



# Implementation Plan

Traffic Engineering Services:  
Lee Rd/Van Aken Blvd  
Traffic Operational &  
Safety Study

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June 21, 2018

## PREPARED FOR

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*Synchro analysis files and simulation videos available electronically.*

## 1. INTRODUCTION

The City of Shaker Heights retained HNTB to evaluate measures to improve traffic operations and safety at the Lee Road/Van Aken Boulevard intersection. The Lee/Van Aken intersection is one of the highest crash locations in both the city and the NOACA region. In addition to a well-established crash history, there are also numerous “near-miss” incidents. This implementation plan recommends a set of countermeasures to improve traffic operations and safety at this location.

## 2. BACKGROUND

The City has taken several measures to address crashes at the Lee/Van Aken intersection, including:

- Utilizing optically programmed signal heads with louvers;
- Installing “Traffic Must Stop After Left Turn” signs on the Van Aken approaches;
- Mounting supplemental LED Stop Signs next to the left turn signals on the interior Lee approaches; and
- Placing bollards to protect local businesses and pedestrians.

The Ohio Department of Transportation’s (ODOT’s) Statewide GIS crash analysis tool (GCAT) was used to review the most recent three years of crash data. Between the years 2014 and 2016, there were 36 total crashes at the Lee/Van Aken intersection. The number of crashes steadily increased over the three-year period, with one crash in 2014, 13 crashes in 2015, 22 crashes in 2016. A detailed review of the crash reports indicated that 20 crashes (56%) occurred when vehicles turning from the Van Aken one-way pair fail to stop at the light immediately downstream. Furthermore, 19 crashes (53%) resulted in an injury. A summary of the crash data is included in Appendix A.

## 3. METHODOLOGY

TMS Engineers, Inc. collected 9-hour turning movement counts (including trucks, buses, pedestrians and bicycles) at the following intersections:

- Lee/Van Aken Westbound (July, 2018)
- Lee/Van Aken Eastbound (July, 2018)
- Lee/Library/Heinen’s drives (December, 2018)
- Lee/Chagrin/Kenyon (December, 2018)
- Lee/Lomond (December, 2018)

The 9-hour count data was adjusted for daily and seasonal variations to estimate the average daily traffic (ADT) at each location (see Appendix B). The traffic counts were analyzed to determine three peak travel periods for the Lee Road corridor, which are:

- AM Peak Hour – 7:30am to 8:30am

- Midday Peak Hour – 12:30pm to 1:30pm
- PM Peak Hour – 5:00pm to 6:00pm

The traffic volumes for the peak travel periods were adjusted to account for variations inherent in collecting data during different days and months and to balance the number of vehicles traveling between intersections. In general, the traffic volumes at the Lee/Van Aken intersections were found to be the highest. The remaining intersections in the corridor were adjusted upward to match these volumes to reflect the worst-case traffic operational conditions in the corridor. The peak hour volumes for the corridor are shown in Appendix C. Existing timing plans and record signal plans were also utilized to accurately model traffic operations along the Lee Road corridor.

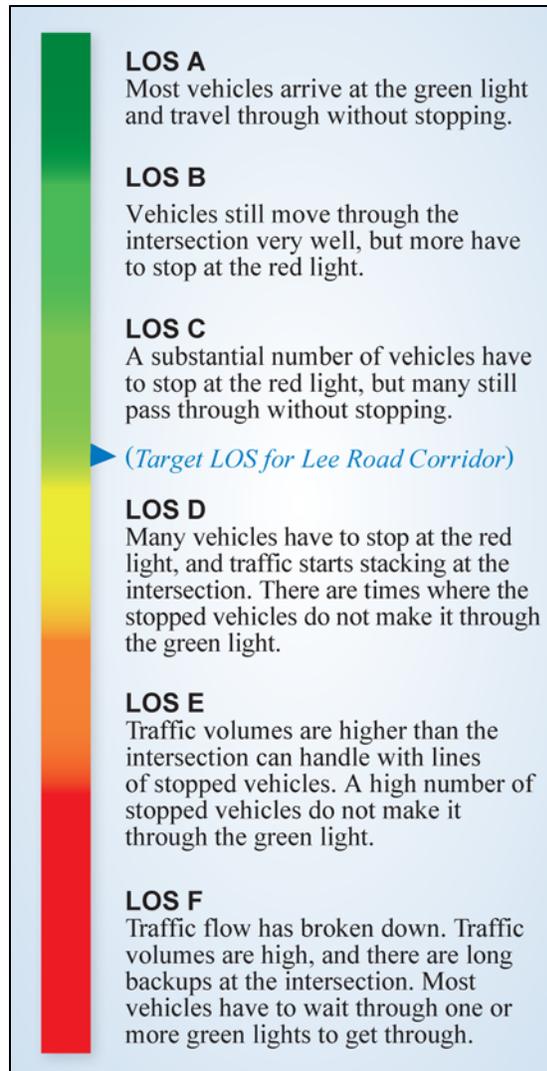
Level of Service (LOS) describes the quality of traffic flow. It is graded on a letter scale from A (best) to F (worst). LOS A represents near ideal traffic flow, while LOS F represents a breakdown of the traffic flow (see Figure 1). The target level of service for urban areas like Shaker Heights is LOS D.

A series of countermeasures were evaluated to address the crash history at the Lee/Van Aken intersection. The evaluation criteria included:

- Minimizing the number of stops required on Lee Road between the one-way Van Aken roadways to reduce the number of crashes resulting from running red lights;
- Providing a target LOS D or better for both the overall Lee/Van Aken intersection and the individual movements; and
- Minimizing back-ups (queues) on the intersection approaches to reduce the potential for rear end crashes.

The levels of service for potential countermeasures were determined using Synchro traffic analysis software. SimTraffic – a traffic simulation tool – was used to evaluate traffic queues in the corridor. The countermeasures were developed for the Lee/Van Aken intersection only. However, revising the phasing at this intersection required changes to the overall signal cycle length, which would affect progression along the Lee Road corridor. Therefore, the signal timing at the remaining intersections was optimized using the new cycle lengths to verify that potential countermeasures would not adversely affect operations at other intersections along the corridor. The existing phasing was maintained at the Lee Road intersections with the

Figure 1: Levels of Service



Library/Heinen's drives, Chagrin/Kenyon, and Lomond. However, the pedestrian clearance intervals were updated to meet current standards, as the existing "flashing don't walk" times are insufficient throughout the corridor.

## 4. RECOMMENDATIONS

The recommended countermeasures at the Lee/Van Aken intersection are summarized below:

1. Revise the signal timing and phasing to maintain a green light for vehicles entering the internal Lee Road approaches from all directions.
2. Remove the internal crosswalks on Lee Road to avoid pedestrian conflicts.
  - Remove crosswalk pavement markings.
  - Remove pedestrian signals.
  - Remove pedestrian pushbuttons and signs.
  - Rebuild the curbs to remove the curb ramps. If necessary, plastic delineators could be installed along the curb lines to prevent pedestrian movements across the removed crosswalks on a short-term basis until the curbs can be rebuilt.
3. Re-mask the Lee Road signal heads to provide visibility to the upstream crosswalks.
4. Remove the louvers from the signal heads to increase the intensity of the light visible to approaching vehicles.
5. Restrict Chalfant Road to right-in/right-out access to avoid conflicts.
  - Remove the near side vehicular signal heads and support on the westbound Van Aken approach.
  - Remove pedestrian signals, supports, pushbuttons and signs for the crosswalk on Chalfant Road.
  - Move the stop bar on westbound Van Aken to include Chalfant Road movements.
  - Extend the painted island to stripe out movements entering Chalfant from the south and west.
  - Cut new detector loops for the westbound Van Aken vehicles and tie them into existing pull box.
6. Update the traffic control signs in the Lee/Van Aken intersection area.
  - Remove the LED STOP displays from Lee Road mast arms.
  - Remove the "Traffic Must Stop After Left Turn" signs from the Van Aken mast arms and the Van Aken intersection approaches.
  - Install a "Signal Operation Changed" sign on all external intersection approaches for a minimum of fourteen days and a maximum of thirty days.
  - Install a "Signal Operation Changed" sign on all mast arms adjacent to the signal heads for a minimum of fourteen days and a maximum of thirty days.
  - Install "One Way" signs on the Lee Road mast arms.

- Install a “No Right Turn” sign on Lee Road at the westbound Van Aken intersection to notify drivers of the changed access at Chalfant Road. The sign may be installed on the same post as the “Do Not Enter” sign described below.
  - Move the “Do Not Enter” sign on westbound Van Aken closer to the intersection. Install a second “Do Not Enter” sign on the north side of the road.
  - Remove the “Stop Here On Red” sign from the westbound Van Aken approach.
  - Add “No Pedestrian Crossing” and “Use Crosswalk” signs to the internal intersection curbs.
7. Update the signal timing plans at the remaining intersections along Lee Road to provide adequate pedestrian clearance intervals and to accommodate the new cycle lengths at the Lee/Van Aken intersection.

A conceptual drawing of the recommended countermeasures is provided in Figure 2. A conceptual signing plan is provided in Figure 3. Signal and sign details are provided in Appendix D.

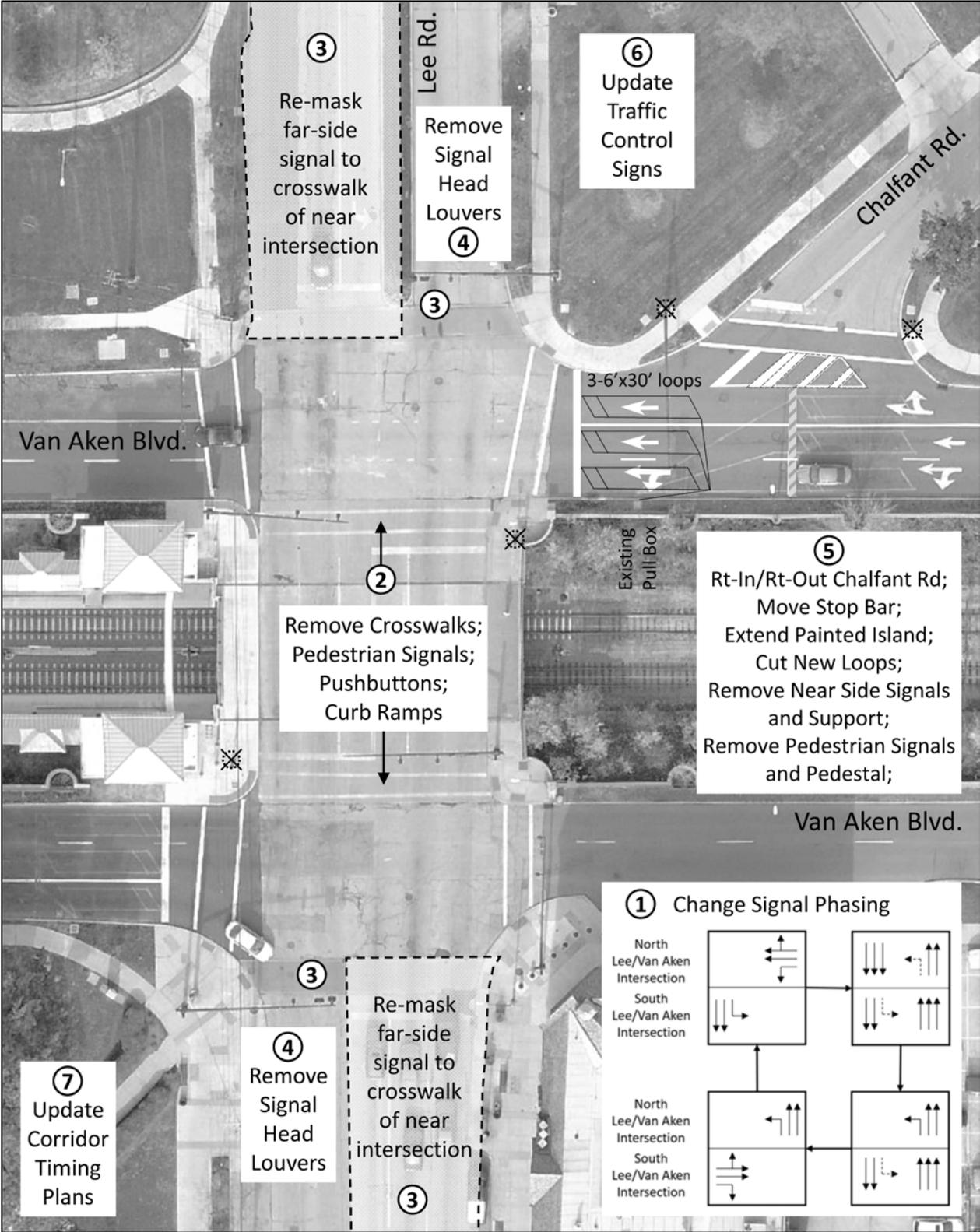
The countermeasures listed above are expected to improve safety at the Lee/Van Aken intersection. The revised phasing will allow vehicles to pass through both intersections without stopping, substantially reducing the potential for crashes due to running a red light. Traffic queues throughout the corridor will also be minimized, reducing the potential for rear end crashes. The revised timing plans will provide LOS C or better at the intersections along Lee Road, and most of the movements will operate at LOS D or better. The only exception is the eastbound through movement at the Lee/Chagrin/Kenyon intersection, which will operate at LOS E in the PM peak hour. However, this movement also operates at LOS E under the existing conditions. The proposed levels of service are shown in Figure 4, Figure 5 and Figure 6. Results of the Synchro analyses are included in Appendix E.

## 5. ESTIMATED COSTS

The cost to implement the recommended countermeasures is estimated at \$74,250. This estimate is based on the scope of work; quantities measured from aerial mapping; unit costs derived from ODOT’s historic contract bid tabulations and the bid tabulation for the city’s recent Farnsleigh Road improvements; and HNTB’s recent project experience. The cost estimate includes sidewalk and curb ramp removal and replacement, erosion control, signing, pavement markings, signalization, maintenance of traffic, mobilization and miscellaneous items.

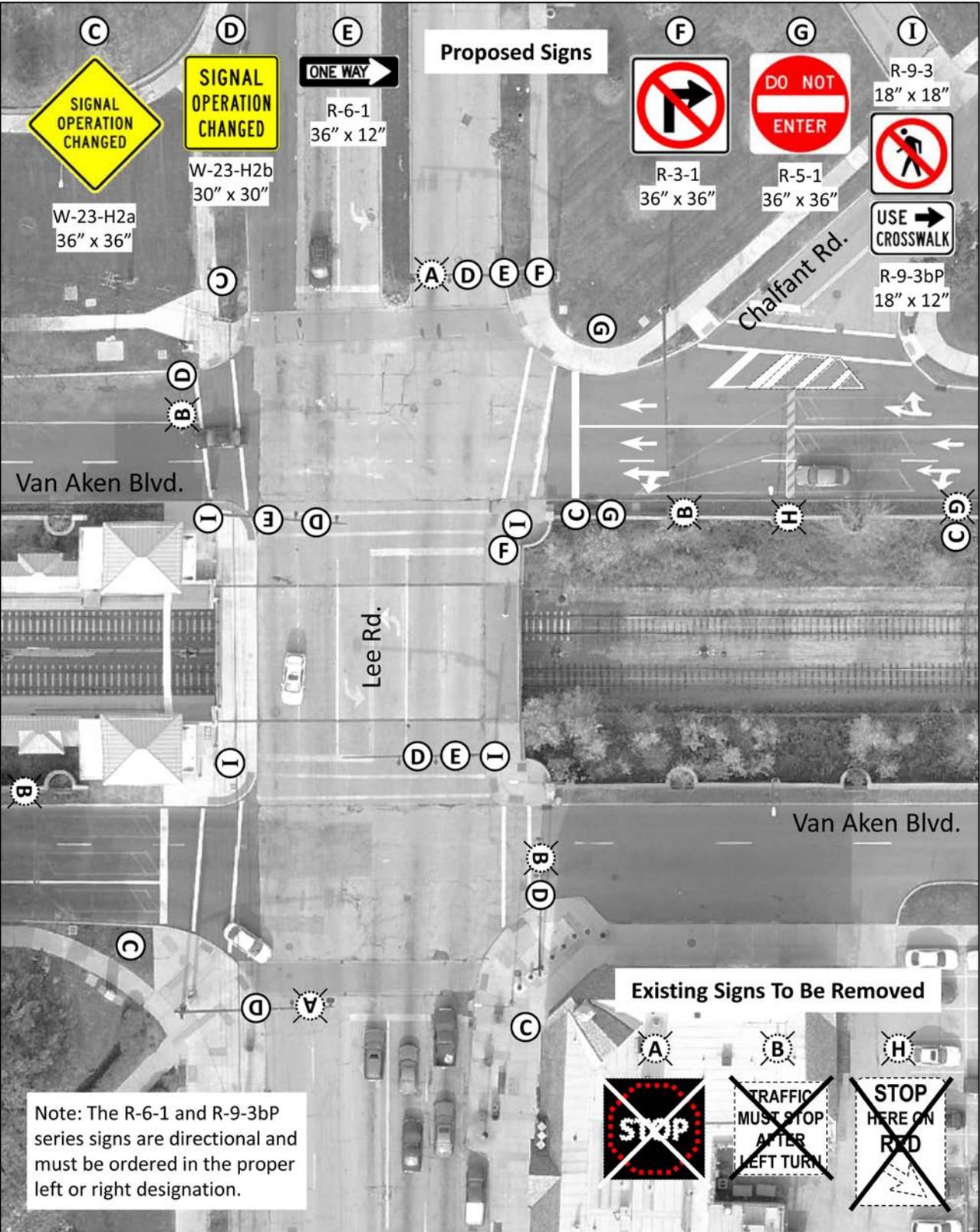
HNTB’s estimate accounts for several factors that elevate the project costs. The scope of work is relatively small, which limits the economies of scale that can be present on larger projects. Some equipment will only be needed for a short duration (i.e., to remove a signal support), but the mobilization costs will be the same. In addition, the work will likely require a team of different contractors (i.e., one to complete the traffic control items, one to construct the sidewalk and curbs, and one to set up and maintain lane closures), which increases costs. Finally, staging the construction in a small project area with high traffic volumes could also increase costs. The goal of incorporating these issues was to provide the city with a conservative cost estimate to aid in the planning, budgeting, and programming of the recommended countermeasures. The detailed cost estimate is included in Appendix F.

Figure 2: Recommended Countermeasures Schematic Plan



IMPLEMENTATION PLAN

Figure 3: Recommended Countermeasures Conceptual Signing Plan



IMPLEMENTATION PLAN

Figure 4: Proposed AM Peak Hour Levels of Service

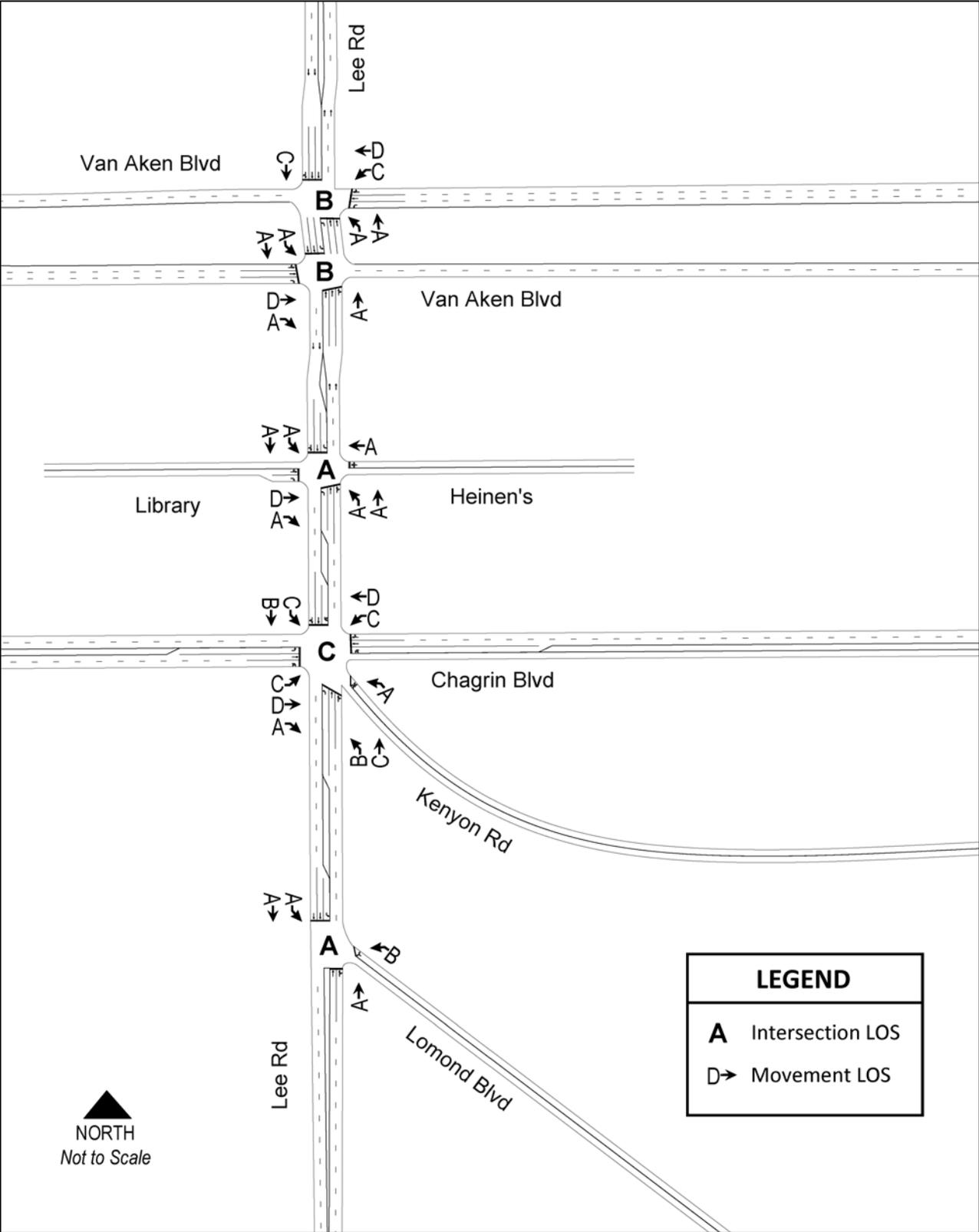
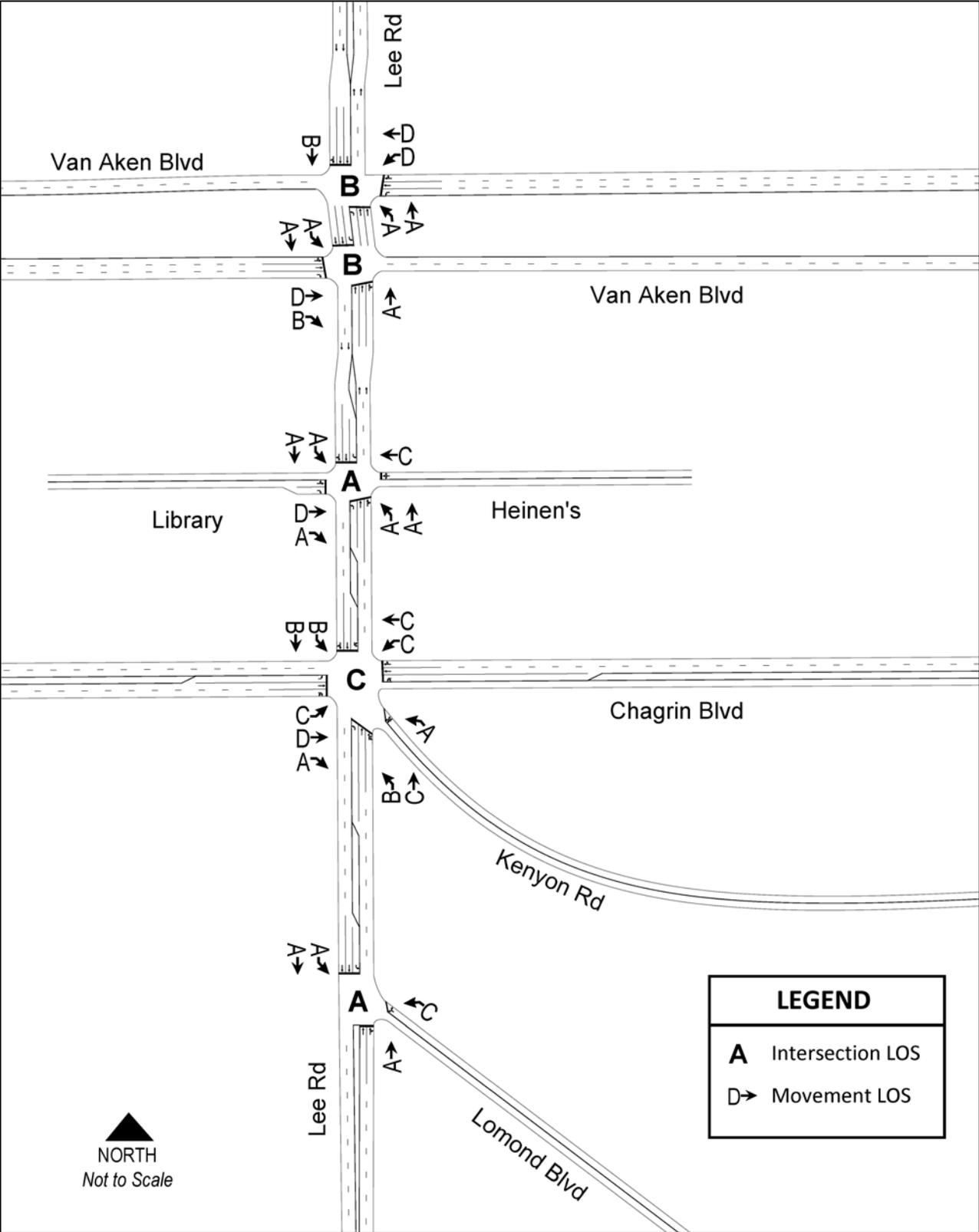


Figure 5: Proposed Midday Peak Hour Levels of Service





## **APPENDIX A: CRASH DATA**

Lee-Van Aken Intersection Crashes (2014-2016)

	Number
<b>Total</b>	<b>36</b>

CRASH_SEVERITY	Number	%
Injury Crash	19	52.8%
Property Damage Crash	17	47.2%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

TRAFFIC_CRASH_YEAR	Number	%
2014	1	2.8%
2015	13	36.1%
2016	22	61.1%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

DAY_OF_WEEK	Number	%
Thursday	8	22.2%
Tuesday	7	19.4%
Wednesday	6	16.7%
Sunday	5	13.9%
Saturday	5	13.9%
Monday	4	11.1%
Friday	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

HOOR_OF_DAY	Number	%
01	1	2.8%
03	1	2.8%
05	1	2.8%
06	1	2.8%
07	1	2.8%
08	2	5.6%
10	4	11.1%
11	4	11.1%
13	2	5.6%
14	2	5.6%
15	5	13.9%
16	1	2.8%
17	4	11.1%
18	1	2.8%
19	2	5.6%
20	2	5.6%
22	2	5.6%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

TYPE_OF_CRASH	Number	%
Angle	17	47.2%
Rear End	8	22.2%
Sideswipe - Passing	5	13.9%
Left Turn	3	8.3%
Head On	1	2.8%
Backing	1	2.8%
Sideswipe - Meeting	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

Lee-Van Aken Intersection Crashes (2014-2016)

WEATHER_CONDITION	Number	%
Clear	20	55.6%
Cloudy	11	30.6%
Rain	3	8.3%
Other/Unknown	1	2.8%
Snow	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

ROAD_CONDITION	Number	%
Dry	26	72.2%
Wet	9	25.0%
Snow	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

LIGHT_CONDITION	Number	%
Daylight	24	66.7%
Dark - Lighted Roadway	11	30.6%
Dawn	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

NUMBER_OF_VEHICLES	Number	%
	2	36
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

LOCATION	Number	%
Four-Way Intersection	31	86.1%
Not An Intersection	5	13.9%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

CRASH_MONTH_NBR	Number	%
1	4	11.1%
2	5	13.9%
3	2	5.6%
4	2	5.6%
5	3	8.3%
6	2	5.6%
7	1	2.8%
8	1	2.8%
9	4	11.1%
10	4	11.1%
11	5	13.9%
12	3	8.3%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

ROAD_CONTOUR	Number	%
Straight Level	36	100.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

SPECIAL_AREA	Number	%
(blank)	36	100.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

ANIMAL_TYPE	Number	%
(blank)	36	100.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

Lee-Van Aken Intersection Crashes (2014-2016)

<b>ACTION1</b>	<b>Number</b>	<b>%</b>
Straight Ahead	25	69.4%
Making Left Turn	4	11.1%
Changing Lanes	3	8.3%
Slowing Or Stopped In Traffic	2	5.6%
Backing	1	2.8%
Overtaking/Passing	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

<b>CONTRIBUTING_FACTOR1</b>	<b>Number</b>	<b>%</b>
Ran Red Light	16	44.4%
Followed To Closely/ACDA	9	25.0%
Improper Lane Change/Passing/Offroad	4	11.1%
Ran Stop Sign	1	2.8%
Failure To Obey Signs/Signals/Officer	1	2.8%
Left Of Center	1	2.8%
Failure To Control	1	2.8%
Failure To Yield	1	2.8%
Improper Backing	1	2.8%
Load Shifting/Falling/Spilling	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

	<b>Number</b>	<b>%</b>
<b>Total</b>	<b>36</b>	<b>100.0%</b>

<b>TRAFFIC_CONTROL1</b>	<b>Number</b>	<b>%</b>
Traffic Signal	33	91.7%
Construction Barricade	1	2.8%
No Controls	1	2.8%
Pavement Markings	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

<b>DRIVER_ALCOHOL1</b>	<b>Number</b>	<b>%</b>
No	35	97.2%
Yes	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

<b>DRIVER_DRUGS1</b>	<b>Number</b>	<b>%</b>
No	36	100.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

Lee-Van Aken Intersection Crashes (2014-2016)

DIRECTION_FROM1	Number	%
North	19	52.8%
South	11	30.6%
West	4	11.1%
East	2	5.6%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

DIRECTION_TO1	Number	%
South	17	47.2%
North	9	25.0%
Unknown	5	13.9%
East	3	8.3%
West	1	2.8%
Southeast	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

POSTED_SPEED1	Number	%
25	24	66.7%
35	11	30.6%
5	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

ESTIMATED_SPEED1	Number	%
5	10	27.8%
10	8	22.2%
25	5	13.9%
15	4	11.1%
20	3	8.3%
8	2	5.6%
1	1	2.8%
30	1	2.8%
35	1	2.8%
2	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

VEHICLE_TYPE1	Number	%
Mid Size	13	36.1%
Sport Utility Vehicle	9	25.0%
Full Size	6	16.7%
Compact	5	13.9%
Minivan	2	5.6%
Pickup	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

VEHICLE_TYPE2	Number	%
Mid Size	14	38.9%
Sport Utility Vehicle	7	19.4%
Compact	4	11.1%
Full Size	4	11.1%
Minivan	2	5.6%
Single Unit Truck; 3+ Axles	1	2.8%
Van	1	2.8%
Sub-Compact	1	2.8%
Bus/Van (9-15 Seats Inc Driver)	1	2.8%
Pickup	1	2.8%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

Lee-Van Aken Intersection Crashes (2014-2016)

<b>ACTION2</b>	<b>Number</b>	<b>%</b>
Straight Ahead	27	75.0%
Slowing Or Stopped In Traffic	9	25.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

<b>CONTRIBUTING_FACTOR2</b>	<b>Number</b>	<b>%</b>
None-Motorist	36	100.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

<b>DIRECTION_FROM2</b>	<b>Number</b>	<b>%</b>
West	15	41.7%
East	9	25.0%
North	7	19.4%
South	5	13.9%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

<b>DIRECTION_TO2</b>	<b>Number</b>	<b>%</b>
East	15	41.7%
West	9	25.0%
South	7	19.4%
North	5	13.9%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

<b>DRIVER_ALCOHOL2</b>	<b>Number</b>	<b>%</b>
(blank)	36	100.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

