	163.63	119.02	130.55	116.56	112.56	133.03	58.87	58.84
Lane Group LOS	F	E	F	F	F	F	F	F	F	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	9.96	21.37	24.05	9.61	27.76	30.45	4.82	33.33	33.34	10.11	7.32
50th-Percentile Queue Length [m/ln]	75.93	162.84	183.28	73.25	211.55	232.00	36.75	254.00	254.02	77.03	55.78
95th-Percentile Queue Length [veh/ln]	15.73	28.95	32.10	15.13	39.26	42.76	8.42	45.53	46.85	15.32	11.76
95th-Percentile Queue Length [m/ln]	119.88	220.61	244.56	115.30	299.18	325.85	64.20	346.98	356.98	116.76	89.59

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	172.21	79.16	87.96	163.63	122.86	130.55	116.56	120.24	133.03	0.00	58.87	58.84
Movement LOS	F	E	F	F	F	F	F	F	F		E	E
d_A, Approach Delay [s/veh]	88.61			126.48			122.14			58.86		
Approach LOS	F			F			F			E		
d_I, Intersection Delay [s/veh]	105.42											
Intersection LOS	F											
Intersection V/C	0.899											

Emissions

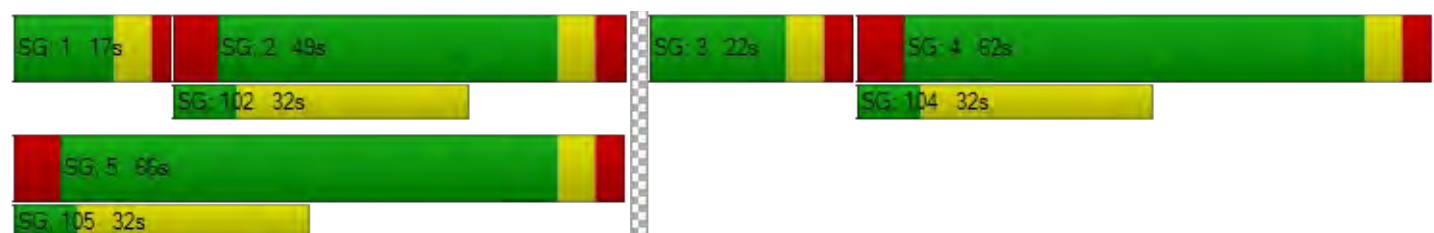
Vehicle Kilometers Traveled [km/h]	72.78	432.60	224.64	33.54	233.19	121.64	22.95	170.79	162.12	124.50	45.33
Stops [stops/h]	239.14	1025.77	577.25	230.70	1332.60	730.71	115.76	800.01	800.06	485.20	175.67
Fuel consumption [L/h]	33.91	120.05	68.41	28.40	153.40	85.94	12.77	91.61	97.78	47.26	17.18
CO [g/h]	626.12	2216.89	1263.21	524.50	2832.69	1586.94	235.80	1691.69	1805.66	872.71	317.28
NOx [g/h]	121.82	431.33	245.77	102.05	551.14	308.76	45.88	329.14	351.32	169.80	61.73
VOC [g/h]	145.11	513.79	292.76	121.56	656.50	367.79	54.65	392.07	418.48	202.26	73.53

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	6.01			6.72			9.77			9.62		
d_p, Pedestrian Delay [s]	64.40			64.40			64.40			64.40		
I_p,int, Pedestrian LOS Score for Intersectio	3.135			3.139			2.788			2.759		
Crosswalk LOS	C			C			C			C		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	667			667			720			493		
d_b, Bicycle Delay [s]	33.33			33.33			30.72			42.56		
I_b,int, Bicycle LOS Score for Intersection	2.461			2.573			2.717			2.185		
Bicycle LOS	B			B			B			B		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 17: Stony Plain Road and 149 Street

Control Type:	Signalized	Delay (sec / veh):	65.6
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.824

