TRAFFIC IMPACT STUDY FOR THE PROPOSED GLEN MIXED-USE DEVELOPMENT ON GLEN AVENUE IN ANN ARBOR, MI

Prepared for: **Neumann/Smith Architecture**
400 Galleria Officentre, #555
Southfield, MI 48034

Prepared by: **Tapan K. Datta, Ph.D., P.E.**
Wayne State University
Transportation Research Group
5050 Anthony Wayne Drive, EDC #0504
Detroit, MI 48202

Date: **March 22, 2016**

Revised: **May 9, 2016**

Revised: **May 22, 2017**

TRAFFIC IMPACT STUDY FOR THE PROPOSED GLEN MIXED-USE DEVELOPMENT ON GLEN AVENUE IN ANN ARBOR, MI

Prepared for: Neumann/Smith Architecture
400 Galleria Officentre, #555
Southfield, MI 48034

Prepared by: Tapan K. Datta, Ph.D., P.E.
Wayne State University
Transportation Research Group
5050 Anthony Wayne Drive, EDC #0504
Detroit, MI 48202

Date: March 22, 2016

Revised: May 9, 2016

Revised: May 22, 2017

TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... A
INTRODUCTION AND STUDY OBJECTIVES 1
HISTORICAL DATA COLLECTION 4
FIELD DATA COLLECTION 7
TRAFFIC VOLUME BALANCING, PEAK HOUR FACTOR, AND HEAVY VEHICLES 16
BACKGROUND GROWTH 21
TRAFFIC CRASH ANALYSIS 21
TRIP GENERATION ANALYSIS 29
TRIP DISTRIBUTION AND FUTURE BUILD-OUT CONDITIONS 36
LEVEL OF SERVICE ANALYSIS 45
INVESTIGATING FUTURE LIGHT RAIL PLAN 58
PARKING ANALYSIS 59
CONCLUSIONS AND RECOMMENDATIONS 65
APPENDIX I – POPULATION AND HOUSEHOLD GROWTH TREND EXCERPTS 68
APPENDIX II – TURNING VOLUME COUNTS FOR THE AM AND PM PEAK HOURS ON WEEKDAYS 75
APPENDIX III – COLLISION DIAGRAMS FOR 2012, 2013 AND 2014 FOR THE STUDY INTERSECTIONS 92
APPENDIX IV – CRASH PREDICTION ANALYSIS 110
APPENDIX V – ITE TRIP GENERATION EXCERPTS 117
APPENDIX VI – SIGNAL-TIMING PERMITS 133
APPENDIX VII – SIMTRAFFIC TABLES 140
APPENDIX VIII – EXISTING PARKING SPACE LEASE AGREEMENT FOR ANGELO'S RESTAURANT 181
APPENDIX IX – EXCERPTS FROM ITE PARKING GENERATION 208
APPENDIX X – LETTER FROM THE UNIVERSITY OF MICHIGAN AND MEMORANDUM FROM LAURENCE DEITCH RELATED TO PARKING 212

LIST OF FIGURES

Figure 1: Proposed Site Location 2
Figure 2: Historical Traffic Counts 6
Figure 3: Existing Condition Diagram (Glen Avenue Corridor) 8
Figure 4: Existing Condition Diagram (Ingalls Street) 9
Figure 5: Existing Condition Diagram (Ann Street) 10
Figure 6: Existing Weekday AM Peak Hour Volume - Glen Avenue (Traffic Count - 2/2/16) 11
Figure 7: Existing Weekday AM Peak Hour Volume – Ingalls Street, Fletcher Street 12
Figure 8: Existing Weekday PM Peak Hour Volume - Glen Avenue 14
Figure 9: Existing Weekday PM Peak Hour Volume – Ingalls Street, Fletcher Street 15
Figure 10: Existing Balanced Weekday AM Peak Hour Traffic Volumes for Glen Avenue 17
Figure 11: Existing Balanced Weekday AM Peak Hour Traffic Volumes – Ingalls Street, Fletcher Street 18
Figure 12: Existing Balanced Weekday PM Peak Hour Traffic Volumes for Glen Avenue 19
Figure 13: Existing Balanced Weekday PM Peak Hour Traffic Volumes – Ingalls Street, Fletcher Street 20
Figure 14: Background Balanced Weekday AM Peak Hour Traffic Volume - Glen Avenue 22
Figure 15: Background Balanced Weekday AM Peak Hour Traffic Volume – Ingalls Street, Fletcher Street 23
Figure 16: Background Balanced Weekday PM Peak Hour Traffic Volume - Glen Avenue 24
Figure 17: Background Balanced Weekday PM Peak Hour Traffic Volume – Ingalls Street, Fletcher Street 25
Figure 18: Percent Trip Distribution - Inbound 37
Figure 19: Percent Trip Distribution - Outbound 38
Figure 20: Newly Generated Trips - Weekday AM Peak Hour 39
Figure 21: Newly Generated Trips - Weekday PM Peak Hour 40
Figure 22: Build-Out Weekday AM Peak Hour Volume - Glen Avenue 41
Figure 23: Build-Out Weekday AM Peak Hour Volume – Ingalls Street, Fletcher Street 42
Figure 24: Build-Out Weekday PM Peak Hour Volume - Glen Avenue 43
Figure 25: Build-Out Weekday PM Peak Hour Volume - Ingalls Street, Fletcher Street 44
Figure 26: Access to the Ann 57
Figure 28: Alternate Routes 58
Figure 29: Occupancy Rate of the United States Hotel Industry from 2001 to 2015 61
Figure 30: Monthly Occupancy Rates for Michigan, Detroit, and United States from January 2009 through October 2014 62

LIST OF TABLES

Table 1: Washtenaw County 2040 Forecasts (Population, Households, and Employment) 4
Table 2: Average Annual VMT in Washtenaw County Year 2000 to Year 2012 5
Table 3: Three Year Crash History by Type 26
Table 4: Three-Year Crash History by Injury Severity 28
Table 5: Summary of Trip Generation Analysis 35
Table 6: LOS Criteria from HCM (Signalized Intersections) 45
Table 7: Comparison of Signal Phase Lengths for Weekday AM Peak Hour at Glen and Huron 47
Table 8: Comparison of Signal Phase Lengths for Weekday AM Peak Hour at Glen and Catherine 48
Table 9: Comparison of Signal Phase Lengths for Weekday PM Peak Hour at Glen and Huron 48
Table 10: Comparison of Signal Phase Lengths for Weekday PM Peak Hour at Glen and Catherine 49
Table 11: Background and Build-Out Optimized Delays for Glen and Catherine 49
Table 12: Background and Build-Out Optimized Delays for Glen and Huron 50
Table 13: LOS for Weekday AM Peak Hour at Glen Avenue and Catherine Street 51
Table 14: LOS for Weekday AM Peak Hour at Glen Avenue and Ann Street 51
Table 15: LOS for Weekday AM Peak Hour at Glen Avenue and Huron Street 52
Table 16: LOS for Weekday AM Peak Hour at Ann Street and Ingalls Street 52
Table 17: LOS for Weekday AM Peak Hour at Huron Street and Fletcher Street 53
Table 18: LOS for Weekday AM Peak Hour at Ann Street and Glen Hotel Driveway Exit 53
Table 19: LOS for Weekday PM Peak Hour at Glen Avenue and Catherine Street 54
Table 20: LOS for Weekday PM Peak Hour at Glen Avenue and Ann Street 54
Table 21: LOS for Weekday PM Peak Hour at Glen Avenue and Huron Street 55
Table 22: LOS for Weekday PM Peak Hour at Ann Street and Ingalls Street 55
Table 23: LOS for Weekday PM Peak Hour at Huron Street and Fletcher Street 56
Table 24: LOS for Weekday PM Peak Hour at Ann Street and Glen Hotel Driveway Exit 56
Table 25: Hourly Parking Requirement Analysis 64

EXECUTIVE SUMMARY

The proposed Glen Mixed-Use Project is located on the west side of Glen Avenue, between Ann Street and Catherine Street, in close proximity to the University of Michigan (U of M) medical campus in Ann Arbor, Michigan. It consists of an upscale boutique hotel with retail space, restaurant, bar, and community gathering areas at ground level, flexible meeting, reception and conference space on level 2, hotel rooms on levels 3 through 7, residential apartments on levels 8 and 9, and four floors of underground parking.

The surrounding land uses include the U of M medical clinics, research facilities and nursing school, residential apartments, single-family homes (used primarily for student rentals), neighborhood restaurants, and U of M parking structures. The proposed project will provide a needed high quality hotel space within walking distance of the U of M medical campus and downtown Ann Arbor.

The strategic location, adjacent to the U of M medical campus and within walking distance of other U of M facilities and downtown Ann Arbor, will enable guests and visitors to walk to their destinations, use public transportation, bicycles or vehicle sharing programs. The City of Ann Arbor and the community promote alternative modes of transportation and provide the facilities to support them. The proposed Glen Mixed-Use Development will support this initiative by being centrally located and supporting these alternative modes of transportation.

Data Collection

A comprehensive review of the Southeast Michigan Council of Governments' (SEMCOG) transportation plan, population growth and trend, and vehicle miles of travel data resulted in identifying population growth trends in the City of Ann Arbor and Washtenaw County. The Michigan Department of Transportation (MDOT) databases were also reviewed to identify relevant travel data. The Washtenaw Area Transportation Study (WATS) provided valuable information regarding all transportation-related projects, programs, and policies the local jurisdictions (city, townships) have participated in and adopted. The WATS website provides information regarding upcoming projects that may have an impact on private sector projects, such as the proposed Glen Mixed-Use Development.

The regional forecast indicates the population in Washtenaw County is expected to have a total growth of 12% in the next 30 years (2010 to 2040). The growth in the number of households will be approximately 20% in the same 30-year period, and employment is expected to rise approximately 21% in the same period. Considering the 30-year planning period for analysis, the annual average growth rates for the population and households are 0.4% and 0.67%, respectively.

In order to be on the conservative side, this traffic impact analysis has assumed a 1% annual growth in traffic. Considering the compounding effect, the growth factor for a three-year construction period is 1.0303.

Field data collection included a survey of existing roadway geometry, signs and markings, traffic signals, pedestrian crosswalks, and bicycle facilities. Turning movement data was collected for a typical weekday (Tuesday, Wednesday, and Thursday) AM and PM peak period.

Traffic Crash Analysis

A traffic crash history for a three-year period (2012, 2013, and 2014) was investigated to determine if there are any crash issues present at the intersections considered in the study.

The annual average crashes at study intersections range from slightly over one to slightly over ten. Most of the crashes, considering all study intersections, are rear-end type indicating property damage type of crashes, although there was a fatal pedestrian crash at the intersection of Ann Street and Zina Pitcher Pl.

Trip Generation Analysis

The trip generation analysis for the proposed mixed-use development was performed using the ITE Trip Generation Manual for the appropriate land use codes to estimate the expected trips that will be generated due to the proposed development. It is expected that the proposed development will generate the following trips:

AM Peak (Weekday) Hour of the Adjacent Roadways

- 91 trips (49 entering and 42 exiting)

AM Peak Hour of the Generator

– 155 trips (84 entering and 71 exiting)

PM Peak (Weekday) Hour of the Adjacent Roadways

- 185 trips (102 entering and 83 exiting)

PM Peak Hour of the Generator

– 186 trips (110 entering and 76 exiting)

Level of Service Analysis

The Highway Capacity Manual (HCM) considers the average delay per vehicle as the primary measure for assessing the performance of traffic at signalized and unsignalized intersections. Delay is defined as the difference between actual travel time and ideal travel time if no traffic signal or stop control is present. Delays may be qualitatively described in terms of Level of Service (LOS) at the intersection. The LOS may range from "A" to "F", with LOS "A" being the best and "F" being the worst. For most urban intersections, LOS "D" or better during the peak hour is generally acceptable.

A delay and LOS analysis was performed for the intersections of Glen Avenue and Catherine Street, Glen Avenue and Ann Street, Glen Avenue and Huron Street, Ann Street and Ingalls Street, Huron Street and Ingalls Street, and Huron Street and Fletcher Street, utilizing Synchro Version 9. The operational analysis included the weekday AM peak period and the weekday PM peak period. This LOS analysis was performed for four scenarios: existing, background, build-out using existing signal timings, and build-out using optimized signal timings. All study intersections indicated an acceptable LOS during weekday peak hours, which is considered the worst-case scenario.

Parking Analysis

The proposed Glen Mixed-Use Development consists of 162 hotel rooms, 24 apartments, 5,135 square feet (SF) [Gross Floor Area (GFA)] of retail space, and a restaurant consisting of an area of 3,131 SF (GFA). The major attraction in this mixed-use development is the boutique

hotel located on the U of M medical center campus in the City of Ann Arbor. According to the City‘s zoning ordinance and parking requirements for the proposed development, 226 parking spaces are required.

Hotel occupancy in the United States from 2001 to 2015 ranged from 59% to approximately 66%. This is an average for all hotels that are included in the database used in the analysis. Another study indicated the highest average occupancy rate observed was 75%. The hotel occupancy rate is important while considering the strategy of satisfying parking needs. The highest parking accumulation expected is 193 parking spaces. The proposed Glen Mixed-Use Development provides 252 off-street (underground) valet parking spaces.

Conclusions

The Traffic Impact and Parking Study of the proposed Glen Mixed-Use Development indicated the following:

- The high-end boutique hotel located at the northwest corner of Glen Avenue and Ann Street will serve an important function as a temporary residence for business travelers visiting Ann Arbor, especially those with a destination to the U of M and its medical campus.

- A significant portion of the hotel guests are expected to travel through the Detroit Metropolitan Airport and possibly use a taxi, a shuttle service, or an Uber service. The inclusion of a restaurant and retail space in the proposed development will serve as a needed convenience for hotel guests.

- A trip generation analysis was performed for both the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods of the adjacent roadways. The weekday AM peak hour of the adjacent roadway uses the AM peak hour of the generators’ newly generated trips as per the city traffic engineer’s request.

- A capacity/LOS analysis was performed for the critical signalized intersections which are expected to be affected by the newly generated trips in the vicinity: Glen Avenue and Ann Street, Glen Avenue and Catherine Street, Glen Avenue and Huron Street, Ann

Street and Ingalls Street, Huron Street and Ingalls Street, and Huron Street and Fletcher Street. All study intersections will operate at an overall LOS "D" or better during both the AM and PM peak hours of the adjacent roadways for the build-out traffic scenario using both the existing signal timings and optimized signal timings. The proposed driveway at Ann Street operates at LOS "A" for both the AM and PM peak periods.

- A crash analysis was conducted for the past three years at all of the affected intersections and has indicated traffic crashes and injuries are reasonably low.

- The hotel website will help provide detailed directions for potential guests to access. In addition, the hotel will send out email confirmations in which the hotel can remind each guest of special instructions prior to their arrival. The other primary sources of route guidance today that are heavily relied upon are cabs, limousines, shuttles, ride shares (Uber/Lyft) and many guests utilize traffic sites like Apple maps, Google maps or Waze. These sites can have specific instructions programmed into their direction guidance, like no left turns and one way streets, which will facilitate efficient navigation of the Glen and Zina Pitcher corridors. Upon leaving the Glen Mixed-Use Development, each car will be given instructions by the valet attendant prior to exiting on Glen Avenue.

- The number of required parking spaces for the proposed Glen Mixed-Use Development, per the City of Ann Arbor's ordinance, is 226 spaces.

- The Glen Mixed-Use Development will provide underground off-street valet parking. The parking capacity provided on site is 252 spaces, exceeding the code requirement. This parking supply includes eight (8) parking spaces for Angelo's employees, as per the existing agreement.

- In addition, parking that may be needed for large banquets or wedding receptions can be accommodated by utilizing available, adjacent parking in the U of M parking facilities in the vicinity. This is in addition to the 252 valet parking spaces provided on site.

- The hotel and banquet staff will be using remote parking facilities and will utilize the hotel shuttle service, as required. They will not be allowed to use on-street parking in the neighborhood.

This Traffic Impact Study and analysis conducted are detailed in the report which indicates the proposed Glen Mixed-Use Development will not adversely impact traffic operations and safety in the vicinity of the development and the community. It will provide a needed function to the community and support the initiatives of alternative transportation modes within the City.

INTRODUCTION AND STUDY OBJECTIVES

The proposed Glen Mixed-Use Project is located on the west side of Glen Avenue (see Figure 1), between Ann Street and Catherine Street, in close proximity to the University of Michigan (U of M) medical campus in Ann Arbor, Michigan. It consists of an upscale boutique hotel with retail space, restaurant, bar, and community gathering areas at the ground level, flexible meeting, reception and conference space on level 2, hotel rooms on levels 3 through 7, residential apartments on levels 8 and 9, and four floors of underground parking.

The surrounding land uses include the U of M medical clinics, research facilities and nursing school, residential apartments, single-family homes used primarily for student rentals, neighborhood restaurants, and U of M parking structures. The proposed project will provide a much needed high quality hotel space within walking distance of the U of M medical campus and downtown Ann Arbor.

It is expected it will have a positive impact on the economic activities of the community. The traffic impact must be carefully analyzed and mitigation measures should be considered, if needed, to ensure safety and mobility in the vicinity of the proposed Glen development and the entire community.

It is important to note that the City of Ann Arbor promotes alternative modes of transportation and provides the facilities to support them. The strategic location, adjacent to the U of M medical campus, and within walking distance of other U of M facilities and downtown Ann Arbor, will enable guests and visitors to walk to their destinations or use public transportation, bicycles, or vehicle sharing programs.

The purpose of this study includes the following:

1. Collecting existing/historical traffic data from various sources that can assist in developing trends in the study area.
2. Performing a field survey of roadway infrastructure, traffic control devices, and other relevant information.

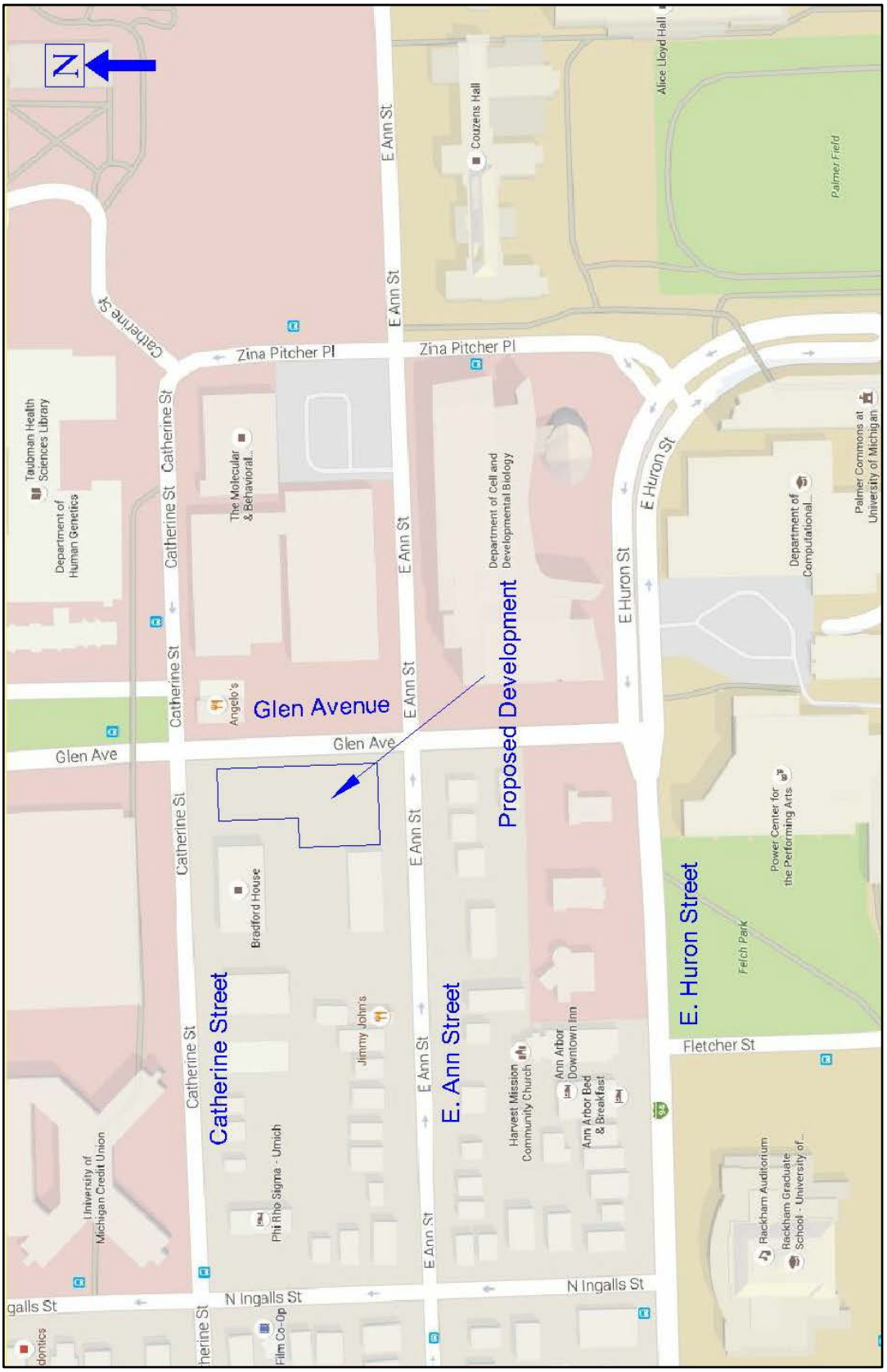


Figure 1: Proposed Site Location

3. Collecting traffic volume data at nearby intersections including Glen Avenue and Ann Street, Glen Avenue and Catherine Street, Glen Avenue and Huron Street, Ann Street and Ingalls Street, Huron Street and Ingalls Street, and Huron Street and Fletcher Street for AM and PM peak hours of the adjacent roadways' peak traffic (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM) periods.
4. Collecting crash data for the past three years and conducting a safety analysis.
5. Developing background traffic trends from the natural growth of the city and the region.
6. Preparing a condition diagram of roadway infrastructure.
7. Performing a trip generation analysis as per the Institute of Transportation Engineers (ITE) Trip Generation Manual.
8. Performing a trip distribution and traffic assignment of the newly generated trips.
9. Developing a Synchro model for all five intersections to perform an operational, capacity, and level of service (LOS) analysis for existing, background and build-out scenarios.
10. Preparing the Traffic Impact Study report that incorporates all of the above analysis, as required by the City of Ann Arbor.

A Parking Analysis will involve the following tasks:

1. Developing a reasonable set of assumptions, as related to alternative modes of transportation, peak parking load characteristics, and alternative parking supply strategies.
2. Developing cost-effective parking operational strategies such as, self-parking, valet parking, utilization of adjacent public parking, remote parking for employees, and others.
3. Estimating the peak demand periods for each land use and their distribution through a typical 24-hour period.
4. Performing hour-by-hour parking space requirements, comparing them with parking supply, and determining critical parking needs.

5. Developing various parking operational alternatives and recommendations for the best alternative that will satisfy the day-to-day parking needs and also for large scale event needs.
6. Preparing a parking analysis summarizing all assumptions, analysis, and any recommended parking scenarios for the proposed Glen Mixed-Use Development project.

The following sections present details of the data collection, analysis, and results related to the noted study objectives. Conclusions and recommendations based on the analysis are also included.

HISTORICAL DATA COLLECTION

A comprehensive review of the Southeast Michigan Council of Governments' (SEMCOG) transportation plan, population growth and trend, and vehicle miles of travel (VMT) data resulted in identifying the population growth trends in the City of Ann Arbor and Washtenaw County (see Appendix I). The Michigan Department of Transportation (MDOT) databases were also consulted to identify relevant travel data. The Washtenaw Area Transportation Study (WATS) provided valuable information regarding all transportation-related projects, programs, and policies the local jurisdictions (city, townships) have participated in and adopted. The WATS website provides information regarding upcoming projects that may have an impact on private sector projects, such as the proposed Glen Mixed-Use Development. The data shown in Tables 1 and 2 are excerpts from regional forecasts and estimated travel data of VMT, which are relevant to this study.

Table 1: Washtenaw County 2040 Forecasts (Population, Households, and Employment)
(Source: SEMCOG website)

	YEAR						
	2010	2015	2020	2025	2030	2035	2040
Population	344,791	350,781	354,116	360,371	368,262	377,183	386,235
Households	137,193	141,483	146,870	151,822	156,324	160,691	164,447
Employment	236,676	246,721	252,598	260,024	268,528	277,576	285,655

Table 2: Average Annual VMT in Washtenaw County Year 2000 to Year 2012

(Source: SEMCOG website)

YEAR					
2000	2005	2007	2010	2011	2012
11,037,801	10,356,769	10,520,429	11,026,457	10,914,535	10,802,613

This data indicates for the period 2000 to 2012 (12 years), the average annual VMT has reduced approximately 0.18% annually. However, the use of this travel data is not appropriate since it includes the economic downturn and higher gasoline prices. For the purpose of estimating future traffic, the VMT travel trend data reflecting this will not be considered.

The forecast indicates the population in Washtenaw County is expected to have a total growth of 12% in the next 30 years (2010 to 2040). The growth in the number of households will be approximately 20% in the same 30 year period and employment is expected to rise approximately 21% in the same period. Considering the 30 year planning period, the annual average growth rates for the population and households are 0.4% and 0.67%, respectively. The City of Ann Arbor's population and household growth rates are much lower than the Washtenaw County rates. This is expected since the opportunity of growth in population and households are limited within the City, whereas the surrounding townships have mostly contributed to the growth trend in the county.

In order to be on the conservative side, this traffic impact analysis has assumed a 1% annual growth in traffic. Considering the compounding effect, the growth factor for a three-year construction period is 1.0303.

Past traffic counts in the vicinity of the project were also reviewed as a part of the study. This allows for a reasonable comparison of traffic counts that were a part of this impact analysis (see Figure 2).

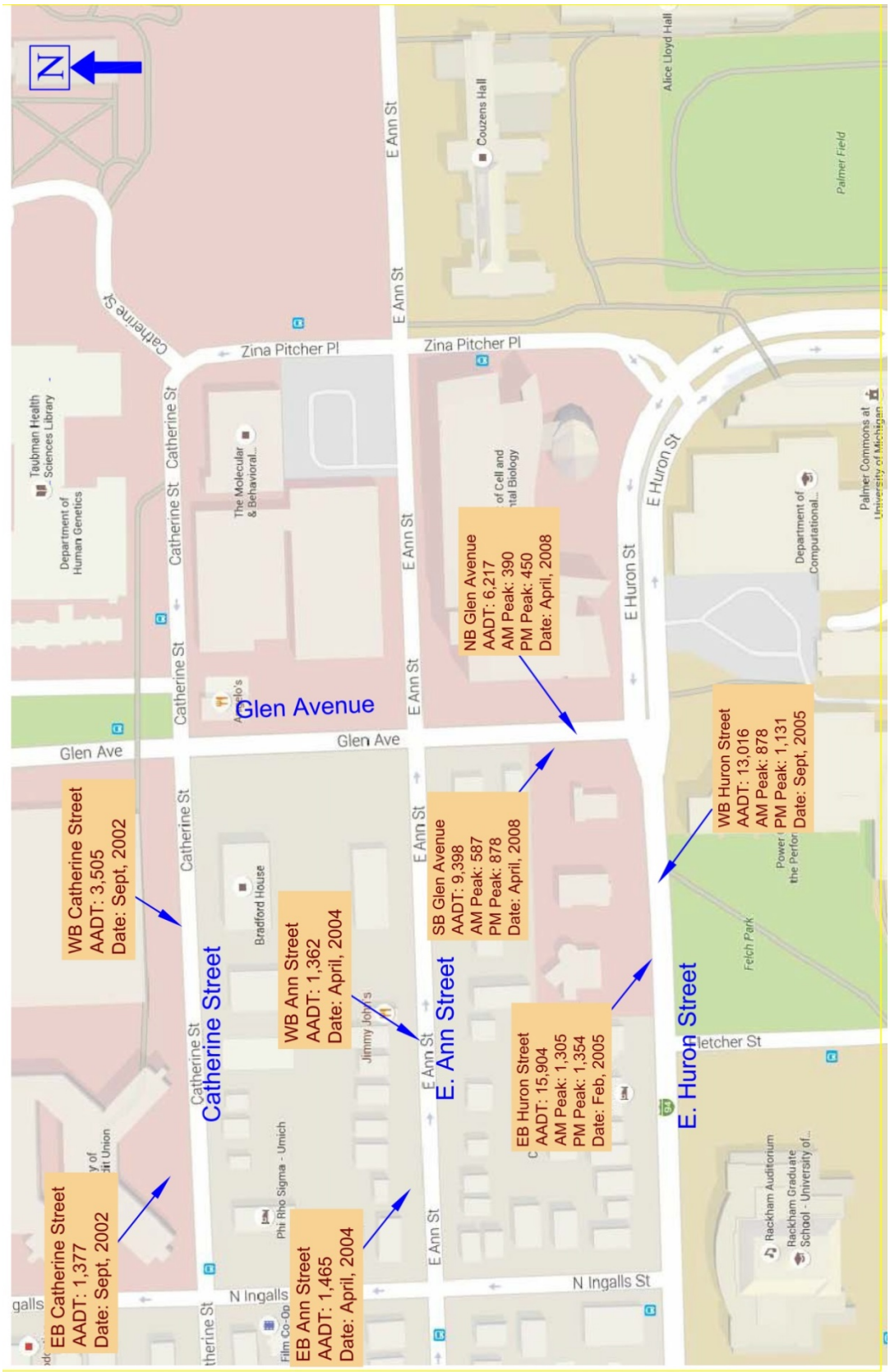


Figure 2: Historical Traffic Counts

FIELD DATA COLLECTION

In order to achieve the study objectives, it was necessary to collect several existing site-related and traffic movement data. This included a site visit to identify the scope of field data that will be necessary. It was determined that the Traffic Impact Study should include the Glen Avenue corridor from Catherine Street to Huron Street. Additional signalized intersections on Ingalls Street and Fletcher Street were added to the study in response to the city's request. Therefore, for the purpose of the turning movement data collection, the intersections of Glen Avenue and Catherine Street, Glen Avenue and Ann Street, Glen Avenue and Huron Street, Ann Street and Ingalls Street, Huron Street and Ingalls Street, and Huron Street and Fletcher Street were included (see Appendix II).

A survey of existing geometry, signs and markings, traffic signals, pedestrian crosswalks, and bicycle facilities were documented. Existing condition diagrams were prepared (see Figures 3 – 5) using the field survey data and numerous photographs that were taken.

Since the proposed development's core is an upscale boutique hotel, it was decided the detailed turning movement (manual) data collection will be performed during the following time periods:

1. Typical weekday (Tuesday, Wednesday, or Thursday) AM peak period 7:00 AM to 9:00 AM.
2. Typical weekday PM peak period 4:00 PM to 6:00 PM.

AM Peak Hour Traffic Volumes – Weekday Traffic

The weekday AM peak hour counts are shown in Figures 6 and 7 and indicate the following:

a. Traffic on Catherine Street is quite low; however, pedestrian movement on Catherine Street crossing Glen Avenue is high on the north side of the intersection. The observation indicated the main source of pedestrians was to and from the Medical School campus.

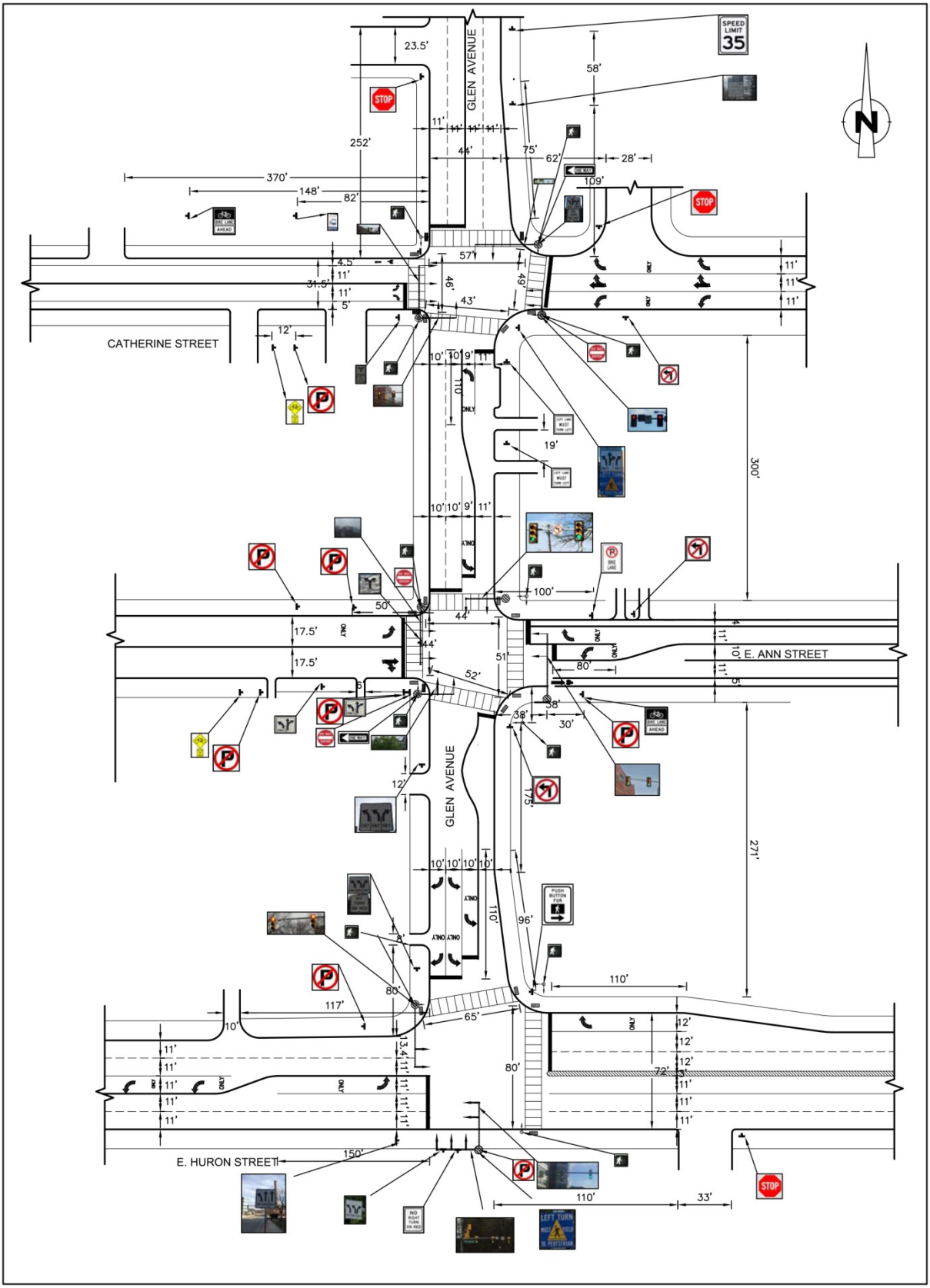


Figure 3: Existing Condition Diagram (Glen Avenue Corridor)

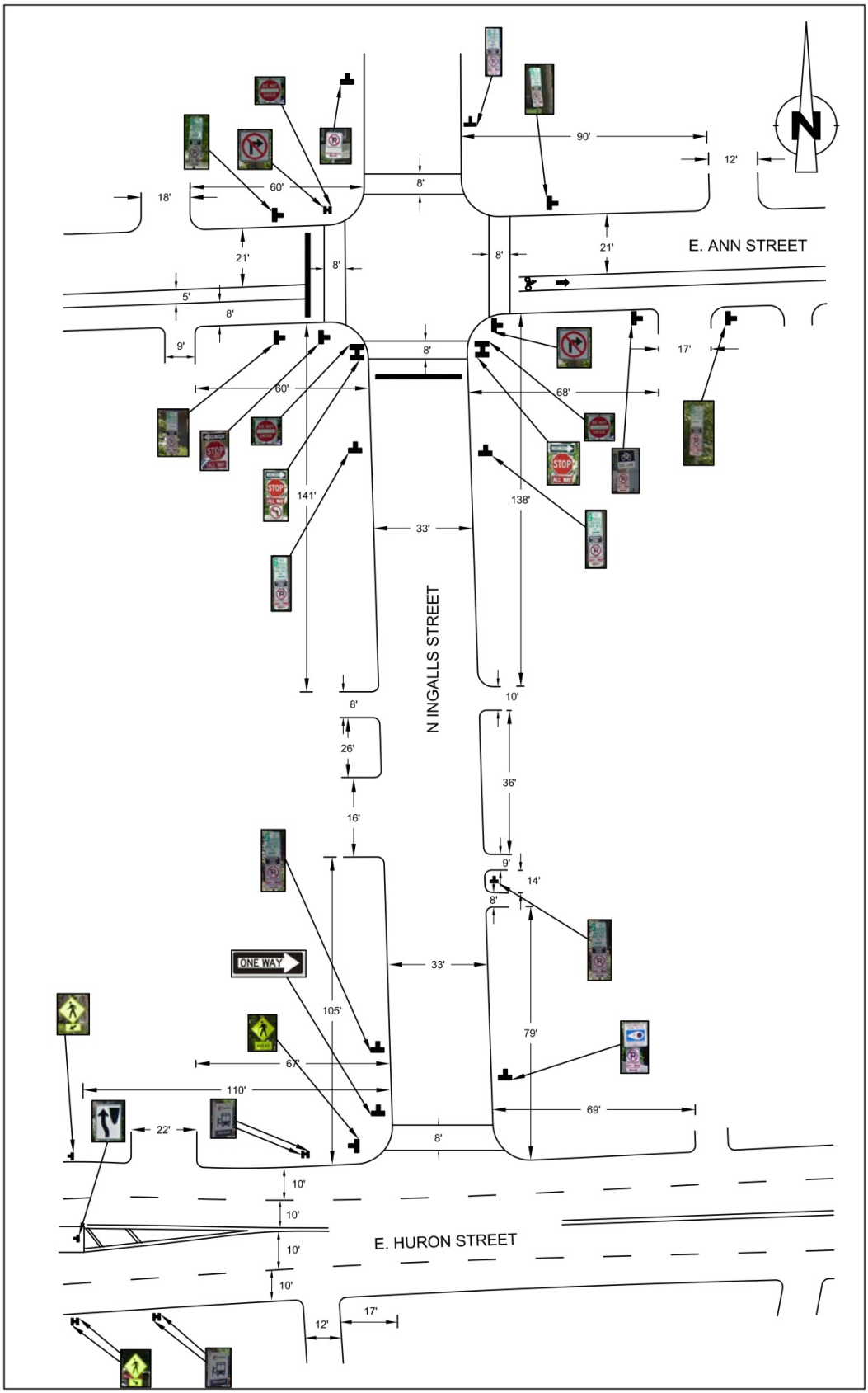


Figure 4: Existing Condition Diagram (Ingalls Street)

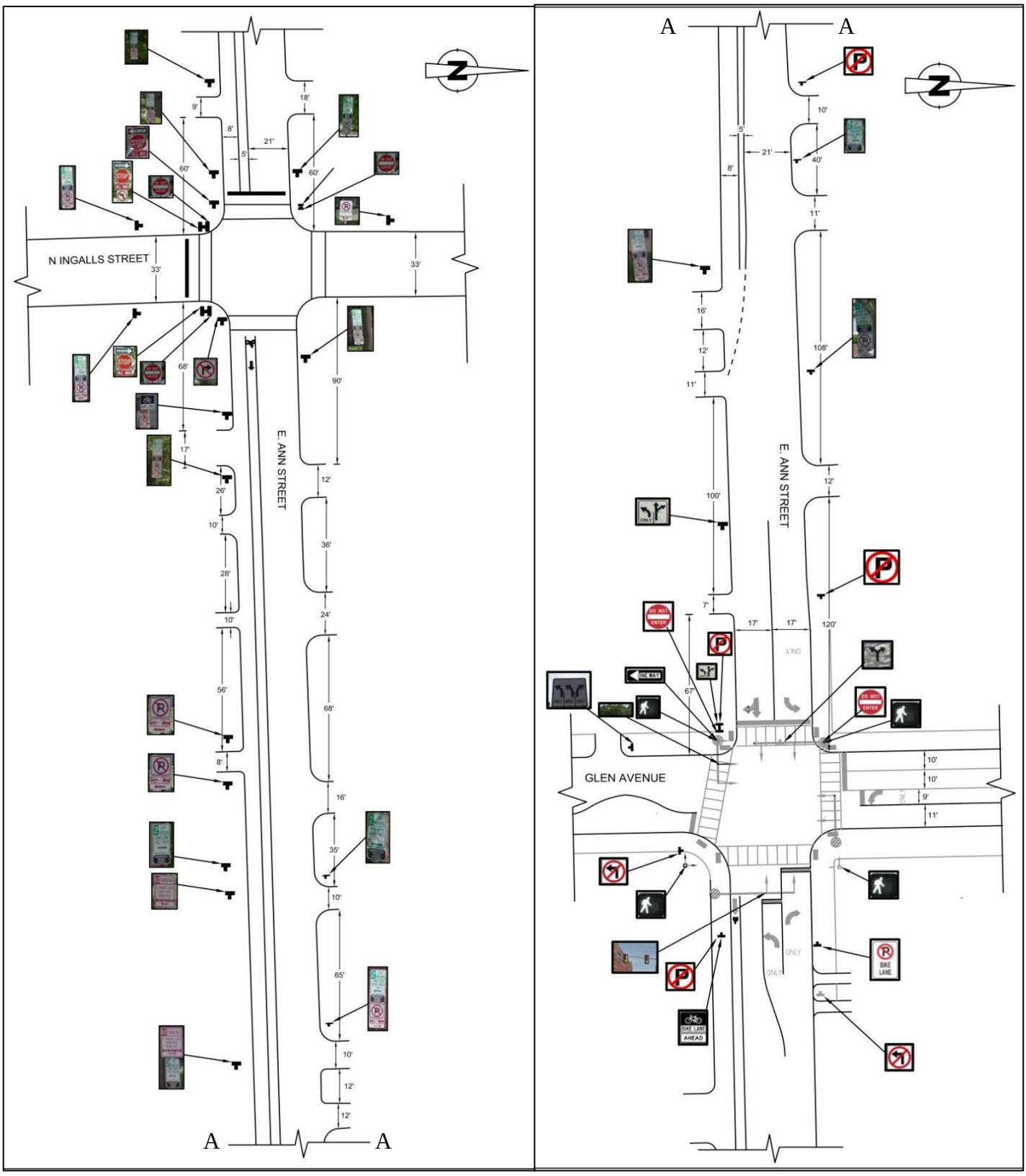


Figure 5: Existing Condition Diagram (Ann Street)

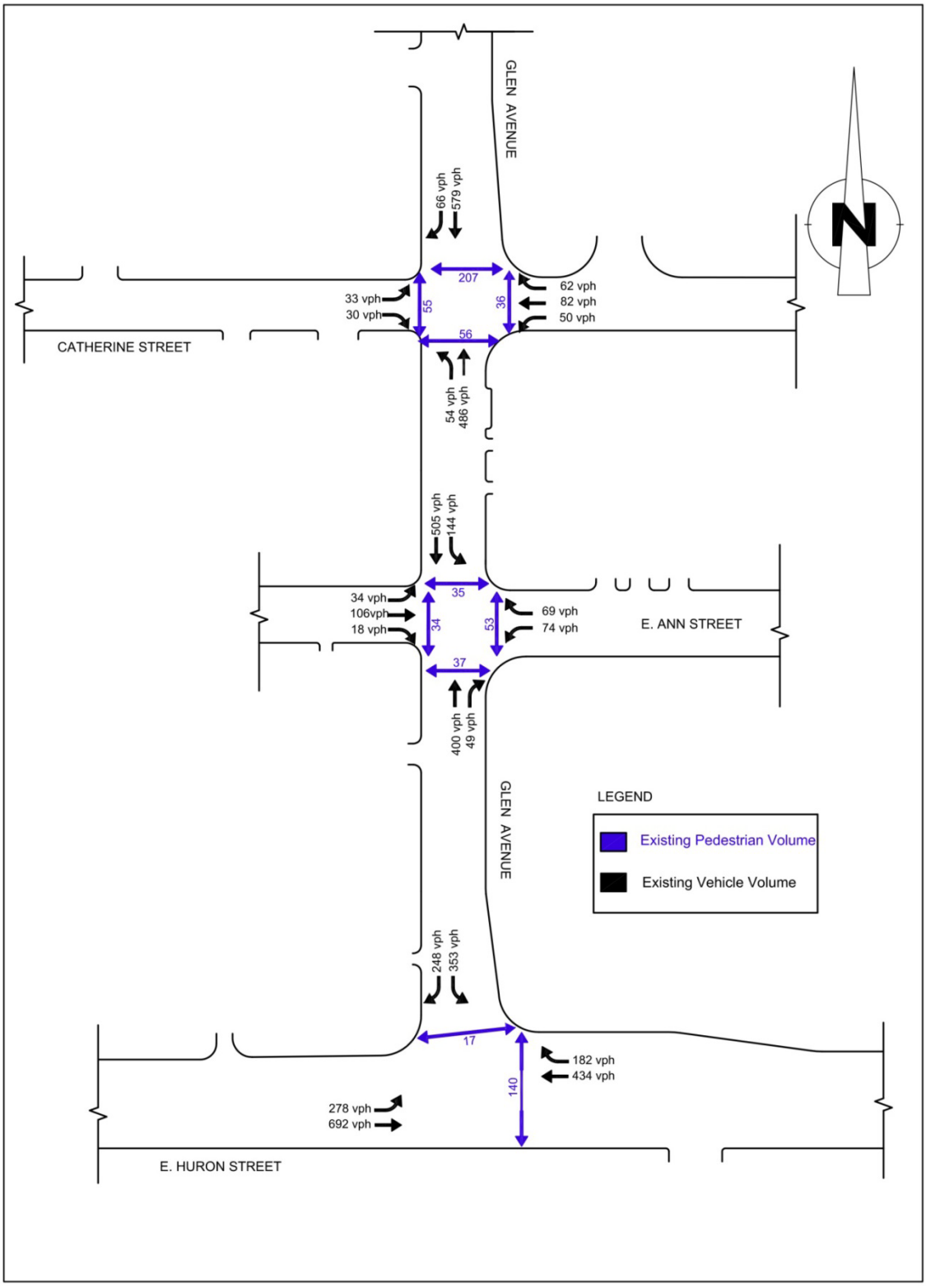


Figure 6: Existing Weekday AM Peak Hour Volume - Glen Avenue (Traffic Count - 2/2/16)

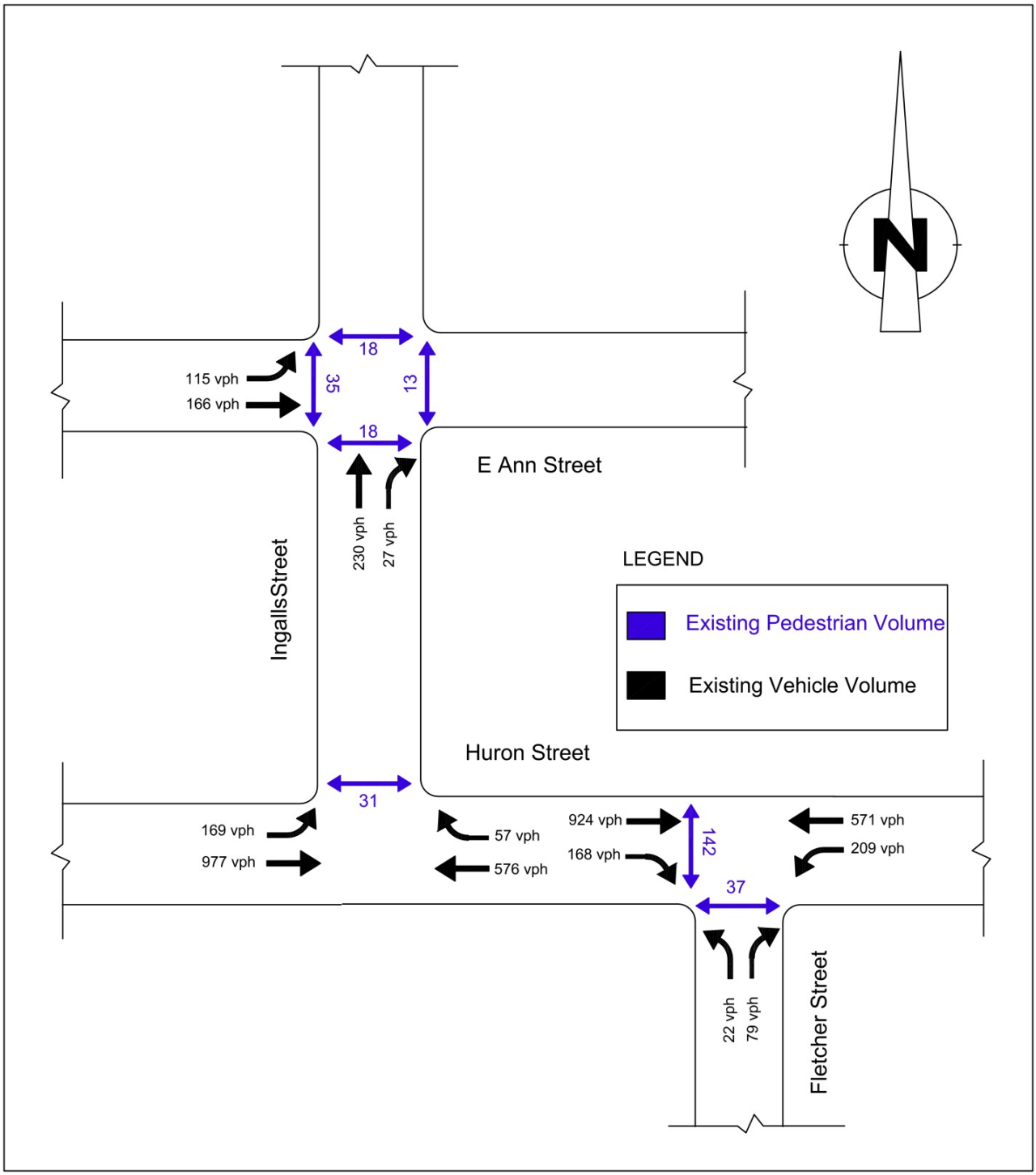


Figure 7: Existing Weekday AM Peak Hour Volume – Ingalls Street, Fletcher Street
(Traffic Count - 2/21/17)

Vehicular traffic movement on Glen Avenue is generally higher than the east-west movement on Catherine Street and Ann Street.

b. Catherine Street east of Glen Avenue is one-way westbound (WB).
c. Ann Street is also one-way eastbound (EB), west of Glen Avenue, and a two-way street east of Glen Avenue. Traffic volume on Ann Street is low.
d. Glen Avenue at Huron Street is a three-legged T-intersection. EB Huron Street has a much higher traffic volume than WB Huron Street.
e. Traffic volume on eastbound Huron Street turning left on Glen is high.
    a. Note: The eastbound Huron traffic in the models appears to change lanes sooner than in the actual field resulting in minor queuing.

PM Peak Hour Traffic Volumes – Weekday Traffic

Typical weekday PM peak hour traffic turning movements are shown in Figures 8 and 9. The following are observations from the PM peak hour traffic volumes:

a. Vehicular traffic volumes on Catherine Street and Ann Street are reasonably moderate. However, due to the existence of one-way legs at both of the intersections, forced turning movements are required at these intersections.
b. Pedestrian volumes along the north crosswalk along Catherine Street (crossing Glen Avenue) are relatively higher than the other crosswalks in any of the five intersections under study.
c. Southbound (SB) Glen Avenue traffic is higher than northbound (NB) Glen traffic.
d. Northbound Fletcher traffic turning left on Huron is high. There is also a high number of pedestrians crossing Huron conflicting with the left turn volume from Fletcher.

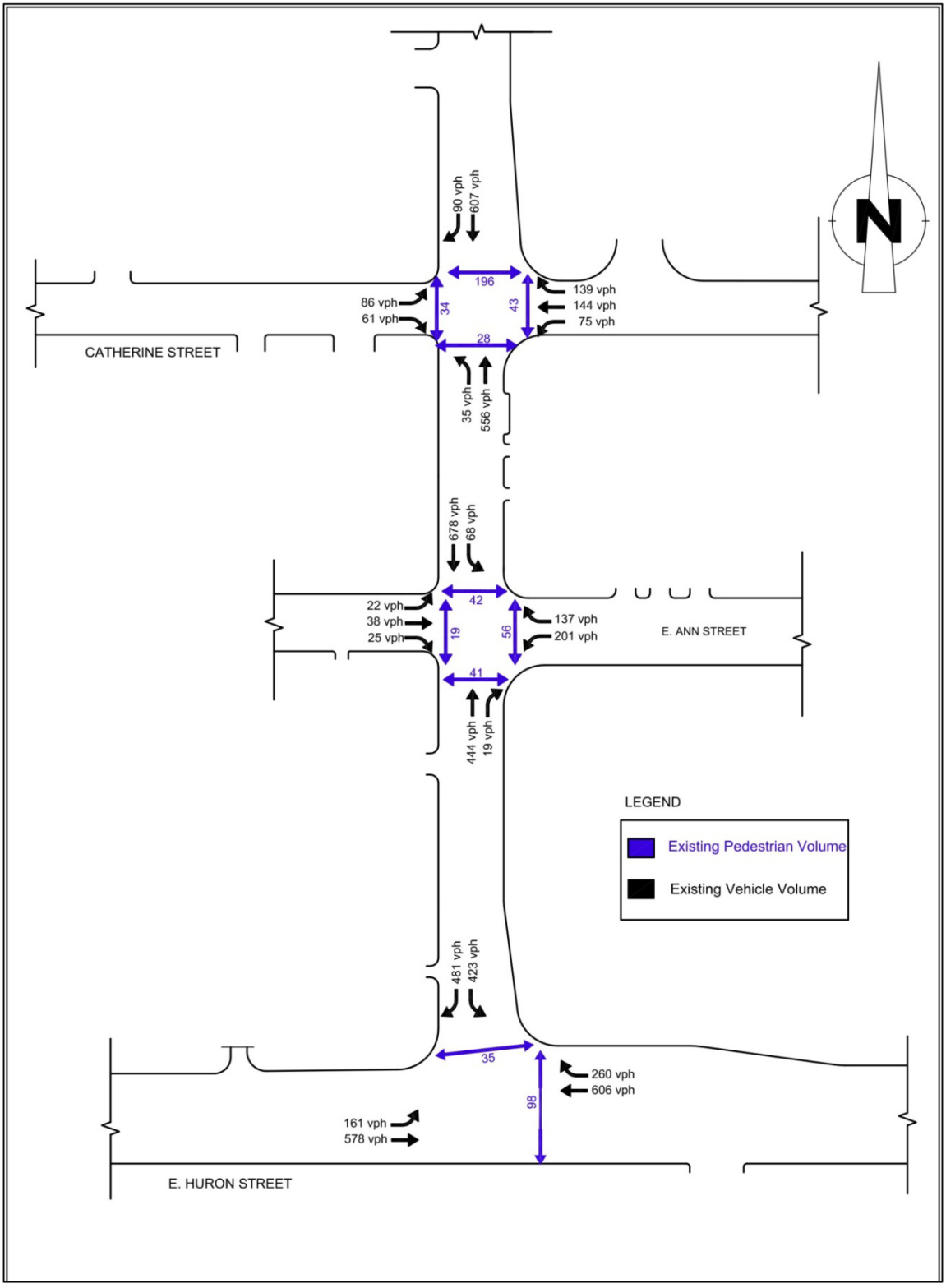


Figure 8: Existing Weekday PM Peak Hour Volume - Glen Avenue
(Traffic Count - 1/27/16)

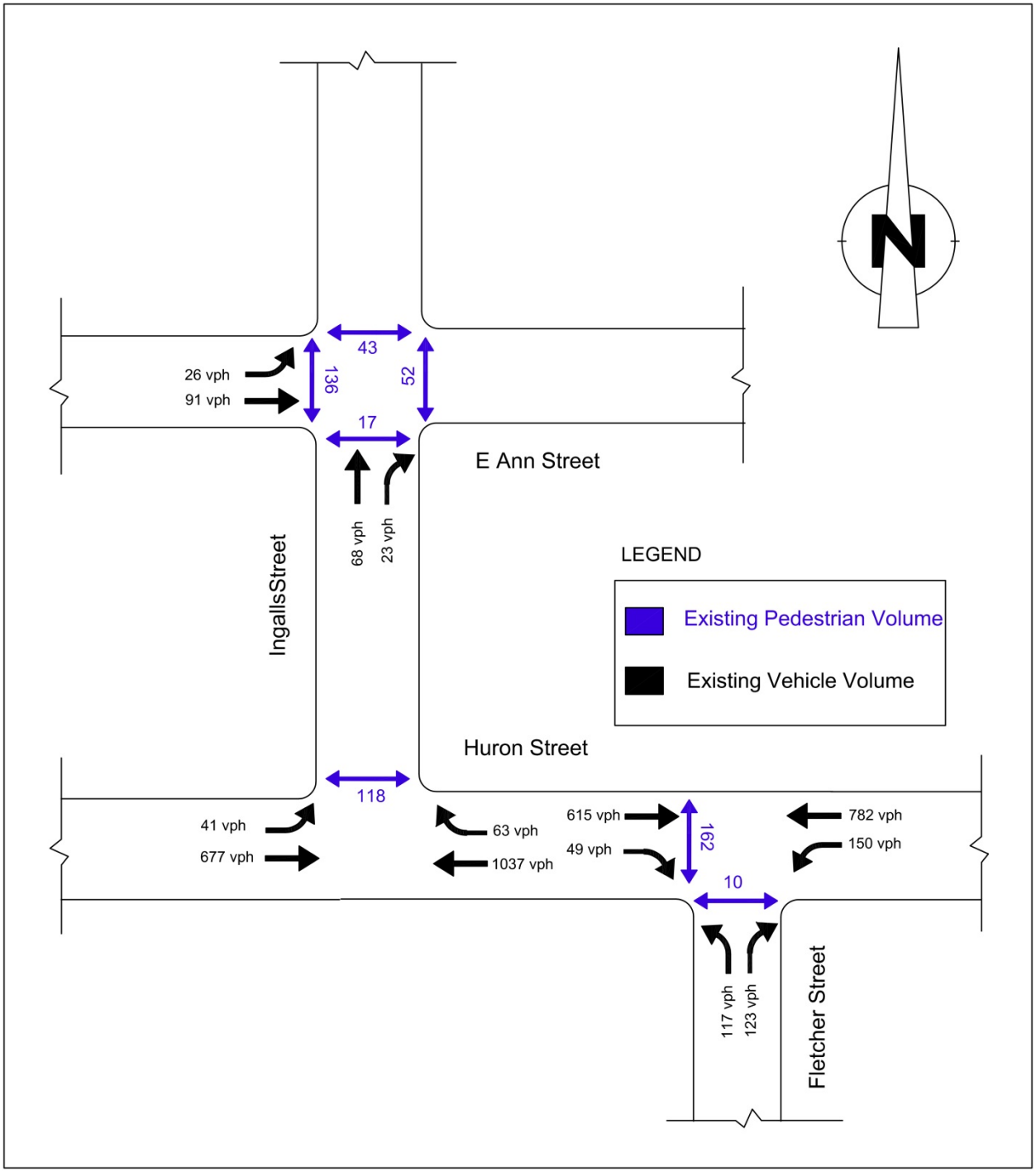


Figure 9: Existing Weekday PM Peak Hour Volume – Ingalls Street, Fletcher Street (Traffic Count - 2/21/17)

TRAFFIC VOLUME BALANCING, PEAK HOUR FACTOR, AND HEAVY VEHICLES

Volume balancing should be performed to provide an operational analysis in areas with short blocks. Balanced volumes, peak hour factor (PHF), and heavy vehicle percentages (HV%) have been calculated within the models (see link below) in the following manner:

Synchro Volume Balance Models
http://141.217.48.12/glenhotelanalysismarch23.zip

- The highest calculated northbound and southbound through volume along Glen from Catherine to Huron has been projected across the other Glen intersections. The existing balanced weekday AM and PM peak hour volumes for Glen Avenue are shown in Figures 10 and 12.
- To compensate for the significant traffic volume drops that occur on Ann Street between Glen Avenue and Ingalls Street, and on Ingalls Street between Ann Street and Huron Street, two right-turn in / right-turn out volume balancing nodes have been added to the model to add/remove traffic as needed. The Huron Street traffic volume drop was balanced manually. The existing balanced weekday AM and PM peak hour volumes are shown in Figures 11 and 13.
- The PHF and HV% for each approach have been entered in accordance with the field observations. The "Electronic Traffic Control Device Guidelines" (Revision 8/4/15) by the Michigan Department of Transportation (MDOT) recommends the HV% and PHFs are entered, per each approach, as observed in the field. The MDOT methodology unavoidably creates issues with "ghosting vehicles" that disappear or reappear on the SimTraffic model as it tries to reconcile the differences in PHF and HVs between intersections. Significant effort has been made to select appropriate PHFs and HVs for each Volume Balancing Node and the site driveway. However, "ghosting" still occurs to some degree on the models and cannot be completely removed without selecting a more global PHF and HV%.