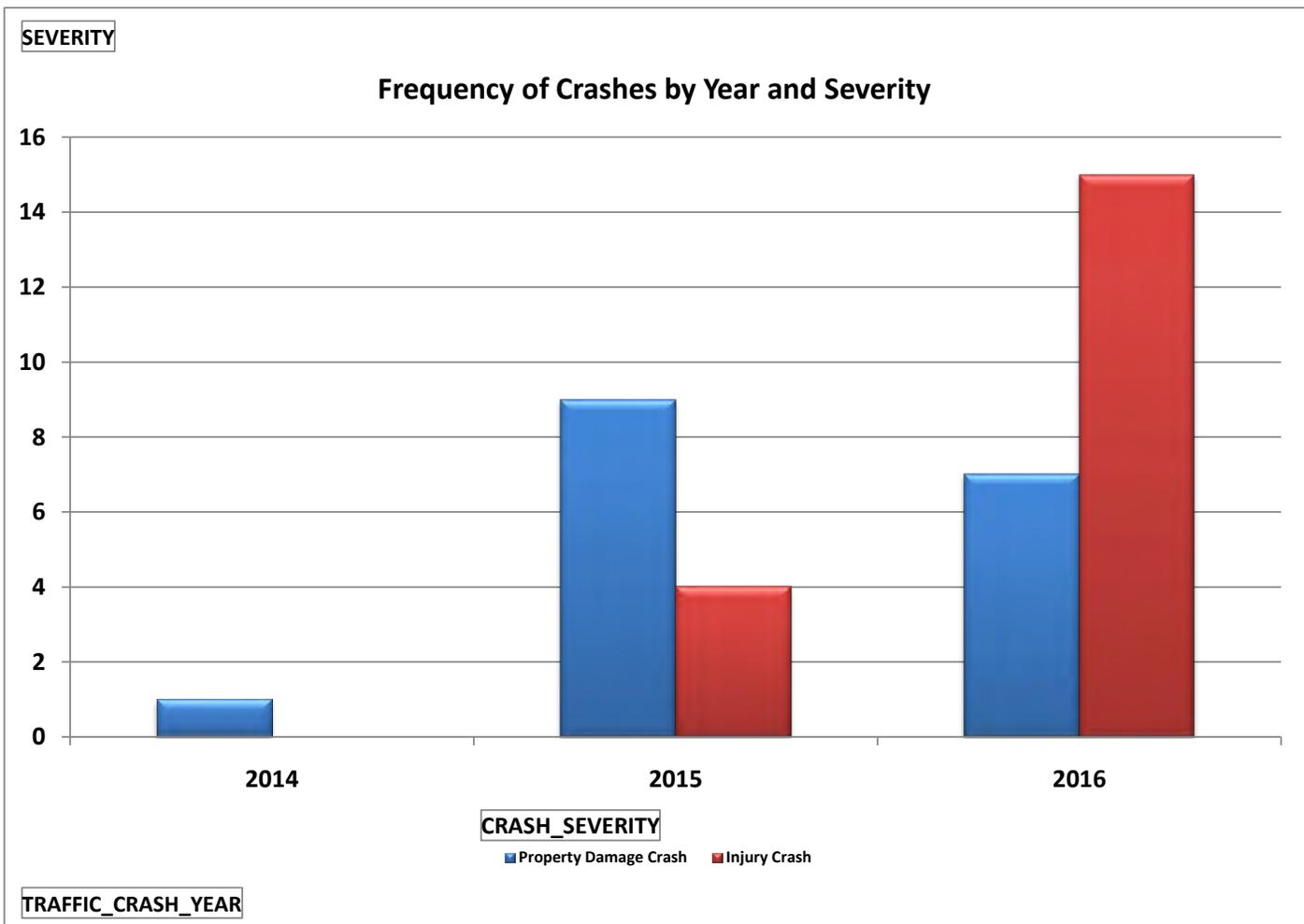
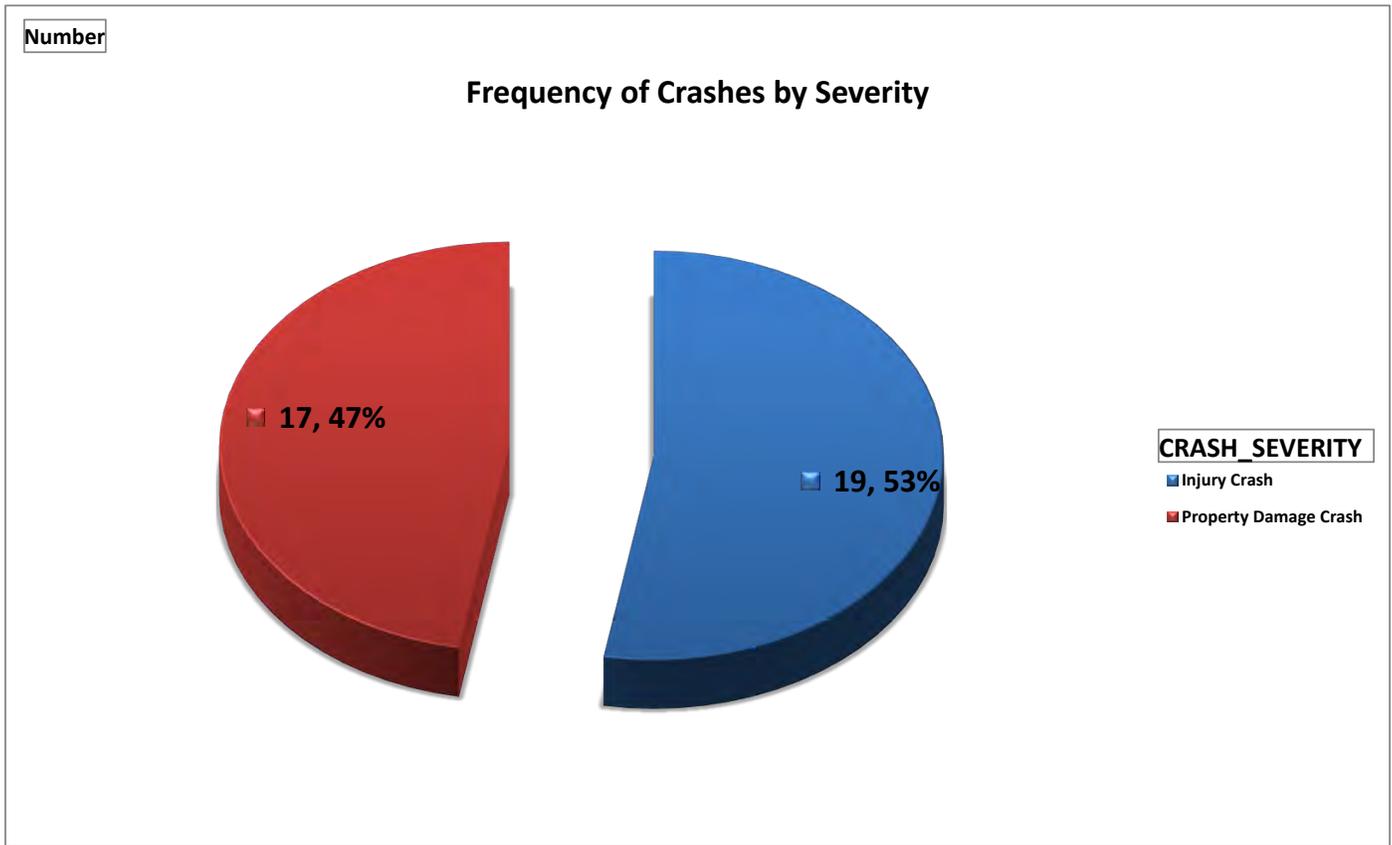
<b>DRIVER_DRUGS2</b>	<b>Number</b>	<b>%</b>
(blank)	36	100.0%
<b>Grand Total</b>	<b>36</b>	<b>100.0%</b>

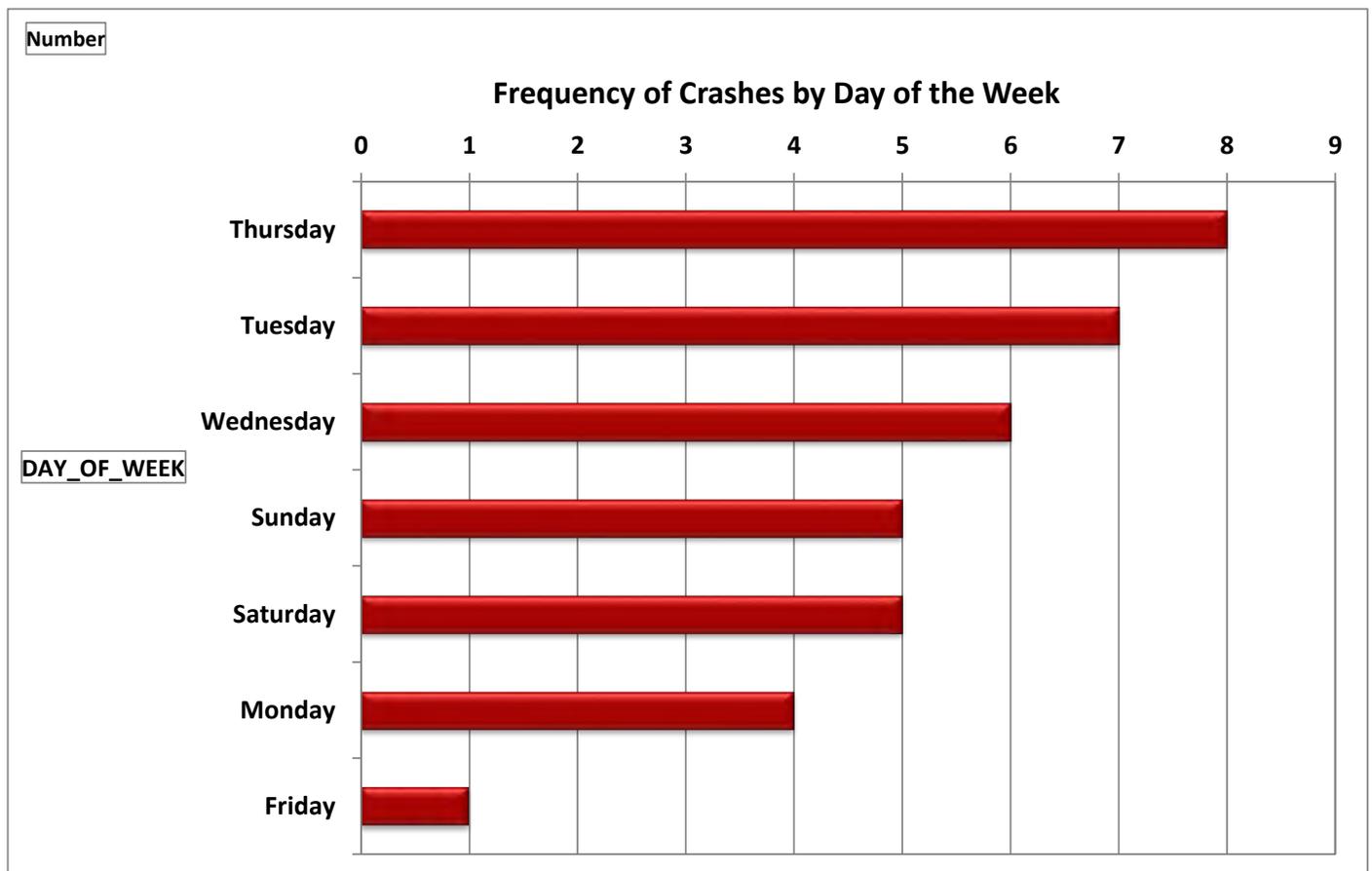
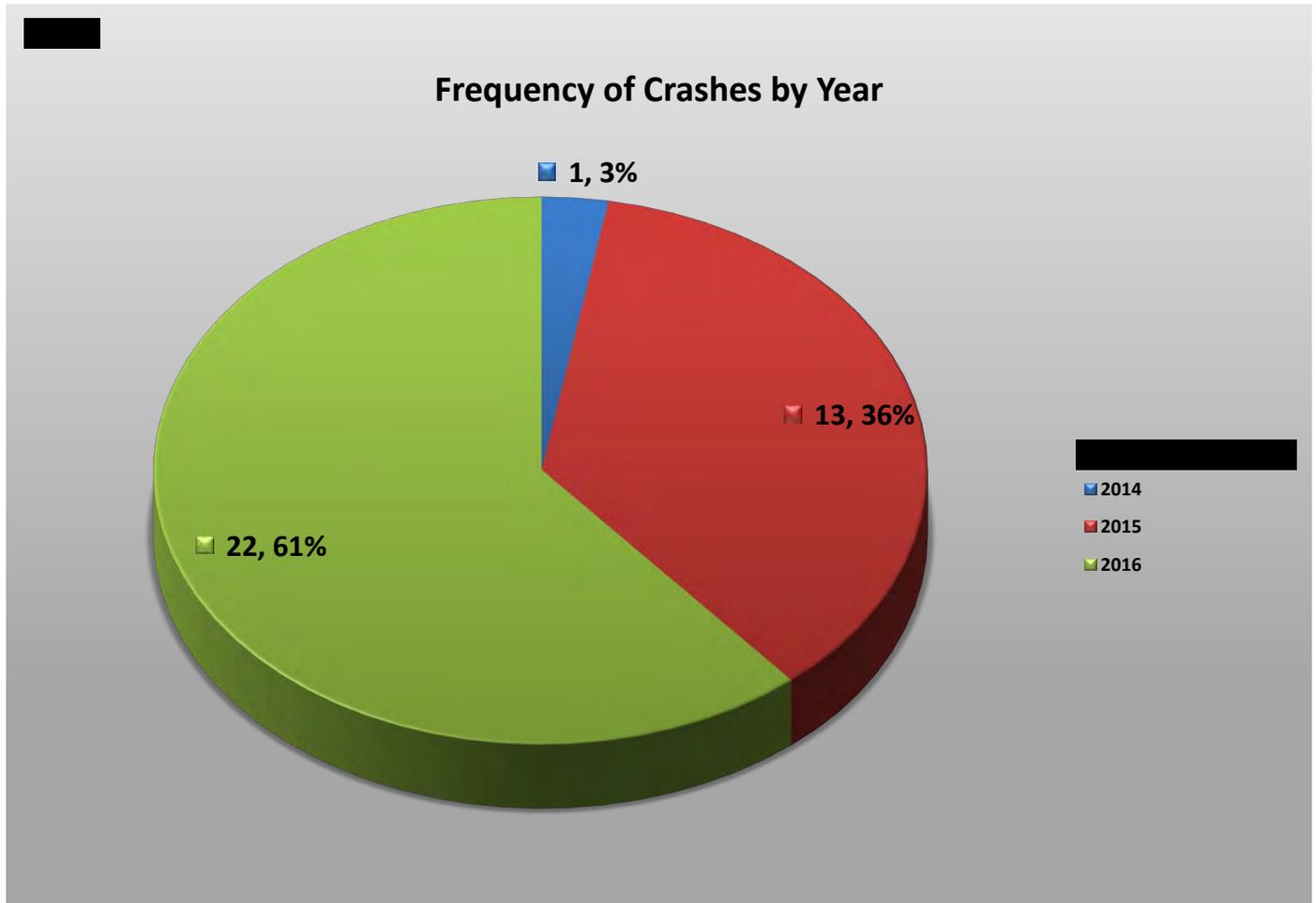
Lee-Van Aken Intersection Crashes (2014-2016)

SEVERITY		CRASH_SEVERITY	
TRAFFIC_CRASH_YEAR		Property Damage Crash	Injury Crash
	2014	1	0
	2015	9	4
	2016	7	15
	<b>Grand Total</b>	<b>17</b>	<b>19</b>

TRAFFIC_CRASH_YEAR	Fatalities	Incapacitating Injuries
2014	0	0
2015	0	0
2016	0	0
<b>Grand Total</b>	<b>0</b>	<b>0</b>

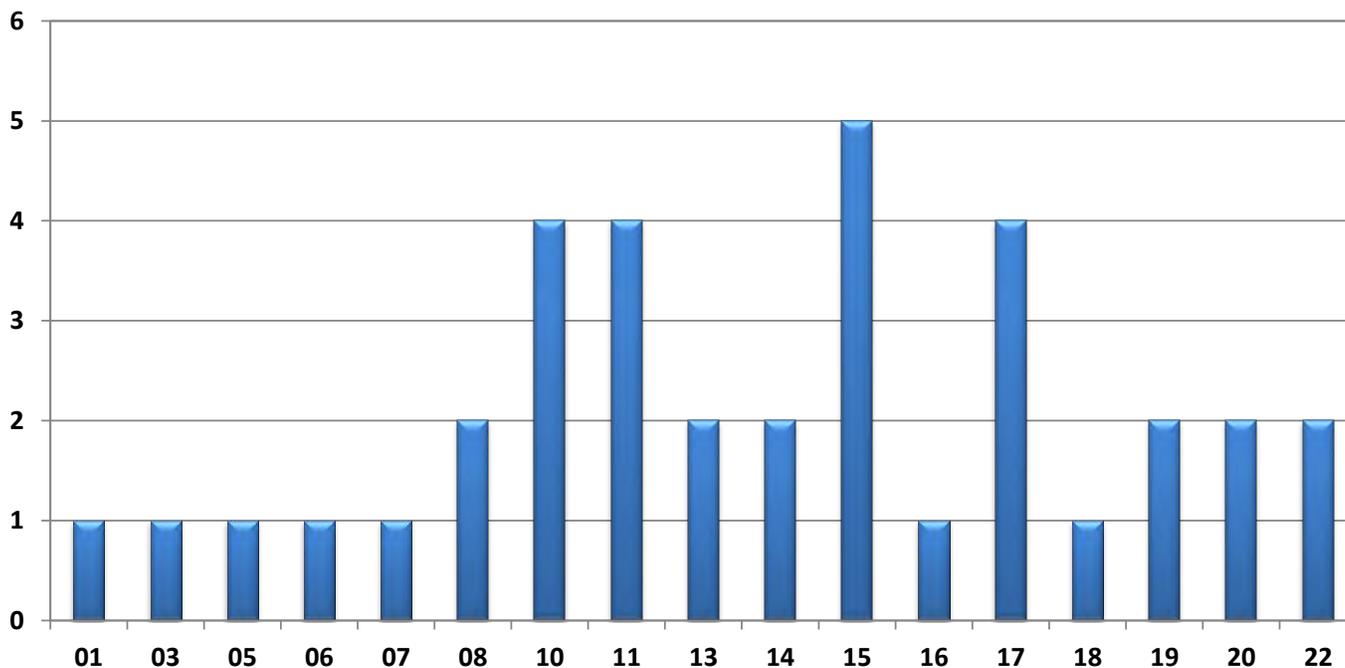
TRAFFIC_CRASH_YEAR	INJ_TYPE2_SERIOUS_VISIBLE	INJ_TYPE3_MINOR_VISIBLE	INJ_TYPE4_NO_VISIBLE
2014	0	0	0
2015	0	1	5
2016	0	2	23
<b>Grand Total</b>	<b>0</b>	<b>3</b>	<b>28</b>





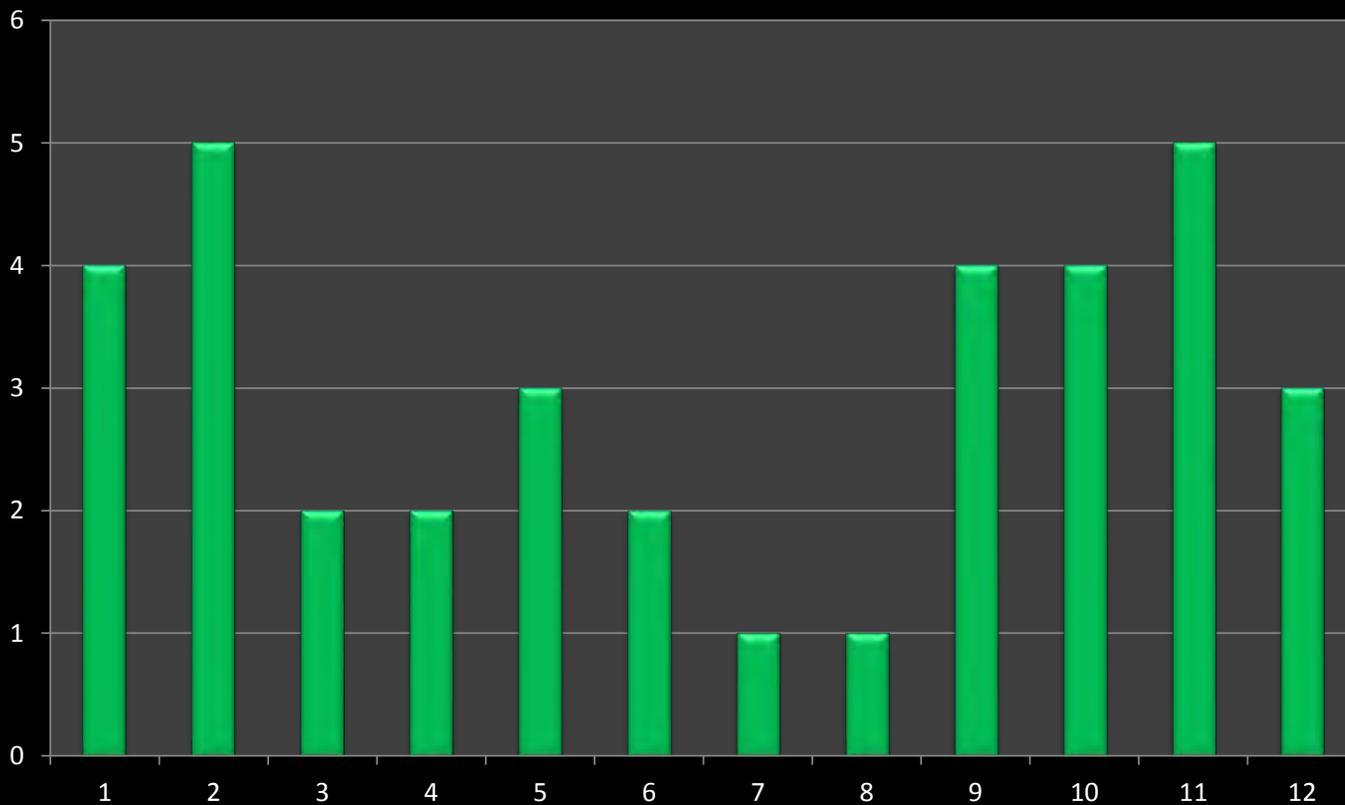


Frequency of Crashes by Hour

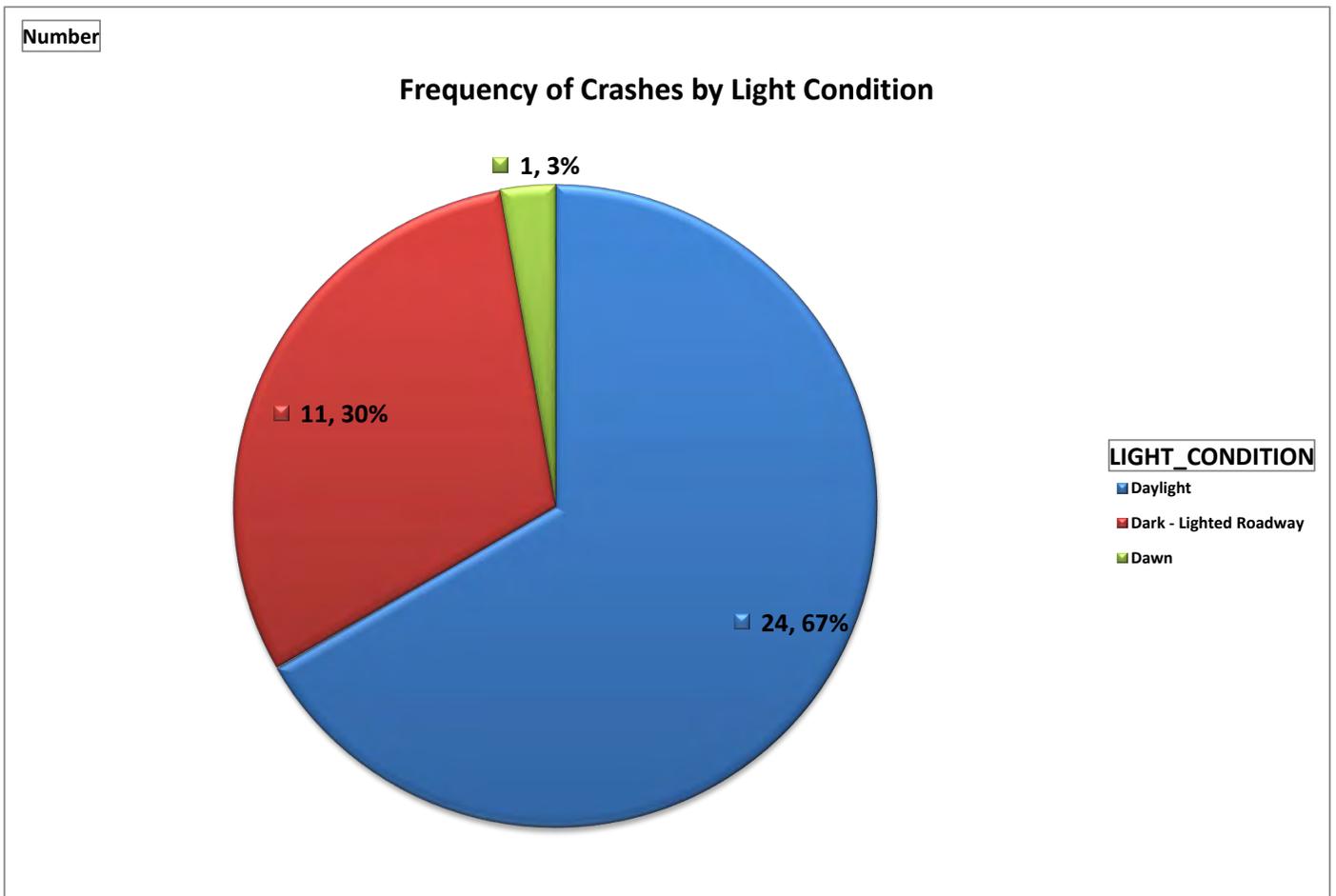
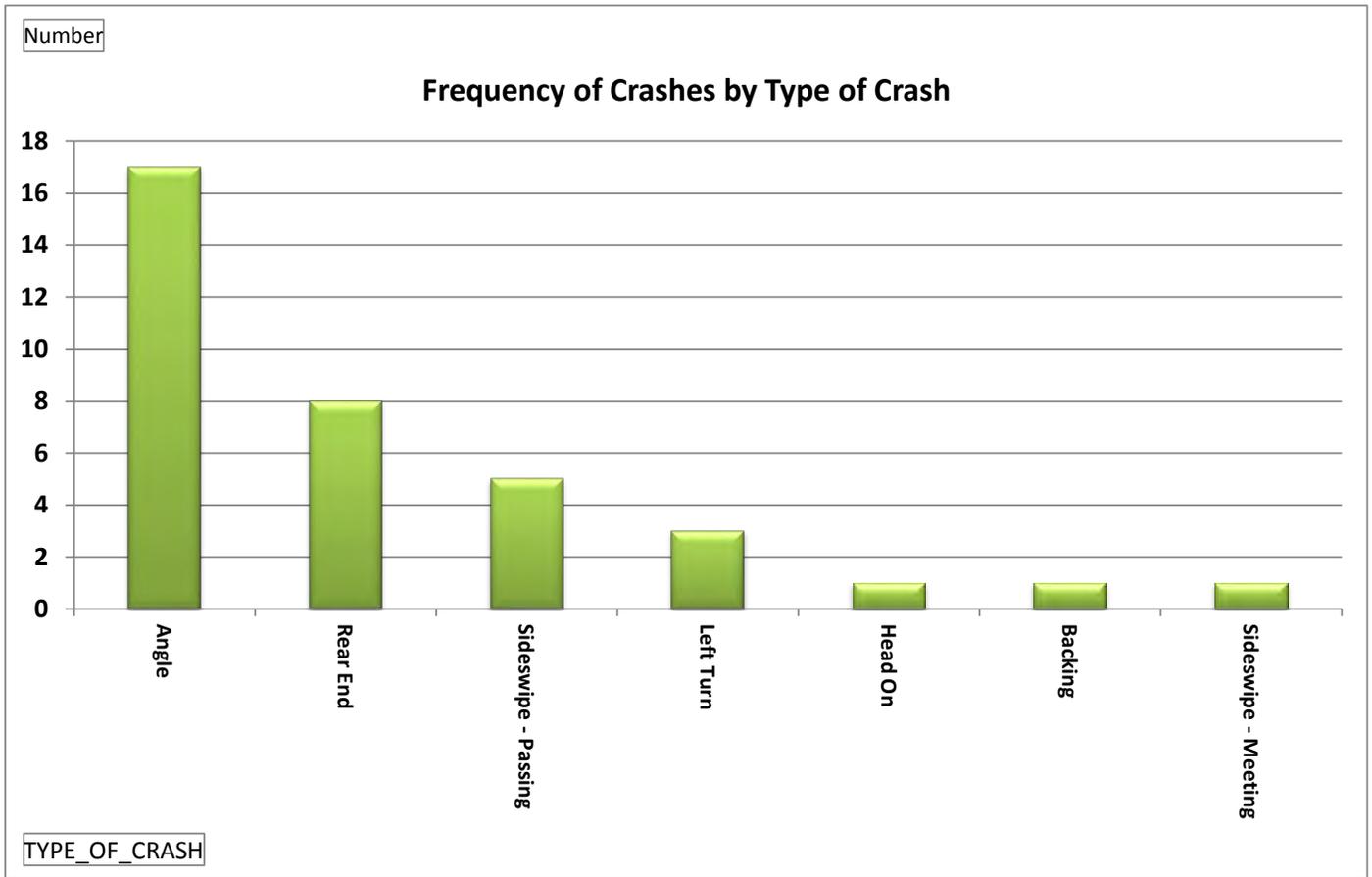


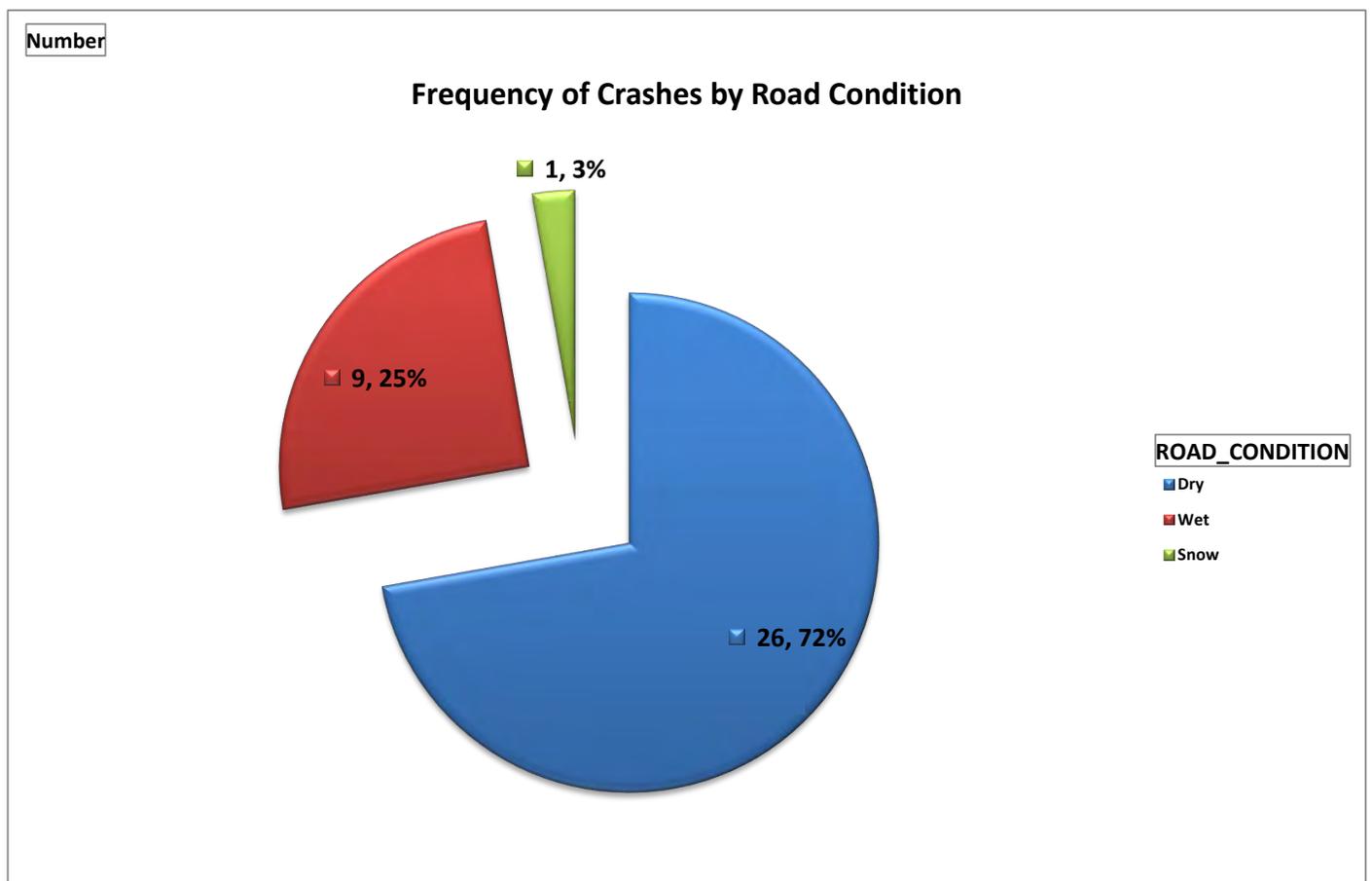
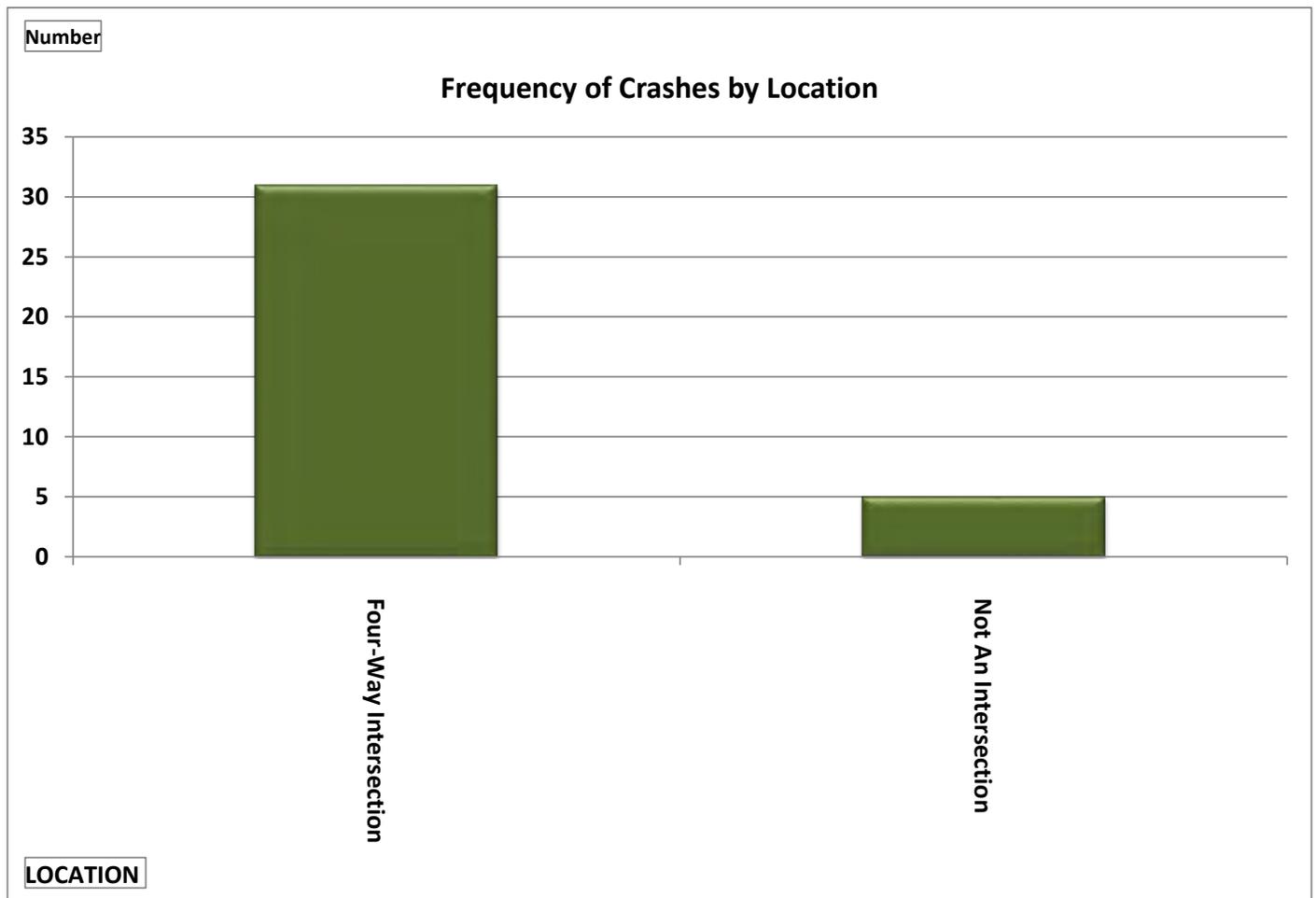
Number