Intersection Setup												
Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
No. of Lanes in Entry Pocket	1	0	0	1	0	1	1	0	1	1	0	1
Entry Pocket Length [m]	90.00	30.48	30.48	65.00	30.48	75.00	50.00	30.48	15.00	110.00	30.48	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	60.00			60.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	45	1327	475	20	644	65	100	472	59	70	656	264
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	48	0	0	7	0	0	6	0	0	26
Total Hourly Volume [veh/h]	45	1327	475	20	644	65	100	472	59	70	656	264
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	11	332	119	5	161	16	25	118	15	18	164	66
Total Analysis Volume [veh/h]	45	1327	475	20	644	65	100	472	59	70	656	264
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			10			10			10		
v_di, Inbound Pedestrian Volume crossing m	10			10			10			10		
v_co, Outbound Pedestrian Volume crossing	10			10			10			10		
v_ci, Inbound Pedestrian Volume crossing mi	10			10			10			10		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	44.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	7	0	5	6	0	1	3	0	1	3	0
Auxiliary Signal Groups												
Maximum Green [s]	0	40	0	8	51	0	11	37	0	11	37	0
Amber [s]	0.0	4.0	0.0	3.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	30	0	0	30	0	0	30	0	0	30	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	5.0	0.0	1.0	5.0	0.0	5.0	5.0	0.0	5.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	52	0	8	60	0	14	46	0	14	46	0
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall		No		No	No		No	No		No	No	
Maximum Recall		Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall		Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	5.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	45	45	45	53	53	53	7	39	39	7	39	39
g / C, Green / Cycle	0.38	0.38	0.38	0.44	0.44	0.44	0.06	0.33	0.33	0.06	0.33	0.33
(v / s)_i Volume / Saturation Flow Rate	0.06	0.40	0.30	0.05	0.20	0.04	0.06	0.25	0.04	0.02	0.35	0.17
s, saturation flow rate [veh/h]	734	3279	1589	417	3279	1553	1640	1870	1589	3186	1870	1589
c, Capacity [veh/h]	223	1230	596	174	1448	686	96	608	517	186	608	517
d1, Uniform Delay [s]	38.70	37.50	33.43	27.92	23.27	19.50	56.50	36.57	28.39	54.40	40.50	32.78
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.03	49.84	10.62	1.34	0.99	0.27	104.75	9.42	0.45	5.74	59.79	3.58
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.20	1.08	0.80	0.12	0.44	0.09	1.05	0.78	0.11	0.38	1.08	0.51
d, Delay for Lane Group [s/veh]	40.73	87.34	44.04	29.27	24.27	19.78	161.25	45.98	28.84	60.14	100.29	36.37
Lane Group LOS	D	F	D	C	C	B	F	D	C	E	F	D
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.22	25.85	13.69	0.38	6.37	1.10	5.68	13.94	1.26	1.17	27.71	6.71
50th-Percentile Queue Length [m/ln]	9.26	196.95	104.35	2.87	48.53	8.35	43.25	106.25	9.63	8.89	211.16	51.12
95th-Percentile Queue Length [veh/ln]	2.19	36.03	19.76	0.68	10.51	1.97	9.71	20.07	2.27	2.10	38.24	10.96
95th-Percentile Queue Length [m/ln]	16.67	274.57	150.59	5.17	80.07	15.03	74.01	152.92	17.33	16.00	291.41	83.49

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	40.73	87.34	44.04	29.27	24.27	19.78	161.25	45.98	28.84	60.14	100.29	36.37
Movement LOS	D	F	D	C	C	B	F	D	C	E	F	D
d_A, Approach Delay [s/veh]	75.07			24.00			62.65			80.41		
Approach LOS	E			C			E			F		
d_I, Intersection Delay [s/veh]	65.59											
Intersection LOS	E											
Intersection V/C	0.824											

Emissions

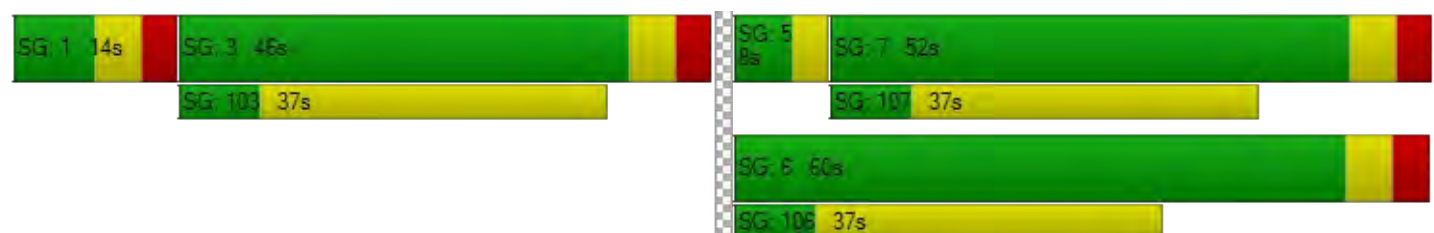
Vehicle Kilometers Traveled [km/h]	11.30	333.30	119.31	4.18	134.50	13.58	23.80	112.35	14.04	25.22	236.38	95.13
Stops [stops/h]	36.45	1550.82	410.81	11.30	382.12	32.87	170.27	418.31	37.90	69.98	831.35	201.27
Fuel consumption [L/h]	3.57	168.36	39.76	1.18	36.08	3.23	18.50	36.79	3.50	7.21	91.81	20.96
CO [g/h]	65.97	3108.82	734.22	21.77	666.24	59.70	341.68	679.38	64.58	133.18	1695.38	387.06
NOx [g/h]	12.83	604.86	142.85	4.24	129.63	11.61	66.48	132.18	12.56	25.91	329.86	75.31
VOC [g/h]	15.29	720.50	170.16	5.05	154.41	13.84	79.19	157.45	14.97	30.87	392.92	89.71

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			92.53			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	56.17			32.22			53.57			21.74		
d_p, Pedestrian Delay [s]	49.50			49.50			49.50			49.50		
I_p,int, Pedestrian LOS Score for Intersectio	2.969			2.972			2.530			2.692		
Crosswalk LOS	C			C			B			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	750			883			650			650		
d_b, Bicycle Delay [s]	23.44			18.70			27.34			27.34		
I_b,int, Bicycle LOS Score for Intersection	3.123			2.167			2.611			3.236		
Bicycle LOS	C			B			B			C		