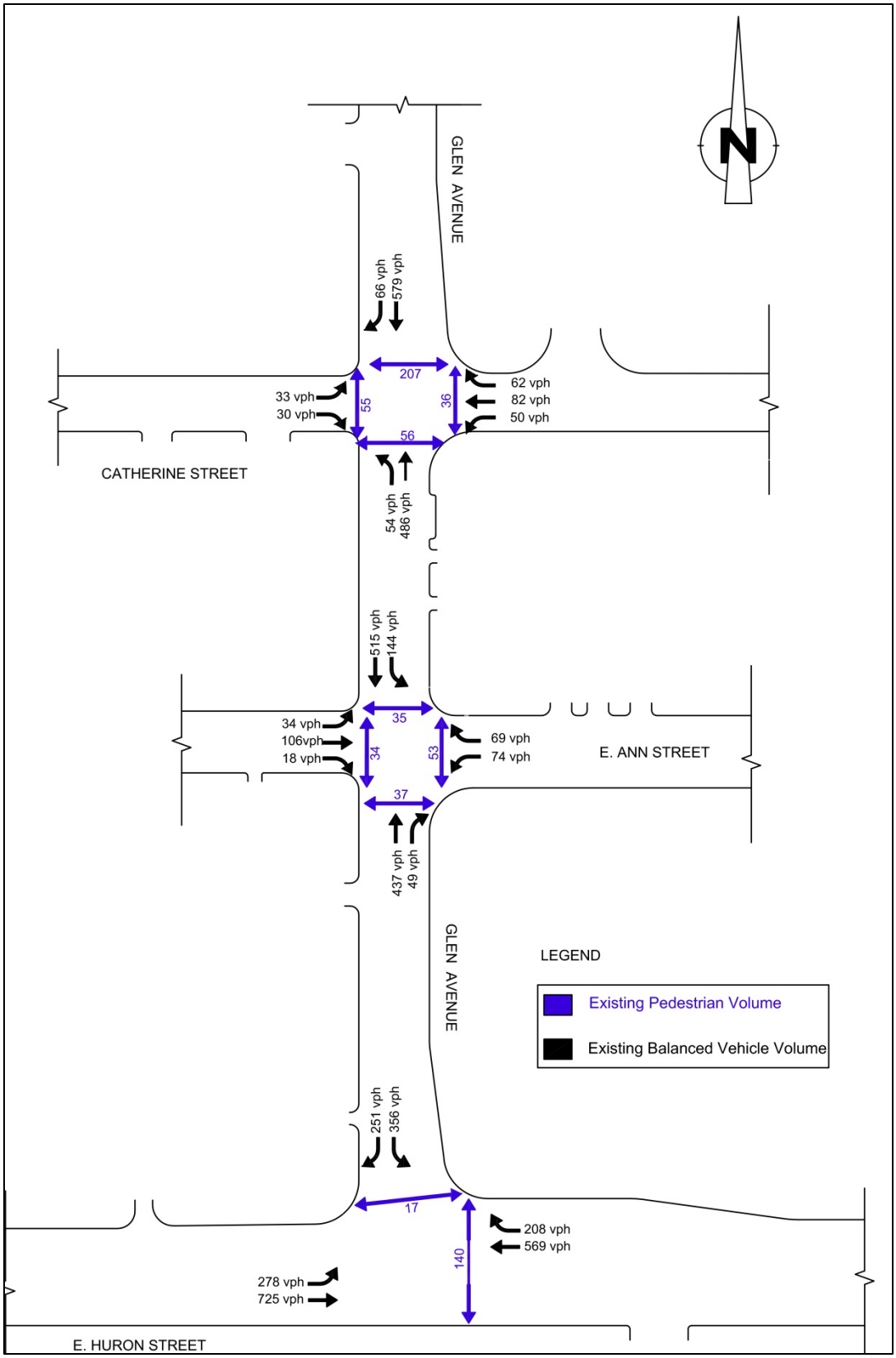


Figure 10: Existing Balanced Weekday AM Peak Hour Traffic Volumes for Glen Avenue

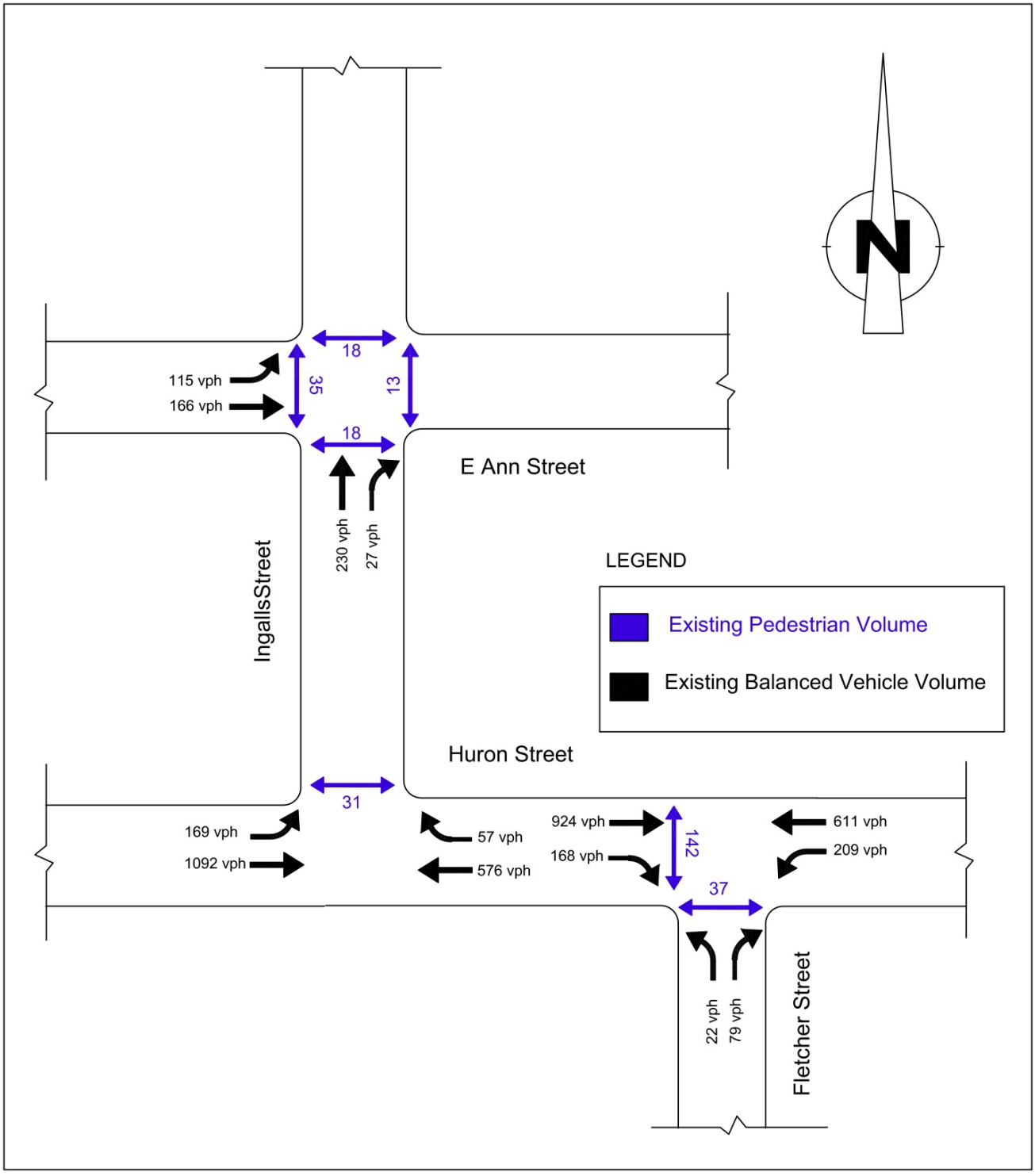


Figure 11: Existing Balanced Weekday AM Peak Hour Traffic Volumes – Ingalls Street, Fletcher Street

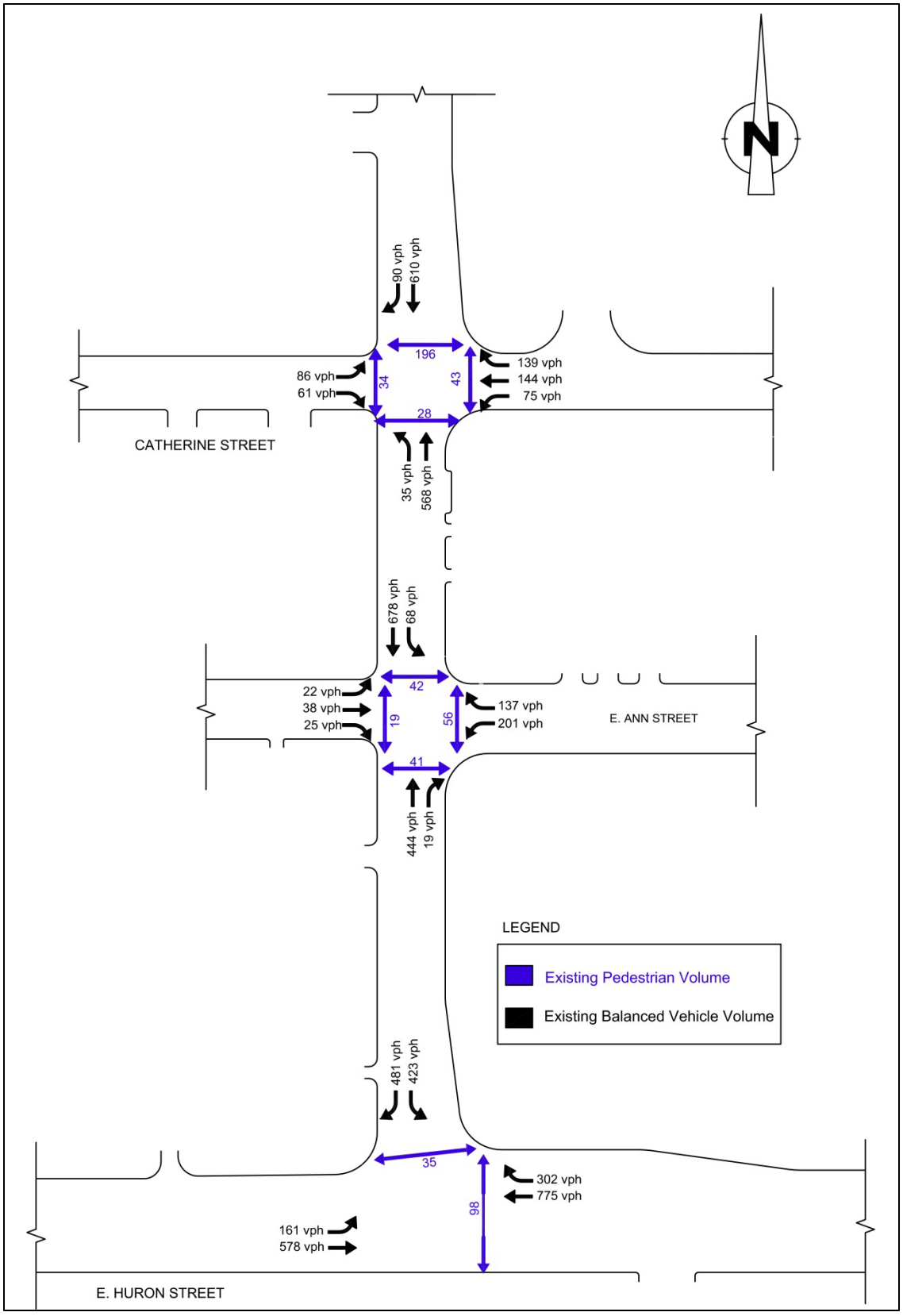


Figure 12: Existing Balanced Weekday PM Peak Hour Traffic Volumes for Glen Avenue

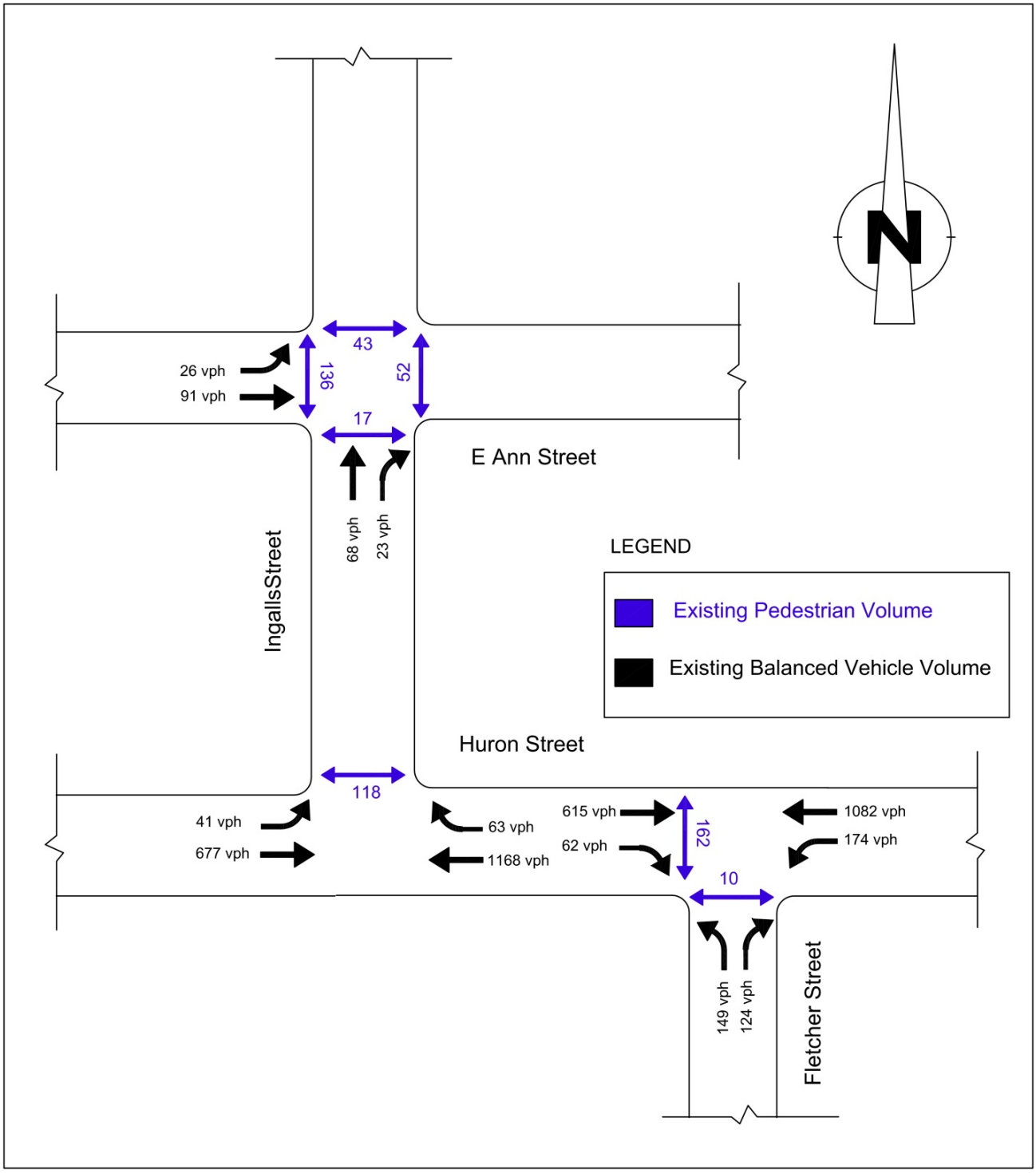


Figure 13: Existing Balanced Weekday PM Peak Hour Traffic Volumes – Ingalls Street, Fletcher Street

BACKGROUND GROWTH

The consideration of background traffic growth for the period between existing traffic volumes and the build-out scenario (3 years) in the analysis is essential to accurately estimate the impact of the proposed development. A three-year planning and construction period has been assumed as the background period. As indicated on page 5 of this report, the growth factor for a three-year construction period is 1.0303. The traffic volumes for the background traffic for all movements were calculated by multiplying the growth factor to the existing balanced weekday peak hour traffic volumes (see Figures 14 – 17).

TRAFFIC CRASH ANALYSIS

A traffic crash history for a three-year period (2012, 2013, and 2014) was studied to determine if there are any traffic crash issues existing at the target intersections that need to be considered. The Michigan Traffic Crash Facts site (https://www.michigantrafficcrashfacts.org) was used to collect the traffic crash history at the study intersections. After identifying the crashes, an additional review of the crash report forms was performed to develop the crash analysis. All inconsistencies between the crash diagram/narrative and crash fields, such as crash type, were corrected on the crash report form, as appropriate. Table 3 shows the detailed breakdown by crash type at the intersections of Glen Avenue and Catherine Street, Glen Avenue and Ann Street, Glen Avenue and Huron Street, Ann Street and Ingalls Street, Huron Street and Ingalls Street, and Huron Street and Fletcher Street. The following are the observations from this analysis:

a. The average (three-year) annual traffic crashes at Glen Avenue and Catherine Street is 10.33, Glen Avenue and Ann Street is 9.33, Glen Avenue and Huron Street is 7.00, Ann Street and Ingalls Street is 0.67, Huron Street and Ingalls Street is 1.67, and Huron Street and Fletcher Street is 5.00. The average annual crash frequencies are comparable to similar intersection traffic crashes in the SEMCOG region.
b. The predominant type of crash is rear-end, which is generally associated with property damage and sometimes minor or non-severe injuries.

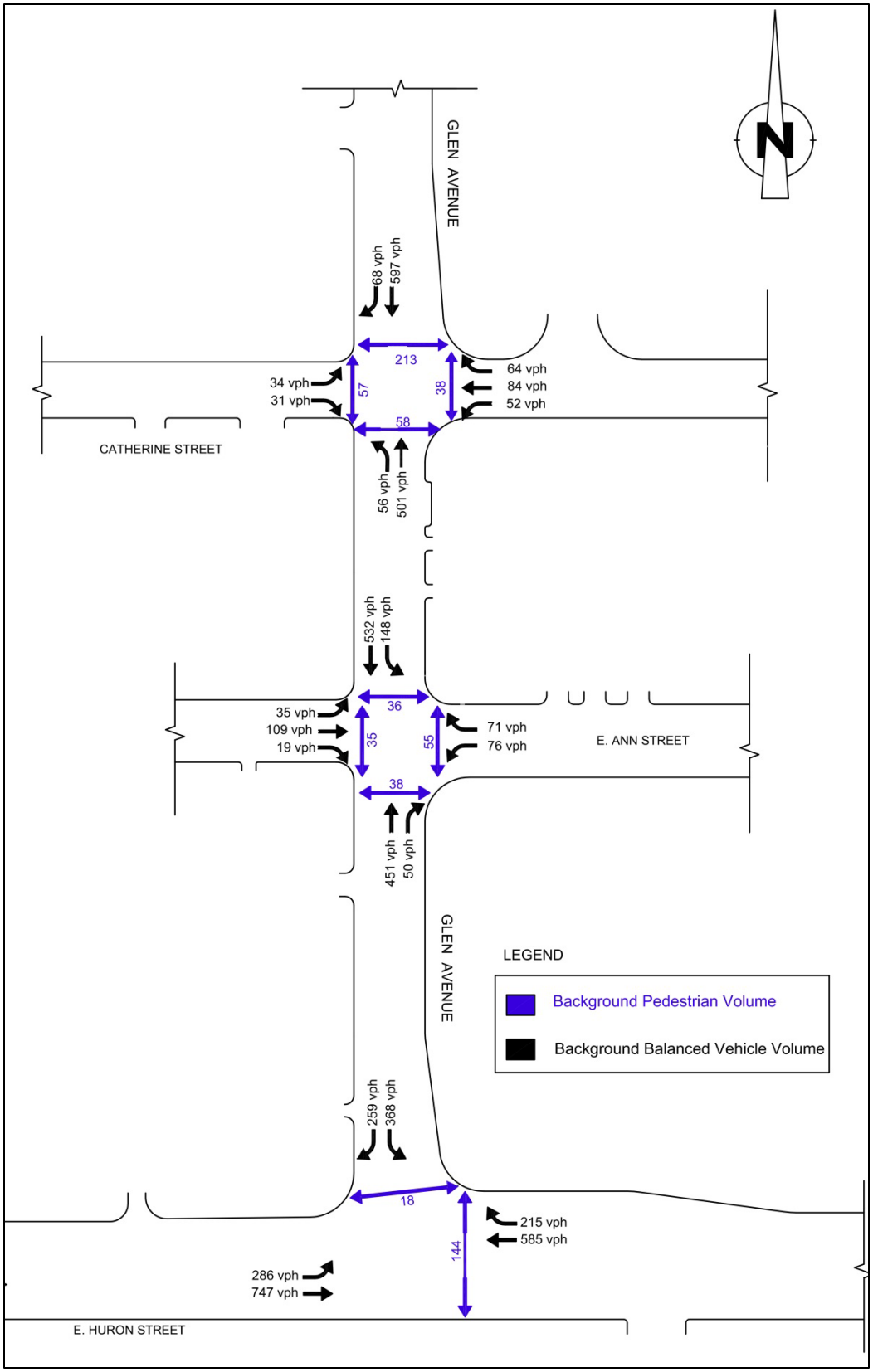


Figure 14: Background Balanced Weekday AM Peak Hour Traffic Volume - Glen Avenue

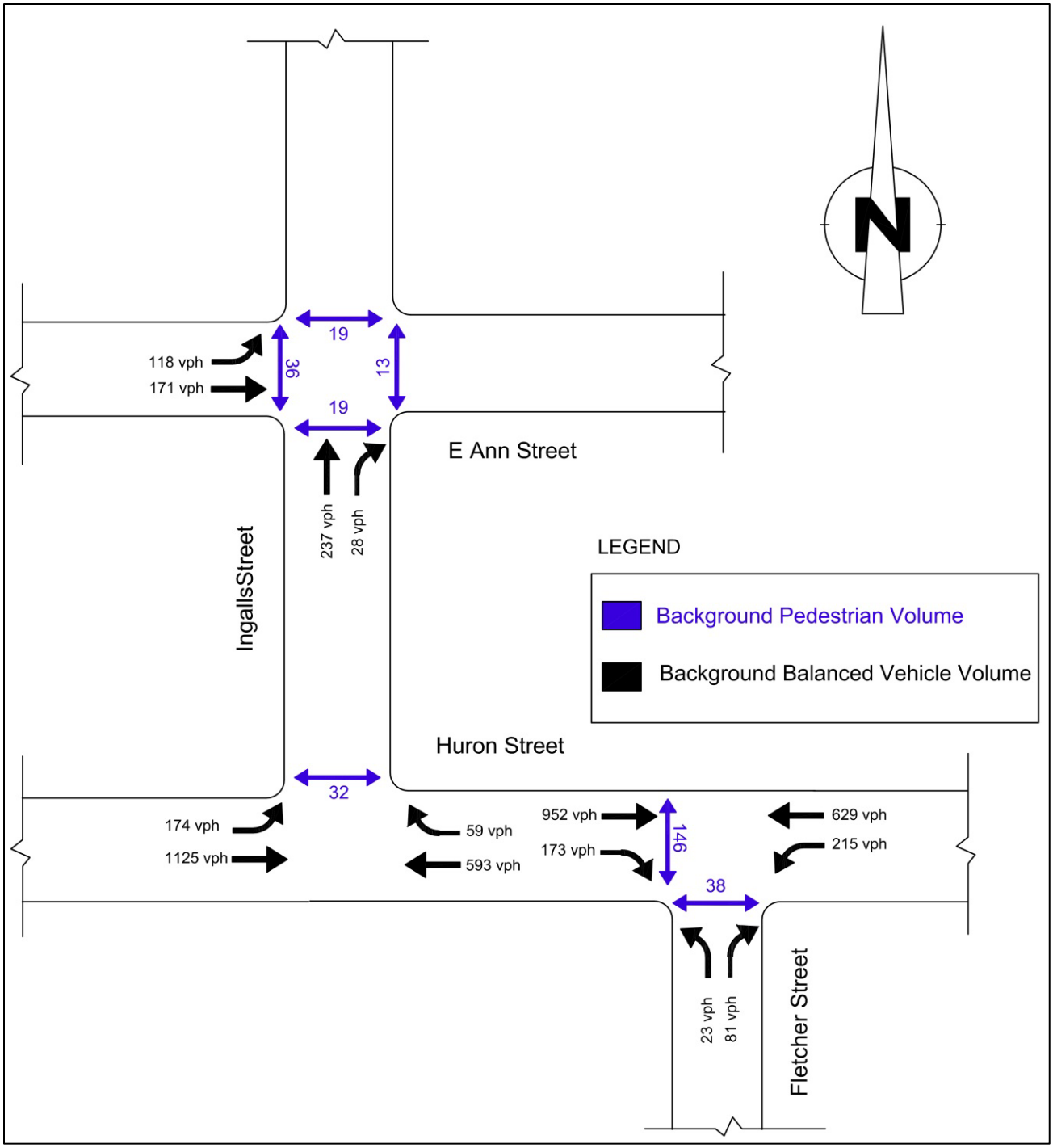


Figure 15: Background Balanced Weekday AM Peak Hour Traffic Volume – Ingalls Street, Fletcher Street

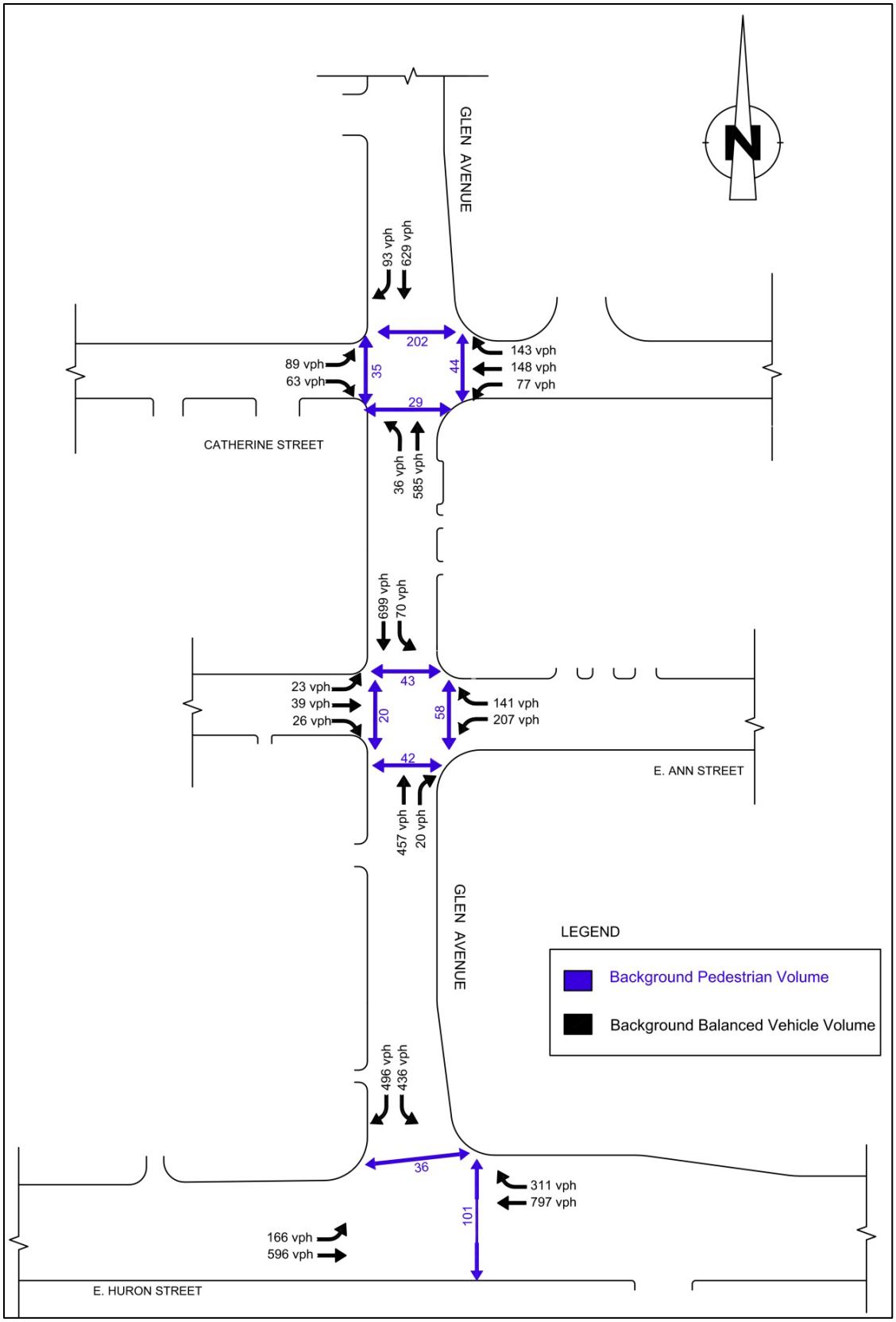


Figure 16: Background Balanced Weekday PM Peak Hour Traffic Volume - Glen Avenue

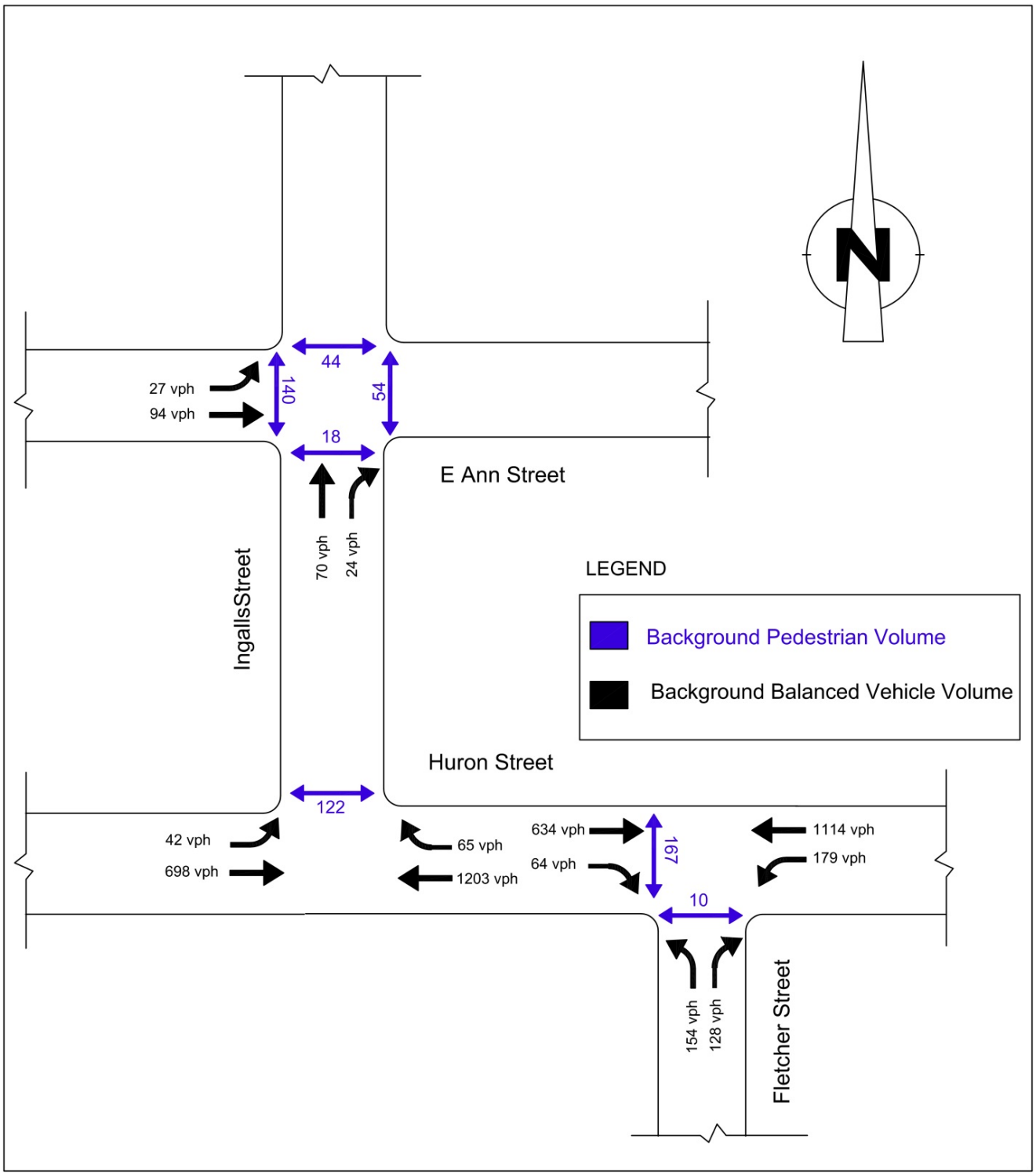


Figure 17: Background Balanced Weekday PM Peak Hour Traffic Volume – Ingalls Street, Fletcher Street

Table 3: Three Year Crash History by Type

Intersection	Type of Crash	Year			Average
		2012	2013	2014	
Glen and Catherine	Single Motor Vehicle	0	1	1	0.67
	Head-On Left-Turn	0	3	2	1.67
	Rear-End	6	4	4	4.67
	Sideswipe Same	2	1	2	1.67
	Backed Into	2	1	1	1.33
	Bicycle	0	0	1	0.33
	Total	**10**	**10**	**11**	**10.33**
Glen and Ann	Single Motor Vehicle	1	0	0	0.33
	Head-On Left-Turn	0	2	0	0.67
	Rear-End	1	3	6	3.33
	Sideswipe Same	0	5	2	2.33
	Sideswipe Opposite	1	1	1	1.00
	Pedestrian	1	0	1	0.67
	Backed Into	0	0	1	0.33
	Bicycle	0	0	2	0.67
	Total	**4**	**11**	**13**	**9.33**
Glen and Huron	Single Motor Vehicle	0	0	1	0.33
	Head-On Left-Turn	0	1	0	0.33
	Rear-End	4	4	4	4.00
	Sideswipe Same	1	2	0	1.00
	Sideswipe Opposite	0	0	1	0.33
	Backed Into	0	1	0	0.33
	Other	1	1	0	0.67
	Total	**6**	**9**	**6**	**7.00**
Fletcher and Huron	Rear-End	4	2	2	2.67
	Sideswipe Same	3	1	0	1.33
	Angle	0	0	1	0.33
	Pedestrian	0	1	0	0.33
	Other/Unknown	0	1	0	0.33
	Total	**7**	**5**	**3**	**5.00**
Ingalls and Huron	Rear-End	2	1	1	4.00
	Bicycle	0	0	1	1.00
	Total	**2**	**1**	**2**	**1.67**
Ingalls and Ann	Sideswipe Same	0	0	1	1.00
	Other/Unknown	0	1	0	1.00
	Total	**0**	**1**	**1**	**0.67**

Analyses of injury severity for all intersections are shown in Table 4. Most of the crashes are property damage type crashes and few of them are non-incapacitating (Type-B) or less severe, except for one fatal pedestrian-involved crash at the intersection of Zina Pitcher Pl and Ann Street.

A complete set of collision diagrams have been prepared as a part of this study and are included in Appendix III.

A traffic safety analysis using the Highway Safety Manual (HSM) methodology is not typical of a smaller development such as this one with a limited number of newly generated trips. Crash predictions are based on traffic volumes. HSM users are aware of the use of such predictive methodology at specific intersections which often does not result in a reasonable estimate for future crashes. However, as per the city's request, a crash prediction analysis for critical intersections including Glen and Catherine, Glen and Ann and Glen and Huron was performed both for the existing condition and the build-out condition (see Appendix IV). The rest of the study intersections including Ann and Ingalls, Huron and Ingalls and Huron and Fletcher seem to have comparatively low crash rates and, therefore, crash prediction analysis was not performed. It can be concluded that additional traffic generation due to the proposed Glen Mixed-Use Development will only increase crashes from 3.8 to 4.1 on Glen Avenue and Catherine Street, 3.4 to 3.8 on Glen Avenue and Ann Street and 3.2 to 3.6 on Glen Avenue and Huron Street intersections. Safety Performance Functions (SPF) and Crash Modification Factors (CMFs) are based on a large pool of intersections of similar traffic volumes that naturally predict lower future frequencies of crashes.

Table 4: Three-Year Crash History by Injury Severity

Intersection	Injury Severity	Year			Average
		2012	2013	2014	
Glen and Catherine	K- Fatal Accident	0	0	0	0.00
	A-Type Injury Accident	0	0	0	0.00
	B-Type Injury Accident	0	0	0	0.00
	C-Type Injury Accident	0	0	1	0.33
	No Injury (Property Damage Only)	10	10	10	10.00
	Total	**10**	**10**	**11**	**10.33**
Glen and Ann	K- Fatal Accident	0	0	0	0.00
	A-Type Injury Accident	0	0	0	0.00
	B-Type Injury Accident	0	0	2	0.67
	C-Type Injury Accident	1	1	2	1.33
	No Injury (Property Damage Only)	3	10	9	7.33
	Total	**4**	**11**	**13**	**9.33**
Glen and Huron	K- Fatal Accident	0	0	0	0.00
	A-Type Injury Accident	0	0	0	0.00
	B-Type Injury Accident	0	0	0	0.00
	C-Type Injury Accident	1	2	0	1.00
	No Injury (Property Damage Only)	5	7	6	6.00
	Total	**6**	**9**	**6**	**7.00**
Fletcher and Huron	K- Fatal Accident	0	0	0	0.00
	A-Type Injury Accident	0	0	0	0.00
	B-Type Injury Accident	1	3	0	1.33
	C-Type Injury Accident	0	0	0	0.00
	No Injury (Property Damage Only)	6	2	3	3.67
	Total	**7**	**5**	**3**	**5.00**
Ingalls and Huron	K- Fatal Accident	0	0	0	0.00
	A-Type Injury Accident	0	0	0	0.00
	B-Type Injury Accident	0	0	1	0.33
	C-Type Injury Accident	0	0	0	0.00
	No Injury (Property Damage Only)	2	1	1	1.33
	Total	**2**	**1**	**2**	**1.67**
Ingalls and Ann	K- Fatal Accident	0	0	0	0.00
	A-Type Injury Accident	0	0	0	0.00
	B-Type Injury Accident	0	0	0	0.00
	C-Type Injury Accident	0	0	0	0.00
	No Injury (Property Damage Only)	0	1	1	0.67
	Total	**0**	**1**	**1**	**0.67**

TRIP GENERATION ANALYSIS

The trip generation analysis for the proposed Glen Mixed-Use Development was performed using the Institute of Transportation Engineers (ITE) Trip Generation Manual for the appropriate land use codes and to estimate the expected trips that will be generated due to the development (see Appendix V). The nature of the proposed development will encourage the following:

a. A significant percent of hotel guests will travel from the airport and probably use a shuttle service, taxi, or an Uber. The hotel will cater to the business travelers whose destinations may be the U of M Medical complex or other businesses in the vicinity and, therefore, may just need a ride to and from the Detroit Metropolitan Airport. This will make the trip generation analysis very conservative (i.e., the actual trips may be lower than the trip generation projections as per the ITE Manual).

b. The restaurant and the retail space are expected to largely attract hotel guests. Therefore, the assumption that the restaurant and retail development will attract independent customers is very conservative. As a result, the vehicle trip ends estimated using the ITE Trip Generation Manual may be much higher than the actual build-out scenario trips.

Finally, pass-by trips as recommended in the Trip Generation Manual, were not considered in the study to remain conservative in estimating build-out scenario trips.

The actual trip ends for the Glen Mixed-Use Development will be lower than the estimated traffic. However, the estimated newly generated trips, as per the ITE Trip Generation Manual, are used in the operational analysis to be conservative in estimating the potential impact of the proposed development. The following is the trip generation analysis for the proposed land uses:

Hotel

Total number of hotel rooms = 162 rooms

Trip Generation for the AM Peak Hour of the Adjacent Roadway

Using the ITE Trip Generation Manual for the AM peak hour trip rates

(ITE land use code: 310, page no. 581)

Ln (T) = 1.24 Ln (X) – 2.00

With $R^2 = 0.75$

Where: T = Total trip ends per hour (with directional distribution of 61% entering and 39% exiting)

X = Number of Rooms

Ln (T) = 1.24 Ln (162) – 2.00

T = 75 trip ends/hour (46 entering, 29 exiting)

Trip Generation for the AM Peak Hour of Generator

Using the ITE Trip Generation Manual for the AM peak hour trip rates

(ITE land use code: 310, page no. 583)

Average Rate = 0.52 (directional distribution of 55% entering and 45% exiting)

T = 0.52X, where X = Number of Rooms

T = (0.52) (162) = 85 trip ends / hour (47 entering and 38 exiting)

Trip Generation for the PM Peak Hour of the Adjacent Roadway

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 310, page no. 582)

Average Rate = 0.59 (directional distribution of 53% entering and 47% exiting)

T = 0.59X, where X = Number of Rooms

T = (0.59) (162) = 96 trip ends / hour (51 entering and 45 exiting)

Trip Generation for the PM Peak Hour of Generator

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 310, page no. 584)

Average Rate = 0.61 (directional distribution of 58% entering and 42% exiting)

T = 0.61X, where X = Number of Rooms

T = (0.61) (162) = 99 trip ends / hour (57 entering and 42 exiting)

Retail Store

Retail Store Area = 5,135 square feet (SF)

Trip Generation for the AM Peak Hour of Generator

Using the ITE Trip Generation Manual for the AM peak hour trip rates

(ITE land use code: 814, page no. 1389)

T = 6.84X

With $R^2 = 0.9$

Where: T = Total trip ends per hour (with directional distribution of 48% entering and 52% exiting)

X = 1000 SF Gross Floor Area (GFA)

T = (6.84) (5.135)

T = 35 trip ends / hour (17 entering, 18 exiting)

Trip Generation for the PM Peak Hour of the Adjacent Roadway

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 814, page no. 1388)

T = 2.4X + 21.48

With $R^2 = 0.98$

Where: T = Total trip ends per hour (directional distribution of 44% entering and 56% exiting)

X = 1000 SF GFA

T = 2.4 (5.135) + 21.48

T = 34 trip ends / hour (15 entering, 19 exiting)

Trip Generation for the PM Peak Hour of Generator

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 814, page no. 1390)

Average rate = 5.02 (directional distribution of 56% entering and 44% exiting)

T = 5.02X, where X = 1000 SF Gross Leasable Area

T = (5.02) (5.135) = 26 trip ends / hour (15 entering and 11 exiting)

Restaurant

Restaurant area = 3,131 SF

Trip Generation for the AM Peak Hour of the Adjacent Roadway

Using the ITE Trip Generation Manual for the AM peak hour trip rates

(ITE land use code: 931, page no. 1777)

Average Rate = 0.81 (directional distribution not available)

T = 0.81X, where X = 1,000 SF GFA

T = (0.81) (3.131)

T = 3 trip ends / hour (assumed 2 entering and 1 exiting)

Trip Generation for the AM Peak Hour of Generator

Using the ITE Trip Generation Manual for the AM peak hour trip rates

(ITE land use code: 931, page no. 1779)

Average Rate = 5.57 (directional distribution of 82% entering and 18% exiting)

T = 5.57X, where X = 1,000 SF GFA

T = (5.57) (3.131)

T = 18 trip ends / hour (15 entering, 3 exiting)

Trip Generation for the PM Peak Hour of the Adjacent Roadway

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 931, page no. 1778)

Average Rate = 7.49 (directional distribution of 67% entering and 33% exiting)

T = 7.49X, where X = 1,000 SF GFA

T = (7.49) (3.131)

T = 24 trip ends / hour (16 entering, 8 exiting)

Trip Generation for the PM Peak Hour of Generator

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 931, page no. 1780)

Average Rate = 9.02 (directional distribution of 62% entering and 38% exiting)

T = 9.02X, where X = 1,000 SF GFA

T = (9.02) (3.131)

T = 29 trip ends / hour (18 entering, 11 exiting)

The café part of the restaurant was eliminated, thus reducing the area to 2,303 SF. Thus, the trip generation number will be lower as well.

<u>Apartment</u>

Number of Units = 24 Units

Trip Generation for the AM peak Hour of the Adjacent Roadway

Using the ITE Trip Generation Manual for the AM peak hour trip rates

(ITE land use code: 220, page no. 328)

$T = 0.49X + 3.73$

With $R^2 = 0.83$

Where: T = Total trip ends per hour (directional distribution of 20% entering and 80% exiting)

X = Number of dwelling units

T= (0.49) (24) + 3.73

T = 16 trip ends / hour (3 entering, 13 exiting)

Trip Generation for the AM Peak Hour of Generator

Using the ITE Trip Generation Manual for the AM peak hour trip rates

(ITE land use code: 220, page no. 330)

$T = 0.54X + 2.45$

With $R^2 = 0.82$

Where: T = Total trip ends per hour (directional distribution of 29% entering and 71% exiting)

X = Number of dwelling units

T = (0.53) (24) + 4.21

T = 17 trip ends / hour (5 entering, 12 exiting)

Trip Generation for the PM Peak Hour of the Adjacent Roadway

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 220, page no. 329)

$T = 0.55X + 17.65$

With $R^2 = 0.77$

Where: T = Total trip ends per hour (with directional distribution of 65% entering and 35% exiting)

X = Number of dwelling units

T= (0.55) (24) + 17.65

T = 31 trip ends / hour (20 entering, 11 exiting)

Trip Generation for the PM Peak Hour of Generator

Using the ITE Trip Generation Manual for the PM peak hour trip rates

(ITE land use code: 220, page no. 331)

$T = 0.6X + 17.52$

With $R^2 = 0.8$

Where: T = Total trip ends per hour (directional distribution of 61% entering and 39% exiting)

X = Number of dwelling units

T= (0.6) (24) + 17.52

T = 32 trip ends / hour (20 entering, 12 exiting)

Table 5 shows a summary of the trip generation analysis. It is expected the total trip ends during the AM peak hour of the adjacent roadways will be 94 with 51 entering trips and 43 exiting trips. However, at the request of the City's Traffic Department, the trip generation of the AM peak hour of the generator, which is 155 newly generated trips with 84 entering and 71 exiting, was used in the subsequent analysis. The total trip ends for the PM peak hour of the adjacent roadways will be 185 with 102 entering trips and 83 exiting trips.

It is important to note that the total trip generation for the PM peak hour of the generator is 186 trips and the generated trips during the PM peak hour of the adjacent roadway are 185; however, the adjacent roadway traffic is considerably higher during the peak period of the adjacent roadway traffic. Therefore, for the capacity / level of service analysis, the worst case scenarios will be the peak hour of the adjacent roadways.

Table 5: Summary of Trip Generation Analysis

Land Use	**ITE Land Use Code**	**No. Of Units / Gross Floor Area**	**AM Peak Hour of Generator (vph)**			**PM Peak Hour of Adjacent Street Traffic (vph)**		
			Total Trips	**Entering Trips**	**Exiting Trips**	**Total Trips**	**Entering Trips**	**Exiting Trips**
Hotel	310	162 rooms	85	47	38	96	51	45
Retail Store	814	5,135 SF (GFA)	35	17	18	34	15	19
Restaurant	931	3,131 SF (GFA)	18	15	3	24	16	8
Apartment	220	24 units	17	5	12	31	20	11
		Total	**155**	**84**	**71**	**185**	**102**	**83**

TRIP DISTRIBUTION AND FUTURE BUILD-OUT CONDITIONS

With regard to the trip distribution and traffic assignment analysis, the following assumptions have been considered:

a. For inbound traffic, 38 percent will access the proposed development through NB Washtenaw Avenue and then to NB N. Ingalls Street, 12 percent will access via NB State Street and then to EB E. Ann Street, 25 percent will access from the west through EB E. Huron Street, NB N. State Street and then to EB E. Ann Street, 15 percent will access from the north via SB N. State Street and then to EB E. Ann Street. The balance of 10 percent of trips will access from the north through Fuller Road and then onto NB Glen Avenue. The proposed path of the inbound trips is shown in Figure 18.

b. For outbound traffic, 38 percent will use NB Glen Avenue and then SB Huron Street (Washtenaw Avenue) to go the south direction, 37 percent will use NB Glen Avenue and then WB E. Huron Street to go to the west direction and the south direction. The balance of 25% will use NB Glen Avenue to go to the north direction. The specific routes of the outbound traffic are shown in Figure 19.

The access drive to the hotel property will be from EB Ann Street only. Since Ann Street is one-way EB, all outbound traffic will have to go through the intersection of Glen Avenue and Ann Street and split-up between SB and NB Glen Avenue in order to go to their respective destinations as shown in Figure 19.

In regard to proposed parking on the property, only valet parking will be used. This assures compliance to the planned access.

The incoming and outgoing newly generated trips for various peak periods are shown in Figures 20 and 21. These traffic volumes at the critical intersections, relevant to this development, were used in calculating the build-out traffic volumes for the purpose of capacity / level of service analyses.

The newly generated trips were added to the background balanced traffic to determine the build-out scenario traffic movements at the critical intersections and are shown in Figures 22 through 25.