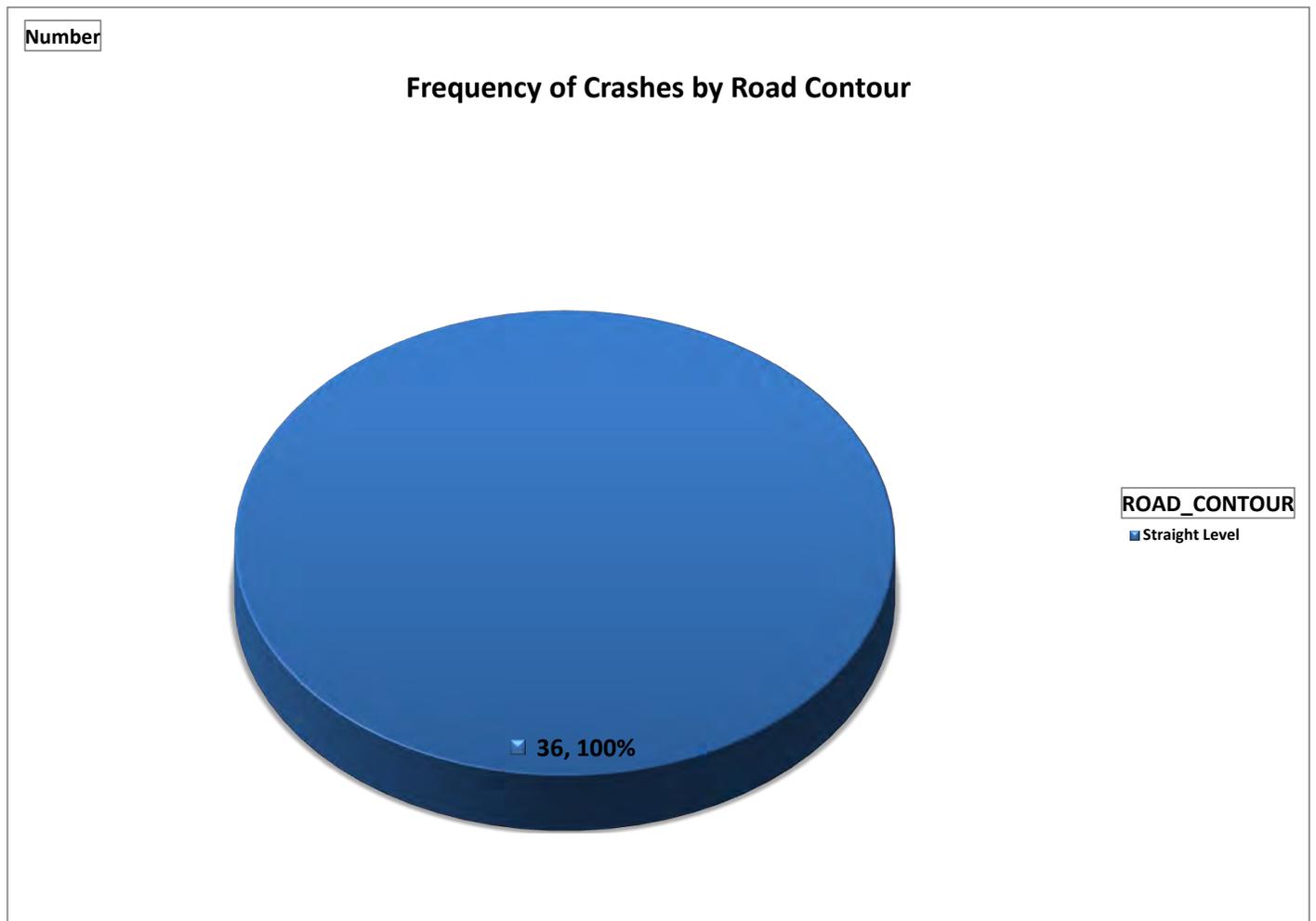
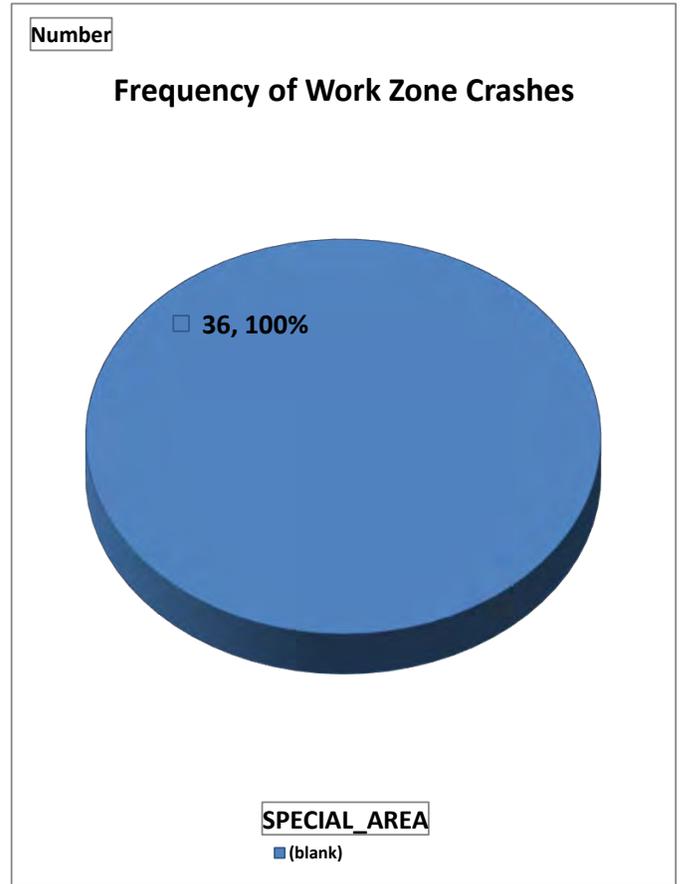
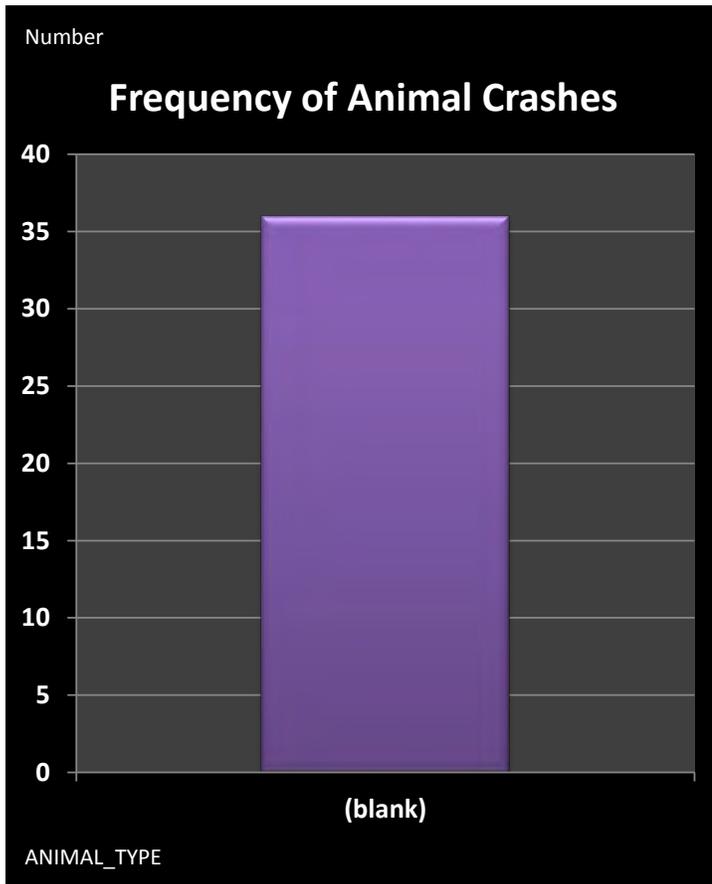
Frequency of Crashes by Month



CRASH\_MONTH\_NBR

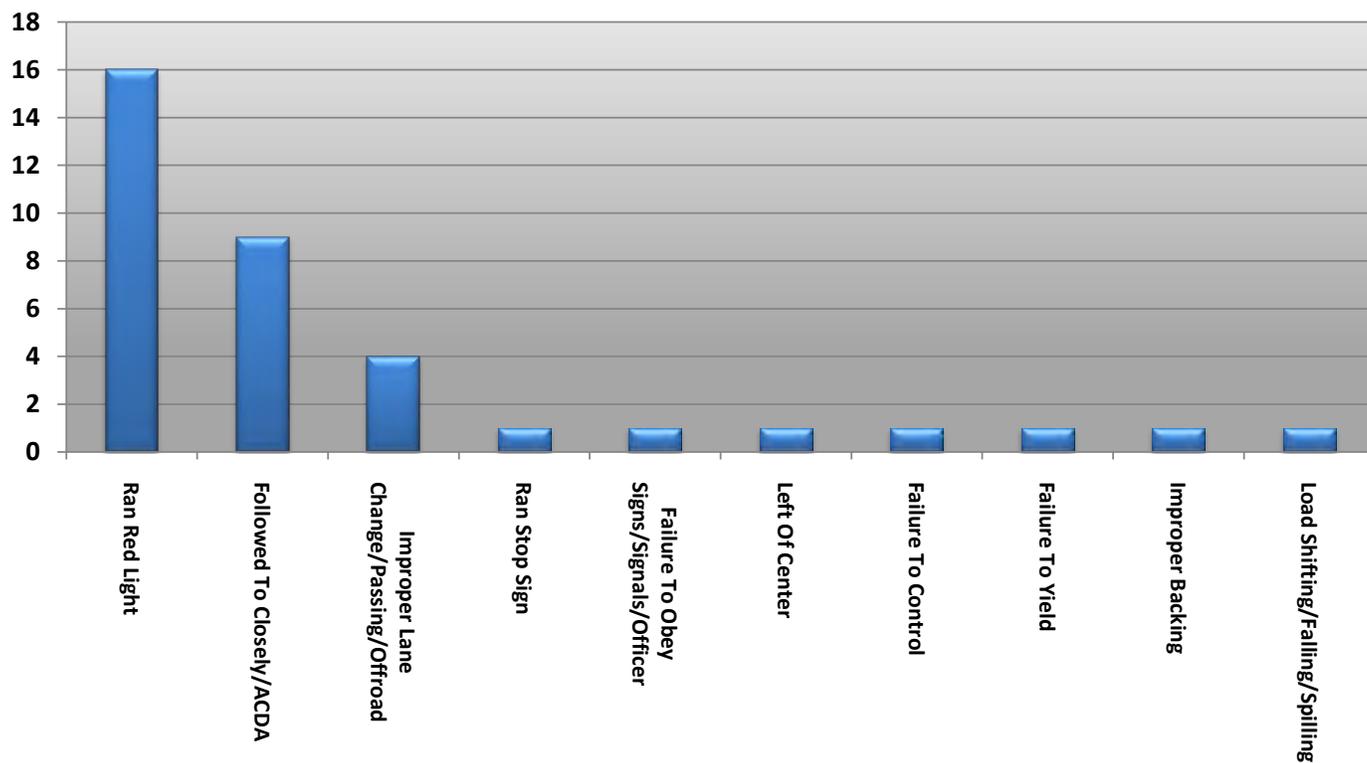






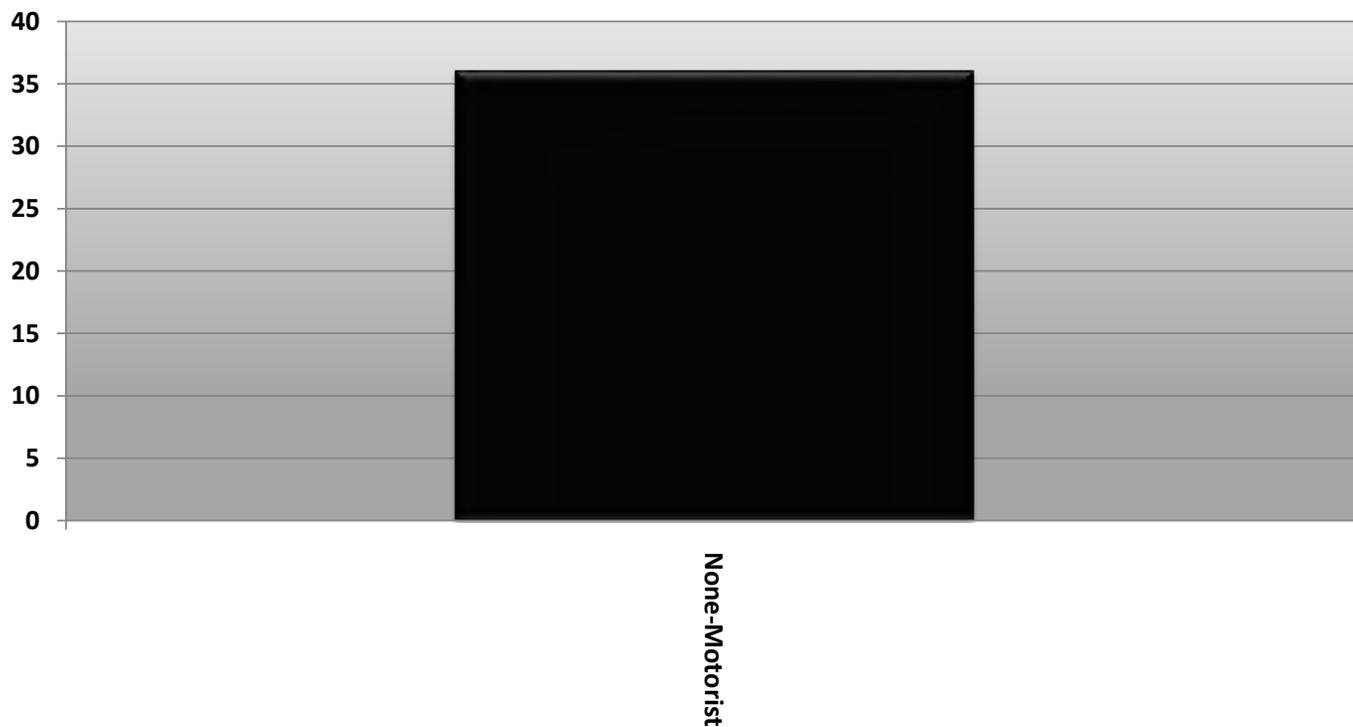


Frequency of Crashes by Contributing Factor 1

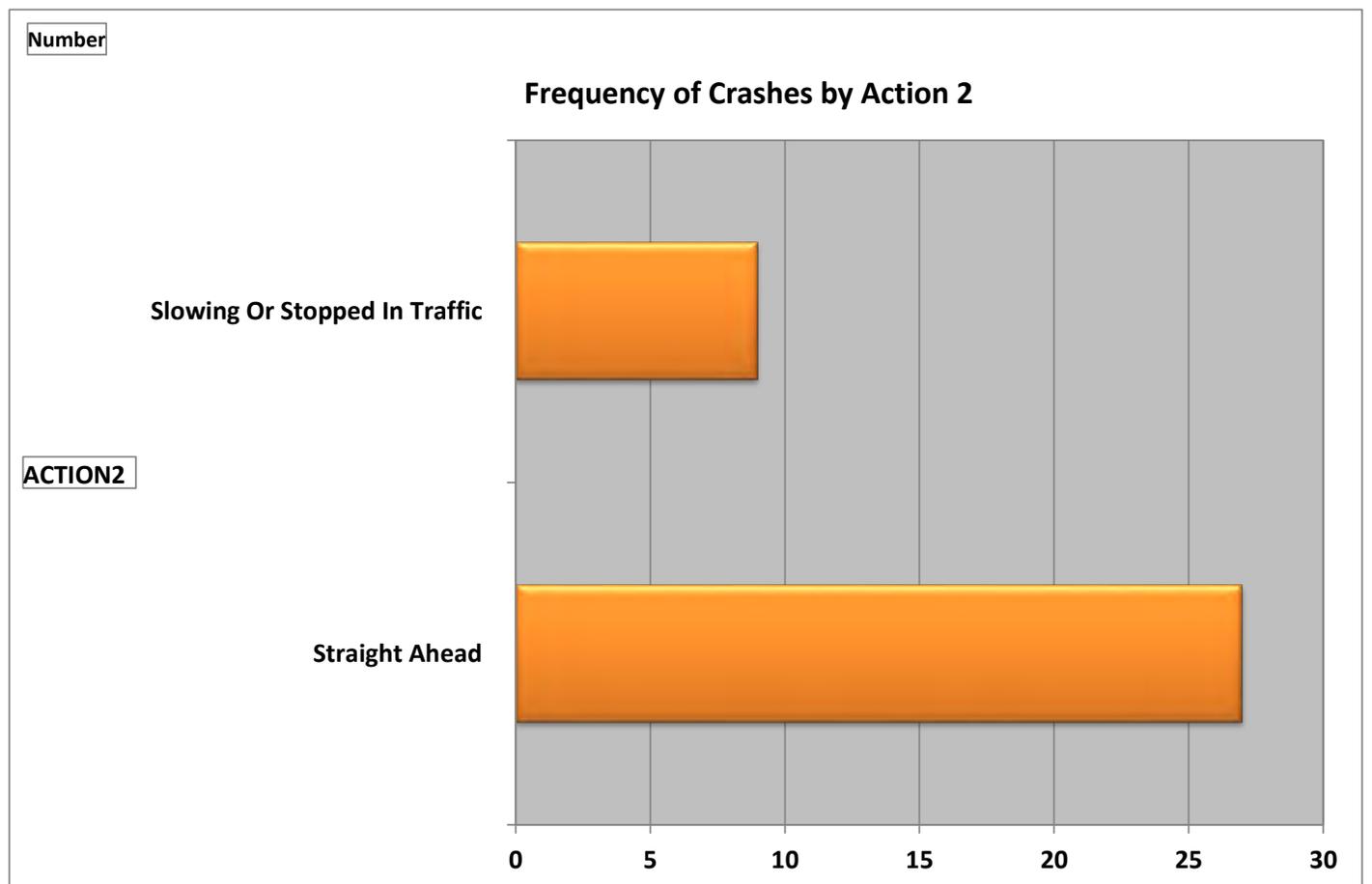
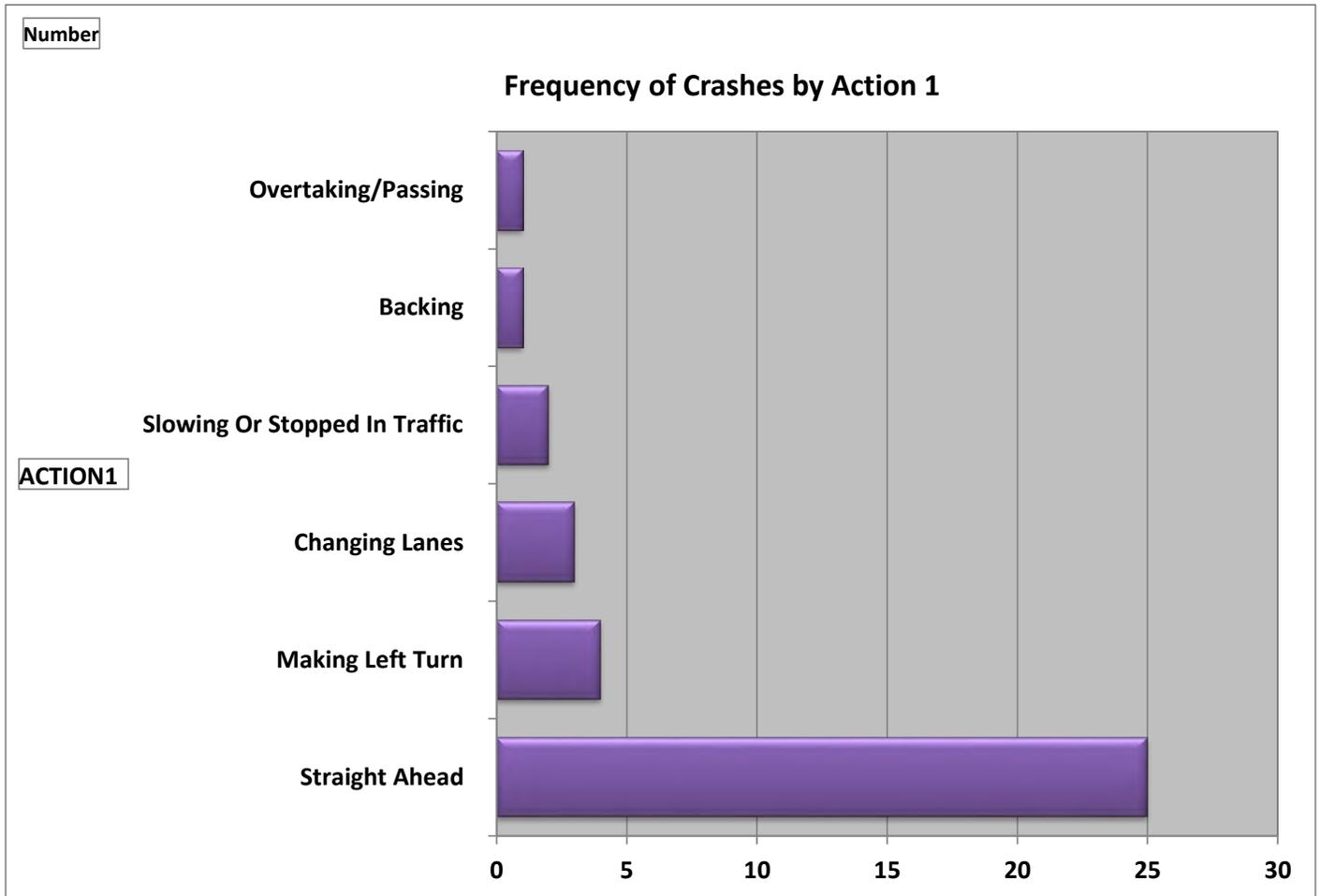


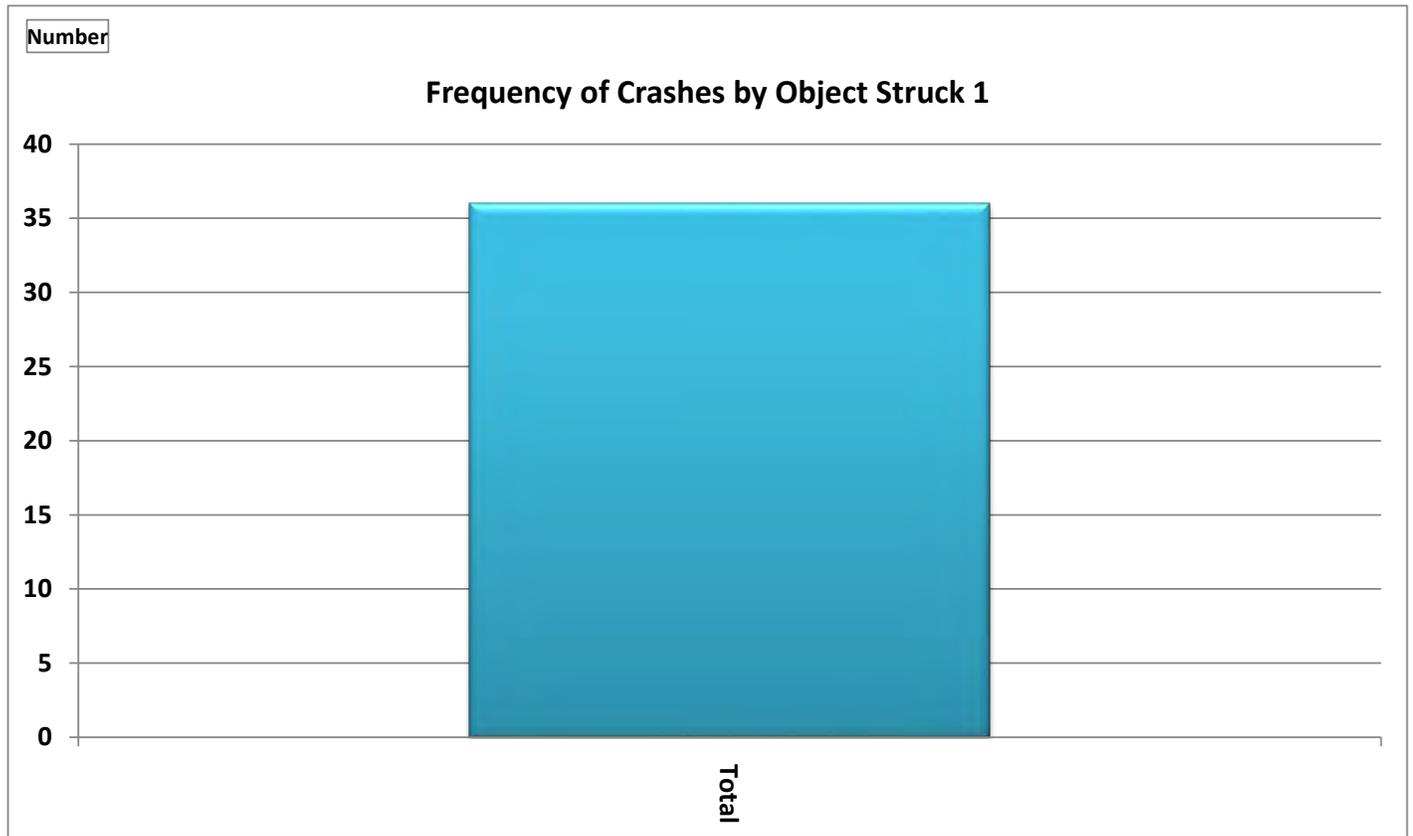
Number

Frequency of Crashes by Contributing Factor 2



CONTRIBUTING\_FACTOR2





**APPENDIX B:  
9-HOUR TRAFFIC COUNTS**

# 9-Hour Traffic Count Summary

Municipality: Shaker Heights  
 Date: 07/25/2017  
 Day: Tuesday  
 Weather: Clear

Intersection: Lee Road & Van Aken Boulevard WB

Start Time	Van Aken Boulevard Eastbound							Van Aken Boulevard Westbound							Lee Road Northbound							Lee Road Southbound						
	Left	Thru	Right	Total	Trk	Bus	Ped/Bike	Left	Thru	Right	Total	Trk	Bus	Ped/Bike	Left	Thru	Right	Total	Trk	Bus	Ped/Bike	Left	Thru	Right	Total	Trk	Bus	Ped/Bike
07:00 AM	0	0	0	0	0	0	2	5	49	10	64	0	0	0	46	71	1	118	2	1	0	0	38	0	38	0	0	1
07:15 AM	0	0	0	0	0	0	5	10	59	9	78	0	0	3	65	89	5	159	5	6	0	0	60	0	60	0	0	4
07:30 AM	0	0	0	0	0	0	0	10	80	14	104	0	1	1	61	127	0	188	4	2	1	0	70	0	70	2	1	0
07:45 AM	0	0	0	0	0	0	5	7	101	16	124	1	0	0	45	112	2	159	10	1	0	0	80	3	83	0	0	0
08:00 AM	0	0	0	0	0	0	4	11	90	20	121	1	0	5	52	120	1	173	8	4	4	0	97	2	99	2	1	5
08:15 AM	0	0	0	0	0	0	8	18	85	26	129	0	1	2	51	118	0	169	8	0	1	0	82	4	86	3	3	1
08:30 AM	0	0	0	0	0	0	4	10	72	27	109	0	1	2	64	105	0	169	11	1	0	1	85	4	90	3	0	2
08:45 AM	0	0	0	0	0	0	5	14	61	11	86	0	0	2	43	118	1	162	4	1	1	0	113	7	120	3	1	1
09:00 AM	0	0	0	0	0	0	5	10	63	19	92	4	3	4	41	105	1	147	8	4	2	0	105	3	108	3	0	1
09:15 AM	0	0	0	0	0	0	2	11	57	13	81	1	2	5	31	120	0	151	10	0	0	0	88	4	92	2	1	1
09:30 AM	0	0	0	0	0	0	1	13	61	15	89	1	2	3	42	127	0	169	7	2	1	0	95	4	99	3	1	1
09:45 AM	0	0	0	0	0	0	3	19	47	13	79	4	0	4	43	125	0	168	3	0	1	0	114	4	118	8	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	3	16	39	17	72	0	0	2	35	91	1	127	5	1	2	0	83	4	87	5	1	1
11:15 AM	0	0	0	0	0	0	3	8	47	8	63	1	0	6	41	83	0	124	5	0	0	0	95	7	102	3	0	3
11:30 AM	0	0	0	0	0	0	2	10	52	5	67	0	2	5	45	99	2	146	5	2	0	0	120	6	126	4	0	3
11:45 AM	0	0	0	0	0	0	7	12	42	6	60	2	0	3	44	110	1	155	8	4	2	0	117	2	119	9	1	4
12:00 PM	0	0	0	0	0	0	4	16	46	7	69	0	2	11	28	105	6	139	4	0	0	0	113	6	119	6	1	1
12:15 PM	0	0	0	0	0	0	4	16	52	5	73	2	3	4	34	102	1	137	2	3	1	0	124	4	128	3	0	0
12:30 PM	0	0	0	0	0	0	0	6	52	9	67	1	0	4	35	122	3	160	4	3	0	1	126	1	128	4	2	2
12:45 PM	0	0	0	0	0	0	1	13	55	14	82	3	1	2	42	113	4	159	9	1	1	1	124	2	127	4	0	1
01:00 PM	0	0	0	0	0	0	4	14	42	19	75	4	1	3	36	107	1	144	4	0	0	1	145	3	149	3	0	1
01:15 PM	0	0	0	0	0	0	8	12	53	5	70	2	0	4	39	109	0	148	5	1	0	0	113	6	119	2	1	1
01:30 PM	0	0	0	0	0	0	3	10	48	11	69	3	2	2	36	104	3	143	4	1	2	0	115	7	122	5	0	0
01:45 PM	0	0	0	0	0	0	1	14	61	13	88	3	1	6	38	106	2	146	4	0	1	0	113	8	121	4	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	7	6	59	7	72	1	0	3	41	115	2	158	2	0	0	0	137	6	143	2	1	2
03:15 PM	0	0	0	0	0	0	1	20	64	13	97	8	1	6	51	127	3	181	2	0	0	0	144	2	146	6	1	1
03:30 PM	0	0	0	0	0	0	2	19	62	12	93	1	0	5	44	107	2	153	1	2	0	0	150	7	157	0	2	0
03:45 PM	0	0	0	0	0	0	5	10	64	6	80	0	0	5	43	111	3	157	0	1	0	1	175	7	183	4	0	2
04:00 PM	0	0	0	0	0	0	7	13	66	9	88	0	1	7	40	100	5	145	3	1	0	0	193	8	201	9	0	1
04:15 PM	0	0	0	0	0	0	5	19	72	10	101	0	0	0	41	122	1	164	1	1	1	1	173	2	176	9	0	7
04:30 PM	0	0	0	0	0	0	7	13	59	5	77	0	0	2	34	113	1	148	0	0	1	0	193	5	198	5	1	1
04:45 PM	0	0	0	0	0	0	2	21	67	6	94	0	0	3	35	130	4	169	2	0	0	0	162	9	171	7	0	2
05:00 PM	0	0	0	0	0	0	1	17	62	13	92	1	1	5	50	164	3	217	3	1	1	0	188	8	196	2	1	5
05:15 PM	0	0	0	0	0	0	10	20	88	15	123	0	2	4	45	154	3	202	1	0	0	0	213	8	221	4	0	0
05:30 PM	0	0	0	0	0	0	7	20	90	17	127	0	0	4	67	141	2	210	2	0	2	0	214	7	221	3	0	2
05:45 PM	0	0	0	0	0	0	9	21	83	14	118	1	0	8	49	139	4	192	0	1	0	0	182	11	193	1	1	3
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>147</b>	<b>484</b>	<b>2250</b>	<b>439</b>	<b>3173</b>	<b>45</b>	<b>27</b>	<b>135</b>	<b>1577</b>	<b>4111</b>	<b>68</b>	<b>5756</b>	<b>156</b>	<b>45</b>	<b>25</b>	<b>6</b>	<b>4539</b>	<b>171</b>	<b>4716</b>	<b>133</b>	<b>21</b>	<b>60</b>
<b>ADT</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>766</b>	<b>3561</b>	<b>695</b>	<b>5022</b>	<b>71</b>	<b>43</b>	<b>-</b>	<b>2496</b>	<b>6506</b>	<b>108</b>	<b>9110</b>	<b>247</b>	<b>71</b>	<b>-</b>	<b>9</b>	<b>7183</b>	<b>271</b>	<b>7463</b>	<b>210</b>	<b>33</b>	<b>-</b>

Hourly Factor: 1.689      Monthly Factor: 0.94      Combined Factor: 1.58

# 9-Hour Traffic Count Summary

Municipality: Shaker Heights  
 Date: 07/25/2017  
 Day: Tuesday  
 Weather: Clear

