

# *Updated Traffic Study*

## *Greensborough Village*

*prepared for:*

*Greensborough Investments, LLC*

Johnson Avenue (Highway 49)

Jonesboro,  
Arkansas



A handwritten signature in black ink, appearing to read "Ernest J. Peters".



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## BACKGROUND

Peters & Associates Engineers, Inc. previously conducted a traffic engineering study relating to Greensboro Village, a proposed mixed-use development to be located on the north side of Johnson Avenue (Highway 49) and on the west side of Old Greensboro Road (Highway 351) in Jonesboro, Arkansas. That previous study report is dated December 1, 2014. Subsequently, changes to the nearby roadway systems are planned that affects access to this development including not re-aligning Old Greensboro Road (Highway 351) to tie-in as the north leg of the Johnson Avenue and Red Wolf Boulevard intersection. Additionally, an updated site development plan has been developed by Littlejohn (dated October, 2016). This revised report includes estimates of projected traffic volumes likely associated with full build-out of the proposed Greensboro Village development. It also presents findings of capacity and level of service calculations for the following intersections:

- Johnson Avenue (Highway 49) and Old Greensboro Road (Highway 351).
- Johnson Avenue (Highway 49) and West Street.
- Johnson Avenue (Highway 49) and East Street.
- Old Greensboro Road (Highway 351) and Village Boulevard.



## INTRODUCTION

Peters & Associates Engineers, Inc. has conducted an updated traffic study for a mixed-use development (Greensborough Village) proposed to be located on the north side of Johnson Avenue (Highway 49) and on the west side of Old Greensboro Road (Highway 351) in Jonesboro, Arkansas. The revised study was conducted for full build-out of the proposed Greensboro Village development projected traffic conditions.

This is a report of methodology and findings relating to a traffic engineering study undertaken to:

- Determine Full Build-Out projected traffic volumes at the study intersections.
- Identify the effects on traffic operations resulting from existing traffic in combination with Greensboro Village full build-out associated traffic volumes for the study intersections.
- Evaluate traffic operations for the study intersections for existing plus projected traffic conditions and make recommendations for mitigative improvements which may be necessary and appropriate for acceptable traffic operations.

In the following sections of this report there are presented traffic data, study methods and findings. The study is technical in nature. Analysis techniques employed are those most commonly used in the traffic engineering profession for traffic impact analysis. Certain data and calculations relative to traffic operational analysis referenced, as well as recommendations, are included. Complete calculations and data are to be included in the Appendix of the report.



## THE SITE

Greensborough Village is located on approximately 227 acres contiguous with the City of Jonesboro. The site is located on the north side of Johnson Avenue (Highway 49) and on the west side of Old Greensboro Road (Highway 351). The site has frontage along Johnson Avenue (Highway 49) which is classified as a “Major Arterial” road and Old Greensboro Road (Highway 351) which is classified as a “Collector” road. Greensboro Road, which bisects the northern portion of the site is a local street.

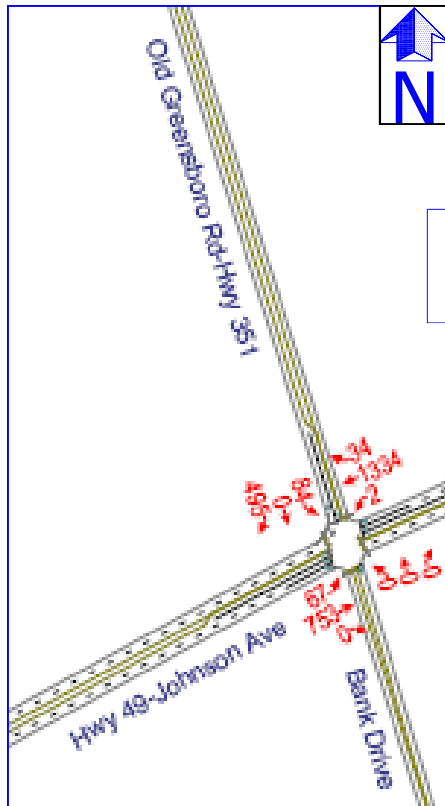
## EXISTING TRAFFIC CONDITIONS

Hourly, 24-hour traffic counts in the vicinity of the study area are listed below:

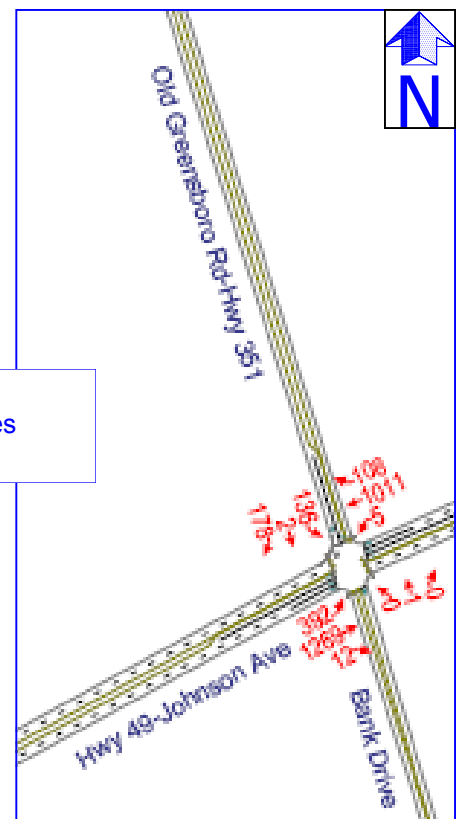
STREET	24-HOUR VOLUME
*Johnson Avenue, East of Red Wolf Blvd. and West of Highway 351 (Two-Way)	36,280
Old Greensboro Road, north of Johnson Avenue (Two-Way)	9,624
<i>*Volumes provided by AHTD.</i>	

Existing AM and PM vehicle turning movement counts were researched and provided by AHTD for the intersection of Johnson Avenue (Highway 49) and Old Greensboro Road (Highway 351).

The AM and PM peak hour vehicle turning movement counts are shown on Figure 3A, “Existing Traffic Volumes - AM Peak Hour,” and Figure 3B, “Existing Traffic Volumes - PM Peak Hour.” The AM and PM peak hour turning movement count data and the 24-hour traffic counts included as a part of this study are presented in detail in the Appendix of the report.



**Figure 3A**  
Existing Traffic Volumes  
AM Peak Hour



**Figure 3B**  
Existing Traffic Volumes  
PM Peak Hour

## TRIP GENERATION and SITE TRAFFIC PROJECTIONS

The Trip Generation, an Informational Report, published by the Institute of Transportation Engineers (ITE) and The Trip Generation Manual by Trafficware, LLC (9th Edition), 2012, were utilized in calculating the magnitude of traffic volumes expected to be generated by the proposed Greensborough Village land uses. These are reliable sources for this information and are universally used in the traffic engineering profession.

Using the selected trip generation rates, calculations were made as a part of this study to provide a reliable estimate of traffic volumes that can be expected to be associated with the development as proposed for full build-out projected conditions. Applying the appropriate trip-generation rates to the land use proposed makes these calculations. Results of these calculations are summarized on Table 1, “Summary of Trip-Generation at Full Build-Out.”

The trip-generation data for full build-out land uses has been adjusted to include ITE calculated “internal trip capture” (i.e. multi-purpose trips within the site as opposed to new trips for each site land use).

In the projected traffic conditions, these data have been adjusted for “pass-by” trips (i.e. that portion of the site destined traffic that may come from the existing adjacent street traffic stream).

The mixed-use land uses traffic, as will be associated with this site, ordinarily does contribute to the adjacent street traffic conditions during the on-street AM peak traffic hour and the PM peak traffic hour. Accordingly, both the AM and PM peak traffic periods of the study intersections in the immediate vicinity of the site are the traffic operating conditions which have warranted primary traffic analysis as a part of this study.



TRACT #	PROPOSED LAND USE	APPROXIMATE SIZE	ITE CODE	24-HOUR TWO-WAY WEEKDAY VOLUME	AM PEAK HOUR VOLUME		PM PEAK HOUR VOLUME	
					ENTER	EXIT	ENTER	EXIT
1-3 & 5-8	Retail / Restaurant	93,024 Sq. Ft.	820	3,972	55	34	166	179
4	Financial	7,225 Sq. Ft.	912	1,070	50	37	88	87
9	Convenience Retail	4,000 Sq. Ft.	853	3,382	82	82	102	102
10	Retail / Restaurant	6,600 Sq. Ft.	932	839	39	32	39	26
11	Grocery	56,400 Sq. Ft.	850	5,766	119	73	273	262
12	Office / Retail	114,884 Sq. Ft.	820 / 710	3,087	113	32	117	182
13	Movie Theater	47,272 Sq. Ft.	445	650	0	0	61	75
14 - 18	Retail / Restaurant	56,410 Sq. Ft.	820	2,409	33	21	100	109
19 & 20	Office / Retail	176,961 Sq. Ft.	820 / 710	4,754	174	49	179	281
21	Retail / Restaurant	7,200 Sq. Ft.	931	648	3	3	36	18
22 & 23	Office	15,300 Sq. Ft.	710	169	21	3	4	19
24	Retail / Restaurant	4,500 Sq. Ft.	932	572	27	22	26	18
25	Hotel	100 Rooms	310	817	31	22	31	29
26	Office / Residential	69,786 Sq. Ft.	710 / 220	613	66	15	18	60
27 - 33	Office	72,000 Sq. Ft.	710	794	99	13	18	89
34 - 36	Future Retail	135,298 Sq. Ft.	820	5,777	81	49	241	261
37	Residential Multi-Family	341 Units	220	2,268	35	139	137	74
38	Residential Townhomes	28 Units	230	163	2	10	10	5
39	Residential Multi-Family	263 Units	220	1,749	27	107	106	57
40	Residential Single-Family	185 Lots	210	1,761	35	104	117	68
41	Community Open Space	30.5 Acres	n/a	0	0	0	0	0
UNADJUSTED TOTAL DRIVEWAY VOLUMES				41,260	1092	847	1869	2001
INTERNAL TRIP CAPTURE					-153	-153	-520	-520
ADJUSTED DRIVEWAY VOLUMES					939	694	1349	1481
TOTAL ENTERING + EXITING					1,633		2,830	