Sequence

Ring 1	1	3	5	7	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 21: 95 Avenue and 156 Street

Control Type:	Signalized	Delay (sec / veh):	51.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.644

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [m]	75.00	30.48	30.48	75.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	227	494	134	53	203	92	65	342	45	68	293	31
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	13	0	0	9	0	0	5	0	0	3
Total Hourly Volume [veh/h]	227	494	134	53	203	92	65	342	45	68	293	31
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	57	124	34	13	51	23	16	86	11	17	73	8
Total Analysis Volume [veh/h]	227	494	134	53	203	92	65	342	45	68	293	31
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			20			20			20		
v_di, Inbound Pedestrian Volume crossing m	20			20			20			20		
v_co, Outbound Pedestrian Volume crossing	20			20			20			20		
v_ci, Inbound Pedestrian Volume crossing mi	20			20			20			20		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	40.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	2	3	0	1	5	0	7	9	0	7	9	0
Auxiliary Signal Groups												
Maximum Green [s]	22	42	0	12	32	0	7	31	0	7	31	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	30	0	0	30	0	0	30	0	0	30	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	3.0	0.0	1.0	3.0	0.0	1.0	3.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	26	56	0	12	42	0	8	44	0	8	44	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	3.00	3.00	0.00	3.00	0.00	3.00
g_i, Effective Green Time [s]	21	46	7	32	47	34	47	34
g / C, Green / Cycle	0.18	0.38	0.06	0.27	0.39	0.28	0.39	0.28
(v / s)_i Volume / Saturation Flow Rate	0.14	0.35	0.03	0.17	0.05	0.23	0.06	0.19
s, saturation flow rate [veh/h]	1640	1788	1640	1744	1192	1671	1147	1680
c, Capacity [veh/h]	287	685	96	465	374	473	321	476
d1, Uniform Delay [s]	47.40	35.17	54.98	38.84	25.00	40.11	26.17	38.18
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	19.61	19.07	21.13	6.46	1.01	14.48	1.50	7.66
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.79	0.92	0.55	0.63	0.17	0.82	0.21	0.68
d, Delay for Lane Group [s/veh]	67.01	54.23	76.11	45.30	26.01	54.59	27.67	45.84
Lane Group LOS	E	D	E	D	C	D	C	D
Critical Lane Group	No	Yes	Yes	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	8.04	20.69	2.12	8.47	1.28	12.46	1.36	9.43
50th-Percentile Queue Length [m/ln]	61.24	157.64	16.16	64.56	9.75	94.94	10.39	71.82
95th-Percentile Queue Length [veh/ln]	12.69	28.15	3.82	13.25	2.30	18.25	2.46	14.46
95th-Percentile Queue Length [m/ln]	96.67	214.49	29.08	100.94	17.54	139.05	18.71	110.19

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	67.01	54.23	54.23	76.11	45.30	45.30	26.01	54.59	54.59	27.67	45.84	45.84
Movement LOS	E	D	D	E	D	D	C	D	D	C	D	D
d_A, Approach Delay [s/veh]	57.63			49.99			50.48			42.69		
Approach LOS	E			D			D			D		
d_I, Intersection Delay [s/veh]	51.89											
Intersection LOS	D											
Intersection V/C	0.644											

Emissions

Vehicle Kilometers Traveled [km/h]	57.37	158.71	18.01	100.24	18.60	110.71	23.38	111.41
Stops [stops/h]	241.10	620.65	63.61	254.18	38.37	373.79	40.92	282.76
Fuel consumption [L/h]	22.58	55.26	6.25	25.53	3.93	35.19	4.59	28.38
CO [g/h]	417.00	1020.34	115.36	471.46	72.61	649.83	84.79	524.11
NOx [g/h]	81.13	198.52	22.45	91.73	14.13	126.43	16.50	101.97
VOC [g/h]	96.64	236.47	26.74	109.27	16.83	150.60	19.65	121.47

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	27.17	28.00	21.79	18.60
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
I_p,int, Pedestrian LOS Score for Intersectio	2.402	2.314	2.424	2.386
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	767	533	567	567
d_b, Bicycle Delay [s]	22.82	32.27	30.82	30.82
I_b,int, Bicycle LOS Score for Intersection	2.992	2.149	2.314	2.211
Bicycle LOS	C	B	B	B

Sequence

Ring 1	1	3	7	9	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 26: 109 Street and 87 Ave

Control Type:	Signalized	Delay (sec / veh):	110.1
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.991

Intersection Setup

Name	109 Street				109 Street				87 Ave			
Approach	Northbound				Southbound				Eastbound			
Lane Configuration												
Turning Movement	Left	Thru	Thru	Right	Left	Left	Thru	Right	Left	Left	Thru	Right
Lane Width [m]	3.20	3.66	3.20	4.00	3.66	3.66	3.60	4.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [m]	80.00	30.48	30.48	35.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	45.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00				50.00				50.00			
Grade [%]	0.00				0.00				0.00			
Curb Present	Yes				Yes				Yes			
Crosswalk	Yes				Yes				Yes			