Intersection: Lee Road & Van Aken Boulevard EB

Start Time	Van Aken Boulevard Eastbound							Van Aken Boulevard Westbound							Lee Road Northbound							Lee Road Southbound						
	Left	Thru	Right	Total	Trk	Bus	Ped/Bike	Left	Thru	Right	Total	Trk	Bus	Ped/Bike	Left	Thru	Right	Total	Trk	Bus	Ped/Bike	Left	Thru	Right	Total	Trk	Bus	Ped/Bike
07:00 AM	3	34	17	54	1	0	2	0	0	0	0	0	0	0	0	126	2	128	4	2	2	3	44	0	47	0	0	0
07:15 AM	10	47	28	85	0	1	2	0	0	0	0	0	0	2	0	143	3	146	4	5	2	5	64	0	69	0	1	1
07:30 AM	8	54	40	102	0	3	4	0	0	0	0	0	0	0	0	180	9	189	6	2	1	9	74	0	83	2	0	0
07:45 AM	7	57	37	101	4	0	3	0	0	0	0	0	0	0	0	146	9	155	9	2	1	9	70	0	79	0	0	0
08:00 AM	7	56	34	97	3	0	8	0	0	0	0	0	0	2	0	162	6	168	8	3	2	14	96	0	110	1	1	2
08:15 AM	6	85	34	125	1	0	3	0	0	0	0	0	0	1	0	175	7	182	12	0	2	11	101	0	112	0	4	0
08:30 AM	7	71	41	119	3	0	2	0	0	0	0	0	0	2	0	163	5	168	9	1	1	12	85	0	97	2	0	0
08:45 AM	15	72	34	121	3	0	3	0	0	0	0	0	0	2	0	142	12	154	7	2	1	17	116	0	133	4	1	0
09:00 AM	11	48	41	100	1	1	6	0	0	0	0	0	0	4	0	136	7	143	8	2	1	18	89	0	107	2	2	0
09:15 AM	13	47	42	102	2	1	5	0	0	0	0	0	0	2	0	156	5	161	10	0	0	10	80	0	90	1	1	0
09:30 AM	8	58	30	96	2	0	6	0	0	0	0	0	0	2	0	158	17	175	7	2	0	13	94	0	107	3	3	0
09:45 AM	9	68	27	104	1	0	2	0	0	0	0	0	0	4	0	156	15	171	5	0	2	19	112	0	131	10	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	8	61	35	104	1	1	6	0	0	0	0	0	0	2	0	117	7	124	5	1	1	11	80	0	91	6	1	0
11:15 AM	6	48	38	92	2	0	3	0	0	0	0	0	0	6	0	122	14	136	5	0	2	9	95	0	104	4	0	0
11:30 AM	3	49	32	84	0	1	8	0	0	0	0	0	0	6	0	155	11	166	5	7	4	19	116	0	135	4	0	0
11:45 AM	7	61	40	108	7	0	3	0	0	0	0	0	0	1	0	136	7	143	5	2	3	13	119	0	132	10	1	0
12:00 PM	15	71	55	141	2	1	7	0	0	0	0	0	0	11	0	131	9	140	3	0	9	20	108	0	128	6	1	4
12:15 PM	8	55	60	123	2	2	8	0	0	0	0	0	0	6	0	114	7	121	4	2	4	15	105	0	120	3	2	0
12:30 PM	6	49	31	86	0	0	7	0	0	0	0	0	0	6	0	152	6	158	3	3	0	17	118	0	135	5	1	1
12:45 PM	8	38	25	71	3	0	0	0	0	0	0	0	0	2	0	145	11	156	8	1	1	20	131	0	151	4	0	0
01:00 PM	10	54	45	109	5	0	5	0	0	0	0	0	0	5	0	135	7	142	5	0	2	25	125	0	150	2	0	1
01:15 PM	12	59	51	122	1	0	10	0	0	0	0	0	0	5	0	139	10	149	5	2	4	8	113	0	121	6	1	1
01:30 PM	8	48	43	99	1	0	6	0	0	0	0	0	0	3	0	145	13	158	3	0	1	15	110	0	125	4	1	0
01:45 PM	7	47	41	95	3	0	3	0	0	0	0	0	0	9	0	133	12	145	4	0	1	10	125	0	135	6	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	10	59	45	114	0	0	11	0	0	0	0	0	0	3	0	148	9	157	2	0	0	16	134	0	150	2	1	0
03:15 PM	8	72	49	129	0	0	9	0	0	0	0	0	0	6	0	175	7	182	2	0	5	18	150	0	168	11	0	0
03:30 PM	7	86	49	142	1	0	14	0	0	0	0	0	0	1	0	130	15	145	1	3	1	23	158	0	181	1	2	1
03:45 PM	16	103	70	189	1	0	6	0	0	0	0	0	0	6	0	152	10	162	0	1	0	27	145	0	172	2	0	2
04:00 PM	5	108	69	182	4	0	8	0	0	0	0	0	0	9	0	124	9	133	2	1	0	40	160	0	200	8	0	1
04:15 PM	10	104	89	203	1	0	13	0	0	0	0	0	0	2	0	169	13	182	1	1	4	24	179	0	203	5	0	0
04:30 PM	9	130	92	231	0	0	11	0	0	0	0	0	0	2	0	151	13	164	1	0	3	36	200	0	236	3	1	0
04:45 PM	11	125	88	224	2	0	4	0	0	0	0	0	0	5	0	173	11	184	2	0	1	26	162	0	188	5	0	2
05:00 PM	6	136	81	223	0	0	12	0	0	0	0	0	0	4	0	239	15	254	2	1	3	36	191	0	227	2	1	0
05:15 PM	9	172	113	294	1	0	13	0	0	0	0	0	0	7	0	198	12	210	1	0	3	35	195	0	230	4	0	2
05:30 PM	18	175	100	293	0	1	10	0	0	0	0	0	0	5	0	201	18	219	2	0	4	32	223	0	255	3	0	1
05:45 PM	13	135	99	247	1	0	6	0	0	0	0	0	0	4	0	194	15	209	0	1	2	31	186	0	217	0	1	0
<b>Totals</b>	<b>324</b>	<b>2742</b>	<b>1845</b>	<b>4911</b>	<b>59</b>	<b>12</b>	<b>229</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>137</b>	<b>0</b>	<b>5521</b>	<b>358</b>	<b>5879</b>	<b>160</b>	<b>47</b>	<b>73</b>	<b>666</b>	<b>4453</b>	<b>0</b>	<b>5119</b>	<b>131</b>	<b>27</b>	<b>19</b>
<b>ADT</b>	<b>513</b>	<b>4339</b>	<b>2920</b>	<b>7772</b>	<b>93</b>	<b>19</b>	<b>-</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>0</b>	<b>8737</b>	<b>567</b>	<b>9304</b>	<b>253</b>	<b>74</b>	<b>-</b>	<b>1054</b>	<b>7047</b>	<b>0</b>	<b>8101</b>	<b>207</b>	<b>43</b>	<b>-</b>

Hourly Factor:  Monthly Factor:  Combined Factor:

# 9-Hour Traffic Count Summary

Municipality: Shaker Heights

Intersection: Lee Road & Library Drive & Heinen's Drive

Date: 12/08/2017

Day: Friday

Weather: Clear

Start Time	Library Drive Eastbound						Heinen's Drive Westbound						Lee Road Northbound						Lee Road Southbound					
	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus
07:00 AM	0	0	1	1	0	0	0	0	0	0	0	0	0	132	0	132	1	7	0	94	0	94	1	0
07:15 AM	1	0	0	1	0	0	0	0	6	6	0	0	1	190	0	191	3	9	4	85	3	92	2	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	209	0	209	4	5	0	129	0	129	1	1
07:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1	192	0	193	9	2	3	143	0	146	1	2
08:00 AM	2	0	0	2	0	0	1	0	7	8	0	0	1	181	0	182	3	3	7	153	5	165	2	2
08:15 AM	0	0	1	1	0	0	1	0	3	4	1	0	3	174	0	177	4	2	11	144	7	162	0	6
08:30 AM	2	0	0	2	0	0	0	0	6	6	0	0	5	138	0	143	3	2	9	131	7	147	2	2
08:45 AM	1	0	2	3	0	0	2	0	6	8	1	0	2	148	0	150	4	3	10	124	7	141	5	2
09:00 AM	1	0	6	7	0	0	1	0	8	9	0	0	4	151	2	157	7	3	16	125	13	154	2	3
09:15 AM	1	0	5	6	0	0	1	1	4	6	0	0	8	126	1	135	5	1	11	119	5	135	10	1
09:30 AM	6	0	2	8	0	0	1	0	3	4	0	0	1	156	2	159	8	2	9	104	8	121	4	3
09:45 AM	4	1	1	6	0	0	1	4	4	9	0	0	0	125	1	126	1	1	7	113	8	128	2	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	6	4	8	18	0	0	3	0	3	6	0	0	3	70	2	75	6	2	14	83	2	99	3	1
11:15 AM	6	5	8	19	0	0	2	0	6	8	0	0	12	120	0	132	5	1	16	105	9	130	7	1
11:30 AM	3	1	10	14	2	0	0	1	4	5	0	0	5	109	4	118	5	1	17	93	6	116	4	1
11:45 AM	7	4	8	19	1	0	3	1	10	14	0	0	3	114	1	118	3	2	16	116	4	136	8	1
12:00 PM	8	4	7	19	0	0	1	0	11	12	0	0	10	128	3	141	7	1	20	134	5	159	9	2
12:15 PM	7	1	5	13	0	0	2	0	9	11	1	0	6	109	2	117	7	0	22	103	7	132	4	1
12:30 PM	2	5	8	15	0	0	5	0	7	12	0	0	6	135	1	142	4	2	22	119	6	147	1	2
12:45 PM	5	1	8	14	0	0	7	2	5	14	0	0	7	80	4	91	1	1	18	129	3	150	6	2
01:00 PM	4	1	2	7	0	0	4	0	8	12	0	0	1	103	4	108	2	0	20	107	1	128	3	0
01:15 PM	2	1	3	6	0	0	2	0	11	13	1	0	2	115	3	120	4	1	18	102	8	128	4	1
01:30 PM	4	0	2	6	1	0	7	1	13	21	0	0	1	119	1	121	4	0	22	108	5	135	4	1
01:45 PM	7	0	5	12	0	0	9	1	16	26	0	0	4	125	1	130	5	0	18	91	5	114	1	1
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	3	1	4	8	0	0	2	1	8	11	1	0	5	156	4	165	1	0	22	157	5	184	4	4
03:15 PM	4	4	5	13	0	0	7	0	5	12	0	0	6	168	1	175	3	4	17	168	5	190	11	0
03:30 PM	1	4	4	9	0	0	3	4	14	21	0	0	5	154	2	161	1	3	26	192	4	222	2	6
03:45 PM	7	1	3	11	0	0	3	0	9	12	0	0	0	144	4	148	3	2	32	222	5	259	3	4
04:00 PM	2	2	9	13	0	0	6	0	20	26	0	0	4	141	2	147	2	3	26	208	8	242	1	2
04:15 PM	1	4	4	9	0	0	3	0	14	17	0	0	3	168	8	179	1	2	23	212	5	240	2	2
04:30 PM	4	1	3	8	0	0	2	1	6	9	0	0	4	163	0	167	0	1	32	218	10	260	6	5
04:45 PM	6	3	5	14	0	0	6	1	11	18	0	0	2	192	1	195	1	2	24	225	7	256	0	3
05:00 PM	6	2	6	14	0	0	5	2	14	21	0	0	3	168	2	173	0	2	25	171	6	202	1	1
05:15 PM	2	3	4	9	0	0	4	2	11	17	0	0	2	196	0	198	1	2	28	201	3	232	2	1
05:30 PM	5	2	7	14	0	0	7	0	14	21	0	0	5	174	2	181	0	0	28	178	6	212	1	1
05:45 PM	2	5	6	13	0	0	4	3	14	21	0	0	6	173	4	183	3	2	41	209	12	262	5	0
<b>Totals</b>	<b>123</b>	<b>60</b>	<b>152</b>	<b>335</b>	<b>4</b>	<b>0</b>	<b>105</b>	<b>25</b>	<b>290</b>	<b>420</b>	<b>5</b>	<b>0</b>	<b>131</b>	<b>5246</b>	<b>62</b>	<b>5439</b>	<b>121</b>	<b>74</b>	<b>634</b>	<b>5115</b>	<b>200</b>	<b>5949</b>	<b>124</b>	<b>66</b>
<b>ADT</b>	<b>189</b>	<b>92</b>	<b>234</b>	<b>515</b>	<b>6</b>	<b>0</b>	<b>162</b>	<b>38</b>	<b>446</b>	<b>646</b>	<b>8</b>	<b>0</b>	<b>202</b>	<b>8072</b>	<b>95</b>	<b>8369</b>	<b>186</b>	<b>114</b>	<b>976</b>	<b>7870</b>	<b>308</b>	<b>9154</b>	<b>191</b>	<b>102</b>

Hourly Factor: 1.689

Monthly Factor: 0.91

Combined Factor: 1.54

## 9-Hour Traffic Count Summary

Municipality: Shaker Heights  
 Date: 12/12/2017  
 Day: Tuesday  
 Weather: Snow

Intersection: Lee Road & Chagrin Boulevard & Kenyon Road

From	Chagrin Boulevard Eastbound						Chagrin Boulevard Westbound						Lee Road Northbound					
	Lee NB	Chagrin EB	Kenyon SEB	Lee SB	Total	Trk/Bus	Kenyon SEB	Lee NB	Chagrin WB	Lee SB	Total	Trk/Bus	Chagrin WB	Lee NB	Chagrin EB	Kenyon SEB	Total	Trk/Bus
07:00 AM	19	66	8	20	113	31	1	6	55	8	70	13	16	113	36	0	165	42
07:15 AM	11	72	3	14	100		2	6	60	3	71		8	134	38	0	180	
07:30 AM	29	75	4	23	131		1	8	87	9	105		14	140	34	0	188	
07:45 AM	32	87	8	20	147		3	8	81	6	98		21	133	41	0	195	
08:00 AM	24	71	3	21	119	36	0	11	89	8	108	17	7	144	36	0	187	29
08:15 AM	32	93	13	13	151		1	11	104	10	126		13	135	33	0	181	
08:30 AM	33	77	11	22	143		2	14	63	6	85		12	138	42	2	194	
08:45 AM	26	93	4	19	142		1	8	63	8	80		10	96	32	0	138	
09:00 AM	21	97	10	26	154	37	0	14	52	24	90	17	13	103	31	0	147	23
09:15 AM	27	94	8	37	166		1	9	59	14	83		13	91	42	0	146	
09:30 AM	23	56	4	22	105		0	11	64	16	91		11	113	36	1	161	
09:45 AM	23	72	5	18	118		3	14	46	16	79		11	124	37	2	174	
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	
10:30 AM	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	
10:45 AM	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	
11:00 AM	26	68	2	22	118	24	1	11	47	20	79	25	12	92	22	0	126	13
11:15 AM	23	57	7	27	114		0	10	54	15	79		12	72	32	0	116	
11:30 AM	18	61	4	17	100		0	12	55	17	84		19	76	24	1	120	
11:45 AM	21	55	3	22	101		1	7	57	15	80		19	75	22	0	116	
12:00 PM	22	46	4	28	100	29	0	13	59	24	96	25	11	74	18	1	104	26
12:15 PM	17	43	6	16	82		0	14	60	16	90		24	90	17	0	131	
12:30 PM	22	69	6	25	122		3	9	66	24	102		22	72	33	2	129	
12:45 PM	23	76	4	33	136		0	9	53	26	88		17	86	24	3	130	
01:00 PM	34	65	4	19	122	35	0	13	77	18	108	14	27	94	26	0	147	16
01:15 PM	23	72	8	35	138		0	10	55	24	89		26	83	27	1	137	
01:30 PM	17	55	5	30	107		1	15	61	37	114		24	65	18	0	107	
01:45 PM	33	63	1	19	116		0	15	71	18	104		21	81	31	0	133	
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	
02:30 PM	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	
02:45 PM	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	
03:00 PM	33	66	7	24	130	14	1	11	74	25	111	18	22	86	25	0	133	21
03:15 PM	31	74	7	42	154		0	12	81	28	121		32	108	26	0	166	
03:30 PM	28	70	8	22	128		4	5	75	24	108		21	101	37	1	160	
03:45 PM	37	79	8	42	166		3	21	83	23	130		24	101	35	1	161	
04:00 PM	28	80	4	35	147	10	0	18	95	26	139	10	21	106	33	0	160	11
04:15 PM	32	68	3	39	142		2	18	88	37	145		28	103	37	0	168	
04:30 PM	38	84	4	32	158		0	9	96	28	133		41	116	34	2	193	
04:45 PM	42	100	19	44	205		0	9	116	26	151		32	89	34	1	156	
05:00 PM	32	101	15	45	193	12	0	14	110	21	145	8	27	120	37	1	185	11
05:15 PM	39	84	16	30	169		4	9	101	38	152		26	127	40	0	193	
05:30 PM	28	92	19	44	183		3	8	110	32	153		17	94	25	3	139	
05:45 PM	27	94	15	39	175		0	6	78	32	116		29	122	45	2	198	
<b>Totals</b>	<b>974</b>	<b>2675</b>	<b>260</b>	<b>986</b>	<b>4895</b>	<b>228</b>	<b>38</b>	<b>398</b>	<b>2645</b>	<b>722</b>	<b>3803</b>	<b>147</b>	<b>703</b>	<b>3697</b>	<b>1140</b>	<b>24</b>	<b>5564</b>	<b>192</b>
<b>ADT</b>	<b>1657</b>	<b>4550</b>	<b>442</b>	<b>1677</b>	<b>8326</b>	<b>388</b>	<b>65</b>	<b>677</b>	<b>4499</b>	<b>1228</b>	<b>6469</b>	<b>250</b>	<b>1196</b>	<b>6288</b>	<b>1939</b>	<b>41</b>	<b>9464</b>	<b>327</b>

Note: Truck volumes only available in hourly totals.

Hourly Factor:

Monthly Factor:

Combined Factor:

# 9-Hour Traffic Count Summary

Municipality: Shaker Heights  
 Date: 12/12/2017  
 Day: Tuesday  
 Weather: Snow

Intersection: Lee Road & Chagrin Boulevard & Kenyon Road

Lee Road Southbound						Kenyon Road Northwestbound					
Chagrin EB	Kenyon SEB	Lee SB	Chagrin WB	Total	Trk/ Bus	Lee SB	Chagrin WB	Lee NB	Chagrin EB	Total	Trk/ Bus
16	3	57	3	79	3	0	3	0	2	5	0
20	0	78	6	104		3	2	0	0	5	
19	2	84	9	114		3	1	0	2	6	
31	2	76	10	119		6	0	0	0	6	
25	3	100	7	135	31	1	2	0	0	3	2
25	2	87	11	125		7	3	0	0	10	
29	3	102	15	149		5	4	0	1	10	
33	4	88	7	132		4	4	0	1	9	
21	2	109	6	138	32	2	0	0	2	4	1
20	1	81	3	105		2	3	0	1	6	
18	2	90	5	115		2	1	1	0	4	
20	1	78	1	100		3	5	0	1	9	
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0		0	0	0	0	0	
0	0	0	0	0		0	0	0	0	0	
0	0	0	0	0		0	0	0	0	0	
14	5	65	7	91	36	3	2	1	1	7	0
18	3	65	11	97		4	2	0	2	8	
14	2	49	15	80		6	5	0	1	12	
17	2	79	7	105		2	2	1	2	7	
20	2	60	9	91	14	1	4	1	2	8	3
20	3	82	16	121		2	2	1	4	9	
20	0	72	19	111		3	4	0	0	7	
24	0	51	12	87		1	3	0	0	4	
9	3	55	12	79	17	2	1	0	2	5	1
22	3	61	14	100		0	2	0	2	4	
14	7	47	14	82		4	3	1	1	9	
28	3	79	9	119		3	4	0	1	8	
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0		0	0	0	0	0	
0	0	0	0	0		0	0	0	0	0	
0	0	0	0	0		0	0	0	0	0	
24	5	107	11	147	31	2	4	0	2	8	1
32	3	116	12	163		5	3	4	2	14	
32	4	130	15	181		5	0	0	4	9	
29	6	136	10	181		5	1	1	1	8	
32	6	134	19	191	23	3	4	1	1	9	3
28	5	130	14	177		8	3	1	2	14	
32	1	142	17	192		4	2	1	2	9	
36	5	139	17	197		6	0	2	3	11	
27	3	132	19	181	9	4	3	2	4	13	0
22	2	139	13	176		5	3	0	3	11	
22	4	143	13	182		3	5	2	5	15	
21	4	139	20	184		11	2	0	6	19	
<b>834</b>	<b>106</b>	<b>3382</b>	<b>408</b>	<b>4730</b>	<b>196</b>	<b>130</b>	<b>92</b>	<b>20</b>	<b>63</b>	<b>305</b>	<b>11</b>
<b>1418</b>	<b>180</b>	<b>5752</b>	<b>694</b>	<b>8044</b>	<b>333</b>	<b>221</b>	<b>156</b>	<b>34</b>	<b>107</b>	<b>518</b>	<b>19</b>

Note: Truck volumes only available in hourly totals.

Hourly Factor:

Monthly Factor:

Combined Factor:

# 9-Hour Traffic Count Summary

Municipality: Shaker Heights  
 Date: 12/08/2017  
 Day: Friday  
 Weather: Clear

Intersection: Lee Road & Lomond Boulevard

Start Time	Eastbound						Lomond Boulevard Westbound						Lee Road Northbound						Lee Road Southbound					
	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus
07:00 AM	0	0	0	0	0	0	4	0	11	15	0	0	0	155	14	169	3	8	7	80	0	87	3	1
07:15 AM	0	0	0	0	0	0	4	0	15	19	0	1	0	192	23	215	2	18	7	72	0	79	0	1
07:30 AM	0	0	0	0	0	0	5	0	27	32	0	2	0	196	26	222	4	6	9	109	0	118	3	1
07:45 AM	0	0	0	0	0	0	4	0	18	22	0	0	0	194	15	209	4	5	10	130	0	140	2	1
08:00 AM	0	0	0	0	0	0	5	0	24	29	0	1	0	164	23	187	4	3	23	122	0	145	0	2
08:15 AM	0	0	0	0	0	0	4	0	15	19	1	0	0	164	18	182	1	1	12	118	0	130	1	8
08:30 AM	0	0	0	0	0	0	6	0	17	23	2	0	0	155	13	168	5	3	19	115	0	134	4	1
08:45 AM	0	0	0	0	0	0	3	0	14	17	0	1	0	161	26	187	8	5	15	90	0	105	3	2
09:00 AM	0	0	0	0	0	0	11	0	21	32	0	0	0	133	25	158	5	1	15	117	0	132	3	3
09:15 AM	0	0	0	0	0	0	9	0	16	25	2	0	0	108	19	127	4	1	11	105	0	116	4	1
09:30 AM	0	0	0	0	0	0	6	0	19	25	1	0	0	137	22	159	5	2	17	117	0	134	3	2
09:45 AM	0	0	0	0	0	0	7	0	11	18	1	0	0	127	11	138	3	2	14	112	0	126	2	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	3	0	11	14	1	0	0	110	8	118	4	1	18	88	0	106	3	1
11:15 AM	0	0	0	0	0	0	3	0	18	21	3	0	0	138	19	157	4	3	10	98	0	108	4	1
11:30 AM	0	0	0	0	0	0	5	0	15	20	2	0	1	135	13	149	5	0	16	94	0	110	6	1
11:45 AM	0	0	0	0	0	0	2	0	7	9	0	0	0	129	17	146	2	3	22	129	0	151	9	0
12:00 PM	0	0	0	0	0	0	3	0	18	21	0	0	0	131	13	144	6	1	12	135	0	147	9	2
12:15 PM	0	0	0	0	0	0	5	0	12	17	0	0	0	136	15	151	5	0	13	128	0	141	5	1
12:30 PM	0	0	0	0	0	0	6	0	13	19	2	0	0	164	20	184	4	1	14	155	0	169	4	1
12:45 PM	0	0	0	0	0	0	9	0	9	18	0	0	1	120	8	129	1	1	23	156	0	179	6	3
01:00 PM	0	0	0	0	0	0	9	0	11	20	1	0	0	126	17	143	2	0	18	129	0	147	5	0
01:15 PM	0	0	0	0	0	0	4	0	9	13	1	0	0	158	11	169	4	2	12	127	0	139	5	1
01:30 PM	0	0	0	0	0	0	12	0	17	29	5	0	0	131	8	139	1	0	21	137	0	158	5	0
01:45 PM	0	0	0	0	0	0	10	0	14	24	9	0	0	135	25	160	8	1	14	120	0	134	2	1
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	9	0	19	28	1	0	0	153	26	179	1	0	35	152	0	187	10	2
03:15 PM	0	0	0	0	0	0	11	0	16	27	0	1	0	164	26	190	2	4	35	168	0	203	8	1
03:30 PM	0	0	0	0	0	0	10	0	17	27	0	0	0	178	29	207	2	4	17	201	0	218	2	3
03:45 PM	0	0	0	0	0	0	16	0	11	27	0	1	0	166	25	191	3	4	19	225	0	244	2	2
04:00 PM	0	0	0	0	0	0	10	0	17	27	1	0	0	126	11	137	1	2	26	215	0	241	4	3
04:15 PM	0	0	0	0	0	0	13	0	13	26	0	0	0	164	24	188	1	2	27	216	0	243	3	2
04:30 PM	0	0	0	0	0	0	8	0	19	27	0	0	0	167	20	187	2	1	28	218	0	246	5	5
04:45 PM	0	0	0	0	0	0	7	0	13	20	0	0	0	208	35	243	1	4	22	195	0	217	3	1
05:00 PM	0	0	0	0	0	0	9	0	14	23	0	0	0	184	33	217	1	2	29	184	0	213	0	1
05:15 PM	0	0	0	0	0	0	20	0	15	35	0	0	0	167	20	187	1	1	30	219	0	249	2	2
05:30 PM	0	0	0	0	0	0	15	0	9	24	0	0	0	174	31	205	1	0	25	210	0	235	1	1
05:45 PM	0	0	0	0	0	0	9	0	14	23	0	0	0	149	33	182	1	1	40	182	0	222	2	1
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>276</b>	<b>0</b>	<b>539</b>	<b>815</b>	<b>33</b>	<b>7</b>	<b>2</b>	<b>5499</b>	<b>722</b>	<b>6223</b>	<b>111</b>	<b>93</b>	<b>685</b>	<b>5168</b>	<b>0</b>	<b>5853</b>	<b>133</b>	<b>60</b>
<b>ADT</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>425</b>	<b>0</b>	<b>829</b>	<b>1254</b>	<b>51</b>	<b>11</b>	<b>3</b>	<b>8461</b>	<b>1111</b>	<b>9575</b>	<b>171</b>	<b>143</b>	<b>1054</b>	<b>7952</b>	<b>0</b>	<b>9006</b>	<b>205</b>	<b>92</b>

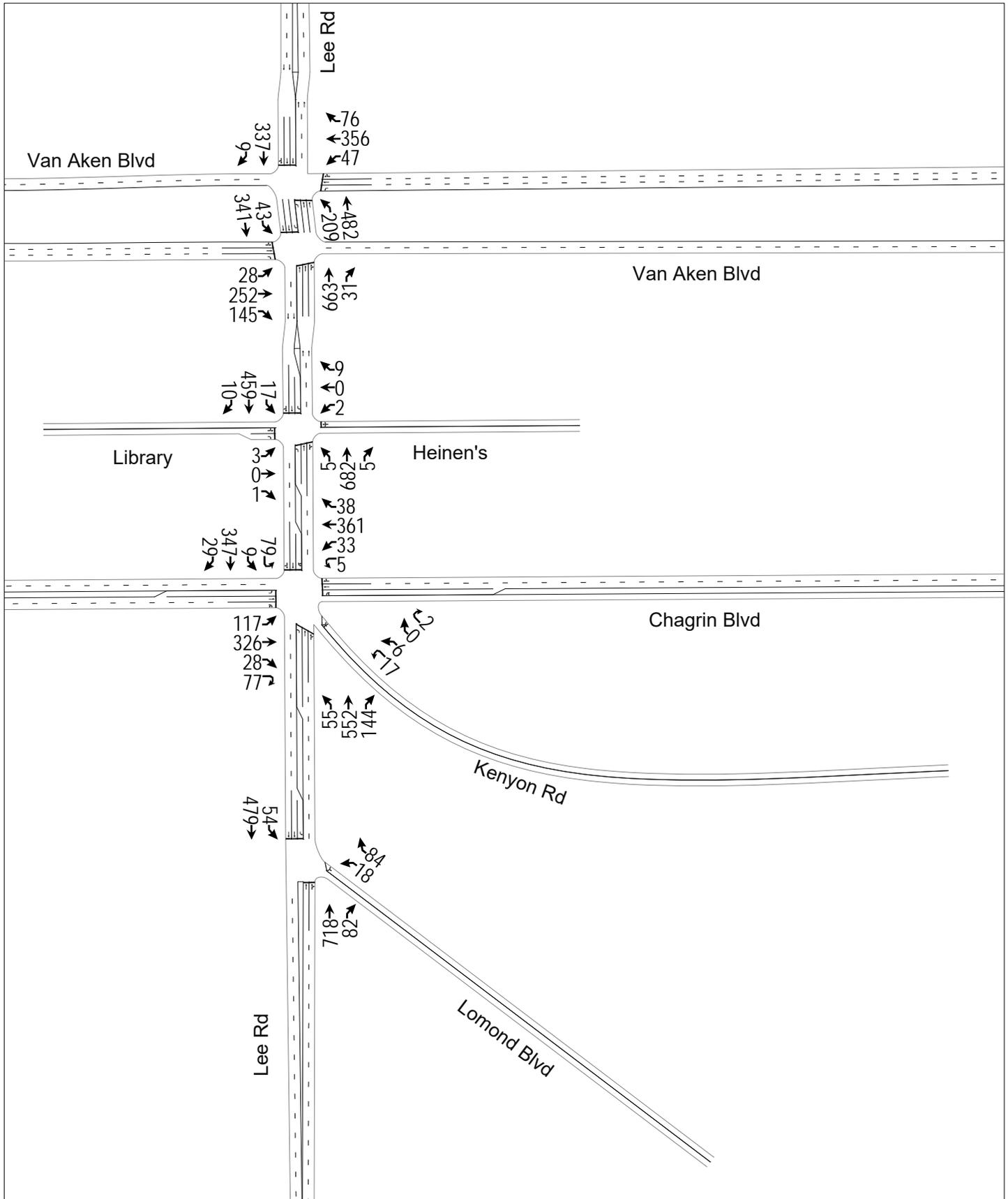
Hourly Factor: 1.689

Monthly Factor: 0.91

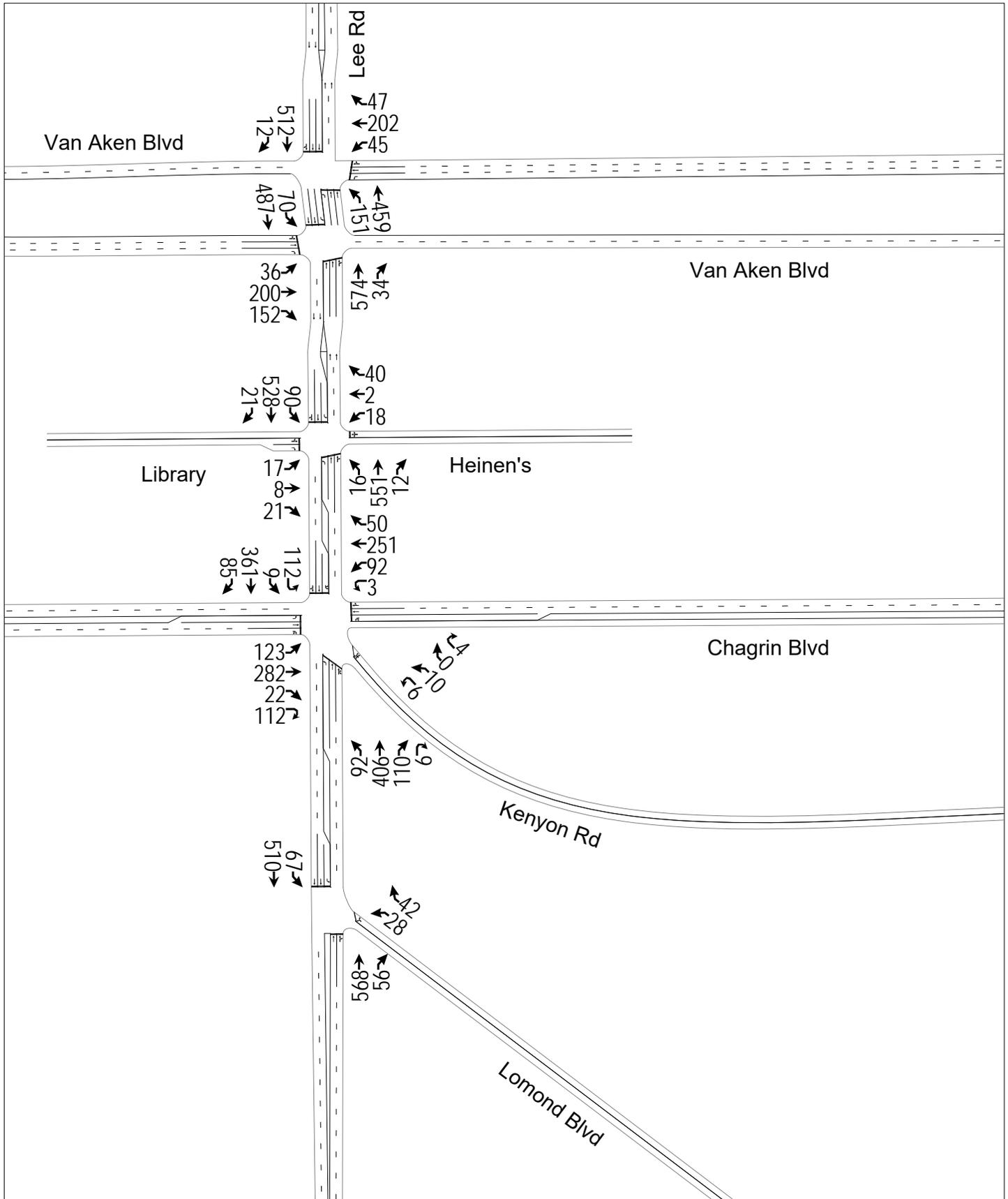
Combined Factor: 1.54

**APPENDIX C:  
ADJUSTED PEAK HOUR VOLUMES**

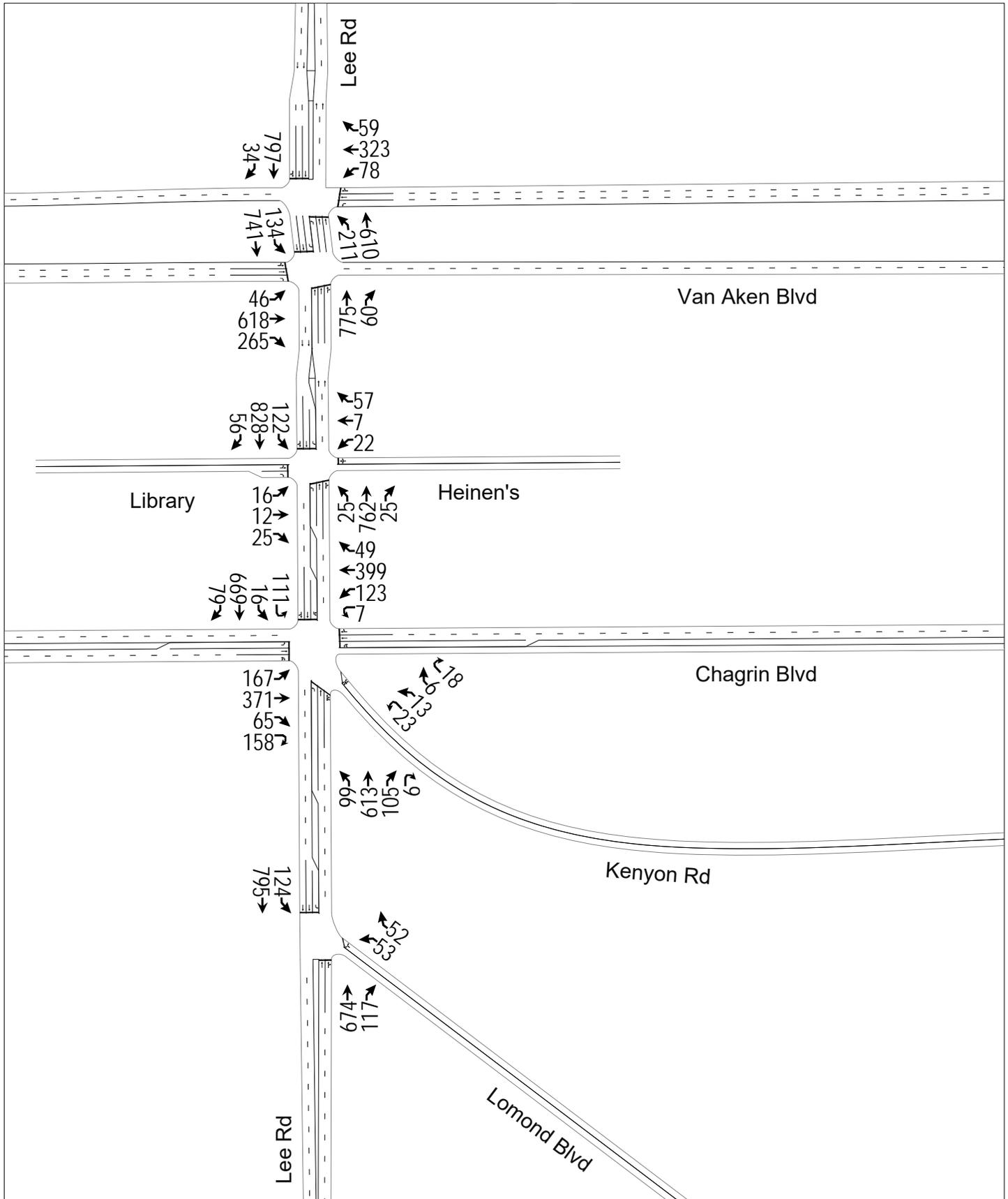
# Adjusted AM Peak Hour Volumes



# Adjusted Midday Peak Hour Volumes



# Adjusted PM Peak Hour Volumes



**APPENDIX D:  
SIGNAL AND SIGN DETAIL SHEETS**

### SIGNAL TIMING

INTERVAL	ø1	ø2	ø3	ø4				
MIN GREEN(AM)	10	5	10	10				
MIN GREEN(PM)	10	5	10	10				
MIN GREEN(OFF)	10	5	10	10				
PASSAGE	-	3.0	3.0	3.0				
YELLOW	3.0	3.0	3.0	3.0				
RED CLEAR	2.0	2.0	2.0	2.0				
MAX I (AM)	19	5	32	24				
MAX II (PM)	27	7	30	26				
MAX III (OFF)	24	6	25	25				
WALK	5	-	5	5				
PED CLEAR	12	-	19	19				
RECALL	MIN	NONE	NONE	NONE				
MEMORY	OFF	OFF	OFF	OFF				

**PREEMPT NOTES:**

- ACTIVE WALK INDICATIONS SHALL IMMEDIATELY GO TO "DON'T WALK" UPON RECEIVING PREEMPTION SIGNAL.
- IF ACTIVE PHASE CONFLICTS WITH PREEMPT PHASE CALLED, IT SHALL IMMEDIATELY TIME ITS YELLOW AND ALL RED CLEARANCES.
- IF ACTIVE PHASE = THE PREEMPT PHASE, THEN THE PHASE SHALL HOLD FOR THE DURATION OF THE PREEMPT SIGNAL.
- AFTER RELEASE FROM PREEMPT, YELLOW AND ALL RED CLEARANCE SHALL BE DISPLAYED AND RETURN PHASE SHALL BE ø1.
- IF PREEMPT PHASE = RETURN PHASE ø1 THEN YELLOW AND ALL RED CLEARANCE AFTER PREEMPT SHALL NOT BE DISPLAYED.