Table 1 – Summary of Trip-Generation at Full Build-Out



## TRAFFIC VOLUME ASSIGNMENTS

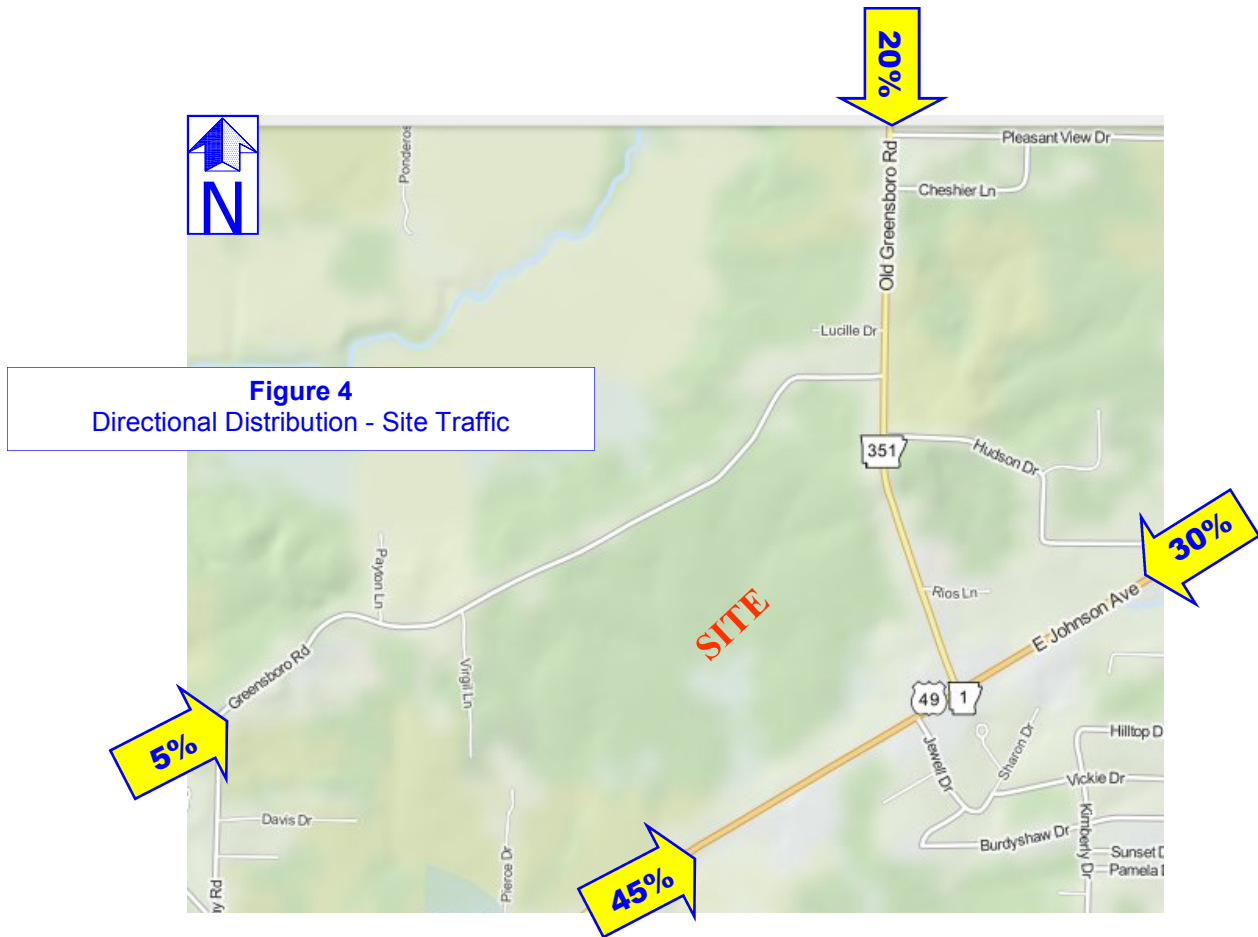
Once projected traffic was estimated for the site, directional distributions were made to reflect the percent of anticipated left-turns, right-turns and thru vehicle movements at the study intersections. Vehicle trip distribution was developed based on the location of the site in relation to the area street network, existing traffic volumes and input from the development team. Directional distribution percentages used in this study are shown on Figure 4, “Directional Distribution - Site Traffic.”

The directional distribution percentages for site traffic have been equated to percentage turns for each movement at the study intersections. The site-generated traffic volumes result from applying the projected entering and exiting percentages to the corresponding projected site-generated traffic volumes summarized on Table 1, “Summary of Trip-Generation at Full Build-Out.”

The full build-out site-generated traffic volumes and existing background traffic volumes have been combined. Full build-out projected traffic volumes are depicted on Figure 5A, “Full Build-Out Projected Traffic Volumes - AM Peak Hour,” and Figure 6B, “Full Build-Out Projected Traffic Volumes - PM Peak Hour.”

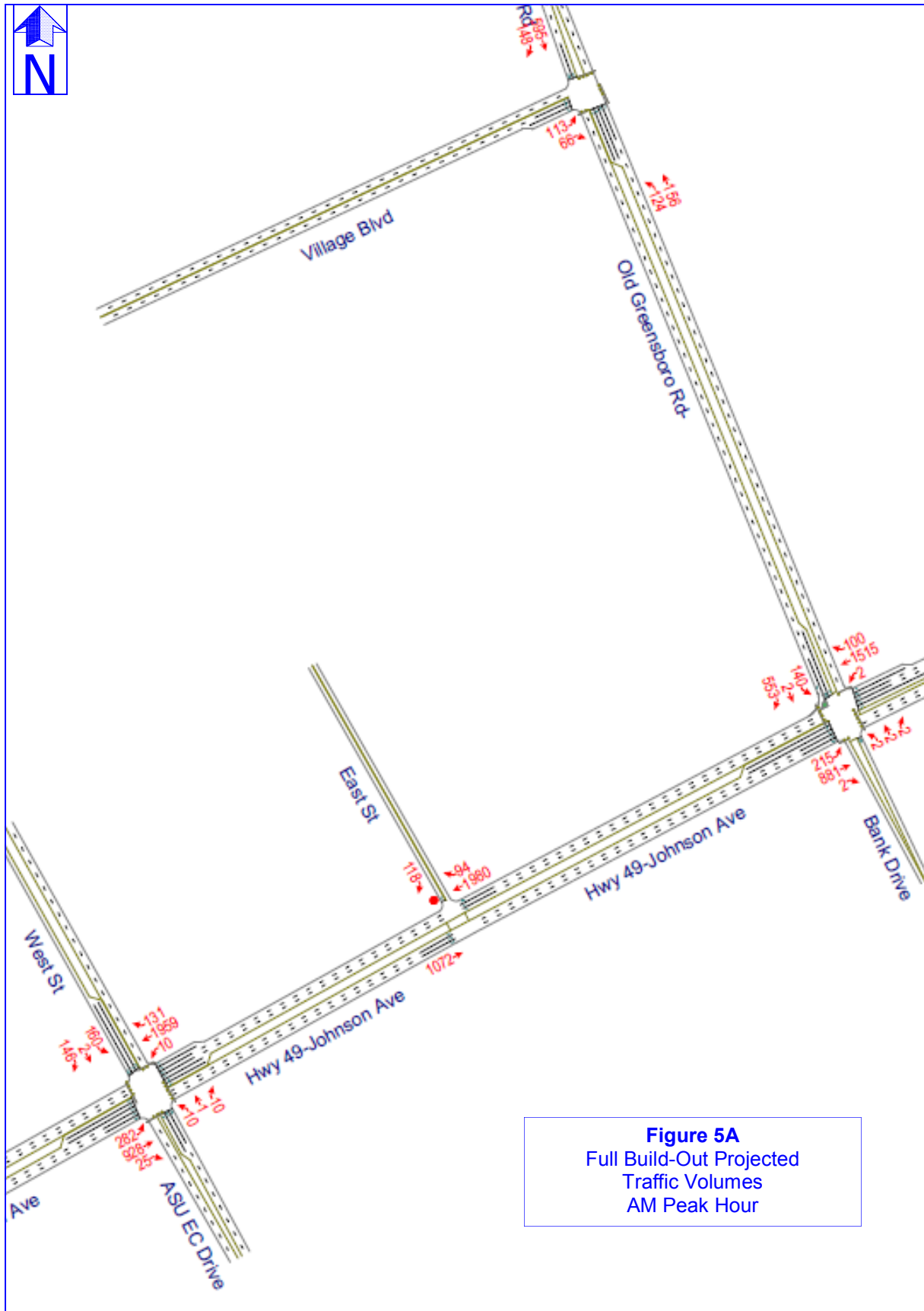
Traffic volumes shown on Figures 5A and 5B are the values used in capacity and level of service calculations conducted as a part of this study. The effect of existing background traffic (i.e. the adjacent street non-site traffic which exists), in the vicinity has thus been accounted for in this analysis.



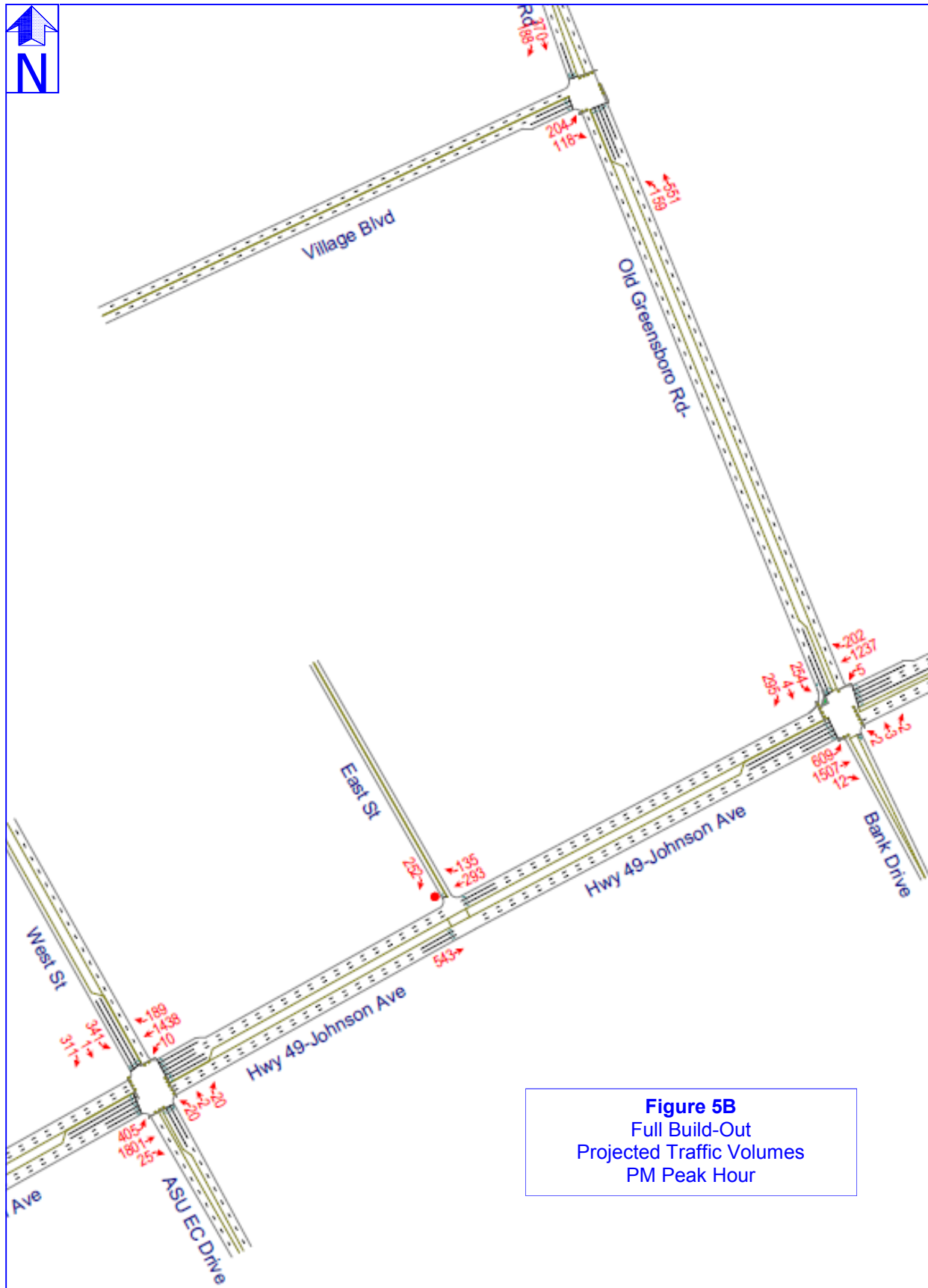


AHTD is currently considering options for roadway improvements in the vicinity along Johnson Avenue (Highway 49) along the site frontage that will include improvements to the intersection of Johnson Avenue (Highway 49) and Old Greensboro Road (Highway 351). Planned improvements Old Greensboro Road (Highway 351) from Johnson Avenue (Highway 49) to Greensboro Road. Included in these options are roadway widening, geometric and traffic control improvements. These plans are still in the planning stage and plans are not yet completed. As a part of this study it has been assumed that a median break will be provided along Johnson Avenue (Highway 49) at West Street proposed to provide access to Greensboro Village.