Figure 18: Percent Trip Distribution - Inbound

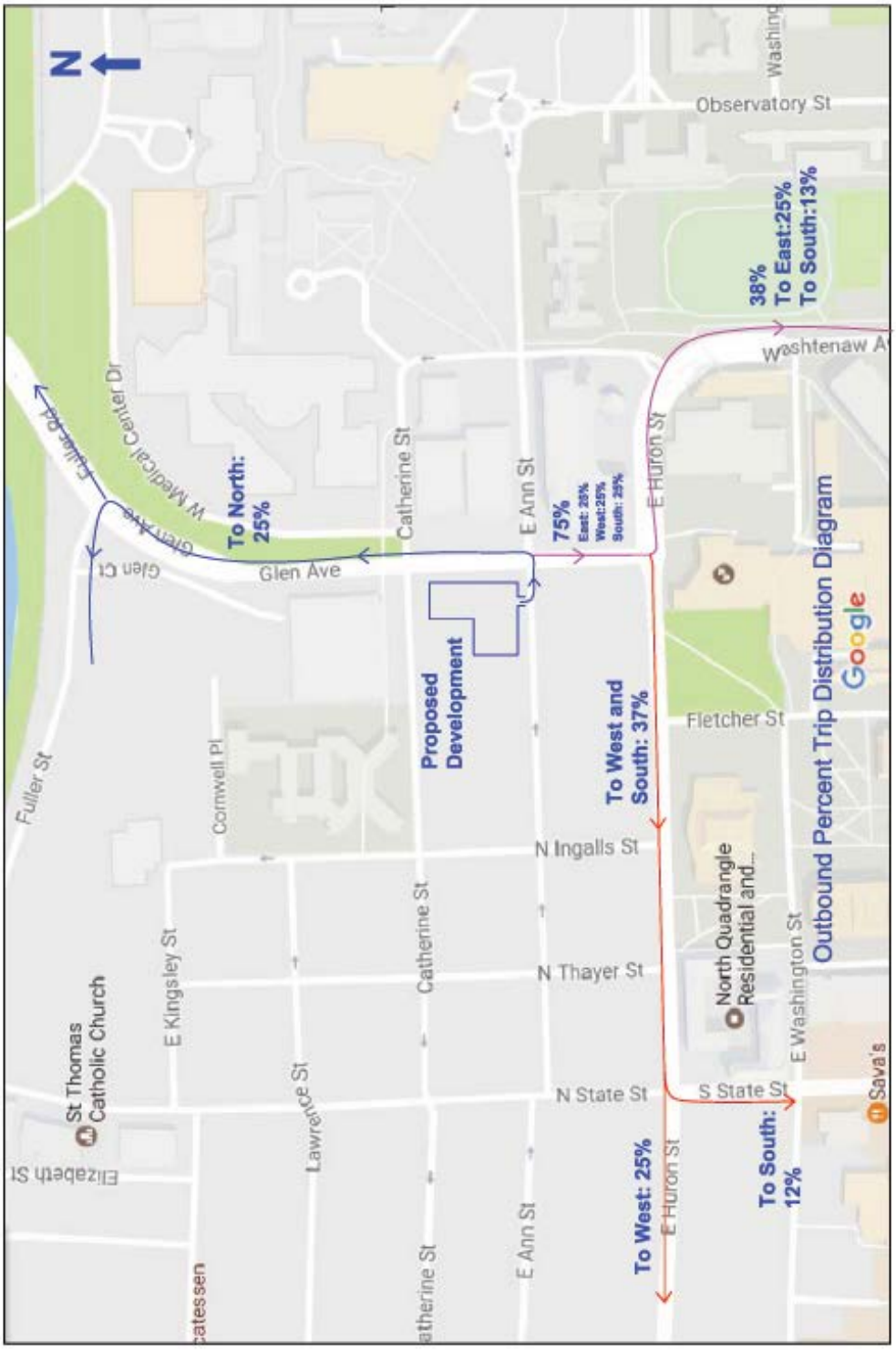


Figure 19: Percent Trip Distribution - Outbound

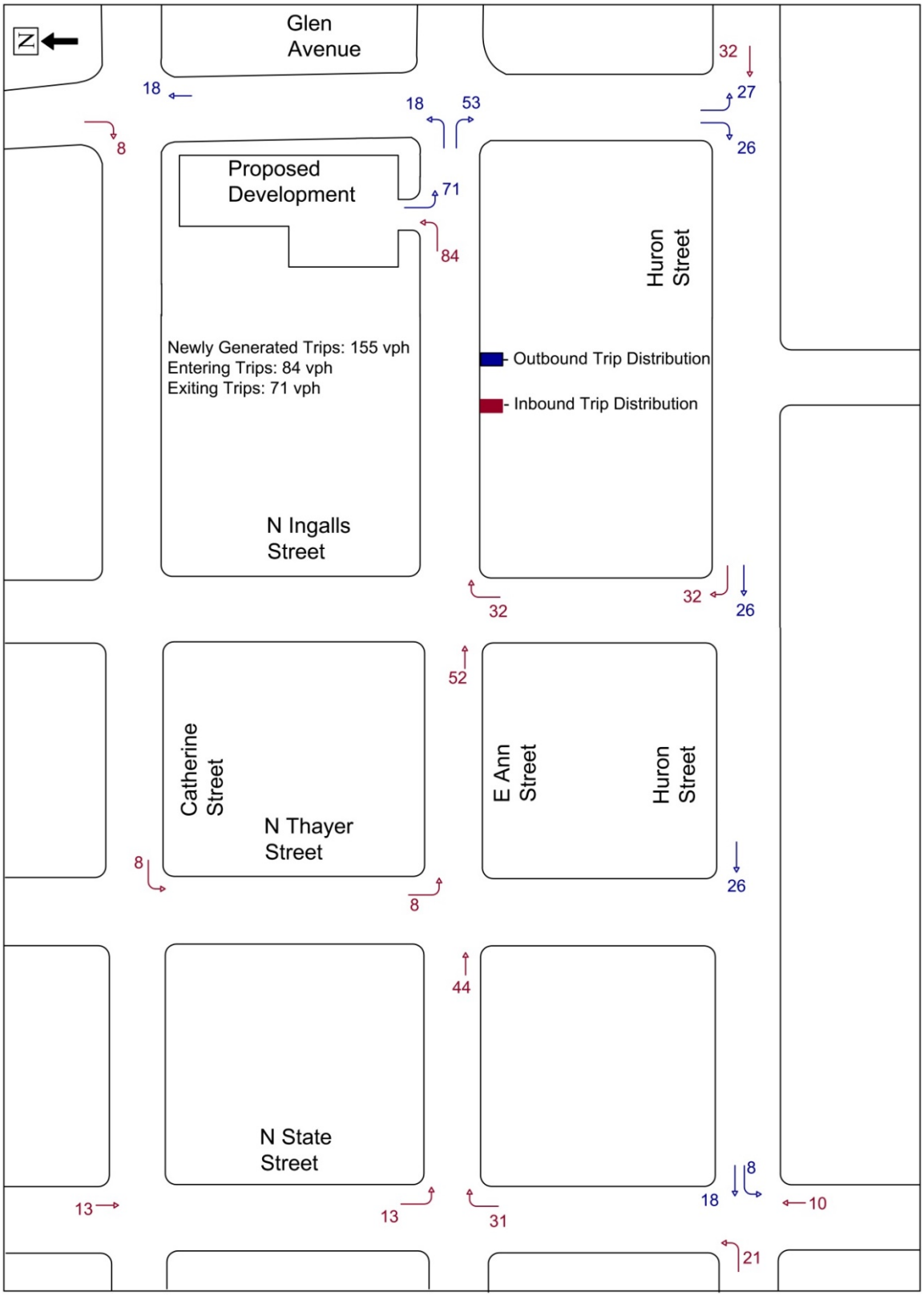


Figure 20: Newly Generated Trips - Weekday AM Peak Hour

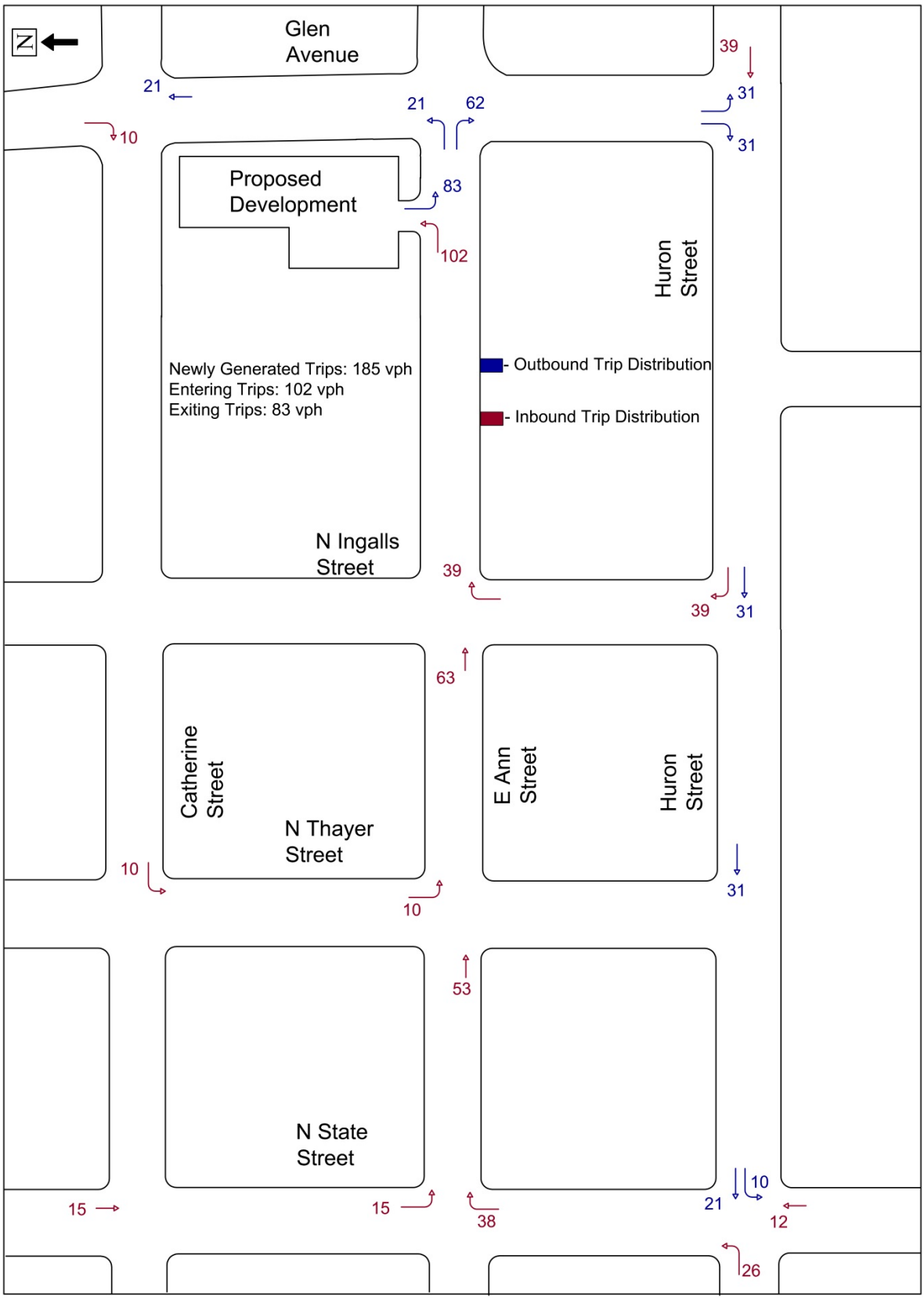


Figure 21: Newly Generated Trips - Weekday PM Peak Hour

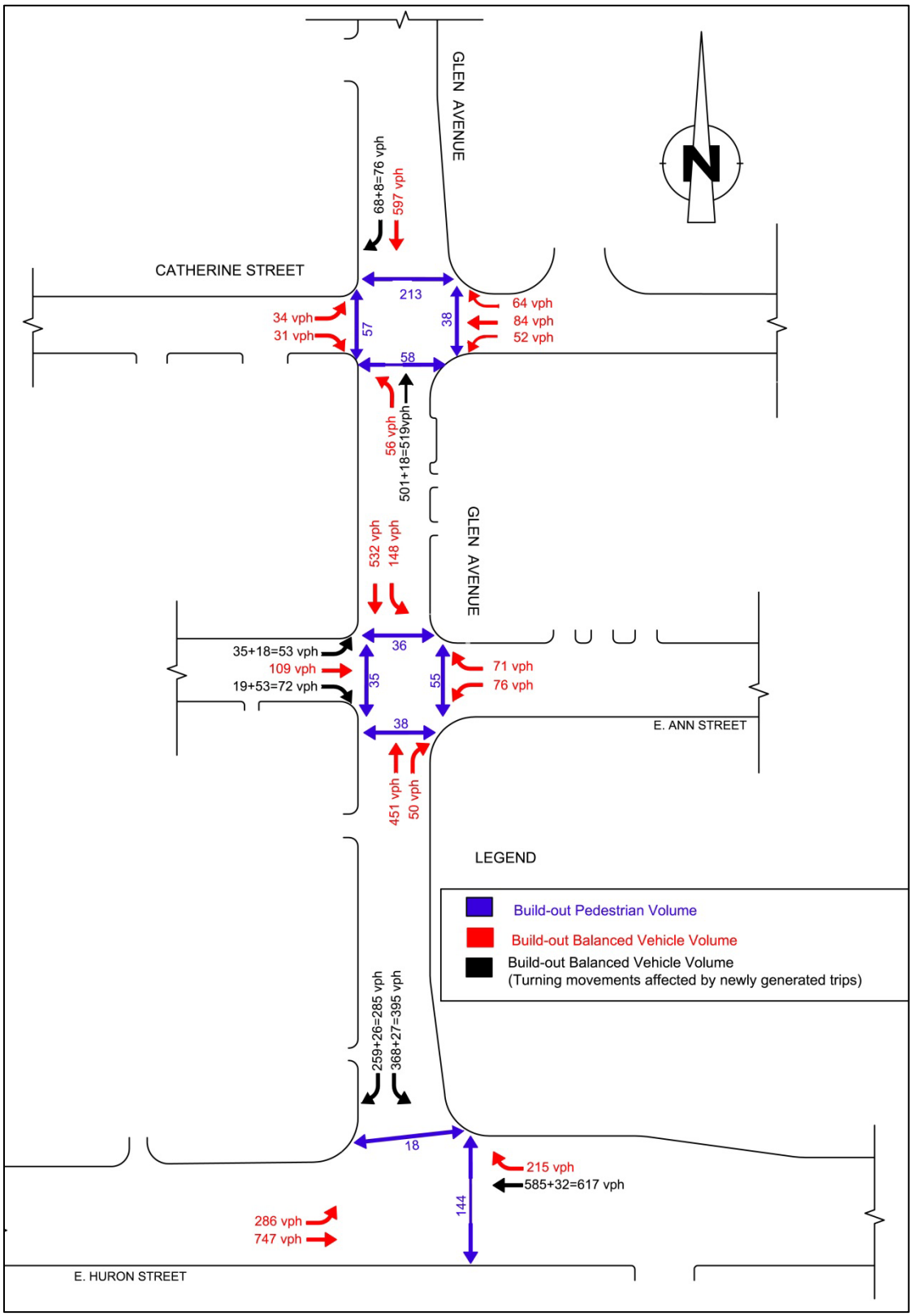


Figure 22: Build-Out Weekday AM Peak Hour Volume - Glen Avenue

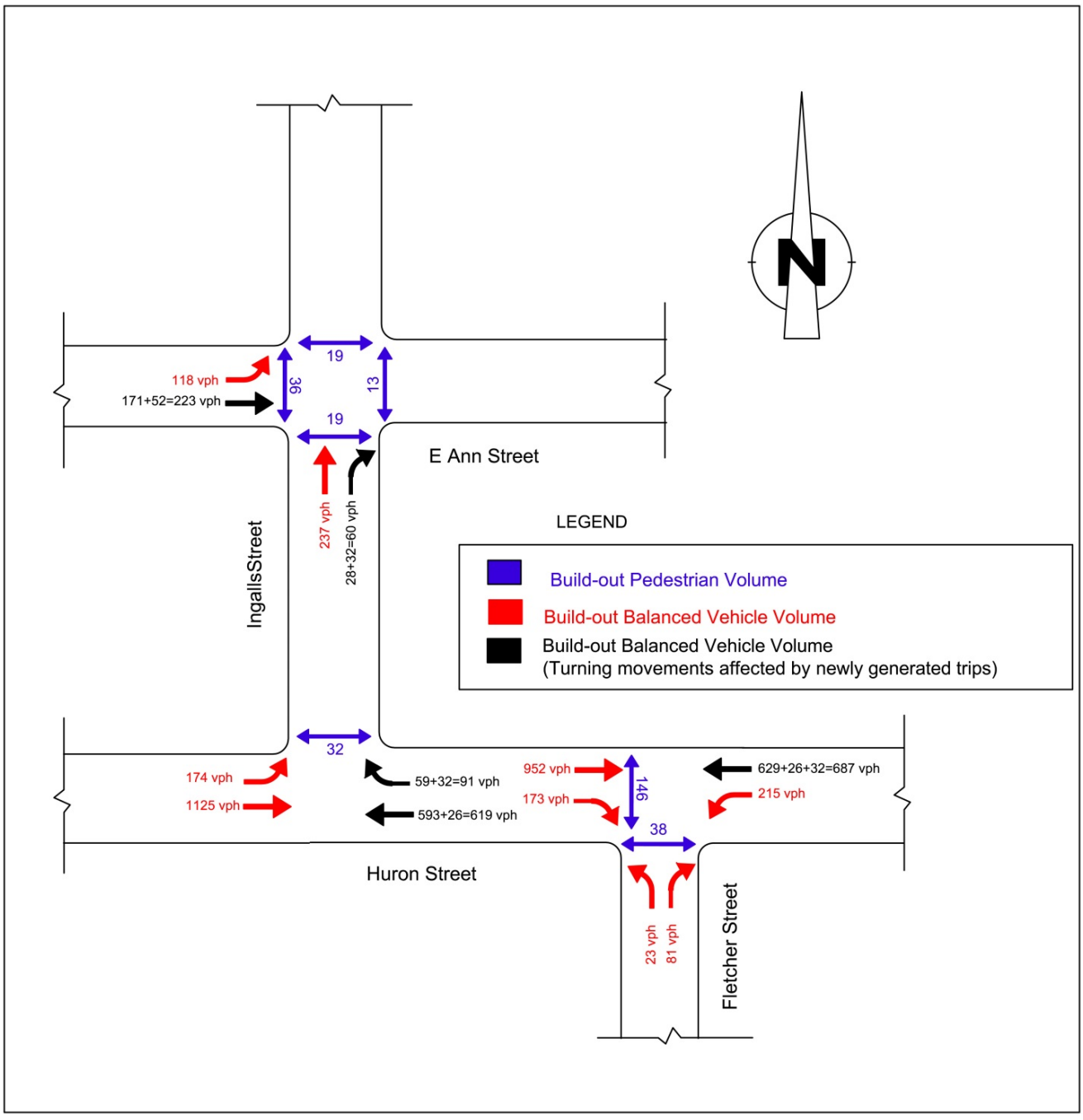


Figure 23: Build-Out Weekday AM Peak Hour Volume – Ingalls Street, Fletcher Street

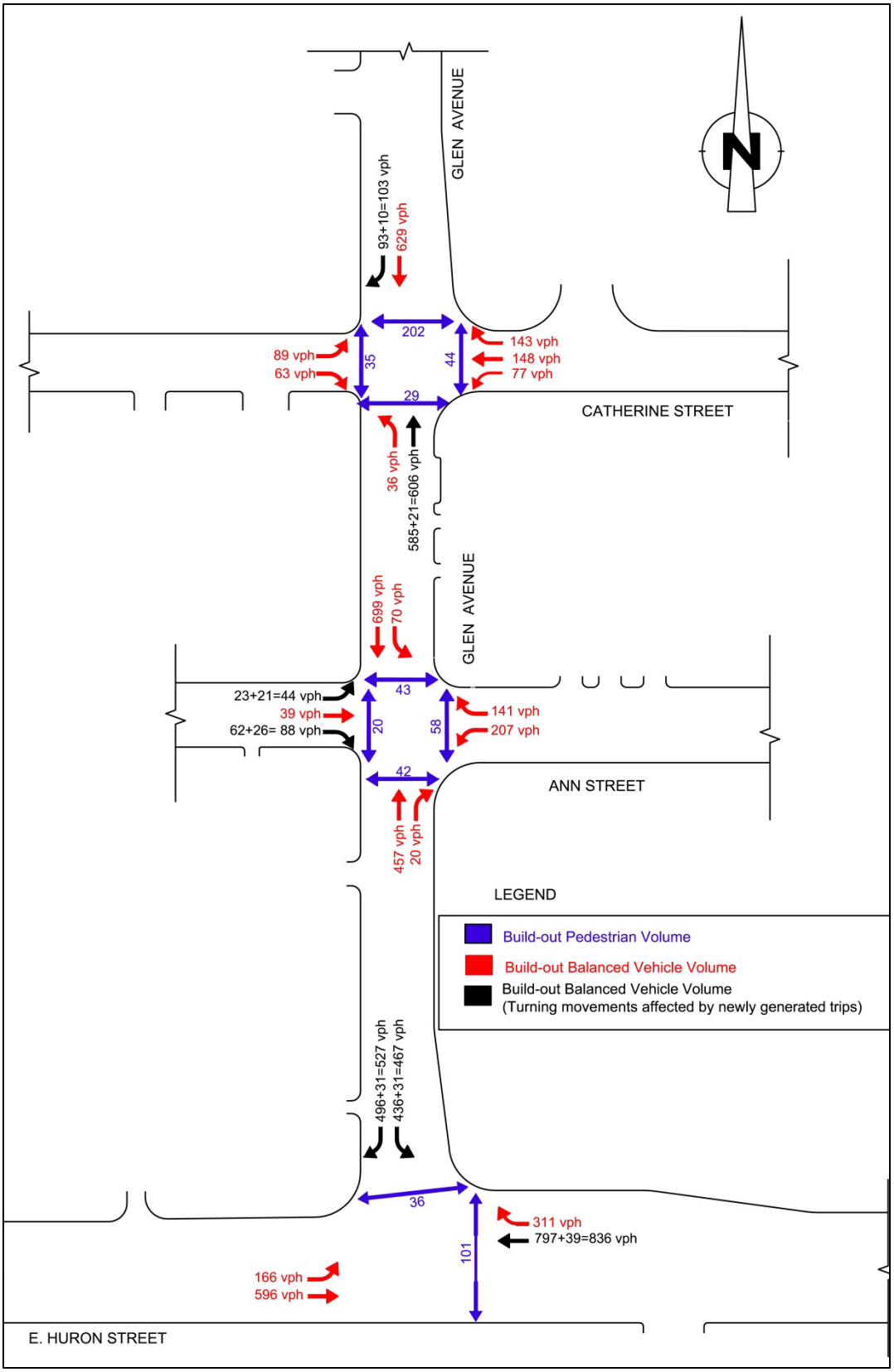


Figure 24: Build-Out Weekday PM Peak Hour Volume - Glen Avenue

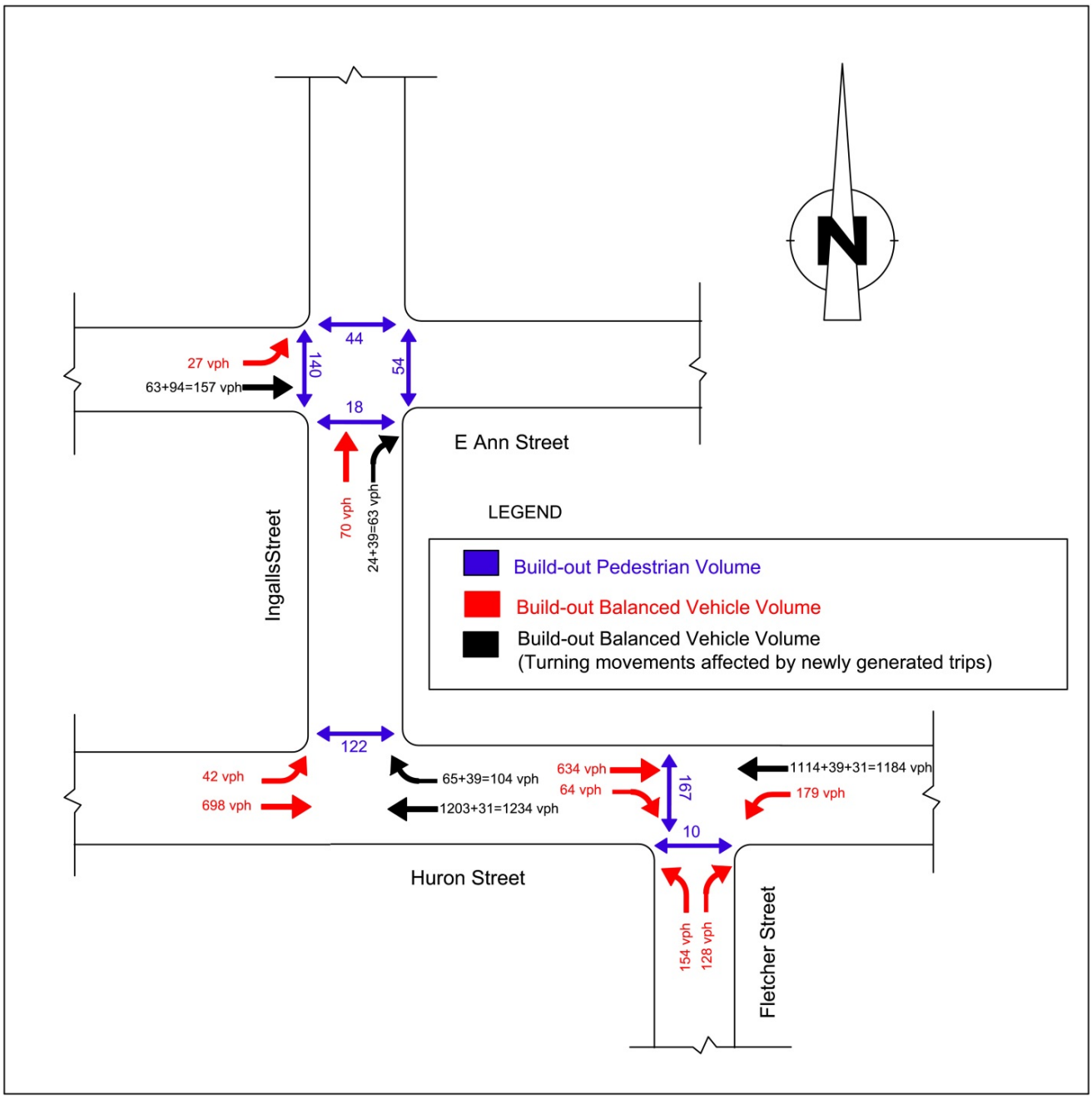


Figure 25: Build-Out Weekday PM Peak Hour Volume - Ingalls Street, Fletcher Street

LEVEL OF SERVICE ANALYSIS

The Highway Capacity Manual (HCM) considers the average delay per vehicle as the primary measure for assessing the performance of traffic at signalized intersections. Delay is defined as the difference between actual travel time and ideal travel time if no traffic signal is present. Delays may be qualitatively described in terms of "Level of Service" (LOS) provided by the intersection. The LOS may range from "A" to "F" with LOS "A" being the best and "F" being the worst. For most urban intersections, LOS "D" or better during the peak hour is generally acceptable. The HCM characterizes the LOS of signalized intersections based on the range of average delay per vehicle as shown in Table 6.

Table 6: LOS Criteria from HCM (Signalized Intersections)

(Source: HCM 2010)

LOS	Average Stopped Delay / Vehicle (seconds)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

A delay and LOS analysis was performed for the intersections of Glen Avenue and Catherine Street, Glen Avenue and Ann Street, Glen Avenue and Huron Street, Ann Street and Ingalls Street, Huron Street and Ingalls Street, and Huron Street and Fletcher Street using Synchro Version 9. The operational analysis covers the weekday AM peak period and the weekday PM peak period. This LOS analysis was performed for existing, background, build-out non-optimized (existing signal timings), and build-out optimized traffic scenarios. The LOS analysis for the existing, background, and non-optimized build-out scenario was performed using existing signal timings (see Appendix VI). It is important to note the existing peak period turning movement data was collected by the Wayne State University – Transportation Research Group staff and the LOS analysis was performed on the basis of the peak hour traffic data.

The Synchro models built for the purpose of this specific capacity/LOS analysis, along with all of the outputs, are included in the following links and may also be used to investigate future options, if desired by the city.

Volume Balance Models
http://141.217.48.12/glenhotelanalysismarch23.zip

Outputs for Capacity Analysis
http://141.217.48.12/Synchro_Simtraffic_Results.zip

The existing capacity analysis shows an overall LOS of "D" or better for all of the study intersections; however, the eastbound approach at the intersection of Catherine and Glen, especially during PM peak hours, is observed to be operating with a higher delay and LOS "F'. A portion of the potential reasons for the observed lower LOS at this approach could be due to the high conflicting pedestrian volume crossing Glen Avenue (refer to Figure 8). The Synchro model set up for the intersection of Glen and Catherine incorporates the advance pedestrian phase setting specified in the timing permit provided by the City of Ann Arbor. The advance pedestrian phases in Synchro models are observed to have further increased the eastbound vehicle delay, which is not the case with SimTraffic models. The SimTraffic models are observed to have overlooked the advance pedestrian phases, thereby virtually improving the eastbound LOS.

The newly generated traffic, due to the proposed development, did increase delays at a few of the intersections, but an overall LOS of "D" or better was still maintained. These changes were noted for the background and build-out scenarios that used existing signal timings. An optimization of the signal timings for the build-out scenario was also performed to help improve the LOS. An acceptable LOS was achieved by adjusting the splits, while maintaining the existing phasing sequences, offsets, and the signal cycle lengths. The optimized traffic signal timing changes not only considered Glen, but the performance of the network as a whole. The signal timings were only optimized at Glen / Catherine and Glen / Huron (see Tables 7 – 10).

All other studied intersections follow the existing signal timing permits. The optimized Glen split, at all intersections during the AM peak period, matches the existing signal timing permit, but the Glen split at Catherine during the PM peak period has been increased from 41 seconds to 43 seconds to help mitigate any backups along Glen. Tables 11 and 12 show the intersection delay results from Synchro, HCM, and SimTraffic (20 run analysis). The results show the build-out optimized conditions do not have a negative significant impact and, in most cases, show improvement to the background condition.

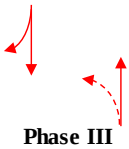
It is important to note that the optimized traffic signal timing changes are recommended, but changes to the existing signal timings are not required. It is ultimately up to the local agency as to whether to implement the changes or not.

Table 7: Comparison of Signal Phase Lengths for Weekday AM Peak Hour at Glen and Huron

Phase Sequence	Phase I			Phase II			Phase III			Pedestrian Phase
	Φ	Y	AR	Φ	Y	AR	Φ	Y	AR	
Build-Out Using Existing Traffic Signal Timing Permit	31 sec	Same	Same	12 sec	Same	Same	23 sec	Same	Same	24 sec
Build-Out Optimized Traffic Signal Timing	27 sec	Same	Same	16 sec	Same	Same	23 sec	Same	Same	24 sec

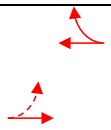
Note:
"Same" means phase and interval lengths maintained as shown in existing signal timing permit
Φ = Phase Length
Y = Yellow Time
AR = All Red Time

Table 8: Comparison of Signal Phase Lengths for Weekday AM Peak Hour at Glen and Catherine

Phase Sequence	Phase I			Phase II			 Phase III			Pedestrian Phase	Hold Phase
	Φ	Y	AR	Φ	Y	AR	Φ	Y	AR		
Build-Out Using Existing Traffic Signal Timing Permit	22 sec	Same	Same	18 sec	Same	Same	45 sec	Same	Same	27 sec	5 sec
Build-Out Optimized Traffic Signal Timing	21 sec	Same	Same	19 sec	Same	Same	45 sec	Same	Same	26 sec	5 sec

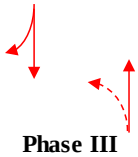
Note:
Pedestrian Phase consists of Phase I and "Hold" time of 5 seconds
"Same" means phase and interval lengths maintained as shown in existing timing permit
Φ = Phase Length
Y = Yellow Time
AR = All Red Time

Table 9: Comparison of Signal Phase Lengths for Weekday PM Peak Hour at Glen and Huron

Phase Sequence	 Phase I			Phase II			Phase III			Pedestrian Phase
	Φ	Y	AR	Φ	Y	AR	Φ	Y	AR	
Build-Out Using Existing Traffic Signal Timing Permit	31 sec	Same	Same	12 sec	Same	Same	23 sec	Same	Same	24 sec
Build-Out Optimized Traffic Signal Timing	31 sec	Same	Same	13 sec	Same	Same	22 sec	Same	Same	24 sec

Note:
"Same" means phase and interval lengths maintained as shown in existing timing permit
Φ = Phase Length
Y = Yellow Time
AR = All Red Time

Table 10: Comparison of Signal Phase Lengths for Weekday PM Peak Hour at Glen and Catherine

Phase Sequence	Phase I			Phase II			 Phase III			Pedestrian Phase	Hold Phase
	Φ	Y	AR	Φ	Y	AR	Φ	Y	AR		
Build-Out Using Existing Traffic Signal Timing Permit	22 sec	Same	Same	22 sec	Same	Same	41 sec	Same	Same	27 sec	5 sec
Build-Out Optimized Traffic Signal Timing	22 sec	Same	Same	20 sec	Same	Same	43 sec	Same	Same	27 sec	5 sec

Note:
Pedestrian Phase consists of Phase I and "Hold" time of 5 seconds
"Same" means phase and interval lengths maintained as shown in existing timing permit
Φ = Phase Length
Y = Yellow Time
AR = All Red Time

Table 11: Background and Build-Out Optimized Delays for Glen and Catherine

Glen and Catherine - Intersection Delay						
Scenario	AM Peak			PM Peak		
	Synchro (sec/veh)	HCM (sec/veh)	SimTraffic (sec/veh)	Synchro (sec/veh)	HCM (sec/veh)	SimTraffic (sec/veh)
Background - Existing Signal Timings	31.6	30.1	25.2	41.3	39.1	25.8
Build-Out - Optimized Signal Timings	32.3	30.3	24.8	41.0	38.9	24.7

Table 12: Background and Build-Out Optimized Delays for Glen and Huron

Glen and Huron - Intersection Delay						
Scenario	AM Peak			PM Peak		
	Synchro (sec/veh)	HCM (sec/veh)	SimTraffic (sec/veh)	Synchro (sec/veh)	HCM (sec/veh)	SimTraffic (sec/veh)
Background - Existing Signal Timings	29.6	31.2	34.8	34.6	37.5	27.7
Build-Out - Optimized Signal Timings	28.6	30.0	30.5	37.5	42.6	29.5

Tables 13 – 24 show a detailed breakdown of the delay and LOS analysis performed for the existing volume, background volume, build-out volume using the existing signal timing permits, and build-out volume using optimized signal timings. The delay and LOS for each approach and movement is also included. The delay and LOS analysis was performed during the weekday AM and PM peak periods for the intersections of Glen Avenue and Catherine Street, Glen Avenue and Ann Street, Glen Avenue and Huron Street, Ann Street and Ingalls Street, Huron Street and Ingalls Street, Huron Street and Fletcher Street and the Glen Hotel driveway and Ann Street, respectively. Additional simulation results, such as queue length, travel time, total stops, and average speed are included within the SimTraffic tables (see Appendix VII).

The proposed driveway is planned to be left-turn in and out from and to EB Ann Street as Ann Street is one-way EB. Figure 26 shows the location and an enlarged sketch of the proposed driveway respectively. A LOS analysis of the Glen Hotel driveway operates at a LOS “A” (see Table 18 and 24) when analyzed as an un-signalized intersection.

Table 13: LOS for Weekday AM Peak Hour at Glen Avenue and Catherine Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume Optimizing Signal Timing Splits (CL=90s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Catherine Street	Left and Right	47.1	D	48.4	D	48.4	D	52.6	D
	Approach	**47.1**	**D**	**48.4**	**D**	**48.4**	**D**	**52.6**	**D**
Westbound Catherine Street	Left	57.8	E	58.4	E	58.1	E	54.3	D
	Thru	71.5	E	72.5	E	72.3	E	64.9	E
	Right	63.6	E	64	E	63.8	E	59	E
	Approach	**65.7**	**E**	**66.4**	**E**	**66.1**	**E**	**60.4**	**E**
Northbound Glen Avenue	Left	18.9	B	19.7	B	20.4	C	21.3	C
	Thru	25.1	C	26.7	C	30.1	C	30.9	C
	Approach	**24.5**	**C**	**26**	**C**	**29.2**	**C**	**30**	**C**
Southbound Glen Avenue	Thru and Right	20.7	C	21	C	21.2	C	21.2	C
	Approach	**20.7**	**C**	**21**	**C**	**21.2**	**C**	**21.2**	**C**
Intersection		**30.8**	**C**	**31.6**	**C**	**32.6**	**C**	**32.3**	**C**

Table 14: LOS for Weekday AM Peak Hour at Glen Avenue and Ann Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume Optimizing Signal Timing Splits (CL=90 s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Ann Street	Left	26.3	C	26.3	C	27	C	27	C
	Thru & Right	**27.2**	**C**	27.4	C	26.4	C	26.4	C
	Approach	**27**	**C**	**27.1**	**C**	**26.5**	**C**	**26.5**	**C**
Westbound Ann Street	Left	23.6	C	23.9	C	26.4	C	26.4	C
	Right	5.7	A	5.7	A	5.7	A	5.7	A
	Approach	**15**	**B**	**15.1**	**B**	**16.4**	**B**	**16.4**	**B**
Northbound Glen Avenue	Thru & Right	7.2	A	8	A	8.1	A	8.4	A
	Approach	**7.2**	**A**	**8**	**A**	**8.1**	**A**	**8.4**	**A**
Southbound Glen Avenue	Left	6.4	**A**	7.2	A	7.1	A	7	A
	Thru	3.2	A	3.3	A	3.3	A	3.2	A
	Approach	**3.9**	**A**	**4.1**	**A**	**4.1**	**A**	**4**	**A**
Intersection		**8.9**	**A**	**9.3**	**A**	**10.2**	**B**	**10.3**	**B**

Table 15: LOS for Weekday AM Peak Hour at Glen Avenue and Huron Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume Optimizing Signal Timing Splits (CL=90 s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Huron Street	Left	94.1	F	106.5	F	127.3	F	82.9	F
	Thru	8.6	A	8.6	A	8.6	A	8.6	A
	Approach	**32.3**	**C**	**35.7**	**D**	**41.5**	**D**	**29.2**	**C**
Westbound Huron Street	Thru	31.5	C	31.9	C	32.8	C	41	D
	Right	6.7	A	7.2	A	8.1	A	10.7	B
	Approach	**24.9**	**C**	**25.3**	**C**	**26.4**	**C**	**33.2**	**C**
Southbound Glen Avenue	Left	32.8	C	32.9	C	32.2	C	32.2	C
	Right	12.6	B	12.7	B	13	B	9.8	A
	Approach	**24.4**	**C**	**24.5**	**C**	**24.2**	**C**	**22.8**	**C**
Intersection		**28**	**C**	**29.6**	**C**	**32.1**	**C**	**28.6**	**C**

Table 16: LOS for Weekday AM Peak Hour at Ann Street and Ingalls Street

Approach	Movement	Existing Volume (Stop Controlled Intersection)		Background Volume (Stop Controlled Intersection)		Build-Out Volume (Stop Controlled Intersection)		Build-Out Volume for the Optimized Case (Stop Controlled Intersection)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Ann Street	Left and Through	12	B	12.3	B	14.7	B	14.7	B
	Approach	**12**	**B**	**12.3**	**B**	**14.7**	**B**	**14.7**	**B**
Northbound Ingalls Street	Through and Right	11	B	11.3	B	12.5	B	12.5	B
	Approach	**11**	**B**	**11.3**	**B**	**12.5**	**B**	**12.5**	**B**
Intersection		**11.5**	**B**	**11.8**	**B**	**13.7**	**B**	**13.7**	**B**

Table 17: LOS for Weekday AM Peak Hour at Huron Street and Fletcher Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume Optimizing Signal Timing Splits (CL=90 s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Huron Street	Thru and Right	22.7	C	23.4	C	23.4	C	23.4	C
	Approach	**22.7**	**C**	**23.4**	**C**	**23.4**	**C**	**23.4**	**C**
Westbound Huron Street	Left	29.4	C	33.6	C	32.9	C	28.4	C
	Thru	6.1	A	6.1	A	6	A	4.5	A
	Approach	**12**	**B**	**13.1**	**B**	**12.4**	**B**	**10.2**	**B**
Northbound Fletcher Street	Left	30.7	C	30.8	C	30.8	C	30.8	C
	Right	8.6	A	8.6	A	8.6	A	8.6	A
	Approach	**13.5**	**B**	**13.5**	**B**	**13.5**	**B**	**13.5**	**B**
Intersection		**18.1**	**B**	**18.9**	**B**	**18.5**	**B**	**17.6**	**B**

Table 18: LOS for Weekday AM Peak Hour at Ann Street and Glen Hotel Driveway Exit

Approach	Movement	Build-Out Volume (Stop Controlled Driveway)		Build-Out Volume for the Optimized Case (Stop Controlled Driveway)	
		Delay	**LOS**	**Delay**	**LOS**
Hotel Exit	Left	11.7	B	11.7	B
Eastbound Ann Street	Left	0.5	A	0.5	A
	Thru	1.6	A	1.6	A
Intersection		**4.4**	**A**	**4.4**	**A**

Table 19: LOS for Weekday PM Peak Hour at Glen Avenue and Catherine Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Optimized Signal Timing Splits (CL=90 s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Catherine Street	Left and Right	116	F	126.9	F	126.9	F	126.9	F
	Approach	**116**	**F**	**126.9**	**F**	**126.9**	**F**	**126.9**	**F**
Westbound Catherine Street	Left	35.6	D	35.7	D	35.7	D	38.1	D
	Thru	43.2	D	43.6	D	43.7	D	51.3	D
	Right	42.7	D	43.2	D	43.3	D	49.9	D
	Approach	**41.4**	**D**	**41.8**	**D**	**41.9**	**D**	**48.1**	**D**
Northbound Glen Avenue	Left	11.6	B	12.2	B	13.9	B	12	B
	Thru	34.5	C	37.8	D	46.3	D	35.5	D
	Approach	**33.2**	**C**	**36.3**	**D**	**44.4**	**D**	**34.1**	**C**
Southbound Glen Avenue	Thru and Right	24.2	C	24.5	C	24.8	C	22.8	C
	Approach	**24.2**	**C**	24.5	C	**24.8**	**C**	**22.8**	**C**
Intersection		**39**	**D**	**41.3**	**D**	**44**	**D**	**41**	**D**

Table 20: LOS for Weekday PM Peak Hour at Glen Avenue and Ann Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Optimized Signal Timing Splits (CL=90 s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Ann Street	Left	23.3	C	23	C	23.1	C	23.1	C
	Thru & Right	16.3	B	16	B	9.6	A	9.6	A
	Approach	**18.1**	**B**	**17.8**	**B**	**13.1**	**B**	**13.1**	**B**
Westbound Ann Street	Left	31.3	C	31	C	32.5	C	32.6	C
	Right	3	A	2.8	A	2.7	A	2.7	A
	Approach	**19.8**	**B**	**19.6**	**B**	**20.4**	**C**	**20.5**	**C**
Northbound Glen Avenue	Thru & Right	13.1	B	15.1	B	17.1	B	15.6	B
	Approach	**13.1**	**B**	**15.1**	**B**	**17.1**	**B**	**15.6**	**B**
Southbound Glen Avenue	Left	4.5	A	4.6	A	4.8	A	5.3	**A**
	Thru	4.8	A	4.9	A	5.1	A	5.5	A
	Approach	**4.8**	**A**	**4.8**	**A**	**5**	**A**	**5.5**	**A**
Intersection		**11.1**	**B**	**11.7**	**B**	**12.3**	**B**	**12**	**B**

Table 21: LOS for Weekday PM Peak Hour at Glen Avenue and Huron Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Optimized Signal Timing Splits (CL=90 s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Huron Street	Left	94	F	110.5	F	117.1	F	84.5	F
	Thru	11.8	B	11.8	B	10.7	C	11.6	B
	Approach	**29.7**	**C**	**33.3**	**C**	**33.8**	**C**	**27.5**	**C**
Westbound Huron Street	Thru	51.7	D	57	E	68.7	E	68.7	E
	Right	18.2	B	19.3	B	20.6	C	20.5	C
	Approach	**42.3**	**D**	**46.4**	**D**	**55.6**	**E**	**55.6**	**E**
Southbound Glen Avenue	Left	27.4	C	27.4	C	28.1	C	29.8	C
	Right	12.2	B	12.4	B	13.7	B	14	B
	Approach	**19.3**	**B**	**19.4**	**B**	**20.5**	**C**	**21.4**	**C**
Intersection		**31.9**	**C**	**34.6**	**C**	**38.8**	**D**	**37.5**	**D**

Table 22: LOS for Weekday PM Peak Hour at Ann Street and Ingalls Street

Approach	Movement	Existing Volume (Stop Controlled Intersection)		Background Volume (Stop Controlled Intersection)		Build-Out Volume (Stop Controlled Intersection)		Build-Out Volume for the Optimized Case (Stop Controlled Intersection)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Ann Street	Left and Through	8.2	A	8.3	A	9.1	A	9.1	A
	Approach	**8.2**	**A**	**8.3**	**A**	**9.1**	**A**	**9.1**	**A**
Northbound Ingalls Street	Through and Right	7.6	A	7.7	A	8	A	8	A
	Approach	**7.6**	**A**	**7.7**	**A**	**8**	**A**	**8**	**A**
Intersection		**8**	**A**	**8**	**A**	**8.7**	**A**	**8.7**	**A**

Table 23: LOS for Weekday PM Peak Hour at Huron Street and Fletcher Street

Approach	Movement	Existing Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Background Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume with Same Offsets, Same Splits, Phasing & Timing (CL=90 s)		Build-Out Volume Optimizing Signal Timing Splits (CL=90 s)	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
Eastbound Huron Street	Thru and Right	25.8	C	25.5	C	15.1	B	25.5	C
	Approach	**25.8**	**C**	**25.5**	**C**	**15.1**	**B**	**25.5**	**C**
Westbound Huron Street	Left	7	A	7.2	A	7	A	7	A
	Thru	5.9	A	6	A	6.1	A	6.2	A
	Approach	**6.1**	**A**	**6.2**	**A**	**6.3**	**A**	**6.3**	**A**
Northbound Fletcher Street	Left	45.7	D	47.9	D	47.9	D	47.9	D
	Right	7.8	A	7.8	A	7.8	A	7.8	A
	Approach	**28.5**	**C**	**29.7**	**C**	**29.7**	**C**	**29.7**	**C**
Intersection		**15**	**B**	**15.1**	**B**	**11.8**	**B**	**15**	**B**

Table 24: LOS for Weekday PM Peak Hour at Ann Street and Glen Hotel Driveway Exit

Approach	Movement	Build-Out Volume (Stop Controlled Driveway)		Build-Out Volume for the Optimized Case (Stop Controlled Driveway)	
		Delay	**LOS**	**Delay**	**LOS**
Hotel Exit	Left	11.4	B	12	B
Eastbound Ann Street	Left	0.5	A	0.6	A
	Thru	1.9	A	2	A
Intersection		**6.3**	**A**	**6.2**	**A**

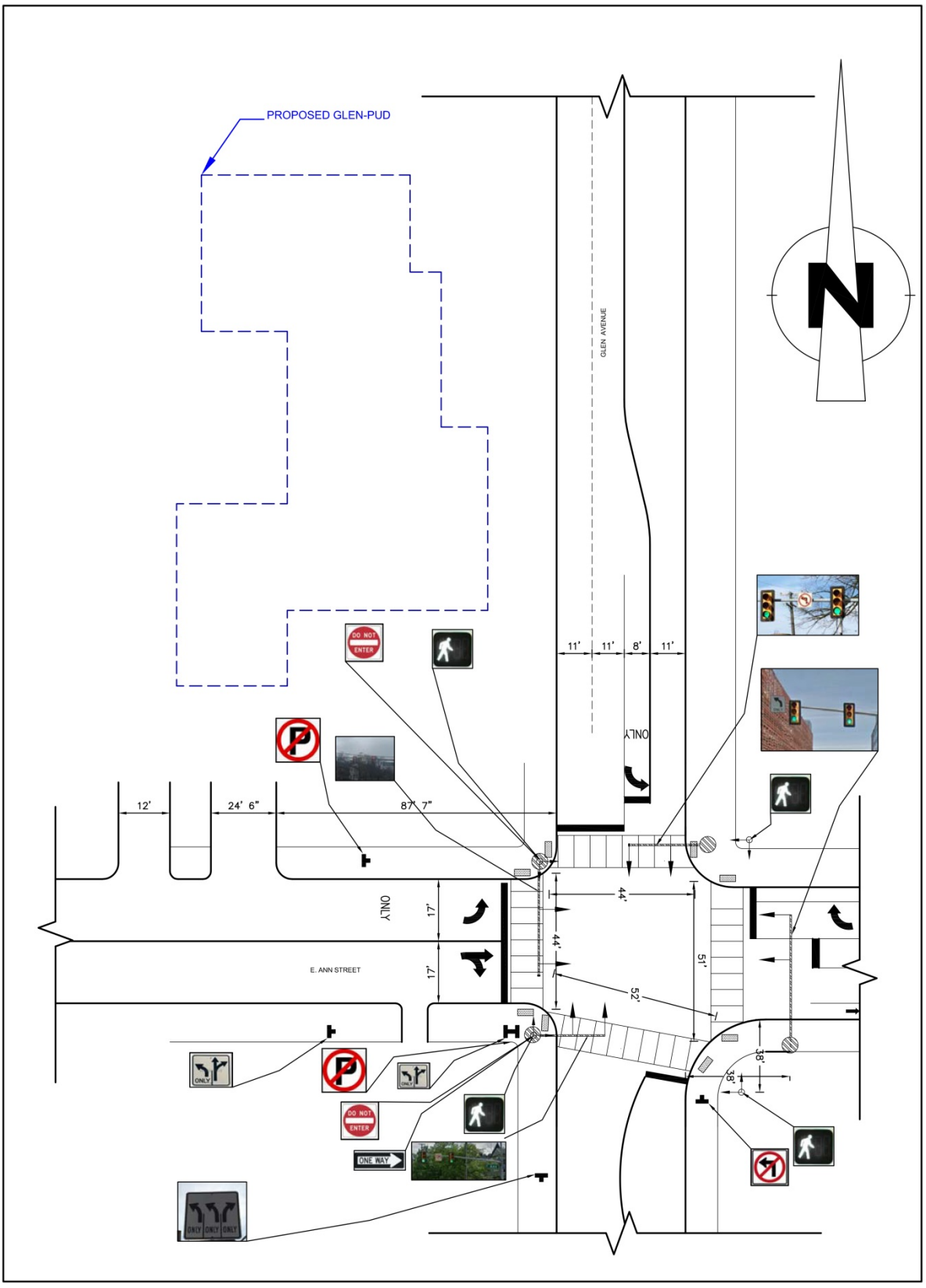


Figure 26: Access to the Ann

INVESTIGATING FUTURE LIGHT RAIL PLAN

The light rail transit service, the "Connector," is being planned for the area with several alternative routes that will serve the travel needs in the area. Implementation of this is expected to have an impact on existing downtown traffic. The proposed transit service can potentially reduce vehicular local trips, thereby reducing traffic at certain locations. However, the existing traffic control may need some adjustment in order to accommodate light rail cars along the route. In general, the light rail cars will follow existing traffic signal control; however, the affected intersections may be equipped with street-car signals and a detection system.

As shown in Figure 28, the proposed street-cars may follow either Glen Avenue (Alternative Route-1) or Catherine Street (Alternative Route-2), thereby impacting the Glen Hotel study area. It is expected to reduce vehicular traffic along the roadway when the route is finally selected. Therefore, access to the Glen Hotel may be even more convenient in this case.

Figure 27: Alternate Routes

PARKING ANALYSIS

The proposed Glen Mixed-Use Development consists of 162 rooms, 24 apartments, 5,135 SF (GFA) of retail space, and a restaurant consisting of an area of 3,131 SF (GFA). The major attraction in this mixed-use development is the boutique hotel located in the medical center on the U of M campus in the City of Ann Arbor. The planned restaurant and retail space will primarily provide the necessary services and needs of the hotel and apartment guests and, therefore, is not expected to serve as a primary destination.

A detailed analysis of the parking needs was conducted. According to the City of Ann Arbor zoning ordinance and parking requirements, the following parking spaces are required:

1. For the 162 room hotel --- 162 spaces
2. For the 24 apartment units --- 24 spaces
3. For the restaurant (2,303 SF) --- 23 spaces
4. For the retail space (5,135 SF) --- 17 spaces

Therefore, a total of 226 parking spaces are required per the City code relative to off-street parking. An additional eight (8) spaces will be required for Angelo's employees as a result of an existing agreement (Appendix VIII).

While investigating the actual parking needs and the accumulation during a typical 24-hour period, issues and assumptions include the following:

1. Parking accumulation at various times of day and night for various types of land uses is different. For example, retail and restaurants generally have a limited amount of time in a 24-hour period they are open. Hotels and apartments generally have peak parking requirements during the late evening and through the night.
2. Hotel occupancy rates are also a critical issue when performing a parking supply-demand analysis.

3. Valet parking will be provided, thus exceeding the accommodation of the parking space requirements for the proposed development. The parking space supply, as shown in the proposed building plan, is 252 spaces considering valet parking.
4. An additional safeguard in providing for any unusual parking overflow can be accommodated by a remote parking facility for the employees in surface parking lots near Ann Arbor-Saline and Waters, and the Oak Valley area shopping centers. The owners of the Glen Mixed-Used Development have agreed to provide a shuttle service on an as needed basis for their employees.
5. All employees will be given an identification sticker for their personal vehicles and will be prohibited from using the on-street parking that is available in the surrounding residential areas.

Based on the above noted assumptions, an investigation was made to determine the expected hotel occupancy rate that can be realistically assumed to determine the expected parking space requirement. Figure 29 shows the United States hotel occupancy rates from 2001 to 2015. The source of this data is included in the figure. It shows the overall hotel occupancy rates ranged from 59% to approximately 66%. This, however, is an average for all hotels that are included in the database.

Figure 30 shows the monthly hotel occupancy rates for the period 2009 to 2014 in Detroit, the State of Michigan, and the entire United States. The highest average occupancy rate observed was 75%.

The hotel occupancy rate is important while considering the strategy for satisfying parking needs. The analysis of parking space requirements was performed and the following were used:

a) A portion of the customers visiting the retail space and the restaurant will be hotel guests. For the purpose of the parking requirement analysis it is assumed 10% of the retail and restaurant customers will be hotel residents.
b) The internal/multi-purpose trips to the retail space and the restaurant are assumed to be 5% of the hotel guests occupying for various times of day and night.
c) Some hotel guests are expected to use alternative modes, such as a taxi, Uber, limo, airport shuttle, etc. 10% of the hotel guests are expected to use such alternative modes that will not require a parking space.

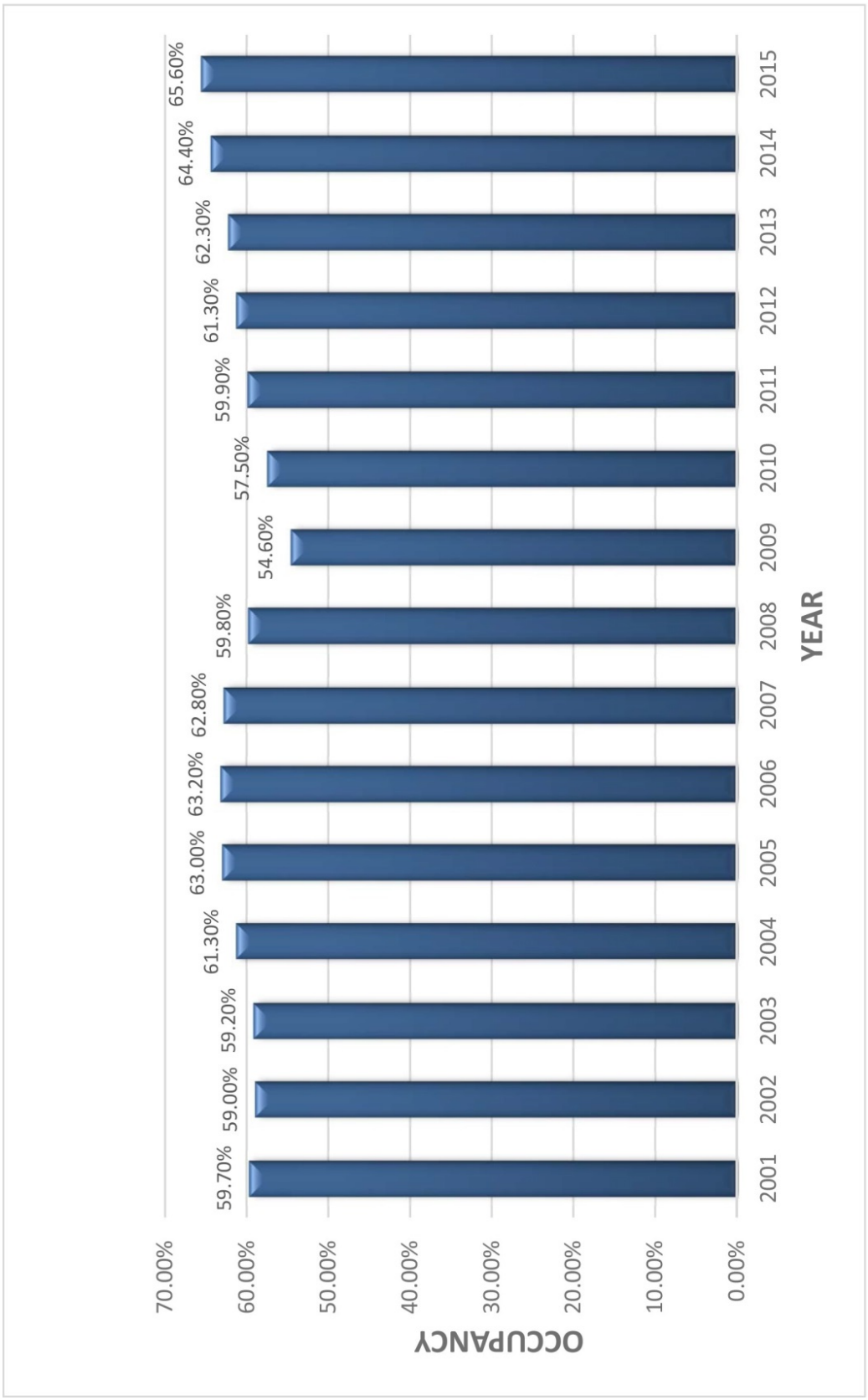
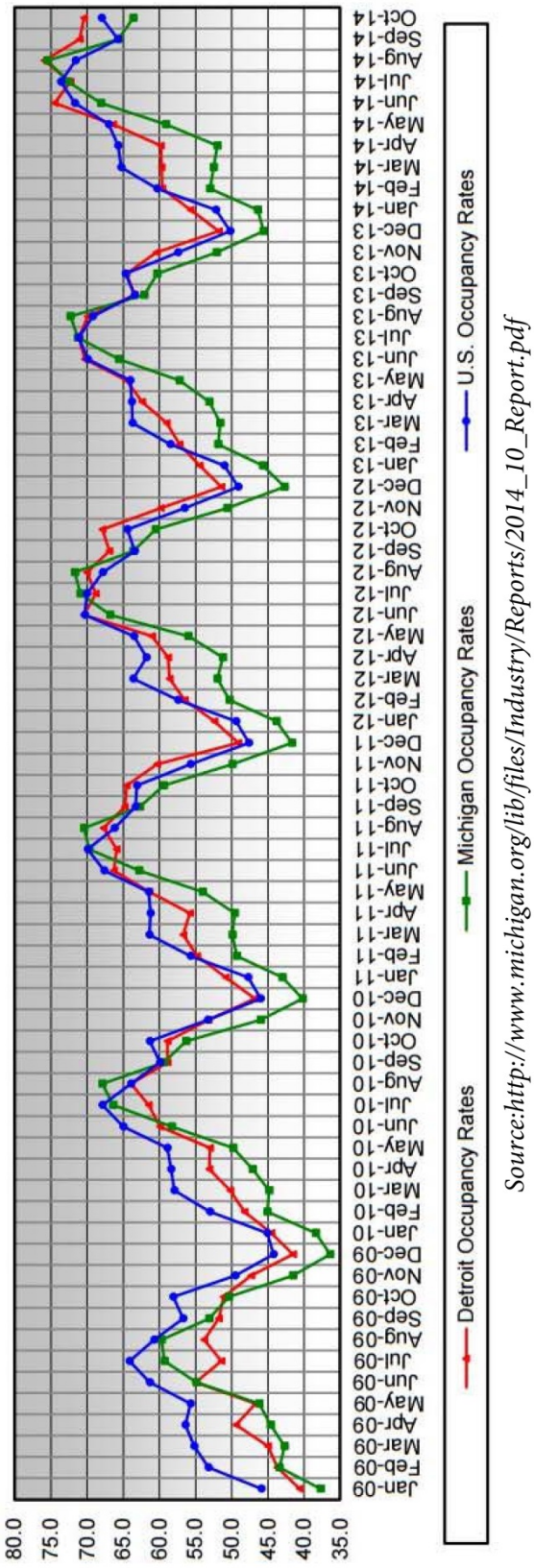


Figure 28: Occupancy Rate of the United States Hotel Industry from 2001 to 2015



Source:http://www.michigan.org/lib/files/Industry/Reports/2014_10_Report.pdf

Figure 29: Monthly Occupancy Rates for Michigan, Detroit, and United States from January 2009 through October 2014

Table 25 shows the hourly distribution of the expected parking space requirements for the Glen Mixed-Use Development (hotel, apartment, retail, and restaurant). It also shows the net hourly occupied parking spaces for a typical 24-hour period. The hourly distribution of the hotel development was used as per the ITE Parking Generation Guideline (Appendix IX). The retail and restaurant hourly distribution of potential customers are based on normal business hours of similar establishments.

According to the Ann Arbor City code, the total parking requirement is 226 parking spaces. Using reasonable industry assumptions of hourly distribution and for multi-purpose/internal trips, the highest parking accumulation expected is 193 parking spaces. This is without consideration of any reduction for hotel occupancy rates as evidenced in Figures 29 and 30 (pages 62 and 63). Therefore, it is clear that the proposed development is providing a significantly higher off-street parking facility, as compared to what is expected or realistically needed, to satisfy the potential parking demand.

The proposed development includes meeting rooms and a banquet hall that can be used for business meetings and business-related banquets during weekdays and evenings. It can also accommodate large events, such as wedding receptions during the weekends. The worst-case scenario will be a large banquet or a large wedding reception. Such events generally occur on weekends and, therefore, the need for additional parking can be satisfied by a variety of parking management strategies including the following (see Appendix X):

1. Utilizing the U of M parking deck for overflow parking.
2. Providing a shuttle service to all hotel and banquet staff to and from remote parking lots in Ann Arbor-Saline Road and Waters Road area shopping centers owned by the same owners.

Large events that will require excess parking generally occur during evening hours and weekends when the U of M parking deck is relatively empty. Such events may even include the residents of the hotel who may be visiting for the express purpose of attending these events. In these cases, parking needs may be further reduced. Necessary information regarding remote parking for any major event will be made available to event attendees prior to the event through the event organizers. This information may even lead to some selecting the option of remote parking.

Table 25: Hourly Parking Requirement Analysis

Time Of Day	Parking Spaces Occupancy Rates % Of Space Required By Zoning Ordinance				Parking Spaces Occupied (Estimated)				Reduction In Parking Space Required Due To:			Net Hourly Occupied Spaces (Estimated)	Excess Parking Spaces Provided / Available on Site (with Valet Parking 265)
	Retail	Restaurant	Hotel	Apartment	Retail	Restaurant	Hotel	Apartment	Retail patron, restaurant customer who use alternative routes (Assumed 10%)	Internal / Multi-purpose trips from hotel (Assumed 5%)	Hotel guests using using alternative modes (bus, taxi, uber, limo, airport shuttle) (Assumed 10%)		
6:00 AM	20%	40%	79%	80%	3	12	128	19	2	6	13	142	123
7:00 AM	20%	80%	77%	80%	3	25	125	19	3	6	12	151	114
8:00 AM	50%	80%	100%	60%	9	25	162	14	3	8	16	182	83
9:00 AM	60%	90%	96%	50%	10	28	156	12	4	8	16	178	87
10:00 AM	80%	100%	55%	50%	14	31	89	12	4	4	9	128	137
11:00 AM	90%	100%	52%	40%	15	31	84	10	5	4	8	123	142
12:00 PM	100%	100%	60%	40%	17	31	97	10	5	5	10	135	130
1:00 PM	100%	90%	60%	40%	17	28	97	10	4	5	10	133	132
2:00 PM	100%	80%	55%	40%	17	25	89	10	4	4	9	123	142
3:00 PM	90%	80%	52%	40%	15	25	84	10	4	4	8	117	148
4:00 PM	80%	80%	53%	50%	14	25	86	12	4	4	9	120	145
5:00 PM	80%	80%	58%	70%	14	25	94	17	4	5	9	131	134
6:00 PM	80%	80%	62%	80%	14	25	100	19	4	5	10	139	126
7:00 PM	80%	100%	66%	80%	14	31	107	19	4	5	11	150	115
8:00 PM	80%	100%	68%	90%	14	31	110	22	4	6	11	155	110
9:00 PM	40%	90%	100%	90%	7	28	162	22	3	8	16	191	74
10:00 PM	40%	90%	100%	100%	7	28	162	24	3	8	16	193	72
11:00 PM	0%	80%	100%	100%	0	25	162	24	2	8	16	184	81
12:00 AM	0%	70%	100%	100%	0	22	162	24	2	8	16	181	84
1:00 AM	0%	0%	100%	100%	0	0	162	24	0	8	16	162	103
2:00 AM	0%	0%	100%	100%	0	0	162	24	0	8	16	162	103
3:00 AM	0%	0%	100%	100%	0	0	162	24	0	8	16	162	103
4:00 AM	0%	0%	100%	100%	0	0	162	24	0	8	16	162	103
5:00 AM	0%	0%	100%	90%	0	0	162	22	0	8	16	159	106
Parking Spaces Required As Per Zoning Ordianace					**17**	**31**	**162**	**24**					
Total Required Parking Spaces							**234**						

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The Traffic Impact Study for the proposed Glen Mixed-Use Development indicated the following:

1. The upscale boutique hotel at the northwest corner of Glen Avenue and Ann Street will serve a very important function as the temporary residence of business travelers to Ann Arbor, especially those with a destination to the U of M and its medical campus.

2. The strategic location will promote walking. A significant portion of the hotel guests will most likely come through the Detroit Metropolitan Airport and possibly use a taxi, a shuttle service, or an Uber service. The inclusion of a restaurant and retail space in the Glen development will serve as an important convenience for guests of the hotel.

3. A trip generation analysis was performed for both the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods of the adjacent roadways using the ITE Trip Generation Manual. No reduction for internal trips or pass-by trips was made in order to identify the worst-case scenario for the adjacent intersections.