### SYSTEM COORDINATION TIMING

PATTERN	1	2	3
TIME OF DAY PATTERN	AM PEAK	PM PEAK	OFF PEAK
CYCLE LENGTH	100	110	100
OFFSET	0%	0%	0%
ø1	24%	29%	29%
ø2	10%	11%	11%
ø3	37%	32%	30%
ø4	29%	28%	30%

- PHASE SPLITS INCLUDE ALL GREEN PLUS YELLOW AND ALL RED.
- OFFSETS ARE REFERENCED TO THE BEGINNING OF ø1 YELLOW.

### LOOP DETECTOR CHART

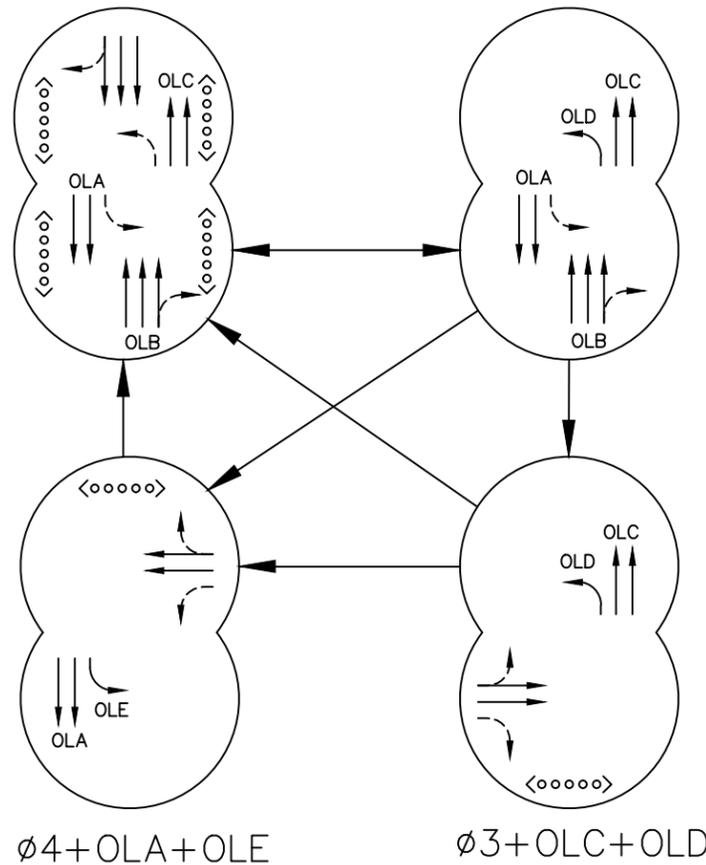
LOOP #	SIZE	# TURNS	MODE	DELAY	AMP #	PHASE	COMMENTS	LOCATION
L1	-	-	PRESENCE	0	1	2	EXISTING	S Int. NB Thru Left Lane
L2	-	-	PRESENCE	0	2	1	EXISTING	S Int. NB Thru Center Lane
L3	-	-	PRESENCE	0	3	1	EXISTING	S Int. NB Thru/Right
L4	-	-	PRESENCE	0	4	1	EXISTING	N Int. SB Thru Left Lane
L5	-	-	PRESENCE	0	5	1	EXISTING	N Int. SB Thru Center Lane
L6	-	-	PRESENCE	0	6	1	EXISTING	N Int. SB Thru/Right
L7	-	-	PRESENCE	0	7	3	EXISTING	S Int. EB Thru/Left
L8	-	-	PRESENCE	0	8	3	EXISTING	S Int. EB Thru
L9	-	-	PRESENCE	0	9	3	EXISTING	S Int. EB Right
L10	6'X30' PH	3+3	PRESENCE	0	10	4	RELOCATED*	N Int. WB Left
L11	6'X30' PH	3+3	PRESENCE	0	11	4	RELOCATED*	N Int. WB Thru
L12	6'X30' PH	3+3	PRESENCE	0	12	4	RELOCATED*	N Int. WB Thru/Right
L13	-	-	PRESENCE	0	13	SYS	EXISTING	N Int. NB Left Lane
L14	-	-	PRESENCE	0	14	SYS	EXISTING	N Int. NB Right Lane
L15	-	-	PULSE	0	15	SYS	EXISTING	S Int. EB Left Lane
L16	-	-	PULSE	0	16	SYS	EXISTING	S Int. EB Right Lane
L17	-	-	PULSE	0	17	SYS	EXISTING	N Int. WB Right Lane
L18	-	-	PULSE	0	18	SYS	EXISTING	N Int. WB Left Lane
L19	-	-	PULSE	0	19	SYS	EXISTING	S Int. SB Right Lane
L20	-	-	PULSE	0	20	SYS	EXISTING	S Int. SB Left Lane

\* SEE COUNTERMEASURES SECTION OF IMPLEMENTATION PLAN FOR RELOCATED LOOP LOCATIONS

### PHASING DIAGRAM

ø1+OLA+OLB+OLC  
RECALL

ø2+OLA+OLB+OLC+OLD



### FIELD WIRING HOOK-UP CHART

SIGNAL HEAD	INDICATION	FIELD TERMINAL	FLASH	SIGNAL HEAD	INDICATION	FIELD TERMINAL	FLASH
A (NB L) (N Int.)	R	OLC R	R	B (NB) (N Int.)	R	OLC R	R
	Y	OLC Y			Y	OLC Y	
	G	OLC G			G	OLC G	
	øY	OLD øY					
	øG	OLD øG					
C&D (NB) (S Int.)	R	OLB R	R	G&H (SB) (N Int.)	R	ø1 R	R
	Y	OLB Y			Y	ø1 Y	
	G	OLB G			G	ø1 G	
	R	OLA R			R	OLA R	
E(SB L) (S Int.)	Y	OLA Y	R	F (SB) (S Int.)	Y	OLA Y	R
	G	OLA G			G	OLA G	
	øY	OLE øY					
	øG	OLE øG					
L&K (WB)	R	ø4 R	R	M&N (EB)	R	ø3 R	R
	Y	ø4 Y			Y	ø3 Y	
	G	ø4 G			G	ø3 G	
W-W (WEST)	DW	ø1P R	OFF	X-X (NORTH)	DW	ø4P R	OFF
	W	ø1P G			W	ø4P G	
Y-Y (EAST)	DW	ø1P R	OFF	Z-Z (SOUTH)	DW	ø3P R	OFF
	W	ø1P G			W	ø3P G	OFF



TRAFFIC SIGNAL DETAILS  
LEE RD. & VAN AKEN BLVD.

CITY OF  
SHAKER HEIGHTS

LEE AND LIBRARY/HEINEN'S

LEE AND CHAGRIN/KENYON

LEE AND LOMOND

SIGNAL TIMING								
INTERVAL	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8
MIN GREEN(AM)	7	51		10	7	52		10
MIN GREEN(PM)	7	52		10	7	58		10
MIN GREEN(OFF)	7	44		10	7	48		10
PASSAGE	3.0	-		3.0	3.0	-		3.0
YELLOW	3.0	3.0		3.0	3.0	3.0		3.0
RED CLEAR	2.0	2.0		2.0	2.0	2.0		2.0
MAX I (AM)	10	51		24	9	52		24
MAX II (PM)	15	52		28	9	58		28
MAX III (OFF)	13	44		28	9	48		28
WALK	-	5		5	-	5		5
PED CLEAR	-	12		19	-	12		19
RECALL	NONE	MIN		NONE	NONE	MIN		NONE
MEMORY	OFF	OFF		OFF	OFF	OFF		OFF
LOOPS	SB L	-		EB T(2)	NB L	-		WB T

SIGNAL TIMING								
INTERVAL	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8
MIN GREEN(AM)	7	29	7	10	7	29	7	10
MIN GREEN(PM)	7	32	7	10	7	33	7	10
MIN GREEN(OFF)	7	26	7	10	7	28	7	10
PASSAGE	3.0	-	3.0	3.0	3.0	-	3.0	3.0
YELLOW	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
RED CLEAR	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MAX I (AM)	7	29	7	25	7	29	7	25
MAX II (PM)	8	32	7	31	7	33	7	31
MAX III (OFF)	9	26	7	26	7	28	7	26
WALK	-	5	-	5	-	5	-	5
PED CLEAR	-	23	-	20	-	23	-	20
RECALL	NONE	MIN	NONE	NONE	NONE	MIN	NONE	NONE
MEMORY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LOOPS	SB L	-	EB/WB L	EB T/EB R	NB L	-	NWB T	WB T

SIGNAL TIMING								
INTERVAL	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8
MIN GREEN(AM)	7	48				62		10
MIN GREEN(PM)	7	53				72		10
MIN GREEN(OFF)	7	46				62		10
PASSAGE	3.0	-				-		3.0
YELLOW	3.0	3.0				3.0		3.0
RED CLEAR	2.0	2.0				2.0		2.0
MAX I (AM)	9	48				62		28
MAX II (PM)	14	53				72		28
MAX III (OFF)	11	46				62		28
WALK	-	5				5		5
PED CLEAR	-	22				22		19
RECALL	NONE	MIN				MIN		NONE
MEMORY	OFF	OFF				OFF		OFF
LOOPS	SB L	-				-		WB T

SYSTEM COORDINATION TIMING			
PATTERN	1	2	3
TIME OF DAY PATTERN	AM PEAK	PM PEAK	OFF PEAK
CYCLE LENGTH	100	110	100
OFFSET	4%	38%	29%
ø1	15%	18%	18%
ø2	56%	52%	49%
ø3	-	-	-
ø4	29%	30%	33%
ø5	14%	13%	14%
ø6	57%	57%	53%
ø7	-	-	-
ø8	29%	30%	33%

SYSTEM COORDINATION TIMING			
PATTERN	1	2	3
TIME OF DAY PATTERN	AM PEAK	PM PEAK	OFF PEAK
CYCLE LENGTH	100	110	100
OFFSET	93%	2%	93%
ø1	12%	12%	14%
ø2	34%	34%	31%
ø3	12%	11%	12%
ø4	30%	32%	31%
ø5	12%	11%	12%
ø6	34%	35%	33%
ø7	12%	11%	12%
ø8	30%	32%	31%

SYSTEM COORDINATION TIMING			
PATTERN	1	2	3
TIME OF DAY PATTERN	AM PEAK	PM PEAK	OFF PEAK
CYCLE LENGTH	100	110	100
OFFSET	24%	37%	3%
ø1	14%	17%	16%
ø2	53%	53%	51%
ø3	-	-	-
ø4	-	-	-
ø5	-	-	-
ø6	67%	70%	67%
ø7	-	-	-
ø8	33%	30%	33%

1. PHASE SPLITS INCLUDE ALL GREEN PLUS YELLOW AND ALL RED.
2. OFFSETS ARE REFERENCED TO THE BEGINNING OF ø2 + ø6 YELLOW.

1. PHASE SPLITS INCLUDE ALL GREEN PLUS YELLOW AND ALL RED.
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1. PHASE SPLITS INCLUDE ALL GREEN PLUS YELLOW AND ALL RED.
2. OFFSETS ARE REFERENCED TO THE BEGINNING OF ø2 + ø6 YELLOW.



TRAFFIC SIGNAL TIMING  
LEE RD. CORRIDOR

CITY OF  
SHAKER HEIGHTS



DRAWING NAME: NAME  
PLOT SCALE: SCALE  
PLOT DATE: DATE

the acquisition and installation of a generic preemption system as determined by the lowest contract bid price. In addition to obtaining generic bids, a local governmental agency may request alternate bids if they desire a specific brand of preemption equipment and agree to pay any extra cost above the generic bid price. A Plan Note specifying three different preemption systems by manufacturer and model is equivalent to a generic bid item.

When a municipality adds intersections to its existing preempt system, it can obtain the same type of equipment by either the use of alternate bids or, if justified, proprietary bids.

For proprietary bids to be considered justified, the existing preempt system must control an appreciable part of the municipality's intersections before it can be considered to represent the municipality's standard. As a measure of this standard, the existing system must constitute at least fifty percent of the signalized intersections of a municipality. If this test is met, a proprietary bid requested by the municipality will be given consideration. Otherwise, alternate bids may be used to limit **State** and **Federal** participation to the generic system costs.

#### 403-6.3 Preemption Emitters

The quantity of vehicle hardware provided with the system shall be as determined by the municipality, but should not exceed three emitters for each signalized intersection which will be equipped with preemption as a part of the project. Only fire, emergency medical, police and transit vehicles are eligible to be equipped. If alternate bids are used and the desired system utilizes vehicle-mounted emitters, the cost of this hardware shall be included in the alternate bid cost for comparison to the generic bids.

#### 403-6.4 Local Maintaining Agency Policies

As a requirement for inclusion of vehicle preemption equipment in the contract, the local governmental agency shall have policies for the use of preemption. For safety forces, the policies shall specify the types of emergency calls for which preemption may be employed and shall define any use of preemption when lights and sirens are not simultaneously employed. For transit vehicles, the policies shall define when and under what conditions the preemption may be employed.

When possible, municipalities are strongly encouraged to develop signal preemption policies which coordinate with surrounding **City**, **County** and **Township** forces. They should take into account mutual aid agreements, access to hospitals and transit where a vehicle operates outside of its normal jurisdiction.

#### 403-7 Flashing Yellow Arrow (FYA) Operation

The **OMUTCD Section 4D.18** permits the use of a flashing yellow arrow (FYA) indication on applicable protected/permissive left-turn phases. However, the FYA indication shall not be used with traffic control signals on **ODOT**-maintained highways until such time as design and traffic signal cabinet standards approved by the **Offices of Roadway Engineering (ORE) and Traffic Operations (OTO)** have been developed and tested, and educational materials on the intended use of this new signal indication have been made available to the public.

Once the cabinet standards have been developed and tested, permission for pilot installation of the FYA may only be granted by **OTO** on a case-by-case basis to monitor and determine any crash and safety benefits. An education campaign shall be part of any project introducing this device in an area, and as noted in **OMUTCD Section 4D.18**, the LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-H12c) sign shall be used with the FYA for at least five years (see **OMUTCD Figure 4D-7**).

#### 403-8 SIGNAL OPERATION CHANGED Sign (W23-H2a, W23-H2b)

Concurrent with the actuation of any new signal operation which alters the sequence of the signal

displays from the existing operation, a SIGNAL OPERATION CHANGED sign (W23-H2a or W23-H2b) shall be installed. The signs shall be displayed for a minimum of fourteen days and a maximum of thirty days.

The W23-H2a sign shall be installed on all approaches to an intersection and the W23-H2b sign shall be installed on the span wire or mast arm adjacent to the signal heads.

The following are examples of signal operation modifications which would normally warrant installation of the sign:

1. Installation of a protected left turn
2. Switching from a lead to lagging left turn (or vice versa).
3. Installation of a split phase where two directions used to run together or removal of a split phase where two directions used to run separately.

The following are examples of signal operation modifications which normally do not warrant installation of the sign:

1. Installation of a NO TURN ON RED sign.
2. Actuated phase being set to min (max) recall due to detector malfunction. Any deviation shall be made only with approval from the **Office of Traffic Operations (OTO)**.

#### **403-9 Yellow Trap**

Yellow Trap is a term used to describe a condition which occurs during certain yellow change intervals. During a Yellow Trap event, drivers facing a CIRCULAR YELLOW signal indication are mistakenly led to complete their movement in order to clear the intersection by the display of the CIRCULAR YELLOW signal indication. What they fail to realize is that opposing motor vehicles are facing a CIRCULAR GREEN signal indication and not a CIRCULAR YELLOW signal indication. This condition can occur under the following conditions:

1. When Protected/Permissive Left-Turn Signal Face Displays are used and the sequence is changing from a concurrent through movement to a through and left-turn movement in the same direction of travel (lagging left turn).
2. During a transition into preemption, with or without Protected/Permissive Left-Turn Signal Face Displays and the sequence is changing from a concurrent through movement to a through and left-turn movement in the same direction of travel (lagging left turn).

Depending on the nature of the yellow trap condition, it may be necessary to address the condition in order to implement the desired signal sequence. The following are examples of methods which may be used to resolve the yellow trap condition:

1. Left-turn signal face displays on an approach to the intersection where yellow trap occurs can be changed to Protected Only displays.
2. Opposing movements may be reconfigured to provide exclusive or "split" phase sequencing.
3. During a transition into preemption, the controller sequence may be designed such that both directions of travel transition to red before the display of a green indication on a single approach. This ensures that there is a simultaneous display of CIRCULAR YELLOW on both approaches prior to the display of green on a single approach.

The use of W25-1 and W25-2 signs (ONCOMING TRAFFIC HAS EXTENDED GREEN and ONCOMING TRAFFIC MAY HAVE EXTENDED GREEN, respectively) are not recommended by **ODOT** to resolve a yellow trap condition.

# STANDARD SIGN DESIGN

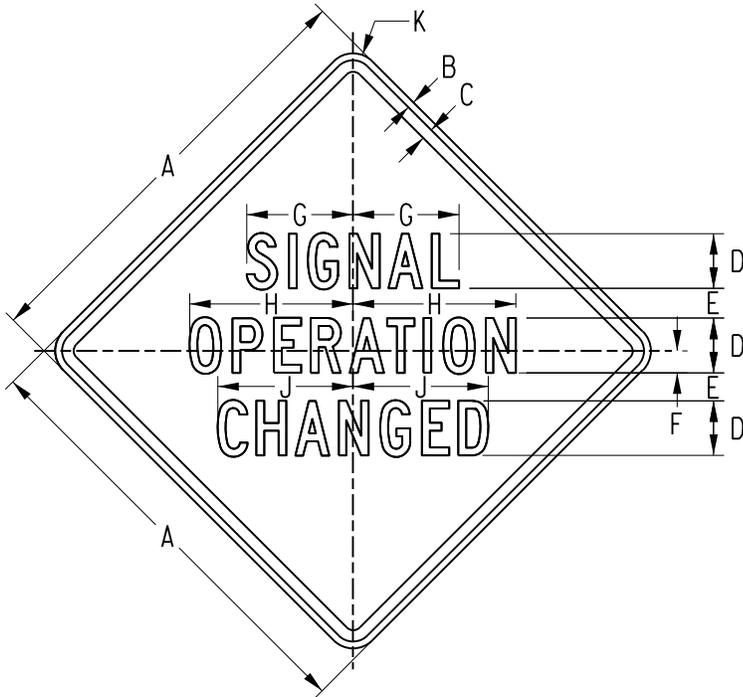
## ODOT - OFFICE OF TRAFFIC OPERATIONS

DATE: 01/20/12

COLORS: BLACK ON YELLOW

SERIES: WARNING

CODE NO.: W23-H2a



ALL DIMENSIONS SHOWN IN INCHES

A	B	C	D	E	F	G	H	J	K
36	0.625	0.875	5C	3	1	9.689	14.92	12.39	2.25
48	0.75	1.25	6D	4	1	14.087	21.586	18.07	3

# STANDARD SIGN DESIGN

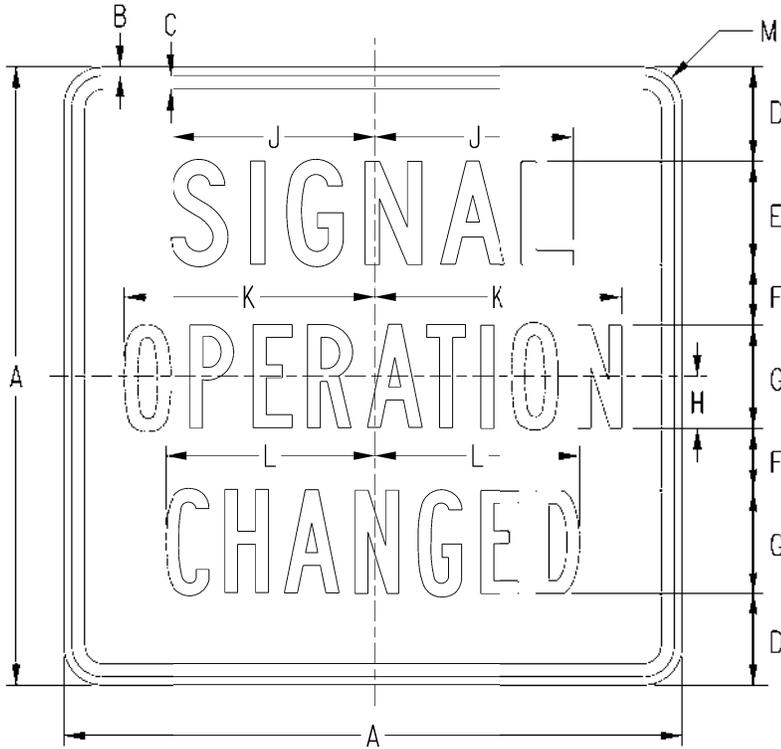
## ODOT - OFFICE OF TRAFFIC OPERATIONS

DATE: 01/20/12

COLORS: BLACK ON YELLOW

SERIES: WARNING

CODE NO.: W23-H2b



ALL DIMENSIONS SHOWN IN INCHES

A	B	C	D	E	F	G	H	J	K	L	M
30	0.5	0.75	4.5	5C	3	5B	2.5	9.689	12.059	9.971	1.875

# STANDARD SIGN DESIGN

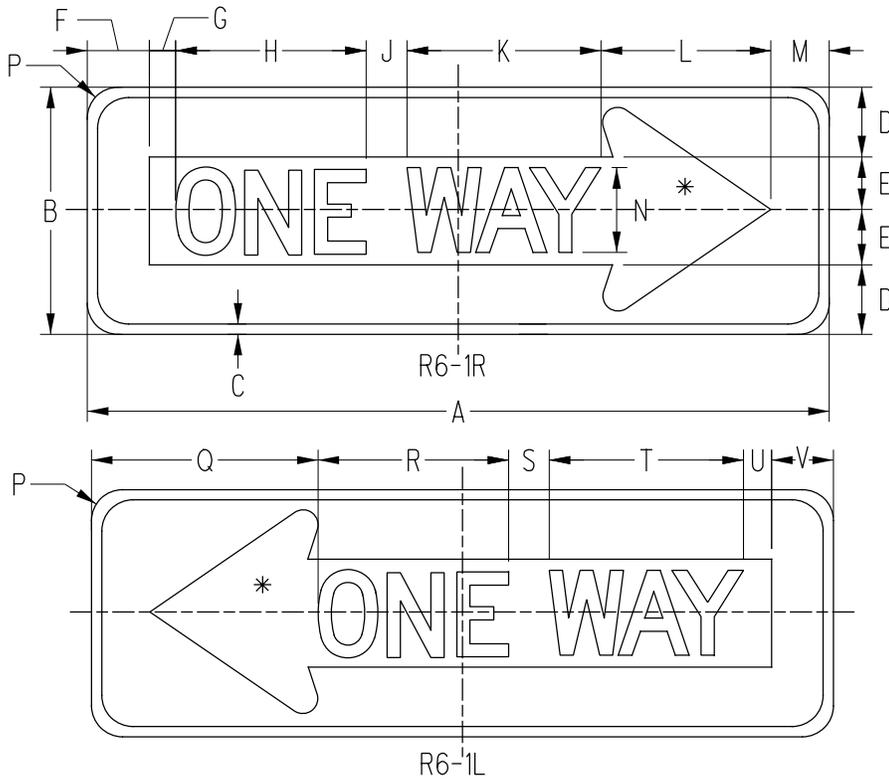
## ODOT - OFFICE OF TRAFFIC OPERATIONS

DATE: 07/17/09

COLORS: SEE BELOW

SERIES: REGULATORY

CODE NO.: R6-1



COLORS-  
 BACKGROUND & LEGEND: BLACK  
 ARROW & OUTLINE: WHITE



\*SEE APPENDIX A FOR STANDARD ARROW DETAILS

ALL DIMENSIONS SHOWN IN INCHES

A	B	C	D	E	F	G	H	J	K	L	M
36	12	0.5	3.375	2.625	3	1.25	9.125	2	9.625	9	2
54	18	0.5	5.5	3.5	5	4	12.309	2.929	12.762	13	4
72	24	0.5	6.75	5.25	6	2.5	18.25	4	19.25	18	4

N	P	Q	R	S	T	U	V
4D	1.5	11	9.125	2	9.625	1.25	3
5D	1.5	17	12.309	2.929	12.762	4	5
8D	1.5	22	18.25	4	19.25	2.5	6

# STANDARD SIGN DESIGN

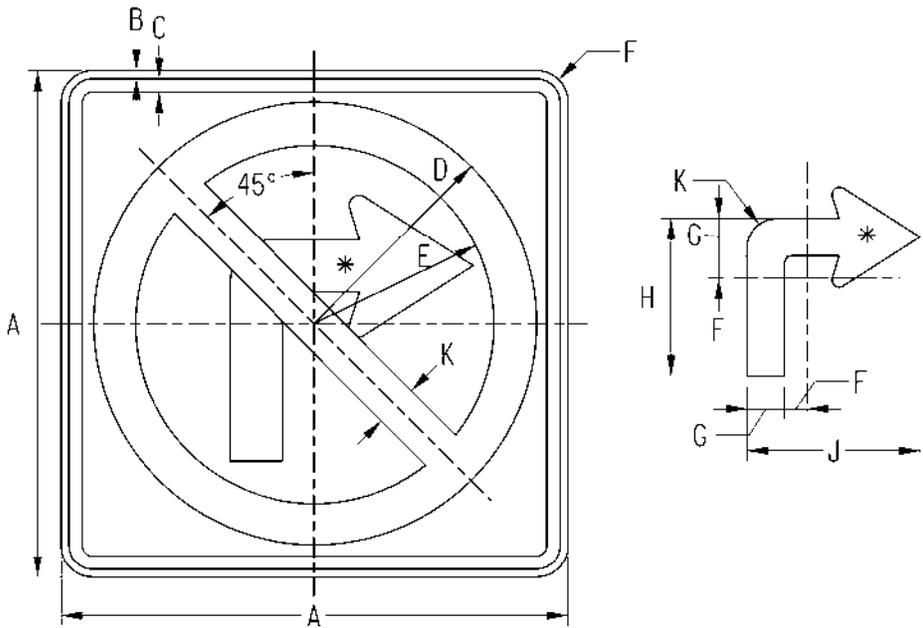
## ODOT - OFFICE OF TRAFFIC OPERATIONS

DATE: 04/16/04

COLORS: SEE BELOW

SERIES: REGULATORY

CODE NO.: R3-1



COLORS-  
 CIRCLE & DIAGONAL: RED  
 BORDER & SYMBOL: BLACK  
 BACKGROUND: WHITE



\*SEE APPENDIX A FOR STANDARD ARROW DETAILS

ALL DIMENSIONS SHOWN IN INCHES

A	B	C	D	E	F	G	H	J	K
24	0.375	0.625	10.5	8.5	1.5	2.5	10.5	11.5	2
30	0.5	0.75	13.125	10.625	1.875	3.125	13.125	14.5	2.5
36	0.625	0.875	15.75	12.75	2.25	3.75	15.75	17.25	3
48	0.75	1.25	21	17	3	5	21	23	4

# STANDARD SIGN DESIGN

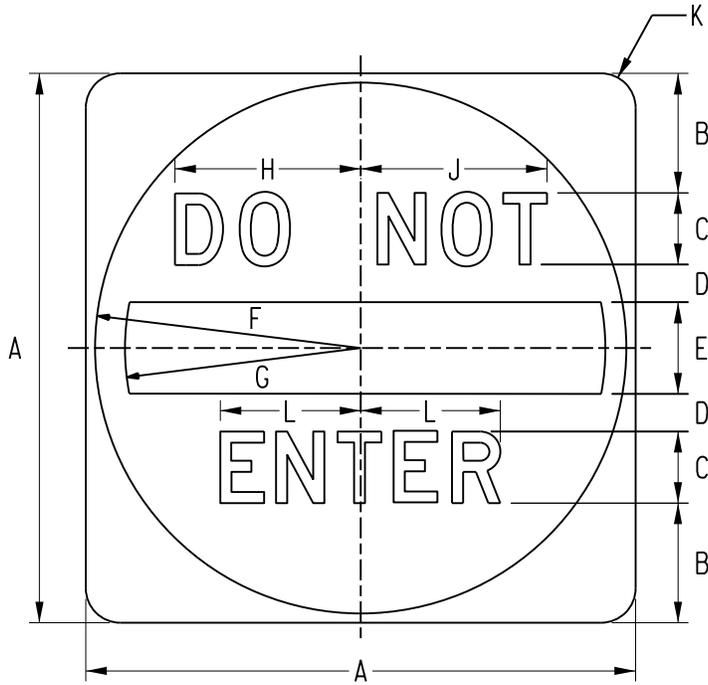
## ODOT - OFFICE OF TRAFFIC OPERATIONS

DATE: 07/20/07

COLORS: SEE BELOW

SERIES: REGULATORY

CODE NO.: R5-1



COLORS-  
BACKGROUND/LEGEND: WHITE  
SYMBOL: RED



ALL DIMENSIONS SHOWN IN INCHES

A	B	C	D	E	F	G	H	J	K	L
30	6.5	4D	2	5	14.5	12.5	9.75	10	1.875	7.875
36	7.5	5D	2.5	6	17.5	15	12	12.375	2.25	9.813
48	11	6D	3	8	23.5	20	14.5	15	3	11.75

# STANDARD SIGN DESIGN

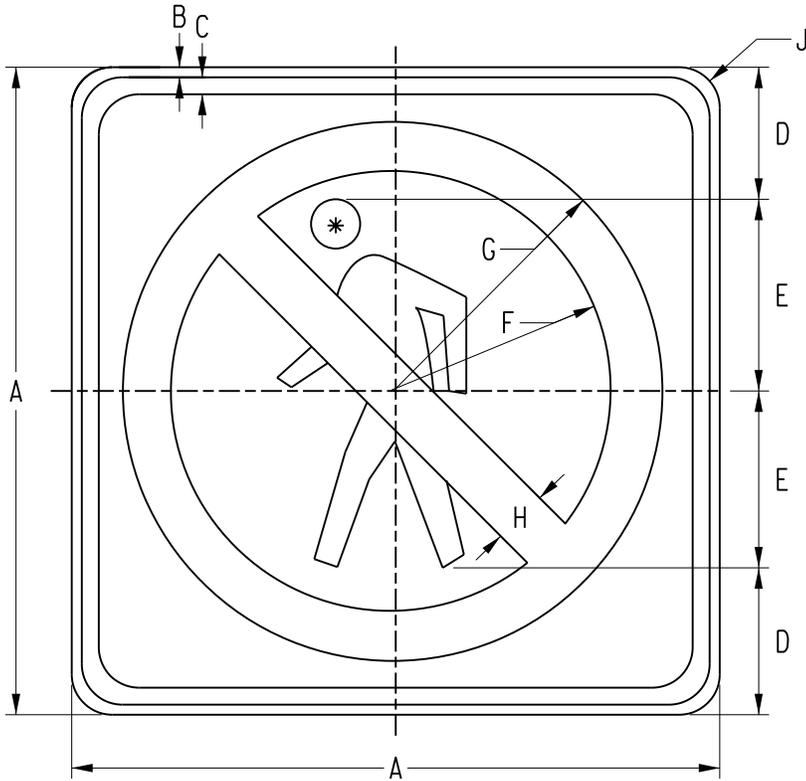
## ODOT - OFFICE OF TRAFFIC OPERATIONS

DATE: 04/20/12

COLORS: SEE BELOW

SERIES: REGULATORY

CODE NO.: R9-3



COLORS-  
 BORDER, CIRCLE & DIAGONAL: RED  
 SYMBOL: BLACK  
 BACKGROUND: WHITE



\*SEE APPENDIX A FOR PEDESTRIAN SYMBOL DESIGN

ALL DIMENSIONS SHOWN IN INCHES DOWN IN INCHES

A	B	C	D	E	F	G	H	J
18	0.375	0.625	3.5	5.5	6.375	7.875	1.5	1.5
24	0.375	0.625	4.5	7.5	8.5	10.5	2	1.5
30	0.5	0.75	5.75	9.25	10.625	13.063	2.5	1.875