# Traffic Study



# Traffic Study



## CAPACITY and LEVEL OF SERVICE

Generally, the "capacity" of a street is a measure of its ability to accommodate a certain magnitude of moving vehicles. It is a rate as opposed to a quantity, measured in terms of vehicles per hour. More specifically, street capacity refers to the maximum number of vehicles that a street element (e.g. an intersection) can be expected to accommodate in a given time period under the prevailing roadway and traffic conditions.

Traffic operational analysis for the study intersections were evaluated based on the methodologies outlined in the Highway Capacity Manual, 2010 Edition, published by the Transportation Research Board. The operating conditions at an intersection are graded by the "level of service" experienced by drivers. Level of service (LOS) describes the quality of traffic operating conditions and is rated from "A" to "F". LOS "A" represents the most desirable condition with free-flow movement of traffic with minimal delays. LOS "F" generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in the average delay per stopped vehicle. Delay is measured in seconds per vehicle. The table below shows the upper limit of delay associated with each level of service for signalized and un-signalized intersections.

### Intersection Level of Service Delay Thresholds

#### Level of Service

(LOS)	Signalized	Un-Signalized
A	< 10 Seconds	< 10 Seconds
B	< 20 Seconds	< 15 Seconds
C	< 35 Seconds	< 25 Seconds
D	< 55 Seconds	< 35 Seconds
E	< 80 Seconds	< 50 Seconds
F	≥ 80 Seconds	≥ 50 Seconds



The LOS rating deemed acceptable varies by community, facility type and traffic control device. A LOS “D” is the desirable goal for movements at un-signalized intersections that must yield to other movements; however, a LOS “E” or “F” is often accepted for low to moderate traffic volumes where the installation of a traffic signal is not warranted by the conditions at the intersection or the location is deemed undesirable for signalization for other reasons. For signalized intersections, level of service and average delay relate to all vehicles using the intersection, LOS “D” is the typical desirable standard for signalized intersections. All study intersections were evaluated using the Synchro analysis software package based on Highway Capacity Manual methods. This computer program has been proven to be reliable when used to analyze capacity and levels of traffic service under various operating conditions. Detailed results for all capacity calculations will be included in the Appendix. The conditions of the AM and PM peak traffic periods were used for these calculations. Factors included in the analysis are as follows:

- o Existing traffic volumes and patterns.
- o Directional distribution of projected traffic volumes.
- o Existing, planned and proposed intersection geometry (including elements such as turn lanes).
- o Existing background traffic volumes and full build-out projected traffic volumes.
- o Existing, planned and proposed traffic control.
- o Assumed lane geometry as depicted on Figures 5A and 5B.

## CAPACITY ANALYSIS

### *Results and Level of Service Analysis*

#### Projected Full Build-Out Traffic Conditions

Capacity and LOS analysis was performed for full build-out of the Greensboro Village development projected traffic conditions for the AM and PM peak hours for the following study intersections:

- Johnson Avenue (Highway 49) and Old Greensboro Road (Highway 351).
- Johnson Avenue (Highway 49) and West Street.
- Johnson Avenue (Highway 49) and East Street.
- Old Greensboro Road (Highway 351) and Village Boulevard.

Traffic volumes and assumed intersection schematic lane geometry and traffic control used for these projected traffic conditions are shown on Figure 5A, “Full Build-Out Projected Traffic Volumes - AM Peak Hour,” and Figure 5B, “Full Build-Out Projected Traffic Volumes - PM Peak Hour.” The operating conditions projected to exist at the study intersections are summarized in Table 2, “Level of Service Summary - Full Build-Out Projected Traffic Conditions.”

Projected overall intersection capacity utilization and average control delay are found to be acceptable for all of the study intersections during the AM and PM peak hours for these projected traffic conditions with the intersection improvements assumed. Some vehicle movements show constrained operation at projected full build-out conditions. Consideration should be given to design measures for individual vehicle movements that are shown for projected full build-out conditions to have constrained operation.



FULL BUILD-OUT PROJECTED TRAFFIC CONDITIONS		INTERSECTION		PEAK HOUR - LEVEL OF SERVICE												Overall Intersection	Avg. Control Delay Seconds / Vehicle	Intersection Capacity Utilization (%)								
		PEAK HR	Traffic Control	Eastbound	Eastbound	Thru	Eastbound	Right-Turn	Left-Turn	Westbound	Thru	Westbound	Right-Turn	Northbound	Left-Turn				Northbound	Thru	Southbound	Left-Turn	Southbound	Thru	Southbound	Right-Turn
				Left-Turn	Eastbound	Thru	Eastbound	Right-Turn	Westbound	Thru	Westbound	Right-Turn	Northbound	Left-Turn	Northbound				Thru	Southbound	Left-Turn	Southbound	Thru	Southbound	Right-Turn	
Johnson Ave. (Hwy 49) and Old Greensboro Road (Hwy 351)		AM	SIGNAL	F	B	C	C	F	A	A	C	C	C	C	C	C	C	B	C	B	C	B	D	51.2	84.1%	
		PM		F	B	C	C	F	B	B	C	C	C	C	C	D	D	D	B	E	55.4	71.5%				
Johnson Ave. (Hwy 49) and West Street / ASU EC Drive		AM	SIGNAL	D	B	B	B	F	A	A	D	A	A	A	D	D	D	B	E	63.5	73.7%					
		PM		E	C	C	C	E	A	A	D	A	A	D	A	D	A	D	D	42.0	75.7%					
Johnson Ave. (Hwy 49) and East Street		AM	1-WAY "STOP" SIGN		A			A	A									B	n/a	0.4	57.0%					
		PM			A		A											B	n/a	2.3	32.3%					
Old Greensboro Road (Hwy 351 and Village Boulevard		AM	SIGNAL	C		B					A	A	A	D				C	25.8	43.2%						
		PM		C	A					A	A	A	B					B	13.1	41.8%						

**Table 2 - Level of Service Summary - Full Build-Out Projected Traffic Conditions**



## TRAFFIC SIGNAL WARRANTS ANALYSIS

In evaluating the need for a traffic signal, certain established warrants must be examined by a comprehensive investigation of traffic conditions and physical characteristics of the location. The decision to install a traffic signal at a particular location must be evaluated quantitatively relative to these warrants. These warrants, as specified in the Manual on Uniform Traffic Control Devices (MUTCD), are described in detail in the appendix of this report. They are summarized as follows:

- ◆ **Warrant One: Eight-Hour Vehicular Volume**
- ◆ **Warrant Two: Four-Hour Vehicular Volume**
- ◆ **Warrant Three: Peak Hour**
- ◆ **Warrant Four: Pedestrian Volume**
- ◆ **Warrant Five: School Crossing**
- ◆ **Warrant Six: Coordinated Signal System**
- ◆ **Warrant Seven: Crash Experience**
- ◆ **Warrant Eight: Roadway Network**

Traffic signal warrants analysis was made for full build-out projected traffic conditions for the intersections of Johnson Avenue (Highway 49) and West Street and Old Greensboro Road (Highway 351) and Village Boulevard.



It was found that traffic signal warrants are projected to be met for the intersection of Johnson Avenue (Highway 49) and West Street with projected traffic volumes associated with full build-out of Greensboro Village as proposed. Traffic signal warrants analysis for this intersection indicates volumes are expected to be sufficient to satisfy Warrants 1, 2 and 3 for these conditions. Traffic signal warrants should be monitored at this intersection as the development phases are constructed to determine when traffic signal control is to be constructed in the future. The traffic signal warrants analysis results for this intersection are summarized in Table 3, "Traffic Signal Warrants Results - Johnson Avenue and West Street – Full Build-Out Projected Traffic Conditions."

FINAL RESULTS:			Traffic Signal Warrants Analysis							
Projected FBO										
Traffic Conditions			Hour warrant was met:							
Major St.:	Johnson Avenue		VOLUME		COMB.		4 Hr.		Peak	
Minor St.:	West Street		420	630	336	504				
			105	52	84	41				
					#8-1	#8-2				
HOUR	SUM MAJOR	MAX. MINOR	1A	1B		1AB		2	3	
7:00	3331	166	1	1	1	1	1	1	1	
8:00	2971	133	1	1	1	1	1	1	1	
9:00	2750	160	1	1	1	1	1	1	1	
10:00	2982	224	1	1	1	1	1	1	1	
11:00	3160	261	1	1	1	1	1	1	1	
12:00	3733	285	1	1	1	1	1	1	1	
13:00	3683	309	1	1	1	1	1	1	1	
14:00	3871	300	1	1	1	1	1	1	1	
15:00	4230	375	1	1	1	1	1	1	1	
16:00	4367	403	1	1	1	1	1	1	1	
17:00	4320	356	1	1	1	1	1	1	1	
18:00	3232	380	1	1	1	1	1	1	1	
19:00	2461	332	1	1	1	1	1	1	1	
20:00	2021	237	1	1	1	1	1	1	1	
21:00	1406	190	1	1	1	1	1	1	1	
			15	15		15		15	15	
This intersection SATISFIES the warrants for signalization as outlined in the "M.U.T.C.D."										

**Table 3**  
Traffic Signal Warrants Results  
Johnson Avenue and West Street  
Full Build-Out  
Projected Traffic Conditions



It was found that traffic signal warrants are projected to be met for the intersection of Old Greensboro Road (Highway 351) and Village Boulevard with projected traffic volumes associated with full build-out of Greensboro Village as proposed. Traffic signal warrants analysis for this intersection indicates volumes are expected to be sufficient to satisfy Warrants 1, 2 and 3 for these conditions. Traffic signal warrants should be monitored at this intersection as the development phases are constructed to determine when traffic signal control is to be constructed in the future. The traffic signal warrants analysis results for this intersection are summarized in Table 4, "Traffic Signal Warrants Results - Old Greensboro Road and Village Boulevard – Full Build-Out Projected Traffic Conditions."