4. A capacity/LOS analysis was performed for all six study intersections along with several others in the vicinity including Glen Avenue and Ann Street, Glen Avenue and Catherine Street, Glen Avenue and Huron Street, Ann Street and Ingalls Street, Huron Street and Ingalls Street, and Huron Street and Fletcher Street. All intersections will be operating at an overall LOS ‘D’ or better during both the AM and PM peak hours of the adjacent roadways for the existing and build-out traffic scenarios.

5. The existing signal phasing and timings were maintained while performing the Synchro analysis for the existing, background, and non-optimized build-out scenarios. An optimization of the signal timings for the build-out volume was also performed to help improve the LOS. An acceptable LOS was achieved by adjusting the splits, while maintaining the existing phasing sequences, offsets, and the signal cycle lengths. It is identified as a build-out optimized in the Synchro models and in the summary of the results.

6. A crash analysis was performed for the past three years at affected intersections. Crash frequencies and severity are low at all locations and are expected to maintain similar crash frequencies in the future.

The following is a summary of conclusions from the parking analysis:

1. The required number of parking spaces for the proposed Glen Mixed-Use Development, as per the Ann Arbor City code is 226. However, a parking accumulation study indicated the maximum parking demand will be 193 during late evening based on normal business hours of the restaurant and the retail establishments.

2. The off-street parking will be underground and valet parking. The parking capacity provided on site is 252 spaces.

3. Parking needs for large banquets or wedding receptions can be satisfied by utilizing available parking in the U of M parking deck and other public parking facilities in the vicinity. The capacity of available parking in the parking deck during weekends is far greater than the overflow parking need for the Glen Hotel. Appendix X includes a letter from the U of M Community Relations Department that assures their cooperation during off-peak periods, as well as a memorandum, which includes Enforcement (Exhibit A) and Enforcement Hours – Medical Campus (Exhibit B).

4. Hotel and banquet staff will be using remote parking and hotel shuttle service, as required, and will be prohibited from using any on-street parking in the nearby residential areas.

Recommendations

The following is a summary of recommendations:

1. Access to the Glen Mixed-Use Development will be from Ann Street west of the intersection of Glen Avenue and Ann Street. Ann Street is a one-way street EB.

2. Underground valet parking will be used for the proposed hotel.

3. Intersections in the vicinity of the proposed development were analyzed using the Synchro model. The signal timings were optimized by adjusting the splits at Glen and Huron and Glen and Catherine for the build-out scenario. However, the analysis maintained the existing peak hour cycle length of 90 seconds and offsets for all five intersections. The phasing design has also been kept as it is in the existing signal settings. The optimized signal timings are appropriate and will be able to handle the build-out traffic without sacrificing any LOS, and in most cases, indicate improvement to the background condition.

The Traffic Impact Study presented here shows the proposed Glen Mixed-Use Development will not adversely impact the traffic operation and safety in the vicinity of the development and the community.

APPENDIX I – POPULATION AND HOUSEHOLD GROWTH TREND EXCERPTS

(Source: SEMCOG)

Southeast Michigan 2040 Forecast Summary

Revised, April 2012

SEMCOG . . . Creating Success in Southeast Michigan

Southeast Michigan Council of Governments

2040 Forecast by County for Southeast Michigan

	2010	2015	2020	2025	2030	2035	2040	Change 2010-40 Number	Change 2010-40 Percent
Southeast Michigan									
Population	4,704,743	4,667,111	4,646,938	4,648,713	4,678,718	4,708,371	4,742,083	37,340	0.8%
Households	1,844,758	1,863,648	1,885,802	1,905,850	1,931,495	1,948,137	1,954,953	110,195	6.0%
Employment	2,484,251	2,601,122	2,635,153	2,672,708	2,713,955	2,756,878	2,786,082	301,831	12.1%
Livingston County									
Population	180,967	186,015	192,116	198,021	204,704	210,664	214,323	33,356	18.4%
Households	67,380	70,558	73,620	75,959	78,514	80,706	82,223	14,843	22.0%
Employment	69,057	74,482	77,468	80,337	83,506	86,820	89,727	20,670	29.9%
Macomb County									
Population	840,978	855,374	863,378	872,740	884,865	896,423	905,390	64,412	7.7%
Households	331,668	341,557	349,242	356,597	363,519	368,169	370,604	38,936	11.7%
Employment	362,517	377,116	379,981	387,217	395,239	403,398	409,886	47,369	13.1%
Monroe County									
Population	152,021	155,690	156,592	158,332	160,841	163,180	164,720	12,699	8.4%
Households	58,230	60,815	62,539	64,305	66,071	67,189	67,823	9,593	16.5%
Employment	53,761	56,262	56,928	57,637	58,669	60,081	61,382	7,621	14.2%
Oakland County									
Population	1,202,362	1,215,321	1,218,449	1,221,349	1,230,755	1,232,672	1,246,863	44,501	3.7%
Households	483,698	496,555	504,731	506,549	509,286	511,137	510,257	26,559	5.5%
Employment	842,222	901,219	921,533	936,923	951,622	964,459	970,797	128,575	15.3%
St. Clair County									
Population	163,040	161,671	161,508	162,553	164,656	166,659	167,621	4,581	2.8%
Households	63,841	64,680	65,492	66,586	67,887	68,634	68,960	5,119	8.0%
Employment	62,614	65,243	66,061	67,045	68,350	70,038	71,480	8,866	14.2%
Washtenaw County									
Population	344,791	350,781	354,116	360,371	368,262	377,183	386,235	41,444	12.0%
Households	137,193	141,483	146,870	151,822	156,324	160,691	164,447	27,254	19.9%
Employment	236,676	246,721	252,598	260,024	268,528	277,576	285,655	48,979	20.7%
Wayne County									
Population	1,820,584	1,742,259	1,700,779	1,675,347	1,664,635	1,661,590	1,656,931	-163,653	-9.0%
Households	702,749	688,000	683,308	684,032	689,894	691,611	690,639	-12,110	-1.7%
Employment	857,404	880,079	880,584	883,525	888,041	894,506	897,155	39,751	4.6%

SEMCOG Quick facts

January 2014

Transportation Data in Southeast Michigan

SEMCOG, the Southeast Michigan Council of Governments, collects, analyzes, and reports on transportation data in Southeast Michigan as a service to its member local governments and the public for both planning and modeling purposes. Data are collected from member organizations, Michigan Department of Transportation (MDOT), county road commissions, federal agencies, and other partners.

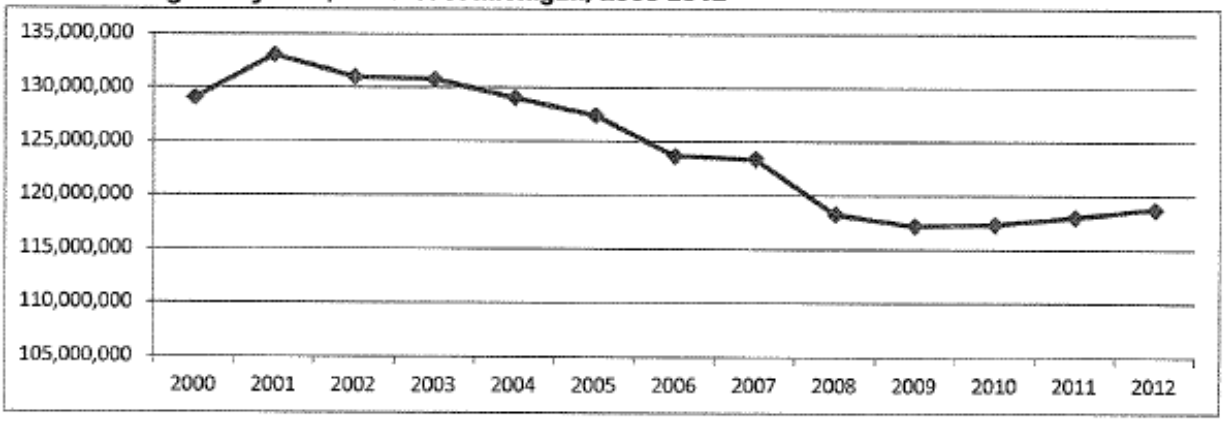
Southeast Michigan and its seven counties (Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne) have a robust transportation system. There are over 3.6 million registered vehicles in the region, contributing to 43.3 billion vehicle miles traveled annually. The transportation system includes 25,116 miles of road, more than 2,900 bridges, 123 fixed bus routes, six passenger airports, and eight international border crossings. This report provides trends and information on major transportation assets in Southeast Michigan.

Summary			
Registered Vehicles		3,659,233	Vehicles
Centerline Road Miles (including local roads)		25,116	Miles
Centerline Road Miles Eligible for Federal Aid (Paved)		8,535	Miles
Lane Miles Eligible for Federal Aid (Paved)		21,403	Miles
Bridges		2,916	Structures
	Daily	**Annual**	
Vehicle Miles Traveled	118,746,667	43,342,533,455	Miles
Transit Ridership (Unlinked Passenger Trips)	175,547	64,074,885	Trips
Airline Passengers (Enplanements)	43,084	15,725,781	Passengers
Airplane Takeoff and Landings	2,719	992,599	Aircraft
International Bridge Crossings	45,324	16,543,505	Vehicles

Roadway

Vehicle miles traveled (VMT) is the measure of miles a motor vehicle operates on the transportation system, usually reported daily and annually. The transportation system in Southeast Michigan supports over 118 million miles of travel each day, which resulted in an annual VMT of 43.3 billion in 2012. Figure 1 shows average daily VMT from 2000-2012. Since 2000, the region has seen an eight percent loss in vehicle miles traveled. The last significant drop in VMT was from 2007-2008, when VMT decreased just over four percent due to the 2008 economic downturn. Since the economic downturn in 2008, VMT has remained relatively consistent with less than a one percent change from 2008-2012. The VMT trend that we saw in Southeast Michigan is consistent with the national trend reported by Federal Highway Administration, which suggests that Americans are driving less since the last peak in 2007. Table 1 shows VMT by county.

Figure 1
Annual Average Daily VMT, Southeast Michigan, 2000-2012



Source: SEMCOG Travel Demand Model

Table 1
Annual Average Daily VMT by County and City of Detroit

	2000	2005	2007	2010	2011	2012
Detroit	16,159,448	16,012,759	15,899,522	14,627,865	14,359,475	14,091,084
Wayne	26,644,310	26,972,734	27,401,830	23,608,216	23,919,209	24,230,202
Oakland	36,432,017	36,105,592	33,413,347	33,639,747	33,499,810	33,359,873
Macomb	19,770,469	20,380,179	18,909,048	18,150,410	19,035,486	19,920,561
Washtenaw	11,037,801	10,356,769	10,520,429	11,026,457	10,914,535	10,802,613
Monroe	7,593,415	5,250,317	5,583,990	5,672,411	5,731,780	5,791,149
St. Clair	5,007,017	4,973,864	4,749,950	4,240,941	4,104,295	3,967,650
Livingston	6,417,470	7,393,058	6,928,510	6,368,418	6,475,977	6,583,535
Regional Total	**129,061,947**	**127,445,271**	**123,406,626**	**117,334,466**	**118,040,567**	**118,746,667**

Source: SEMCOG Travel Demand Model

SEMCOG | Southeast Michigan Council of Governments

Custom Community Profiles

YOU ARE VIEWING DATA FOR:

City of Ann Arbor

301 E Huron St
Ann Arbor, MI 48104-1908
http://www.a2gov.org

SEMCOG MEMBER

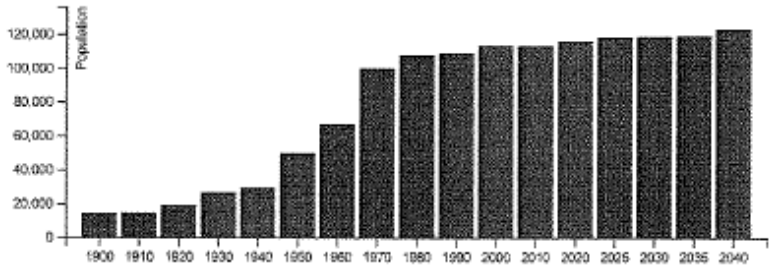
Census 2010 Population:
113,934
Area: 27.6 square miles

Population and Households

Link to American Community Survey (ACS) Profiles: 2014 **Social | Demographic**

Population and Household Estimates for Southeast Michigan, July 2015

Population Forecast



Source: **U.S. Census Bureau** and **SEMCOG 2040 Forecast** produced in 2012.

Note for City of Ann Arbor : 1950 population includes the City of East Ann Arbor. East Ann Arbor was disincorporated by 1960 Census and annexed to City of Ann Arbor.

Population and Households

Population and Households	Census 2010	Change 2000-2010	Pct Change 2000-2010	SEMCOG Jul 2015	SEMCOG 2040
Total Population	113,934	-90	-0.1%	118,017	123,786
Group Quarters Population	11,840	-549	-4.4%	11,277	12,236
Household Population	102,094	459	0.5%	106,740	111,550
Housing Units	49,789	2,571	5.4%	50,972	-
Households (Occupied Units)	47,060	1,367	3.0%	49,851	52,277
Residential Vacancy Rate	5.5%	2.3%	-	2.2%	-
Average Household Size	2.17	-0.05	-	2.14	2.13

Source: U.S. Census Bureau and SEMCOG 2040 Forecast produced in 2012.

Components of Population Change

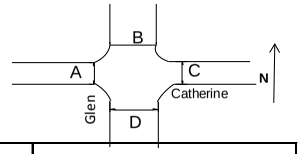
Components of Population Change	2000-2005 Avg.	2006-2010 Avg.
Natural Increase (Births - Deaths)	817	803
Births	1,382	1,329
Deaths	565	526
Net Migration (Movement In - Movement Out)	-1,076	-562
Population Change (Natural Increase + Net Migration)	-259	241

Source: Michigan Department of Community Health Vital Statistics U.S. Census Bureau, and SEMCOG.

APPENDIX II – TURNING VOLUME COUNTS FOR THE AM AND PM PEAK HOURS ON WEEKDAYS

Traffic Volume Counts at the Intersection of Glen and Catherine St (AM PEAK HOUR)

February 3, 2016



AM Peak Hour

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck										Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound				North-South	Eastbound				Westbound						East-West		A	B	C	D
	Left		Through		Through		Right			Left		Right		Left		Through		Right							
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T						
7:00AM - 7:15AM	11	0	54	2	105	2	20	1	5	2	0	4	0	7	0	18	2	7	0	24	235	5	19	0	5
7:15AM - 7:30AM	12	1	89	2	115	2	20	0	10	4	1	3	0	3	0	14	4	6	4	44	280	5	40	5	4
7:30AM - 7:45AM	26	0	110	5	110	1	24	3	13	3	0	0	0	13	0	34	2	10	2	62	343	10	54	3	8
7:45AM - 8:00AM	28	1	90	1	137	1	21	0	24	0	0	1	1	16	1	44	11	9	5	84	367	18	82	6	2
8:00AM - 8:15AM	20	0	102	4	123	6	24	1	22	7	0	7	0	19	0	27	8	9	6	60	363	12	54	10	6
8:15AM - 8:30AM	10	0	114	3	122	7	12	0	17	11	1	13	0	6	1	15	1	6	5	38	327	11	34	6	4
8:30AM - 8:45AM	11	0	119	4	163	7	14	2	29	3	0	4	0	7	1	10	4	10	5	46	364	17	41	12	5
8:45AM - 9:00AM	13	0	135	5	144	7	11	2	23	9	2	6	0	16	0	14	3	14	7	119	388	15	78	8	41

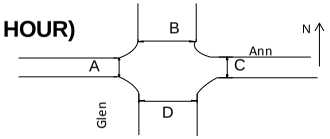
Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck)										Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound				North-South	Eastbound				Westbound						East-West		A	B	C	D
	Left		Through		Through		Right			Left		Right		Left		Through		Right							
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T						
7:00AM - 8:00AM	77	2	343	10	467	6	85	4	52	9	1	8	1	39	1	110	19	32	11	214	1225	38	195	14	19
7:15AM - 8:15AM	86	2	391	12	485	10	89	4	69	14	1	11	1	51	1	119	25	34	17	250	1353	45	230	24	20
7:30AM - 8:30AM	84	1	416	13	492	15	81	4	76	21	1	21	1	54	2	120	22	34	18	244	1400	51	224	25	20
7:45AM - 8:45AM	69	1	425	12	545	21	71	3	92	21	1	25	1	48	3	96	24	34	21	228	1421	58	211	34	17
8:00AM - 9:00AM	54	0	470	16	552	27	61	5	91	30	3	30	0	48	2	66	16	39	23	263	1442	55	207	36	56

TOTAL PEAK HOUR VOLUME **1442**

Peak Hour Factor **0.93**

Traffic Volume Counts at the Intersection of Glen and Ann St (AM PEAK HOUR)

February 3, 2016



AM Peak Hour

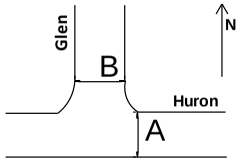
Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Ann (PC = passenger car, T = truck										Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound					Eastbound						Westbound									
	Through		Right		Left		Through			Left		Through		Right		Left		Through		Right						
	PC	T	PC	T	PC	T	PC	T	North-South	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	East-West		A	B	C	D
7:00AM - 7:15AM	51	2	21	1	55	1	63	1	18	2	0	41	4	3	0	15	2	9	0	7	271	4	2	14	5
7:15AM - 7:30AM	84	6	14	2	54	1	64	5	23	6	0	40	5	5	0	19	0	11	0	9	316	5	5	18	4
7:30AM - 7:45AM	93	0	6	1	29	1	85	2	20	10	1	32	2	1	0	38	0	30	1	5	332	4	2	16	3
7:45AM - 8:00AM	120	1	15	1	40	2	114	3	24	9	0	38	2	1	0	20	1	24	0	23	391	6	9	18	14
8:00AM - 8:15AM	88	5	12	2	30	2	119	6	13	5	0	27	2	0	0	28	0	18	0	11	344	5	7	8	4
8:15AM - 8:30AM	90	2	9	2	33	2	108	7	23	10	0	14	1	8	0	12	1	10	1	17	310	13	10	10	7
8:30AM - 8:45AM	91	3	7	1	33	2	142	6	27	10	0	20	2	9	0	12	0	15	1	21	354	10	9	17	12
8:45AM - 9:00AM	92	4	10	1	27	2	138	6	33	8	1	21	3	6	0	19	0	3	0	19	341	13	8	20	11

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Ann (PC = passenger car, T = truck)										Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound					Eastbound						Westbound									
	Through		Right		Left		Through			Left		Through		Right		Left		Through		Right						
	PC	T	PC	T	PC	T	PC	T	North-South	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	East-West		A	B	C	D
7:00AM - 8:00AM	348	9	56	5	178	5	326	11	85	27	1	151	13	10	0	92	3	74	1	44	1310	19	18	66	26
7:15AM - 8:15AM	385	12	47	6	153	6	382	16	80	30	1	137	11	7	0	105	1	83	1	48	1383	20	23	60	25
7:30AM - 8:30AM	391	8	42	6	132	7	426	18	80	34	1	111	7	10	0	98	2	82	2	56	1377	28	28	52	28
7:45AM - 8:45AM	389	11	43	6	136	8	483	22	87	34	0	99	7	18	0	72	2	67	2	72	1399	34	35	53	37
8:00AM - 9:00AM	361	14	38	6	123	8	507	25	96	33	1	82	8	23	0	71	1	46	2	68	1349	41	34	55	34

TOTAL PEAK HOUR VOLUME **1399**

Peak Hour Factor **0.89**

Traffic Volume Counts at the Intersection of Glen and Huron St
February 9, 2016



AM Peak Hour

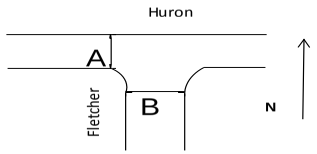
Time	Glen (PC = passenger car, T = truck) Southbound Left PC	Left T	Right PC	Right T	Pedestrian Count North-South(A)	Huron (PC = passenger car, T = truck Eastbound Left PC	Left T	Through PC	Through T	Westbound Through PC	Through T	Right PC	Right T	Pedestrian Count East-West(B)	Total
7:00AM - 7:15AM	41	1	20	3	5	59	3	95	2	46	6	25	1	3	302
7:15AM - 7:30AM	42	3	34	5	5	64	4	105	4	81	3	28	2	2	375
7:30AM - 7:45AM	56	1	41	5	4	84	1	125	5	121	4	43	1	2	487
7:45AM - 8:00AM	65	1	61	6	14	69	5	160	5	104	6	49	0	3	531
8:00AM - 8:15AM	64	2	38	10	26	70	5	146	12	94	8	57	3	3	509
8:15AM - 8:30AM	87	0	69	5	28	62	5	182	5	104	6	44	1	5	570
8:30AM - 8:45AM	92	1	45	7	27	61	9	170	7	116	4	40	2	5	554
8:45AM - 9:00AM	106	1	64	10	59	65	1	165	5	97	5	34	1	4	554

Time	Glen (PC = passenger car, T = truck) Southbound Left PC	Left T	Right PC	Right T	Pedestrian Count North-South(A)	Huron (PC = passenger car, T = truck) Eastbound Left PC	Left T	Through PC	Through T	Westbound Through PC	Through T	Right PC	Right T	Pedestrian Count East West(B)	Total
7:00AM - 8:00AM	204	6	156	19	28	276	13	485	16	352	19	145	4	10	1695
7:15AM - 8:15AM	227	7	174	26	49	287	15	536	26	400	21	177	6	10	1902
7:30AM - 8:30AM	272	4	209	26	72	285	16	613	27	423	24	193	5	13	2097
7:45AM - 8:45AM	308	4	213	28	95	262	24	658	29	418	24	190	6	16	2164
8:00AM - 9:00AM	349	4	216	32	140	258	20	663	29	411	23	175	7	17	2187

TOTAL PEAK HOUR VOLUME **2187**
Peak Hour Factor **0.96**

Traffic Volume Counts at the Intersection of Huron and Fletcher St. (AM PEAK HOUR)

February 21, 2017



AM Peak Hour

Time	Fletcher (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck)								Total Vehicle Count	Pedestrian Count	
	Northbound				Eastbound				Westbound						
	Left		Right		Through		Right		Left		Through				
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T		A	B
7:00AM - 7:15AM	2	1	7	0	135	1	19	2	11	2	77	2	259	2	2
7:15AM - 7:30AM	4	0	5	4	159	3	42	3	21	3	114	2	360	3	2
7:30AM - 7:45AM	3	0	3	4	185	5	36	0	21	7	175	5	444	5	4
7:45AM - 8:00AM	5	2	23	5	232	5	44	2	33	7	150	4	512	38	5
8:00AM - 8:15AM	4	1	6	5	221	3	48	2	49	9	143	6	497	29	6
8:15AM - 8:30AM	3	0	15	4	227	3	30	2	54	6	140	3	487	33	14
8:30AM - 8:45AM	7	0	16	5	230	3	39	1	43	8	122	3	477	42	12
8:45AM - 9:00AM	9	1	25	5	198	7	38	3	73	12	128	3	502	29	19

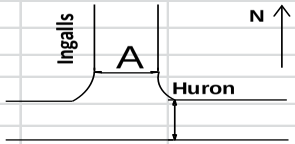
Time	Fletcher (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck)								Total Vehicle Count	Total Pedestrian Volume	
	Northbound				Eastbound				Westbound						
	Left		Right		Through		Right		Left		Through			A	B
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T			
7:00AM - 8:00AM	14	3	38	13	711	14	141	7	86	19	516	13	1575	48	13
7:15AM - 8:15AM	16	3	37	18	797	16	170	7	124	26	582	17	1813	75	17
7:30AM - 8:30AM	15	3	47	18	865	16	158	6	157	29	608	18	1940	105	29
7:45AM - 8:45AM	19	3	60	19	910	14	161	7	179	30	555	16	1973	142	37
8:00AM - 9:00AM	23	2	62	19	876	16	155	8	219	35	533	15	1963	133	51

TOTAL PEAK HOUR VOLUME **1973**

Peak Hour Factor **0.96**

Traffic Volume Counts at the Intersection of Ingalls and Huron St.

February 21, 2017



AM Peak Hour

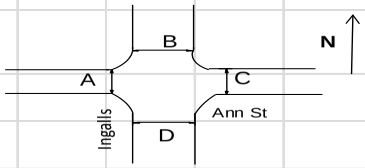
Time	Huron (PC = passenger car, T = truck								Total	Pedestrian Count
	Eastbound				Westbound					
	Left		Through		Through		Right			
	PC	T	PC	T	PC	T	PC	T		A
7:00AM - 7:15AM	39	0	149	4	67	3	9	0	271	0
7:15AM - 7:30AM	69	0	192	3	102	1	10	0	377	3
7:30AM - 7:45AM	54	0	186	4	153	3	14	1	415	3
7:45AM - 8:00AM	67	0	278	4	137	6	20	0	512	15
8:00AM - 8:15AM	27	1	255	5	147	5	10	0	450	6
8:15AM - 8:30AM	19	1	239	6	122	3	12	0	402	7
8:30AM - 8:45AM	16	0	197	6	129	2	11	0	361	10
8:45AM - 9:00AM	21	0	238	9	108	3	13	0	392	7

Time	Huron (PC = passenger car, T = truck)								Total	Total Pedestrian Count
	Eastbound				Westbound					
	Left		Through		Through		Right			
	PC	T	PC	T	PC	T	PC	T		A
7:00AM - 8:00AM	229	0	805	15	459	13	53	1	1575	21
7:15AM - 8:15AM	217	1	911	16	539	15	54	1	1754	27
7:30AM - 8:30AM	167	2	958	19	559	17	56	1	1779	31
7:45AM - 8:45AM	129	2	969	21	535	16	53	0	1725	38
8:00AM - 9:00AM	83	2	929	26	506	13	46	0	1605	30

TOTAL PEAK HOUR VOLUME	**1779**
Peak Hour Factor	**0.87**

Traffic Volume Counts at the Intersection of Ingalls and Ann St. (AM PEAK HOUR)

February 21, 2017



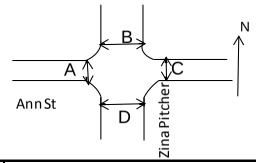
AM Peak Hour

Time	Ingalls St. (PC = passenger car, T = truck)				Ann St. (PC = passenger car, T = truck)				Total Vehicle Count	Pedestrian Count			
	Northbound				Eastbound								
	Through		Right		Left		Through						
	PC	T	PC	T	PC	T	PC	T		A	B	C	D
7:00AM-7:15 AM	37	0	8	0	15	0	28	0	88	0	1	0	5
7:15AM-7:30 AM	67	0	6	0	27	0	47	0	147	4	3	1	4
7:30AM-7:45 AM	74	0	3	0	41	0	47	0	165	8	6	3	0
7:45AM-8:00 AM	52	0	10	0	32	0	43	1	138	23	8	9	9
8:00AM-8:15 AM	20	0	5	0	11	0	32	2	70	18	7	12	3
8:15AM-8:30 AM	22	0	13	0	19	0	31	0	85	13	5	21	6
8:30AM-8:45 AM	20	0	7	0	15	0	43	0	85	7	2	20	2
8:45AM-9:00 AM	23	0	7	0	12	0	32	0	74	39	14	24	8

Time	Ingalls St. (PC = passenger car, T = truck)				Ann St. (PC = passenger car, T = truck)				Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Eastbound								
	Through		Right		Left		Through						
	PC	T	PC	T	PC	T	PC	T		A	B	C	D
7:00AM - 8:00AM	230	0	27	0	115	0	165	1	538	35	18	13	18
7:15AM - 8:15AM	213	0	24	0	111	0	169	3	520	53	24	25	16
7:30AM - 8:30AM	168	0	31	0	103	0	153	3	458	62	26	45	18
7:45AM - 8:45AM	114	0	35	0	77	0	149	3	378	61	22	62	20
8:00AM - 9:00AM	85	0	32	0	57	0	138	2	314	77	28	77	19
						Total Peak Hour Volume			**538**				
						Peak Hour Factor			**0.82**				

Traffic Volume Counts at the Intersection of Ann St and Zina Pitcher (AM Peak Hour)

April 21, 2016



Weekday AM Peak Hour

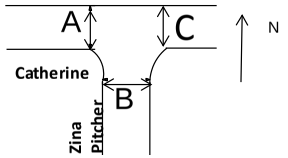
Time	Zina Pitcher (PC = passenger car, T = truck)						Pedestrian Count	Ann St (PC = passenger car, T = truck)												Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound						North-South	Eastbound						Westbound						East-West					
	Left		Through		Right			Left		Through		Right		Left		Through		Right				A	B	C	D
	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T	PC	T						
7:00AM - 7:15AM	38	0	36	0	36	3	17	7	0	22	0	38	0	10	5	20	0	11	2	65	228	4	62	13	3
7:15AM - 7:30AM	31	0	23	3	52	4	27	4	1	27	0	0	0	11	2	24	2	16	2	67	202	9	59	18	8
7:30AM - 7:45AM	22	0	45	0	35	6	29	2	1	20	1	3	0	21	4	49	0	25	2	33	236	7	30	22	3
7:45AM - 8:00AM	18	0	53	1	33	8	60	4	0	16	0	2	0	17	5	14	3	16	4	39	194	6	38	54	1
8:00AM - 8:15AM	10	1	52	2	41	6	59	4	0	37	1	2	0	7	3	9	0	10	3	25	188	12	15	47	10
8:15AM - 8:30AM	7	1	40	0	31	6	63	9	0	28	1	0	0	2	5	9	0	5	3	13	147	14	10	49	3
8:30AM - 8:45AM	6	0	27	1	32	3	69	4	0	18	0	1	0	25	3	4	1	12	3	13	140	8	8	61	5
8:45AM - 9:00AM	6	0	35	3	8	6	111	4	2	19	1	0	0	6	8	6	1	13	4	22	122	24	8	87	14

Time	Zina Pitcher (PC = passenger car, T = truck)						Pedestrian Count	Ann St (PC = passenger car, T = truck)												Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound						A	Eastbound						Westbound						B		A	B	C	D
	Left		Through		Right			Left		Through		Right		Left		Through		Right							
	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T	PC	T						
7:00AM - 8:00AM	109	0	157	4	156	21	133	17	2	85	1	43	0	59	16	107	5	68	10	204	860	26	189	107	15
7:15AM - 8:15AM	81	1	173	6	161	24	175	14	2	100	2	7	0	56	14	96	5	67	11	164	820	34	142	141	22
7:30AM - 8:30AM	57	2	190	3	140	26	211	19	1	101	3	7	0	47	17	81	3	56	12	110	765	39	93	172	17
7:45AM - 8:45AM	41	2	172	4	137	23	251	21	0	99	2	5	0	51	16	36	4	43	13	90	669	40	71	211	19
8:00AM - 9:00AM	29	2	154	6	112	21	302	21	2	102	3	3	0	40	19	28	2	40	13	73	597	58	41	244	32

Total Peak Hour Volume **860**

Peak Hour Factor **0.91**

Traffic Volume Counts at the Intersection of Catherine St and Zina Pitcher (AM Peak Hour)
April 21, 2016



Weekday AM Peak Hour

Time	Zina Pitcher (PC = passenger car, T = truck)				Pedestrian Count	Catherine St (PC = passenger car, T = truck)		Pedestrian Count	Total Vehicle Count	Pedestrian Count		
	Northbound					Westbound						
	Left-Through		Right		North-South	Through		East-West		A	B	C
	PC	T	PC	T		PC	T					
7:00AM - 7:15AM	48	2	4	0	22	4	0	2	58	10	2	12
7:15AM - 7:30AM	52	3	2	0	15	2	0	10	59	8	10	7
7:30AM - 7:45AM	70	2	3	0	20	3	0	4	78	8	4	12
7:45AM - 8:00AM	65	7	5	0	37	2	0	4	79	8	4	29
8:00AM - 8:15AM	64	4	4	0	36	6	0	5	78	13	5	23
8:15AM - 8:30AM	43	5	3	1	43	4	0	3	56	11	3	32
8:30AM - 8:45AM	40	1	3	0	41	2	1	1	47	8	1	33
8:45AM - 9:00AM	43	8	3	0	71	2	0	3	56	18	3	53

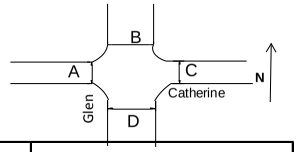
Time	Zina Pitcher (PC = passenger car, T = truck)				Pedestrian Count	Catherine St (PC = passenger car, T = truck)		Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume		
	Northbound					Westbound						
	Left-Through		Right		North-South	Through		East-West		A	B	C
	PC	T	PC	T		PC	T					
7:00AM - 8:00AM	235	14	14	0	94	11	0	20	274	34	20	60
7:15AM - 8:15AM	251	16	14	0	108	13	0	23	294	37	23	71
7:30AM - 8:30AM	242	18	15	1	136	15	0	16	291	40	16	96
7:45AM - 8:45AM	212	17	15	1	157	14	1	13	260	40	13	117
8:00AM - 9:00AM	190	18	13	1	191	14	1	12	237	50	12	141

Total Peak Hour Volume **294**

Peak Hour Factor **0.93**

Traffic Volume Counts at the Intersection of Glen and Catherine St (PM PEAK HOUR)

January 27, 2016



PM Peak Hour

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck										Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound				North-South	Eastbound				Westbound						East-West					
	Left		Through		Through		Right			Left		Right		Left		Through		Right							
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T			A	B	C	D
4:00PM-4:15 PM	7	0	122	3	126	3	19	0	18	19	1	21	2	18	1	43	1	43	2	46	431	7	37	11	9
4:15PM-4:30 PM	9	0	121	4	127	1	16	2	9	9	0	15	0	15	0	38	0	32	3	46	392	3	40	6	6
4:30PM-4:45 PM	13	0	130	2	131	0	22	0	22	29	0	17	0	21	2	42	1	20	2	57	432	13	53	9	4
4:45PM-5:00 PM	5	0	133	0	156	0	27	1	19	19	0	15	1	19	0	34	2	35	4	44	451	12	35	7	9
5:00PM-5:15 PM	6	0	141	5	152	4	15	0	24	18	2	16	1	14	2	34	0	32	4	80	446	4	70	20	10
5:15PM-5:30 PM	11	0	143	2	161	3	24	1	12	18	0	11	0	17	0	29	2	40	2	43	464	5	38	7	5
5:30PM-5:45 PM	7	0	130	2	155	5	23	0	17	7	2	11	0	21	0	26	1	28	0	33	418	5	27	12	6
5:45PM-6:00 PM	2	0	145	3	176	3	20	0	10	9	1	8	0	24	2	27	1	15	3	32	439	7	29	3	3

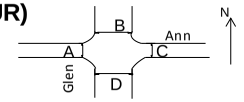
Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck)										Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound				North-South	Eastbound				Westbound						East-West					
	Left		Through		Through		Right			Left		Right		Left		Through		Right							
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T			A	B	C	D
4:00PM - 5:00PM	34	0	506	9	540	4	84	3	68	76	1	68	3	73	3	157	4	130	11	193	1706	35	165	33	28
4:15PM - 5:15PM	33	0	525	11	566	5	80	3	74	75	2	63	2	69	4	148	3	119	13	227	1721	32	198	42	29
4:30PM - 5:30PM	35	0	547	9	600	7	88	2	77	84	2	59	2	71	4	139	5	127	12	224	1793	34	196	43	28
4:45PM - 5:45PM	29	0	547	9	624	12	89	2	72	62	4	53	2	71	2	123	5	135	10	200	1779	26	170	46	30
5:00PM - 6:00PM	26	0	559	12	644	15	82	1	63	52	5	46	1	76	4	116	4	115	9	188	1767	21	164	42	24

TOTAL PEAK HOUR VOLUME **1793**

Peak Hour Factor **0.97**

Traffic Volume Counts at the Intersection of Glen and Ann St (PM PEAK HOUR)

January 27, 2016



PM Peak Hour

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Ann (PC = passenger car, T = truck										Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound					Eastbound						Westbound							A	B	C	D
	Through		Right		Left		Through			Left		Through		Right		Left		Through		Right						
	PC	T	PC	T	PC	T	PC	T	North-South	PC	T	PC	T	PC	T	PC	T	PC	T	East-West						
4:00PM-4:15 PM	98	4	6	2	17	2	143	2	15	6	1	6	0	8	0	37	0	31	0	25	363	10	11	5	14
4:15PM-4:30 PM	80	0	13	1	18	2	133	5	16	4	0	16	2	8	0	31	1	43	0	15	357	7	9	9	6
4:30PM-4:45 PM	100	0	4	0	25	1	140	3	16	3	0	10	1	5	0	24	0	49	0	21	365	8	11	8	10
4:45PM-5:00 PM	88	1	2	2	17	2	171	6	16	8	0	15	1	2	0	45	0	30	0	22	390	8	16	8	6
5:00PM-5:15 PM	118	0	4	1	11	1	162	4	30	7	0	10	2	4	0	61	0	35	0	29	420	5	19	25	10
5:15PM-5:30 PM	106	0	3	2	18	1	164	7	18	8	0	7	1	11	0	54	0	38	0	14	420	3	6	15	8
5:30PM-5:45 PM	96	0	3	1	13	0	159	6	15	3	0	5	1	3	0	44	0	38	0	21	372	7	8	8	13
5:45PM-6:00 PM	124	0	3	2	23	1	172	4	12	4	0	11	1	7	0	42	0	26	0	19	420	4	9	8	10

144

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Ann (PC = passenger car, T = truck)										Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound					Eastbound						Westbound							A	B	C	D
	Through		Right		Left		Through			Left		Through		Right		Left		Through		Right						
	PC	T	PC	T	PC	T	PC	T	North-South	PC	T	PC	T	PC	T	PC	T	PC	T	East-West						
4:00PM - 5:00PM	366	5	25	5	77	7	587	16	63	21	1	47	4	23	0	137	1	153	0	83	1475	33	47	30	36
4:15PM - 5:15PM	386	1	23	4	71	6	606	18	78	22	0	51	6	19	0	161	1	157	0	87	1532	28	55	50	32
4:30PM - 5:30PM	412	1	13	5	71	5	637	20	80	26	0	42	5	22	0	184	0	152	0	86	1595	24	52	56	34
4:45PM - 5:45PM	408	1	12	6	59	4	656	23	79	26	0	37	5	20	0	204	0	141	0	86	1602	23	49	56	37
5:00PM - 6:00PM	444	0	13	6	65	3	657	21	75	22	0	33	5	25	0	201	0	137	0	83	1632	19	42	56	41

TOTAL PEAK HOUR VOLUME **1632**
Peak Hour Factor **0.97**

Traffic Volume Counts at the Intersection of Glen and Huron St
January 27, 2016

PM Peak Hour

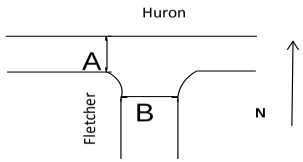
Time	Glen (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck								Total
	Southbound				Eastbound				Westbound				
	Left		Right		Left		Through		Through		Right		
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	
4:00PM - 4:15PM	97	2	99	3	48	2	127	5	140	3	48	0	574
4:15PM - 4:30PM	81	0	92	5	40	3	124	4	121	4	43	1	478
4:30PM - 4:45PM	109	1	82	4	44	0	125	3	112	7	51	1	539
4:45PM - 5:00PM	99	1	119	5	42	1	108	5	144	3	45	1	573
5:00PM - 5:15PM	113	0	104	5	54	0	174	6	184	3	76	1	720
5:15PM - 5:30PM	102	0	132	5	34	0	131	5	153	7	47	2	584
5:30PM - 5:45PM	95	0	115	5	29	1	128	2	129	4	66	1	575
5:45PM - 6:00PM	113	0	112	3	43	0	129	3	124	2	67	0	596

Time	Glen (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck)								Total
	Southbound				Eastbound				Westbound				
	Left		Right		Left		Through		Through		Right		
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	
7:00AM - 8:00AM	386	4	392	17	174	6	484	17	517	17	187	3	2204
7:15AM - 8:15AM	402	2	397	19	180	4	531	18	561	17	215	4	2350
7:30AM - 8:30AM	423	2	437	19	174	1	538	19	593	20	219	5	2450
7:45AM - 8:45AM	409	1	470	20	159	2	541	18	610	17	234	5	2486
8:00AM - 9:00AM	423	0	463	18	160	1	562	16	590	16	256	4	2509

TOTAL PEAK HOUR VOLUME **2509**
Peak Hour Factor **0.87**

Traffic Volume Counts at the Intersection of Huron and Fletcher St. (PM PEAK HOUR)

February 21, 2017



PM Peak Hour

Time	Fletcher (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck								Total Vehicle Count	Pedestrian Count	
	Northbound				Eastbound				Westbound						
	Left		Right		Through		Right		Left		Through				
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T		A	B
4:00PM - 4:15PM	24	1	19	2	168	0	4	1	32	5	195	3	454	31	1
4:15PM - 4:30PM	19	1	18	3	142	1	5	3	31	5	192	3	423	16	0
4:30PM - 4:45PM	25	0	19	2	129	3	6	0	29	7	170	2	392	11	0
4:45PM - 5:00PM	20	1	27	3	152	0	12	2	31	8	167	2	425	31	2
5:00PM - 5:15PM	38	0	27	2	159	1	7	0	34	5	212	1	486	45	3
5:15PM - 5:30PM	32	2	28	5	161	1	10	2	29	7	208	2	487	42	1
5:30PM - 5:45PM	24	0	28	3	141	0	15	1	32	4	188	2	438	44	4
5:45PM - 6:00PM	15	1	14	3	139	4	10	1	37	7	153	1	385	23	4

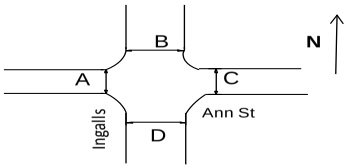
Time	Fletcher (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck)								Total Vehicle Count	Total Pedestrian Volume	
	Northbound				Eastbound				Westbound						
	Left		Right		Through		Right		Left		Through			A	B
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T			
4:00PM - 5:00PM	88	3	83	10	591	4	27	6	123	25	724	10	1694	89	3
4:15PM - 5:15PM	102	2	91	10	582	5	30	5	125	25	741	8	1726	103	5
4:30PM - 5:30PM	115	3	101	12	601	5	35	4	123	27	757	7	1790	129	6
4:45PM - 5:45PM	114	3	110	13	613	2	44	5	126	24	775	7	1836	162	10
5:00PM - 6:00PM	109	3	97	13	600	6	42	4	132	23	761	6	1796	154	12

TOTAL PEAK HOUR VOLUME **1836**

Peak Hour Factor **0.94**

Traffic Volume Counts at the Intersection of Ingalls and Ann St. (PM PEAK HOUR)

February 21, 2017



PM Peak Hour

Time	Ingalls St. (PC = passenger car, T = truck)				Ann St. (PC = passenger car, T = truck)				Total Vehicle Count	Pedestrian Count			
	Northbound				Eastbound								
	Through		Right		Left		Through						
	PC	T	PC	T	PC	T	PC	T		A	B	C	D
4:00PM-4:15 PM	17	1	6	0	2	0	14	1	41	12	8	19	3
4:15PM-4:30 PM	18	0	4	0	4	1	21	2	50	7	5	17	8
4:30PM-4:45 PM	14	0	2	1	13	0	22	3	55	14	11	10	5
4:45PM-5:00 PM	10	0	5	0	4	1	17	1	38	18	11	12	3
5:00PM-5:15 PM	19	0	4	0	8	0	22	2	55	23	14	24	5
5:15PM-5:30 PM	17	0	6	0	3	1	17	1	45	42	8	7	6
5:30PM-5:45 PM	14	1	8	0	2	0	21	2	48	48	11	9	2
5:45PM-6:00 PM	17	0	5	0	11	1	25	1	60	23	10	12	4

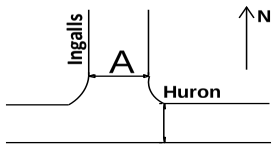
Time	Ingalls St. (PC = passenger car, T = truck)				Ann St. (PC = passenger car, T = truck)				Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Eastbound								
	Through		Right		Left		Through						
	PC	T	PC	T	PC	T	PC	T		A	B	C	D
4:00PM - 5:00PM	59	1	17	1	23	2	74	7	184	51	35	58	19
4:15PM - 5:15PM	61	0	15	1	29	2	82	8	198	62	41	63	21
4:30PM - 5:30PM	60	0	17	1	28	2	78	7	193	97	44	53	19
4:45PM - 5:45PM	60	1	23	0	17	2	77	6	186	131	44	52	16
5:00PM - 6:00PM	67	1	23	0	24	2	85	6	208	136	43	52	17

Total Peak Hour Volume **208**

Peak Hour Factor **0.87**

Traffic Volume Counts at the Intersection of Ingalls and Huron St.

February 21, 2017



PM Peak Hour

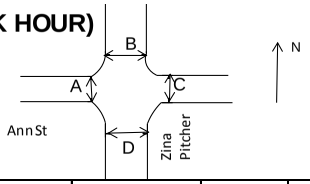
Time	Huron (PC = passenger car, T = truck								Total	Pedestrian Count
	Eastbound				Westbound					
	Left		Through		Through		Right			
	PC	T	PC	T	PC	T	PC	T		A
4:00PM - 4:15PM	13	0	153	1	221	2	27	0	417	15
4:15PM - 4:30PM	10	0	160	5	243	2	15	0	435	8
4:30PM - 4:45PM	8	0	139	2	207	3	10	0	369	17
4:45PM - 5:00PM	9	0	166	5	240	2	9	0	431	20
5:00PM - 5:15PM	13	0	169	1	292	2	24	0	501	26
5:15PM - 5:30PM	7	0	173	7	270	3	17	0	477	43
5:30PM - 5:45PM	11	1	154	2	226	2	13	0	409	29
5:45PM - 6:00PM	13	0	172	4	196	3	13	0	401	27

Time	Huron (PC = passenger car, T = truck)								Total	Total Pedestrian Count
	Eastbound				Westbound					
	Left		Through		Through		Right			
	PC	T	PC	T	PC	T	PC	T		A
4:00PM - 5:00PM	40	0	618	13	911	9	61	0	1652	60
4:15PM - 5:15PM	40	0	634	13	982	9	58	0	1736	71
4:30PM - 5:30PM	37	0	647	15	1009	10	60	0	1778	106
4:45PM - 5:45PM	40	1	662	15	1028	9	63	0	1818	118
6:00PM - 7:00PM	44	1	668	14	984	10	67	0	1788	125

TOTAL PEAK HOUR VOLUME **1818**

Peak Hour Factor **0.91**

Traffic Volume Counts at the Intersection of Ann St and Zina Pitcher (PM PEAK HOUR)



PM Peak Hour

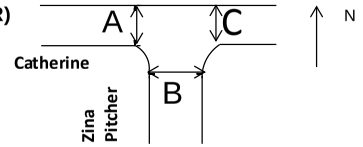
Time	Zina Pitcher (PC = passenger car, T = truck)						Pedestrian Count	Ann St (PC = passenger car, T = truck)												Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound						North-South	Eastbound						Westbound						East-West					
	Left		Through		Right			Left		Through		Right		Left		Through		Right				A	B	C	D
	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T	PC	T						
4:00PM - 4:15PM	1	0	14	3	10	2	41	5	0	28	4	0	0	12	3	67	0	27	5	63	181	24	34	17	29
4:15PM - 4:30PM	1	0	18	7	14	3	55	10	0	20	4	0	0	12	4	61	0	28	3	33	185	23	28	32	5
4:30PM - 4:45PM	4	0	20	2	27	3	75	9	0	30	3	4	0	28	4	53	0	24	2	40	213	14	33	61	7
4:45PM - 5:00PM	7	0	32	4	14	2	61	5	0	24	5	0	0	13	2	38	0	27	1	29	174	14	21	47	8
5:00PM - 5:15PM	5	1	24	1	18	1	76	13	0	28	4	0	0	21	4	64	0	29	5	34	218	13	27	63	7
5:15PM - 5:30PM	7	0	36	4	26	4	85	6	0	14	5	0	0	10	2	49	0	23	3	36	189	14	31	71	5
5:30PM - 5:45PM	8	0	31	1	20	2	62	17	0	42	4	0	0	11	2	30	0	19	2	37	189	17	33	45	4
5:45PM - 6:00PM	4	0	9	4	27	2	46	9	0	30	5	0	0	9	6	37	0	12	1	20	155	7	12	39	8

Time	Zina Pitcher (PC = passenger car, T = truck)						Pedestrian Count	Ann St (PC = passenger car, T = truck)												Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound						North-South	Eastbound						Westbound						B		A	B	C	D
	Left		Through		Right			Left		Through		Right		Left		Through		Right							
	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T	PC	T						
4:00PM - 5:00PM	13	0	84	16	65	10	232	29	0	102	16	4	0	65	13	219	0	106	11	165	753	75	116	157	49
4:15PM - 5:15PM	17	1	94	14	73	9	267	37	0	102	16	4	0	74	14	216	0	108	11	136	790	64	109	203	27
4:30PM - 5:30PM	23	1	112	11	85	10	297	33	0	96	17	4	0	72	12	204	0	103	11	139	794	55	112	242	27
4:45PM - 5:45PM	27	1	123	10	78	9	284	41	0	108	18	0	0	55	10	181	0	98	11	136	770	58	112	226	24
5:00PM - 6:00PM	24	1	100	10	91	9	269	45	0	114	18	0	0	51	14	180	0	83	11	127	751	51	103	218	24

Total Peak Hour Volume **794**

Peak Hour Factor **0.91**

Traffic Volume Counts at the Intersection of Catherine St and Zina Pitcher (PM PEAK HOUR)
April 26, 2016



PM Peak Hour

Time	Zina Pitcher (PC = passenger car, T = truck)				Pedestrian Count	Catherine St (PC = passenger car, T = truck)		Pedestrian Count	Total Vehicle Count	Pedestrian Count		
	Northbound					Westbound						
	Left-Through		Right		North-South	Through		East-West		A	B	C
	PC	T	PC	T		PC	T					
4:00PM - 4:15PM	43	5	3	0	41	3	0	31	54	25	31	16
4:15PM - 4:30PM	40	7	4	0	42	2	0	8	53	22	8	20
4:30PM - 4:45PM	46	6	5	0	44	2	0	9	59	24	9	20
4:45PM - 5:00PM	52	5	8	0	52	5	0	4	70	21	4	31
5:00PM - 5:15PM	57	6	3	0	65	10	0	10	76	35	10	30
5:15PM - 5:30PM	65	6	3	0	46	2	0	5	76	16	5	30
5:30PM - 5:45PM	54	6	3	0	49	2	0	3	65	26	3	23
5:45PM - 6:00PM	30	6	2	0	46	5	0	7	43	22	7	24

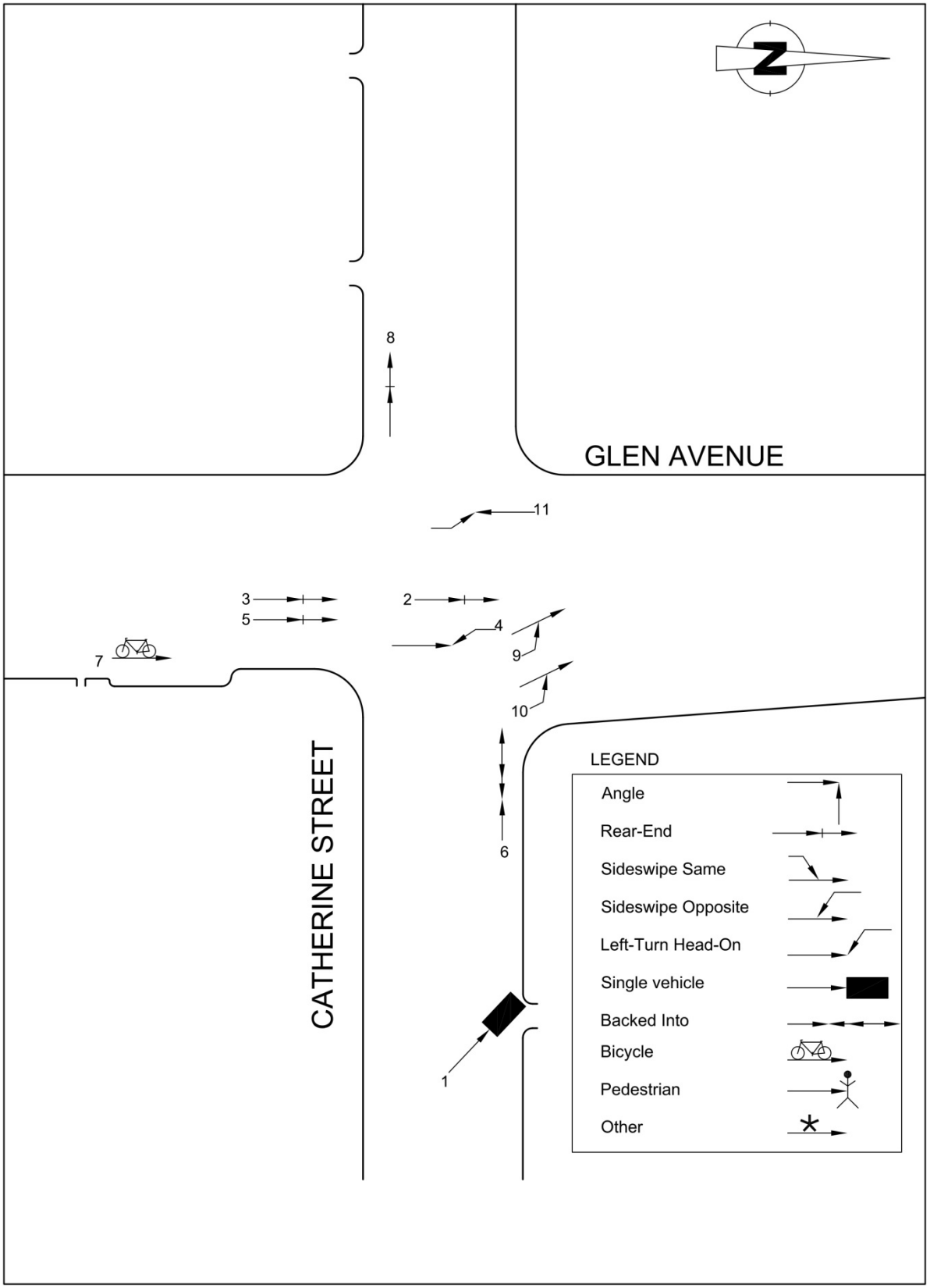
Time	Zina Pitcher (PC = passenger car, T = truck)				Pedestrian Count	Catherine St (PC = passenger car, T = truck)		Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume		
	Northbound					Westbound						
	Left-Through		Right		North-South	Through		B		A	B	C
	PC	T	PC	T		PC	T					
4:00PM - 5:00PM	181	23	20	0	179	12	0	52	236	92	52	87
4:15PM - 5:15PM	195	24	20	0	203	19	0	31	258	102	31	101
4:30PM - 5:30PM	220	23	19	0	207	19	0	28	281	96	28	111
4:45PM - 5:45PM	228	23	17	0	212	19	0	22	287	98	22	114
5:00PM - 6:00PM	206	24	11	0	206	19	0	25	260	99	25	107