Volumes

Name	109 Street				109 Street				87 Ave			
Base Volume Input [veh/h]	686	1562	0	10	0	0	833	450	359	0	1	232
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	1	0	0	0	45	0	0	0	23
Total Hourly Volume [veh/h]	686	1562	0	9	0	0	833	405	359	0	1	209
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	172	391	0	2	0	0	208	101	90	0	0	52
Total Analysis Volume [veh/h]	686	1562	0	9	0	0	833	405	359	0	1	209
Presence of On-Street Parking	No			No	No			No	No			No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	53				0				13			
v_di, Inbound Pedestrian Volume crossing th	52				0				14			
v_co, Outbound Pedestrian Volume along th	16				14				52			
v_ci, Inbound Pedestrian Volume along the l	16				13				53			
v_ab, Corner Pedestrian Volume [ped/h]	0				0				0			
Bicycle Volume [bicycles/h]	25				6				5			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	200
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	85.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Overlap	Overlap	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	1	0	3	0	0	1	0	0	0	3	2
Auxiliary Signal Groups	1,2	1,2		1,3								
Maximum Green [s]	30	59	0	26	0	0	59	0	0	0	26	30
Amber [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
All red [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
Walk [s]	0	8	0	7	0	0	8	0	0	0	7	0
Pedestrian Clearance [s]	0	16	0	19	0	0	16	0	0	0	19	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk												
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	61	84	0	25	0	0	84	0	0	0	25	61
Lead / Lag	Lag	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	24	0	7	0	0	24	0	0	0	7	5
Vehicle Extension [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Minimum Recall	No	Yes		No			Yes				No	
Maximum Recall	Yes	No		No			No				No	
Pedestrian Recall	No	No		Yes			No				Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	200	200	200	200	200	200	200	200
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	140	140	134	79	79	20	20	20
g / C, Green / Cycle	0.70	0.70	0.67	0.40	0.40	0.10	0.10	0.10
(v / s)_i Volume / Saturation Flow Rate	0.73	0.49	0.01	0.37	0.40	0.13	0.19	0.15
s, saturation flow rate [veh/h]	943	3204	1436	1683	1541	1210	1082	1397
c, Capacity [veh/h]	534	2247	963	667	610	145	144	140
d1, Uniform Delay [s]	64.91	17.43	10.96	57.69	60.39	93.24	93.24	89.77
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.41	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	142.07	1.80	0.02	21.17	39.98	86.40	226.52	256.76
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.29	0.70	0.01	0.93	1.01	1.07	1.42	1.50
d, Delay for Lane Group [s/veh]	206.98	19.24	10.97	78.86	100.37	179.64	319.76	346.53
Lane Group LOS	F	B	B	E	F	F	F	F
Critical Lane Group	Yes	No	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	32.00	21.38	0.14	33.89	37.72	11.11	16.65	17.26
50th-Percentile Queue Length [m/ln]	243.83	162.95	1.10	258.24	287.40	84.62	126.88	131.50
95th-Percentile Queue Length [veh/ln]	49.64	28.97	0.26	43.44	48.31	17.01	26.36	27.50
95th-Percentile Queue Length [m/ln]	378.23	220.74	1.98	330.99	368.12	129.63	200.83	209.54

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	206.98	19.24	0.00	10.97	0.00	0.00	84.39	100.37	259.37	0.00	319.76	346.53
Movement LOS	F	B		B			F	F	F		F	F
d_A, Approach Delay [s/veh]	76.27				89.62				291.50			
Approach LOS	E				F				F			
d_I, Intersection Delay [s/veh]	110.14											
Intersection LOS	F											
Intersection V/C	0.991											

Emissions

Vehicle Kilometers Traveled [km/h]	72.47	165.02	0.95	64.09	64.09	30.52	40.52	41.25
Stops [stops/h]	575.99	769.83	2.59	610.01	678.91	199.90	299.72	310.62
Fuel consumption [L/h]	129.17	56.12	0.22	57.38	69.18	28.79	61.14	66.67
CO [g/h]	2385.15	1036.23	4.15	1059.54	1277.42	531.56	1129.07	1231.10
NOx [g/h]	464.06	201.61	0.81	206.15	248.54	103.42	219.68	239.53
VOC [g/h]	552.78	240.16	0.96	245.56	296.05	123.19	261.67	285.32

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	18.16	210.96	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	2.98	0.00	0.00
d_p, Pedestrian Delay [s]	89.30	89.30	89.30
I_p,int, Pedestrian LOS Score for Intersectio	3.083	2.464	2.701
Crosswalk LOS	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1400	790	200
d_b, Bicycle Delay [s]	9.11	36.71	81.20
I_b,int, Bicycle LOS Score for Intersection	3.422	2.618	2.536
Bicycle LOS	C	B	B