<b>FINAL RESULTS:</b> <span style="float: right;"><b>Traffic Signal Warrants Analysis</b></span>									
Projected Full Build Traffic Conditions			Hour warrant was met:						
Major St.: Hwy 351			VOLUME		COMB.		4 Hr.	Peak	
Minor St.: Village Blvd.			420	630	336	504			
			105	52	84	41			
					#8-1	#8-2			
HOUR	SUM MAJOR	MAX. MINOR	1A	1B	1AB	2	3		
7:00	1014	108	1	1	1	1	1	1	1
8:00	785	93	0	1	1	1	1	1	0
9:00	678	99	0	1	1	1	1	0	0
10:00	831	151	1	1	1	1	1	1	0
11:00	942	189	1	1	1	1	1	1	1
12:00	1100	186	1	1	1	1	1	1	1
13:00	1091	233	1	1	1	1	1	1	1
14:00	1212	196	1	1	1	1	1	1	1
15:00	1290	186	1	1	1	1	1	1	1
16:00	1436	201	1	1	1	1	1	1	1
17:00	1329	202	1	1	1	1	1	1	1
18:00	1402	217	1	1	1	1	1	1	1
19:00	986	201	1	1	1	1	1	1	1
20:00	808	155	1	1	1	1	1	1	0
21:00	574	130	1	0	1	1	1	0	0
			13	14	15	13	10		
<b>This intersection SATISFIES the warrants for signalization as outlined in the "M.U.T.C.D."</b>									

**Table 4**  
Traffic Signal Warrants Results  
Old Greensboro Road and  
Village Boulevard  
Full Build-Out  
Projected Traffic Conditions



## SUMMARY of FINDINGS

Findings of this study are summarized as follows:

- Capacity and level of service analysis was performed for full build-out projected traffic conditions for the AM and PM peak hours for the study intersections. With proposed mitigation to include traffic signal at the study intersections Johnson Avenue (Highway 49) and West Street and Old Greensboro Road (Highway 351) and Village Boulevard plus assumed intersection widening, the study intersections operated at acceptable levels of service for both the AM and PM peak hours. However, some vehicle movements have constrained operation for these full build-out projected conditions. Consideration should be given to design measures for individual vehicle movements that are shown for projected full build-out conditions to have constrained operation.
- It was found that traffic signal warrants are projected to be met for the intersection of Johnson Avenue (Highway 49) and West Street with projected traffic volumes associated with full build-out of Greensboro Village as proposed. Traffic signal warrants analysis for this intersection indicates volumes are expected to be sufficient to satisfy Warrants 1, 2 and 3 for these conditions. Traffic signal warrants should be monitored at this intersection as the development phases are constructed to determine when traffic signal control is to be constructed in the future.
- It was found that traffic signal warrants are projected to be met for the intersection of Old Greensboro Road (Highway 351) and Village Boulevard with projected traffic volumes associated with full build-out of Greensboro Village as proposed. Traffic signal warrants analysis for this intersection indicates volumes are expected to be sufficient to satisfy Warrants 1, 2 and 3 for these conditions. Traffic signal warrants should also be monitored at this intersection as the development phases are constructed to determine when traffic signal control is to be constructed in the future.



# APPENDIX



# Trip-Generation Data



PETERS & ASSOCIATES  
ENGINEERS, INC.

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# BUILDING MASSING STUDY GREENSBOROUGH VILLAGE JONESBORO, ARKANSAS OCTOBER 2016



## PROPOSED USES

- OFFICE
- 1 STORY OFFICE/RETAIL
- 2 STORY RETAIL/OFFICE
- COMMERCIAL
- HOTEL
- MULTI-FAMILY
- SINGLE FAMILY



OUT/INCEL #	USE	FOOTPRINT (S.F.)	LOT SIZE (S.F.)	AGE
1	RETAIL RESTAURANT	8,800	44,224	1.02
2	RETAIL RESTAURANT	8,800	44,000	1.01
3	RETAIL RESTAURANT	8,800	44,000	1.01
4	FINANCIAL	7,225	45,095	1.04
5	RETAIL RESTAURANT	6,000	34,063	0.78
6	RETAIL RESTAURANT	6,000	34,063	0.78
7	RETAIL RESTAURANT	44,500	238,901	0.87
8	RETAIL RESTAURANT	7,162	35,432	0.81
9	CONVENIENCE RETAIL	4,000	47,579	1.09
10	RETAIL RESTAURANT	4,000	47,579	1.09
11	GROCERY	56,400	190,865	4.36
12	OFFICE RETAIL	68,792	191,052	3.70
13	MOVIE THEATER	42,272	332,797	7.15
14	RETAIL RESTAURANT	17,200	75,300	1.73
15	RETAIL RESTAURANT	9,727	40,077	0.92
16	RETAIL RESTAURANT	10,500	34,111	0.78
17	RETAIL RESTAURANT	10,500	34,111	0.78
18	OFFICE RETAIL	72,586	191,789	4.17
19	OFFICE RETAIL	63,573	191,522	3.71
20	RETAIL RESTAURANT	7,200	35,505	0.80
21	OFFICE	8,400	37,445	0.90
22	OFFICE	8,400	37,445	0.90
23	OFFICE	8,400	37,445	0.90
24	RETAIL RESTAURANT	4,500	44,816	1.0
25	HOTEL	36,360	173,527	4.9
26	RETAIL RESTAURANT	17,200	75,300	1.73
27	RESIDENTIAL	25,176	108,450	2.49
28	OFFICE	12,000	53,217	1.22
29	OFFICE	12,000	53,217	1.22
30	OFFICE	12,000	53,217	1.22
31	OFFICE	12,000	53,217	1.22
32	OFFICE	12,000	53,217	1.22
33	OFFICE	12,000	53,217	1.22
34	OFFICE	12,000	53,217	1.22
35	OFFICE	12,000	53,217	1.22
36	OFFICE	12,000	53,217	1.22
37	OFFICE	12,000	53,217	1.22
38	OFFICE	12,000	53,217	1.22
39	OFFICE	12,000	53,217	1.22
40	OFFICE	12,000	53,217	1.22
41	OFFICE	12,000	53,217	1.22

\*FOR OUT PARCEL #S 33-41, 0.25 A.F. MAXIMUM HAS BEEN USED.  
\*FOR IN PARCEL #S 1-32, 0.25 A.F. MAXIMUM HAS BEEN USED.  
\*ACREAGE FOR MULTI-FAMILY DOES INCLUDE INTERNAL ROADWAYS AS PART OF OVERALL ACREAGE.



# GREENSBORO VILLAGE FULL BUILD-OUT

12/2/2016

TRACT #	PROPOSED LAND USE	APPROXIMATE SIZE	ITE CODE	24-HOUR TWO-WAY WEEKDAY VOLUME	AM PEAK HOUR VOLUME		PM PEAK HOUR VOLUME	
					ENTER	EXIT	ENTER	EXIT
1-3 & 5-8	Retail / Restaurant	93,024 Sq. Ft.	820	3,972	55	34	166	179
4	Financial	7,225 Sq. Ft.	912	1,070	50	37	88	87
9	Convenience Retail	4,000 Sq. Ft.	853	3,382	82	82	102	102
10	Retail / Restaurant	6,600 Sq. Ft.	932	839	39	32	39	26
11	Grocery	56,400 Sq. Ft.	850	5,766	119	73	273	262
12	Office / Retail	114,884 Sq. Ft.	820 / 710	3,087	113	32	117	182
13	Movie Theater	47,272 Sq. Ft.	445	650	0	0	61	75
14 - 18	Retail / Restaurant	56,410 Sq. Ft.	820	2,409	33	21	100	109
19 & 20	Office / Retail	176,961 Sq. Ft.	820 / 710	4,754	174	49	179	281
21	Retail / Restaurant	7,200 Sq. Ft.	931	648	3	3	36	18
22 & 23	Office	15,300 Sq. Ft.	710	169	21	3	4	19
24	Retail / Restaurant	4,500 Sq. Ft.	932	572	27	22	26	18
25	Hotel	100 Rooms	310	817	31	22	31	29
26	Office / Residential	69,786 Sq. Ft.	710 / 220	613	66	15	18	60
27 - 33	Office	72,000 Sq. Ft.	710	794	99	13	18	89
34 - 36	Future Retail	135,298 Sq. Ft.	820	5,777	81	49	241	261
37	Residential Multi-Family	341 Units	220	2,268	35	139	137	74
38	Residential Townhomes	28 Units	230	163	2	10	10	5
39	Residential Multi-Family	263 Units	220	1,749	27	107	106	57
40	Residential Single-Family	185 Lots	210	1,761	35	104	117	68
41	Community Open Space	30.5 Acres	n/a	0	0	0	0	0
<b>UNADJUSTED TOTAL DRIVEWAY VOLUMES</b>				<b>41,260</b>	<b>1092</b>	<b>847</b>	<b>1869</b>	<b>2001</b>
<b>INTERNAL TRIP CAPTURE</b>					<b>-153</b>	<b>-153</b>	<b>-520</b>	<b>-520</b>
<b>ADJUSTED DRIVEWAY VOLUMES</b>					<b>939</b>	<b>694</b>	<b>1349</b>	<b>1481</b>
<b>TOTAL ENTERING + EXITING</b>					<b>1,633</b>		<b>2,830</b>	



### Trip Generation Summary - Full Build

Project: P1720  
Alternative: Greensboro Village

Open Date: 12/2/2016  
Analysis Date: 12/2/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
820	CENTERSHOPPING 1 93.02 Gross Leasable Area 1000 SF	1986	1986	3972	55	34	89	166	179	345
912	BANKDRIVEIN 1 7.22 Gross Floor Area 1000 SF	535	535	1070	50	37	87	88	87	175
853	CONVMARKETGAS 1 4 Gross Floor Area 1000 SF	1691	1691	3382	82	82	164	102	102	204
932	RESTAURANTHT 1 6.6 Gross Floor Area 1000 SF	420	419	839	39	32	71	39	26	65
850	SUPERMARKET 1 56.4 Gross Floor Area 1000 SF	2883	2883	5766	119	73	192	273	262	535
820	CENTERSHOPPING 2 57.44 Gross Leasable Area 1000 SF	1227	1226	2453	34	21	55	102	111	213
710	OFFICEGENERAL 1 57.44 Gross Floor Area 1000 SF	317	317	634	79	11	90	15	71	86
445	THEATERMULTI 1 10 Movie Screens							61	75	136
820	CENTERSHOPPING 3 56.41 Gross Leasable Area 1000 SF	1205	1204	2409	33	21	54	100	109	209
820	CENTERSHOPPING 4 88.48 Gross Leasable Area 1000 SF	1889	1889	3778	53	32	85	157	171	328
710	OFFICEGENERAL 2 88.48 Gross Floor Area 1000 SF	488	488	976	121	17	138	22	110	132
931	RESTAURANTQ 1 7.2 Gross Floor Area 1000 SF	324	324	648	3	3	6	36	18	54
710	OFFICEGENERAL 3 15.3 Gross Floor Area 1000 SF	85	84	169	21	3	24	4	19	23
932	RESTAURANTHT 2 4.5 Gross Floor Area 1000 SF	286	286	572	27	22	49	26	18	44
310	HOTEL 1 100 Rooms	409	408	817	31	22	53	31	29	60
710	OFFICEGENERAL 4 46.52 Gross Floor Area 1000 SF	257	256	513	64	9	73	12	57	69

Source: Institute of Transportation Engineers, Trip Generation Manual 9th Edition, 2012

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
220	APT 1	50	50	100	2	6	8	6	3	9
	15 Dwelling Units									
710	OFFICEGENERAL 5	397	397	794	99	13	112	18	89	107
	72 Gross Floor Area 1000 SF									
820	CENTERSHOPPING 5	2889	2888	5777	81	49	130	241	261	502
	135.2 Gross Leasable Area 1000 SF									
220	APT 2	1134	1134	2268	35	139	174	137	74	211
	341 Dwelling Units									
230	CONDO 1	82	81	163	2	10	12	10	5	15
	28 Dwelling Units									
220	APT 3	875	874	1749	27	107	134	106	57	163
	263 Dwelling Units									
210	SFHOUSE 1	881	880	1761	35	104	139	117	68	185
	185 Dwelling Units									
Unadjusted Volume		20310	20300	40610	1092	847	1939	1869	2001	3870
Internal Capture Trips		0	0	0	153	153	306	520	520	1040
Pass-By Trips		0	0	0	48	43	91	371	360	731
Volume Added to Adjacent Streets		20310	20300	40610	891	651	1542	978	1121	2099
Total AM Peak Hour Internal Capture = 16 Percent										
Total PM Peak Hour Internal Capture = 27 Percent										

# Traffic Count Data



PETERS & ASSOCIATES  
ENGINEERS, INC.

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# ARKANSAS STATE HIGHWAY COMMISSION

## Turning Movement Counts

### Scope of Work

Location :	<u>See Attached Map</u>	Turning Movement Number	<u>2013 – 1513, 1514, 1515, 1516</u>
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Turning Movement Counts are requested for the intersection(s) shown on the attached map(s).