Total Peak Hour Volume **287**

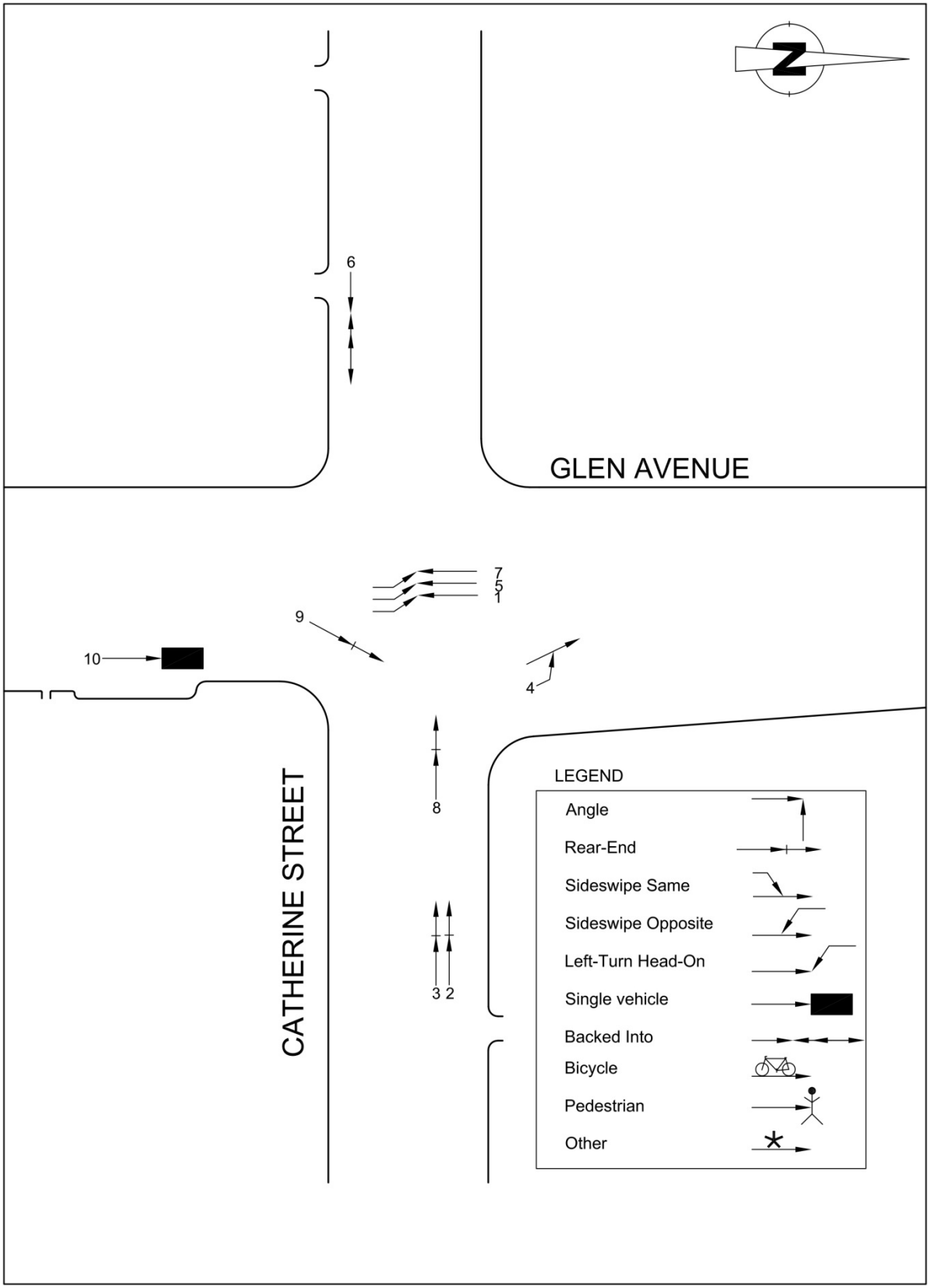
Peak Hour Factor **0.94**

APPENDIX III – COLLISION DIAGRAMS FOR 2012, 2013 AND 2014 FOR THE STUDY INTERSECTIONS

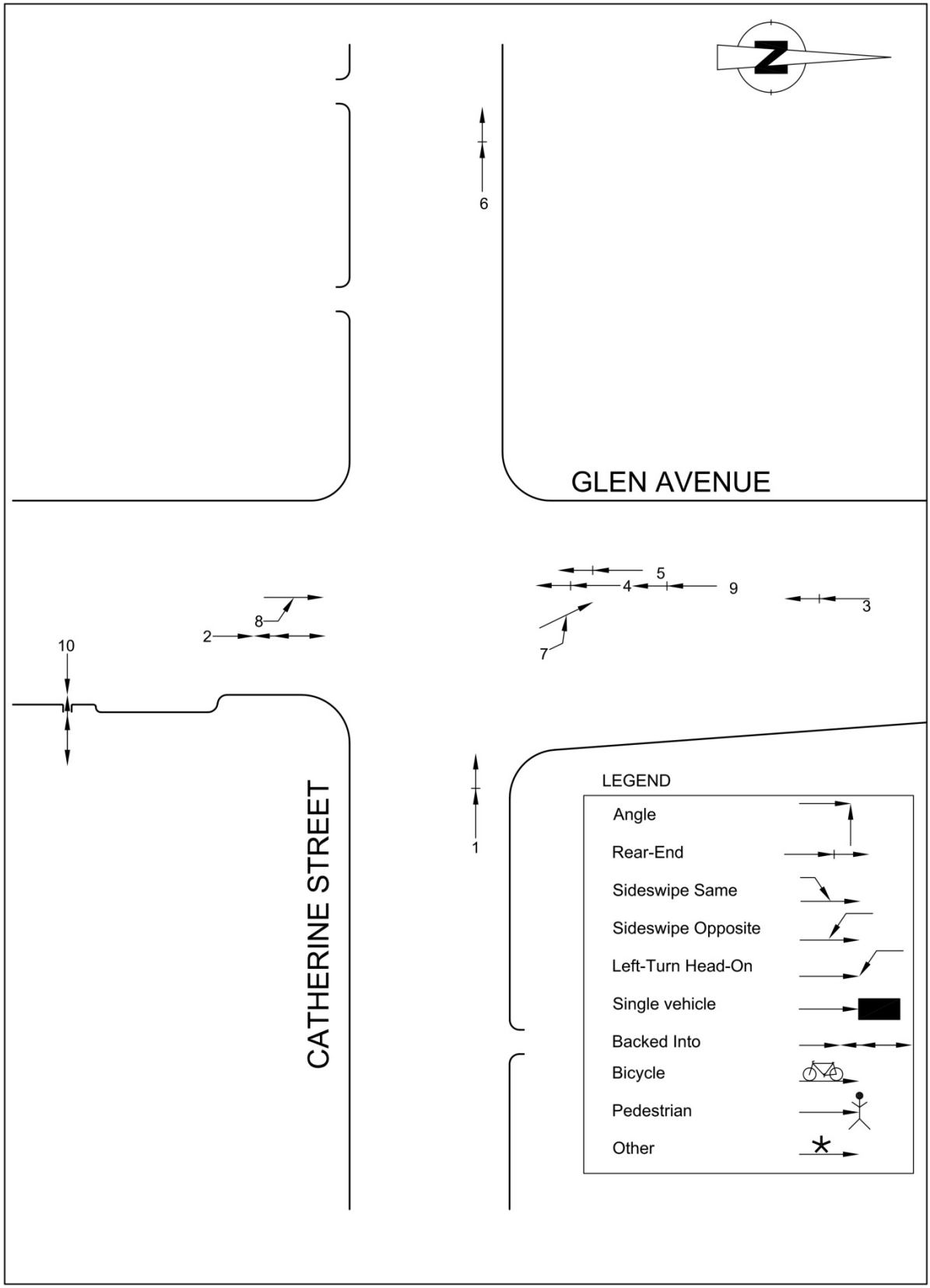
Source: Michigan Traffic Crash Facts



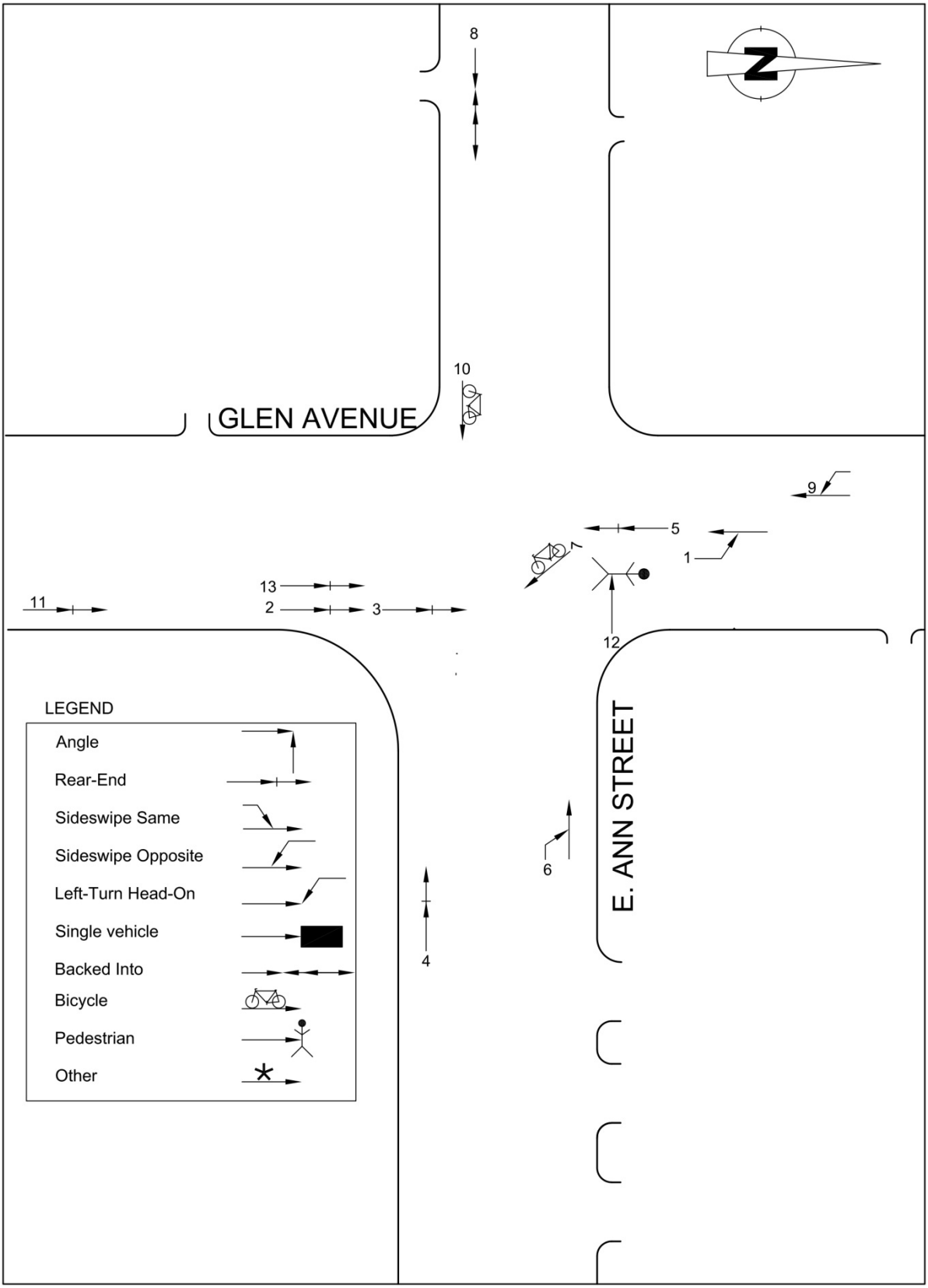
Collision Diagram of Glen Avenue and Catherine for 2014



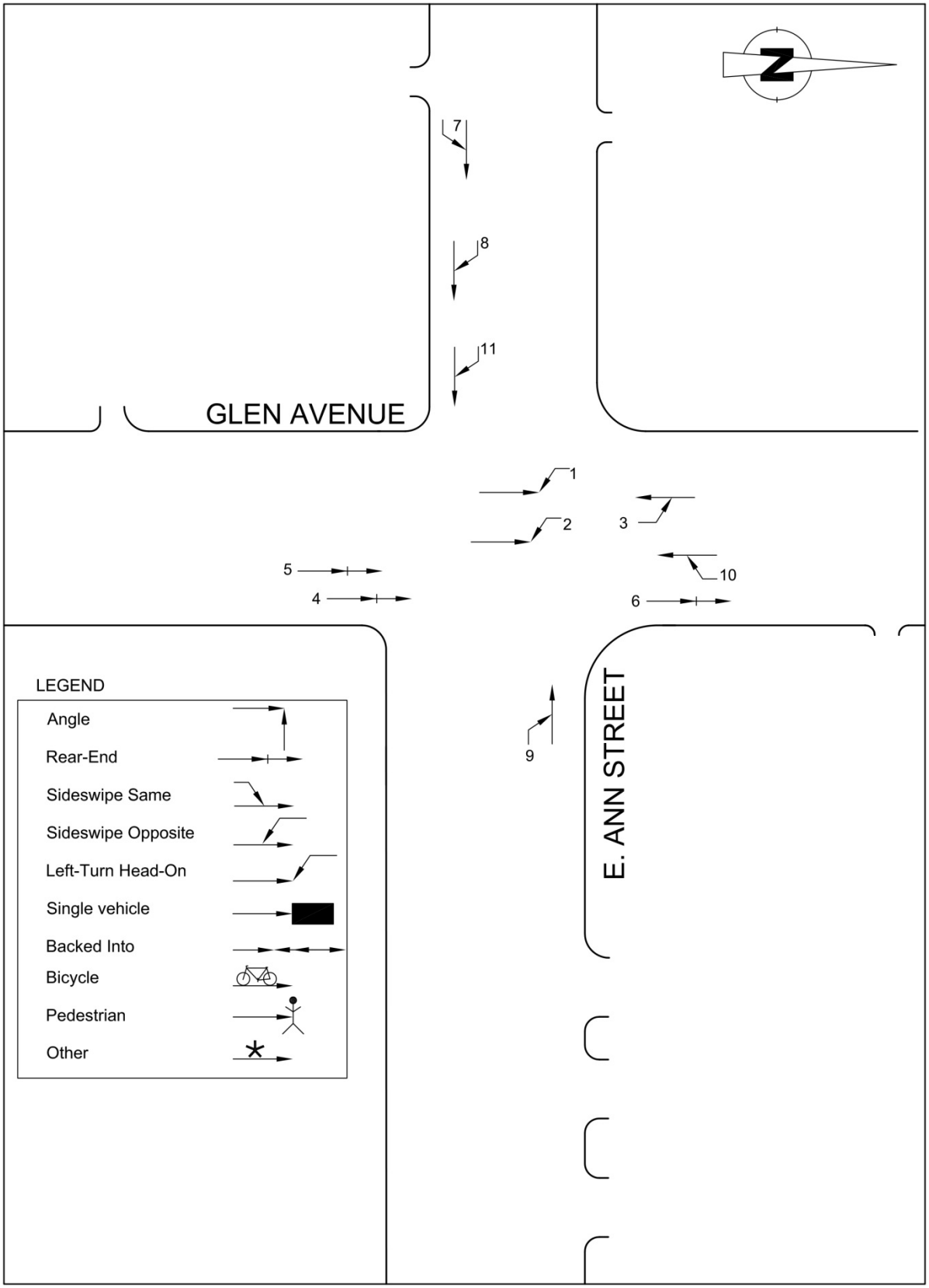
Collision Diagram of Glen Avenue and Catherine Street for 2013



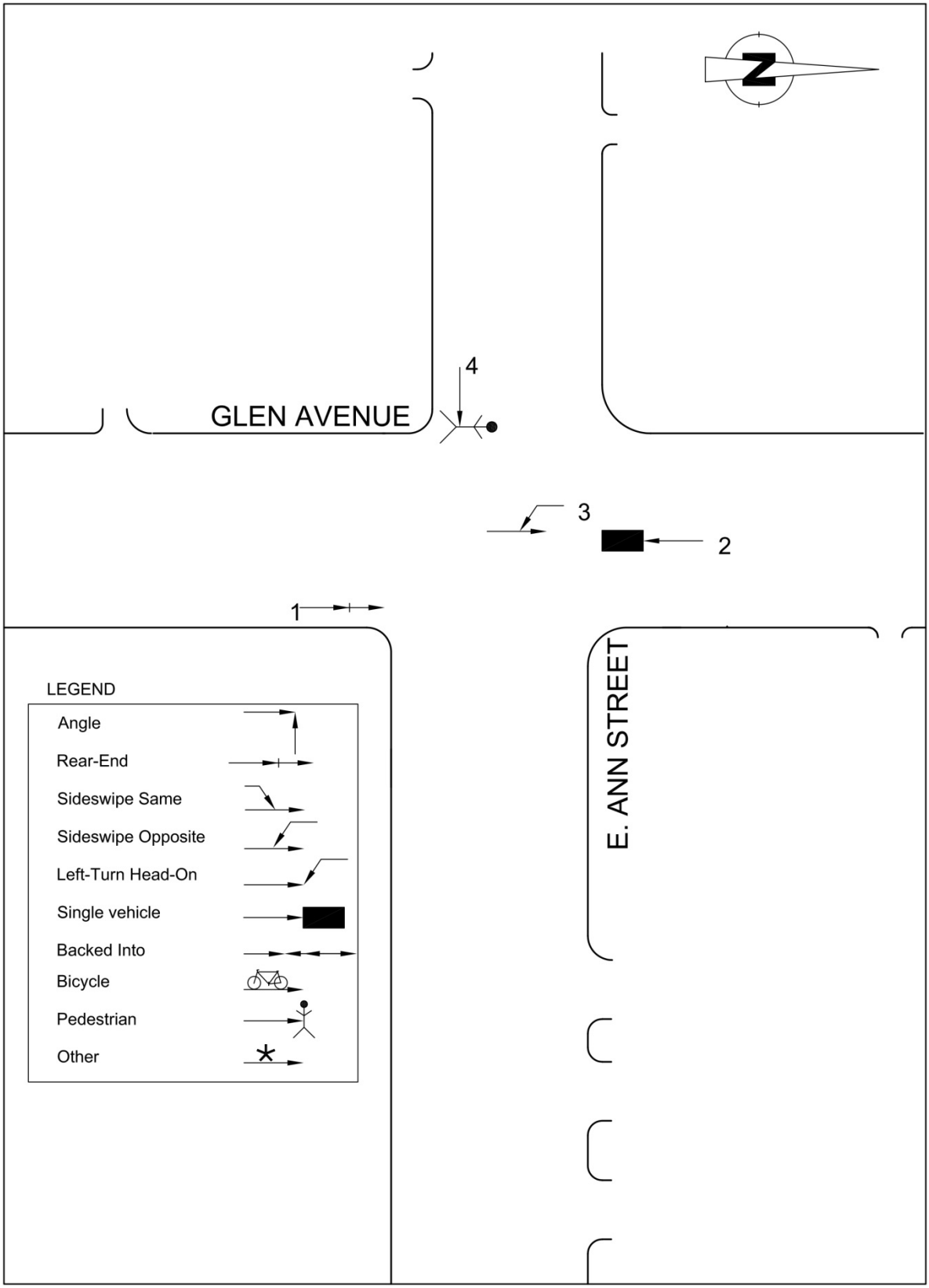
Collision Diagram of Glen Avenue and Catherine Street for 2012



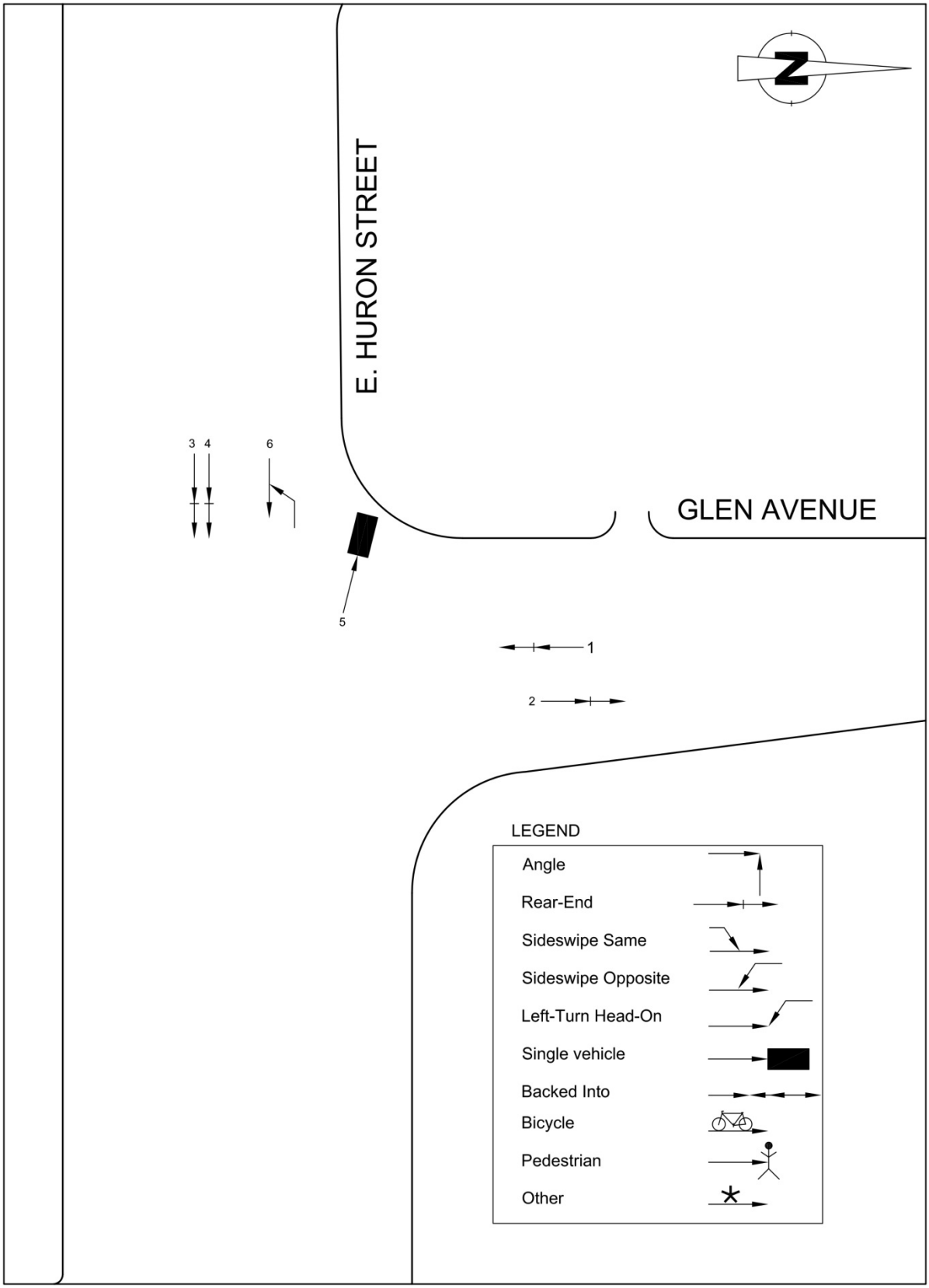
Collision Diagram of Glen Avenue and Ann Street for 2014



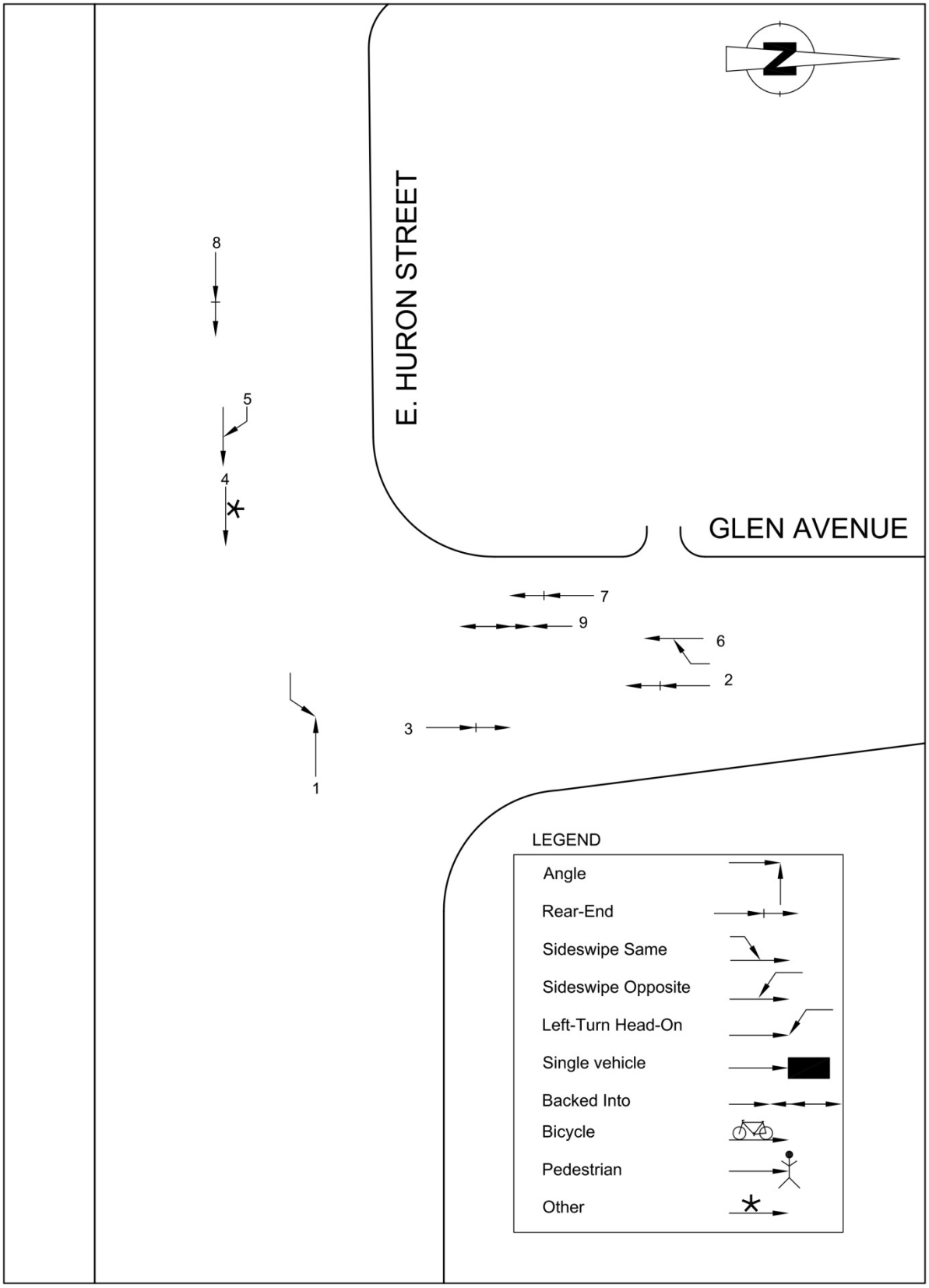
Collision Diagram of Glen Avenue and Ann Street for 2013



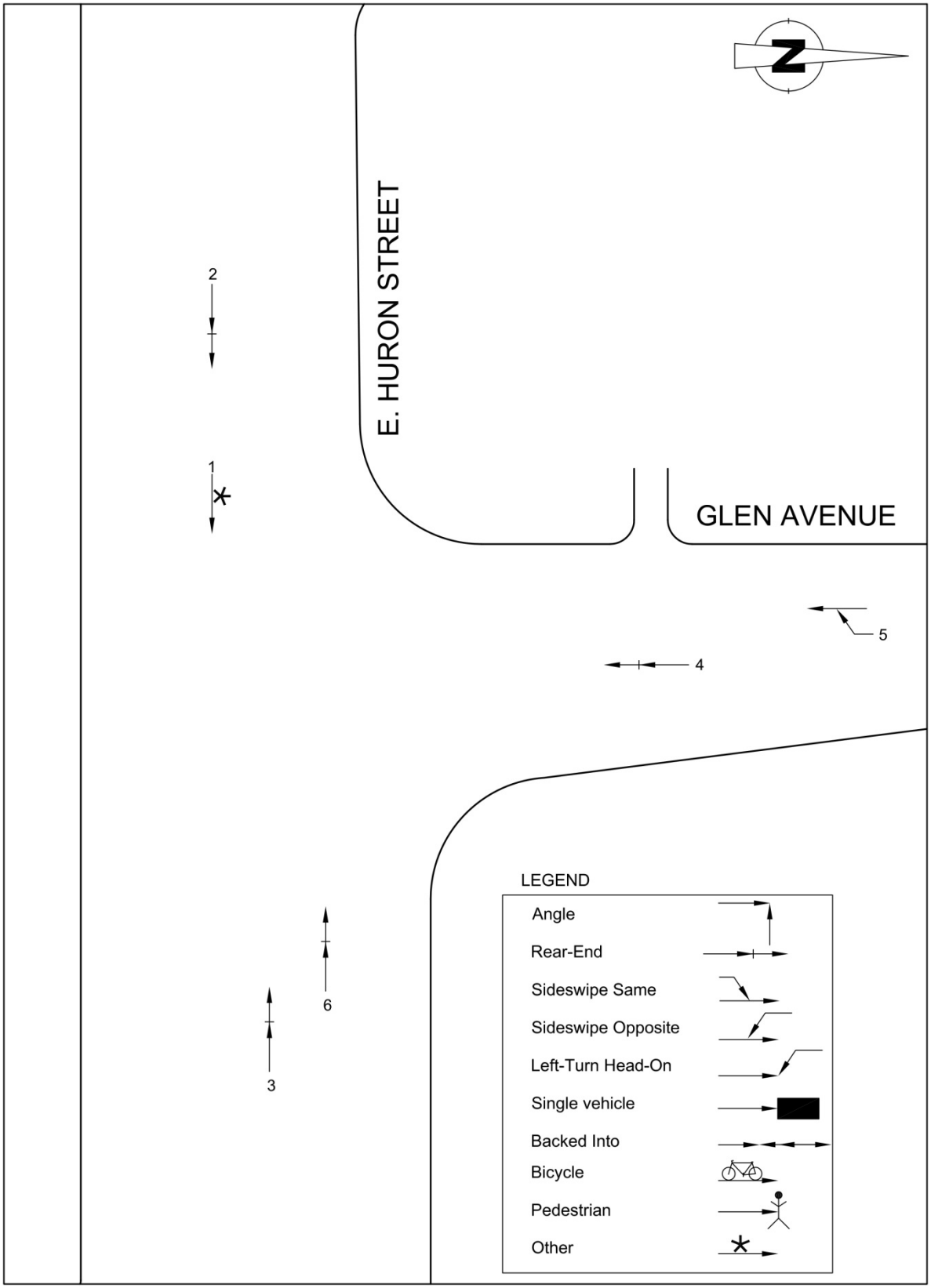
Collision Diagram of Glen Avenue and Ann Street for 2012



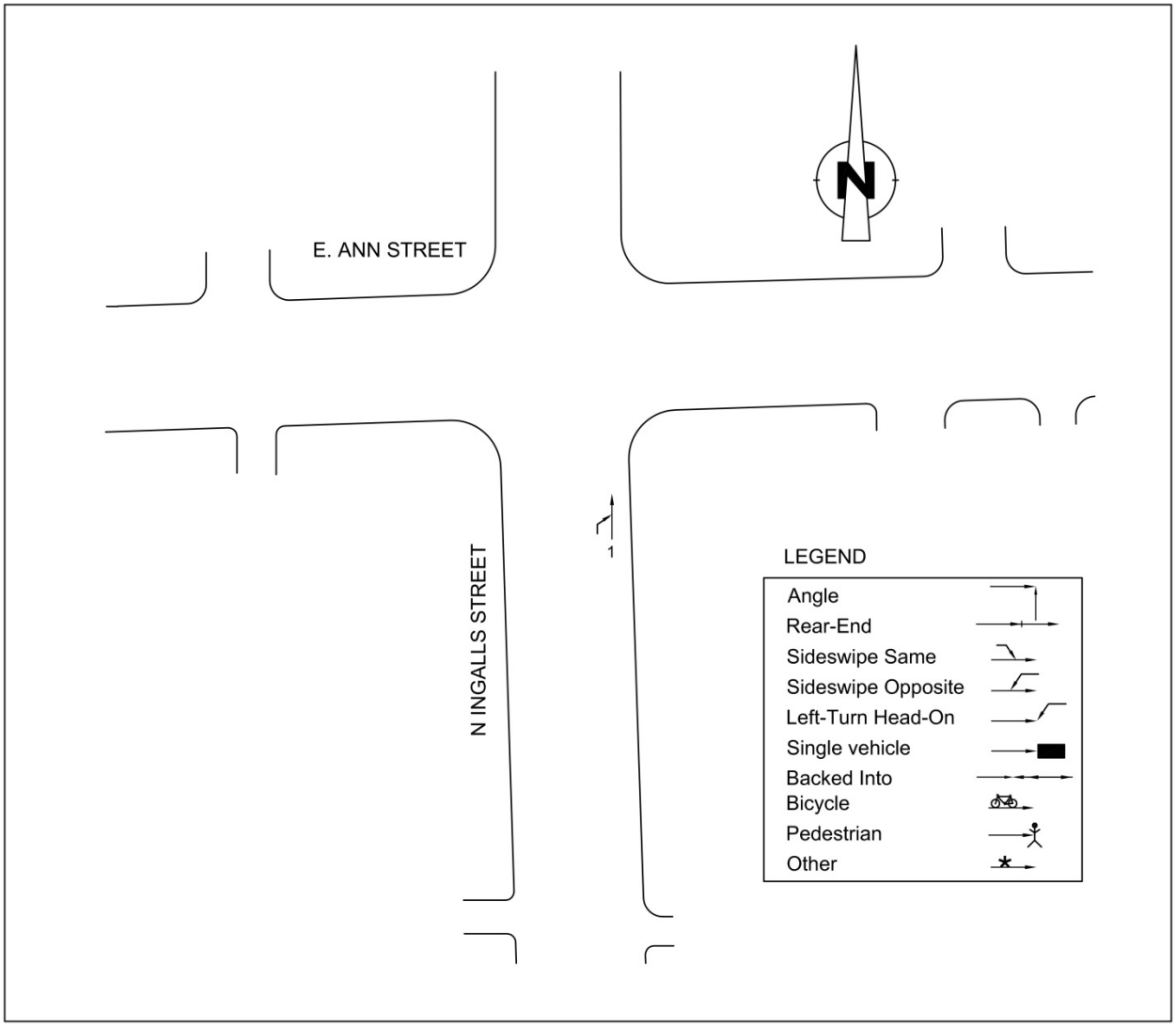
Collision Diagram of Glen Avenue and Huron Street for 2014



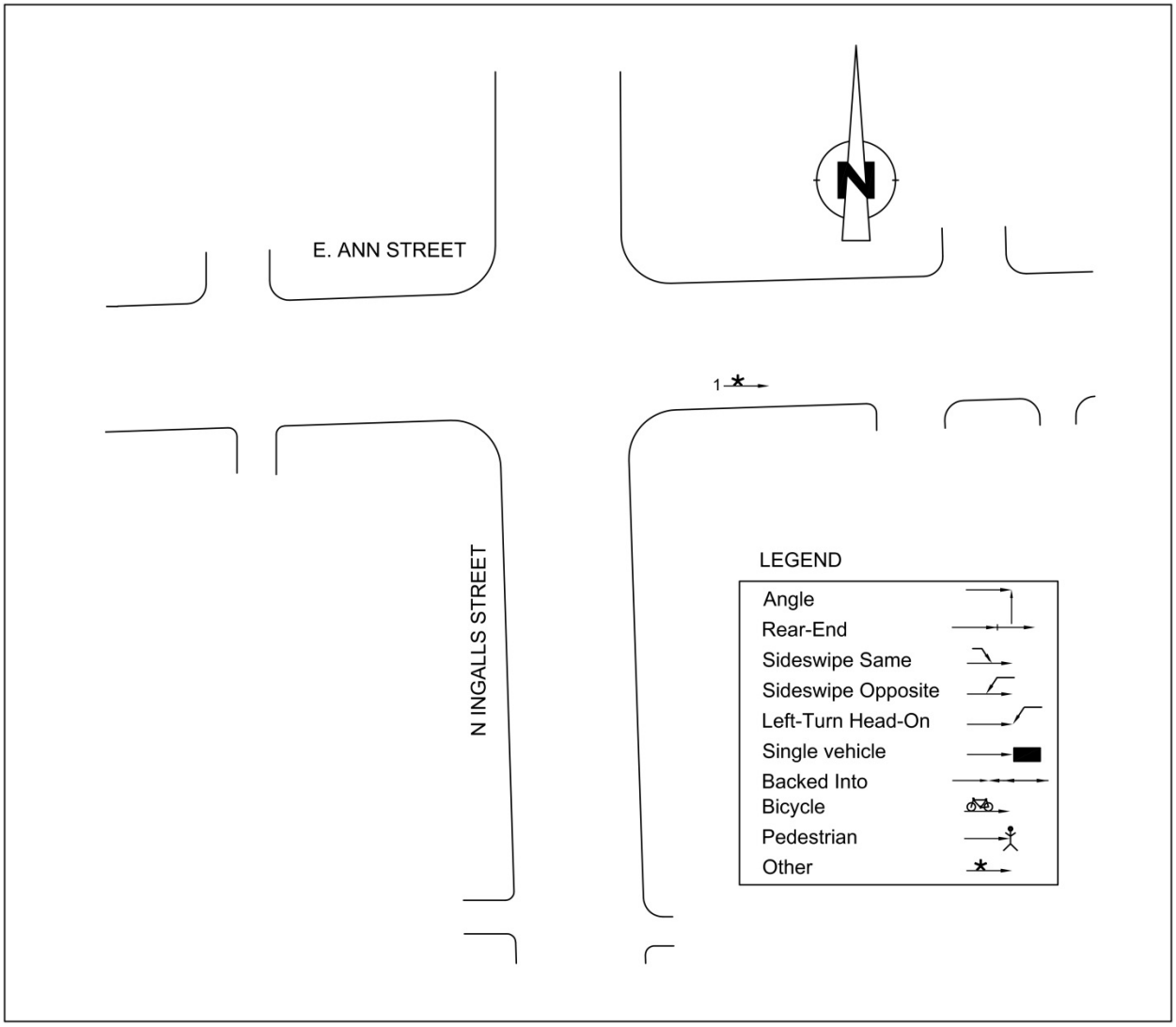
Collision Diagram of Glen Avenue and Huron Street for 2013



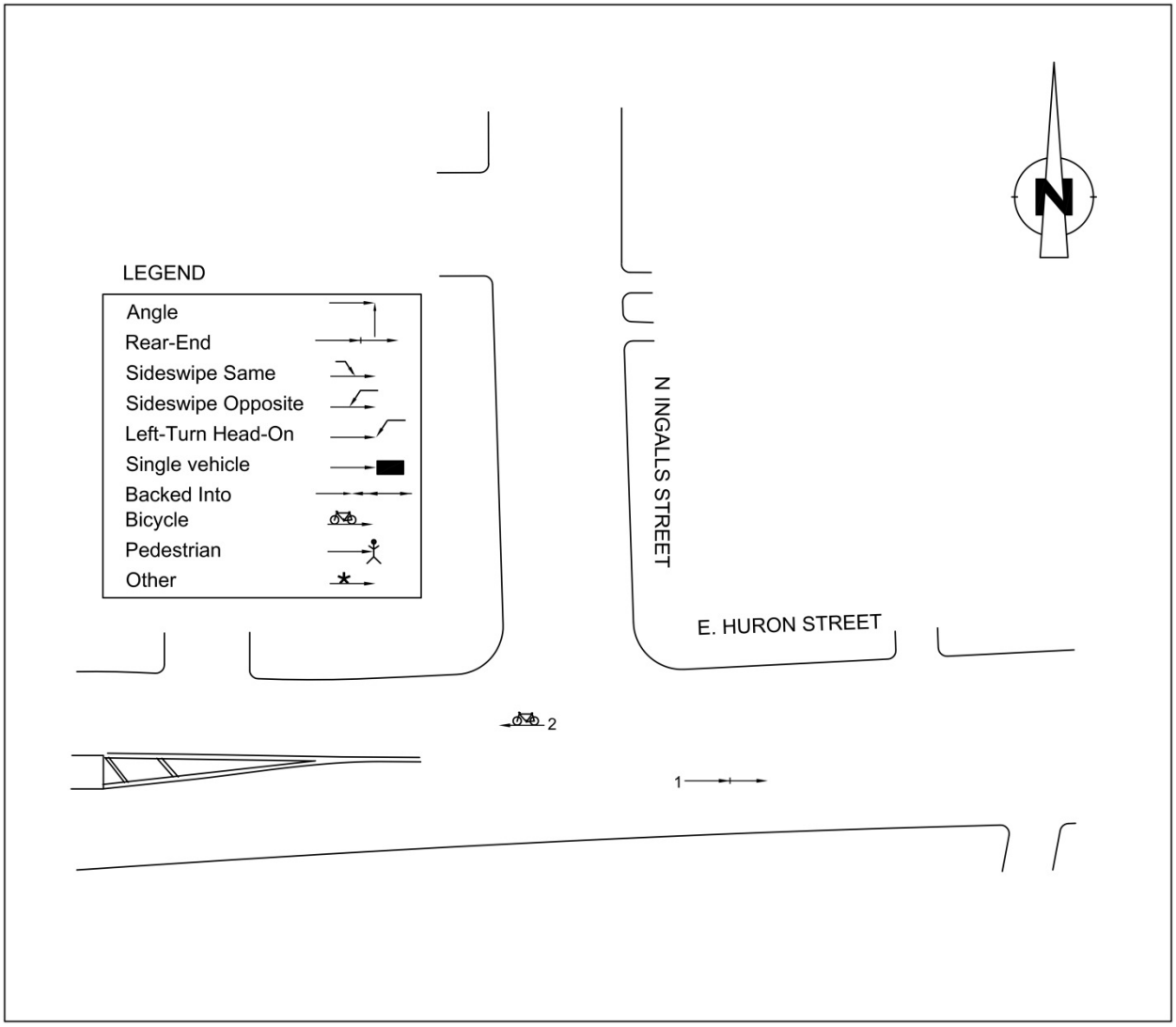
Collision Diagram of Glen Avenue and Huron Street for 2012



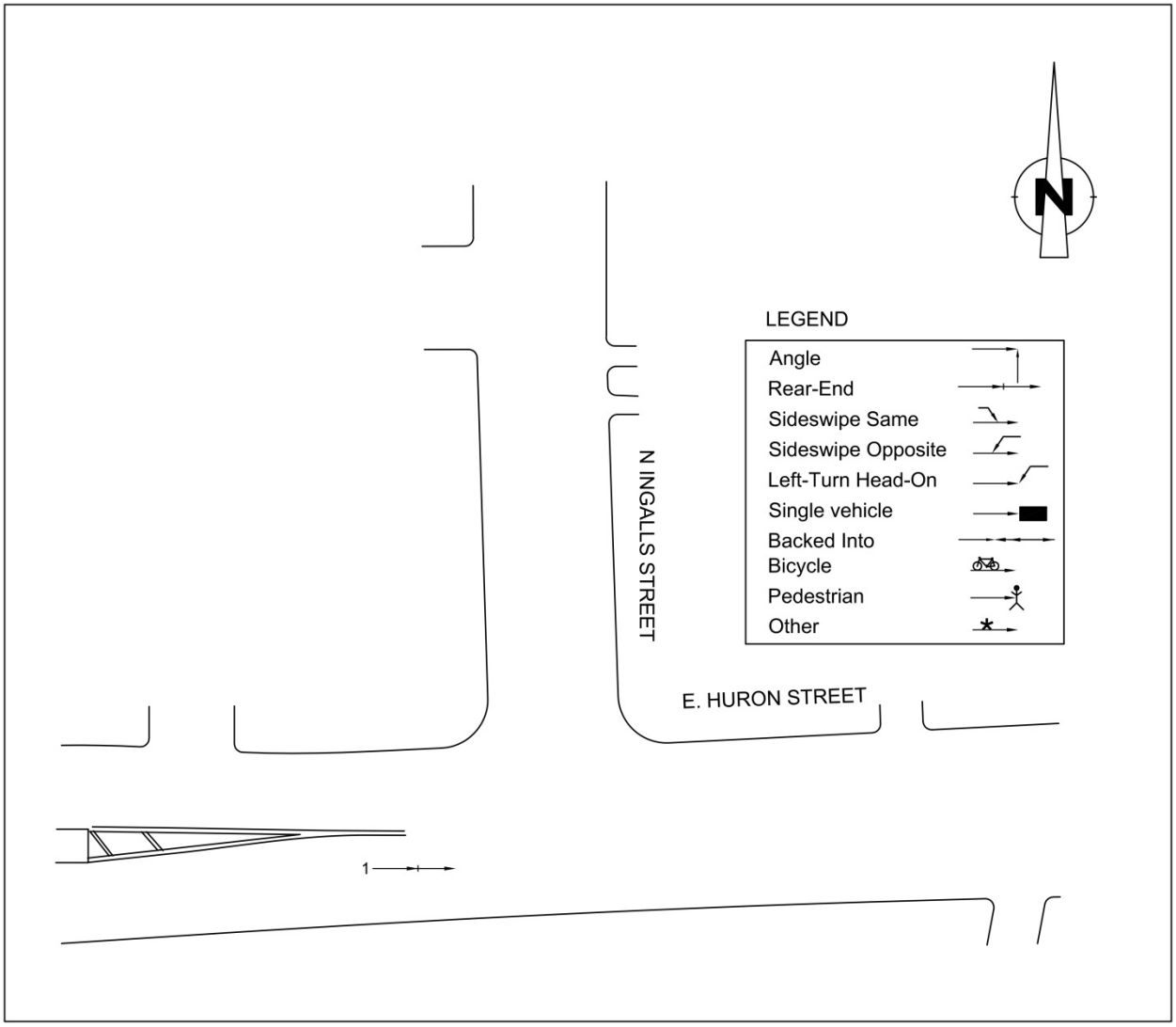
Collision Diagram of Ann Street and Ingalls Street for 2014



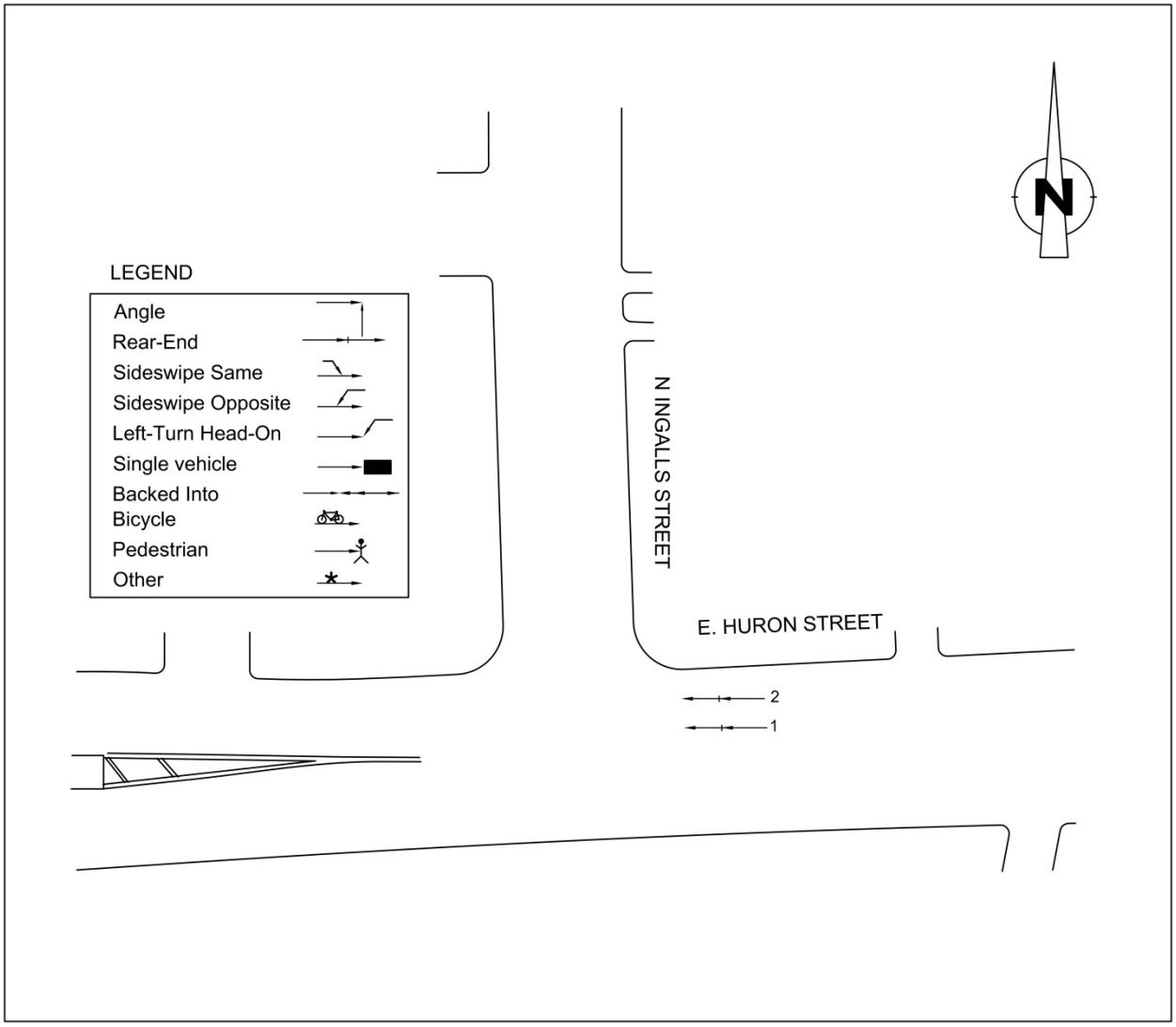
Collision Diagram of Ann Street and Ingalls Street for 2013



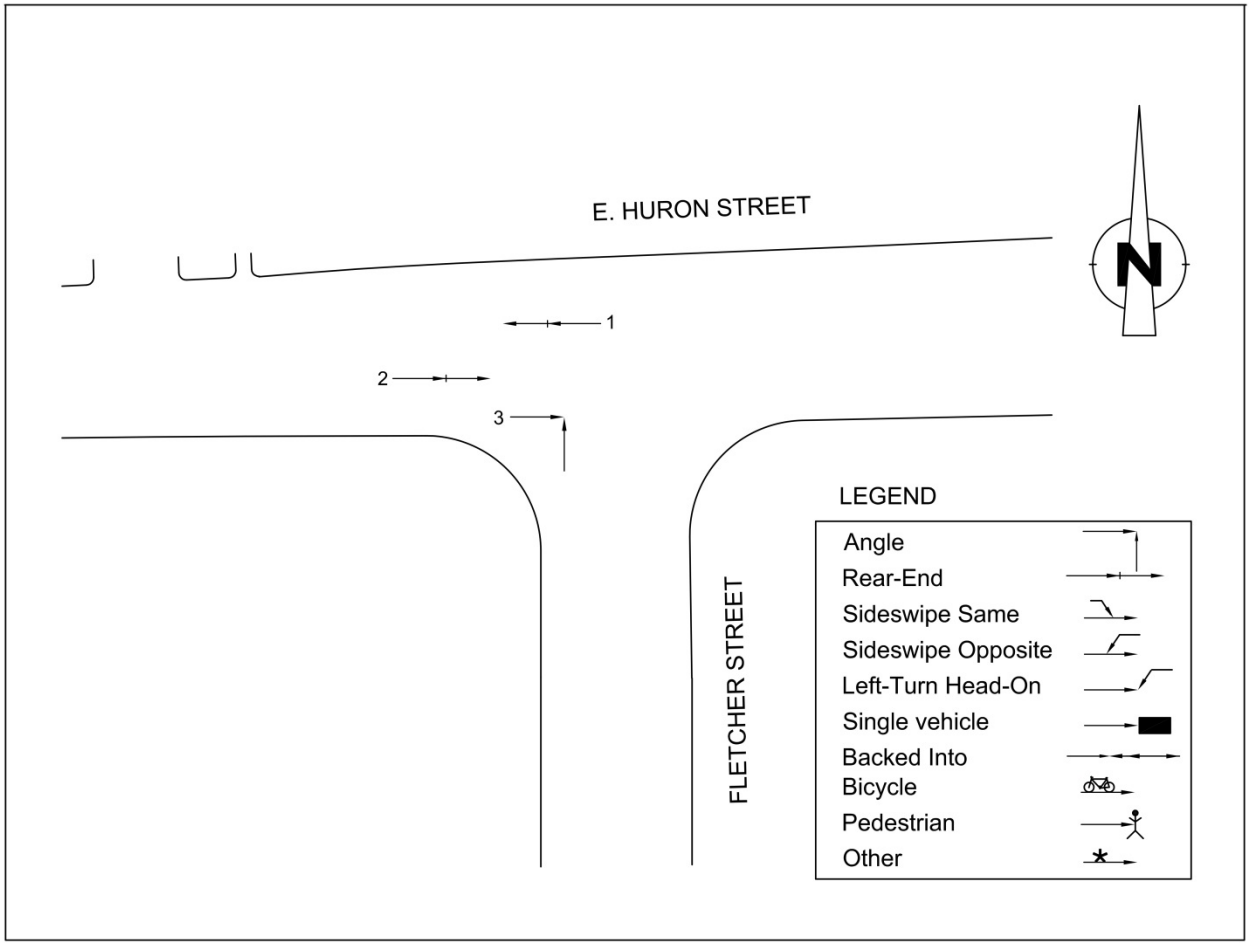
Collision Diagram of Huron Street and Ingalls Street for 2014



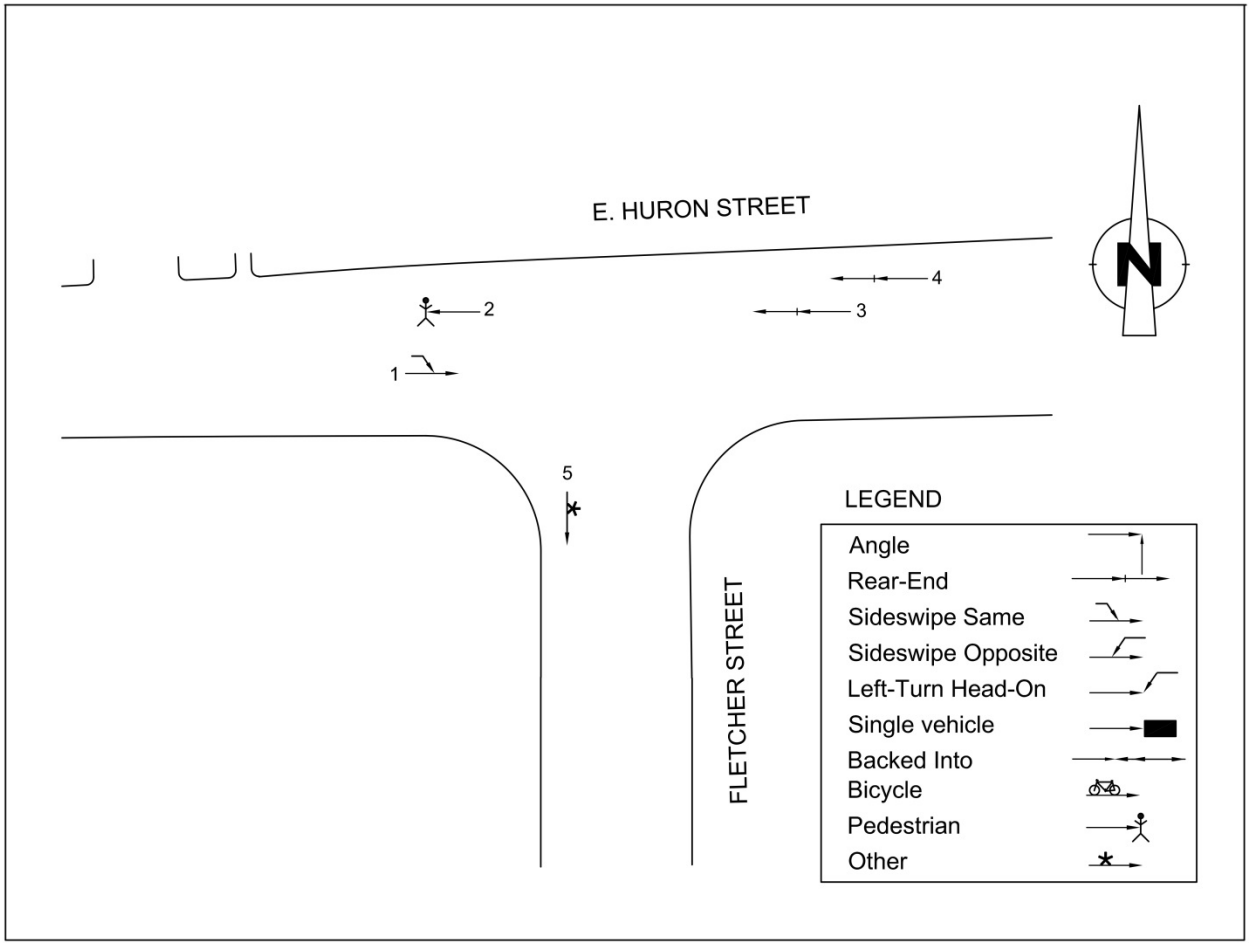
Collision Diagram of Huron Street and Ingalls Street for 2013



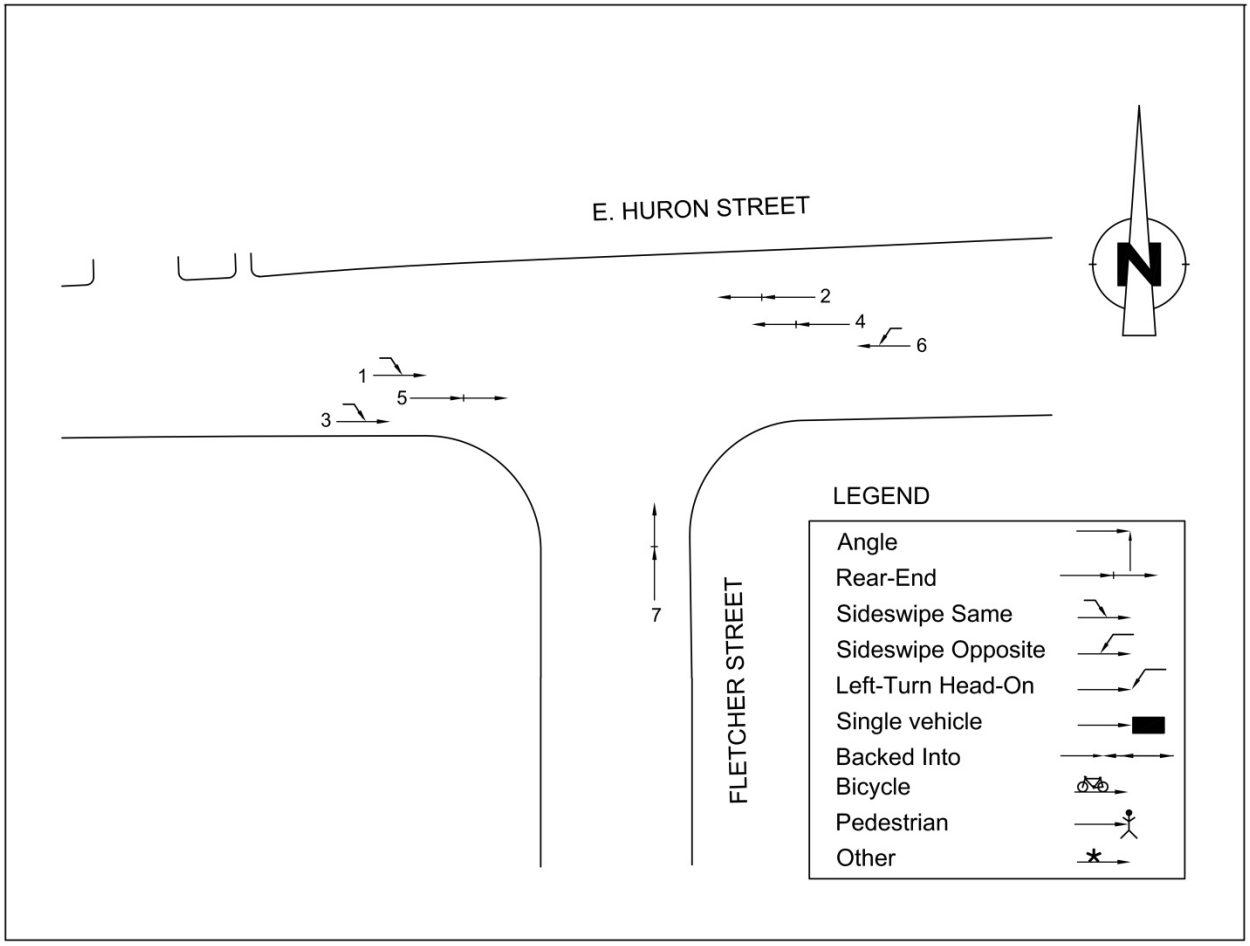
Collision Diagram of Huron Street and Ingalls Street for 2012



Collision Diagram of Huron Street and Fletcher Street for 2014



Collision Diagram of Huron Street and Fletcher Street for 2013



Collision Diagram of Huron Street and Fletcher Street for 2012

APPENDIX IV – CRASH PREDICTION ANALYSIS

Traffic count data along Glen Avenue, at various locations, were queried via the Washtenaw Area Traffic Study (WATS) and is shown in Table A1. The WATS can be accessed using the web link - http://www.miwats.org/traffic-counts

Table A1. Average Daily Traffic (ADT) and Peak Hour Volume at Various Locations in the Vicinity of the Proposed Glen Hotel Development

Location of Count	Date of Traffic Count	Travel Direction	24 Hour Count (vpd)	PM Peak Hour Count (vph)	Per Hour Count as a Percentage of ADT
Glen Ave. at Catherine	Oct - 1995	Northbound	8,856	674	7.6%
Glen Ave. at Catherine	Oct - 1995	Southbound	7,216	627	8.7%
Glen Ave. at Catherine	Apr - 1995	Two-way	16,072	1,301	8.1%
Glen Ave. at Fuller St.	Apr - 1989	Southbound	10,016	765	7.6%
Glen Ave. at Fuller St.	Apr - 1989	Northbound	5,659	560	9.9%
Average Peak Hour Count as the Percent of ADT					8.4%

The average peak hour volume, as a percentage of ADT, was calculated and utilized to estimate ADTs of the study intersections based on the observed peak hour counts as shown in Table A2. A typical example of ADT calculation for the intersection of Glen Avenue for a build-out scenario is as shown below:

AADT = (Two-Way Peak Hour Approach Volume) / (Average Peak Hour Count as a Percent of ADT)

Where,
Two-Way Peak Hour Approach Volume = Sum of Northbound and Southbound Peak Hour Approach Volume
Northbound Peak Hour Approach Volume on Glen Avenue at Catherine Street = 609 vph
Southbound Peak Hour Approach Volume on Glen Avenue at Catherine Street = 743 vph
Two-Way Peak Hour Approach Volume = 609+743 = 1,352 vph

Using the average percent factor from Table A1 to calculate ADT

ADT along Glen Avenue = 1352/8.4% = 16,095 vpd

Table A2 shows the estimated ADTs for various intersections for existing and build-out scenarios.