Intersection Setup

Name	87 Ave							
Approach	Westbound				Southwestbound			
Lane Configuration								
Turning Movement	Left	Thru	Right	Right	Left	Thru	Right	Right
Lane Width [m]	3.50	3.66	3.50	3.66	3.66	3.66	3.66	3.66
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0
Entry Pocket Length [m]	30.48	30.48	30.48	10.00	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	30.00				50.00			
Grade [%]	0.00				0.00			
Curb Present	Yes							
Crosswalk	Yes				Yes			

Volumes

Name	87 Ave							
Base Volume Input [veh/h]	20	0	0	65	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00							
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	7	0	0	0	0
Total Hourly Volume [veh/h]	20	0	0	58	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	0	0	15	0	0	0	0
Total Analysis Volume [veh/h]	20	0	0	58	0	0	0	0
Presence of On-Street Parking	No			No				
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	16				0			
v_di, Inbound Pedestrian Volume crossing th	16				0			
v_co, Outbound Pedestrian Volume along th	0				0			
v_ci, Inbound Pedestrian Volume along the l	0				0			
v_ab, Corner Pedestrian Volume [ped/h]	0				0			
Bicycle Volume [bicycles/h]	0				0			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	200
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	85.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	3	0	0	0	0	0	0	0
Auxiliary Signal Groups								
Maximum Green [s]	26	0	0	0	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All red [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk [s]	7	0	0	0	0	0	0	0
Pedestrian Clearance [s]	19	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk								
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	25	0	0	0	0	0	0	0
Lead / Lag	Lag	-	-	-	-	-	-	-
Minimum Green [s]	7	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	No							
Maximum Recall	No							
Pedestrian Recall	Yes							

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	R	
C, Calculated Cycle Length [s]	200	200	
L, Total Lost Time per Cycle [s]	5.00	5.00	
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	
l2, Clearance Lost Time [s]	3.00	3.00	
g_i, Effective Green Time [s]	20	20	
g / C, Green / Cycle	0.10	0.10	
(v / s)_i Volume / Saturation Flow Rate	0.02	0.04	
s, saturation flow rate [veh/h]	1054	1431	
c, Capacity [veh/h]	36	143	
d1, Uniform Delay [s]	100.00	84.42	
k, delay calibration	0.11	0.11	
l, Upstream Filtering Factor	1.00	1.00	
d2, Incremental Delay [s]	12.70	1.84	
d3, Initial Queue Delay [s]	0.00	0.00	
Rp, platoon ratio	1.00	1.00	
PF, progression factor	1.00	1.00	

Lane Group Results

X, volume / capacity	0.56	0.41	
d, Delay for Lane Group [s/veh]	112.70	86.26	
Lane Group LOS	F	F	
Critical Lane Group	No	No	
50th-Percentile Queue Length [veh/ln]	1.19	2.95	
50th-Percentile Queue Length [m/ln]	9.07	22.50	
95th-Percentile Queue Length [veh/ln]	2.14	5.31	
95th-Percentile Queue Length [m/ln]	16.33	40.49	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	112.70	0.00	0.00	86.26	0.00	0.00	0.00	0.00
Movement LOS	F			F				
d_A, Approach Delay [s/veh]	93.04				0.00			
Approach LOS	F				A			
d_I, Intersection Delay [s/veh]	110.14							
Intersection LOS	F							
Intersection V/C	0.991							

Emissions

Vehicle Kilometers Traveled [km/h]	0.73	2.11	
Stops [stops/h]	21.43	53.14	
Fuel consumption [L/h]	2.00	4.53	
CO [g/h]	36.86	83.73	
NOx [g/h]	7.17	16.29	
VOC [g/h]	8.54	19.41	

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	19.20	0.00
d_p, Pedestrian Delay [s]	89.30	89.30
I_p,int, Pedestrian LOS Score for Intersectio	2.007	3.302
Crosswalk LOS	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	200	0
d_b, Bicycle Delay [s]	81.00	100.00
I_b,int, Bicycle LOS Score for Intersection	1.560	4.132
Bicycle LOS	A	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 29: 114 Street and 82 Ave

Control Type: Signalized
Analysis Method: HCM 7th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 48.4
Level Of Service: D
Volume to Capacity (v/c): 0.778