**Work Required** -- Using details provided in the AHTD *Technical Services Field Manual, 1988 Edition, Part III, Section E*, the work required to be performed by the Consultant is as follows:

- (a) Set machines to obtain both a 24-consecutive hour vehicle traffic count of the inbound vehicles. Counts are to be taken Monday through Thursday only.
- (b) Set machines to obtain a total volume count for outbound vehicles for the same time period as in (a).
- (c) Obtain all pertinent information as to land use (e.g., businesses, major driveways, shopping centers, etc.) and provide sketch.
- (d) Record posted speed limits on all legs of the intersection.
- (e) Obtain manual count and classification for a total of 6 hours using the periods 7:00 a.m. to 10:00 a.m. and 3:00 p.m. to 6:00 p.m. Traffic classification shall be the four major vehicle types defined in the *Field Manual*.
- (f) Submit the completed "Intersection Turning Movements" form (furnished by AHTD).
- (g) Submit an ASCII file, which includes the manual count data in 1- hour intervals and identifies the location, in a format acceptable to the AHTD.

Special Instructions:	<u>See Above</u>
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**Completion Date** -- Ample time shall be scheduled and adequate resources dedicated to the project to complete the Turning Movement Count within 30 days from order date. Completion includes all submittals, reviews and returns, and acceptance by the Arkansas State Highway and Transportation Department (AHTD) Planning and Research Division.

**Quality Control** -- The Consultant is to properly supervise and maintain close contact with employees in order to provide the highest quality service possible to the AHTD. The Consultant will test and certify his equipment in accordance with the standards contained in *the FHWA Traffic Monitoring Guide* (TMG), the *AASHTO Guidelines for Traffic Data Programs*, and the *Highway Performance Monitoring System (HPMS) Program Field Manual*. These standards will govern the frequency of testing, duration of testing, and the minimum precision for the various types of devices being used for the Turning Movement Counts.

**Supervision** -- The Consultant will prosecute and direct the work subject to the Contract requirements. Except for initial training on performing Turning Movement Counts and in the matter of advising the Consultant as to the work to be done and the results expected, the AHTD shall have no supervision over the Consultant or any of his employees.


**Compliance** -- All work performed by the Consultant shall be in compliance with all applicable Federal, State and local laws, regulations and ordinances.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

INTEROFFICE MEMORANDUM

January 22, 2014

**TO:** Ms. Elizabeth Mayfield-Hart, Staff Planning Engineer for Traffic Information Systems Section

**FROM:** John Spears, Jr., Transportation Engineer 

**SUBJECT:** Request for Highway 49 and Highway 351 Traffic Counts  
Jonesboro, Craighead County

Traffic counts are needed in Jonesboro along Highway 49 (Johnson Avenue) and Highway 351 (North Old Greensboro Road) for a feasibility of improvements study. The traffic count locations along Highway 49 and Highway 351 are indicated on the attached map.

The following intersection turning movement counts (15-minute increments) are needed:

1. Intersection of Highway 49 and Pleasant Grove Rd./Airport Rd.
2. Intersection of Highway 49 and Highway 351
3. Intersection of Highway 49 and Red Wolf Blvd. (formerly known as Stadium Blvd.)
4. Intersection of Red Wolf Blvd. and Aggie Rd.

Two-week traffic volume counts and vehicle classification counts are needed at these locations:

5. Highway 351 north of Greensboro Road (class counts)
6. Highway 49 west of Jewell Drive (class counts)
7. Highway 351 south of Rios Lane (volume counts)
8. Highway 49 east of A Street (volume counts)
9. Alumni Blvd. east of Olympic Drive (volume counts)
10. Red Wolf Blvd. north of Alumni Blvd. (volume counts)

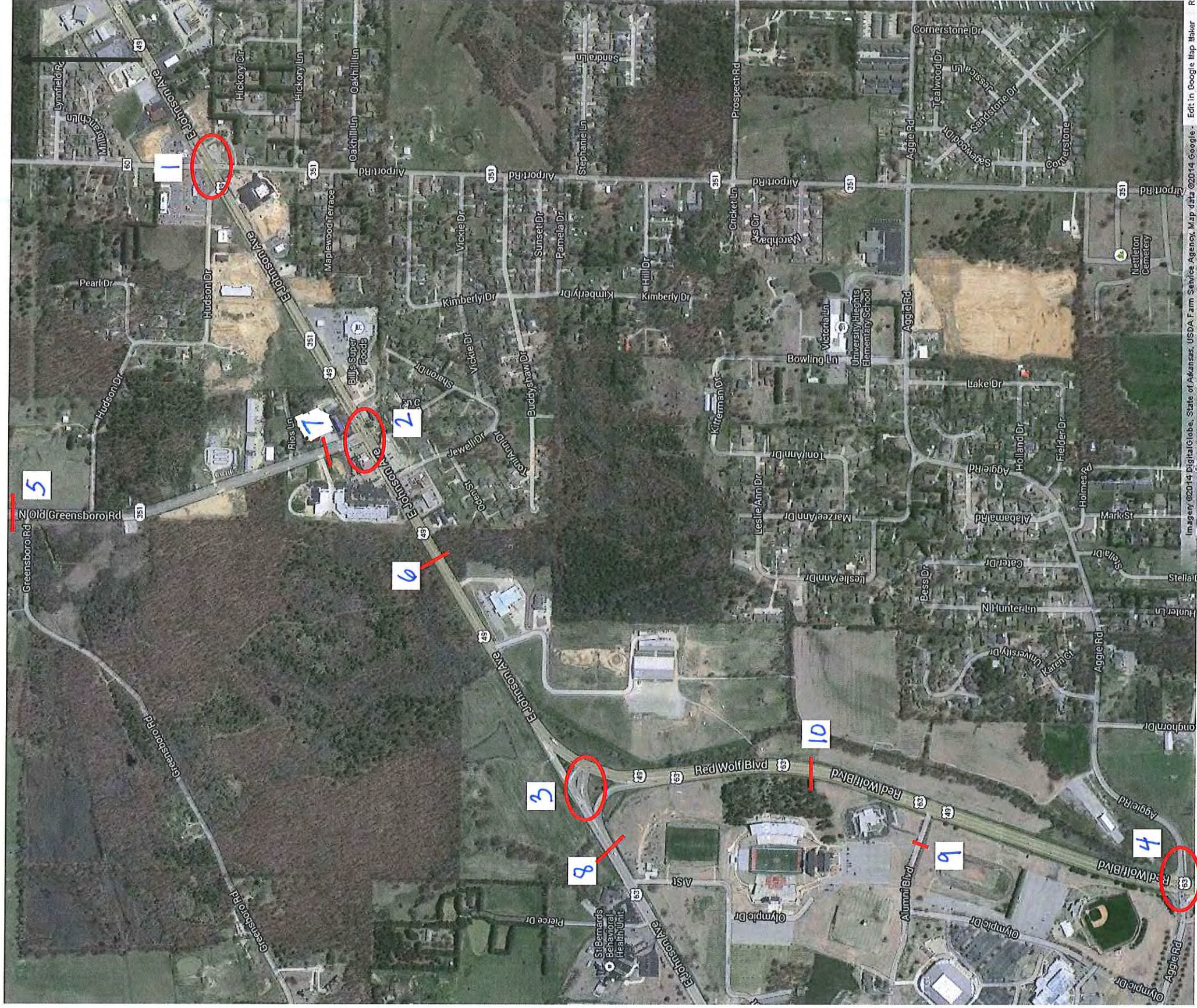
If you have any questions, please call me at 2934.

Attachment

JHS



# ATTACHMENT





**The Traffic Group Inc!**

1-800-583-8411 \* www.trafficgroup.com

*Merging Innovation and Excellence®*Date Out: 1/27/14Date In: 1/29/14Tech: EM

TM # 2014- 1514

Sta. #1 North Leg Route: Hwy 351 Direction 5

Detailed Location:

ADR # 101025 Start Rec: 2300 Stop Rec: 2313TT6 # 100541 Time Out: 2315 24 Hour: 3619

Remarks:

Sta. #2 East Leg Route: Hwy 49 Direction 7

Detailed Location:

ADR # 101659 Start Rec: 2330 Stop Rec: 2200TT6 # 100967 Time Out: 2330 24 Hour: 13910

Remarks:

Sta. #3 South Leg Route: Bank Entrance/Exit Direction 1

Detailed Location:

ADR # Start Rec: Stop Rec:

TT6 # Time Out: 24 Hour:

Remarks: not able to set machine counts to get good count. Did work manual on it.Sta. #4 West Leg Route: Hwy 49 Direction 3

Detailed Location:

ADR # 101484 Start Rec: 2315 Stop Rec: 2151TT6 # 100747 Time Out: 2315 24 Hour: 15720

Remarks:

Sta. #5 Route: Direction

Detailed Location:

ADR # Start Rec: Stop Rec:

TT6 # Time Out: 24 Hour:

Remarks:

Lat-N: 35.85742

LON-W: 90.65641

Weth. Out clearWeth. In: clear

Direction Code: North = 1 East = 3 South=5 West=7





# The Traffic Group, Inc

9900 Franklin Square Drive, STE H

Baltimore, MD 21236

Latitude: N35.85742  
Longitude: W90.65641

File Name: **Hwy\_49 @ Hwy\_351\_151\_148401\_01-29-2014[1]**

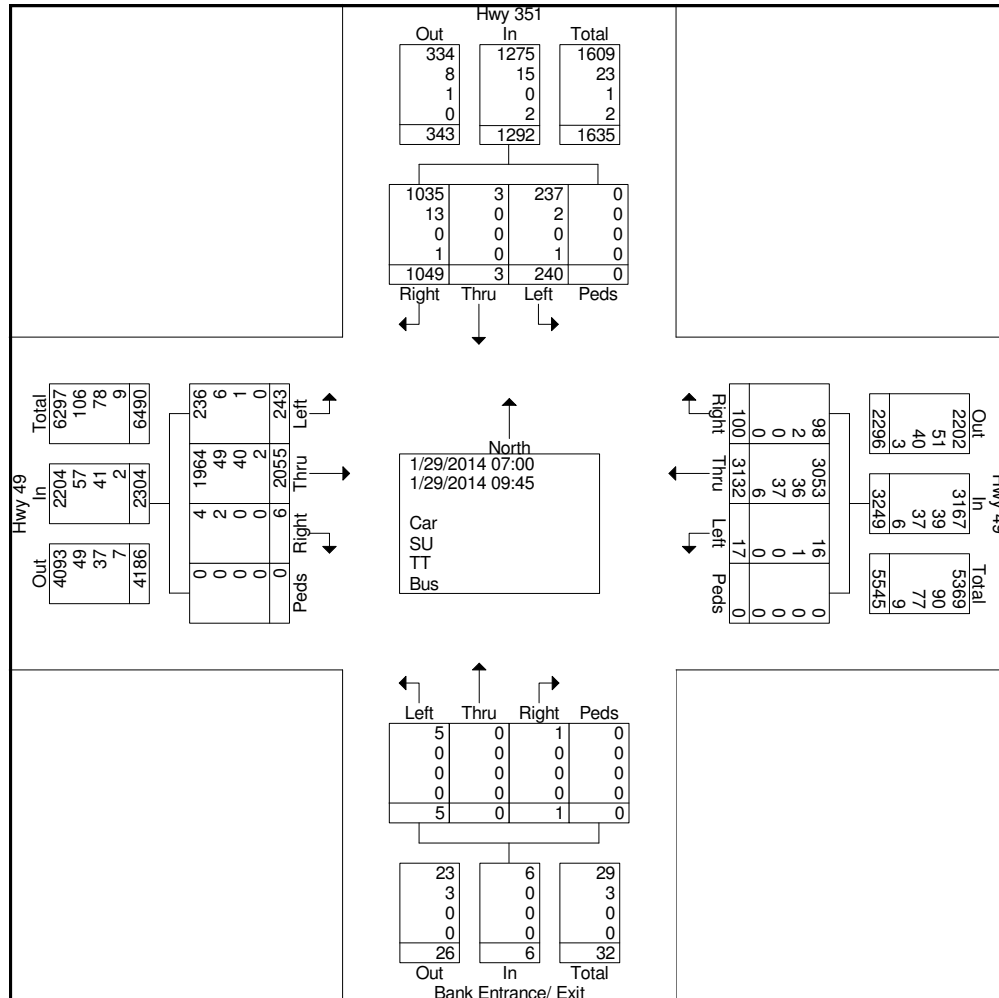
Site Code : 20141514

Start Date : 1/29/2014

Page No : 1

Groups Printed- Car - SU - TT - Bus

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Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00	120	0	27	0	147	6	181	0	0	187	0	0	0	0	0	0	156	12	0	168	502
07:15	135	0	20	0	155	9	279	1	0	289	0	0	0	0	0	0	164	14	0	178	622
07:30	122	0	21	0	143	11	441	1	0	453	0	0	0	0	0	0	219	16	0	235	831
07:45	118	0	16	0	134	8	433	0	0	441	0	0	0	0	0	0	214	25	0	239	814
Total	495	0	84	0	579	34	1334	2	0	1370	0	0	0	0	0	0	753	67	0	820	2769
08:00	86	0	28	0	114	9	268	0	0	277	0	0	0	0	0	0	189	26	0	215	606
08:15	96	0	22	0	118	10	263	2	0	275	0	0	1	0	1	0	154	31	0	185	579
08:30	93	0	19	0	112	9	285	2	0	296	0	0	1	0	1	2	160	17	0	179	588
08:45	80	1	19	0	100	5	223	3	0	231	0	0	1	0	1	1	144	24	0	169	501
Total	355	1	88	0	444	33	1039	7	0	1079	0	0	3	0	3	3	647	98	0	748	2274
09:00	64	0	20	0	84	8	184	0	0	192	1	0	1	0	2	0	158	14	0	172	450
09:15	38	1	19	0	58	5	194	2	0	201	0	0	0	0	0	0	176	17	0	193	452
09:30	42	0	12	0	54	10	209	4	0	223	0	0	1	0	1	1	160	22	0	183	461
09:45	55	1	17	0	73	10	172	2	0	184	0	0	0	0	0	2	161	25	0	188	445
Total	199	2	68	0	269	33	759	8	0	800	1	0	2	0	3	3	655	78	0	736	1808
Grand Total	1049	3	240	0	1292	100	3132	17	0	3249	1	0	5	0	6	6	2055	243	0	2304	6851
Apprch %	81.2	0.2	18.6	0		3.1	96.4	0.5	0		16.7	0	83.3	0		0.3	89.2	10.5	0		
Total %	15.3	0	3.5	0	18.9	1.5	45.7	0.2	0	47.4	0	0	0.1	0	0.1	0.1	30	3.5	0	33.6	
Car	1035	3	237	0	1275	98	3053	16	0	3167	1	0	5	0	6	4	1964	236	0	2204	6652
% Car	98.7	100	98.8	0	98.7	98	97.5	94.1	0	97.5	100	0	100	0	100	66.7	95.6	97.1	0	95.7	97.1
SU	13	0	2	0	15	2	36	1	0	39	0	0	0	0	0	2	49	6	0	57	111
% SU	1.2	0	0.8	0	1.2	2	1.1	5.9	0	1.2	0	0	0	0	0	33.3	2.4	2.5	0	2.5	1.6
TT	0	0	0	0	0	0	37	0	0	37	0	0	0	0	0	0	40	1	0	41	78
% TT	0	0	0	0	0	0	1.2	0	0	1.1	0	0	0	0	0	0	1.9	0.4	0	1.8	1.1
Bus	1	0	1	0	2	0	6	0	0	6	0	0	0	0	0	0	2	0	0	2	10
% Bus	0.1	0	0.4	0	0.2	0	0.2	0	0	0.2	0	0	0	0	0	0	0.1	0	0	0.1	0.1



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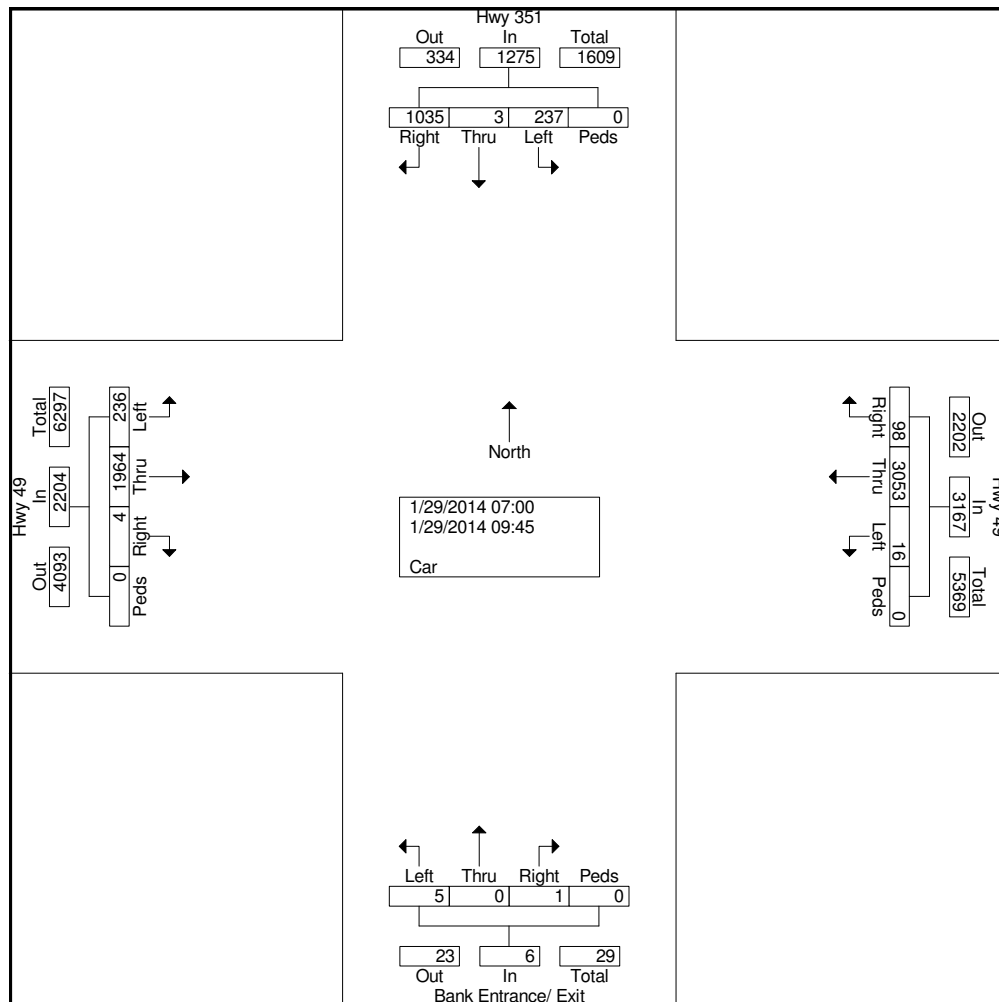
9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

Latitude: N35.85742  
Longitude: W90.65641

File Name : **Hwy\_49 @ \_Hwy\_351\_151\_148401\_01-29-2014[1]**  
Site Code : 20141514  
Start Date : 1/29/2014  
Page No : 1

Groups Printed- Car

Start Time	Hwy 351 From North					Hwy 49 From East					Bank Entrance/ Exit From South					Hwy 49 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
07:00	119	0	26	0	145	6	178	0	0	184	0	0	0	0	0	0	155	12	0	167	496
07:15	134	0	20	0	154	9	276	1	0	286	0	0	0	0	0	0	157	13	0	170	610
07:30	122	0	21	0	143	11	437	1	0	449	0	0	0	0	0	0	214	14	0	228	820
07:45	116	0	16	0	132	8	426	0	0	434	0	0	0	0	0	0	212	24	0	236	802
Total	491	0	83	0	574	34	1317	2	0	1353	0	0	0	0	0	0	738	63	0	801	2728
08:00	86	0	28	0	114	8	259	0	0	267	0	0	0	0	0	0	178	26	0	204	585
08:15	94	0	20	0	114	10	256	2	0	268	0	0	1	0	1	0	150	31	0	181	564
08:30	92	0	19	0	111	9	276	2	0	287	0	0	1	0	1	0	149	17	0	166	565
08:45	79	1	19	0	99	5	217	2	0	224	0	0	1	0	1	1	138	24	0	163	487
Total	351	1	86	0	438	32	1008	6	0	1046	0	0	3	0	3	1	615	98	0	714	2201
09:00	63	0	20	0	83	8	180	0	0	188	1	0	1	0	2	0	152	14	0	166	439
09:15	37	1	19	0	57	5	187	2	0	194	0	0	0	0	0	0	165	16	0	181	432
09:30	40	0	12	0	52	10	195	4	0	209	0	0	1	0	1	1	150	22	0	173	435
09:45	53	1	17	0	71	9	166	2	0	177	0	0	0	0	0	2	144	23	0	169	417
Total	193	2	68	0	263	32	728	8	0	768	1	0	2	0	3	3	611	75	0	689	1723
Grand Total	1035	3	237	0	1275	98	3053	16	0	3167	1	0	5	0	6	4	1964	236	0	2204	6652
Apprch %	81.2	0.2	18.6	0		3.1	96.4	0.5	0		16.7	0	83.3	0		0.2	89.1	10.7	0		
Total %	15.6	0	3.6	0	19.2	1.5	45.9	0.2	0	47.6	0	0	0.1	0	0.1	0.1	29.5	3.5	0	33.1	



# The Traffic Group, Inc

9900 Franklin Square Drive, STE H

Baltimore, MD 21236

Latitude: N35.85742

Longitude: W90.65641

*Merging into mainline and Exit*

File Name: Hwy\_49 @ Hwy\_351\_151\_148401\_01-29-2014[1]