Table A2. Estimated ADTs Based on Peak Hour Approach Volume

Location	Existing Scenario		Build-Out Scenario		Estimated ADT (Existing) (vpd)	Estimated ADT (Build-Out) (vpd)
	Peak Hour Approach Volume (vph)	Two-Way Peak Hour Approach Volume (vph)	Peak Hour Approach Volume (vph)	Two-Way Peak Hour Approach Volume (vph)		
Northbound Glen at Catherine	591	1,288	609	1,352	15,333	16,095
Southbound Glen at Catherine	697		743			
Eastbound Catherine at Glen	147	505	152	618	6,012	7,357
Westbound Catherine at Glen	358		466			
Northbound Glen at Ann	463	1,209	477	1,329	14,393	15,821
Southbound Glen at Ann	746		852			
Eastbound Ann at Glen	85	423	88	436	5,036	5,190
Westbound Ann at Glen	338		348			
Southbound Glen at Huron	904	1,325	1,015	1,449	15,774	17,250
Northbound Glen at Huron	421		434			
Eastbound Huron at Glen	739	1,605	800	1,692	19,107	20,143
Westbound Huron at Glen	866		892			
Eastbound Ann at Zina Pitcher	150	552	156	572	6,571	6,810
Westbound Ann at Zina Pitcher	402		416			
Northbound Zina Pitcher at Ann	242	242	348	348	2,881	4,143
Northbound Zina Pitcher at Catherine	268	268	375	375	3,190	4,464
South-West bound Zina Pitcher at Catherine	19	19	20	20	226	238

Multiple vehicle crash frequency was estimated using the Safety Performance Function (SPF) included in the Highway Safety Manual. The estimated ADTs for Glen Avenue, Catherine Street, Huron Street, and Zina Pitcher were utilized to predict the total number of multiple vehicle crash frequencies.

Highway Safety Manual (HSM), Figure 12-13 (page 12-32) shows a graphical form of the intersection SPF for multiple vehicle collisions on four-legged signalized intersections (4SG) based on the equation 12-21 (page 12-29) and regression coefficients given by Table 12-10 (page 12-30), HSM, 2010.

The following expression from HSM 2010 is used to predict base condition multiple vehicle intersection-related collisions:

$N_{bimv} = \exp (a + b \times \ln (AADT_{maj}) + c \times \ln (AADT_{min}))$ … Equation 12-21, HSM 2010, Page No. 12-29

Where,
N_{bimv} = multiple vehicle crash frequency
$AADT_{maj}$ = average daily traffic volume (vehicles/day) for major road (both directions of travel combined);
$AADT_{min}$ = average daily traffic volume (vehicles/day) for minor road (both directions of travel combined); and
a, b, c = regression coefficients.

The values of regression coefficients, a, b, c, are obtained from Table 12-10, HSM, Page No. 12-30 and are as follows:

For, four-legged signalized intersections (4SG)
a = -10.99
b = 1.07
c = 0.23

For, three-legged signalized intersections (3SG)
a = -12.13
b = 1.11
c = 0.26

A typical example of base multiple vehicle crash prediction for the four-legged intersection - Glen Avenue and Catherine Street is as shown below:

Using the Equation 12-21 and regression coefficients for four-legged signalized intersections, we arrive at;

$$N_{bimv} = \exp (-10.99 + 1.07 \times \ln (AADT_{maj}) + 0.23 \times \ln (AADT_{min}))$$

Where,
N_{bimv} = Base condition multiple vehicle crash frequency
$AADT_{maj}$ = AADT along Glen Avenue = 16,095 vpd ……(Refer to Table A2)
$AADT_{min}$ = AAD along Catherine Street = 7,357 vpd ……(Refer to Table A2)

N_{bimv} (Glen Avenue and Catherine Street) = exp (-10.99 + 1.07 x ln (16,095) + 0.23 x ln (7,357))
= 4.1 crashes/year

Table A3 shows multiple vehicle crash frequency predictions based on the Highway Safety Manual (HSM) 2010 for existing and build-out scenarios.

Table A3. Multiple Vehicle Crash Frequency Prediction for Existing and Build-Out Scenario

Intersection	Existing Condition		Build-Out Condition		Existing Base Condition Crash Prediction (crashes/yr)	Build-Out Base Condition Crash Prediction (crashes/yr)
	Major Street ADT (vpd)	Minor Street ADT (vpd)	Major Street ADT (vpd)	Minor Street ADT (vpd)		
Glen Avenue and Catherine Street (Major Street: Glen Avenue)	15,333	6,012	16,095	7,357	3.8	4.1
Glen Avenue and Ann Street (Major Street: Glen Avenue)	14,393	5,036	15,821	5,190	3.4	3.8
Glen Avenue and Huron Street (Major Street: Huron Street)	19,107	15,774	20,143	17,250	3.2	3.6
Ann Street and Zina Pitcher (Major Street: Ann Street)	6,571	2,881	6,810	4,143	1.3	1.4
Catherine Street and Zina Pitcher (Major Street: Zina Pitcher)	3,190	226	4,464	238	0.2	0.3

As per HSM 2010, Page No. 12-39, Paragraph-2, “crash modification factors (CMFs) are used to adjust the SPF estimates of predicted average crash frequency for the effect of individual geometric design and traffic control features”. The following expression shows the adjustment of predicted multiple-vehicle crash frequency by applicable CMFs.

The predicted crash frequencies presented in Table A3 were further multiplied by crash modification factors (CMF) associated with multiple-vehicle collisions at intersections as per Highway Safety Manual (HSM) 2010 Table 12-18, Page No. 12-39.

Predicted frequency = Base condition crash frequency x CMF_{1i} x CMF_{2i} x CMF_{3i} x CMF_{4i} x CMF_{5i} x CMF_{6i}

The CMFs applied in the above expression are determined as referred by Table 12-18, HSM 2010, Page 12-39.

CMF_{1i} = Intersection Left-Turn Lanes CMF (Table 12-24, HSM 2010, Page 12-43)
CMF_{2i} = Intersection Left-Turn Signal Phasing (Table 12-25, HSM 2010, Page 12-44)
CMF_{3i} = Intersection Right-Turn Signal Phasing (Table 12-26, HSM 2010, Page 12-44)
CMF_{4i} = Right-Turn-On-Red (Equation 12-35, HSM 2010, Page 12-44)
CMF_{5i} = Lighting (Equation 12-36 and Table 12-27, HSM 2010, Page 12-45)
CMF_{6i} = Red-Light Cameras (Equations 12-37, 12-38, 12-39, HSM 2010, Page 12-45)

Table A4. Crash Modification Factors (CMFs) for Study Intersections

Intersection	CMF_{1i}	CMF_{2i}	CMF_{3i}	CMF_{4i}	CMF_{5i}	CMF_{6i}
Glen Avenue and Catherine Street	0.81 (Two approaches with left-turn lane)	0.94 x 0.94 (Protected left-turn eastbound and protected left-turn westbound)	0.96 (Right-turn lane westbound)	0.98^4 (No right-turn on red four approaches)	1 (Lighted intersection)	1 (Red light camera absent)
Glen Avenue and Ann Street	0.73 (Three approaches with left-turn lane)	1.0 (Permissive left-turn movement)	0.96 (Right-turn lane westbound)	0.98 (No right turn on red southbound)	1 (Lighted intersection)	1 (Red light camera absent)
Glen Avenue and Huron Street	0.86 (Three legged intersection with two approaches with left-turn lane)	0.99 x 0.94 (Permissive - protected left-turn eastbound and protected left-turn southbound)	0.92 (Three legged, right-turn lane southbound and westbound)	0.98 (No right-turn on red southbound)	1 (Lighted intersection)	1 (Red light camera absent)
Ann Street and Zina Pitcher	0.81 (Two approaches with left-turn lane)	1.0 (Permissive left-turn movement)	0.96 (Right-turn lane westbound)	0.98^2 (No right-turn on red eastbound and westbound)	1 (Lighted intersection)	1 (Red light camera absent)
Catherine Street and Zina Pitcher	0.93 (Three-legged intersection with a left-turn approach)	0.99 (Protected left-turn phase northbound)	1 (No right-turn lane)	0.98 (No right-turn on red northbound)	1 (Lighted intersection)	1 (Red light camera absent)

The adjustment factor, which is the product of CMF_{1i}, $CMF_{2i,}$ $CMF_{3i,}$ CMF_{4i}, CMF_{5i}, and CMF_{6i} was calculated and applied to the base condition multiple-vehicle crash frequency to predict an adjusted multiple-vehicle crash frequency. Also, traffic crash history for a three-year period (2012, 2013, and 2014) was queried via Michigan Traffic Crash Fact (MTCF) and calculated an average crash rate for each intersection in order to compare with the predicted crash rates as shown in Table A5.

Table A5. Final Multiple-Vehicle Crash Frequencies

Intersection	Existing Base Condition Multiple Vehicle Crash Frequency	Build-Out Base Condition Multiple Vehicle Crash Frequency	Adjustment Factor (CMF_{1i} * CMF_{2i} * CMF_{3i} * CMF_{4i} * CMF_{5i} * CMF_{6i})	Adjusted Existing Multiple Vehicle Crash Frequency	Adjusted Build-Out Multiple Vehicle Crash Frequency	Existing Average Crash Rate (Queried via MTCF)
Glen Avenue and Catherine Street	3.8	4.1	0.63	2.4	2.6	10.33
Glen Avenue and Ann Street	3.4	3.8	0.69	2.3	2.6	9.33
Glen Avenue and Huron Street	3.2	3.6	0.72	2.3	2.6	6.33
Ann Street and Zina Pitcher	1.3	1.4	0.75	1.0	1.0	4.33
Catherine Street and Zina Pitcher	0.2	0.3	0.9	0.2	0.3	1.33

The adjusted existing crash frequency rates predicted using the HSM 2010 were observed to be much less than the actual crash rates queried from the MTCF database.

APPENDIX V – ITE TRIP GENERATION EXCERPTS

Source: ITE Trip Generation, 8th Edition, Washington, D.C., 2008

Hotel
(310)

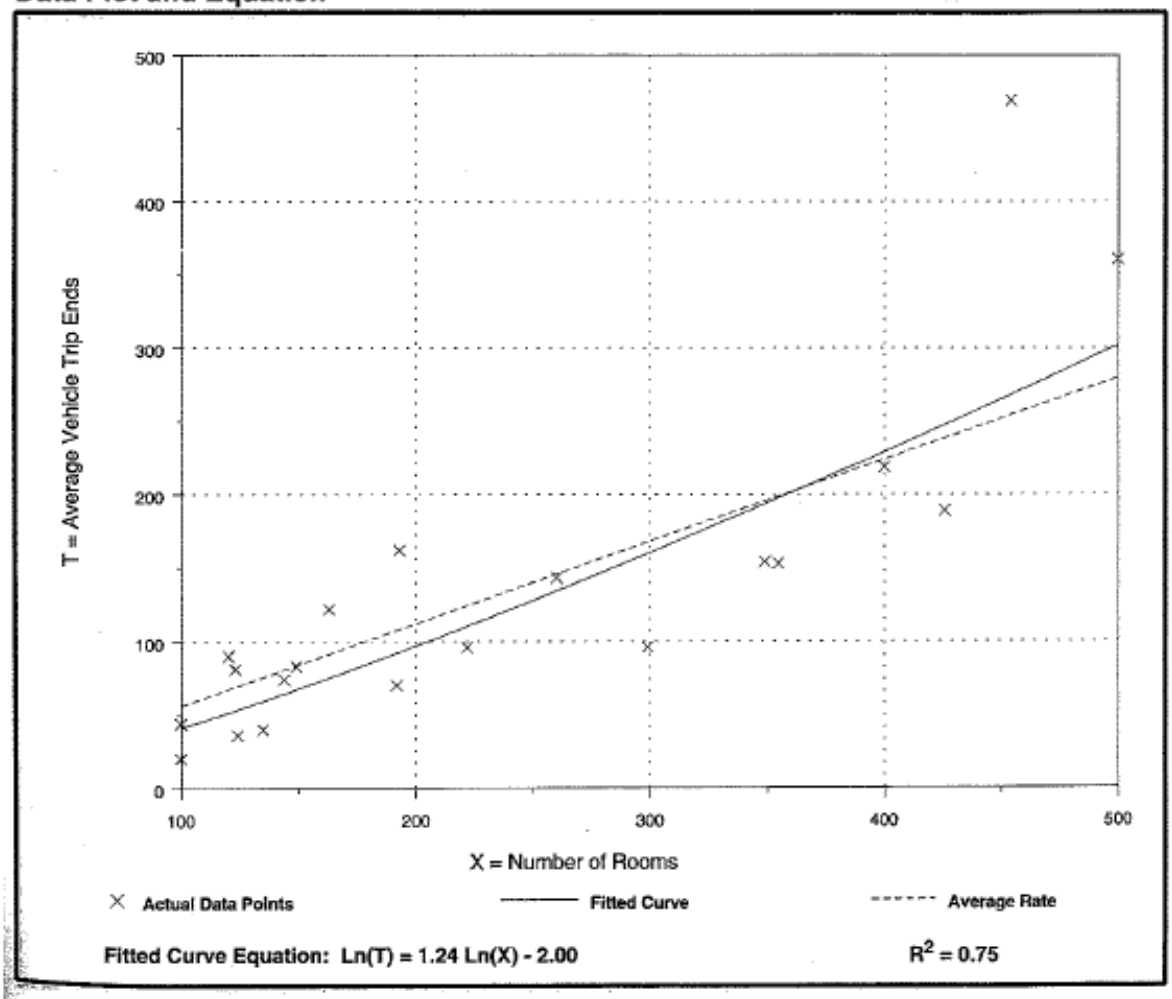
Average Vehicle Trip Ends vs: **Rooms**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 20
Average Number of Rooms: 240
Directional Distribution: 61% entering, 39% exiting

Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
0.56	0.20 - 1.03	0.78

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 1.24 Ln(X) - 2.00

$R^2 = 0.75$

Hotel
(310)

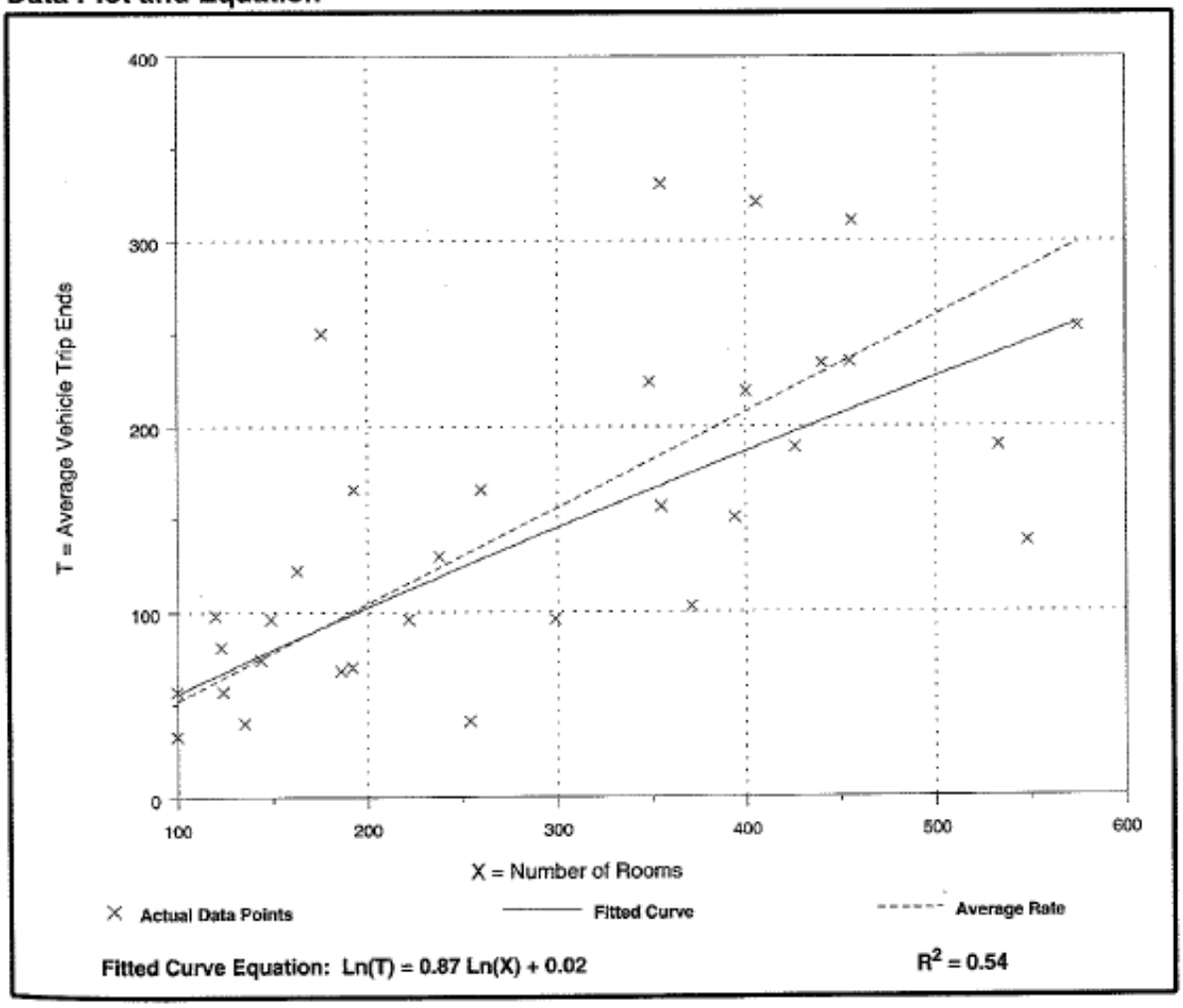
Average Vehicle Trip Ends vs: **Rooms**
On a: **Weekday,**
A.M. Peak Hour of Generator

Number of Studies: 32
Average Number of Rooms: 289
Directional Distribution: 55% entering, 45% exiting

Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
0.52	0.16 - 1.42	0.75

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.87 Ln(X) + 0.02

R^2 = 0.54

Hotel
(310)

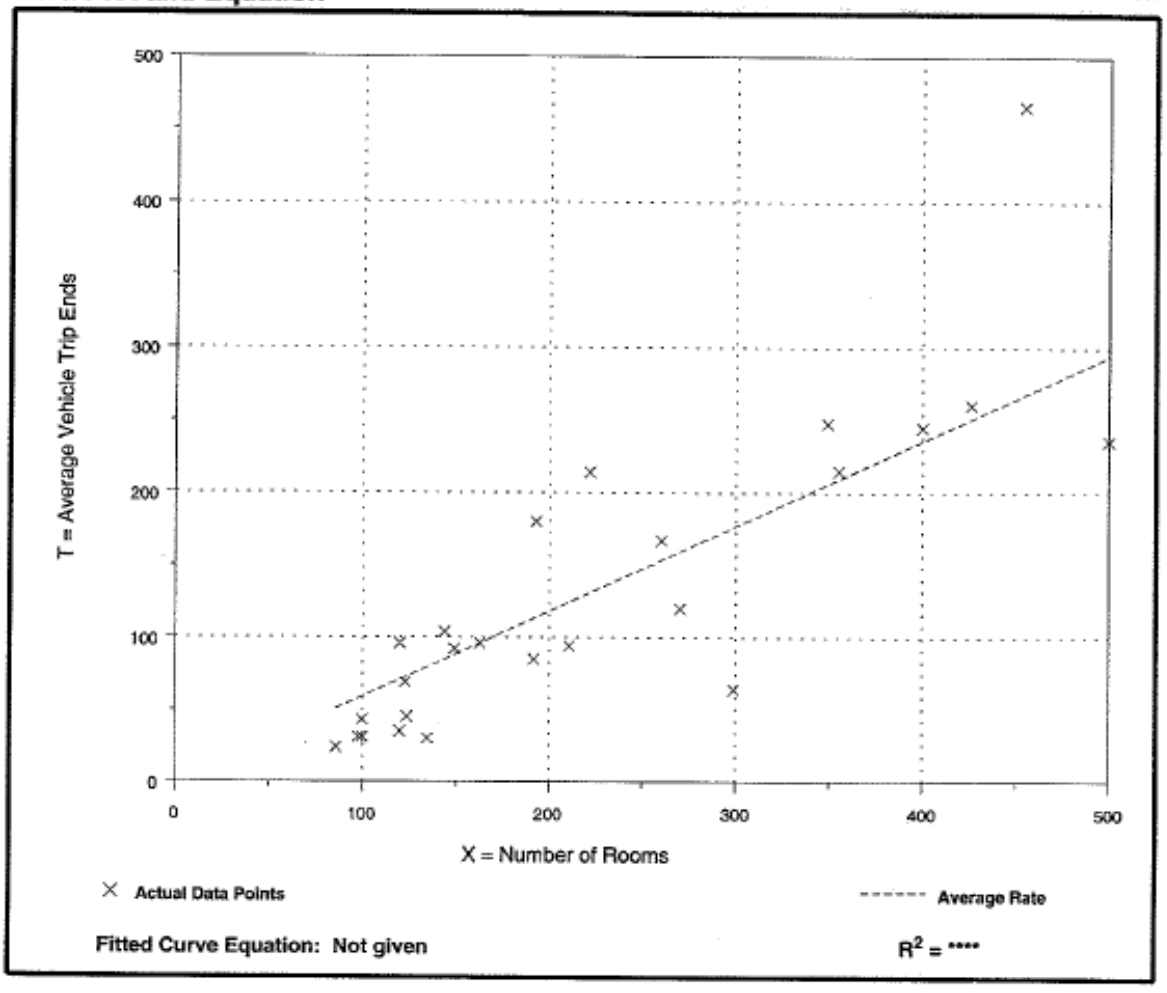
Average Vehicle Trip Ends vs: **Rooms**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 25
Average Number of Rooms: 224
Directional Distribution: 53% entering, 47% exiting

Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
0.59	0.21 - 1.03	0.80

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

Hotel
(310)

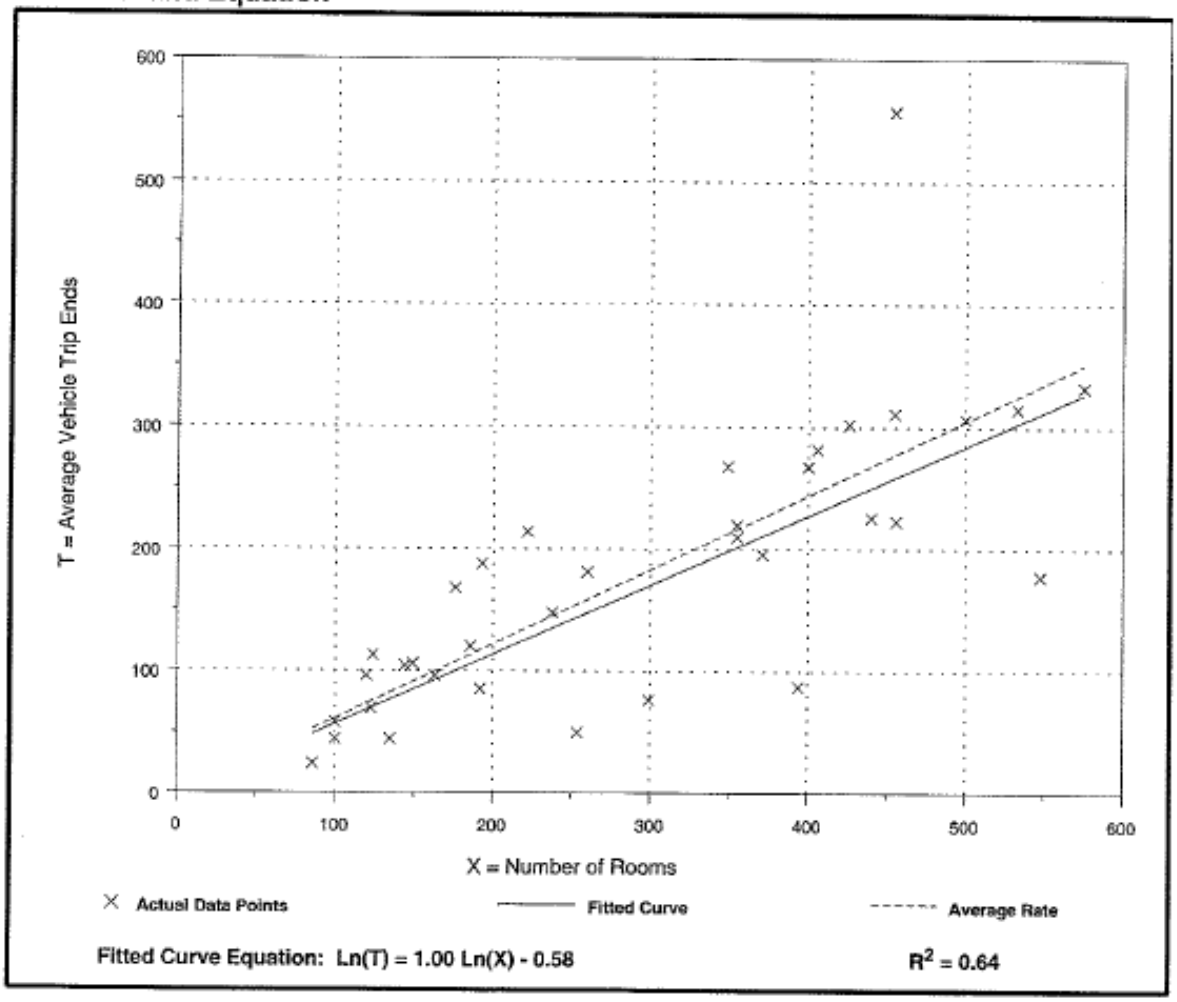
Average Vehicle Trip Ends vs: Rooms
On a: Weekday,
P.M. Peak Hour of Generator

Number of Studies: 35
Average Number of Rooms: 294
Directional Distribution: 58% entering, 42% exiting

Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
0.61	0.20 - 1.23	0.81

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 1.00 Ln(X) - 0.58

R^2 = 0.64

Specialty Retail Center
(814)

Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Leasable Area**
On a: **Weekday,**
A.M. Peak Hour of Generator

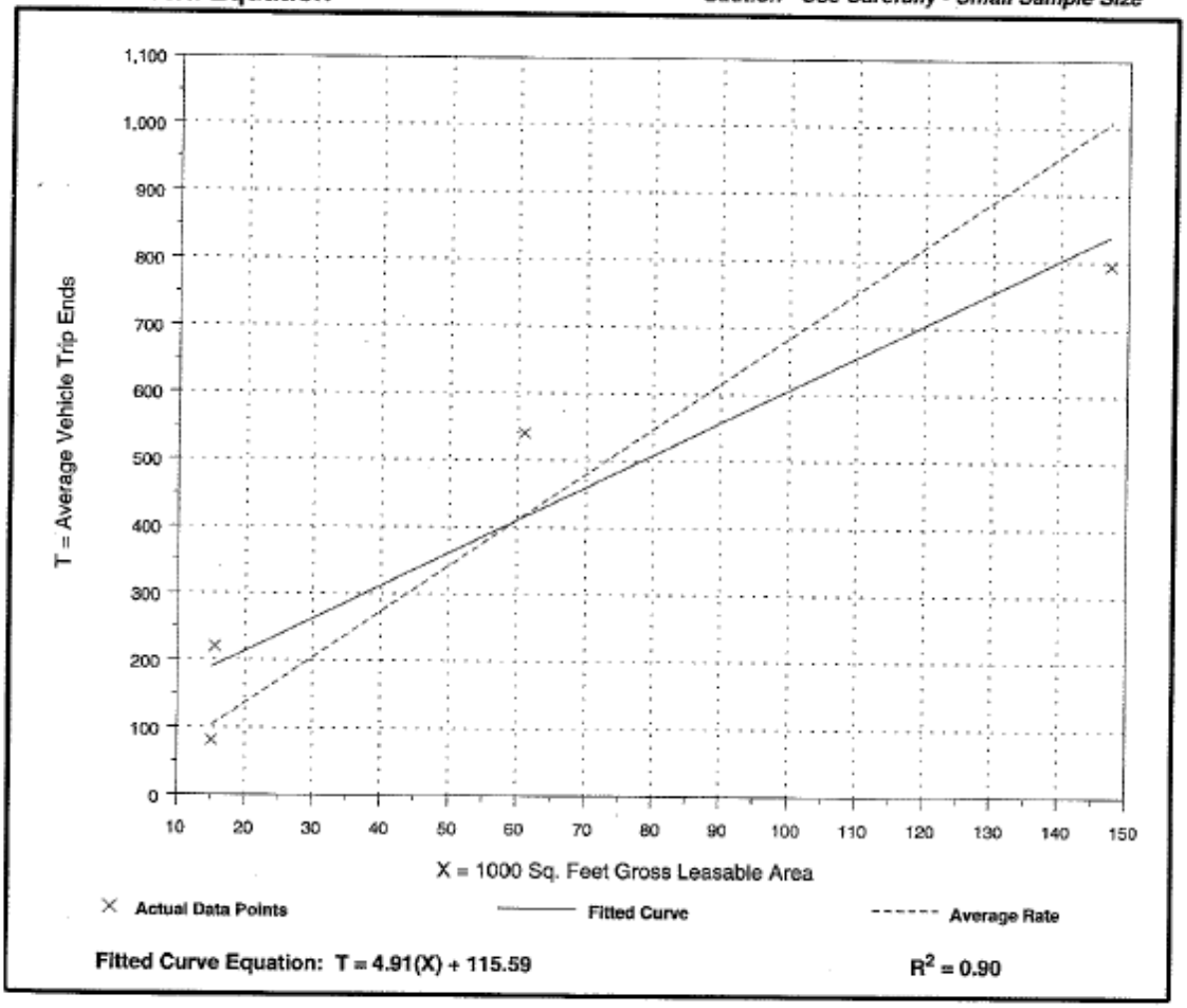
Number of Studies: 4
Average 1000 Sq. Feet GLA: 60
Directional Distribution: 48% entering, 52% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
6.84	5.33 - 14.08	3.55

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: T = 4.91(X) + 115.59

R^2 = 0.90

Specialty Retail Center
(814)

Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Leasable Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

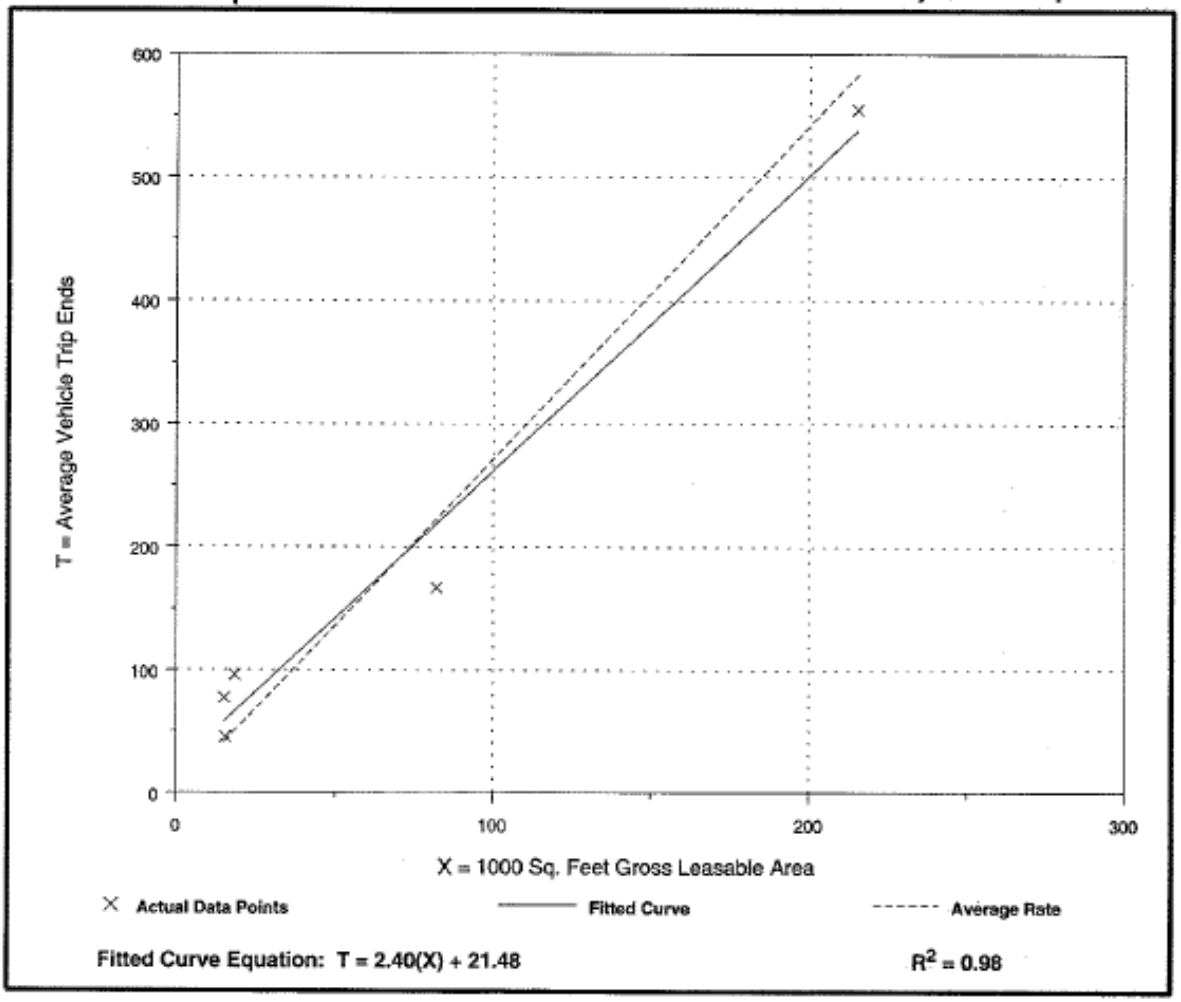
Number of Studies: 5
Average 1000 Sq. Feet GLA: 69
Directional Distribution: 44% entering, 56% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
2.71	2.03 - 5.16	1.83

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: T = 2.40(X) + 21.48

R^2 = 0.98

Specialty Retail Center
(814)

Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Leasable Area**
On a: **Weekday,**
P.M. Peak Hour of Generator

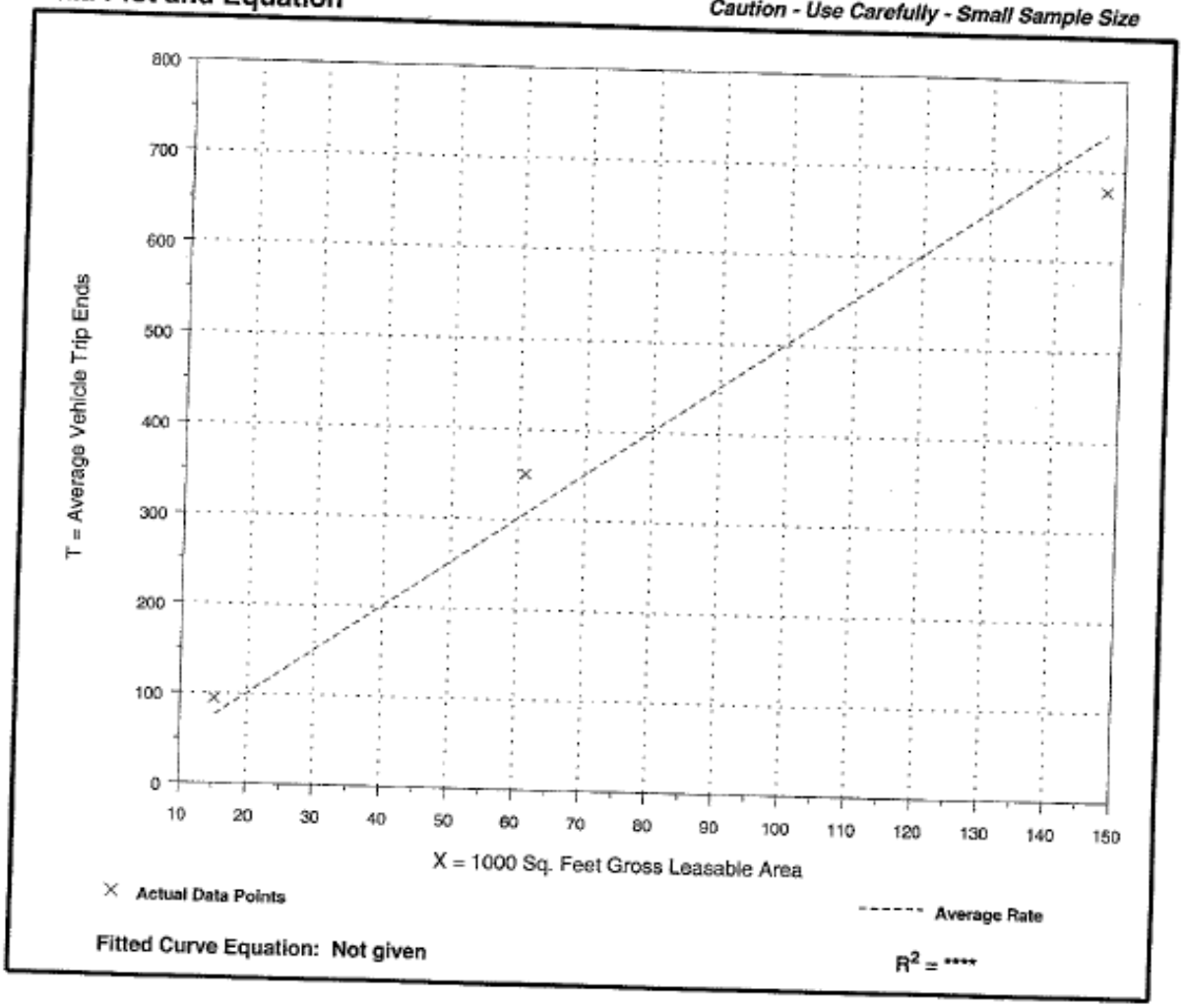
Number of Studies: 3
Average 1000 Sq. Feet GLA: 75
Directional Distribution: 56% entering, 44% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
5.02	4.59 - 6.18	2.31

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Fitted Curve Equation: **Not given**

R^2 = ****

Quality Restaurant
(931)

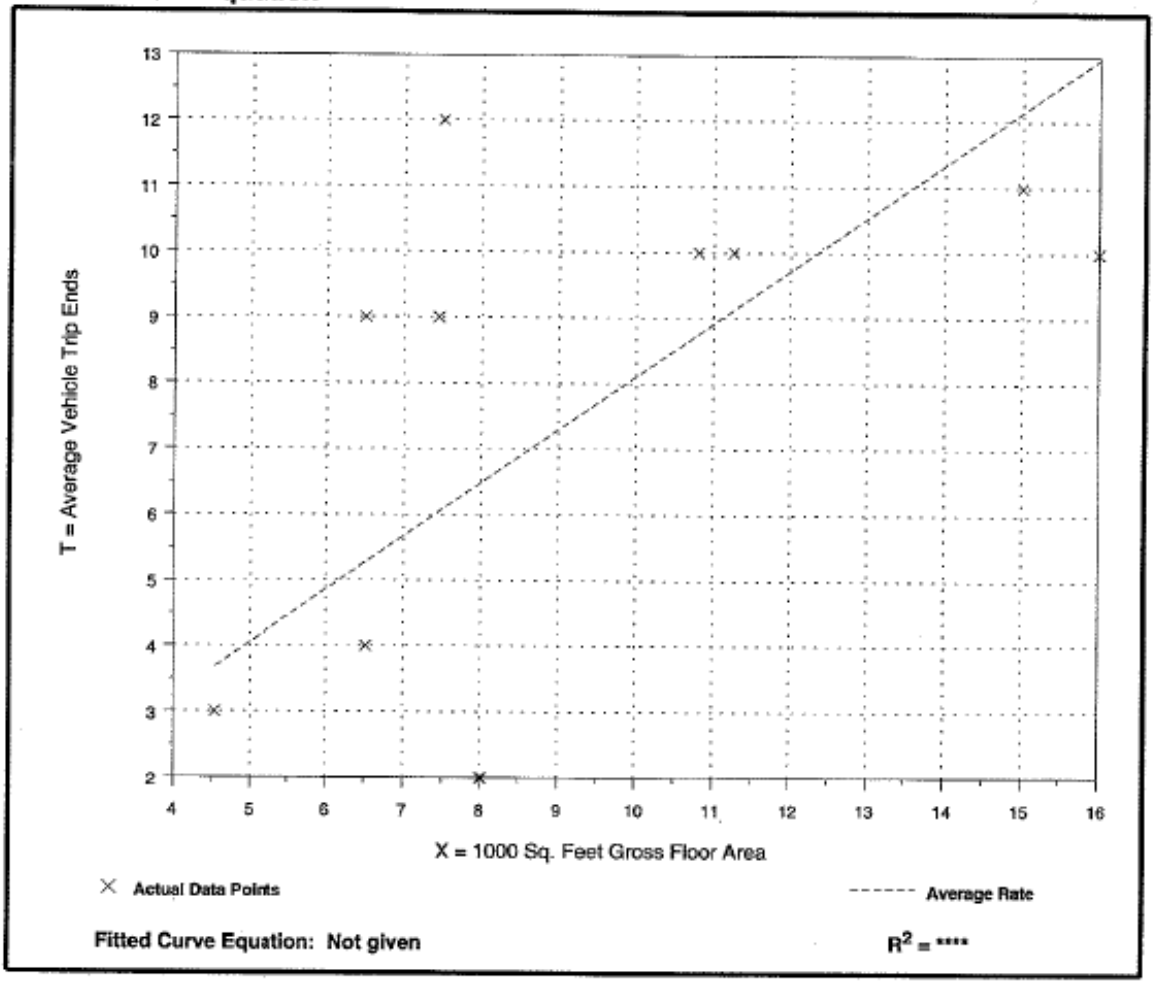
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 11
Average 1000 Sq. Feet GFA: 9
Directional Distribution: Not available

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
0.81	0.25 - 1.60	0.93

Data Plot and Equation



Quality Restaurant
(931)

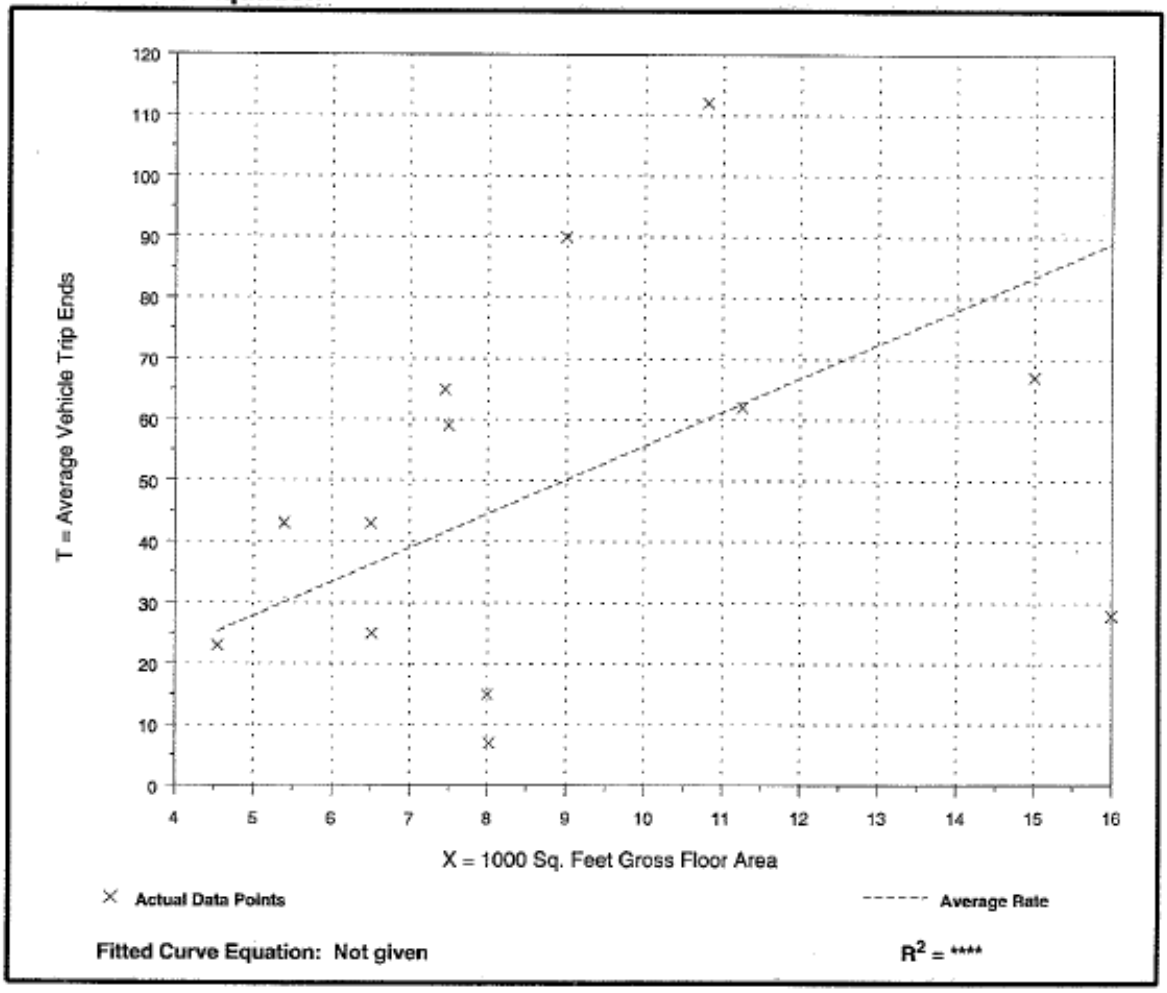
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
A.M. Peak Hour of Generator

Number of Studies: 14
Average 1000 Sq. Feet GFA: 9
Directional Distribution: 82% entering, 18% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
5.57	0.87 - 10.37	3.79

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

Quality Restaurant
(931)

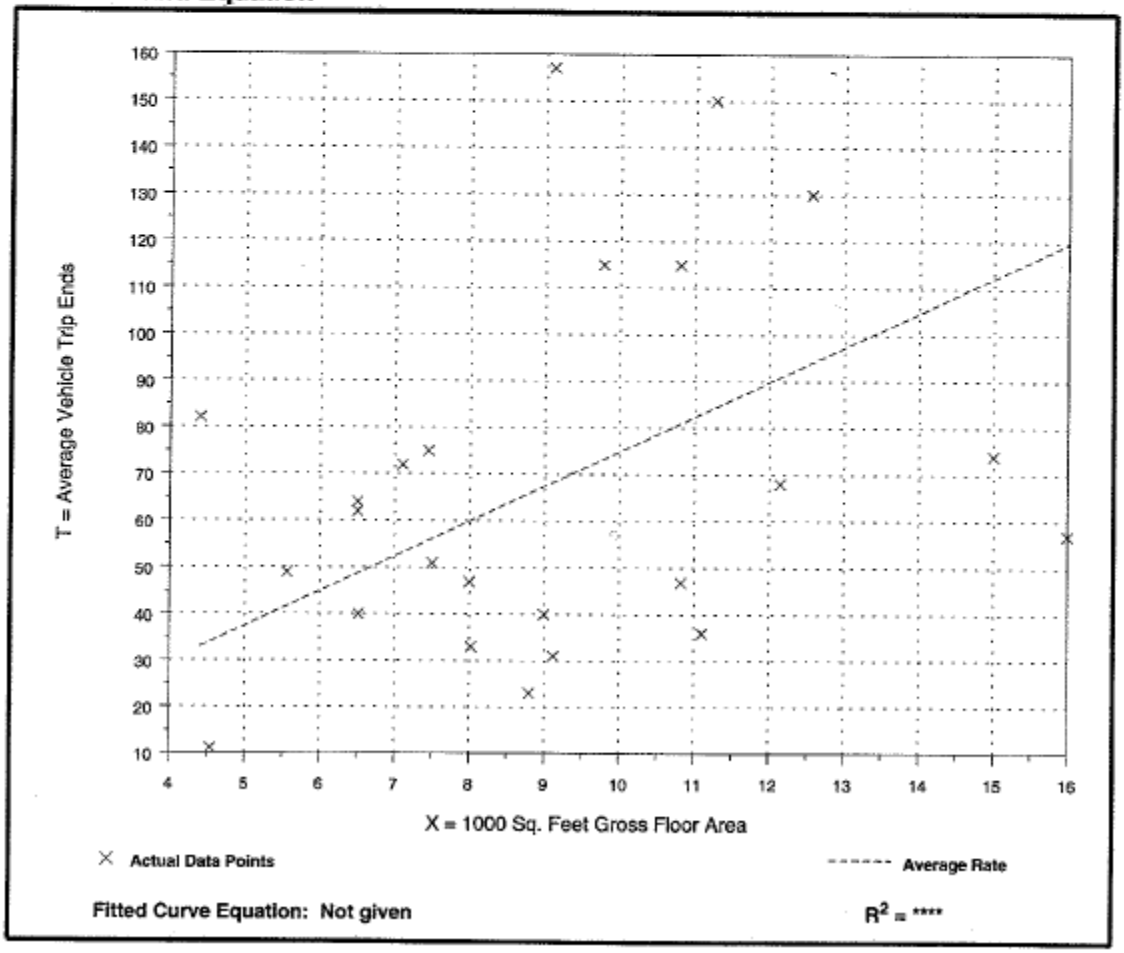
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 24
Average 1000 Sq. Feet GFA: 9
Directional Distribution: 67% entering, 33% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
7.49	2.42 - 18.64	4.89

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

Quality Restaurant
(931)

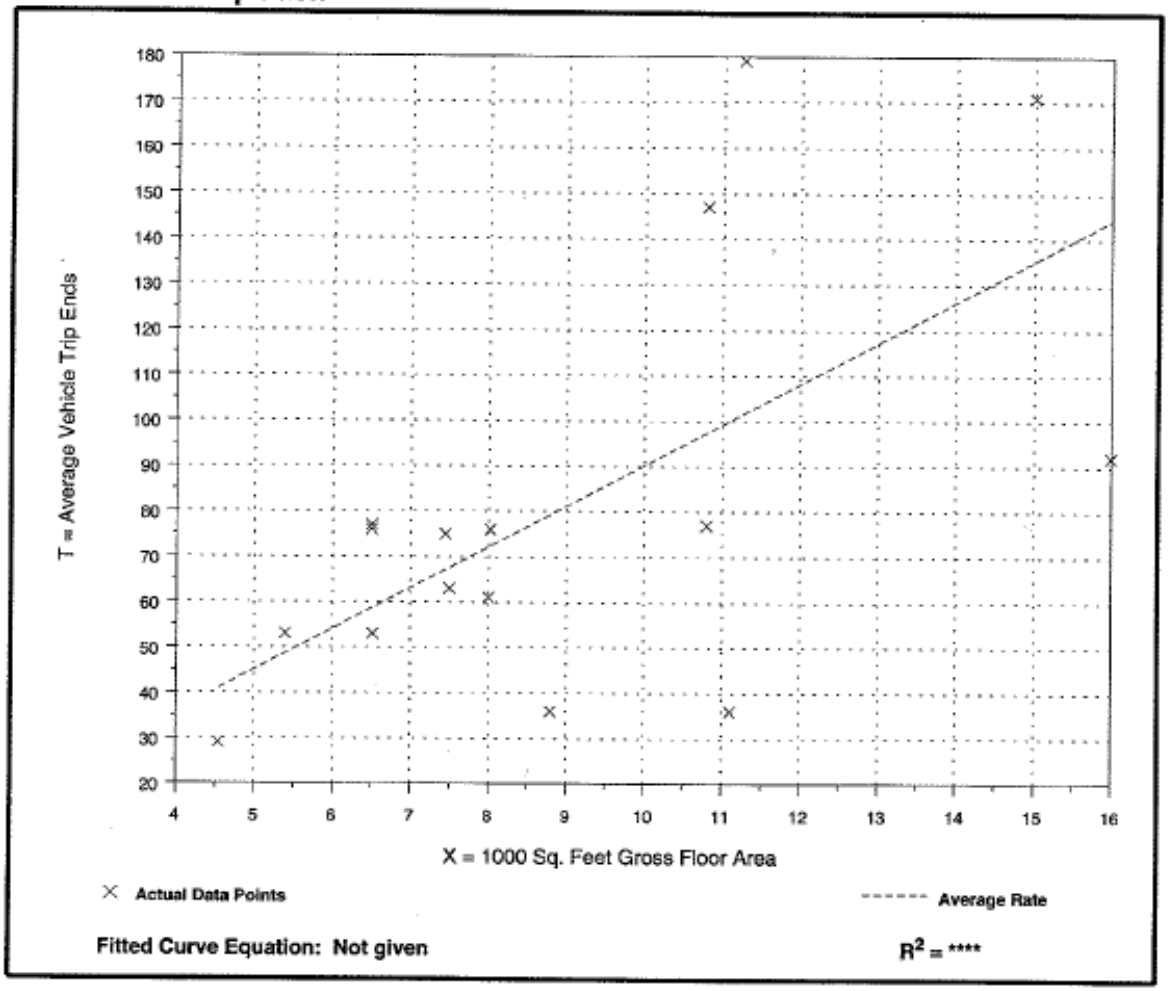
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
P.M. Peak Hour of Generator

Number of Studies: 16
Average 1000 Sq. Feet GFA: 9
Directional Distribution: 62% entering, 38% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
9.02	3.24 - 15.89	4.55

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

Apartment
(220)

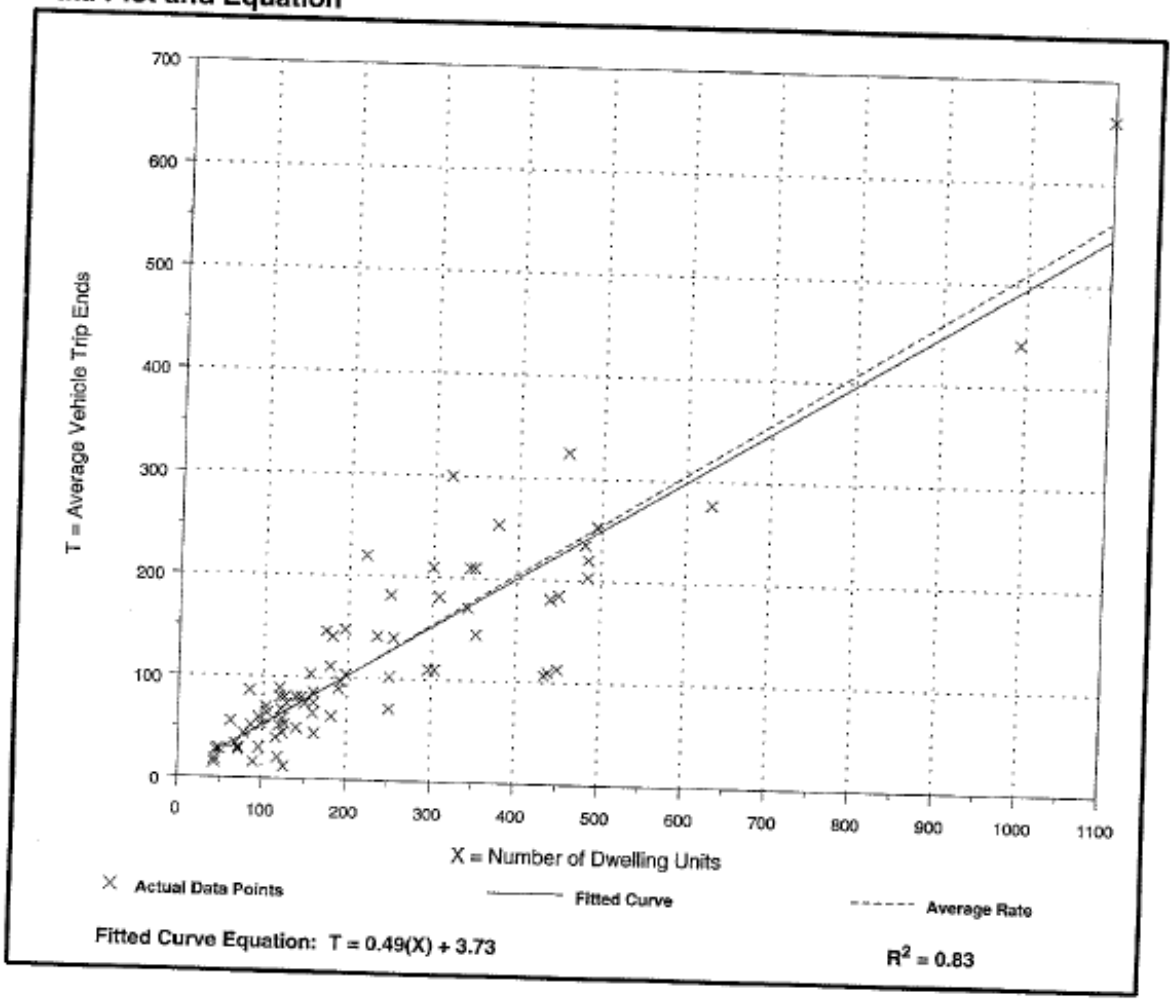
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 78
Avg. Number of Dwelling Units: 235
Directional Distribution: 20% entering, 80% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.10 - 1.02	0.73

Data Plot and Equation



Apartment
(220)

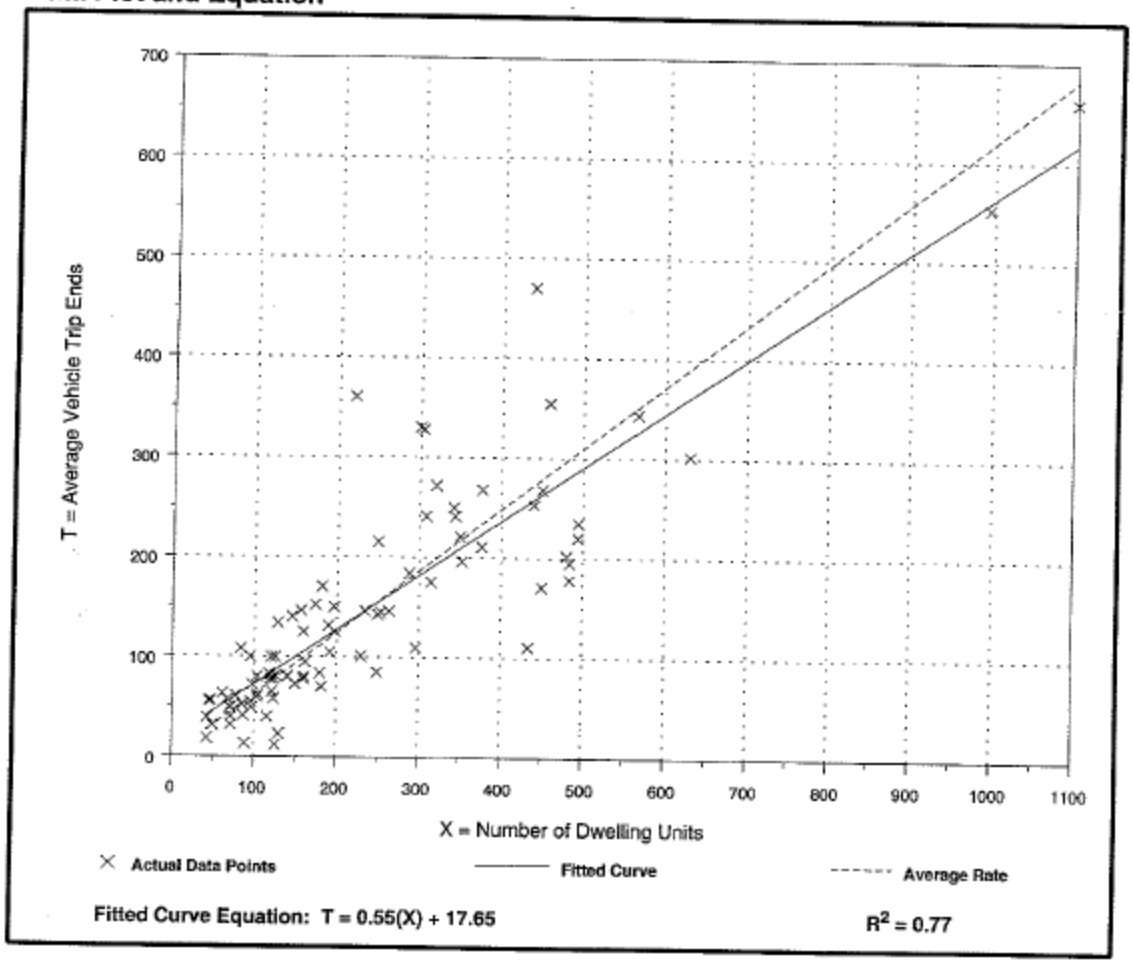
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 90
Avg. Number of Dwelling Units: 233
Directional Distribution: 65% entering, 35% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.62	0.10 - 1.64	0.82