Intersection Setup

Name	114 Street			114 Street			University Ave			82 Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	T T T			T T			T T T			T T T		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.70	3.60	3.66	3.60	3.60	4.00	3.60	3.60	3.66	3.66	3.66
No. of Lanes in Entry Pocket	2	0	1	0	0	1	1	0	1	2	0	0
Entry Pocket Length [m]	170.00	30.48	2.00	30.48	30.48	105.00	95.00	30.48	95.00	100.00	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	114 Street			114 Street			University Ave			82 Ave		
Base Volume Input [veh/h]	870	1228	253	0	294	62	46	347	566	153	423	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	25	0	0	6	0	0	0	0	0	2
Total Hourly Volume [veh/h]	870	1228	228	0	294	62	46	347	566	153	423	18
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	218	307	57	0	74	16	12	87	142	38	106	5
Total Analysis Volume [veh/h]	870	1228	228	0	294	62	46	347	566	153	423	18
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			2			2			2		
v_di, Inbound Pedestrian Volume crossing m	2			2			2			2		
v_co, Outbound Pedestrian Volume crossing	18			0			0			18		
v_ci, Inbound Pedestrian Volume crossing mi	18			0			0			18		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	190
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Overlap	Permiss	Permiss	Permiss	Overlap	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss
Signal Group	2	1	0	0	1	2	3	6	2	5	4	0
Auxiliary Signal Groups		1,2				1,2			2,6			
Maximum Green [s]	60	33	0	0	33	60	15	38	60	16	38	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
All red [s]	3.0	3.0	0.0	0.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0	0.0
Walk [s]	0	9	0	0	9	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	24	0	0	24	0	0	22	0	0	22	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.0	4.0	0.0	0.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0	0.0
Detector Location [m]	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	0.0
Detector Length [m]	5.0	5.0	0.0	0.0	5.0	5.0	5.0	0.0	0.0	5.0	5.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	70	33	0	0	33	70	46	36	70	51	41	0
Lead / Lag	Lag	-	-	-	-	-	Lead	-	-	Lag	-	-
Minimum Green [s]	10	27	0	0	27	10	7	29	10	7	29	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
Minimum Recall	No	Yes			Yes	No	No	No	No	No	No	
Maximum Recall	No	No			No	No	No	Yes	No	No	Yes	
Pedestrian Recall	No	No			No	No	No	No	No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	C	R	L	C	R	L	C	C
C, Calculated Cycle Length [s]	167	167	167	167	167	167	167	167	167	167	167
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	0.00	4.00	4.00	0.00	5.00	5.00	0.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	60	99	33	33	99	6	38	104	10	42	42
g / C, Green / Cycle	0.36	0.59	0.20	0.20	0.59	0.04	0.23	0.62	0.06	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.37	0.38	0.16	0.09	0.05	0.03	0.12	0.24	0.05	0.14	0.14
s, saturation flow rate [veh/h]	2342	3204	1431	3204	1318	1535	2951	2329	3113	1550	1527
c, Capacity [veh/h]	855	1895	282	632	779	58	670	1447	193	390	384
d1, Uniform Delay [s]	56.13	22.65	64.18	59.40	14.66	79.88	56.67	15.85	77.43	54.75	54.77
k, delay calibration	0.11	0.40	0.28	0.11	0.11	0.11	0.50	0.11	0.11	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	18.77	1.37	13.15	0.53	0.04	20.96	2.85	0.17	7.11	5.93	6.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.02	0.65	0.81	0.47	0.08	0.79	0.52	0.39	0.79	0.57	0.57
d, Delay for Lane Group [s/veh]	74.90	24.02	77.33	59.93	14.71	100.84	59.52	16.02	84.54	60.68	60.83
Lane Group LOS	F	C	E	E	B	F	E	B	F	E	E
Critical Lane Group	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	20.71	16.34	10.36	5.61	1.05	2.32	6.75	5.52	3.46	8.89	8.80
50th-Percentile Queue Length [m/ln]	157.80	124.53	78.92	42.77	8.03	17.68	51.46	42.02	26.39	67.74	67.04
95th-Percentile Queue Length [veh/ln]	28.51	22.97	15.64	9.50	1.90	4.18	11.02	9.37	6.23	13.78	13.66
95th-Percentile Queue Length [m/ln]	217.23	175.05	119.14	72.37	14.45	31.83	83.93	71.37	47.51	105.01	104.10

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	74.90	24.02	77.33	0.00	59.93	14.71	100.84	59.52	16.02	84.54	60.75	60.83
Movement LOS	F	C	E		E	B	F	E	B	F	E	E
d_A, Approach Delay [s/veh]	48.28			52.06			35.83			66.88		
Approach LOS	D			D			D			E		
d_I, Intersection Delay [s/veh]	48.39											
Intersection LOS	D											
Intersection V/C	0.778											

Emissions

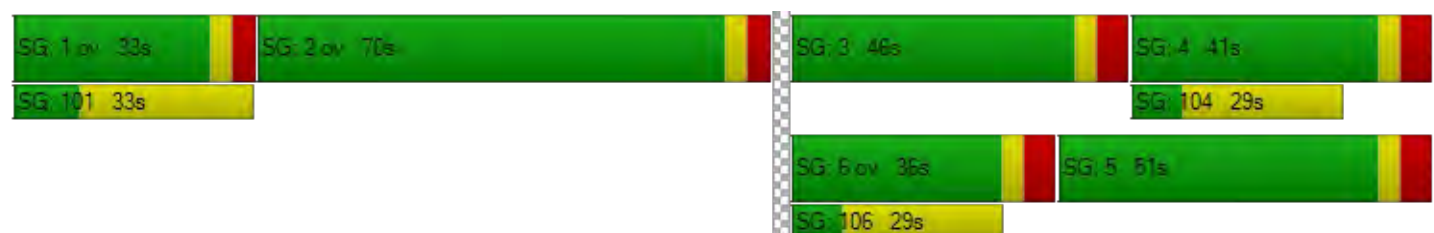
Vehicle Kilometers Traveled [km/h]	246.27	347.60	64.54	67.96	14.33	15.12	114.09	186.10	25.38	36.81	36.36
Stops [stops/h]	890.97	703.13	222.80	241.47	22.67	49.92	290.54	237.27	149.01	191.25	189.24
Fuel consumption [L/h]	93.61	71.57	24.72	25.45	2.57	6.13	33.28	30.02	15.72	18.16	17.97
CO [g/h]	1728.50	1321.60	456.43	470.02	47.54	113.22	614.55	554.25	290.28	335.34	331.85
NOx [g/h]	336.30	257.14	88.81	91.45	9.25	22.03	119.57	107.84	56.48	65.25	64.57
VOC [g/h]	400.60	306.29	105.78	108.93	11.02	26.24	142.43	128.45	67.27	77.72	76.91