## **APPENDIX E: SYNCHRO RESULTS**

Lanes, Volumes, Timings  
101: Lee Rd & Lomond Blvd

Recommended Countermeasures  
Timing Plan: AM Peak (7:30)

	↑	↖	↙	↓	↘	↗
Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations	↑↑		↖	↑↑	↘	
Traffic Volume (vph)	718	82	54	479	18	84
Future Volume (vph)	718	82	54	479	18	84
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	80		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.985				0.889	
Flt Protected			0.950		0.991	
Satd. Flow (prot)	3486	0	1597	3539	1532	0
Flt Permitted			0.299		0.991	
Satd. Flow (perm)	3486	0	503	3539	1532	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	17				91	
Link Speed (mph)	25			25	25	
Link Distance (ft)	785			521	1059	
Travel Time (s)	21.4			14.2	28.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	13%	2%	6%	10%
Adj. Flow (vph)	780	89	59	521	20	91
Shared Lane Traffic (%)						
Lane Group Flow (vph)	869	0	59	521	111	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	0		1	0	1	
Detector Template						
Leading Detector (ft)	0		37	0	60	
Trailing Detector (ft)	0		-3	0	0	
Detector 1 Position(ft)	0		-3	0	0	
Detector 1 Size(ft)	6		40	6	60	
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	8	
Permitted Phases			6			
Detector Phase	2		1	6	8	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	33.0		12.0	15.0	29.0	

Lanes, Volumes, Timings  
101: Lee Rd & Lomond Blvd

Recommended Countermeasures

Timing Plan: AM Peak (7:30)

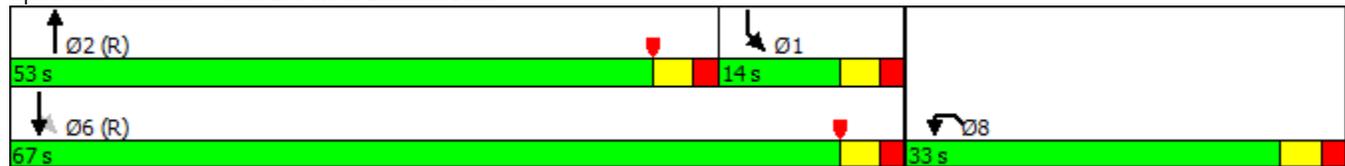


Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Total Split (s)	53.0		14.0	67.0	33.0	
Total Split (%)	53.0%		14.0%	67.0%	33.0%	
Maximum Green (s)	48.0		9.0	62.0	28.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Max		None	C-Max	None	
Walk Time (s)	5.0			0.0	5.0	
Flash Dont Walk (s)	22.0			0.0	19.0	
Pedestrian Calls (#/hr)	0			0	0	
Act Effect Green (s)	68.3		79.5	79.5	10.5	
Actuated g/C Ratio	0.68		0.80	0.80	0.10	
v/c Ratio	0.36		0.12	0.19	0.46	
Control Delay	7.7		1.4	1.0	19.2	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	7.7		1.4	1.0	19.2	
LOS	A		A	A	B	
Approach Delay	7.7			1.0	19.2	
Approach LOS	A			A	B	
90th %ile Green (s)	63.7		9.0	77.7	12.3	
90th %ile Term Code	Coord		Hold	Coord	Gap	
70th %ile Green (s)	66.0		9.0	80.0	10.0	
70th %ile Term Code	Coord		Hold	Coord	Min	
50th %ile Green (s)	66.0		9.0	80.0	10.0	
50th %ile Term Code	Coord		Hold	Coord	Min	
30th %ile Green (s)	66.0		9.0	80.0	10.0	
30th %ile Term Code	Coord		Hold	Coord	Min	
10th %ile Green (s)	80.0		0.0	80.0	10.0	
10th %ile Term Code	Coord		Skip	Coord	Min	
Stops (vph)	315		4	35	30	
Fuel Used(gal)	8		0	2	1	
CO Emissions (g/hr)	545		19	165	100	
NOx Emissions (g/hr)	106		4	32	19	
VOC Emissions (g/hr)	126		4	38	23	
Dilemma Vehicles (#)	0		0	0	0	
Queue Length 50th (ft)	115		2	10	12	
Queue Length 95th (ft)	162		5	15	63	
Internal Link Dist (ft)	705			441	979	
Turn Bay Length (ft)			80			
Base Capacity (vph)	2387		498	2815	494	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.36		0.12	0.19	0.22	

Intersection Summary

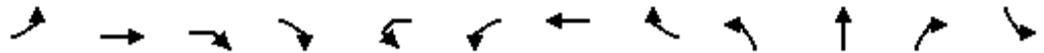
Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	21 (21%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.46
Intersection Signal Delay:	6.0
Intersection LOS:	A
Intersection Capacity Utilization	49.1%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 101: Lee Rd & Lomond Blvd



Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: AM Peak (7:30)



Lane Group	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2
Lane Configurations												
Traffic Volume (vph)	117	326	28	77	5	33	361	38	55	552	144	79
Future Volume (vph)	117	326	28	77	5	33	361	38	55	552	144	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		0			350		0	150		0	
Storage Lanes	1		1			1		0	1		0	
Taper Length (ft)	25					25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Frt			0.850				0.986			0.969		
Flt Protected	0.950					0.950			0.950			
Satd. Flow (prot)	1787	1845	1591	0	0	1742	3432	0	1787	3396	0	0
Flt Permitted	0.365					0.216			0.460			
Satd. Flow (perm)	687	1845	1591	0	0	396	3432	0	865	3396	0	0
Right Turn on Red				Yes				Yes				
Satd. Flow (RTOR)			175				11					
Link Speed (mph)		25					25			25		
Link Distance (ft)		1469					1615			521		
Travel Time (s)		40.1					44.0			14.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	3%	3%	1%	1%	4%	4%	1%	1%	3%	3%	1%
Adj. Flow (vph)	127	354	30	84	5	36	392	41	60	600	157	86
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	354	114	0	0	41	433	0	60	757	0	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Right	Left	Left	Left	Right	Left	Left	Right	Left
Median Width(ft)		12					12			12		
Link Offset(ft)		0					0			0		
Crosswalk Width(ft)		16					16			16		
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	9	15	15		9	15		9	15
Number of Detectors	1	1	1		1	1	1		1	0		1
Detector Template			Right		Left	Left						Left
Leading Detector (ft)	20	20	20		20	20	20		20	0		20
Trailing Detector (ft)	-10	0	0		0	0	0		-10	0		0
Detector 1 Position(ft)	-10	0	0		0	0	0		-10	0		0
Detector 1 Size(ft)	30	20	20		20	20	20		30	6		20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0
Turn Type	pm+pt	NA	Perm		pm+pt	pm+pt	NA		pm+pt	NA		pm+pt
Protected Phases	3	4			3	3	4		5	2		1
Permitted Phases	4		4		4	4			2			6
Detector Phase	3	4	4		3	3	4		5	2		1
Switch Phase												
Minimum Initial (s)	7.0	10.0	10.0		7.0	7.0	10.0		7.0	10.0		7.0
Minimum Split (s)	12.0	30.0	30.0		12.0	12.0	30.0		12.0	24.0		12.0

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

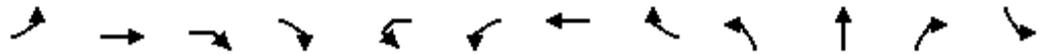
Recommended Countermeasures  
Timing Plan: AM Peak (7:30)



Lane Group	SBL	SBT	SBR	NWL2	NWL	NWR2
Lane Configurations						
Traffic Volume (vph)	9	347	29	17	6	2
Future Volume (vph)	9	347	29	17	6	2
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0		0	
Storage Lanes	1		0		1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt		0.988			0.990	
Flt Protected	0.950				0.956	
Satd. Flow (prot)	1783	3468	0	0	1771	0
Flt Permitted	0.228				0.956	
Satd. Flow (perm)	428	3468	0	0	1771	0
Right Turn on Red			Yes			Yes
Satd. Flow (RTOR)		9			185	
Link Speed (mph)		25			25	
Link Distance (ft)		339			1456	
Travel Time (s)		9.2			39.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	1%	1%	3%	1%
Adj. Flow (vph)	10	377	32	18	7	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	96	409	0	0	27	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12	
Link Offset(ft)		0			0	
Crosswalk Width(ft)		16			16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15	15	9
Number of Detectors	1	0		1	1	
Detector Template				Left	Left	
Leading Detector (ft)	20	0		20	30	
Trailing Detector (ft)	-10	0		0	0	
Detector 1 Position(ft)	-10	0		0	0	
Detector 1 Size(ft)	30	6		20	30	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		Prot	Prot	
Protected Phases	1	6		7	7	
Permitted Phases	6					
Detector Phase	1	6		7	7	
Switch Phase						
Minimum Initial (s)	7.0	10.0		7.0	7.0	
Minimum Split (s)	12.0	33.0		12.0	12.0	

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: AM Peak (7:30)



Lane Group	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2
Total Split (s)	12.0	30.0	30.0		12.0	12.0	30.0		12.0	34.0		12.0
Total Split (%)	12.0%	30.0%	30.0%		12.0%	12.0%	30.0%		12.0%	34.0%		12.0%
Maximum Green (s)	7.0	25.0	25.0		7.0	7.0	25.0		7.0	29.0		7.0
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0			5.0	5.0		5.0	5.0		
Lead/Lag	Lead	Lag	Lag		Lead	Lead	Lag		Lead	Lag		Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	None		None	None	None		None	C-Max		None
Walk Time (s)		5.0	5.0				5.0			5.0		
Flash Dont Walk (s)		20.0	20.0				20.0			14.0		
Pedestrian Calls (#/hr)		0	0				0			0		
Act Effect Green (s)	29.9	22.9	22.9			29.9	22.9		44.4	38.2		
Actuated g/C Ratio	0.30	0.23	0.23			0.30	0.23		0.44	0.38		
v/c Ratio	0.45	0.84	0.23			0.19	0.55		0.13	0.58		
Control Delay	28.0	54.8	2.1			22.9	35.4		14.3	23.7		
Queue Delay	0.0	0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	28.0	54.8	2.1			22.9	35.4		14.3	23.7		
LOS	C	D	A			C	D		B	C		
Approach Delay		39.0					34.4			23.0		
Approach LOS		D					C			C		
90th %ile Green (s)	7.0	25.0	25.0		7.0	7.0	25.0		8.0	29.0		8.0
90th %ile Term Code	Max	Max	Max		Max	Max	Max		Max	Coord		Max
70th %ile Green (s)	7.0	25.0	25.0		7.0	7.0	25.0		8.0	29.0		8.0
70th %ile Term Code	Max	Max	Max		Max	Max	Max		Max	Coord		Max
50th %ile Green (s)	7.0	25.0	25.0		7.0	7.0	25.0		7.8	29.0		8.0
50th %ile Term Code	Max	Max	Max		Max	Max	Max		Gap	Coord		Max
30th %ile Green (s)	7.0	22.4	22.4		7.0	7.0	22.4		7.0	43.2		7.4
30th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Min	Coord		Gap
10th %ile Green (s)	7.0	17.1	17.1		7.0	7.0	17.1		0.0	60.9		0.0
10th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Skip	Coord		Skip
Stops (vph)	84	297	3			26	329		22	524		
Fuel Used(gal)	2	9	1			1	10		0	8		
CO Emissions (g/hr)	171	619	96			56	672		34	591		
NOx Emissions (g/hr)	33	120	19			11	131		7	115		
VOC Emissions (g/hr)	40	143	22			13	156		8	137		
Dilemma Vehicles (#)	0	0	0			0	0		0	0		
Queue Length 50th (ft)	54	210	0			17	121		15	232		
Queue Length 95th (ft)	96	#341	11			39	170		29	305		
Internal Link Dist (ft)		1389					1535			441		
Turn Bay Length (ft)	225					350			150			
Base Capacity (vph)	282	461	529			212	866		453	1297		
Starvation Cap Reductn	0	0	0			0	0		0	0		
Spillback Cap Reductn	0	0	0			0	0		0	0		
Storage Cap Reductn	0	0	0			0	0		0	0		
Reduced v/c Ratio	0.45	0.77	0.22			0.19	0.50		0.13	0.58		

Lanes, Volumes, Timings  
 102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
 Timing Plan: AM Peak (7:30)

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle:	100
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.84
Intersection Signal Delay:	28.1
Intersection LOS:	C
Intersection Capacity Utilization	74.5%
ICU Level of Service	D
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 102: Kenyon Rd & Chagrin Blvd

 Ø1 12 s	 Ø2 (R) 34 s	 Ø3 12 s	 Ø4 30 s	 Ø7 12 s
 Ø5 12 s	 Ø6 (R) 34 s			

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: AM Peak (7:30)



Lane Group	SBL	SBT	SBR	NWL2	NWL	NWR2
Total Split (s)	12.0	34.0		12.0	12.0	
Total Split (%)	12.0%	34.0%		12.0%	12.0%	
Maximum Green (s)	7.0	29.0		8.0	8.0	
Yellow Time (s)	3.0	3.0		3.5	3.5	
All-Red Time (s)	2.0	2.0		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0			4.0	
Lead/Lag	Lead	Lag				
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	None	
Walk Time (s)		5.0				
Flash Dont Walk (s)		23.0				
Pedestrian Calls (#/hr)		0				
Act Effct Green (s)	44.6	38.3			7.0	
Actuated g/C Ratio	0.45	0.38			0.07	
v/c Ratio	0.33	0.31			0.09	
Control Delay	21.2	18.7			0.6	
Queue Delay	0.0	0.0			0.0	
Total Delay	21.2	18.7			0.6	
LOS	C	B			A	
Approach Delay		19.2			0.6	
Approach LOS		B			A	
90th %ile Green (s)	8.0	29.0		7.0	7.0	
90th %ile Term Code	Max	Coord		Min	Min	
70th %ile Green (s)	8.0	29.0		7.0	7.0	
70th %ile Term Code	Max	Coord		Min	Min	
50th %ile Green (s)	8.0	29.2		7.0	7.0	
50th %ile Term Code	Max	Coord		Min	Min	
30th %ile Green (s)	7.4	43.6		0.0	0.0	
30th %ile Term Code	Gap	Coord		Skip	Skip	
10th %ile Green (s)	0.0	60.9		0.0	0.0	
10th %ile Term Code	Skip	Coord		Skip	Skip	
Stops (vph)	47	172			0	
Fuel Used(gal)	1	3			0	
CO Emissions (g/hr)	57	222			22	
NOx Emissions (g/hr)	11	43			4	
VOC Emissions (g/hr)	13	51			5	
Dilemma Vehicles (#)	0	0			0	
Queue Length 50th (ft)	19	61			0	
Queue Length 95th (ft)	83	128			0	
Internal Link Dist (ft)		259			1376	
Turn Bay Length (ft)	75					
Base Capacity (vph)	294	1335			311	
Starvation Cap Reductn	0	0			0	
Spillback Cap Reductn	0	0			0	
Storage Cap Reductn	0	0			0	
Reduced v/c Ratio	0.33	0.31			0.09	

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Intersection Summary

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Lanes, Volumes, Timings  
103: Library/Heinen's

Recommended Countermeasures

Timing Plan: AM Peak (7:30)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↖	↕		↖	↕	↗
Traffic Volume (vph)	3	0	1	2	0	9	5	682	5	17	459	10
Future Volume (vph)	3	0	1	2	0	9	5	682	5	17	459	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		50	0		0	75		0	75		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.887			0.999			0.997	
Flt Protected		0.950			0.992		0.950			0.950		
Satd. Flow (prot)	0	1787	1599	0	1631	0	1787	3468	0	1787	3496	0
Flt Permitted							0.464			0.360		
Satd. Flow (perm)	0	1881	1599	0	1644	0	873	3468	0	677	3496	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76		76			1			3	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		521			577			339			190	
Travel Time (s)		14.2			15.7			9.2			5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	10%	1%	1%	1%	4%	1%	1%	3%	1%
Adj. Flow (vph)	3	0	1	2	0	10	5	741	5	18	499	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	3	1	0	12	0	5	746	0	18	510	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	0		1	0	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	30	35	20	40		40	0		40	0	
Trailing Detector (ft)	0	-10	-5	0	0		0	0		0	0	
Detector 1 Position(ft)	0	-10	-5	0	0		0	0		0	0	
Detector 1 Size(ft)	20	40	40	20	40		40	6		40	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	10.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	10.0	10.0	10.0	29.0	29.0		12.0	22.0		12.0	31.0	

Lanes, Volumes, Timings  
103: Library/Heinen's

Recommended Countermeasures  
Timing Plan: AM Peak (7:30)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	29.0	29.0	29.0	29.0	29.0		14.0	56.0		15.0	57.0	
Total Split (%)	29.0%	29.0%	29.0%	29.0%	29.0%		14.0%	56.0%		15.0%	57.0%	
Maximum Green (s)	24.0	24.0	24.0	24.0	24.0		9.0	51.0		10.0	52.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)				5.0	5.0			5.0			5.0	
Flash Dont Walk (s)				19.0	19.0			12.0			21.0	
Pedestrian Calls (#/hr)				0	0			0			0	
Act Effect Green (s)		6.6	6.6		10.0		90.0	90.2		91.0	93.6	
Actuated g/C Ratio		0.07	0.07		0.10		0.90	0.90		0.91	0.94	
v/c Ratio		0.02	0.01		0.05		0.01	0.24		0.03	0.16	
Control Delay		42.7	0.0		0.5		0.8	1.5		0.5	0.9	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		42.7	0.0		0.5		0.8	1.5		0.5	0.9	
LOS		D	A		A		A	A		A	A	
Approach Delay		32.0			0.5			1.5			0.9	
Approach LOS		C			A			A			A	
90th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		7.0	68.0		7.0	68.0	
90th %ile Term Code	Hold	Hold	Hold	Min	Min		Min	Coord		Min	Coord	
70th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		0.0	83.0		7.0	95.0	
70th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Skip	Coord		Min	Coord	
50th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		0.0	95.0		0.0	95.0	
50th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Skip	Coord		Skip	Coord	
30th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		0.0	95.0		0.0	95.0	
30th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Skip	Coord		Skip	Coord	
10th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		0.0	95.0		0.0	95.0	
10th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Skip	Coord		Skip	Coord	
Stops (vph)		5	0		0		1	57		1	27	
Fuel Used(gal)		0	0		0		0	2		0	2	
CO Emissions (g/hr)		4	0		4		1	169		4	117	
NOx Emissions (g/hr)		1	0		1		0	33		1	23	
VOC Emissions (g/hr)		1	0		1		0	39		1	27	
Dilemma Vehicles (#)		0	0		0		0	0		0	0	
Queue Length 50th (ft)		2	0		0		0	0		0	0	
Queue Length 95th (ft)		11	0		0		m1	66		2	43	
Internal Link Dist (ft)		441			497			259			110	
Turn Bay Length (ft)			50				75			75		
Base Capacity (vph)		451	441		452		874	3128		731	3272	
Starvation Cap Reductn		0	0		0		0	292		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.01	0.00		0.03		0.01	0.26		0.02	0.16	

Lanes, Volumes, Timings  
 103: Library/Heinen's

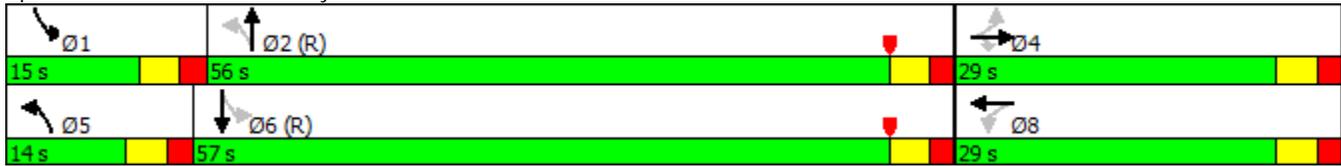
Recommended Countermeasures  
 Timing Plan: AM Peak (7:30)

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	12 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.24
Intersection Signal Delay:	1.4
Intersection LOS:	A
Intersection Capacity Utilization	38.0%
ICU Level of Service	A
Analysis Period (min)	15

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

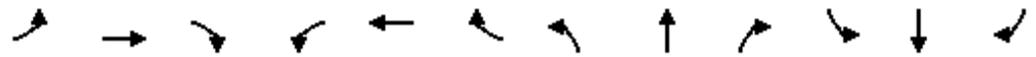
Splits and Phases: 103: Library/Heinen's



Lanes, Volumes, Timings  
104: Van Aken Blvd

Recommended Countermeasures

Timing Plan: AM Peak (7:30)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗					↕↕↕		↘	↕↕	
Traffic Volume (vph)	28	252	145	0	0	0	0	663	31	43	341	0
Future Volume (vph)	28	252	145	0	0	0	0	663	31	43	341	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.95	1.00
Fr <sub>t</sub>			0.850					0.993				
Fl <sub>t</sub> Protected		0.995								0.950		
Satd. Flow (prot)	0	3515	1568	0	0	0	0	4877	0	1719	3539	0
Fl <sub>t</sub> Permitted		0.995								0.321		
Satd. Flow (perm)	0	3515	1568	0	0	0	0	4877	0	581	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			161					7				
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1474			1581			190			110	
Travel Time (s)		28.7			30.8			5.2			3.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	4%	2%	3%	2%	2%	2%	0%	5%	19%	5%	2%	2%
Adj. Flow (vph)	31	280	161	0	0	0	0	737	34	48	379	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	311	161	0	0	0	0	771	0	48	379	0
Enter Blocked Intersection	No	No	No	No	No	No	No	1 veh	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1		0	0	
Detector Template	Left											Thru
Leading Detector (ft)	20	40	33					34		0	0	
Trailing Detector (ft)	0	0	-7					-6		0	0	
Detector 1 Position(ft)	0	0	-7					-6		0	0	
Detector 1 Size(ft)	20	40	40					40		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Turn Type	Split	NA	Perm					NA		custom	NA	
Protected Phases	8	8						2 5		9	5 6 9	
Permitted Phases			8							5 6		
Detector Phase	8	8	8					2 5				
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0							4.0		
Minimum Split (s)	37.0	37.0	37.0							29.0		
Total Split (s)	37.0	37.0	37.0							29.0		
Total Split (%)	37.0%	37.0%	37.0%							29.0%		
Maximum Green (s)	32.0	32.0	32.0							24.0		

Lane Group	Ø2	Ø5	Ø6
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Turn Type			
Protected Phases	2	5	6
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	4.0	10.0
Minimum Split (s)	22.0	9.0	22.0
Total Split (s)	34.0	10.0	24.0
Total Split (%)	34%	10%	24%
Maximum Green (s)	29.0	5.0	19.0

Lanes, Volumes, Timings  
104: Van Aken Blvd

Recommended Countermeasures

Timing Plan: AM Peak (7:30)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.0	3.0							3.0		
All-Red Time (s)	2.0	2.0	2.0							2.0		
Lost Time Adjust (s)		0.0	0.0							0.0		
Total Lost Time (s)		5.0	5.0							5.0		
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0							3.0		
Recall Mode	None	None	None							None		
Walk Time (s)	5.0	5.0	5.0							5.0		
Flash Dont Walk (s)	19.0	19.0	19.0							19.0		
Pedestrian Calls (#/hr)	0	0	0							0		
Act Effct Green (s)		14.4	14.4					51.8		70.6	75.6	
Actuated g/C Ratio		0.14	0.14					0.52		0.71	0.76	
v/c Ratio		0.62	0.44					0.30		0.08	0.14	
Control Delay		45.3	10.0					9.2		0.9	0.6	
Queue Delay		0.0	0.0					0.0		1.5	0.5	
Total Delay		45.3	10.0					9.2		2.4	1.1	
LOS		D	A					A		A	A	
Approach Delay		33.2						9.2			1.2	
Approach LOS		C						A			A	
90th %ile Green (s)	19.0	19.0	19.0							24.0		
90th %ile Term Code	Gap	Gap	Gap							Gap		
70th %ile Green (s)	15.8	15.8	15.8							20.6		
70th %ile Term Code	Gap	Gap	Gap							Gap		
50th %ile Green (s)	14.2	14.2	14.2							18.7		
50th %ile Term Code	Gap	Gap	Gap							Gap		
30th %ile Green (s)	12.6	12.6	12.6							16.8		
30th %ile Term Code	Gap	Gap	Gap							Gap		
10th %ile Green (s)	10.3	10.3	10.3							14.0		
10th %ile Term Code	Gap	Gap	Gap							Gap		
Stops (vph)		255	22					208		4	23	
Fuel Used(gal)		7	2					4		0	0	
CO Emissions (g/hr)		523	140					307		4	31	
NOx Emissions (g/hr)		102	27					60		1	6	
VOC Emissions (g/hr)		121	32					71		1	7	
Dilemma Vehicles (#)		13	0					0		0	0	
Queue Length 50th (ft)		99	0					55		0	1	
Queue Length 95th (ft)		136	53					78		4	4	
Internal Link Dist (ft)		1394			1501			110			30	
Turn Bay Length (ft)												
Base Capacity (vph)		1124	611					2529		624	2676	
Starvation Cap Reductn		0	0					0		470	1834	
Spillback Cap Reductn		0	0					13		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.28	0.26					0.31		0.31	0.45	

Intersection Summary

Area Type: Other  
Cycle Length: 100

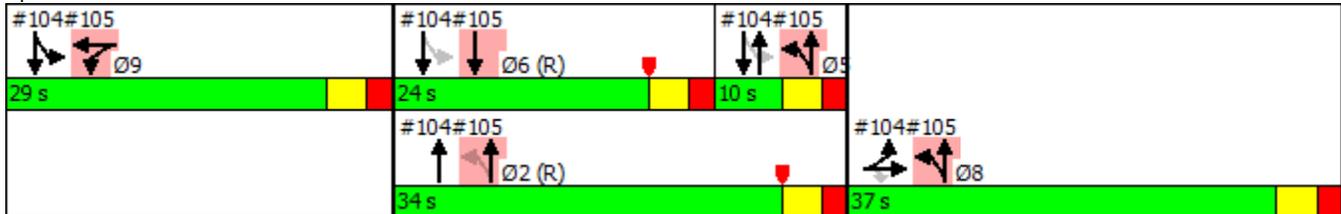
Lane Group	Ø2	Ø5	Ø6
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag		Lag	Lead
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	C-Min
Walk Time (s)	5.0		5.0
Flash Dont Walk (s)	12.0		12.0
Pedestrian Calls (#/hr)	0		0
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
90th %ile Green (s)	42.0	7.7	29.3
90th %ile Term Code	Coord	Gap	Coord
70th %ile Green (s)	48.6	7.7	35.9
70th %ile Term Code	Coord	Gap	Coord
50th %ile Green (s)	52.1	6.7	40.4
50th %ile Term Code	Coord	Gap	Coord
30th %ile Green (s)	55.6	6.7	43.9
30th %ile Term Code	Coord	Gap	Coord
10th %ile Green (s)	60.7	5.7	50.0
10th %ile Term Code	Coord	Gap	Coord
Stops (vph)			
Fuel Used(gal)			
CO Emissions (g/hr)			
NOx Emissions (g/hr)			
VOC Emissions (g/hr)			
Dilemma Vehicles (#)			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
<b>Intersection Summary</b>			

Lanes, Volumes, Timings  
 104: Van Aken Blvd

Recommended Countermeasures  
 Timing Plan: AM Peak (7:30)

Actuated Cycle Length: 100  
 Offset: 8 (8%), Referenced to phase 6:SBTL and 2:NBT, Start of Yellow  
 Natural Cycle: 100  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.72  
 Intersection Signal Delay: 14.0  
 Intersection LOS: B  
 Intersection Capacity Utilization 37.7%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 104: Van Aken Blvd



Lanes, Volumes, Timings  
105: Van Aken Blvd & Lee Rd

Recommended Countermeasures

Timing Plan: AM Peak (7:30)



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2	Ø5	Ø8
Lane Configurations	↵	↑↑		↵	↑↑	↑↑↑				
Traffic Volume (vph)	47	356	76	209	482	337	9			
Future Volume (vph)	47	356	76	209	482	337	9			
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900			
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.91	0.91			
Frt		0.974				0.996				
Flt Protected	0.950			0.950						
Satd. Flow (prot)	1787	3481	0	1770	3406	5005	0			
Flt Permitted	0.950			0.520						
Satd. Flow (perm)	1787	3481	0	969	3406	5005	0			
Right Turn on Red										Yes
Satd. Flow (RTOR)							3			
Link Speed (mph)		35			25	25				
Link Distance (ft)		1547			110	210				
Travel Time (s)		30.1			3.0	5.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Heavy Vehicles (%)	1%	1%	1%	2%	6%	3%	11%			
Adj. Flow (vph)	51	387	83	227	524	366	10			
Shared Lane Traffic (%)										
Lane Group Flow (vph)	51	470	0	227	524	376	0			
Enter Blocked Intersection	No	No	No	No	No	1 veh	No			
Lane Alignment	Left	Left	Right	Left	Left	Left	Right			
Median Width(ft)		12			12	0				
Link Offset(ft)		0			0	0				
Crosswalk Width(ft)		16			16	16				
Two way Left Turn Lane										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Turning Speed (mph)	15		9	15			9			
Number of Detectors	1	1		0	0	1				
Detector Template										
Leading Detector (ft)	40	40		0	0	40				
Trailing Detector (ft)	0	0		0	0	0				
Detector 1 Position(ft)	0	0		0	0	0				
Detector 1 Size(ft)	40	40		20	20	40				
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex				
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0				
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0				
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0				
Turn Type	Split	NA		custom	NA	NA				
Protected Phases	9	9		5 8	2 5 8	6		2	5	8
Permitted Phases				2						
Detector Phase	9	9				6				
Switch Phase										
Minimum Initial (s)	4.0	4.0				10.0		10.0	4.0	10.0
Minimum Split (s)	29.0	29.0				22.0		22.0	9.0	37.0
Total Split (s)	29.0	29.0				24.0		34.0	10.0	37.0
Total Split (%)	29.0%	29.0%				24.0%		34%	10%	37%
Maximum Green (s)	24.0	24.0				19.0		29.0	5.0	32.0

Lanes, Volumes, Timings  
105: Van Aken Blvd & Lee Rd

Recommended Countermeasures

Timing Plan: AM Peak (7:30)



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2	Ø5	Ø8
Yellow Time (s)	3.0	3.0				3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0				2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0				0.0				
Total Lost Time (s)	5.0	5.0				5.0				
Lead/Lag						Lead			Lag	
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0				3.0		3.0	3.0	3.0
Recall Mode	None	None				C-Min		C-Min	None	None
Walk Time (s)	5.0	5.0				5.0		5.0		5.0
Flash Dont Walk (s)	19.0	19.0				12.0		12.0		19.0
Pedestrian Calls (#/hr)	0	0				0		0		0
Act Effect Green (s)	18.8	18.8		71.2	71.2	39.9				
Actuated g/C Ratio	0.19	0.19		0.71	0.71	0.40				
v/c Ratio	0.15	0.72		0.25	0.22	0.19				
Control Delay	33.4	44.3		1.1	0.3	21.3				
Queue Delay	0.0	0.0		0.8	0.3	0.0				
Total Delay	33.4	44.3		1.9	0.6	21.3				
LOS	C	D		A	A	C				
Approach Delay		43.2			1.0	21.3				
Approach LOS		D			A	C				
90th %ile Green (s)	24.0	24.0				29.3		42.0	7.7	19.0
90th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
70th %ile Green (s)	20.6	20.6				35.9		48.6	7.7	15.8
70th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
50th %ile Green (s)	18.7	18.7				40.4		52.1	6.7	14.2
50th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
30th %ile Green (s)	16.8	16.8				43.9		55.6	6.7	12.6
30th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
10th %ile Green (s)	14.0	14.0				50.0		60.7	5.7	10.3
10th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
Stops (vph)	38	391		13	0	221				
Fuel Used(gal)	1	12		0	0	6				
CO Emissions (g/hr)	79	815		20	33	397				
NOx Emissions (g/hr)	15	159		4	7	77				
VOC Emissions (g/hr)	18	189		5	8	92				
Dilemma Vehicles (#)	0	20		0	0	0				
Queue Length 50th (ft)	27	149		1	0	54				
Queue Length 95th (ft)	56	191		5	1	92				
Internal Link Dist (ft)		1467			30	130				
Turn Bay Length (ft)										
Base Capacity (vph)	428	835		900	2424	1998				
Starvation Cap Reductn	0	0		418	1247	0				
Spillback Cap Reductn	0	0		0	0	0				
Storage Cap Reductn	0	0		0	0	0				
Reduced v/c Ratio	0.12	0.56		0.47	0.45	0.19				

Intersection Summary

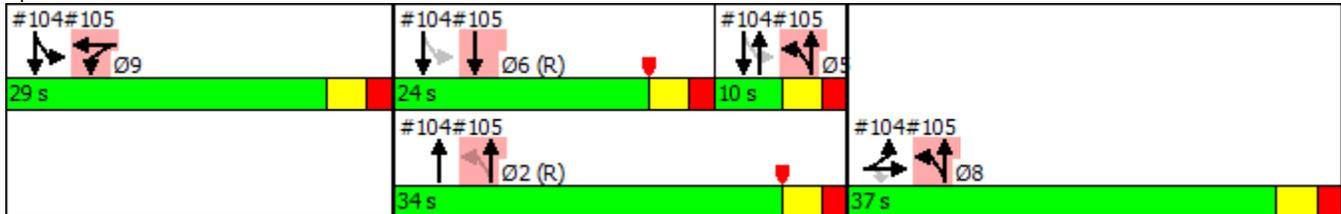
Area Type: Other  
Cycle Length: 100

Lanes, Volumes, Timings  
 105: Van Aken Blvd & Lee Rd

Recommended Countermeasures  
 Timing Plan: AM Peak (7:30)

Actuated Cycle Length: 100  
 Offset: 8 (8%), Referenced to phase 6:SBTL and 2:NBT, Start of Yellow  
 Natural Cycle: 100  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.72  
 Intersection Signal Delay: 19.0  
 Intersection LOS: B  
 Intersection Capacity Utilization 44.7%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 105: Van Aken Blvd & Lee Rd



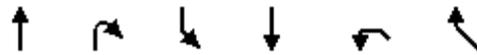
Lanes, Volumes, Timings  
101: Lee Rd & Lomond Blvd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)