Data Plot and Equation



Fitted Curve Equation: T = 0.55(X) + 17.65

R^2 = 0.77

Apartment
(220)

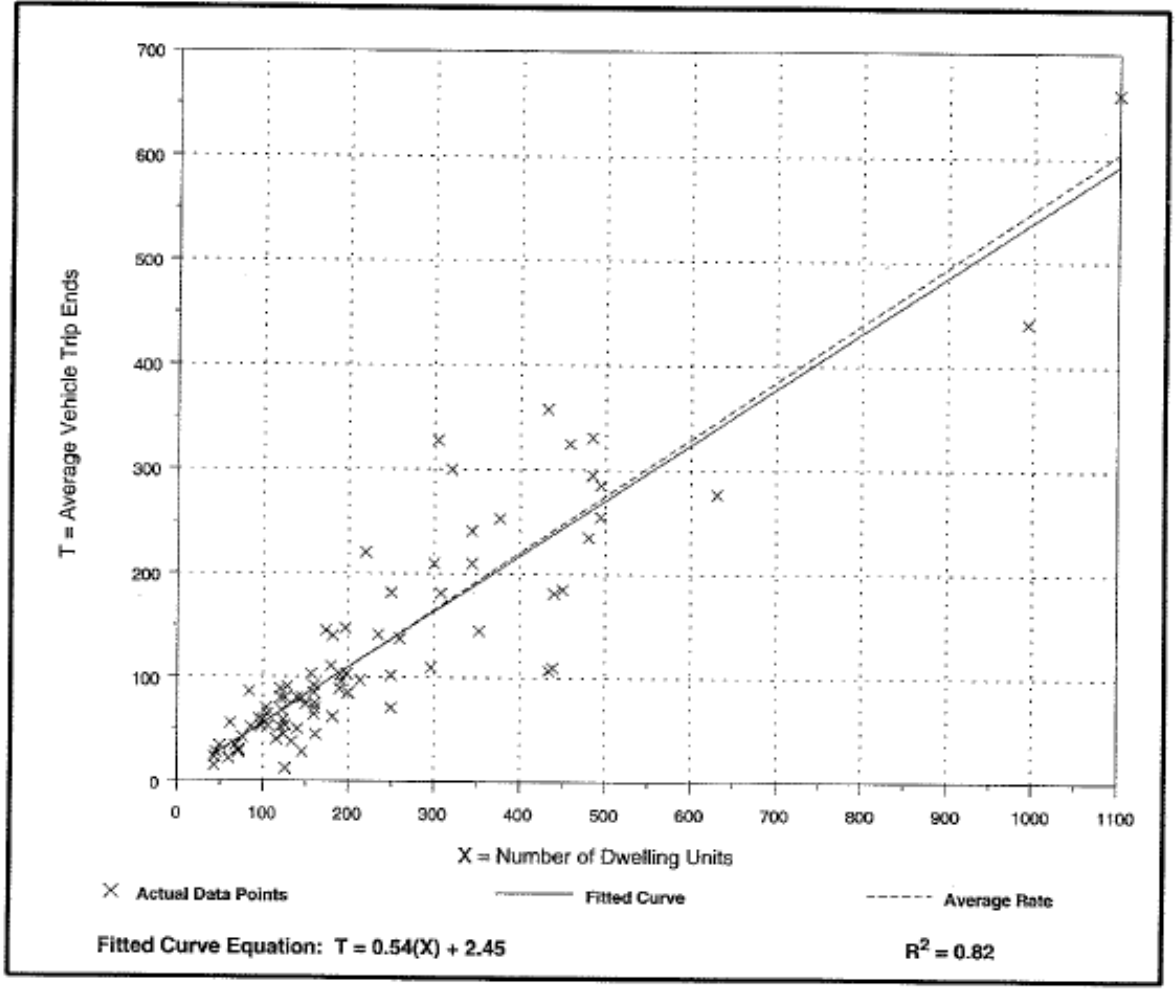
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
A.M. Peak Hour of Generator

Number of Studies: 83
Avg. Number of Dwelling Units: 230
Directional Distribution: 29% entering, 71% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.55	0.10 - 1.08	0.76

Data Plot and Equation



Fitted Curve Equation: T = 0.54(X) + 2.45

R^2 = 0.82

Apartment
(220)

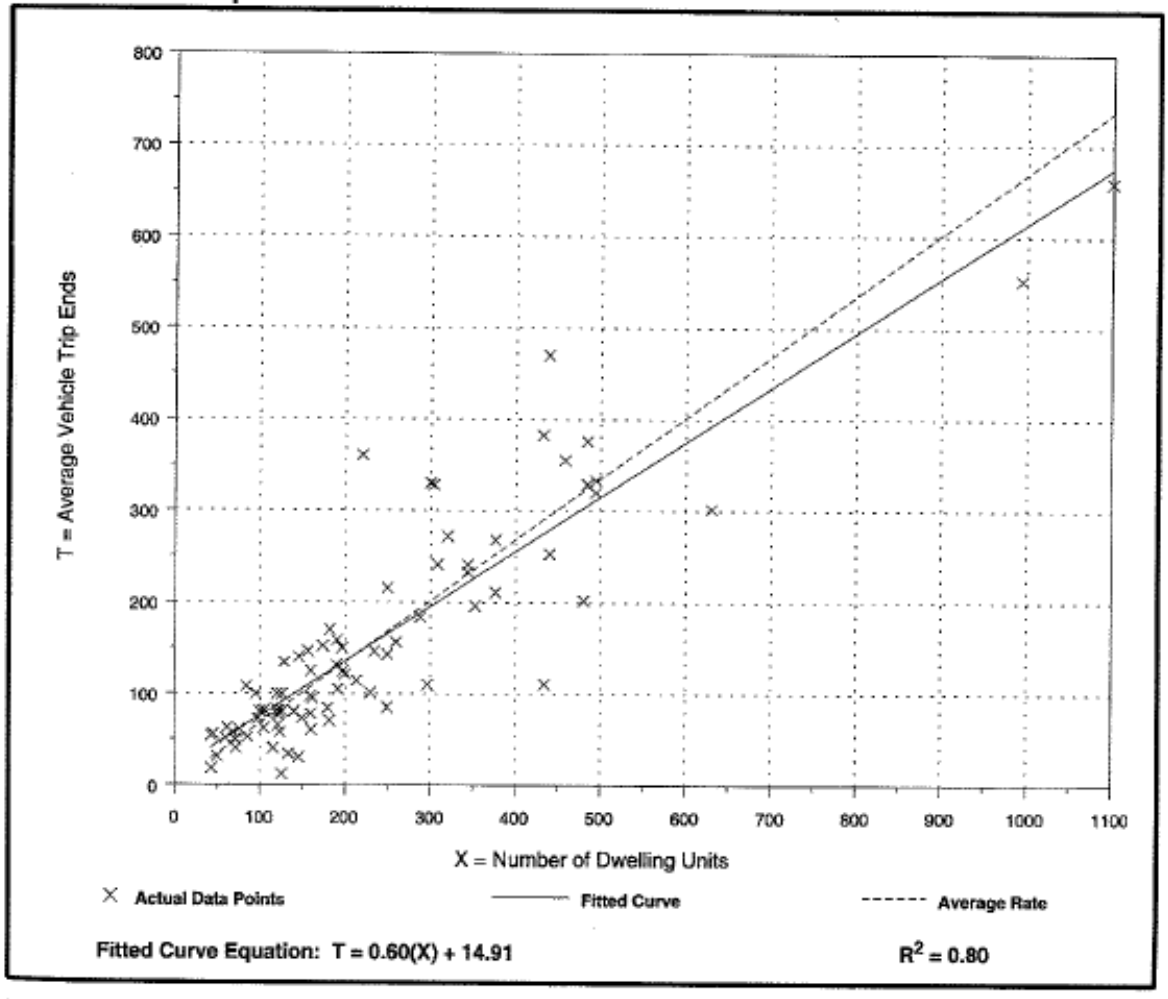
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
P.M. Peak Hour of Generator

Number of Studies: 85
Avg. Number of Dwelling Units: 229
Directional Distribution: 61% entering, 39% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.67	0.10 - 1.64	0.85

Data Plot and Equation



Fitted Curve Equation: T = 0.60(X) + 14.91

R^2 = 0.80

APPENDIX VI – SIGNAL-TIMING PERMITS

3/16/2015 12:03:41

TRAFFIC SIGNAL TIMING PERMIT

PHASE		2		4				8	
APPROACH		NBT-SBT		WB-Thru				EB-Thru	
MINIMUM GREEN	0.0	8.0	0.0	8.0	0.0	0.0	0.0	8.0	
PASSAGE	0.0	4.0	0.0	4.0	0.0	0.0	0.0	4.0	
MAXIMUM NO. 1	0.0	45.0	0.0	35.0	0.0	0.0	0.0	35.0	
MAXIMUM NO. 2	0.0	45.0	0.0	35.0	0.0	0.0	0.0	22.0	
YELLOW CHANGE	3.0	3.6	3.0	3.6	3.0	3.0	3.0	3.6	
RED CLEARANCE	0.0	2.5	0.0	2.5	0.0	0.0	0.0	2.5	
WALK	0.0	4.0	0.0	0.0	0.0	0.0	0.0	6.0	
PEDESTRIAN CLEARANCE	0.0	10.0	0.0	0.0	0.0	0.0	0.0	13.0	
EXTENDED PED. CLEARANCE	0	0	0	0	0	0	0	0	
WALK OFFSET TIME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	
WALK OFFSET MODE (0=Advanced, 1=Delayed)	0	0	0	0	0	0	0	0	
NON-LOCK MEMORY	0	0	0	0	0	0	0	0	
DUAL ENTRY	0	0	0	0	0	0	0	0	
INITIALIZATION	0	4	0	1	0	0	0	1	
NON-ACT RESPONSE	0	1	0	2	0	1	0	2	
VEHICLE RECALL	0	3	0	3	0	0	0	3	
PEDESTRIAN RECALL	0	2	0	0	0	0	0	2	

		CYCLE									O1	O2	O3
DIAL 1	SPLIT 1	70	0	26	0	17	0	0	0	27	17	0	0
DIAL 1	SPLIT 2	80	0	35	0	18	0	0	0	27	24	0	0
DIAL 2	SPLIT 1	80	0	33	0	20	0	0	0	27	24	0	0
DIAL 2	SPLIT 3	80	0	32	0	20	0	0	0	28	24	0	0
DIAL 2	SPLIT 4	110	0	45	0	27	0	0	0	38	32	0	0
DIAL 3	SPLIT 1	90	0	41	0	22	0	0	0	27	30	0	0
DIAL 3	SPLIT 2	90	0	28	0	35	0	0	0	27	36	0	0
DIAL 3	SPLIT 3	90	0	45	0	18	0	0	0	27	5	0	0
DIAL 3	SPLIT 4	110	0	45	0	27	0	0	0	38	8	0	0
DIAL 4	SPLIT 1	90	0	39	0	22	0	0	0	29	30	0	0
DIAL 4	SPLIT 2	90	0	27	0	27	0	0	0	36	33	0	0
DIAL 4	SPLIT 3	100	0	55	0	18	0	0	0	27	5	0	0
DIAL 4	SPLIT 4	110	0	45	0	27	0	0	0	38	32	0	0
MODE			0	1	0	7	0	0	0	5			

Phase

8	Catherine	EB-Thru
4	Catherine	WB-Thru
2	Glen	NB-Thru
2	Glen	SB-Thru

Weekend TBC		
1	00:01	Flash
1	06:30	D1/S1/O1
1	10:00	D3/S1/O1
1	19:00	D2/S1/O1
7	00:01	Flash
7	06:30	D1/S1/O1
7	10:00	D3/S1/O1
7	19:00	D2/S1/O1

Weekday TBC		
2	00:01	Flash
2	05:15	D1/S1/O1
2	06:30	D3/S3/O1
2	09:00	D2/S1/O1
2	15:15	D3/S1/O1
2	18:30	D2/S1/O1

RR PRE-EMPT ☐

FIRE PRE-EMPT ☐

NOTES / REMARKS

EPAC type controller

Leading Peds Crossing Glen

PREPARED BY: City of AA

DATE: Mar 16 2015

CONFLICT FLASH	RED	AMBER	DARK
Catherine	X	.	.
Glen	X	.	.

FLASH SCHEDULE DAILY [X] NONE [ ]

(TIME & DAY) Midngith - 6:30AM

NIGHT FLASH .

Location # 88

Catherine & Glen

CITY/TWP: City of Ann Arbor

COUNTY: Washtenaw

MILE POINT	CONTROL SECTION-SPOT #:
.	.

C.90.c.27.07 AA_1.1

3/16/2015 12:36:21

TRAFFIC SIGNAL TIMING PERMIT

PHASE		2		4					
APPROACH		NBT-SBT		EBT-WBT					
MINIMUM GREEN	0.0	8.0	0.0	5.0	0.0	0.0	0.0	0.0	
PASSAGE	0.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 1	0.0	47.0	0.0	45.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 2	0.0	42.0	0.0	28.0	0.0	0.0	0.0	0.0	
YELLOW CHANGE	3.0	3.6	3.0	3.5	3.0	3.0	3.0	3.0	
RED CLEARANCE	0.0	2.5	0.0	2.5	0.0	0.0	0.0	0.0	
WALK	0.0	10.0	0.0	6.0	0.0	0.0	0.0	0.0	
PEDESTRIAN CLEARANCE	0.0	14.0	0.0	17.0	0.0	0.0	0.0	0.0	
EXTENDED PED. CLEARANCE	0	2	0	2	0	0	0	0	
WALK OFFSET TIME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
WALK OFFSET MODE (0=Advanced, 1=Delayed)	0	0	0	0	0	0	0	0	
NON-LOCK MEMORY	0	0	0	0	0	0	0	0	
DUAL ENTRY	0	0	0	0	0	0	0	0	
INITIALIZATION	0	4	0	1	0	0	0	0	
NON-ACT RESPONSE	0	0	0	0	0	0	0	0	
VEHICLE RECALL	0	2	0	2	0	0	0	0	
PEDESTRIAN RECALL	0	2	0	2	0	0	0	0	

		CYCLE									O1	O2	O3
DIAL 1	SPLIT 1	70	0	40	0	30	0	0	0	0	19	0	0
DIAL 1	SPLIT 2	80	0	52	0	28	0	0	0	0	26	0	0
DIAL 2	SPLIT 1	80	0	48	0	32	0	0	0	0	26	0	0
DIAL 2	SPLIT 4	110	0	61	0	49	0	0	0	0	29	0	0
DIAL 3	SPLIT 1	90	0	49	0	41	0	0	0	0	28	0	0
DIAL 3	SPLIT 2	90	0	56	0	34	0	0	0	0	30	0	0
DIAL 3	SPLIT 3	90	0	55	0	35	0	0	0	0	13	0	0
DIAL 3	SPLIT 4	110	0	63	0	47	0	0	0	0	6	0	0
DIAL 4	SPLIT 1	90	0	56	0	34	0	0	0	0	16	0	0
DIAL 4	SPLIT 2	90	0	50	0	40	0	0	0	0	26	0	0
DIAL 4	SPLIT 3	100	0	60	0	40	0	0	0	0	19	0	94
DIAL 4	SPLIT 4	110	0	61	0	49	0	0	0	0	29	0	0
MODE			0	1	0	7	0	0	0	0			

Phase		
4	Ann	EB-Thru
4	Ann	WB-Thru
2	Glen	NB-Thru
2	Glen	SB-Thru

Weekend TBC		
1	00:01	Flash
1	06:30	D1/S1/O1
1	10:00	D3/S1/O1
1	19:00	D1/S2/O1
7	00:01	Flash
7	06:30	D1/S1/O1
7	10:00	D3/S1/O1
7	19:00	D1/S2/O1

Weekday TBC		
2	00:01	Flash
2	05:15	D1/S1/O1
2	06:30	D3/S3/O1
2	09:00	D2/S1/O1
2	15:15	D3/S1/O1
2	18:30	D1/S2/O1

RR PRE-EMPT ☐

FIRE PRE-EMPT ☐

NOTES / REMARKS

EPAC type controller

PREPARED BY: City of AA

DATE: Mar 16 2015

CONFLICT FLASH	RED	AMBER	DARK
Ann	X	.	.
Glen	X	.	.

FLASH SCHEDULE DAILY [X] NONE [ ]

(TIME & DAY) Weekday Midnight - 5:15AM

NIGHT FLASH Weekend Midnight - 6:30AM

Location # 87

Ann & Glen

CITY/TWP: City of Ann Arbor

COUNTY: Washtenaw

MILE POINT	CONTROL SECTION-SPOT #:
.	.

C.90.c.27.07 AA_1.1

3/16/2015 11:55:43

TRAFFIC SIGNAL TIMING PERMIT

PHASE	1	2	3	4 PED		6		8	
APPROACH	EB-Left	WB-Thru	SB-Left			EB-Thru		SB-Rt	
MINIMUM GREEN	5.0	10.0	5.0	0.0	0.0	10.0	0.0	5.0	
PASSAGE	3.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0	
MAXIMUM NO. 1	12.0	31.0	20.0	28.0	0.0	43.0	0.0	48.0	
MAXIMUM NO. 2	12.0	31.0	20.0	28.0	0.0	43.0	0.0	48.0	
YELLOW CHANGE	3.5	3.5	3.6	3.0	3.0	3.5	3.0	3.6	
RED CLEARANCE	2.3	2.2	2.5	0.0	0.0	2.3	0.0	2.5	
WALK	0.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	
PEDESTRIAN CLEARANCE	0.0	17.0	0.0	19.0	0.0	0.0	0.0	0.0	
EXTENDED PED. CLEARANCE	0	2	0	2	0	0	0	0	
WALK OFFSET TIME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
WALK OFFSET MODE (0=Advanced, 1=Delayed)	0	0	0	0	0	0	0	0	
NON-LOCK MEMORY	0	0	0	0	0	0	0	0	
DUAL ENTRY	0	0	0	0	0	0	0	0	
INITIALIZATION	1	4	1	1	0	4	0	1	
NON-ACT RESPONSE	0	0	0	0	0	0	0	0	
VEHICLE RECALL	3	3	3	0	0	3	0	2	
PEDESTRIAN RECALL	0	0	0	0	0	0	0	0	

	CYCLE								O1	O2	O3
DIAL 1 SPLIT 1	70	11	24	12	23	0	35	0	35	0	0	0
DIAL 1 SPLIT 2	80	12	27	17	24	0	39	0	41	1	0	0
DIAL 1 SPLIT 3	90	12	31	23	24	0	43	0	47	1	0	0
DIAL 2 SPLIT 1	80	12	27	17	24	0	39	0	41	1	0	0
DIAL 3 SPLIT 1	90	12	31	23	24	0	43	0	47	1	0	0
DIAL 3 SPLIT 3	90	20	27	19	24	0	47	0	43	0	0	0
DIAL 4 SPLIT 1	90	12	30	24	24	0	42	0	48	1	0	0
DIAL 4 SPLIT 3	100	22	31	23	24	0	53	0	47	1	0	0
MODE		0	1	3	0	6	1	6	3			

Phase

1	Huron	EB-Left
6	Huron	EB-Thru
2	Huron	WB-Thru
3	Glen	SB-Left
8	Glen	SB-Right
4	Ped only phase crossing Huron	

Weekend TBC

1	06:30	D1/S1/O1
1	10:00	D1/S3/O1
1	19:00	D1/S2/O1
1	23:30	D1/S2/O1
7	06:30	D1/S1/O1
7	10:00	D1/S3/O1
7	19:00	D1/S2/O1
7	23:30	D1/S2/O1

Weekday TBC

2	06:30	D1/S3/O1
2	09:00	D1/S2/O1
2	15:15	D1/S3/O1
2	18:30	D1/S2/O1
2	23:30	D1/S2/O1

RR PRE-EMPT [ ]

FIRE PRE-EMPT [ ]

NOTES / REMARKS

EPAC type controller

EB LEFT TURN:
Permissive with WB THRU phase 6
Protected with phase 1
(4th level arrow indication)

Phase 4 Ped protected by SB LT Phase 3

PREPARED BY: City of AA
DATE: Mar 16 2015

CONFLICT FLASH	RED	AMBER	DARK
Glen	X	.	.
Huron	X	.	.

FLASH SCHEDULE DAILY [ ] NONE [X]
(TIME & DAY)
NIGHT FLASH

Location # 84
Glen & Huron
CITY/TWP: City of Ann Arbor
COUNTY: Washtenaw

MILE POINT	CONTROL SECTION-SPOT #:
00.66	81072-01-015

3/16/2015 10:50:22

TRAFFIC SIGNAL TIMING PERMIT

PHASE		2		4 Ped					
APPROACH		NB-Thru							
MINIMUM GREEN	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	
PASSAGE	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 1	0.0	44.0	0.0	18.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
YELLOW CHANGE	3.0	3.1	3.0	3.1	3.0	3.0	3.0	3.0	
RED CLEARANCE	0.0	2.5	0.0	2.5	0.0	0.0	0.0	0.0	
WALK	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	
PEDESTRIAN CLEARANCE	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	
EXTENDED PED. CLEARANCE	0	0	0	2	0	0	0	0	
WALK OFFSET TIME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
WALK OFFSET MODE (0=Advanced, 1=Delayed)	0	0	0	0	0	0	0	0	
NON-LOCK MEMORY	0	0	0	0	0	0	0	0	
DUAL ENTRY	0	0	0	0	0	0	0	0	
INITIALIZATION	0	4	0	1	0	0	0	0	
NON-ACT RESPONSE	0	0	0	0	0	0	0	0	
VEHICLE RECALL	0	3	0	3	0	0	0	0	
PEDESTRIAN RECALL	0	0	0	2	0	0	0	0	

	CYCLE								O1	O2	O3
DIAL 1 SPLIT 1	70	0	48	0	22	0	0	0	0	30	0	0
DIAL 1 SPLIT 4	60	0	38	0	22	0	0	0	0	25	0	0
DIAL 2 SPLIT 1	80	0	58	0	22	0	0	0	0	60	0	0
DIAL 3 SPLIT 1	90	0	68	0	22	0	0	0	0	50	0	0
DIAL 3 SPLIT 2	90	0	68	0	22	0	0	0	0	66	0	0
MODE		0	1	0	7	0	0	0	0			

Phase
2 Zina Pitcher NB-Thru
4 Exclusive Ped Crossing

Weekend TBC			Weekday TBC		
1	00:01	Flash	2	00:01	Flash
1	06:30	D1/S1/O1	2	06:30	D3/S1/O1
1	10:00	D3/S1/O1	2	09:00	D2/S1/O1
1	14:00	D3/S2/O1	2	15:15	D3/S2/O1
1	19:00	D2/S1/O1	2	18:30	D1/S1/O1

RR PRE-EMPT ☐
FIRE PRE-EMPT ☐

NOTES / REMARKS

EPAC type controller

Exlusive Ped crossing - Phase 4 ped

PREPARED BY: City of AA
DATE: Mar 16 2015

CONFLICT FLASH	RED	AMBER	DARK
Zina Pitcher	X		

FLASH SCHEDULE DAILY [X] NONE [ ]
(TIME & DAY) Midnight - 6:30AM
NIGHT FLASH

Location # 125
Catherine & Zina Pitcher
CITY/TWP: City of Ann Arbor
COUNTY: Washtenaw

MILE POINT	CONTROL SECTION-SPOT #:

TRAFFIC SIGNAL TIMING PERMIT

PHASE	1	2							
APPROACH	NB-Thru	EBT-WBT							
MINIMUM GREEN	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	
PASSAGE	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 1	24.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 2	18.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	
YELLOW CHANGE	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	
RED CLEARANCE	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0	
WALK	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	
PEDESTRIAN CLEARANCE	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	
EXTENDED PED. CLEARANCE	2	2	0	0	0	0	0	0	
WALK OFFSET TIME	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	
WALK OFFSET MODE (0=Advanced, 1=Delayed)	0	0	0	0	0	0	0	0	
NON-LOCK MEMORY	0	0	0	0	0	0	0	0	
DUAL ENTRY	0	0	0	0	0	0	0	0	
INITIALIZATION	4	1	0	0	0	0	0	0	
NON-ACT RESPONSE	0	0	0	0	0	0	0	0	
VEHICLE RECALL	3	3	0	0	0	0	0	0	
PEDESTRIAN RECALL	2	2	0	0	0	0	0	0	

	CYCLE								O1	O2	O3
DIAL 1 SPLIT 1	70	35	35	0	0	0	0	0	0	22	0	0
DIAL 1 SPLIT 4	60	30	30	0	0	0	0	0	0	16	0	0
DIAL 2 SPLIT 1	80	40	40	0	0	0	0	0	0	43	0	0
DIAL 3 SPLIT 1	90	45	45	0	0	0	0	0	0	0	0	0
DIAL 3 SPLIT 2	90	45	45	0	0	0	0	0	0	25	0	0
MODE		1	7	0	0	0	0	0	0			

Phase

2	Ann	EB-Thru
2	Ann	WB-Thru
1	Zina Pitcher	NB-Thru

Weekend TBC			Weekday TBC		
1	00:01	Flash	2	00:01	Flash
1	06:30	D1/S1/O1	2	06:30	D3/S1/O1
1	10:00	D3/S1/O1	2	09:00	D2/S1/O1
1	14:00	D3/S2/O1	2	15:15	D3/S2/O1
1	19:00	D2/S1/O1	2	18:30	D1/S1/O1

RR PRE-EMPT ☐

FIRE PRE-EMPT ☐

NOTES / REMARKS

EPAC type controller

Leading Peds

PREPARED BY: City of AA

DATE: Mar 13 2015

CONFLICT FLASH	RED	AMBER	DARK
Ann	X	.	.
Zina Pitcher	X	.	.

FLASH SCHEDULE DAILY [X] NONE [ ]

(TIME & DAY) Midnight - 630AM

NIGHT FLASH .

Location # 66

Ann & Zina Pitcher

CITY/TWP: City of Ann Arbor

COUNTY: Washtenaw

MILE POINT	CONTROL SECTION-SPOT #:
.	.

TRAFFIC SIGNAL TIMING PERMIT

PHASE	1	2	3	4					
APPROACH	WB-Left	WB-Thru	NB-Thru	EB-Thru					
MINIMUM GREEN	10.0	15.0	10.0	15.0	0.0	0.0	0.0	0.0	
PASSAGE	4.0	5.0	4.0	5.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 1	12.0	35.0	15.0	35.0	0.0	0.0	0.0	0.0	
MAXIMUM NO. 2	30.0	50.0	30.0	50.0	0.0	0.0	0.0	0.0	
YELLOW CHANGE	3.2	3.2	3.1	3.2	3.0	3.0	3.0	3.0	
RED CLEARANCE	2.5	2.5	0.0	2.5	0.0	0.0	0.0	0.0	
WALK	0.0	0.0	7.0	7.0	0.0	0.0	0.0	0.0	
PEDESTRIAN CLEARANCE	0.0	0.0	13.0	14.0	0.0	0.0	0.0	0.0	
EXTENDED PED. CLEARANCE	0	0	2	2	0	0	0	0	
WALK OFFSET TIME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
WALK OFFSET MODE (0=Advanced, 1=Delayed)	0	0	0	0	0	0	0	0	
NON-LOCK MEMORY	0	0	0	0	0	0	0	0	
DUAL ENTRY	0	0	0	0	0	0	0	0	
INITIALIZATION	1	4	1	4	0	0	0	0	
NON-ACT RESPONSE	0	1	0	2	0	1	0	2	
VEHICLE RECALL	2	2	2	2	0	0	0	0	
PEDESTRIAN RECALL	0	0	0	2	0	0	0	0	

		CYCLE								O1	O2	O3
DIAL 1	SPLIT 1	70	17	45	22	31	0	0	0	0	63	0	0
DIAL 1	SPLIT 2	80	17	55	22	41	0	0	0	0	71	0	0
DIAL 1	SPLIT 3	90	17	65	22	51	0	0	0	0	70	0	0
DIAL 3	SPLIT 1	90	17	65	22	51	0	0	0	0	70	0	0
DIAL 3	SPLIT 3	90	17	65	22	51	0	0	0	0	70	0	0
DIAL 4	SPLIT 3	100	20	71	29	51	0	0	0	0	70	0	98
MODE			3	1	7	1	0	0	0	0			

Phase

4	Huron	EB-Thru
1	Huron	WB-Left
2	Huron	WB-Thru
3	Fletcher	NB-Thru

Weekend TBC

1	00:01	Flash
1	06:30	D1/S1/O1
1	10:00	D1/S3/O1
1	19:00	D1/S1/O1
7	00:01	Flash
7	06:30	D1/S1/O1
7	10:00	D1/S3/O1
7	19:00	D1/S2/O1

Weekday TBC

2	00:01	Flash
2	06:30	D1/S3/O1
2	09:00	D1/S2/O1
2	15:15	D1/S3/O1
2	18:30	D1/S1/O1

RR PRE-EMPT ☐

FIRE PRE-EMPT ☐

NOTES / REMARKS

EPAC type controller

WB LEFT TURN:
Permissive with Phase 4
Protected with Phase 1
(4th level arrow indication)

PREPARED BY: City of AA

DATE: Mar 16 2015

CONFLICT FLASH	RED	AMBER	DARK
Fletcher	X		
Huron	X		

FLASH SCHEDULE DAILY [X] NONE [ ]

(TIME & DAY) Midnight - 6:30AM

NIGHT FLASH

Location # 6

Fletcher & Huron

CITY/TWP: City of Ann Arbor

COUNTY: Washtenaw

MILE POINT	CONTROL SECTION-SPOT #:
00.58	81072-01-024

APPENDIX VII – SIMTRAFFIC TABLES

Simulation Results - Existing and Build-out

Weekday AM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Ann Street Intersection - Performance By Approach

		Existing Scenario								Build-Out Scenario (Existing Signal Timing)							
Movement		EB	EB	WB	WB	NB	SB	SB	SB	EB	EB	WB	WB	NB	SB	SB	SB
Directions Served		L	TR	L	R	TR	L	T	T	L	TR	L	R	TR	L	T	T
MOE	Maximum Queue Length (ft)	70	159	109	85	210	146	98	84	67	105	107	86	198	153	117	54
	Average Queue Length (ft)	27	66	45	36	75	57	19	18	30	62	48	31	72	64	22	11
	95th Percentile Queue Length (ft)	63	125	92	71	160	110	61	58	60	103	93	64	148	124	76	37
	Travel Time (veh-hr)	1.6		1.1		2.1	1.7			1.4		1.1		2.2	2		
	Total Delay (veh-hr)	1.2		0.7		0.9	1			1.2		0.8		0.9	1.2		
	Total Stops	112		116		112	149			134		119		116	161		
	Average Speed (mph)	8		7		13	13			2		7		13	11		

Simulation Results - Existing and Build-out

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Glen Avenue and Catherine Street Intersection - Performance By Approach

		Existing Scenario								Build-Out Scenario (Existing Signal Timing)							
Movement		EB	WB	WB	WB	NB	NB	SB	SB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served		LTR	L	TR	R	L	T	T	TR	LTR	L	TR	R	L	T	T	TR
MOE	Maximum Queue Length (ft)	132	130	196	129	96	206	271	238	134	113	201	153	101	208	246	218
	Average Queue Length (ft)	51	50	90	39	33	167	129	89	45	37	93	36	37	162	136	97
	95th Percentile Queue Length (ft)	103	109	159	98	75	213	225	175	102	82	169	102	83	217	228	182
	Travel Time (veh-hr)	1.1	2.9			4		5		0.9	3			4.2		5.4	
	Total Delay (veh-hr)	0.8	2.5			3.4		3.2		0.7	2.6			3.6		3.5	
	Total Stops	60	187			296		347		54	186			306		369	
	Average Speed (mph)	6	4			5		11		6	4			4		11	

Simulation Results - Existing and Build-out

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Glen Avenue and Huron Street Intersection - Performance By Approach

		Existing Scenario									Build-Out Scenario (Existing Signal Timing)								
Movement		EB	EB	EB	WB	WB	WB	SB	SB	SB	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served		L	T	T	T	T	R	L	L	R	L	T	T	T	T	R	L	L	R
MOE	Maximum Queue Length (ft)	200	405	394	271	265	135	158	226	215	200	399	416	320	302	135	160	226	209
	Average Queue Length (ft)	186	311	220	169	140	80	98	107	78	195	359	247	195	161	89	104	120	96
	95th Percentile Queue Length (ft)	238	492	412	247	226	150	155	179	160	230	468	452	287	263	159	163	202	170
	Travel Time (veh-hr)	15.9			7.9			4.6			18.9			9.3			5.5		
	Total Delay (veh-hr)	12.8			4.6			3.1			15.8			5.7			3.8		
	Total Stops	912			586			406			990			683			468		
	Average Speed (mph)	5			10			7			4			9			7		

Simulation Results - Existing and Build-out

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Fletcher and Huron Street Intersection - Performance by Approach

		Existing Scenario							Build-Out Scenario (Existing Signal Timing)						
Movement		**EB**	**EB**	**WB**	**WB**	**WB**	**NB**	**NB**	**EB**	**EB**	**WB**	**WB**	**WB**	**NB**	**NB**
Directions Served		**T**	**TR**	**L**	**T**	**T**	**L**	**R**	**T**	**TR**	**L**	**T**	**T**	**L**	**R**
MOE	**Maximum Queue Length (ft)**	295	309	197	182	172	94	260	297	322	199	336	288	108	275
	Average Queue Length (ft)	238	208	115	40	51	27	121	259	221	145	103	77	28	108
	95th Percentile Queue Length (ft)	357	349	202	148	118	72	242	359	378	233	319	243	76	228
	Travel Time (veh-hr)	10.7		5.3			3.2		13.6		7.4			2.9	
	Total Delay (veh-hr)	8.4		2.9			2.9		11.3		4.7			2.7	
	Total Stops	594		231			94		667		302			88	
	Average Speed (mph)	6		12			2		5		10			2	

Simulation Results - Existing and Build-out

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)					
Ingalls Street and Ann Street Intersection - Performance By Approach					
		Existing Scenario		Build-Out Scenario (Existing Signal Timing)	
Movement		EB	NB	EB	NB
Directions Served		LT	TR	LT	TR
MOE	Maximum Queue Length (ft)	106	89	104	83
	Average Queue Length (ft)	51	46	57	52
	95th Percentile Queue Length (ft)	84	74	86	75
	Travel Time (veh-hr)	1.5	0.7	1.9	0.8
	Total Delay (veh-hr)	0.6	0.4	0.8	0.5
	Total Stops	274	243	339	278
	Average Speed (mph)	17	10	17	10

Simulation Results - Existing and Build-out

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)

Huron and Ingalls Intersection-Performance by Approach

Movement		Existing Scenario				Build-Out Scenario (Existing Signal Timing)			
		EB	EB	WB	WB	EB	EB	WB	WB
Directions Served		LT	T	T	TR	LT	T	T	TR
MOE	Maximum Queue Length (ft)	453	432	23	46	525	519	16	38
	Average Queue Length(ft)	272	210	1	2	403	363	1	2
	95th Percentile Queue Length(ft)	581	568	16	18	661	692	8	18
	Travel Time (veh-hr)	26.3		1.6		71.8		1.8	
	Total Delay (veh-hr)	9.3		0.2		16.7		0.2	
	Total Stops	603		1		832		3	
	Average Speed (mph)	9		25		5		24	

Simulation Results - Build-out Scenario

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)				
Ann Street and Glen Hotel Driveway -Performance by Approach				
Movement		Build-out Scenario		
		EB	EB	SB
Directions Served		LT	T	L
MOE	Maximum Queue Length (ft)	39	48	97
	Average Queue Length(ft)	2	6	40
	95th Percentile Queue Length(ft)	22	30	81
	Travel Time (veh-hr)	0.8		0.6
	Total Delay (veh-hr)	0.2		0.5
	Total Stops	13		64
	Average Speed (mph)	23		2

Simulation Results - Existing and Build-out

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour SImulation)

Glen Avenue and Ann Street Intersection - Performance By Approach

Movement		Existing Scenario								Build-Out Scenario (Existing Signal Timing)							
		EB	EB	WB	WB	NB	SB	SB	SB	EB	EB	WB	WB	NB	SB	SB	SB
Directions Served		L	TR	L	R	TR	L	T	T	L	TR	L	R	TR	L	T	T
MOE	Maximum Queue Length (ft)	60	89	120	242	223	78	140	170	59	89	120	218	238	119	141	155
	Average Queue Length (ft)	16	32	77	62	90	31	43	49	24	43	77	58	106	42	48	49
	95th Percentile Queue Length (ft)	47	70	125	163	182	66	105	119	53	75	124	145	211	94	116	117
	Travel Time (veh-hr)	0.7		2.9		2.3	2.1			0.8		2.8		2.7	2.6		
	Total Delay (veh-hr)	0.4		2		1.1	1.4			0.6		1.9		1.5	1.8		
	Total Stops	56		199		133	172			101		205		167	206		
	Average Speed (mph)	10		6		11	12			3		7		10	10		

Simulation Results - Existing and Build-out

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Catherine Street Intersection - Performance By Approach

Movement		Existing Scenario								Build-Out Scenario (Existing Signal Timing)							
		EB	WB	WB	WB	NB	NB	SB	SB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served		LTR	L	TR	R	L	T	T	TR	LTR	L	TR	R	L	T	T	TR
MOE	Maximum Queue Length (ft)	218	106	159	117	99	190	236	288	198	120	176	127	129	189	233	277
	Average Queue Length (ft)	110	37	93	60	31	131	111	156	101	45	94	65	30	158	116	151
	95th Percentile Queue Length (ft)	189	80	149	103	74	206	196	260	181	95	152	111	79	222	198	241
	Travel Time (veh-hr)	2.8	3.9			3.1		6.6		2.5	4.2			4.3		6.8	
	Total Delay (veh-hr)	2.2	3.1			2.4		4.6		2	3.3			3.5		4.7	
	Total Stops	143	256			240		444		134	269			283		443	
	Average Speed (mph)	5	5			7		10		5	5			5		10	

Simulation Results - Existing and Build-out

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Huron Street Intersection - Performance By Approach

Movement		Existing Scenario									Build-Out Scenario (Existing Signal Timing)								
		EB	EB	EB	WB	WB	WB	SB	SB	SB	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served		L	T	T	T	T	R	L	L	R	L	T	T	T	T	R	L	L	R
MOE	Maximum Queue Length (ft)	196	327	273	453	459	135	160	248	223	199	342	297	483	489	135	160	258	231
	Average Queue Length (ft)	131	143	122	264	254	115	93	118	114	130	135	120	312	304	122	104	133	120
	95th Percentile Queue Length (ft)	213	301	244	437	444	170	158	207	198	215	250	213	504	517	168	170	226	214
	Travel Time (veh-hr)	7.6			18.1			66			7.5			23			7.4		
	Total Delay (veh-hr)	5.4			11.4			4.2			5.3			14.6			4.7		
	Total Stops	508			1079			488			494			1281			536		
	Average Speed (mph)	8			7			8			8			6			8		

Simulation Results - Existing and Build-out

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Fletcher and Huron Street Intersection - Performance By Approach

Movement		Existing Scenario							Build-Out Scenario (Existing Signal Timing)						
		EB	EB	WB	WB	WB	NB	NB	EB	EB	WB	WB	WB	NB	NB
Directions Served		T	TR	L	T	T	L	R	T	TR	L	T	T	L	R
MOE	Maximum Queue Length (ft)	280	258	147	151	164	346	301	226	194	143	141	140	384	375
	Average Queue Length (ft)	163	124	55	63	75	195	133	86	56	63	46	50	345	298
	95th Percentile Queue Length (ft)	278	238	111	132	142	374	279	208	147	115	121	125	374	451
	Travel Time (veh-hr)	5.2		6.2			9.9		2.9		6.2			55.5	
	Total Delay (veh-hr)	3.7		2.2			8		1.4		2			21	
	Total Stops	378		257			266		186		234			213	
	Average Speed (mph)	8		17			2		15		18			1	

Simulation Results - Existing and Build-out

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)					
Ingalls and Ann Street Intersection - Performance By Approach					
Movement		Existing Scenario		Build-Out Scenario (Existing Signal Timing)	
		EB	NB	EB	NB
Directions Served		LT	TR	LT	TR
MOE	Maximum Queue Length (ft)	67	55	103	58
	Average Queue Length (ft)	39	33	48	34
	95th Percentile Queue Length(ft)	60	47	79	50
	Travel Time (veh-hr)	0.5	0.2	1	0.3
	Total Delay (veh-hr)	0.2	0.1	0.4	0.2
	Total Stops	111	96	188	133
	Average Speed (mph)	19	12	18	11

Simulation Results - Existing and Build-out

Weekday PM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)

Huron and Ingalls Intersection-Performance by Approach

Movement		Existing Scenario				Build-Out Scenario (Existing Signal Timing)			
		EB	EB	WB	WB	EB	EB	WB	WB
Directions Served		LT	T	T	TR	LT	T	T	TR
MOE	Maximum Queue Length (ft)	223	145	10	38	256	197	15	48
	Average Queue Length(ft)	64	6	0	1	69	10	1	4
	95th Percentile Queue Length(ft)	166	60	7	13	176	82	10	25
	Travel Time (veh-hr)	3		3.3		3		3.5	
	Total Delay (veh-hr)	0.7		0.5		0.7		0.5	
	Total Stops	96		3		100		7	
	Average Speed (mph)	22		24		23		24	

Simulation Results - Build-out Scenario

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour SImulation)				
Ann Street and Glen Hotel Driveway - Performance By Approach				
Movement		Build-out Scenario		
		EB	EB	SB
Directions Served		LT	T	L
MOE	Maximum Queue Length (ft)	_	8	113
	Average Queue Length (ft)	_	0	41
	95th Percentile Queue Length (ft)	_	4	78
	Travel Time (veh-hr)	0.6		0.5
	Total Delay (veh-hr)	0.1		0.4
	Total Stops	1		80
	Average Speed (mph)	23		4

Simulation Results - Existing and Build-out Optimized

Weekday AM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Ann Street Intersection - Performance By Approach

		Existing Scenario								Build-Out Scenario (Optimized)							
Movement		**EB**	**EB**	**WB**	**WB**	**NB**	**SB**	**SB**	**SB**	**EB**	**EB**	**WB**	**WB**	**NB**	**SB**	**SB**	**SB**
Directions Served		**L**	**TR**	**L**	**R**	**TR**	**L**	**T**	**T**	**L**	**TR**	**L**	**R**	**TR**	**L**	**T**	**T**
MOE	**Maximum Queue Length (ft)**	70	159	109	85	210	146	98	84	82	97	104	87	228	169	122	98
	Average Queue Length (ft)	27	66	45	36	75	57	19	18	29	64	48	34	74	69	24	18
	95th Percentile Queue Length (ft)	63	125	92	71	160	110	61	58	65	105	93	70	159	138	79	59
	Travel Time (veh-hr)	1.6		1.1		2.1	1.7			1.4		1.1		2.3	2.2		
	Total Delay (veh-hr)	1.2		0.7		0.9	1			1.2		0.8		0.9	1.5		
	Total Stops	112		116		112	149			133		117		113	171		
	Average Speed (mph)	8		7		13	13			2		7		13	10		

Simulation Results - Existing and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Glen Avenue and Catherine Street Intersection - Performance By Approach

		Existing Scenario								Build-Out Scenario (Optimized)							
Movement		EB	WB	WB	WB	NB	NB	SB	SB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served		LTR	L	TR	R	L	T	T	TR	LTR	L	TR	R	L	T	T	TR
MOE	Maximum Queue Length (ft)	132	130	196	129	96	206	271	238	115	145	190	136	107	210	288	252
	Average Queue Length (ft)	51	50	90	39	33	167	129	89	48	44	89	39	40	174	144	103
	95th Percentile Queue Length (ft)	103	109	159	98	75	213	225	175	100	105	160	97	82	215	248	192
	Travel Time (veh-hr)	1.1	2.9			4		5		1	3.1			4.6		5.5	
	Total Delay (veh-hr)	0.8	2.5			3.4		3.2		0.7	2.6			3.9		3.6	
	Total Stops	60	187			296		347		57	192			321		376	
	Average Speed (mph)	6	4			5		11		6	4			4		11	

Simulation Results - Existing and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Glen Avenue and Huron Street Intersection - Performance By Approach

		Existing Scenario									Build-Out Scenario (Optimized)								
Movement		EB	EB	EB	WB	WB	WB	SB	SB	SB	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served		L	T	T	T	T	R	L	L	R	L	T	T	T	T	R	L	L	R
MOE	Maximum Queue Length (ft)	200	405	394	271	265	135	158	226	215	200	394	401	378	357	135	160	252	184
	Average Queue Length (ft)	186	311	220	169	140	80	98	107	78	189	315	239	214	189	102	112	134	84
	95th Percentile Queue Length (ft)	238	492	412	247	226	150	155	179	160	231	481	425	326	315	169	173	230	159
	Travel Time (veh-hr)	15.9			7.9			4.6			15.7			10.9			5.7		
	Total Delay (veh-hr)	12.8			4.6			3.1			12.5			7.3			3.9		
	Total Stops	912			586			406			979			782			455		
	Average Speed (mph)	5			10			7			5			8			7		

Simulation Results - Existing and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Fletcher and Huron Street Intersection - Performance by Approach

		Existing Scenario							Build-Out Scenario (Optimized)						
Movement		**EB**	**EB**	**WB**	**WB**	**WB**	**NB**	**NB**	**EB**	**EB**	**WB**	**WB**	**WB**	**NB**	**NB**
Directions Served		**T**	**TR**	**L**	**T**	**T**	**L**	**R**	**T**	**TR**	**L**	**T**	**T**	**L**	**R**
MOE	**Maximum Queue Length (ft)**	295	309	197	182	172	94	260	293	315	198	317	321	150	290
	Average Queue Length (ft)	238	208	115	40	51	27	121	227	192	122	56	68	25	126
	95th Percentile Queue Length (ft)	357	349	202	148	118	72	242	362	337	212	210	185	88	262
	Travel Time (veh-hr)	10.7		5.3			3.2		9.3		6.2			3.4	
	Total Delay (veh-hr)	8.4		2.9			2.9		6.9		3.4			3	
	Total Stops	594		231			94		568		261			98	
	Average Speed (mph)	6		12			2		7		12			2	

Simulation Results - Existing and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)					
Ingalls and Ann Street Intersection - Performance By Approach					
		Existing Scenario		Build-Out Scenario (Optimized)	
Movement		EB	NB	EB	NB
Directions Served		LT	TR	LT	TR
MOE	Maximum Queue Length (ft)	106	89	114	85
	Average Queue Length (ft)	51	46	60	50
	95th Percentile Queue Length (ft)	84	74	91	74
	Travel Time (veh-hr)	1.5	0.7	1.9	0.8
	Total Delay (veh-hr)	0.6	0.4	0.8	0.5
	Total Stops	274	243	345	284
	Average Speed (mph)	17	10	17	10

Simulation Results - Existing and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)

Huron and Ingalls Intersection-Performance by Approach

Movement		Existing Scenario				Build-Out Scenario Optimized			
		EB	EB	WB	WB	EB	EB	WB	WB
Directions Served		LT	T	T	TR	LT	T	T	TR
MOE	Maximum Queue Length (ft)	453	432	23	46	486	456	7	32
	Average Queue Length(ft)	272	210	1	2	257	167	0	2
	95th Percentile Queue Length(ft)	581	568	16	18	532	491	5	16
	Travel Time (veh-hr)	26.3		1.6		16.4		1.9	
	Total Delay (veh-hr)	9.3		0.2		6.7		0.2	
	Total Stops	603		1		596		4	
	Average Speed (mph)	9		25		11		25	

Simulation Results - Build-out Scenario Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)				
Ann Street and Glen Hotel Driveway -Performance by Approach				
Movement		Build-out Optimized Scenario		
		EB	EB	SB
Directions Served		LT	T	L
MOE	Maximum Queue Length (ft)	31	67	88
	Average Queue Length(ft)	1	7	41
	95th Percentile Queue Length(ft)	15	36	75
	Travel Time (veh-hr)	0.8		0.7
	Total Delay (veh-hr)	0.1		0.6
	Total Stops	17		68
	Average Speed (mph)	23		2

Simulation Results - Existing and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour SImulation)

Glen Avenue and Ann Street Intersection - Performance By Approach

Movement		Existing Scenario								Build-Out Scenario (Optimized)							
		EB	EB	WB	WB	NB	SB	SB	SB	EB	EB	WB	WB	NB	SB	SB	SB
Directions Served		L	TR	L	R	TR	L	T	T	L	TR	L	R	TR	L	T	T
MOE	Maximum Queue Length (ft)	60	89	120	242	223	78	140	170	68	94	120	249	237	103	181	180
	Average Queue Length (ft)	16	32	77	62	90	31	43	49	24	40	82	65	91	37	56	53
	95th Percentile Queue Length (ft)	47	70	125	163	182	66	105	119	55	73	127	167	183	78	138	128
	Travel Time (veh-hr)	0.7		2.9		2.3	2.1			0.8		3.1		2.5	2.8		
	Total Delay (veh-hr)	0.4		2		1.1	1.4			0.6		2.1		1.3	2		
	Total Stops	56		199		133	172			96		225		149	220		
	Average Speed (mph)	10		6		11	12			3		6		10	9		

Simulation Results - Existing and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Catherine Street Intersection - Performance By Approach

Movement		Existing Scenario								Build-Out Scenario (Optimized)							
		EB	WB	WB	WB	NB	NB	SB	SB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served		LTR	L	TR	R	L	T	T	TR	LTR	L	TR	R	L	T	T	TR
MOE	Maximum Queue Length (ft)	218	106	159	117	99	190	236	288	309	98	190	136	95	190	262	294
	Average Queue Length (ft)	110	37	93	60	31	131	111	156	122	41	98	66	29	148	115	154
	95th Percentile Queue Length (ft)	189	80	149	103	74	206	196	260	256	82	161	117	75	216	204	248
	Travel Time (veh-hr)	2.8	3.9			3.1		6.6		3.4	4.3			3.6		6.6	
	Total Delay (veh-hr)	2.2	3.1			2.4		4.6		2.9	3.4			2.9		4.5	
	Total Stops	143	256			240		444		145	268			267		443	
	Average Speed (mph)	5	5			7		10		4	5			6		10	

Simulation Results - Existing and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Huron Street Intersection - Performance By Approach

Movement		Existing Scenario									Build-Out Scenario (Optimized)								
		EB	EB	EB	WB	WB	WB	SB	SB	SB	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served		L	T	T	T	T	R	L	L	R	L	T	T	T	T	R	L	L	R
MOE	Maximum Queue Length (ft)	196	327	273	453	459	135	160	248	223	199	262	218	475	491	135	160	257	240
	Average Queue Length (ft)	131	143	122	264	254	115	93	118	114	130	124	115	301	295	122	113	146	125
	95th Percentile Queue Length (ft)	213	301	244	437	444	170	158	207	198	211	226	186	485	497	169	187	248	214
	Travel Time (veh-hr)	7.6			18.1			66			7.1			20.5			8		
	Total Delay (veh-hr)	5.4			11.4			4.2			4.8			13.9			5.3		
	Total Stops	508			1079			488			507			1234			584		
	Average Speed (mph)	8			7			8			9			6			7		

Simulation Results - Existing and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)															
Fletcher and Huron Street Intersection - Performance By Approach															
Movement		Existing Scenario							Build-Out Scenario (Optimized)						
		EB	EB	WB	WB	WB	NB	NB	EB	EB	WB	WB	WB	NB	NB
Directions Served		T	TR	L	T	T	L	R	T	TR	L	T	T	L	R
MOE	Maximum Queue Length (ft)	280	258	147	151	164	346	301	281	252	183	149	140	360	344
	Average Queue Length (ft)	163	124	55	63	75	195	133	174	126	60	69	78	234	162
	95th Percentile Queue Length (ft)	278	238	111	132	142	374	279	287	237	130	137	137	392	331
	Travel Time (veh-hr)	5.2		6.2			9.9		5		6.6			12.3	
	Total Delay (veh-hr)	3.7		2.2			8		18.5		6.5			123.5	
	Total Stops	378		257			266		375		274			288	
	Average Speed (mph)	8		17			2		8		16			2	

Simulation Results - Existing and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)					
Ingalls and Ann Street Intersection - Performance By Approach					
Movement		Existing Scenario		Build-Out Scenario (Optimized)	
		EB	NB	EB	NB
Directions Served		LT	TR	LT	TR
MOE	Maximum Queue Length (ft)	67	55	114	70
	Average Queue Length (ft)	39	33	52	36
	95th Percentile Queue Length(ft)	60	47	86	56
	Travel Time (veh-hr)	0.5	0.2	1	0.3
	Total Delay (veh-hr)	0.2	0.1	0.4	0.2
	Total Stops	111	96	188	132
	Average Speed (mph)	19	12	18	11

Simulation Results - Existing and Build-out Optimized

Weekday PM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)

Huron and Ingalls Intersection-Performance by Approach

Movement		Existing Scenario				Build-Out Scenario Optimized			
		EB	EB	WB	WB	EB	EB	WB	WB
Directions Served		LT	T	T	TR	LT	T	T	TR
MOE	Maximum Queue Length (ft)	223	145	10	38	234	163	33	52
	Average Queue Length(ft)	64	6	0	1	65	16	2	4
	95th Percentile Queue Length(ft)	166	60	7	13	176	98	17	24
	Travel Time (veh-hr)	3		3.3		3		3.6	
	Total Delay (veh-hr)	0.7		0.5		0.7		0.5	
	Total Stops	96		3		98		8	
	Average Speed (mph)	22		24		23		24	

Simulation Results - Build-out Scenario Optimized

Weekday PM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)				
Ann Street and Glen Hotel Driveway -Performance by Approach				
Movement		Build-out Optimized Scenario		
		EB	EB	SB
Directions Served		LT	T	L
MOE	Maximum Queue Length (ft)	24	21	112
	Average Queue Length(ft)	1	1	43
	95th Percentile Queue Length(ft)	13	10	85
	Travel Time (veh-hr)	0.6		0.5
	Total Delay (veh-hr)	0.1		0.4
	Total Stops	4		76
	Average Speed (mph)	23		3

Simulation Results - Background and Build-out Optimized

Weekday AM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Ann Street Intersection - Performance By Approach

		Background Scenario								Build-Out Scenario (Optimized)							
Movement		**EB**	**EB**	**WB**	**WB**	**NB**	**SB**	**SB**	**SB**	**EB**	**EB**	**WB**	**WB**	**NB**	**SB**	**SB**	**SB**
Directions Served		**L**	**TR**	**L**	**R**	**TR**	**L**	**T**	**T**	**L**	**TR**	**L**	**R**	**TR**	**L**	**T**	**T**
MOE	**Maximum Queue Length (ft)**	74	142	112	98	208	157	66	74	82	97	104	87	228	169	122	98
	Average Queue Length (ft)	24	64	52	37	80	68	18	15	29	64	48	34	74	69	24	18
	95th Percentile Queue Length (ft)	61	123	102	77	166	130	52	50	65	105	93	70	159	138	79	59
	Travel Time (veh-hr)	1.6		1.3		2.2	1.9			1.4		1.1		2.3	2.2		
	Total Delay (veh-hr)	1.1		0.9		0.9	1.2			1.2		0.8		0.9	1.5		
	Total Stops	111		131		114	157			133		117		113	171		
	Average Speed (mph)	8		7		13	12			2		7		13	10		

Simulation Results - Background and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Glen Avenue and Catherine Street Intersection - Performance By Approach

		Background Scenario								Build-Out Scenario (Optimized)							
Movement		**EB**	**WB**	**WB**	**WB**	**NB**	**NB**	**SB**	**SB**	**EB**	**WB**	**WB**	**WB**	**NB**	**NB**	**SB**	**SB**
Directions Served		**LTR**	**L**	**TR**	**R**	**L**	**T**	**T**	**TR**	**LTR**	**L**	**TR**	**R**	**L**	**T**	**T**	**TR**
MOE	**Maximum Queue Length (ft)**	121	122	197	144	152	206	300	243	115	145	190	136	107	210	288	252
	Average Queue Length (ft)	46	42	92	38	44	160	149	94	48	44	89	39	40	174	144	103
	95th Percentile Queue Length (ft)	99	94	166	101	104	212	253	180	100	105	160	97	82	215	248	192
	Travel Time (veh-hr)	1	3			4.2		5.4		1	3.1			4.6		5.5	
	Total Delay (veh-hr)	0.7	2.6			3.6		3.5		0.7	2.6			3.9		3.6	
	Total Stops	55	185			303		367		57	192			321		376	
	Average Speed (mph)	6	4			4		11		6	4			4		11	

Simulation Results - Background and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)

Glen Avenue and Huron Street Intersection - Performance By Approach

		Background Scenario									Build-Out Scenario (Optimized)								
Movement		EB	EB	EB	WB	WB	WB	SB	SB	SB	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served		L	T	T	T	T	R	L	L	R	L	T	T	T	T	R	L	L	R
MOE	Maximum Queue Length (ft)	200	391	412	297	273	135	160	246	212	200	394	401	378	357	135	160	252	184
	Average Queue Length (ft)	195	355	225	175	145	84	98	115	89	189	315	239	214	189	102	112	134	84
	95th Percentile Queue Length (ft)	224	466	415	259	231	152	159	201	171	231	481	425	326	315	169	173	230	159
	Travel Time (veh-hr)	18.2			8.3			4.9			15.7			10.9			5.7		
	Total Delay (veh-hr)	15.2			4.9			3.3			12.5			7.3			3.9		
	Total Stops	972			623			423			979			782			455		
	Average Speed (mph)	4			10			7			5			8			7		

Simulation Results - Background and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)															
Fletcher and Huron Street Intersection - Performance by Approach															
		Background Scenario							Build-Out Scenario (Optimized)						
Movement		EB	EB	WB	WB	WB	NB	NB	EB	EB	WB	WB	WB	NB	NB
Directions Served		T	TR	L	T	T	L	R	T	TR	L	T	T	L	R
MOE	Maximum Queue Length (ft)	296	317	199	303	246	110	269	293	315	198	317	321	150	290
	Average Queue Length (ft)	265	218	120	63	55	28	125	227	192	122	56	68	25	126
	95th Percentile Queue Length (ft)	344	362	211	230	160	76	242	362	337	212	210	185	88	262
	Travel Time (veh-hr)	13.2		6			3.2		9.3		6.2			3.4	
	Total Delay (veh-hr)	11		3.4			2.9		6.9		3.4			3	
	Total Stops	616		258			102		568		261			98	
	Average Speed (mph)	5		11			2		7		12			2	

Simulation Results - Background and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour Simulation)					
Ingalls and Ann Street Intersection - Performance By Approach					
		Background Scenario		Build-Out Scenario (Optimized)	
Movement		EB	NB	EB	NB
Directions Served		LT	TR	LT	TR
MOE	Maximum Queue Length (ft)	92	93	114	85
	Average Queue Length (ft)	52	49	60	50
	95th Percentile Queue Length (ft)	76	79	91	74
	Travel Time (veh-hr)	1.5	0.7	1.9	0.8
	Total Delay (veh-hr)	0.6	0.4	0.8	0.5
	Total Stops	278	252	345	284
	Average Speed (mph)	17	10	17	10

Simulation Results - Background and Build-out Optimized

Weekday AM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)

Huron and Ingalls Intersection-Performance by Approach

Movement		Background Scenario				Build-Out Scenario Optimized			
		EB	EB	WB	WB	EB	EB	WB	WB
Directions Served		LT	T	T	TR	LT	T	T	TR
MOE	Maximum Queue Length (ft)	534	519	36	_	486	456	7	32
	Average Queue Length(ft)	410	381	2	_	257	167	0	2
	95th Percentile Queue Length(ft)	680	696	16	_	532	491	5	16
	Travel Time (veh-hr)	81.4		1.7		16.4		1.9	
	Total Delay (veh-hr)	16.4		0.2		6.7		0.2	
	Total Stops	811		2		596		4	
	Average Speed (mph)	5		25		11		25	

Simulation Results - Background and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour SImulation)

Glen Avenue and Ann Street Intersection - Performance By Approach

Movement		Background Scenario								Build-Out Scenario (Optimized)							
		EB	EB	WB	WB	NB	SB	SB	SB	EB	EB	WB	WB	NB	SB	SB	SB
Directions Served		L	TR	L	R	TR	L	T	T	L	TR	L	R	TR	L	T	T
MOE	Maximum Queue Length (ft)	65	100	119	205	249	93	162	183	68	94	120	249	237	103	181	180
	Average Queue Length (ft)	17	33	81	60	109	36	51	55	24	40	82	65	91	37	56	53
	95th Percentile Queue Length (ft)	49	74	125	155	214	74	122	124	55	73	127	167	183	78	138	128
	Travel Time (veh-hr)	0.7		3		2.6	2.4			0.8		3.1		2.5	2.8		
	Total Delay (veh-hr)	0.4		2		1.4	1.6			0.6		2.1		1.3	2		
	Total Stops	57		208		160	197			96		225		149	220		
	Average Speed (mph)	10		7		10	11			3		6		10	9		

Simulation Results - Background and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Catherine Street Intersection - Performance By Approach

Movement		Background Scenario								Build-Out Scenario (Optimized)							
		EB	WB	WB	WB	NB	NB	SB	SB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served		LTR	L	TR	R	L	T	T	TR	LTR	L	TR	R	L	T	T	TR
MOE	Maximum Queue Length (ft)	294	122	190	136	75	194	258	269	309	98	190	136	95	190	262	294
	Average Queue Length (ft)	133	41	100	61	24	147	120	150	122	41	98	66	29	148	115	154
	95th Percentile Queue Length (ft)	258	90	164	111	61	215	205	241	256	82	161	117	75	216	204	248
	Travel Time (veh-hr)	3.7	4.2			3.6		6.5		3.4	4.3			3.6		6.6	
	Total Delay (veh-hr)	3.1	3.3			2.9		4.5		2.9	3.4			2.9		4.5	
	Total Stops	152	266			258		440		145	268			267		443	
	Average Speed (mph)	4	5			6		10		4	5			6		10	

Simulation Results - Background and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Glen Avenue and Huron Street Intersection - Performance By Approach

Movement		Background Scenario									Build-Out Scenario (Optimized)								
		EB	EB	EB	WB	WB	WB	SB	SB	SB	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served		L	T	T	T	T	R	L	L	R	L	T	T	T	T	R	L	L	R
MOE	Maximum Queue Length (ft)	200	346	306	464	470	135	159	262	236	199	262	218	475	491	135	160	257	240
	Average Queue Length (ft)	142	158	138	277	270	119	102	126	110	130	124	115	301	295	122	113	146	125
	95th Percentile Queue Length (ft)	225	320	269	449	461	170	170	219	187	211	226	186	485	497	169	187	248	214
	Travel Time (veh-hr)	8.6			17.9			6.8			7.1			20.5			8		
	Total Delay (veh-hr)	6.4			12.3			4.3			4.8			13.9			5.3		
	Total Stops	545			1154			490			507			1234			584		
	Average Speed (mph)	7			7			8			9			6			7		

Simulation Results - Background and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)

Fletcher and Huron Street Intersection - Performance By Approach

Movement		Background Scenario							Build-Out Scenario (Optimized)						
		EB	EB	WB	WB	WB	NB	NB	EB	EB	WB	WB	WB	NB	NB
Directions Served		T	TR	L	T	T	L	R	T	TR	L	T	T	L	R
MOE	Maximum Queue Length (ft)	282	269	171	154	150	333	330	281	252	183	149	140	360	344
	Average Queue Length (ft)	165	120	59	60	74	194	131	174	126	60	69	78	234	162
	95th Percentile Queue Length (ft)	271	232	123	125	138	355	268	287	237	130	137	137	392	331
	Travel Time (veh-hr)	4.9		6.3			9		5		6.6			12.3	
	Total Delay (veh-hr)	3.5		2.4			8.1		18.5		6.5			123.5	
	Total Stops	367		263			266		375		274			288	
	Average Speed (mph)	8		16			2		8		16			2	

Simulation Results - Background and Build-out Optimized

Weekday PM Peak Hour - By Approach (SimTraffic Output - One Hour Simulation)					
Ingalls and Ann Street Intersection - Performance By Approach					
Movement		Background Scenario		Build-Out Scenario (Optimized)	
		EB	NB	EB	NB
Directions Served		LT	TR	LT	TR
MOE	Maximum Queue Length (ft)	82	49	114	70
	Average Queue Length (ft)	40	31	52	36
	95th Percentile Queue Length(ft)	64	46	86	56
	Travel Time (veh-hr)	0.6	0.2	1	0.3
	Total Delay (veh-hr)	0.2	0.1	0.4	0.2
	Total Stops	119	89	188	132
	Average Speed (mph)	19	12	18	11

Simulation Results - Background and Build-out Optimized

Weekday PM Peak Hour - By Approach (Sim Traffic Output - One Hour SImulation)

Huron and Ingalls Intersection-Performance by Approach

Movement		Background Scenario				Build-Out Scenario Optimized			
		EB	EB	WB	WB	EB	EB	WB	WB
Directions Served		LT	T	T	TR	LT	T	T	TR
MOE	Maximum Queue Length (ft)	199	103	20	43	234	163	33	52
	Average Queue Length(ft)	50	4	1	2	65	16	2	4
	95th Percentile Queue Length(ft)	136	45	11	16	176	98	17	24
	Travel Time (veh-hr)	2.8		3.4		3		3.6	
	Total Delay (veh-hr)	0.5		0.5		0.7		0.5	
	Total Stops	75		4		98		8	
	Average Speed (mph)	24		24		23		24	

APPENDIX VIII – EXISTING PARKING SPACE LEASE AGREEMENT FOR ANGELO'S RESTAURANT

ASSIGNMENT AND ASSUMPTION OF LEASE

KNOW ALL PERSONs that GLEN ANN PLACE LLC, a Michigan limited liability company **("Assignor")**, in consideration of Ten ($10.00) Dollars and other good and valuable consideration, received from Catherine Ann Development Company, a Michigan limited liability company **("Assignee")**, does hereby assign, transfer and deliver unto Assignee, all of its right, title and interest in and to the Occupancy Agreement and Parking Lease attached hereto as **Schedule A** (the "**Lease**").