Other Modes

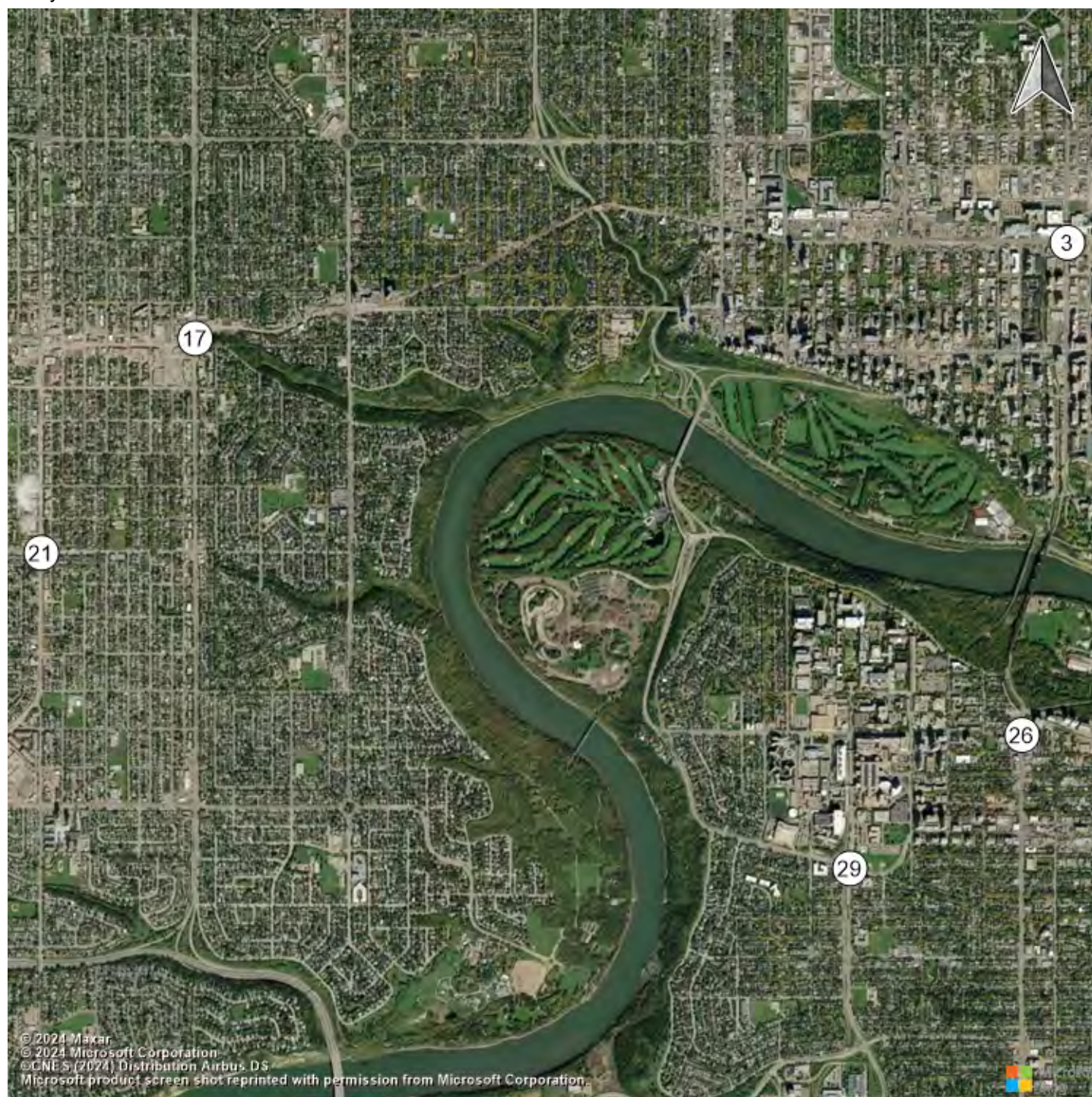
g_Walk,mi, Effective Walk Time [s]	11.0			11.0			13.0			13.0		
M_corner, Corner Circulation Area [m²/ped]	19.71			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	0.00			220.01			0.00			16.61		
d_p, Pedestrian Delay [s]	73.04			73.04			71.18			71.18		
I_p,int, Pedestrian LOS Score for Intersectio	3.014			2.672			4.194			2.685		
Crosswalk LOS	C			B			D			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1159			323			347			406		
d_b, Bicycle Delay [s]	14.79			58.85			57.19			53.13		
I_b,int, Bicycle LOS Score for Intersection	3.499			1.858			2.351			2.051		
Bicycle LOS	C			A			B			B		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	5	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