	↑	↖	↙	↓	↘	↗
Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations	↑↑		↖	↑↑	↘	
Traffic Volume (vph)	568	56	67	510	28	42
Future Volume (vph)	568	56	67	510	28	42
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	80		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.987				0.919	
Flt Protected			0.950		0.981	
Satd. Flow (prot)	3493	0	1703	3471	1619	0
Flt Permitted			0.368		0.981	
Satd. Flow (perm)	3493	0	660	3471	1619	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	14				47	
Link Speed (mph)	25			25	25	
Link Distance (ft)	785			521	1059	
Travel Time (s)	21.4			14.2	28.9	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	6%	4%	4%	7%
Adj. Flow (vph)	638	63	75	573	31	47
Shared Lane Traffic (%)						
Lane Group Flow (vph)	701	0	75	573	78	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	0		1	0	1	
Detector Template						
Leading Detector (ft)	0		37	0	60	
Trailing Detector (ft)	0		-3	0	0	
Detector 1 Position(ft)	0		-3	0	0	
Detector 1 Size(ft)	6		40	6	60	
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	8	
Permitted Phases			6			
Detector Phase	2		1	6	8	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	32.0		12.0	21.0	29.0	

Lanes, Volumes, Timings  
101: Lee Rd & Lomond Blvd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)

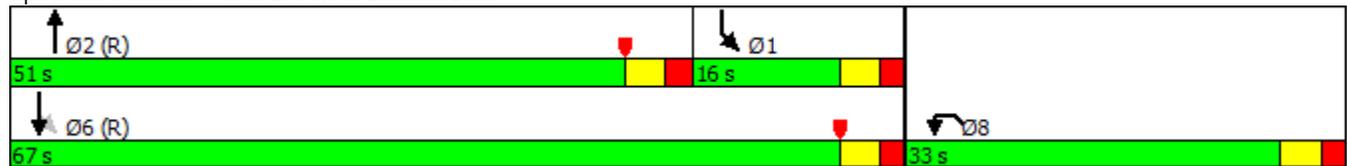


Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Total Split (s)	51.0		16.0	67.0	33.0	
Total Split (%)	51.0%		16.0%	67.0%	33.0%	
Maximum Green (s)	46.0		11.0	62.0	28.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Max		None	C-Max	None	
Walk Time (s)	5.0				5.0	
Flash Dont Walk (s)	22.0				19.0	
Pedestrian Calls (#/hr)	0				0	
Act Effect Green (s)	70.9		83.7	83.7	10.3	
Actuated g/C Ratio	0.71		0.84	0.84	0.10	
v/c Ratio	0.28		0.11	0.20	0.37	
Control Delay	7.5		1.5	1.1	25.6	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	7.5		1.5	1.1	25.6	
LOS	A		A	A	C	
Approach Delay	7.5			1.2	25.6	
Approach LOS	A			A	C	
90th %ile Green (s)	62.4		11.0	78.4	11.6	
90th %ile Term Code	Coord		Hold	Coord	Gap	
70th %ile Green (s)	64.0		11.0	80.0	10.0	
70th %ile Term Code	Coord		Hold	Coord	Min	
50th %ile Green (s)	64.0		11.0	80.0	10.0	
50th %ile Term Code	Coord		Hold	Coord	Min	
30th %ile Green (s)	64.0		11.0	80.0	10.0	
30th %ile Term Code	Coord		Hold	Coord	Min	
10th %ile Green (s)	95.0		0.0	95.0	0.0	
10th %ile Term Code	Coord		Skip	Coord	Skip	
Stops (vph)	226		5	41	32	
Fuel Used(gal)	6		0	3	1	
CO Emissions (g/hr)	418		24	177	77	
NOx Emissions (g/hr)	81		5	34	15	
VOC Emissions (g/hr)	97		5	41	18	
Dilemma Vehicles (#)	0		0	0	0	
Queue Length 50th (ft)	93		3	13	18	
Queue Length 95th (ft)	128		10	28	61	
Internal Link Dist (ft)	705			441	979	
Turn Bay Length (ft)			80			
Base Capacity (vph)	2479		660	2904	487	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.28		0.11	0.20	0.16	

Intersection Summary

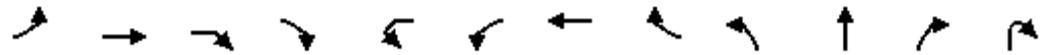
Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	3 (3%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.37
Intersection Signal Delay:	5.6
Intersection LOS:	A
Intersection Capacity Utilization	44.2%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 101: Lee Rd & Lomond Blvd



Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations												
Traffic Volume (vph)	123	282	22	112	3	92	251	50	92	406	110	6
Future Volume (vph)	123	282	22	112	3	92	251	50	92	406	110	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		0			350		0	150		0	
Storage Lanes	1		1			1		0	1		0	
Taper Length (ft)	25					25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Frt			0.850				0.975			0.966		
Flt Protected	0.950					0.950			0.950			
Satd. Flow (prot)	1736	1776	1558	0	0	1770	3352	0	1770	3368	0	0
Flt Permitted	0.472					0.284			0.437			
Satd. Flow (perm)	862	1776	1558	0	0	529	3352	0	814	3368	0	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			185				22			1		
Link Speed (mph)		25					25			25		
Link Distance (ft)		1469					1615			521		
Travel Time (s)		40.1					44.0			14.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	7%	2%	4%	2%	2%	5%	5%	2%	4%	2%	2%
Adj. Flow (vph)	134	307	24	122	3	100	273	54	100	441	120	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	134	307	146	0	0	103	327	0	100	568	0	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Right	Left	Left	Left	Right	Left	Left	Right	Right
Median Width(ft)		12					12			12		
Link Offset(ft)		0					0			0		
Crosswalk Width(ft)		16					16			16		
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	9	15	15		9	15		9	9
Number of Detectors	1	1	1		1	1	1		1	0		
Detector Template					Left							
Leading Detector (ft)	20	20	20		20	20	30		20	0		
Trailing Detector (ft)	-10	0	0		0	0	0		-10	0		
Detector 1 Position(ft)	-10	0	0		0	0	0		-10	0		
Detector 1 Size(ft)	30	20	20		20	20	30		30	6		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		
Turn Type	pm+pt	NA	Perm		pm+pt	pm+pt	NA		pm+pt	NA		
Protected Phases	3	4			3	3	4		5	2		
Permitted Phases	4		4		4	4			2			
Detector Phase	3	4	4		3	3	4		5	2		
Switch Phase												
Minimum Initial (s)	7.0	10.0	10.0		7.0	7.0	10.0		7.0	10.0		
Minimum Split (s)	12.0	30.0	30.0		12.0	12.0	30.0		12.0	24.0		

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

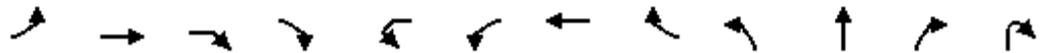
Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	SBL2	SBL	SBT	SBR	NWL2	NWL	NWR2
Lane Configurations							
Traffic Volume (vph)	112	9	361	85	6	10	4
Future Volume (vph)	112	9	361	85	6	10	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		75		0		0	
Storage Lanes		1		0		1	
Taper Length (ft)		25				25	
Lane Util. Factor	0.95	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.971			0.975	
Flt Protected		0.950				0.961	
Satd. Flow (prot)	0	1770	3383	0	0	1728	0
Flt Permitted		0.315				0.942	
Satd. Flow (perm)	0	587	3383	0	0	1694	0
Right Turn on Red				Yes			Yes
Satd. Flow (RTOR)			28			185	
Link Speed (mph)			25			25	
Link Distance (ft)			339			1456	
Travel Time (s)			9.2			39.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	4%	2%	3%	3%	3%
Adj. Flow (vph)	122	10	392	92	7	11	4
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	132	484	0	0	22	0
Enter Blocked Intersection	No						
Lane Alignment	Left	Left	Left	Right	Left	Left	Right
Median Width(ft)			12			12	
Link Offset(ft)			0			0	
Crosswalk Width(ft)			16			16	
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15		9	15	15	9
Number of Detectors	1	1	0		1	1	
Detector Template	Left				Left		
Leading Detector (ft)	20	20	0		20	30	
Trailing Detector (ft)	0	-10	0		0	0	
Detector 1 Position(ft)	0	-10	0		0	0	
Detector 1 Size(ft)	20	30	6		20	30	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	
Turn Type	pm+pt	pm+pt	NA		Perm	Prot	
Protected Phases	1	1	6			7	
Permitted Phases	6	6			7		
Detector Phase	1	1	6		7	7	
Switch Phase							
Minimum Initial (s)	7.0	7.0	10.0		7.0	7.0	
Minimum Split (s)	12.0	12.0	33.0		12.0	12.0	

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	NBR2
Total Split (s)	12.0	31.0	31.0		12.0	12.0	31.0		12.0	31.0		
Total Split (%)	12.0%	31.0%	31.0%		12.0%	12.0%	31.0%		12.0%	31.0%		
Maximum Green (s)	7.0	26.0	26.0		7.0	7.0	26.0		7.0	26.0		
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0			5.0	5.0		5.0	5.0		
Lead/Lag	Lead	Lag	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		
Recall Mode	None	None	None		None	None	None		None	C-Max		
Walk Time (s)		5.0	5.0				5.0			5.0		
Flash Dont Walk (s)		20.0	20.0				20.0			14.0		
Pedestrian Calls (#/hr)		0	0				0			0		
Act Effect Green (s)	28.9	21.9	21.9		28.9	21.9	21.9		45.2	37.8		
Actuated g/C Ratio	0.29	0.22	0.22		0.29	0.22	0.22		0.45	0.38		
v/c Ratio	0.43	0.79	0.30		0.43	0.44	0.44		0.23	0.45		
Control Delay	27.7	51.4	3.7		27.9	32.4	32.4		12.8	20.7		
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		
Total Delay	27.7	51.4	3.7		27.9	32.4	32.4		12.8	20.7		
LOS	C	D	A		C	C	C		B	C		
Approach Delay		34.1					31.3			19.5		
Approach LOS		C					C			B		
90th %ile Green (s)	7.0	26.0	26.0		7.0	7.0	26.0		7.0	26.0		
90th %ile Term Code	Max	Max	Max		Max	Max	Max		Max	Coord		
70th %ile Green (s)	7.0	26.0	26.0		7.0	7.0	26.0		7.0	26.0		
70th %ile Term Code	Max	Max	Max		Max	Max	Max		Max	Coord		
50th %ile Green (s)	7.0	23.2	23.2		7.0	7.0	23.2		8.5	40.4		
50th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Gap	Coord		
30th %ile Green (s)	7.0	19.4	19.4		7.0	7.0	19.4		7.4	45.5		
30th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Gap	Coord		
10th %ile Green (s)	7.0	15.0	15.0		7.0	7.0	15.0		0.0	51.0		
10th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Skip	Coord		
Stops (vph)	90	260	7			65	232		38	353		
Fuel Used(gal)	3	7	2			2	7		1	6		
CO Emissions (g/hr)	180	523	126			146	491		55	411		
NOx Emissions (g/hr)	35	102	25			28	95		11	80		
VOC Emissions (g/hr)	42	121	29			34	114		13	95		
Dilemma Vehicles (#)	0	0	0			0	0		0	0		
Queue Length 50th (ft)	59	183	0			45	86		17	58		
Queue Length 95th (ft)	100	270	26			80	124		36	230		
Internal Link Dist (ft)		1389					1535			441		
Turn Bay Length (ft)	225					350			150			
Base Capacity (vph)	310	461	541			239	887		438	1273		
Starvation Cap Reductn	0	0	0			0	0		0	0		
Spillback Cap Reductn	0	0	0			0	0		0	0		
Storage Cap Reductn	0	0	0			0	0		0	0		
Reduced v/c Ratio	0.43	0.67	0.27		0.43	0.37	0.37		0.23	0.45		

Lanes, Volumes, Timings  
 102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
 Timing Plan: Mid Peak (12:30)

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	93 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle:	100
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.79
Intersection Signal Delay:	23.5
Intersection LOS:	C
Intersection Capacity Utilization	69.0%
ICU Level of Service	C
Analysis Period (min)	15

Splits and Phases: 102: Kenyon Rd & Chagrin Blvd

 Ø1	 Ø2 (R)	 Ø3	 Ø4	 Ø7
14 s	31 s	12 s	31 s	12 s
 Ø5	 Ø6 (R)			
12 s	33 s			

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	SBL2	SBL	SBT	SBR	NWL2	NWL	NWR2
Total Split (s)	14.0	14.0	33.0		12.0	12.0	
Total Split (%)	14.0%	14.0%	33.0%		12.0%	12.0%	
Maximum Green (s)	9.0	9.0	28.0		7.0	7.0	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0			0.0	
Total Lost Time (s)		5.0	5.0			5.0	
Lead/Lag	Lead	Lead	Lag				
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	C-Max		None	None	
Walk Time (s)			5.0		0.0	0.0	
Flash Dont Walk (s)			23.0		0.0	0.0	
Pedestrian Calls (#/hr)			0		0	0	
Act Effect Green (s)		48.4	41.3			7.0	
Actuated g/C Ratio		0.48	0.41			0.07	
v/c Ratio		0.34	0.34			0.08	
Control Delay		15.4	12.3			0.5	
Queue Delay		0.0	0.2			0.0	
Total Delay		15.4	12.6			0.5	
LOS		B	B			A	
Approach Delay			13.2			0.5	
Approach LOS			B			A	
90th %ile Green (s)	9.0	9.0	28.0		7.0	7.0	
90th %ile Term Code	Max	Max	Coord		Max	Max	
70th %ile Green (s)	9.0	9.0	28.0		7.0	7.0	
70th %ile Term Code	Max	Max	Coord		Max	Max	
50th %ile Green (s)	9.4	9.4	41.3		0.0	0.0	
50th %ile Term Code	Gap	Gap	Coord		Skip	Skip	
30th %ile Green (s)	8.1	8.1	46.2		0.0	0.0	
30th %ile Term Code	Gap	Gap	Coord		Skip	Skip	
10th %ile Green (s)	7.0	7.0	63.0		0.0	0.0	
10th %ile Term Code	Min	Min	Coord		Skip	Skip	
Stops (vph)		49	112			0	
Fuel Used(gal)		1	3			0	
CO Emissions (g/hr)		64	198			17	
NOx Emissions (g/hr)		12	39			3	
VOC Emissions (g/hr)		15	46			4	
Dilemma Vehicles (#)		0	0			0	
Queue Length 50th (ft)		21	40			0	
Queue Length 95th (ft)		66	72			0	
Internal Link Dist (ft)			259			1376	
Turn Bay Length (ft)		75					
Base Capacity (vph)		392	1413			290	
Starvation Cap Reductn		0	344			0	
Spillback Cap Reductn		0	0			0	
Storage Cap Reductn		0	0			0	
Reduced v/c Ratio		0.34	0.45			0.08	

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Intersection Summary

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Lanes, Volumes, Timings  
103: Library/Heinen's

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↖	↕↗		↖	↕↗	
Traffic Volume (vph)	17	8	21	18	2	40	16	551	12	90	528	21
Future Volume (vph)	17	8	21	18	2	40	16	551	12	90	528	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		50	0		0	75		0	75		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.911			0.997			0.994	
Flt Protected		0.968			0.985		0.950			0.950		
Satd. Flow (prot)	0	1821	1599	0	1663	0	1787	3458	0	1752	3448	0
Flt Permitted		0.815			0.887		0.426			0.396		
Satd. Flow (perm)	0	1533	1599	0	1497	0	801	3458	0	730	3448	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76		43			3			5	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		521			577			339			190	
Travel Time (s)		14.2			15.7			9.2			5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	6%	1%	1%	1%	4%	8%	3%	4%	6%
Adj. Flow (vph)	18	9	23	20	2	43	17	599	13	98	574	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	27	23	0	65	0	17	612	0	98	597	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	0		1	0	
Detector Template	Left			Left								
Leading Detector (ft)	20	30	35	20	40		40	0		40	0	
Trailing Detector (ft)	0	-10	-5	0	0		0	0		0	0	
Detector 1 Position(ft)	0	-10	-5	0	0		0	0		0	0	
Detector 1 Size(ft)	20	40	40	20	40		40	6		40	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	22.0	22.0	22.0	29.0	29.0		12.0	22.0		12.0	22.0	

Lanes, Volumes, Timings  
103: Library/Heinen's

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	33.0	33.0	33.0	33.0	33.0		14.0	49.0		18.0	53.0	
Total Split (%)	33.0%	33.0%	33.0%	33.0%	33.0%		14.0%	49.0%		18.0%	53.0%	
Maximum Green (s)	28.0	28.0	28.0	28.0	28.0		9.0	44.0		13.0	48.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)				5.0	5.0			5.0			5.0	
Flash Dont Walk (s)				19.0	19.0			12.0			12.0	
Pedestrian Calls (#/hr)				0	0			0			0	
Act Effect Green (s)		10.2	10.2		10.2		78.7	74.1		81.0	79.0	
Actuated g/C Ratio		0.10	0.10		0.10		0.79	0.74		0.81	0.79	
v/c Ratio		0.17	0.10		0.34		0.02	0.24		0.15	0.22	
Control Delay		43.9	0.9		24.6		0.8	1.4		1.5	2.3	
Queue Delay		0.0	0.0		0.0		0.0	0.1		0.0	0.0	
Total Delay		43.9	0.9		24.6		0.8	1.5		1.5	2.3	
LOS		D	A		C		A	A		A	A	
Approach Delay		24.1			24.6			1.5			2.1	
Approach LOS		C			C			A			A	
90th %ile Green (s)	10.8	10.8	10.8	10.8	10.8		7.0	66.5		7.7	67.2	
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Min	Coord		Gap	Coord	
70th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		7.0	68.0		7.0	68.0	
70th %ile Term Code	Min	Min	Min	Min	Min		Min	Coord		Min	Coord	
50th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		0.0	68.0		7.0	80.0	
50th %ile Term Code	Min	Min	Min	Min	Min		Skip	Coord		Min	Coord	
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		0.0	68.0		7.0	80.0	
30th %ile Term Code	Hold	Hold	Hold	Min	Min		Skip	Coord		Min	Coord	
10th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		0.0	95.0		0.0	95.0	
10th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Skip	Coord		Skip	Coord	
Stops (vph)		25	0		27		1	40		7	105	
Fuel Used(gal)		0	0		1		0	2		0	2	
CO Emissions (g/hr)		30	7		49		4	135		24	170	
NOx Emissions (g/hr)		6	1		10		1	26		5	33	
VOC Emissions (g/hr)		7	2		11		1	31		5	39	
Dilemma Vehicles (#)		0	0		0		0	0		0	0	
Queue Length 50th (ft)		16	0		13		0	8		6	21	
Queue Length 95th (ft)		42	0		54		m1	15		4	30	
Internal Link Dist (ft)		441			497			259			110	
Turn Bay Length (ft)			50				75			75		
Base Capacity (vph)		429	502		450		731	2563		737	2726	
Starvation Cap Reductn		0	0		0		0	972		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.06	0.05		0.14		0.02	0.38		0.13	0.22	

Lanes, Volumes, Timings  
 103: Library/Heinen's

Recommended Countermeasures  
 Timing Plan: Mid Peak (12:30)

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	29 (29%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle:	65
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.34
Intersection Signal Delay:	3.6
Intersection LOS:	A
Intersection Capacity Utilization	44.4%
ICU Level of Service	A
Analysis Period (min)	15

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

Splits and Phases: 103: Library/Heinen's



Lanes, Volumes, Timings  
104: Van Aken Blvd

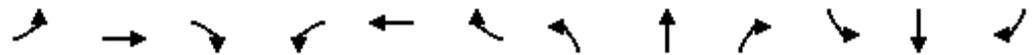
Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	200	152	0	0	0	0	574	34	70	487	0
Future Volume (vph)	36	200	152	0	0	0	0	574	34	70	487	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.95	1.00
Fr <sub>t</sub>			0.850					0.992				
Fl <sub>t</sub> Protected		0.992								0.950		
Satd. Flow (prot)	0	3461	1599	0	0	0	0	4958	0	1787	3471	0
Fl <sub>t</sub> Permitted		0.992								0.380		
Satd. Flow (perm)	0	3461	1599	0	0	0	0	4958	0	715	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			165					10				
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1474			1581			190			110	
Travel Time (s)		28.7			30.8			5.2			3.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	3%	1%	0%	0%	0%	4%	4%	0%	1%	4%	0%
Adj. Flow (vph)	39	217	165	0	0	0	0	624	37	76	529	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	256	165	0	0	0	0	661	0	76	529	0
Enter Blocked Intersection	No	1 veh	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1		0	0	
Detector Template	Left											
Leading Detector (ft)	20	40	33					34		0	0	
Trailing Detector (ft)	0	0	-7					-6		0	0	
Detector 1 Position(ft)	0	0	-7					-6		0	0	
Detector 1 Size(ft)	20	40	40					40		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Turn Type	Split	NA	Perm					NA		custom	NA	
Protected Phases	8	8						2 5		9	5 6 9	
Permitted Phases			8							5 6		
Detector Phase	8	8	8					2 5				
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0							4.0		
Minimum Split (s)	29.0	29.0	29.0							29.0		
Total Split (s)	30.0	30.0	30.0							30.0		
Total Split (%)	30.0%	30.0%	30.0%							30.0%		
Maximum Green (s)	25.0	25.0	25.0							25.0		

Lane Group	Ø2	Ø5	Ø6
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Turn Type			
Protected Phases	2	5	6
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	4.0	10.0
Minimum Split (s)	22.0	9.0	22.0
Total Split (s)	40.0	11.0	29.0
Total Split (%)	40%	11%	29%
Maximum Green (s)	35.0	6.0	24.0

Lanes, Volumes, Timings  
104: Van Aken Blvd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.0	3.0							3.0		
All-Red Time (s)	2.0	2.0	2.0							2.0		
Lost Time Adjust (s)		0.0	0.0							0.0		
Total Lost Time (s)		5.0	5.0							5.0		
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0							3.0		
Recall Mode	None	None	None							None		
Walk Time (s)	5.0	5.0	5.0							5.0		
Flash Dont Walk (s)	19.0	19.0	19.0							19.0		
Pedestrian Calls (#/hr)	0	0	0							0		
Act Effct Green (s)		12.9	12.9					58.6		72.1	77.1	
Actuated g/C Ratio		0.13	0.13					0.59		0.72	0.77	
v/c Ratio		0.58	0.47					0.23		0.12	0.20	
Control Delay		46.0	10.9					8.3		0.6	0.6	
Queue Delay		0.0	0.0					0.0		1.1	0.3	
Total Delay		46.0	10.9					8.3		1.7	1.0	
LOS		D	B					A		A	A	
Approach Delay		32.2						8.3			1.1	
Approach LOS		C						A			A	
90th %ile Green (s)	16.2	16.2	16.2							17.2		
90th %ile Term Code	Gap	Gap	Gap							Gap		
70th %ile Green (s)	14.1	14.1	14.1							15.0		
70th %ile Term Code	Gap	Gap	Gap							Gap		
50th %ile Green (s)	12.7	12.7	12.7							13.5		
50th %ile Term Code	Gap	Gap	Gap							Gap		
30th %ile Green (s)	11.3	11.3	11.3							12.0		
30th %ile Term Code	Gap	Gap	Gap							Gap		
10th %ile Green (s)	10.0	10.0	10.0							9.8		
10th %ile Term Code	Min	Min	Min							Gap		
Stops (vph)		217	23					209		2	35	
Fuel Used(gal)		6	2					4		0	1	
CO Emissions (g/hr)		444	149					269		6	46	
NOx Emissions (g/hr)		86	29					52		1	9	
VOC Emissions (g/hr)		103	34					62		1	11	
Dilemma Vehicles (#)		11	0					0		0	0	
Queue Length 50th (ft)		82	0					53		0	3	
Queue Length 95th (ft)		118	56					71		6	12	
Internal Link Dist (ft)		1394			1501			110			30	
Turn Bay Length (ft)												
Base Capacity (vph)		865	523					2917		660	2677	
Starvation Cap Reductn		0	0					0		433	1516	
Spillback Cap Reductn		0	0					11		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.30	0.32					0.23		0.33	0.46	

**Intersection Summary**  
Area Type: Other  
Cycle Length: 100

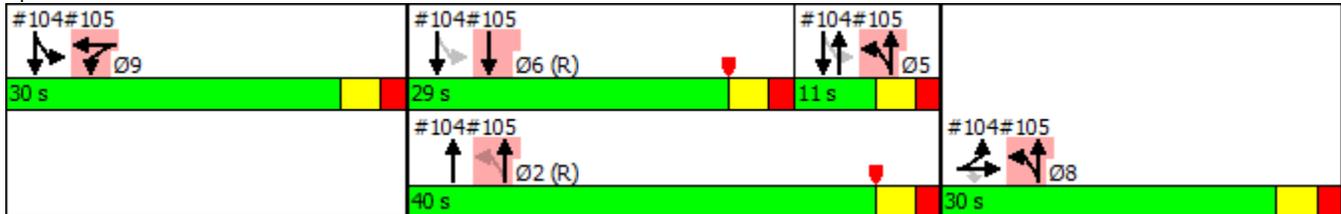
Lane Group	Ø2	Ø5	Ø6
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag		Lag	Lead
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	C-Min
Walk Time (s)	5.0		5.0
Flash Dont Walk (s)	12.0		12.0
Pedestrian Calls (#/hr)	0		0
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
90th %ile Green (s)	51.6	7.7	38.9
90th %ile Term Code	Coord	Gap	Coord
70th %ile Green (s)	55.9	6.7	44.2
70th %ile Term Code	Coord	Gap	Coord
50th %ile Green (s)	58.8	6.7	47.1
50th %ile Term Code	Coord	Gap	Coord
30th %ile Green (s)	61.7	5.7	51.0
30th %ile Term Code	Coord	Gap	Coord
10th %ile Green (s)	65.2	5.7	54.5
10th %ile Term Code	Coord	Gap	Coord
Stops (vph)			
Fuel Used(gal)			
CO Emissions (g/hr)			
NOx Emissions (g/hr)			
VOC Emissions (g/hr)			
Dilemma Vehicles (#)			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
<b>Intersection Summary</b>			

Lanes, Volumes, Timings  
 104: Van Aken Blvd

Recommended Countermeasures  
 Timing Plan: Mid Peak (12:30)

Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 6:SBTL and 2:NBT, Start of Yellow, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 11.7	Intersection LOS: B
Intersection Capacity Utilization 36.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 104: Van Aken Blvd



Lanes, Volumes, Timings  
105: Van Aken Blvd & Lee Rd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2	Ø5	Ø8
Lane Configurations	↶	↶↷		↶	↶↶	↶↶↷				
Traffic Volume (vph)	45	202	47	151	459	512	12			
Future Volume (vph)	45	202	47	151	459	512	12			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900			
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.91	0.91			
Fr <sub>t</sub>		0.972				0.996				
Fl <sub>t</sub> Protected	0.950			0.950						
Satd. Flow (prot)	1703	3446	0	1770	3438	5018	0			
Fl <sub>t</sub> Permitted	0.950			0.398						
Satd. Flow (perm)	1703	3446	0	741	3438	5018	0			
Right Turn on Red										Yes
Satd. Flow (RTOR)										3
Link Speed (mph)		35			25	25				
Link Distance (ft)		1547			110	210				
Travel Time (s)		30.1			3.0	5.7				
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88			
Heavy Vehicles (%)	6%	2%	1%	2%	5%	3%	1%			
Adj. Flow (vph)	51	230	53	172	522	582	14			
Shared Lane Traffic (%)										
Lane Group Flow (vph)	51	283	0	172	522	596	0			
Enter Blocked Intersection	No	No	No	No	No	1 veh	No			
Lane Alignment	Left	Left	Right	Left	Left	Left	Right			
Median Width(ft)		12			12	0				
Link Offset(ft)		0			0	0				
Crosswalk Width(ft)		16			16	16				
Two way Left Turn Lane										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Turning Speed (mph)	15		9	15			9			
Number of Detectors	1	1		0	0	1				
Detector Template										
Leading Detector (ft)	40	40		0	0	40				
Trailing Detector (ft)	0	0		0	0	0				
Detector 1 Position(ft)	0	0		0	0	0				
Detector 1 Size(ft)	40	40		20	20	40				
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex				
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0				
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0				
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0				
Turn Type	Split	NA		custom	NA	NA				
Protected Phases	9	9		5 8	2 5 8	6		2	5	8
Permitted Phases				2						
Detector Phase	9	9				6				
Switch Phase										
Minimum Initial (s)	4.0	4.0				10.0		10.0	4.0	10.0
Minimum Split (s)	29.0	29.0				22.0		22.0	9.0	29.0
Total Split (s)	30.0	30.0				29.0		40.0	11.0	30.0
Total Split (%)	30.0%	30.0%				29.0%		40%	11%	30%
Maximum Green (s)	25.0	25.0				24.0		35.0	6.0	25.0

Lanes, Volumes, Timings  
105: Van Aken Blvd & Lee Rd

Recommended Countermeasures  
Timing Plan: Mid Peak (12:30)



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2	Ø5	Ø8
Yellow Time (s)	3.0	3.0				3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0				2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0				0.0				
Total Lost Time (s)	5.0	5.0				5.0				
Lead/Lag						Lead			Lag	
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0				3.0		3.0	3.0	3.0
Recall Mode	None	None				C-Min		C-Min	None	None
Walk Time (s)	5.0	5.0				5.0		5.0		5.0
Flash Dont Walk (s)	19.0	19.0				12.0		12.0		19.0
Pedestrian Calls (#/hr)	0	0				0		0		0
Act Effect Green (s)	13.5	13.5		76.5	76.5	47.1				
Actuated g/C Ratio	0.14	0.14		0.76	0.76	0.47				
v/c Ratio	0.22	0.61		0.21	0.20	0.25				
Control Delay	39.8	46.2		1.3	0.4	17.1				
Queue Delay	0.0	0.0		1.2	0.4	0.0				
Total Delay	39.8	46.2		2.5	0.8	17.1				
LOS	D	D		A	A	B				
Approach Delay		45.2			1.2	17.1				
Approach LOS		D			A	B				
90th %ile Green (s)	17.2	17.2				38.9		51.6	7.7	16.2
90th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
70th %ile Green (s)	15.0	15.0				44.2		55.9	6.7	14.1
70th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
50th %ile Green (s)	13.5	13.5				47.1		58.8	6.7	12.7
50th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
30th %ile Green (s)	12.0	12.0				51.0		61.7	5.7	11.3
30th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
10th %ile Green (s)	9.8	9.8				54.5		65.2	5.7	10.0
10th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Min
Stops (vph)	40	228		13	6	305				
Fuel Used(gal)	1	7		0	0	8				
CO Emissions (g/hr)	82	478		16	34	560				
NOx Emissions (g/hr)	16	93		3	7	109				
VOC Emissions (g/hr)	19	111		4	8	130				
Dilemma Vehicles (#)	0	12		0	0	0				
Queue Length 50th (ft)	29	90		1	2	80				
Queue Length 95th (ft)	60	125		2	3	120				
Internal Link Dist (ft)		1467			30	130				
Turn Bay Length (ft)										
Base Capacity (vph)	425	861		817	2630	2367				
Starvation Cap Reductn	0	0		460	1555	0				
Spillback Cap Reductn	0	0		0	0	23				
Storage Cap Reductn	0	0		0	0	0				
Reduced v/c Ratio	0.12	0.33		0.48	0.49	0.25				

Intersection Summary

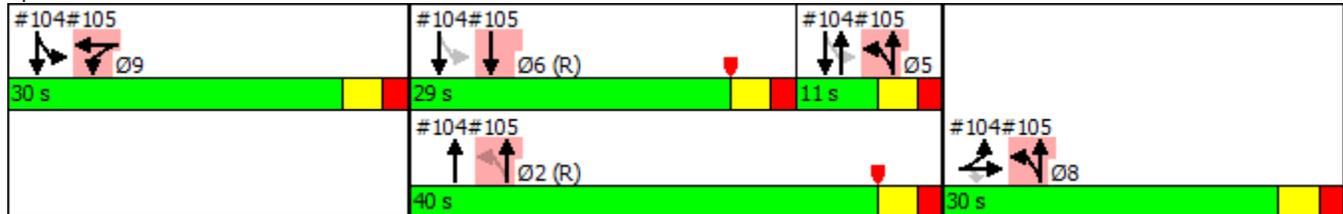
Area Type: Other  
Cycle Length: 100

Lanes, Volumes, Timings  
 105: Van Aken Blvd & Lee Rd

Recommended Countermeasures  
 Timing Plan: Mid Peak (12:30)

Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 6:SBTL and 2:NBT, Start of Yellow, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 16.1	Intersection LOS: B
Intersection Capacity Utilization 38.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 105: Van Aken Blvd & Lee Rd



Lanes, Volumes, Timings  
101: Lee Rd & Lomond Blvd

Recommended Countermeasures  
Timing Plan: PM Peak (5:00)

	↑	↖	↙	↓	↘	↗
Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations	↑↑		↖	↑↑	↘	
Traffic Volume (vph)	674	117	124	795	53	52
Future Volume (vph)	674	117	124	795	53	52
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	80		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.978				0.933	
Flt Protected			0.950		0.975	
Satd. Flow (prot)	3496	0	1787	3574	1711	0
Flt Permitted			0.283		0.975	
Satd. Flow (perm)	3496	0	532	3574	1711	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	25				43	
Link Speed (mph)	25			25	25	
Link Distance (ft)	785			521	1059	
Travel Time (s)	21.4			14.2	28.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	733	127	135	864	58	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	860	0	135	864	115	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	0		1	0	1	
Detector Template						
Leading Detector (ft)	0		37	0	60	
Trailing Detector (ft)	0		-3	0	0	
Detector 1 Position(ft)	0		-3	0	0	
Detector 1 Size(ft)	6		40	6	60	
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	8	
Permitted Phases			6			
Detector Phase	2		1	6	8	
Switch Phase						
Minimum Initial (s)	10.0		7.0	10.0	10.0	
Minimum Split (s)	32.0		12.0	21.0	29.0	

Lanes, Volumes, Timings  
101: Lee Rd & Lomond Blvd

Recommended Countermeasures

Timing Plan: PM Peak (5:00)



Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Total Split (s)	58.0		19.0	77.0	33.0	
Total Split (%)	52.7%		17.3%	70.0%	30.0%	
Maximum Green (s)	53.0		14.0	72.0	28.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Max		None	C-Max	None	
Walk Time (s)	5.0			0.0	5.0	
Flash Dont Walk (s)	22.0			0.0	19.0	
Pedestrian Calls (#/hr)	0			0	0	
Act Effect Green (s)	75.8		88.5	88.5	11.5	
Actuated g/C Ratio	0.69		0.80	0.80	0.10	
v/c Ratio	0.36		0.26	0.30	0.53	
Control Delay	7.6		2.0	1.2	38.3	
Queue Delay	0.0		0.0	0.1	0.0	
Total Delay	7.6		2.0	1.3	38.3	
LOS	A		A	A	D	
Approach Delay	7.6			1.4	38.3	
Approach LOS	A			A	D	
90th %ile Green (s)	70.6		9.1	84.7	15.3	
90th %ile Term Code	Coord		Gap	Coord	Gap	
70th %ile Green (s)	74.9		7.9	87.8	12.2	
70th %ile Term Code	Coord		Gap	Coord	Gap	
50th %ile Green (s)	77.7		7.2	89.9	10.1	
50th %ile Term Code	Coord		Gap	Coord	Gap	
30th %ile Green (s)	78.0		7.0	90.0	10.0	
30th %ile Term Code	Coord		Min	Coord	Min	
10th %ile Green (s)	78.0		7.0	90.0	10.0	
10th %ile Term Code	Coord		Min	Coord	Min	
Stops (vph)	297		8	54	62	
Fuel Used(gal)	8		1	4	2	
CO Emissions (g/hr)	535		44	275	141	
NOx Emissions (g/hr)	104		9	53	27	
VOC Emissions (g/hr)	124		10	64	33	
Dilemma Vehicles (#)	0		0	0	0	
Queue Length 50th (ft)	105		4	15	49	
Queue Length 95th (ft)	171		m15	42	103	
Internal Link Dist (ft)	705			441	979	
Turn Bay Length (ft)			80			
Base Capacity (vph)	2418		587	2874	467	
Starvation Cap Reductn	0		0	875	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.36		0.23	0.43	0.25	

Intersection Summary

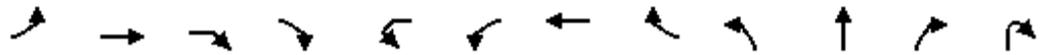
Area Type:	Other
Cycle Length:	110
Actuated Cycle Length:	110
Offset:	41 (37%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.53
Intersection Signal Delay:	6.2
Intersection LOS:	A
Intersection Capacity Utilization	50.1%
ICU Level of Service	A
Analysis Period (min)	15
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 101: Lee Rd & Lomond Blvd



Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: PM Peak (5:00)



Lane Group	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations												
Traffic Volume (vph)	167	371	65	158	7	123	399	49	99	613	105	6
Future Volume (vph)	167	371	65	158	7	123	399	49	99	613	105	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		0			350		0	180		0	
Storage Lanes	1		1			1		0	1		0	
Taper Length (ft)	25					25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Frt			0.850				0.984			0.977		
Flt Protected	0.950					0.950			0.950			
Satd. Flow (prot)	1770	1863	1588	0	0	1787	3517	0	1770	3458	0	0
Flt Permitted	0.330					0.179			0.182			
Satd. Flow (perm)	615	1863	1588	0	0	337	3517	0	339	3458	0	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			169				12		1			
Link Speed (mph)		25					25		25			
Link Distance (ft)		1469					1615		521			
Travel Time (s)		40.1					44.0		14.2			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	1%	2%	1%	1%	1%	1%	2%	2%	2%	1%
Adj. Flow (vph)	182	403	71	172	8	134	434	53	108	666	114	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	182	403	243	0	0	142	487	0	108	787	0	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Right	Left	Left	Left	Right	Left	Right	Right	Right
Median Width(ft)		12					12		12			
Link Offset(ft)		0					0		0			
Crosswalk Width(ft)		16					16		16			
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	9	15	15		9	15		9	9
Number of Detectors	1	1	1		1	1	1		1	0		
Detector Template					Left							
Leading Detector (ft)	20	20	20		20	20	20		20	0		
Trailing Detector (ft)	-10	0	0		0	0	0		-10	0		
Detector 1 Position(ft)	-10	0	0		0	0	0		-10	0		
Detector 1 Size(ft)	30	20	20		20	20	20		30	6		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0		
Turn Type	pm+pt	NA	Perm		pm+pt	pm+pt	NA		pm+pt	NA		
Protected Phases	3	4			3	3	4		5	2		
Permitted Phases	4		4		4	4			2			
Detector Phase	3	4	4		3	3	4		5	2		
Switch Phase												
Minimum Initial (s)	7.0	10.0	10.0		7.0	7.0	10.0		7.0	10.0		
Minimum Split (s)	12.0	30.0	30.0		12.0	12.0	30.0		12.0	24.0		

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures

Timing Plan: PM Peak (5:00)

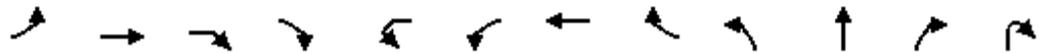


Lane Group	SBL2	SBL	SBT	SBR	NWL2	NWL	NWR	NWR2
Lane Configurations								
Traffic Volume (vph)	111	16	669	79	23	13	6	18
Future Volume (vph)	111	16	669	79	23	13	6	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		75		0		0	0	
Storage Lanes		1		0		1	0	
Taper Length (ft)		25				25		
Lane Util. Factor	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.984			0.945		
Flt Protected		0.950				0.971		
Satd. Flow (prot)	0	1787	3517	0	0	1726	0	0
Flt Permitted		0.182				0.971		
Satd. Flow (perm)	0	342	3517	0	0	1726	0	0
Right Turn on Red				Yes				Yes
Satd. Flow (RTOR)			12			169		
Link Speed (mph)			25			25		
Link Distance (ft)			339			1456		
Travel Time (s)			9.2			39.7		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	121	17	727	86	25	14	7	20
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	138	813	0	0	66	0	0
Enter Blocked Intersection	No							
Lane Alignment	Left	Left	Left	Right	Left	Left	Right	Right
Median Width(ft)			12			12		
Link Offset(ft)			0			0		
Crosswalk Width(ft)			16			16		
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15		9	15	15	9	9
Number of Detectors	1	1	0		1	1		
Detector Template	Left				Left			
Leading Detector (ft)	20	20	0		20	30		
Trailing Detector (ft)	0	-10	0		0	0		
Detector 1 Position(ft)	0	-10	0		0	0		
Detector 1 Size(ft)	20	30	6		20	30		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel								
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0		
Turn Type	pm+pt	pm+pt	NA		Prot	Prot		
Protected Phases	1	1	6		7	7		
Permitted Phases	6	6						
Detector Phase	1	1	6		7	7		
Switch Phase								
Minimum Initial (s)	7.0	7.0	10.0		7.0	7.0		
Minimum Split (s)	12.0	12.0	33.0		12.0	12.0		

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures

Timing Plan: PM Peak (5:00)



Lane Group	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	NBR2
Total Split (s)	12.0	36.0	36.0		12.0	12.0	36.0		12.0	37.0		
Total Split (%)	10.9%	32.7%	32.7%		10.9%	10.9%	32.7%		10.9%	33.6%		
Maximum Green (s)	7.0	31.0	31.0		7.0	7.0	31.0		7.0	32.0		
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0			5.0	5.0		5.0	5.0		
Lead/Lag	Lead	Lag	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		
Recall Mode	None	None	None		None	None	None		None	C-Max		
Walk Time (s)		5.0	5.0				5.0			5.0		
Flash Dont Walk (s)		20.0	20.0				20.0			14.0		
Pedestrian Calls (#/hr)		0	0				0			0		
Act Effect Green (s)	35.2	28.2	28.2			35.2	28.2		44.4	37.0		
Actuated g/C Ratio	0.32	0.26	0.26			0.32	0.26		0.40	0.34		
v/c Ratio	0.68	0.84	0.46			0.71	0.54		0.47	0.68		
Control Delay	39.4	55.5	13.5			45.1	36.3		29.1	30.9		
Queue Delay	0.0	0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	39.4	55.5	13.5			45.1	36.3		29.1	30.9		
LOS	D	E	B			D	D		C	C		
Approach Delay		39.6					38.3			30.7		
Approach LOS		D					D			C		
90th %ile Green (s)	7.0	31.0	31.0		7.0	7.0	31.0		7.0	32.0		
90th %ile Term Code	Max	Max	Max		Max	Max	Max		Max	Coord		
70th %ile Green (s)	7.0	31.0	31.0		7.0	7.0	31.0		7.0	32.0		
70th %ile Term Code	Max	Max	Max		Max	Max	Max		Max	Coord		
50th %ile Green (s)	7.0	30.6	30.6		7.0	7.0	30.6		7.4	32.0		
50th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Max	Coord		
30th %ile Green (s)	7.0	26.6	26.6		7.0	7.0	26.6		8.5	34.8		
30th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Gap	Coord		
10th %ile Green (s)	7.0	21.6	21.6		7.0	7.0	21.6		7.0	54.2		
10th %ile Term Code	Max	Gap	Gap		Max	Max	Gap		Min	Coord		
Stops (vph)	131	340	61			91	364		67	517		
Fuel Used(gal)	4	10	4			3	11		1	10		
CO Emissions (g/hr)	275	709	255			234	760		90	682		
NOx Emissions (g/hr)	53	138	50			46	148		17	133		
VOC Emissions (g/hr)	64	164	59			54	176		21	158		
Dilemma Vehicles (#)	0	0	0			0	0		0	0		
Queue Length 50th (ft)	87	262	40			66	147		43	192		
Queue Length 95th (ft)	140	#387	110			#112	198		96	212		
Internal Link Dist (ft)		1389					1535			441		
Turn Bay Length (ft)	225					350			180			
Base Capacity (vph)	269	525	568			199	999		232	1163		
Starvation Cap Reductn	0	0	0			0	0		0	0		
Spillback Cap Reductn	0	0	0			0	0		0	0		
Storage Cap Reductn	0	0	0			0	0		0	0		
Reduced v/c Ratio	0.68	0.77	0.43			0.71	0.49		0.47	0.68		

Lanes, Volumes, Timings  
 102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
 Timing Plan: PM Peak (5:00)

Intersection Summary

Area Type:	Other
Cycle Length:	110
Actuated Cycle Length:	110
Offset:	2 (2%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle:	100
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.84
Intersection Signal Delay:	33.4
Intersection LOS:	C
Intersection Capacity Utilization:	80.9%
ICU Level of Service:	D
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 102: Kenyon Rd & Chagrin Blvd

 Ø1 13 s	 Ø2 (R) 37 s	 Ø3 12 s	 Ø4 36 s	 Ø7 12 s
 Ø5 12 s	 Ø6 (R) 38 s			

Lanes, Volumes, Timings  
102: Kenyon Rd & Chagrin Blvd

Recommended Countermeasures  
Timing Plan: PM Peak (5:00)



Lane Group	SBL2	SBL	SBT	SBR	NWL2	NWL	NWR	NWR2
Total Split (s)	13.0	13.0	38.0		12.0	12.0		
Total Split (%)	11.8%	11.8%	34.5%		10.9%	10.9%		
Maximum Green (s)	8.0	8.0	33.0		7.0	7.0		
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0		
Lost Time Adjust (s)		0.0	0.0			0.0		
Total Lost Time (s)		5.0	5.0			5.0		
Lead/Lag	Lead	Lead	Lag					
Lead-Lag Optimize?								
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
Recall Mode	None	None	C-Max		None	None		
Walk Time (s)			5.0		0.0	0.0		
Flash Dont Walk (s)			23.0		0.0	0.0		
Pedestrian Calls (#/hr)			0		0	0		
Act Effect Green (s)		46.1	37.9			7.0		
Actuated g/C Ratio		0.42	0.34			0.06		
v/c Ratio		0.55	0.67			0.25		
Control Delay		36.4	27.8			2.2		
Queue Delay		0.0	0.7			0.0		
Total Delay		36.4	28.4			2.2		
LOS		D	C			A		
Approach Delay			29.6			2.2		
Approach LOS			C			A		
90th %ile Green (s)	8.0	8.0	33.0		7.0	7.0		
90th %ile Term Code	Max	Max	Coord		Max	Max		
70th %ile Green (s)	8.0	8.0	33.0		7.0	7.0		
70th %ile Term Code	Max	Max	Coord		Max	Max		
50th %ile Green (s)	8.4	8.4	33.0		7.0	7.0		
50th %ile Term Code	Max	Max	Coord		Min	Min		
30th %ile Green (s)	9.6	9.6	35.9		7.0	7.0		
30th %ile Term Code	Gap	Gap	Coord		Min	Min		
10th %ile Green (s)	7.2	7.2	54.4		0.0	0.0		
10th %ile Term Code	Gap	Gap	Coord		Skip	Skip		
Stops (vph)		74	380			0		
Fuel Used(gal)		2	8			1		
CO Emissions (g/hr)		111	548			55		
NOx Emissions (g/hr)		22	107			11		
VOC Emissions (g/hr)		26	127			13		
Dilemma Vehicles (#)		0	0			0		
Queue Length 50th (ft)		44	88			0		
Queue Length 95th (ft)		122	294			0		
Internal Link Dist (ft)			259			1376		
Turn Bay Length (ft)		75						
Base Capacity (vph)		254	1218			268		
Starvation Cap Reductn		0	146			0		
Spillback Cap Reductn		0	0			0		
Storage Cap Reductn		0	0			0		
Reduced v/c Ratio		0.54	0.76			0.25		

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Intersection Summary

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Lanes, Volumes, Timings  
103: Library/Heinen's

Recommended Countermeasures

Timing Plan: PM Peak (5:00)

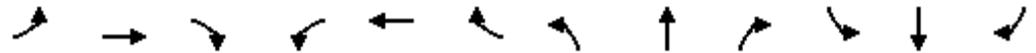


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↖	↕	↕	↖	↕	↖
Traffic Volume (vph)	16	12	25	22	7	57	25	762	25	122	828	56
Future Volume (vph)	16	12	25	22	7	57	25	762	25	122	828	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		50	0		0	75		0	75		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.911			0.995			0.990	
Flt Protected		0.972			0.987		0.950			0.950		
Satd. Flow (prot)	0	1829	1599	0	1691	0	1787	3556	0	1787	3506	0
Flt Permitted		0.680			0.903		0.288			0.297		
Satd. Flow (perm)	0	1279	1599	0	1548	0	542	3556	0	559	3506	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			119		62			4			9	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		521			577			339			190	
Travel Time (s)		14.2			15.7			9.2			5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	1%
Adj. Flow (vph)	17	13	27	24	8	62	27	828	27	133	900	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	30	27	0	94	0	27	855	0	133	961	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	0		1	0	
Detector Template	Left			Left								
Leading Detector (ft)	20	30	35	20	40		40	0		40	0	
Trailing Detector (ft)	0	-10	-5	0	0		0	0		0	0	
Detector 1 Position(ft)	0	-10	-5	0	0		0	0		0	0	
Detector 1 Size(ft)	20	40	40	20	40		40	6		40	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	22.0	22.0	22.0	29.0	29.0		12.0	24.0		12.0	24.0	

Lanes, Volumes, Timings  
103: Library/Heinen's

Recommended Countermeasures

Timing Plan: PM Peak (5:00)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	33.0	33.0	33.0	33.0	33.0		14.0	57.0		20.0	63.0	
Total Split (%)	30.0%	30.0%	30.0%	30.0%	30.0%		12.7%	51.8%		18.2%	57.3%	
Maximum Green (s)	28.0	28.0	28.0	28.0	28.0		9.0	52.0		15.0	58.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)				5.0	5.0			5.0			5.0	
Flash Dont Walk (s)				19.0	19.0			12.0			12.0	
Pedestrian Calls (#/hr)				0	0			0			0	
Act Effect Green (s)		10.5	10.5		10.5		87.0	80.0		89.9	86.3	
Actuated g/C Ratio		0.10	0.10		0.10		0.79	0.73		0.82	0.78	
v/c Ratio		0.25	0.10		0.46		0.05	0.33		0.25	0.35	
Control Delay		50.9	0.8		27.0		1.0	1.5		1.8	1.8	
Queue Delay		0.0	0.0		0.0		0.0	0.3		0.0	0.2	
Total Delay		50.9	0.8		27.0		1.0	1.8		1.8	2.0	
LOS		D	A		C		A	A		A	A	
Approach Delay		27.2			27.0			1.8			2.0	
Approach LOS		C			C			A			A	
90th %ile Green (s)	12.7	12.7	12.7	12.7	12.7		7.0	73.7		8.6	75.3	
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Min	Coord		Gap	Coord	
70th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		7.0	77.5		7.5	78.0	
70th %ile Term Code	Min	Min	Min	Min	Min		Min	Coord		Gap	Coord	
50th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		7.0	77.9		7.1	78.0	
50th %ile Term Code	Min	Min	Min	Min	Min		Min	Coord		Gap	Coord	
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		0.0	78.0		7.0	90.0	
30th %ile Term Code	Min	Min	Min	Min	Min		Skip	Coord		Min	Coord	
10th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		0.0	93.0		7.0	105.0	
10th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Skip	Coord		Min	Coord	
Stops (vph)		26	0		34		1	37		8	93	
Fuel Used(gal)		1	0		1		0	3		0	4	
CO Emissions (g/hr)		36	8		72		6	186		32	245	
NOx Emissions (g/hr)		7	2		14		1	36		6	48	
VOC Emissions (g/hr)		8	2		17		1	43		7	57	
Dilemma Vehicles (#)		0	0		0		0	0		0	0	
Queue Length 50th (ft)		20	0		21		1	14		3	48	
Queue Length 95th (ft)		50	0		72		m3	34		6	54	
Internal Link Dist (ft)		441			497			259			110	
Turn Bay Length (ft)			50				75			75		
Base Capacity (vph)		325	495		440		540	2587		637	2751	
Starvation Cap Reductn		0	0		0		0	967		0	806	
Spillback Cap Reductn		0	4		2		0	0		0	133	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.09	0.05		0.21		0.05	0.53		0.21	0.49	

Lanes, Volumes, Timings  
 103: Library/Heinen's

Recommended Countermeasures  
 Timing Plan: PM Peak (5:00)

Intersection Summary

Area Type:	Other
Cycle Length:	110
Actuated Cycle Length:	110
Offset:	42 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle:	65
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.46
Intersection Signal Delay:	3.7
Intersection LOS:	A
Intersection Capacity Utilization	54.8%
ICU Level of Service	A
Analysis Period (min)	15

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

Splits and Phases: 103: Library/Heinen's



Lanes, Volumes, Timings  
104: Van Aken Blvd

Recommended Countermeasures

Timing Plan: PM Peak (5:00)



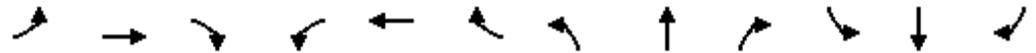
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗					↕↕↕		↗	↕↕	
Traffic Volume (vph)	46	618	265	0	0	0	0	775	60	134	741	0
Future Volume (vph)	46	618	265	0	0	0	0	775	60	134	741	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.95	1.00
Fr <sub>t</sub>			0.850					0.989				
Fl <sub>t</sub> Protected		0.997								0.950		
Satd. Flow (prot)	0	3564	1599	0	0	0	0	5079	0	1787	3574	0
Fl <sub>t</sub> Permitted		0.997								0.248		
Satd. Flow (perm)	0	3564	1599	0	0	0	0	5079	0	467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			209					12				
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1474			1581			190			110	
Travel Time (s)		28.7			30.8			5.2			3.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	50	672	288	0	0	0	0	842	65	146	805	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	722	288	0	0	0	0	907	0	146	805	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1		0	0	
Detector Template	Left											
Leading Detector (ft)	20	40	33					34		0	0	
Trailing Detector (ft)	0	0	-7					-6		0	0	
Detector 1 Position(ft)	0	0	-7					-6		0	0	
Detector 1 Size(ft)	20	40	40					40		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Turn Type	Split	NA	Perm					NA		custom	NA	
Protected Phases	8	8						2 5		9	5 6 9	
Permitted Phases			8							5 6		
Detector Phase	8	8	8					2 5				
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0							10.0		
Minimum Split (s)	29.0	29.0	29.0							31.0		
Total Split (s)	35.0	35.0	35.0							31.0		
Total Split (%)	31.8%	31.8%	31.8%							28.2%		
Maximum Green (s)	30.0	30.0	30.0							26.0		

Lane Group	Ø2	Ø5	Ø6
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Turn Type			
Protected Phases	2	5	6
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	5.0	10.0
Minimum Split (s)	22.0	10.0	23.0
Total Split (s)	44.0	12.0	32.0
Total Split (%)	40%	11%	29%
Maximum Green (s)	39.0	7.0	27.0

Lanes, Volumes, Timings  
104: Van Aken Blvd

Recommended Countermeasures

Timing Plan: PM Peak (5:00)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.0	3.0							3.0		
All-Red Time (s)	2.0	2.0	2.0							2.0		
Lost Time Adjust (s)		0.0	0.0							0.0		
Total Lost Time (s)		5.0	5.0							5.0		
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0							3.0		
Recall Mode	None	None	None							None		
Walk Time (s)	5.0	5.0	5.0							5.0		
Flash Dont Walk (s)	19.0	19.0	19.0							21.0		
Pedestrian Calls (#/hr)	0	0	0							0		
Act Effect Green (s)		27.4	27.4					49.2		67.6	72.6	
Actuated g/C Ratio		0.25	0.25					0.45		0.61	0.66	
v/c Ratio		0.81	0.52					0.40		0.29	0.34	
Control Delay		46.9	13.5					17.9		12.2	1.4	
Queue Delay		0.0	0.0					0.2		9.7	0.5	
Total Delay		46.9	13.5					18.0		21.9	1.9	
LOS		D	B					B		C	A	
Approach Delay		37.4						18.0			5.0	
Approach LOS		D						B			A	
90th %ile Green (s)	30.0	30.0	30.0							23.7		
90th %ile Term Code	Max	Max	Max							Gap		
70th %ile Green (s)	30.0	30.0	30.0							20.2		
70th %ile Term Code	Max	Max	Max							Gap		
50th %ile Green (s)	28.8	28.8	28.8							18.3		
50th %ile Term Code	Gap	Gap	Gap							Gap		
30th %ile Green (s)	25.7	25.7	25.7							16.4		
30th %ile Term Code	Gap	Gap	Gap							Gap		
10th %ile Green (s)	22.3	22.3	22.3							13.7		
10th %ile Term Code	Gap	Gap	Gap							Gap		
Stops (vph)		607	70					342		60	74	
Fuel Used(gal)		18	4					7		1	1	
CO Emissions (g/hr)		1256	285					501		48	83	
NOx Emissions (g/hr)		244	55					98		9	16	
VOC Emissions (g/hr)		291	66					116		11	19	
Dilemma Vehicles (#)		29	0					0		0	0	
Queue Length 50th (ft)		248	43					97		28	22	
Queue Length 95th (ft)		315	122					123		89	26	
Internal Link Dist (ft)		1394			1501			110			30	
Turn Bay Length (ft)												
Base Capacity (vph)		972	588					2282		508	2360	
Starvation Cap Reductn		0	0					492		324	1012	
Spillback Cap Reductn		0	0					138		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.74	0.49					0.51		0.79	0.60	

Intersection Summary

Area Type: Other  
Cycle Length: 110

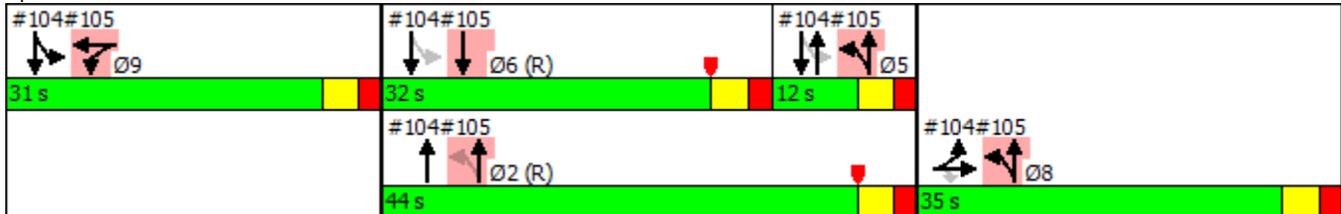
Lane Group	Ø2	Ø5	Ø6
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag		Lag	Lead
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	C-Min
Walk Time (s)	5.0		5.0
Flash Dont Walk (s)	12.0		12.0
Pedestrian Calls (#/hr)	0		0
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
90th %ile Green (s)	41.3	7.0	29.3
90th %ile Term Code	Coord	Max	Coord
70th %ile Green (s)	44.8	7.6	32.2
70th %ile Term Code	Coord	Max	Coord
50th %ile Green (s)	47.9	7.7	35.2
50th %ile Term Code	Coord	Gap	Coord
30th %ile Green (s)	52.9	6.7	41.2
30th %ile Term Code	Coord	Gap	Coord
10th %ile Green (s)	59.0	6.7	47.3
10th %ile Term Code	Coord	Gap	Coord
Stops (vph)			
Fuel Used(gal)			
CO Emissions (g/hr)			
NOx Emissions (g/hr)			
VOC Emissions (g/hr)			
Dilemma Vehicles (#)			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
<b>Intersection Summary</b>			

Lanes, Volumes, Timings  
 104: Van Aken Blvd

Recommended Countermeasures  
 Timing Plan: PM Peak (5:00)

Actuated Cycle Length: 110  
 Offset: 0 (0%), Referenced to phase 6:SBTL and 2:NBT, Start of Yellow, Master Intersection  
 Natural Cycle: 95  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.81  
 Intersection Signal Delay: 20.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 55.6%  
 ICU Level of Service B  
 Analysis Period (min) 15

Splits and Phases: 104: Van Aken Blvd



Lanes, Volumes, Timings  
105: Van Aken Blvd & Lee Rd

Recommended Countermeasures

Timing Plan: PM Peak (5:00)



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2	Ø5	Ø8
Lane Configurations										
Traffic Volume (vph)	78	323	59	211	610	797	34			
Future Volume (vph)	78	323	59	211	610	797	34			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900			
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.91	0.91			
Fr <sub>t</sub>		0.977				0.994				
Fl <sub>t</sub> Protected	0.950			0.950						
Satd. Flow (prot)	1736	3492	0	1787	3574	5101	0			
Fl <sub>t</sub> Permitted	0.950			0.220						
Satd. Flow (perm)	1736	3492	0	414	3574	5101	0			
Right Turn on Red										Yes
Satd. Flow (RTOR)										5
Link Speed (mph)		35			25	25				
Link Distance (ft)		1547			110	222				
Travel Time (s)		30.1			3.0	6.1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Heavy Vehicles (%)	4%	1%	1%	1%	1%	1%	3%			
Adj. Flow (vph)	85	351	64	229	663	866	37			
Shared Lane Traffic (%)										
Lane Group Flow (vph)	85	415	0	229	663	903	0			
Enter Blocked Intersection	No	No	No	No	No	No	No			
Lane Alignment	Left	Left	Right	Left	Left	Right	Right			
Median Width(ft)		12			12	8				
Link Offset(ft)		0			0	0				
Crosswalk Width(ft)		16			16	16				
Two way Left Turn Lane										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Turning Speed (mph)	15		9	15			9			
Number of Detectors	1	1		0	0	1				
Detector Template										
Leading Detector (ft)	40	40		0	0	40				
Trailing Detector (ft)	0	0		0	0	0				
Detector 1 Position(ft)	0	0		0	0	0				
Detector 1 Size(ft)	40	40		20	20	40				
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex				
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0				
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0				
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0				
Turn Type	Split	NA		custom	NA	NA				
Protected Phases	9	9		5 8	2 5 8	6		2	5	8
Permitted Phases				2						
Detector Phase	9	9				6				
Switch Phase										
Minimum Initial (s)	10.0	10.0				10.0		10.0	5.0	10.0
Minimum Split (s)	31.0	31.0				23.0		22.0	10.0	29.0
Total Split (s)	31.0	31.0				32.0		44.0	12.0	35.0
Total Split (%)	28.2%	28.2%				29.1%		40%	11%	32%
Maximum Green (s)	26.0	26.0				27.0		39.0	7.0	30.0

Lanes, Volumes, Timings  
105: Van Aken Blvd & Lee Rd

Recommended Countermeasures

Timing Plan: PM Peak (5:00)



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR	Ø2	Ø5	Ø8
Yellow Time (s)	3.0	3.0				3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0				2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0				0.0				
Total Lost Time (s)	5.0	5.0				5.0				
Lead/Lag						Lead			Lag	
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0				3.0		3.0	3.0	3.0
Recall Mode	None	None				C-Min		C-Min	None	None
Walk Time (s)	5.0	5.0				5.0		5.0		5.0
Flash Dont Walk (s)	21.0	21.0				12.0		12.0		19.0
Pedestrian Calls (#/hr)	0	0				0		0		0
Act Effect Green (s)	18.5	18.5		81.5	81.5	37.0				
Actuated g/C Ratio	0.17	0.17		0.74	0.74	0.34				
v/c Ratio	0.29	0.71		0.29	0.25	0.53				
Control Delay	41.6	49.9		6.9	0.3	31.8				
Queue Delay	0.0	0.0		18.3	0.3	0.1				
Total Delay	41.6	49.9		25.1	0.6	31.9				
LOS	D	D		C	A	C				
Approach Delay		48.5			6.9	31.9				
Approach LOS		D			A	C				
90th %ile Green (s)	23.7	23.7				29.3		41.3	7.0	30.0
90th %ile Term Code	Gap	Gap				Coord		Coord	Max	Max
70th %ile Green (s)	20.2	20.2				32.2		44.8	7.6	30.0
70th %ile Term Code	Gap	Gap				Coord		Coord	Max	Max
50th %ile Green (s)	18.3	18.3				35.2		47.9	7.7	28.8
50th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
30th %ile Green (s)	16.4	16.4				41.2		52.9	6.7	25.7
30th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
10th %ile Green (s)	13.7	13.7				47.3		59.0	6.7	22.3
10th %ile Term Code	Gap	Gap				Coord		Coord	Gap	Gap
Stops (vph)	65	350		108	5	656				
Fuel Used(gal)	2	11		1	1	13				
CO Emissions (g/hr)	141	753		63	44	943				
NOx Emissions (g/hr)	27	147		12	9	184				
VOC Emissions (g/hr)	33	175		15	10	219				
Dilemma Vehicles (#)	0	16		0	0	0				
Queue Length 50th (ft)	53	147		15	1	190				
Queue Length 95th (ft)	95	190		m112	1	254				
Internal Link Dist (ft)		1467			30	142				
Turn Bay Length (ft)										
Base Capacity (vph)	410	825		800	2649	1720				
Starvation Cap Reductn	0	0		554	1223	0				
Spillback Cap Reductn	0	0		0	0	97				
Storage Cap Reductn	0	0		0	0	0				
Reduced v/c Ratio	0.21	0.50		0.93	0.46	0.56				

Intersection Summary

Area Type: Other  
Cycle Length: 110



**APPENDIX F:  
COST ESTIMATE**

**Lee Road/Van Aken Boulevard Recommended Countermeasures  
Cost Estimate**

ITEM NUMBER	ITEM EXTENSION	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE ESTIMATED DOLLARS	CTS	TOTAL AMOUNT EST. DOLLARS	CTS
<b>ROADWAY</b>								
202	30000	WALK REMOVED	SQ FT	800	\$	4.00	\$	3,200.00
202	32000	CURB REMOVED	FT	120	\$	10.00	\$	1,200.00
608	10001	4" CONCRETE WALK, AS PER PLAN	SQ FT	800	\$	6.00	\$	4,800.00
608		CURB RAMP, TYPE A2, B1, B2, B3, AS PER PLAN	EACH	4	\$	1,200.00	\$	4,800.00
609	26001	CURB, TYPE 6, AS PER PLAN	FT	120	\$	25.00	\$	3,000.00
<b>SECTION TOTAL ROADWAY :</b>					<b>\$</b>			<b>17,000.00</b>
<b>PAVEMENT</b>								
<b>SECTION TOTAL PAVEMENT :</b>					<b>\$</b>			<b>-</b>
<b>DRAINAGE</b>								
<b>SECTION TOTAL DRAINAGE :</b>					<b>\$</b>			<b>-</b>
<b>EROSION CONTROL</b>								
832	30000	EROSION CONTROL	EACH	2,000	\$	1.00	\$	2,000.00
<b>SECTION TOTAL EROSION CONTROL :</b>					<b>\$</b>			<b>2,000.00</b>
<b>TRAFFIC CONTROL</b>								
630	79200	SIGN ATTACHMENT ASSEMBLY, MAST ARM	EACH	4	\$	300.00	\$	1,200.00
630	79500	SIGN SUPPORT ASSEMBLY, POLE MOUNTED	EACH	4	\$	150.00	\$	600.00
630	80100	SIGN, FLAT SHEET	SQ FT	90	\$	30.00	\$	2,700.00
630	84900	REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL	EACH	4	\$	25.00	\$	100.00
630	86002	REMOVAL OF GROUND MOUNTED POST SUPPORT AND DISPOSAL	EACH	4	\$	25.00	\$	100.00
630	87400	REMOVAL OF OVERHEAD SIGN AND DISPOSAL	EACH	2	\$	200.00	\$	400.00
632	26501	DETECTOR LOOP, AS PER PLAN	EACH	3	\$	2,000.00	\$	6,000.00
632		SIGNAL HEAD WORK (FIX OP, LOUVERS)	EACH	4	\$	300.00	\$	1,200.00
632		REMOVAL OF LED STOP SIGN	EACH	2	\$	400.00	\$	800.00
632		SYSTEM TIMING	LUMP				\$	2,300.00
632		MAST ARM SIGNAL SUPPORT AND FOUNDATION REMOVED	LUMP				\$	5,000.00
632		REMOVAL OF PEDESTRIAN SIGNAL HEAD	EACH	6	\$	250.00	\$	1,500.00
632		REMOVAL OF PEDESTAL AND FOUNDATION	EACH	1	\$	500.00	\$	500.00
646		VAN AKEN NE/CHALFANT ROAD MARKINGS	LUMP				\$	2,000.00
646	50100	PAVEMENT MARKING REMOVED	FT	280	\$	20.00	\$	5,600.00
<b>SECTION TOTAL TRAFFIC CONTROL :</b>					<b>\$</b>			<b>30,000.00</b>
<b>MISCELLANEOUS</b>								
614		MAINTENANCE OF TRAFFIC	LUMP				\$	10,000.00
623	10001	CONSTRUCTION LAYOUT STAKES AND SURVEYING, AS PER PLAN	LUMP				\$	2,500.00
624	10001	MOBILIZATION, AS PER PLAN	LUMP				\$	5,000.00
SPECIAL		PROJECT DVD RECORDING (REFER TO PROPOSAL NOTES IN THE BID PACKAGE)	LUMP				\$	1,000.00
<b>SECTION TOTAL MISCELLANEOUS :</b>					<b>\$</b>			<b>18,500.00</b>
<b>PROJECT TOTAL</b>							<b>\$</b>	<b>67,500.00</b>
<b>PROJECT CONTINGENCY (10%)</b>							<b>\$</b>	<b>6,750.00</b>
<b>PRELIMINARY GRAND TOTAL ESTIMATED:</b>							<b>\$</b>	<b>74,250.00</b>