TO HAVE AND TO HOLD the same unto Assignee, its successors and assigns, forever, from and after the date hereof, subject to the terms, covenants, conditions and provisions hereof and of said Lease.

AND Assignee does hereby (a) accept the within assignment, (b) assume the performance of all of the terms, covenants and conditions of the said Lease on the part of the Assignor thereunder which are to be performed or arise from and after the date hereof, and (c) indemnify, defend and hold Assignor free and harmless from and against any and all costs, expenses, claims, losses or damages, liabilities and judgments (including reasonable attorneys' fees and disbursements) which Assignor may suffer in respect of any claim arising out of or relating to any default on the part of Assignee to perform said terms, covenants and conditions of the Lease arising with respect to acts or omissions occurring from and after the date hereof.

Assignor does hereby indemnify, defend and hold Assignee free and harmless from and against any and all costs, expenses, claims, losses or damages, liabilities and judgments (including reasonable attorneys' fees and disbursements) which Assignee may suffer in respect of any claim arising out of or relating to any default on the part of Assignor to perform said terms, covenants and conditions of the Lease arising with respect to acts or omissions occurring prior to the date hereof.

This assignment and assumption agreement shall inure to the benefit of Assignee and Assignor and their respective successors and assigns and shall be governed by the laws of the State of Michigan. This assignment and assumption agreement may not be modified, altered or amended, or its terms waived, except by an instrument in writing signed by the parties hereto.

None of the provisions of this instrument are intended to be, nor shall they be construed to be, for the benefit of any third party.

SIGNATURE PAGE TO

ASSIGNMENT AND ASSUMPTION OF LEASE

IN WITNESS WHEREOF, Assignor and Assignee have only executed this assignment and assumption agreement this 11 day of March, 2014.

"ASSIGNOR"

GLEN ANN PLACE LLC,
a Michigan limited liability company

By: JFA Management LLC, an Illinois limited liability company, its Manager

By: _____
One of its Managers

SIGNATURE PAGE TO

ASSIGNMENT AND ASSUMPTION OF LEASE

"ASSIGNEE"

CATHERINE ANN DEVELOPMENT COMPANY LLC, a Michigan limited liability company

By: _____

Name: Craig Strasser

Its: Authorized Representative

SCHEDULE A

PARKING SPACE LEASE AGREEMENT

THIS LEASE, made and entered into this 23rd day of January, 2006 (the "Effective Date") by and between **Glen Ann Place LLC**, of 220 North Smith Street, Suite 300, Palatine, Illinois 60067 (hereinafter "Lessor"), and **Stephen Vangelatos and Patricia Vangelatos**, of 1100 E. Catherine, Ann Arbor, Michigan 48104 (hereinafter "Lessee").

WITNESSETH:

WHEREAS, simultaneously upon execution hereof, Lessor shall have purchased that certain real property located in Ann Arbor, Michigan legally described on Exhibit A attached hereto (the "Property") from Lessee;

WHEREAS, Lessor intends to construct various improvements on the Property (the "Project"), including a parking facility (the "Parking Area") to serve, inter alia, the occupants and guests of the commercial, retail, office and residential improvements on the Project;

WHEREAS, Lessee desires to lease, on a non-exclusive basis, eight (8) unassigned parking spaces within the Parking Area, once it is constructed (the "Premises");

WHEREAS, Lessor desires to lease, on a non-exclusive basis, the Premises, once constructed, to Lessee;

NOW, THEREFORE, in consideration of the Premises and the mutual covenants hereinafter contained, Lessor and Lessee hereby agree as follows;

1. **DEMISE OF PREMISES**. For and in consideration of the rent herein reserved to be paid and the covenants to be kept and performed by Lessee, Lessor hereby leases, lets and demises the Premises unto Lessee, subject to all easements, rights-of-way, encumbrances and other restrictions, if any, of record.

2. **COMMENCEMENT DATE**. This Lease shall commence as of one day after the date the Lessee receives Lessor's notice that the Parking Area construction is completed or Lessee receives notice from Lessor of the availability of the Premises for parking, and Lessor has provided any necessary passkeys, access cards, codes or stickers to Lessee (the "Commencement Date").

3. **TERM**. The term of this Lease shall be twenty (20) years, commencing as of the Commencement Date (the "Term") and ending on the Termination Date (the "Termination Date"), unless sooner terminated pursuant to the terms hereof. Lessor and Lessee shall execute a letter confirming the Commencement Date and the Termination Date, within ten (10) days of the Commencement Date or unless renewed pursuant to Paragraph 21 and 22, below.

4. **RENT**. Rent shall be paid on the first (1st) day of each month, in advance, without demand or set off, in accordance with the following schedule:

Lease Year	Monthly Rent	Annual Rent
1	$320.08	$3,841.00
2	$329.69	$3,956.23
3	$339.58	$4,074.92
4	$349.76	$4,197.17
5	$360.26	$4,323.09
6	$371.08	$4,452.78
7	$382.20	$4,586.36
8	$393.66	$4,723.95
9	$405.47	$4,865.67
10	$417.64	$5,011.64
11	$430.17	$5,161.99
12	$443.07	$5,316.85
13	$456.36	$5,476,36
14	$470.05	$5,640.64
15	$484.16	$5,809.87
16	$498.48	$5,984.17
17	$513.64	$6,163.70
18	$529.05	$6,348.61
19	$544.92	$6,539.07
20	$561.27	$6,735.24

5. **USE OF PREMISES**. The Premises shall be used solely as parking for passenger vehicles of employees or owners of Vangelatos, Inc. (the "Restaurant Owner"), the owner of the Angelo's Restaurant and/or Angelo's On the Side (the "Restaurant") during the hours of

operation of the Restaurant and shall not be used for any other purpose, without the prior written consent of Lessor. Lessee covenants that they shall not use the Premises or any part thereof, nor suffer or permit the Premises or any part thereof to be used, for any purpose or in any manner in violation of any valid and applicable law, ordinance, rule or regulation of any federal, state, local or other governmental entity having jurisdiction over the Premises. Lessee shall provide to Lessor, from time to time during the Term, as extended if applicable, the names of all eligible employees who may use the Premises, along with their respective license plate numbers and model and make of their vehicles. If the Parking Area is a gated facility, as contemplated by Lessor, Lessor shall provide eight (8) pass keys to Lessee, without cost, on the Commencement Date hereof. Thereafter, if Lessee or its employees require replacement pass keys, Lessee shall be responsible for all costs associated therewith. Within five (5) days after the termination of this Lease for any reason, Lessee shall return all eight (8) pass keys to Lessor, failing which Lessee shall pay to Lessor a replacement fee of One Hundred and 00/100 Dollars ($100.00) per card Lessee fails to so deliver. Lessee shall further comply with any and all rules and regulations established by the Lessor for the Project and/or the Parking Area.

6. **REPAIRS**. Lessor shall, at its sole cost and expense, keep and maintain the Premises and the Property in good repair. Lessee acknowledges and agrees that Lessor may with at least five (5) days written notice to Lessee, periodically close all or a portion of the Project, including the Parking Area, for maintenance and repair, including restriping, seal coating and other maintenance. Lessor shall pursue the completion of such maintenance and repair with due diligence, and in a commercially reasonable manner, to minimize disruption to Lessee.

7. **TAXES AND ASSESSMENTS**. All real and personal property taxes and assessments, general or special, and all other taxes, imposts, assessments or other changes of any kind or character whatsoever which at any time during the term of this Lease may be assessed, levied, or imposed upon or in respect of the Premises, or any part thereof or any estate, right or interest therein, shall be paid by Lessor as the same become due.

8. **LIABILITY INSURANCE**. At all times during the continuation of this Lease, Lessee (or the Restaurant Owner) shall, at its sole cost and expense, keep and maintain public liability and property damage insurance in full force and effect which will insure against any loss or damage suffered or sustained by any third party or Lessor on or about the Premises from any cause or condition created by the Lessee or its employees, in substantially the same form as attached hereto as Exhibit C. Each policy of insurance maintained by Lessee pursuant to this Paragraph 8 shall name the following as additional insured:

> Glen Ann Place LLC, TBM GAP LLC, Freed Glen Ann LLC, JFA Management LLC, Joseph Freed and Associates LLC and the partners, members, managers, officers, directors, agents and employees of all of the foregoing and any successor or assignee thereof and of any member of such partners, members, managers, officers, agents and employees and any successor or assignee thereof.

From time to time during the Term of this Lease, Lessee shall increase the amount of insurance coverage provided in connection with this Paragraph 8 and add or remove additional insureds, as reasonably requested by the Lessor.

9. **DAMAGE OR DESTRUCTION**. If, during the Term of this Lease, the Premises or any improvements on the Property thereon shall be damaged or destroyed by the elements or any other cause, Lessee shall give prompt notice thereof to Lessor. Lessor shall, to the extent insurance proceeds are made available to Lessor for same, as speedily as circumstances permit, repair such damage and restore the Premises and Property to their original condition as improved, to the extent permitted by Lessor's mortgagee, if any, and any governmental authority having jurisdiction over same. In the event Lessor is unable to rebuild the Premises or the improvements on the Property, this Lease shall terminate, upon notice from Lessor to Lessee. In no event shall Lessor be liable to Lessee or its employees for any loss or damage to Lessee's or its employees' personal property or vehicles while they are located at the Project.

10. **CONDEMNATION**.

(a) **Effect on Lease**. If a material part of the Parking Area shall be taken by any public authority under power of eminent domain, then this Lease shall terminate as of the date of such taking, and Lessor shall refund to Lessee that portion of any rent paid in advance and not earned as of the date of such taking, together with any rent credits not then recovered by Lessee.

(b) **Ownership of Awards**. All damages awarded for any such taking by any public authority shall be the sole and exclusive property of Lessor, whether such damages shall be awarded as compensation for diminution in value of the leasehold or the fee of the Premises.

11. **MORTGAGES**. Lessor reserves the right to subject and subordinate this Lease to the lien of any mortgage or mortgages now or hereafter placed upon Lessor's interest in the Premises or any part thereof, and Lessee covenants and agrees to execute and deliver to Lessor, within ten (10) days of being requested to do so, any instrument which shall be reasonably demanded by Lessor, or any mortgagee or proposed mortgagee, to subordinate this Lease to the lien of any such mortgage or proposed mortgage, including, but not limited to, the offset statement provided for by Paragraph 20; provided, however, that any such subordination shall provide that Lessee's possession shall not be disturbed, so long as Lessee complies with its obligations under this Lease.

12. **PEACEFUL POSSESSION**. Lessor warrants and covenants that it has full authority to execute this Lease, and that subject to the rights of any mortgagee under any mortgage now or hereafter placed upon the Premises, upon paying rent and performing the covenants and agreements contained in this Lease, Lessee shall have quiet enjoyment and possession, subject to the limitations of this Lease, of the Premises. Lessor acknowledges and agrees that any over commitment of spaces within the Parking Area by the Lessor, which results in the inability of Lessee to use the Premises as contemplated by this Lease, will result in a default of Lessor's covenant to the Lessee of quite enjoyment and possession of the Premises. Notwithstanding anything to the contrary herein, Lessee acknowledges and agrees that Lessor shall have no control over abuses of other tenants of the Property and Lessor shall not have any liability to Lessee by virtue of any tenant of the Property utilizing more spaces within the Property than are allotted to said tenant.

13. **CONDITION OF PREMISES**. Lessee acknowledges and agrees that prior to the Commencement Date, Lessee shall have examined the Premises and knows the condition

thereof, that no representations or warranties as to the condition or state of repairs of the Premises have been made by or on behalf of Lessor which are not herein expressed, and that Lessee accepts the Premises in their condition as of the Commencement Date.

14. **ASSIGNMENT**. It is expressly acknowledged and agreed by Lessor and Lessee that this Lease and Lessee's leasehold interest in the Premises may be assigned in whole upon prior written notice to Lessor; but only if such assignment is made in connection with the sale of the Restaurant or the sale of substantially all of the assets of the restaurant to a purchaser which occupies and operates the Restaurant property as a restaurant. In order for such assignment to be effect, Lessee must provide Lessor written notice of said assignment, along with an assignment of Lease executed by the Assignee whereby Assignee assumes all of Lessee's obligation under this Lease. Said notice shall include a list of employees utilizing the Parking Spaces in the form required by Paragraph 5 above. Otherwise, Lessee shall not assign or sublet, in whole or in part, this Lease or Lessee's leasehold interest in the Premises without the prior written consent of the Lessor, which may be withheld in Lessor's sole discretion. No assignment or subletting by Lessee shall operate in any manner whatsoever to relieve or discharge Lessee from its obligations under this Lease unless Lessor shall otherwise expressly and specifically so agree in writing.

15. **DEFAULT**.

(a) **Events of Default**. Upon the occurrence of any of the following events (hereinafter individually an "Event of Default"), Lessee shall be in default under this Lease:

(i) Any failure by Lessee to pay any installment of rent under this Lease as and when the same shall become due and payable and the continuance of such failure for a period of five (5) days after written notice of default from Lessor to Lessee.

(ii) Lessee's failure to observe or perform any other term, covenant or condition of this Lease and the continuance of such failure for a period of thirty (30) days after written notice thereof from Lessor;

(iii) Lessee's making of a general assignment for the benefit of its creditors or filing of a voluntary petition in bankruptcy; Lessee's adjudication as a bankrupt or insolvent; Lessee's filing of any petition or answer seeking, consenting to, or acquiescing in reorganization, arrangement, adjustment, composition, liquidation, dissolution or similar relief under any present or future statute, law or regulation providing relief to debtors, or Lessee's filing of an answer admitting or failing to deny the material allegations of a petition against it for any such relief;

(iv) The appointment of any trustee, receiver or liquidator of Lessee, any substantial part of its properties or assets or Lessee's estate or interest in the Premises with the consent or acquiescence of Lessee, or if any such appointment is not so consented to or acquiesced in by Lessee, the continuation of such appointment for an aggregate of ninety (90) days, whether or not consecutive;

(v) The liquidation or dissolution of Lessee or the commencement of proceedings or the taking of action toward such liquidation or dissolution, or the

divestiture of all or any substantial portion of Lessee's assets in any manner whatsoever or

(vi) A restaurant is not open for business at the premises known as 1100 E Catherine, Ann Arbor, Michigan for a period in excess of six (6) months (other than as a result of casualty).

(b) **Lessor's Right to Terminate Upon Default**. Upon the occurrence of any Event of Default, Lessor may, at its option, terminate this Lease by giving Lessee written notice and exercise any one or more of the rights and remedies available to Lessor under this Lease or as provided by law. If this Lease shall be so terminated, Lessee shall immediately surrender the Premises to Lessor and Lessor may enter upon and repossess the Premises by summary proceedings, ejectment or otherwise, and remove Lessee and all other persons and any and all personal property therefrom. Lessor shall have no liability to Lessee for or by reason of any such entry, repossession or removal.

(c) **Effect of Termination**. Termination of this Lease, whether because of the occurrence of an Event of Default or otherwise, shall not impair, release or extinguish any debt, obligation, or liability of any party hereto accrued hereunder prior to such date, nor, except as otherwise expressly provided by this Lease, shall any such termination release and discharge Lessee from its obligation to pay rent, or any other sums to be paid by Lessee hereunder, as and when the same shall become due and payable.

(d) **Landlord's Right to Sell or Relet**. After the retaking of possession of the Premises, Lessor may sell or relet the Premises. Lessor shall make reasonable efforts to relet and mitigate Lessee's liability hereunder. Subject to said reasonable effort to relet and mitigate, Lessor may relet the Premises or any part thereof for such term or terms (which may be greater or less than the period which would otherwise have constituted the balance of the term of this Lease), on such conditions (which may include rent concessions or free rent) and for such purposes as Lessor may in good faith determine to be appropriate. Except as otherwise expressly provided by this Lease, Lessee shall be liable to Lessor, and shall pay to Lessor on demand, all amounts which would have been payable to Lessor hereunder had this Lease not been terminated until the Premises shall be sold or relet, under one or more leases, for a term in excess of the period remaining under this Lease. If relet, Lessee shall be liable for the difference between the amount which would have been payable under this Lease and the amounts payable under such other lease or leases. If sold, Lessee's liability for rent shall terminate as of the date of sale of the Premises.

16. **HOLDING OVER**. In the event Lessee holds over after termination of this Lease, a tenancy from month to month shall thereafter exist in the absence of a written agreement to the contrary, provided, however, that Lessor may, increase Lessee's rent by two hundred (200%) percent by giving written notice to Lessee.

17. **SURRENDER OF PREMISES**. Lessee shall, upon the termination or expiration of this Lease, surrender possession of the Premises to Lessor in a quiet and peaceable manner in as good condition as at the commencement of this Lease, reasonable wear and tear excepted. It is specifically agreed that Lessee shall be deemed to have surrendered possession only when all of Lessee's property has been removed from the Premises. Lessee shall continue to be liable for

rent and all other charges, duties, conditions and obligations set forth in this Lease until surrender of possession of the Premises as herein provided.

18. **INDEMNITY OF LESSOR**. Lessee shall indemnify and hold Lessor and its successors and assigns harmless from and against any and all actions, causes of action, suits, claims, demands, damages, debts, expenses (including reasonable attorneys' fees), liabilities and losses, which may be made against or sustained by Lessor and its successors and assigns in law or in equity or otherwise, arising out of or in connection with Lessee's use and occupancy of the Premises during the Term of this Lease.

19. **INDEMNITY OF LESSEE**. Lessor shall indemnify and hold Lessee and its successors and assigns harmless from and against any and all actions, causes of action suits, claims, demands, damages, debts and expenses (including reasonable attorneys' fees), liabilities and losses, which may be made against Lessee and its successors and assigns arising out of the negligent or willful acts of Lessor, its employees and its agents on the Premises or the Parking Area.

20. **OFFSET STATEMENT**. Lessee agrees, within ten (10) days after a request therefor by Lessor, to execute and deliver to Landlord a statement, in writing, certifying to the extent then true that this Lease is in full force and effect, the date of commencement of the Term of this Lease, that rent is paid currently without any offset or defense thereto, the amount of rent, if any, paid in advance, and that there are no uncured defaults by Lessor hereunder or stating those claimed by Lessee, provided that, in fact, such defaults are accurate and supported by ascertainable facts.

21. **RENEWAL OPTION**. Subject to satisfaction of the conditions set forth below, Lessee shall have the right and option to renew this Lease for six (6) additional periods of five (5) years each from and after the expiration of the initial Term, or the applicable extended term, upon the same terms and conditions as are herein set forth ("Options to Extend"). Lessee's Options to Extend shall be automatically exercised, unless Lessee gives notice pursuant to subparagraph (i), below. Lessee's right to so renew this Lease is subject to the following conditions:

(i) Lessee shall not have given Lessor written notice that it will not exercise its option, such notice shall be given at least ninety (90) days, but no more than one hundred and eighty (180) days, prior to expiration of the initial Term or the option Term, as applicable.

(ii) At any time prior to Lessee's exercise of its option, Lessee shall not have been in default in the payment of rent or any other sum due and payable to Lessor hereunder, nor in default in the performance of any other obligation set forth herein to be observed by Lessee.

(iii) Upon Lessee's failure to exercise any Option to Extend hereunder, all remaining Options to Extend shall be deemed to have been waived by Lessee and shall be of no further force and effect.

22. **RENEWAL RENT.** Rent during each Option to Extend shall be paid on the first (1st) day of each month during the applicable Option to Extend, in advance, without demand or off set in accordance with the following schedule:

FIRST OPTION TO EXTEND		
YEAR	MONTHLY RENT	ANNUAL RENT
1	$578.11	$6,937.30
2	$595.45	$7,145.42
3	$613.32	$7,359.78
4	$631.71	$7,580.57
5	$650.67	$7,807.99

SECOND OPTION TO EXTEND		
YEAR	MONTHLY RENT	ANNUAL RENT
1	$670.19	$8,042.23
2	$690.29	$8,283.50
3	$711.00	$8,532.01
4	$732.31	$8,787.97
5	$754.30	$9,051.61

THIRD OPTION TO EXTEND		
YEAR	MONTHLY RENT	ANNUAL RENT
1	$776.93	$9,323.16
2	$800.24	$9,602.85
3	$824.25	$9,890.94
4	$848.98	$10,187.67
5	$874.45	$10,493.27

FOURTH OPTION TO EXTEND		
YEAR	MONTHLY RENT	ANNUAL RENT
1	$900.68	$10,808.07
2	$927.70	$11,132.21
3	$955.53	$11,466.28
4	$984.19	$11,810.27
5	$1,013.72	$12,164.57

FIFTH OPTION TO EXTEND		
YEAR	MONTHLY RENT	ANNUAL RENT
1	$1,044.14	$12,529.51
2	$1,075.46	$12,905.40
3	$1,107.72	$13,292.56
4	$1,140.95	$13,691.33
5	$1,175.18	$14,102.07

SIXTH OPTION TO EXTEND		
YEAR	MONTHLY RENT	ANNUAL RENT
1	$1,210.44	$14,525.13
2	$1,246.75	$14,960.89
3	$1,284.15	$15,409.71
4	$1,322.67	$15,872.00
5	$1,362.36	$16,348.16

23. **CUMULATIVE REMEDIES**. All rights, remedies and benefits under this Lease shall be cumulative and shall not be exclusive of any other rights, remedies and benefits conferred by law or by this Lease.

24. **WAIVER**. No waiver of any provision of this Lease, or of the breach thereof, shall be construed as a continuing waiver, nor shall the same constitute a waiver of such provision or breach on a future occasion or of any other provision or breach.

25. **SUCCESSORS AND ASSIGNS**. This Lease shall inure to the benefit of and be binding upon the parties hereto, their respective heirs, administrators, executors, representatives, successors and permitted assignees.

26. **INTERPRETATION**. The paragraph headings contained herein are solely for convenience and shall in no event affect, or be used in connection with, the interpretation of this Lease. Each separately designated section of this Lease shall be treated as severable, to the end that if one or more such sections or any portion thereof shall be adjudged or declared illegal, invalid or unenforceable, this Lease shall be interpreted, and shall remain in full force and effect, as though such section or sections, to the extent illegal or unenforceable, had never been contained in this Lease. Whenever reasonably necessary for interpretation of this Lease, pronouns of any gender shall be deemed synonymous, as shall singular and plural pronouns.

27. **NOTICES**. Any notice, demand or other writing to be given pursuant to this Lease shall be deemed to have been given and received, and to be effective for all purposes, as of the third regular mail day after having been sent by registered or certified mail, postage prepaid and return receipt requested, to the address of the recipient, or such other address as the recipient shall have hereafter designated by written notice to the other party.

28. **APPLICABLE LAW**. This Lease shall be governed by, and construed in all respects in accordance with, the laws of the State of Michigan.

29. **ENTIRE AGREEMENT**. This Lease constitutes the entire agreement of the parties hereto with respect to the subject matter hereof and all prior and contemporaneous agreements between the parties, whether written or oral, are merged herein and shall be of no force or affect. This Lease cannot be changed, modified or amended except in writing, signed by the party against whom enforcement of the change, modification or amendment is sought.

30. **RECORDING.** Lessor and Lessee agree that this Lease shall not be recorded in the land records of Washtenaw County, Michigan. Lessor and Lessee mutually agree that a memorandum of Parking Space Lease, in the form attached as Exhibit B, may be recorded in the land records of Washtenaw County to provide notice of the existence of this Lease.

31. **RIGHT TO RELOCATE.** If at any time after the execution of the Lease, Steven Vangelatos or Patricia Vangelatos, or either of Steven Vangelatos or Patricia Vangelatos, no longer own a controlling interest in the Restaurant Owner or the Restaurant, directly or indirectly, Lessor may, upon ten (10) days prior written notice to the then owner of the Restaurant or Restaurant Owner, relocate Lessee to alternate parking spaces within a one block

radius of the Restaurant, at no additional cost to Lessee. The terms and conditions of this Lease shall continue to apply to such alternate parking spaces. So long as Steven Vangelatos or Patricia Vangelatos, or either of Steven Vangelatos or Patricia Vangelatos, remain owner(s) of a controlling interest in the Restaurant Owner or the Restaurant, directly or indirectly, Lessor may relocate Lessee to alternate parking spaces, with Lessee's prior consent, which may be withheld for any reason or no reason whatsoever.

[SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, Lessor and Lessee have caused this Lease to be executed as of the date first hereinabove set forth.

LESSOR:
Glen Ann Place LLC, a Michigan limited liability company

By: JFA Management LLC, An Illinois limited liability company

Its: Manager

By: _____
Thomas H. Fraerman, Manager

LESSEE:

_____
Stephen Vangelatos

_____ Attorney-in-fact for
Patricia Vangelatos

Exhibit "A"

Legal Description

Land situated in the City of Ann Arbor, Washtenaw County, Michigan described as:

The East 66 feet of the North 42 feet of Lot 5 South of Catherine Street, Block 2 North, Range 13 East, Eastern Addition to the City of Ann Arbor, as recorded in Liber P of Deeds, Pages 4 and 5, Washtenaw County Records.

Tax I.D. 09-28-213-030

217 Glen Avenue
Ann Arbor, MI

EXHIBIT B

Memorandum of Parking Space Lease

MEMORANDUM OF LEASE

This Memorandum of Lease is made this 24th day of January, 2006, between **GLEN ANN PLACE, LLC**, a Michigan limited liability company, whose address is 220 North Smith Street, Suite 300, Palatine, Illinois 60067 ("Landlord"), and **STEPHEN VANGELATOS** and **PATRICIA VANGELATOS**, with an address at 1100 E. Catherine, Ann Arbor, Michigan 48104 ("Tenant").

WITNESSETH:

1. Landlord and Tenant have entered into a parking space lease ("Lease") for eight, unassigned, non-exclusive parking spaces located on the described premises in the City of Ann Arbor, County of Washtenaw, State of Michigan, as further described on Schedule A attached hereto.

2. The Lease sets forth the above names and addresses of the parties thereto.

3. The term of the Lease is twenty (20) years.

4. Tenant has a right to extend the term for six (6) successive periods of five (5) years each. The rights of extension are exercisable as set forth in the Lease.

5. The terms and conditions of the Lease are incorporated into this Memorandum of Lease as if set forth in full herein.

Landlord and Tenant have caused this Memorandum of Lease to be duly executed and delivered as of the day and year first written above, for the purpose of providing record notice of the Lease.

LANDLORD:

GLEN ANN PLACE LLC, a Michigan limited liability company

By: **JFA MANAGEMENT LLC,** An Illinois limited liability company, its Manager

By _____
Thomas H. Fraerman, Manager

TENANT:

_____
~~Steven~~ Stephen Vangelatos

_____ attorney-in-fact for
Patricia Vangelatos

STATE OF ILLINOIS)
: ss.
COUNTY OF Cook)

The foregoing instrument was acknowledged before me this 23rd day of January, 2006, by Thomas H. Fraerman, Manager of JFA Management LLC, an Illinois limited liability company, as Manager of Glen Ann Place LLC, a Michigan limited liability company, on behalf of the company.

_____
Notary Public
Cook County, Illinois
My Commission Expires: 5-23-06
[Notary Public's Seal]

OFFICIAL SEAL
DANIELLE BERKEMEIER
Notary Public - State of Illinois
My Commission Expires May 23, 2006

OFFICIAL SEAL
DANIELLE BERKEMEIER
Notary Public - State of Illinois
My Commission Expires May 23, 2006

STATE OF MICHIGAN)
: ss.
COUNTY OF WASHTENAW)

The foregoing instrument was acknowledged before me this 24 day of January, 2006, by ~~Steven~~ Stephen Vangelatos.

Notary Public
Washtenaw County, Michigan
My Commission Expires:
[Notary Public's Seal]

Sheri L. Belcher
Notary Public - Washtenaw County, MI
My Commission Expires January 19, 2007

STATE OF MICHIGAN)
: ss.
COUNTY OF WASHTENAW)

The foregoing instrument was acknowledged before me this 24 day of January, 2006, by ~~Steven~~ Stephen Vangelatos on behalf of Patricia Vangelatos, as attorney in fact for Patricia Vangelatos.

Notary Public
Washtenaw County, Michigan
My Commission Expires:
[Notary Public's Seal]

Sheri L. Belcher
Notary Public - Washtenaw County, MI
My Commission Expires January 19, 2007

Exhibit "A"

Legal Description

Land situated in the City of Ann Arbor, Washtenaw County, Michigan described as:

The East 66 feet of the North 42 feet of Lot 5 South of Catherine Street, Block 2 North, Range 13 East, Eastern Addition to the City of Ann Arbor, as recorded in Liber P of Deeds, Pages 4 and 5, Washtenaw County Records.

Tax I.D. 09-28-213-030

217 Glen Avenue
Ann Arbor, MI

EXHIBIT C

Certificate of Insurance

Exhibit 'C'

ACORD CERTIFICATE OF LIABILITY INSURANCE

OP ID Ax — VANGE-1

DATE (MM/DD/YYYY) 01/20/06

PRODUCER

Hylant of Ann Arbor, LLC
301 N Main Street
Ann Arbor MI 48104
Phone: 734-741-0044 Fax: 734-741-1850

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED

Vangelatos, Inc.
dba Angelo's
Stephen Vangelatos
and Patricia Vangelatos
1100 E. Catherine
Ann Arbor MI 48104-1622

INSURERS AFFORDING COVERAGE		NAIC #
INSURER A:	Citizens Ins Co of America	031534
INSURER B:		
INSURER C:		
INSURER D:		
INSURER E:		

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	X	GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY PRO-JECT LOC	MPG0528264	09/01/05	09/01/06	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 100,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
		AUTOMOBILE LIABILITY ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS HIRED AUTOS NON-OWNED AUTOS				COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ $ $ $
		GARAGE LIABILITY ANY AUTO				AUTO ONLY - EA ACCIDENT OTHER THAN AUTO ONLY: EA ACC AGG	$ $ $
		EXCESS/UMBRELLA LIABILITY OCCUR CLAIMS MADE DEDUCTIBLE RETENTION $				EACH OCCURRENCE AGGREGATE	$ $
		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				WC STATU-TORY LIMITS / OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ $ $
		OTHER					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

See attached

CERTIFICATE HOLDER

GLENA-1

Glen Ann Place, LLC
220 N. Smith St., Suite 300
Palatine IL 60067

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

Stephen B Dobson

ACORD 25 (2001/08)

© ACORD CORPORATION 1988

IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.

ACORD 25 (2001/08)

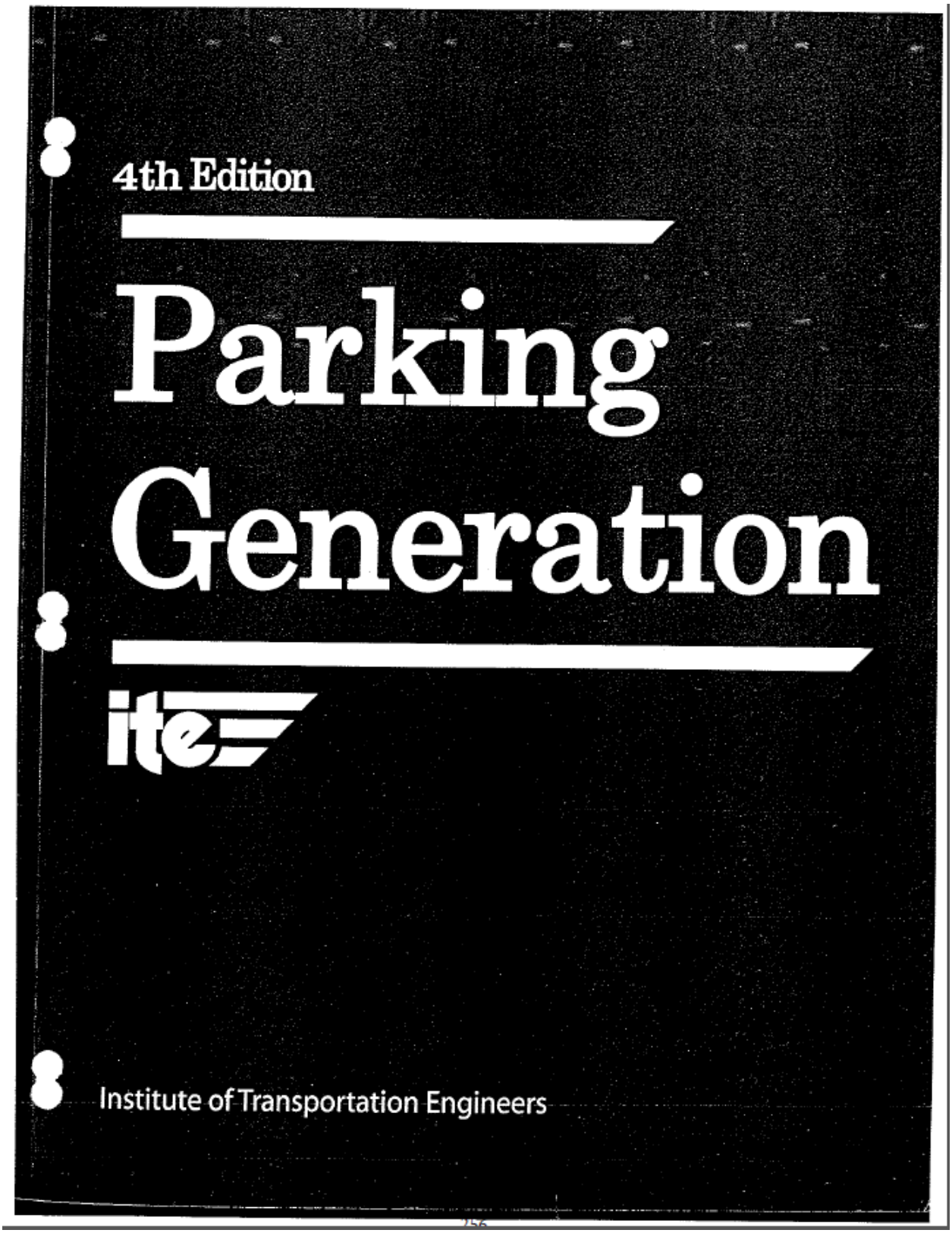
NOTEPAD: HOLDER CODE [illegible] INSURED'S NAME Vangelatos, Inc. VANCE-1 PAGE 1

OP ID AX DATE 01/20/06

Glen Ann Place LLC, TBM GAP LLC, Freed Glen Ann LLC, JFA Management LLC, Joseph Freed and Associates LLC and the partners, members, managers, officers, directors, agents and employees of all of the foregoing and any successor or assignee thereof and of any member of such partners, members, managers, officers, agents and employees of any successor or assignee thereof are named as Additional Insureds as respects General Liability, covering parking lot.

APPENDIX IX – EXCERPTS FROM ITE PARKING GENERATION

(Land Use Code 310)


4th Edition
Parking
Generation
ite
Institute of Transportation Engineers

Land Use: 310
Hotel

The following table presents the time-of-day distributions of parking demand variation for suburban and urban sites.

Based on Vehicles per 1,000 sq. ft. GFA	Weekday Suburban		Weekday Urban	
Hour Beginning	Percent of Peak Period	Number of Data Points*	Percent of Peak Period	Number of Data Points*
12:00–4:00 a.m.	–	0	–	0
5:00 a.m.	–	0	–	0
6:00 a.m.	100	4	79	1
7:00 a.m.	96	4	77	1
8:00 a.m.	90	4	100	1
9:00 a.m.	87	3	96	1
10:00 a.m.	82	3	55	1
11:00 a.m.	77	3	52	1
12:00 p.m.	77	4	60	1
1:00 p.m.	75	4	60	1
2:00 p.m.	73	4	55	1
3:00 p.m.	70	4	52	1
4:00 p.m.	71	4	53	1
5:00 p.m.	70	4	58	1
6:00 p.m.	74	4	62	1
7:00 p.m.	75	4	66	1
8:00 p.m.	79	4	68	1
9:00 p.m.	85	4	–	0
10:00 p.m.	87	4	–	0
11:00 p.m.	97	2	–	0

* Subset of database

Parking demand at a hotel may be related to the presence of supporting facilities such as convention facilities, restaurants, meeting/banquet space and retail facilities. Future data submissions should specify the presence of these amenities. Reporting the level of activity at the supporting facilities (such as full, empty, partially active, number of people attending a meeting/banquet) during observation may also be useful in further analysis of this land use.

For all lodging uses, it is important to collect data on occupied rooms as well as total rooms in order to accurately estimate parking generation characteristics for the site.

Additional Data

During the course of a year, most hotels maintain at least an overall average occupancy ratio of 60 to 70 percent. Peak (above 90 percent) occupancy is common but generally occurs for limited times throughout the year. Analysts are encouraged to consider the month and day activity/occupancy trend of hotels. Supplementary information on seasonal and daily variation in hotel room occupancy is presented below from Smith Travel Research for all hotels in North America. Its direct applicability to this land use code is limited because the occupancy data averages all regions and hotel types, including resort, business, convention and all suites hotels. More parking survey data are needed to better understand these peak and non-peak trends.

Land Use: 310
Hotel

Month	Average Hotel Occupancy (%)
January	51
February	61
March	66
April	65
May	67
June	72
July	72
August	71
September	67
October	67
November	59
December	48

Day of Week	Average Hotel Occupancy (%)
Sunday	51
Monday	62
Tuesday	67
Wednesday	69
Thursday	66
Friday	69
Saturday	72

SOURCE: Smith Travel Research, average data from North American hotels from 2000. www.wwstar.com

Study Sites/Years

Rosemont, IL (1969); Chicago, IL (1973); Newport Beach, CA (1981); Boca Raton, FL (1983); Scottsdale, AZ (1983); Concord, CA (1985); Orlando, FL (1988); Cypress, CA (1989); La Palma, CA (1989); Burlingame, CA (2001); Millbrae, CA (2001); Milpitas, CA (2001); San Mateo, CA (2001); Ventura, CA (2007)

4th Edition Source Number

1015

APPENDIX X – LETTER FROM THE UNIVERSITY OF MICHIGAN AND MEMORANDUM FROM LAURENCE DEITCH RELATED TO PARKING

OFFICE OF GOVERNMENT RELATIONS

UNIVERSITY OF MICHIGAN

503 THOMPSON STREET
FLEMING ADMINISTRATION BUILDING
ANN ARBOR, MICHIGAN 48109-1340
734 763-5554 FAX: 734 764-3316

September 29, 2015

Ms. Jill Thacher
Historic Preservation Coordinator
City of Ann Arbor
301 East Huron Street
Ann Arbor, MI 48104-1908

Dear Ms. Thacher,

I am writing to confirm that the information contained in the September 25, 2015 Memorandum from Laurence Deitch regarding enforcement hours at University of Michigan parking facilities is accurate and correct.

Information on the Parking and Transportation Services web site at (http://pts.umich.edu/parking/enforcement-mc.php) outlines the hours of enforcement for structures in the vicinity of the Medical Center is up-to-date and accurately reprinted in Mr. Deitch's memo.

Please let me know if I can be of any further assistance.

Yours truly,

Jim Kosteva
University of Michigan
Director of Community Relations
734-763-5554

cc: Colin Smith

MEMORANDUM

TO: Jill Thacher
Historic District Coordinator
City of Ann Arbor

FROM: Laurence B. Deitch

DATE: September 24, 2015

SUBJECT: The Glen - Parking

Questions have been raised about the availability of parking on evenings and weekends in the University of Michigan Parking structures which are adjacent to The Glen.

Attached as Exhibit A is an excerpt from the University of Michigan Parking and Transportation Services website entitled "Enforcement".

In pertinent part, it provides as follows:

> "Parking facilities are open to the public outside enforcement hours."

Exhibit B is another excerpt from that website which sets forth enforcement hours for all lots on UM's medical campus. Enforcement hours for the three most adjacent parking structures (being the Catherine Street Structure (Lot #M5 located at 1100 Catherine), the Glen Street Structure (Lot #M61 located at Glen Street at Catherine Street), and the Ann Street Structure (Lot #M86 located at 1115 Ann Street) are 6am-6pm Monday through Friday, except for Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and the following day and Christmas through New Year's Day.

Collectively, there are 2,020 parking spaces available in the Catherine Street, Glen Street, and Ann Street Structures. In addition, there are 191 parking spaces on site 6am-6pm, beneath the proposed hotel which can be amplified significantly when necessary through valet parking. We note that the Campus Inn has about 100 available parking spaces, for more rooms and has operated successfully for over 30 years.

We also note that questions have been raised about the availability of employee parking to service the project.

In that regard, please note that the developer is affiliated with Oak Valley Center Limited Partnership, which owns the Oak Valley Shopping Center in Pittsfield Township. The shopping center has over 2000 available parking spaces. The developer and its affiliate will enter into an agreement to allow employees at The Glen to park at the shopping center. Such employers will then be shuttled to and from the shopping center.

BODMAN PLC
SUITE 400
201 SOUTH DIVISION STREET
ANN ARBOR, MICHIGAN 48104

bodman
ATTORNEYS & COUNSELORS

Detroit_7131045_2

EXHIBIT A

Enforcement

The U-M Police Department (UMPD) is responsible for enforcing University parking regulations, which can be found under the Faculty & Staff, Student and Retiree Parking Options. The regulations are in force throughout the calendar year except for:

- Memorial Day
- Independence Day
- Labor Day
- Thanksgiving Day and the following day
- Christmas through New Year's Day

The distinctive University block M is used on all parking control signs to identify UM parking locations. Parking control signs are installed at the entrances of every University parking lot and structure and indicate the primary parking type, permits required, enforcement hours, and location identification number. Parking facilities are open to the public outside enforcement hours. Published enforcement hours are available for **Central (enforcement-cc.php)**, **Medical (enforcement-mc.php)**, **North (enforcement-nc.php)**, and **South (enforcement-sc.php)** campuses.

List Of Enforced Violations

- Expired Meters
- Parked over 48-Hour Legal Limit
- No Parking Anytime
- No Stopping or Standing
- Commercial Vehicle
- Bus Stop
- Double Parking

- Parking Within 15 ft. of Fire Hydrant
- Parking on Walk
- Left to Curb
- Blocking Driveway
- Blocking Crosswalk
- Handicapped
- Parked over 12 Inches from Curb
- Other (details printed under Remark 1 and Remark 2 on citation)
- No Permits U-M Lots
- Motorcycles Only
- Parked Upon or Across Line
- No Parking Fire Lane
- U-M Vehicle Only
- No Parking in Driveway
- Snow Removal

EXHIBIT B

Enforcement Hours - Medical Campus

Permit And Visitor Parking

Accessible parking is located in all permit and visitor parking areas except as noted below.* In these cases, the ADA-required accessible spaces have been relocated to other areas closer to buildings or the campus core.

Lot #	Lot/Structure Name	Address	Enforcement Hours	Primary Use	Nearby Bus Service
M5	**Catherine Street Structure (structurecatherine.php)**	1100 Catherine	6am-6pm, Mon-Fri	Blue	Bursley Baits, Northwood, Northwood Express, Commuter, North-East Shuttle
M7	Radiation Therapy	1504 E. Medical Center	24 hours/7 days	Restricted Patient	
M10	UMH Emergency Room	1502 E. Medical Center	24 hours/7 days	Restricted	
M13*	Med Inn	E. Hospital Drive	24 hours/7 days	Restricted Patient	
P1/M15	**North Entrance (structurep1.php)**	Medical Center Drive	24 hours/7 days	Gold, Blue & Patient	Commuter, Med Express, North-East Shuttle
P2/M18N	**East Medical Center Drive Structure North (structurep2.php)**	1500 E. Medical Center	24 hours/7 days	Patient	Commuter, Med Express, North-East Shuttle

Lot #	Lot/Structure Name	Address	Enforcement Hours	Primary Use	Nearby Bus Service
P3/M18 S	**East Medical Center Drive Structure South (structurep3.php)**	1500 E. Medical Center	24 hours/7 days	Special Staff Parking Programs	Commuter, Med Express, North-East Shuttle
P4/M22	**Simpson Circle Drive Structure (structurep4.php)**	1535 E. Hospital Drive	24 hrs/7 days	Blue & Visitor	Commuter, Med Express, North-East Shuttle
M27*	Molecular and Behavioral Neuroscience Institute	1100 E. Ann Street	6am-5pm, Mon-Fri	Blue & Restricted	Commuter, Northwood, Bursley Baits, North-East Shuttle
M28	School Public Health Building II	1500 Washington Heights	6am-5pm, Mon-Fri	Blue	Commuter, Med Express, North-East Shuttle
M29*	Helipad-The Pit	1400 Nichols Drive	6am-5pm, Mon-Fri	Blue	Commuter, Med Express, North-East Shuttle
M30*	University Hospital/Taubman Center	1601 E. Medical Center	24 hours/7 days	Patient Oversize Vehicles Only	
M31*	University Hospital Emergency Dept	E. Medical Center Drive	24 hours/7 days	UMH Valet Only	

Lot #	Lot/Structure Name	Address	Enforcement Hours	Primary Use	Nearby Bus Service
M34	Kinesiology Building	201 Observatory Drive	24 hours/7 days	Blue	Commuter, Med Express, North-East Shuttle
M39*	Kellogg Eye Center	Canal Street (behind building)	24 hours/7 days	Gold	
M40	Kellogg Eye Center	1002 Wall Street	6am-5pm, Mon-Fri	Patient	Wall Street -NIB, Wall Street Express
M50	Brehm Tower	1000 Wall Street	6am-5pm, Mon-Fri	Blue	Wall Street -NIB, Wall Street Express
M56*	LS&A Annex	1000 E. Huron Street	6am-5pm, Mon-Fri	Blue	
M57	Health Management Res Ctr	1000 E. Huron Street	6am-5pm, Mon-Fri	Blue	
M61	**Glen Street Structure (structureglen.php)**	Glen St @ Catherine St	6am-6pm, Mon-Fri	Gold & Blue	Northwood, Northwood Express, Diag to Diag Express, Bursley Baits, Wall Street-NIB
M64	400 North Ingalls Building	1000 Cornwell Place	6am-5pm, Mon-Fri;	Gold & Blue Accessible	

Lot #	Lot/Structure Name	Address	Enforcement Hours	Primary Use	Nearby Bus Service
M65*	Cornwell Place	1000 Cornwell Place	6am-5pm, Mon-Fri	Blue	
M66	School of Nursing	402 N. Ingalls	6am-5pm, Mon-Fri	Blue & Visitor	
M67	Hospital Education Center	Fuller Road	6am-5pm, Mon-Fri	Blue	
M69	Medical Science Research Building III Bldg	1150 W. Medical Center	6am-5pm, Mon-Fri	Blue Accessible & Visitor	
M71	City/University Lot	Fuller Road @ E. Medical Ctr Dr.	6am-4pm, Mon-Fri	Yellow	
M75	Fuller/Mitchell Lot	Fuller Road	6am-4pm, Mon-Fri	Orange	Commuter, Med Express, Northwood, Northwood Express, North-East Shuttle, Bursley Baits, Diag to Diag Express
M76	Brehm Tower	Maiden Lane	6am-5pm, Mon-Fri	Blue	North-East Shuttle
M78*	Fuller Pool	1519 Fuller Road	6am-5pm, Mon-Sun; All Vehicles must exit by 10pm	Yellow	
M79	Ronald McDonald House	1600 Washington Heights	24 hours/7 days	Restricted RMH Only	

Lot #	Lot/Structure Name	Address	Enforcement Hours	Primary Use	Nearby Bus Service
M84	Glen Court	Glen Court	6am-5pm, Mon-Fri	Blue	
P5/M85	**Cardiovascular Center Structure (structurep5.php)**	Ann Street	24 hours/7 days	Patient/Visitor & Gold	Commuter
M86	**Ann Street Structure (structureann.php)**	1115 Ann Street	6am-6pm, Mon-Fri	Gold, Blue & Visitor	Commuter, Northwood, Bursley Baits, North-East Shuttle, Wall Street -NIB
M87*	Brehm Tower	900 Wall Street	6am-5pm, Mon-Fri	Blue	Wall Street -NIB, Wall Street Express
M91*	Brehm Tower	900 Wall Street	6am-5pm, Mon-Fri	Blue	Wall Street -NIB, Wall Street Express
M93	**Wall Street Structure (structurewall.php)**	1041 Wall Street	6am Mon - 1am Sat	Gold & Blue	Wall Street -NIB, Wall Street Express
M95	C.S. Mott Children's & Von Voightlander Women's Hospitals	1447 Washington Heights	24 hours/7 days	Gold & Blue	

Service Centers

Service Centers provide delivery and service access for University buildings. Permit and visitor parking is not provided in these areas, except for a few select locations with accessible permit parking. They are enforced 24 hours a day, 7 days per week unless otherwise noted.

Lot #	Lot/Structure Name	Address	Enforcement Hours
M11	Simpson Circle Service Center	Simpson Circle	6am-5pm, Mon-Fri
M16	Towsley/Old Mott Service Center	1500 E. Hospital Drive	24 hours/7 days
M25	School of Public Health Service Center	Washington Heights	24 hours/7 days
M36	Victor Vaughn Dock	1100 W. Medical Center Drive	24 hours/7 days
M38	Taubman Medical Library Service Center	1300 E. Catherine Place	24 hours/7 days
M44	Alice Lloyd Dock	100 Observatory Street	24 hours/7 days
M45	Mosher Jordan Dock	202 Observatory Street	24 hours/7 days
M46	Stockwell Circle Drive	300 Observatory Street	24 hours/7 days
M47	Couzens Hall Dock	1200 E. Ann Street	24 hours/7 days
M48	School Public Health II Dock	1400 Washington Heights	24 hours/7 days
M49	Stockwell Dock	1300 N. University Court	24 hours/7 days
M51	Mary Markley Dock	1503 E. Medical Center	24 hours/7 days
M52	Medical Professional Bldg Service Center	1522 Simpson Circle	24 hours/7 days
M53	University Hospital - Dock V	1506 E. Medical Center	24 hours/7 days
M54	Medical Science Research Bldg III Dock	W. Medical Center Drive	24 hours/7 days
M55	Medical Science Research Bldg II Dock VI	1202 W. Medical Center	24 hours/7 days
M59	Glen Street	Glen Street	6am-5pm, Mon-Fri
M62	North Ingalls Building Dock	1000 Catherine Street	6am-5pm, Mon-Fri
M63	N Ingalls Building Service Center	1000 Catherine Street	24 hours/7 days
M70	Mott Hospital Dock	1500 E. Hospital Drive	24hours/7 days
M72	Molecular & Behavioral Neuroscience Institute Dock	1300 E. Catherine Place	24 hours/7 days
M73	Cardiovascular Center Service Center	Simpson Circle	24 hours/7 days

Lot #	Lot/Structure Name	Address	Enforcement Hours
M89	Biomedical Science Research Build Dock	Ann Street	24 hours/7 days
M90	Glen Avenue – Ann Street Service Center	Glen Avenue	24 hours/7 days