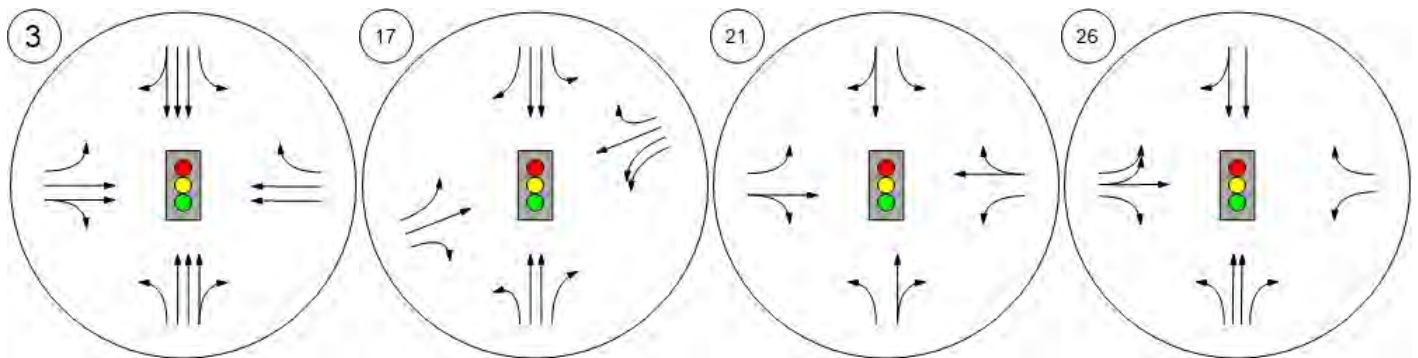
Study Intersections



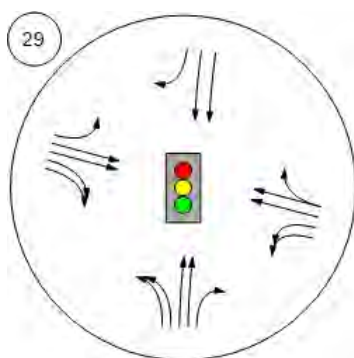
Lane Configuration and Traffic Control



104 Avenue and 109 Street Stony Plain Road and 149 Str 95 Avenue and 156 Street 109 Street and 87 Ave



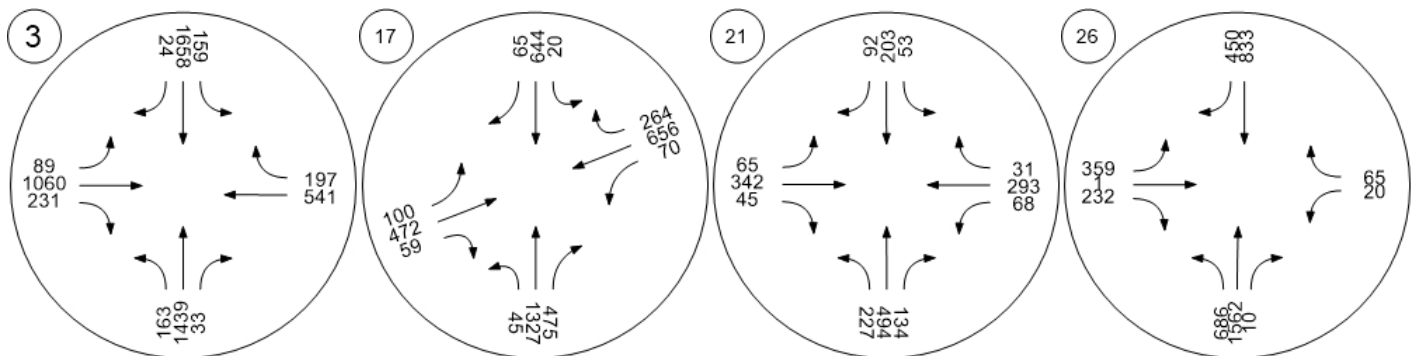
114 Street and 82 Ave



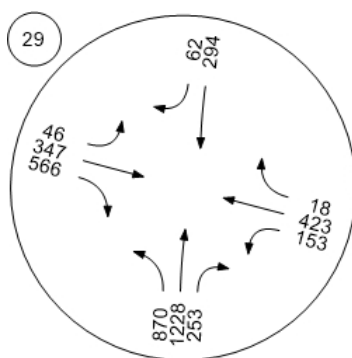
Traffic Volume - Base Volume



104 Avenue and 109 Street Stony Plain Road and 149 Str 95 Avenue and 156 Street 109 Street and 87 Ave



114 Street and 82 Ave



Traffic Conditions



104 Avenue and 109 Street Stony Plain Road and 149 Str 95 Avenue and 156 Street 109 Street and 87 Ave