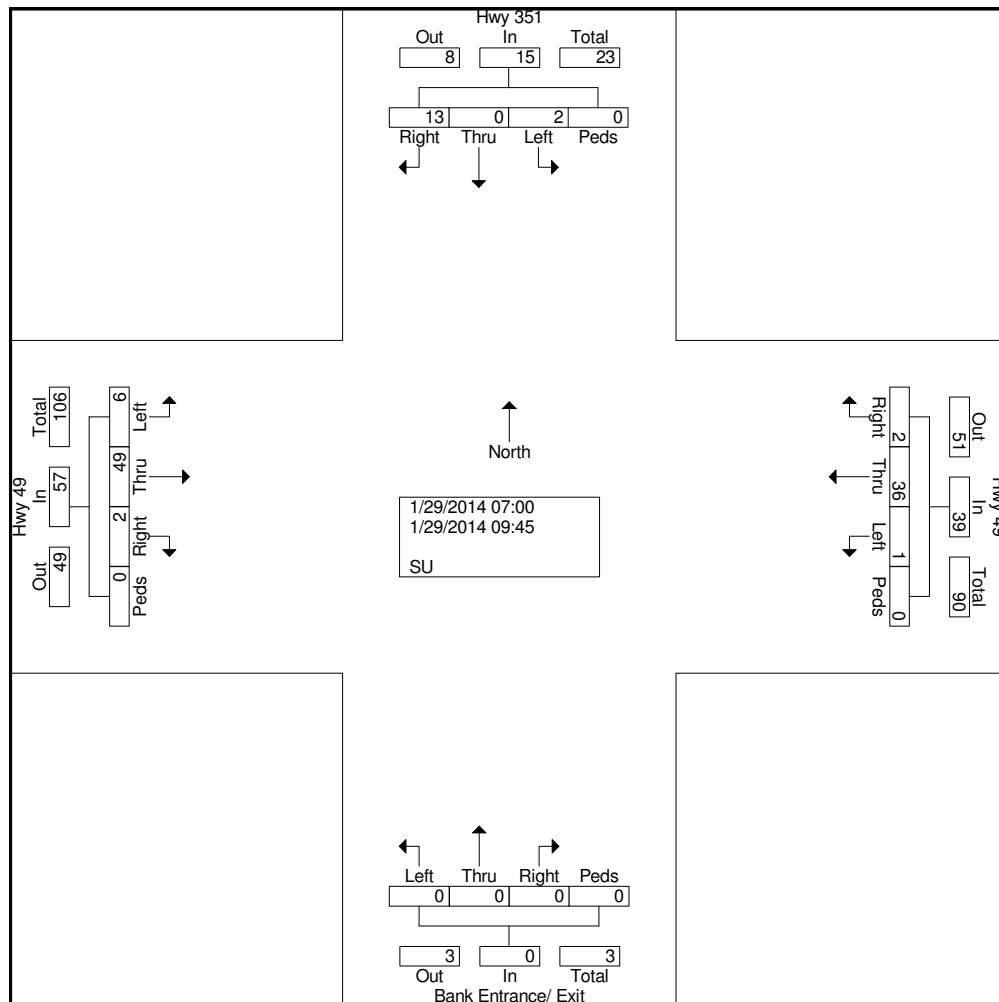
Site Code : 20141514

Start Date : 1/29/2014

Page No : 1

Groups Printed- SU

Start Time	Hwy 351 From North					Hwy 49 From East					Bank Entrance/ Exit From South					Hwy 49 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
07:00	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
07:15	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	4	1	0	5	7
07:30	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	1	2	0	3	6
07:45	2	0	0	0	2	0	3	0	0	3	0	0	0	0	0	0	2	1	0	3	8
Total	3	0	0	0	3	0	8	0	0	8	0	0	0	0	0	0	7	4	0	11	22
08:00	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	6	0	0	6	11
08:15	2	0	2	0	4	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	10
08:30	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	2	4	0	0	6	11
08:45	1	0	0	0	1	0	2	1	0	3	0	0	0	0	0	0	3	0	0	3	7
Total	4	0	2	0	6	1	12	1	0	14	0	0	0	0	0	2	17	0	0	19	39
09:00	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	0	5	0	0	5	8
09:15	1	0	0	0	1	0	5	0	0	5	0	0	0	0	0	0	8	1	0	9	15
09:30	2	0	0	0	2	0	5	0	0	5	0	0	0	0	0	0	4	0	0	4	11
09:45	2	0	0	0	2	1	4	0	0	5	0	0	0	0	0	0	8	1	0	9	16
Total	6	0	0	0	6	1	16	0	0	17	0	0	0	0	0	0	25	2	0	27	50
Grand Total	13	0	2	0	15	2	36	1	0	39	0	0	0	0	0	2	49	6	0	57	111
Apprch %	86.7	0	13.3	0		5.1	92.3	2.6	0		0	0	0	0		3.5	86	10.5	0		
Total %	11.7	0	1.8	0	13.5	1.8	32.4	0.9	0	35.1	0	0	0	0	0	1.8	44.1	5.4	0	51.4	



# The Traffic Group, Inc

9900 Franklin Square Drive, STE H

Baltimore, MD 21236

Latitude: N35.85742  
Longitude: W90.65641

File Name: Hwy\_49 @ Hwy\_351\_151\_148401\_01-29-2014[1]

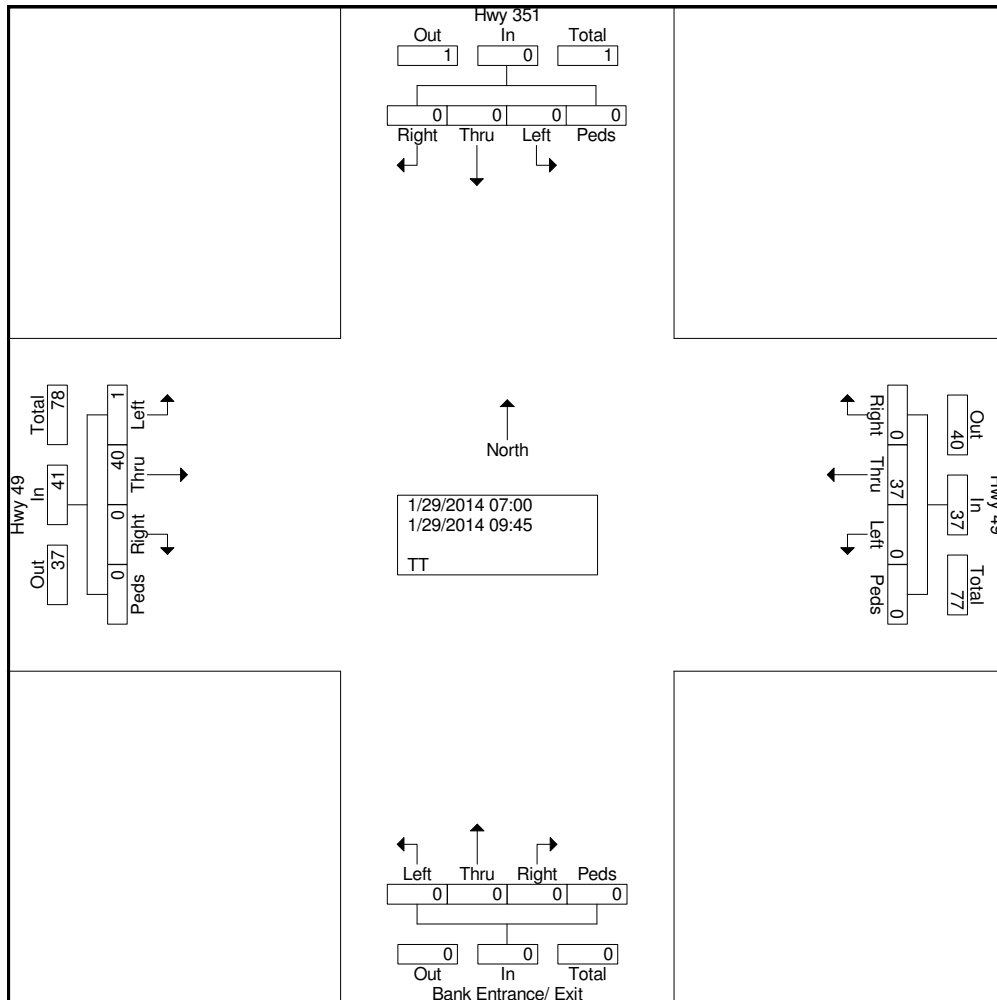
Site Code : 20141514

Start Date : 1/29/2014

Page No : 1

Groups Printed- TT

Start Time	Hwy 351 From North					Hwy 49 From East					Bank Entrance/ Exit From South					Hwy 49 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
07:00	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	3
07:15	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
07:30	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	5
07:45	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	4
Total	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	7	0	0	7	16
08:00	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	5	0	0	5	10
08:15	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
08:30	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	7	0	0	7	10
08:45	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	6
Total	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	0	15	0	0	15	29
09:00	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
09:15	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
09:30	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	6	0	0	6	15
09:45	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	9	1	0	10	12
Total	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	0	18	1	0	19	33
Grand Total	0	0	0	0	0	0	37	0	0	37	0	0	0	0	0	0	40	1	0	41	78
Apprch %	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	97.6	2.4	0	0	0
Total %	0	0	0	0	0	0	47.4	0	0	47.4	0	0	0	0	0	0	51.3	1.3	0	52.6	0



# The Traffic Group, Inc

9900 Franklin Square Drive, STE H

Baltimore, MD 21236

Latitude: N35.85742

Longitude: W90.65641

*Merging into mainline and Exit*

File Name : Hwy\_49 @ Hwy\_351\_151\_148401\_01-29-2014[1]

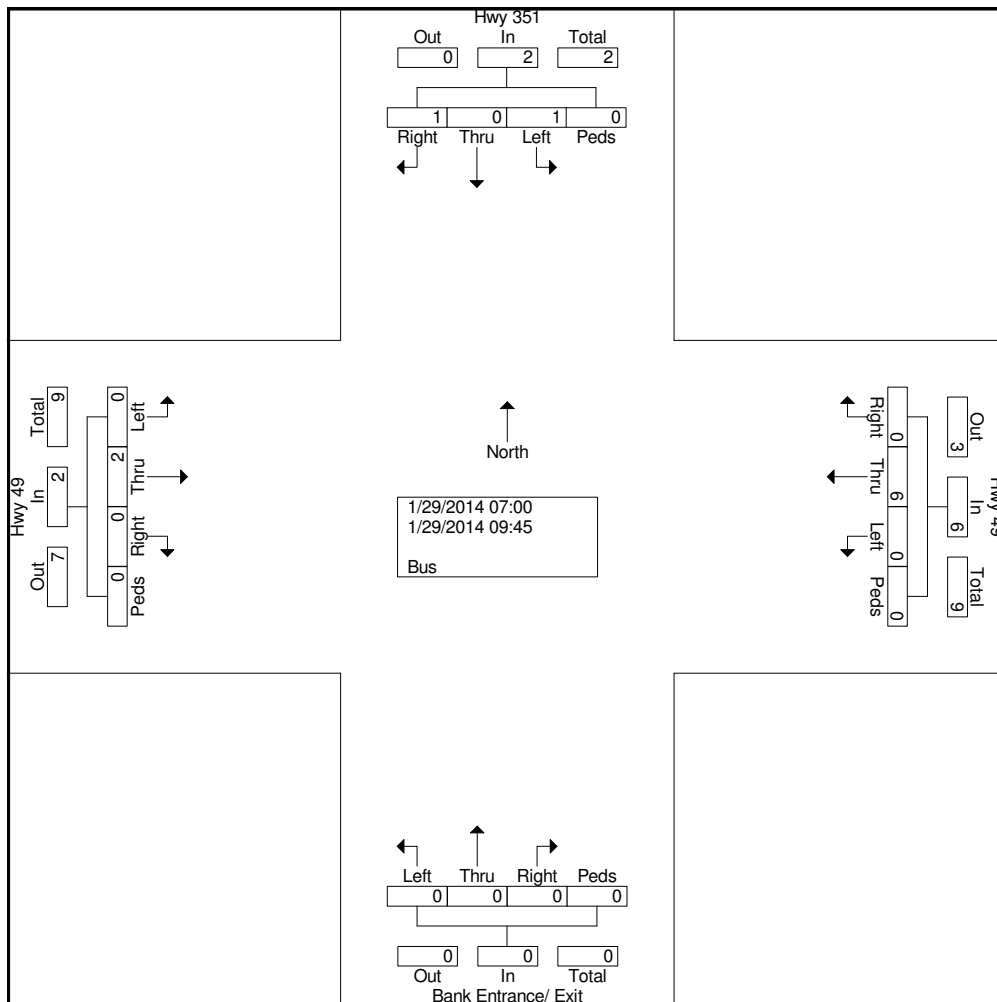
Site Code : 20141514

Start Date : 1/29/2014

Page No : 1

## Groups Printed- Bus

Start Time	Hwy 351 From North					Hwy 49 From East					Bank Entrance/ Exit From South					Hwy 49 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
07:00	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
08:30	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
08:45	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5
09:00	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
Grand Total	1	0	1	0	2	0	6	0	0	6	0	0	0	0	0	0	2	0	0	2	10
Apprch %	50	0	50	0		0	100	0	0		0	0	0	0		0	100	0	0		
Total %	10	0	10	0	20	0	60	0	0	60	0	0	0	0	0	0	20	0	0	20	



# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

*Merging Innovation and Excellence*

Latitude: N35.85742  
Longitude: W90.65641

File Name : Hwy\_49\_@\_Hwy\_351\_151\_148399\_01-28-2014[1]  
Site Code : 20141514  
Start Date : 1/28/2014  
Page No : 1

Groups Printed- Bus

	Hwy 351 From North					Hwy 49 From East					Bank Entrance Exit From South					Hwy 49 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
15:00	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
15:15	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
15:30	0	0	1	0	1	1	1	0	0	2	0	0	0	0	0	0	0	1	0	1	4
15:45	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
Total	0	0	2	0	2	1	4	0	0	5	0	0	0	0	0	0	1	1	0	2	9
16:00	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	1	0	1	3
16:15	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	1	0	1	5
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	2	0	2	1	8	0	0	9	0	0	0	0	0	0	1	2	0	3	14
Apprch %	0	0	100	0		11.1	88.9	0	0		0	0	0	0		0	33.3	66.7	0		
Total %	0	0	14.3	0	14.3	7.1	57.1	0	0	64.3	0	0	0	0	0	0	7.1	14.3	0	21.4	

# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

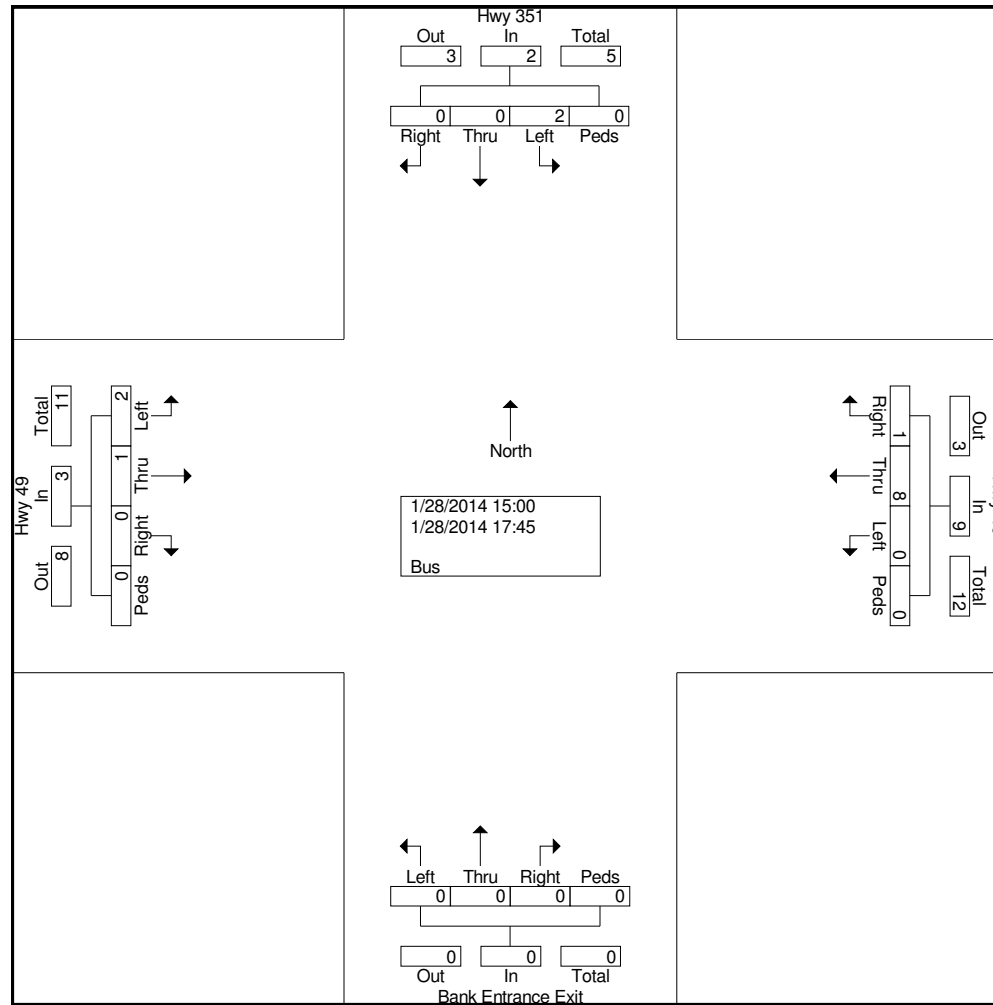
*Merging Innovation and Excellence*

File Name : Hwy\_49\_@\_Hwy\_351\_151\_148399\_01-28-2014[1]

Site Code : 20141514

Start Date : 1/28/2014

Page No : 2





# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

*Merging Innovation and Excellence*

Latitude: N35.85742  
Longitude: W90.65641

File Name : Hwy\_49\_@\_Hwy\_351\_151\_148399\_01-28-2014[1]  
Site Code : 20141514  
Start Date : 1/28/2014  
Page No : 1

Groups Printed- Car																						
	Hwy 351 From North					Hwy 49 From East					Bank Entrance Exit From South					Hwy 49 From West						
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total	
15:00	39	0	24	0	63	21	185	2	0	208	1	0	0	0	1	1	253	49	0	303	575	
15:15	27	0	23	0	50	23	218	4	0	245	0	0	0	0	0	1	254	53	0	308	603	
15:30	42	2	23	0	67	23	260	5	0	288	0	0	0	0	0	6	223	66	0	295	650	
15:45	46	1	25	0	72	22	249	2	0	273	2	0	1	0	3	2	250	78	0	330	678	
Total	154	3	95	0	252	89	912	13	0	1014	3	0	1	0	4	10	980	246	0	1236	2506	
16:00	37	2	39	0	78	30	229	2	0	261	0	0	2	0	2	4	252	64	0	320	661	
16:15	35	1	32	0	68	15	215	1	0	231	0	1	1	0	2	2	273	85	0	360	661	
16:30	44	1	19	0	64	32	243	0	0	275	0	0	0	0	0	4	279	67	0	350	689	
16:45	47	0	28	0	75	26	261	0	0	287	0	0	1	0	1	2	306	97	0	405	768	
Total	163	4	118	0	285	103	948	3	0	1054	0	1	4	0	5	12	1110	313	0	1435	2779	
17:00	42	0	25	0	67	26	272	0	0	298	0	0	0	0	0	5	318	89	0	412	777	
17:15	37	0	32	0	69	32	249	2	0	283	0	1	0	0	1	4	397	128	0	529	882	
17:30	52	0	49	0	101	29	265	2	0	296	0	0	0	0	0	2	296	78	0	376	773	
17:45	45	2	29	0	76	21	212	1	0	234	0	0	0	0	0	1	241	97	0	339	649	
Total	176	2	135	0	313	108	998	5	0	1111	0	1	0	0	1	12	1252	392	0	1656	3081	
Grand Total	493	9	348	0	850	300	2858	21	0	3179	3	2	5	0	10	34	3342	951	0	4327	8366	
Apprch %	58	1.1	40.9	0		9.4	89.9	0.7	0		30	20	50	0		0.8	77.2	22	0			
Total %	5.9	0.1	4.2	0	10.2	3.6	34.2	0.3	0	38	0	0	0.1	0	0.1	0.4	39.9	11.4	0	51.7		

# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
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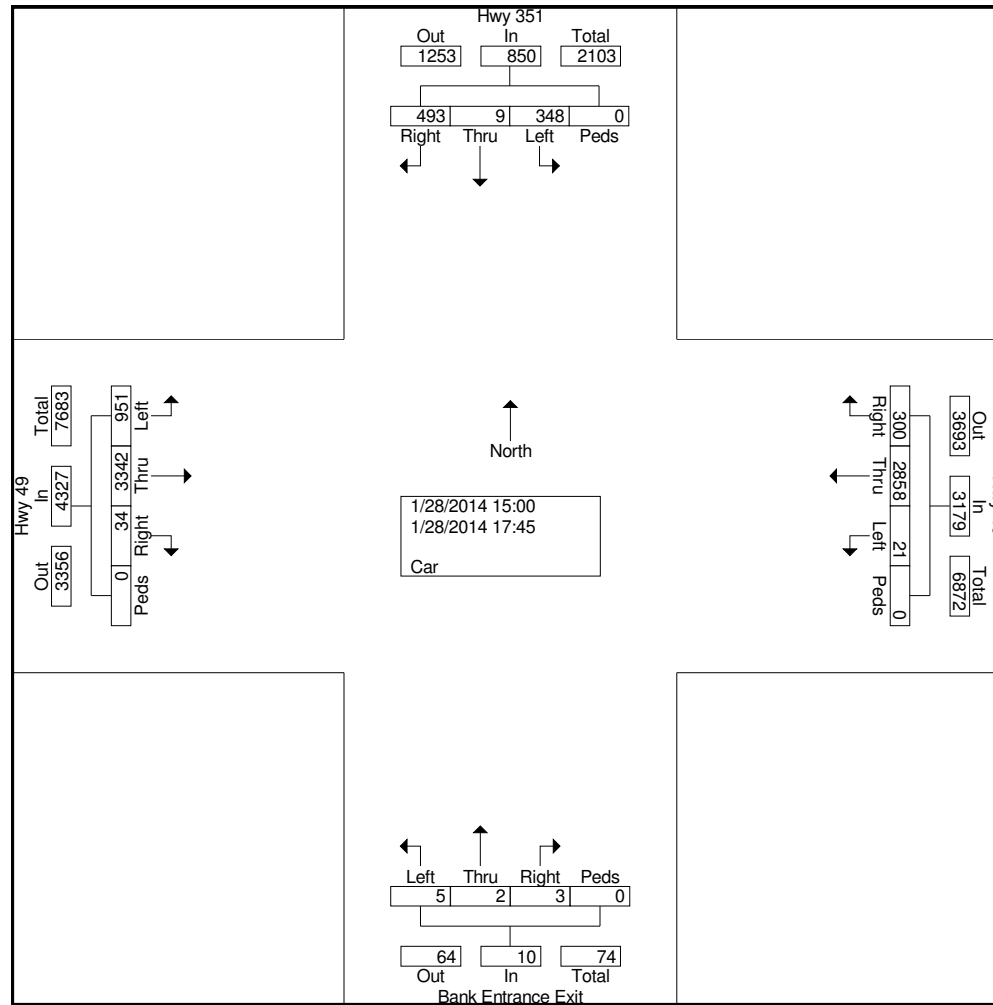
*Merging Innovation and Excellence*

File Name : Hwy\_49\_@\_Hwy\_351\_151\_148399\_01-28-2014[1]

Site Code : 20141514

Start Date : 1/28/2014

Page No : 2



# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

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File Name : Hwy\_49\_@\_Hwy\_351\_151\_148399\_01-28-2014[1]

Site Code : 20141514

Start Date : 1/28/2014

Page No : 1

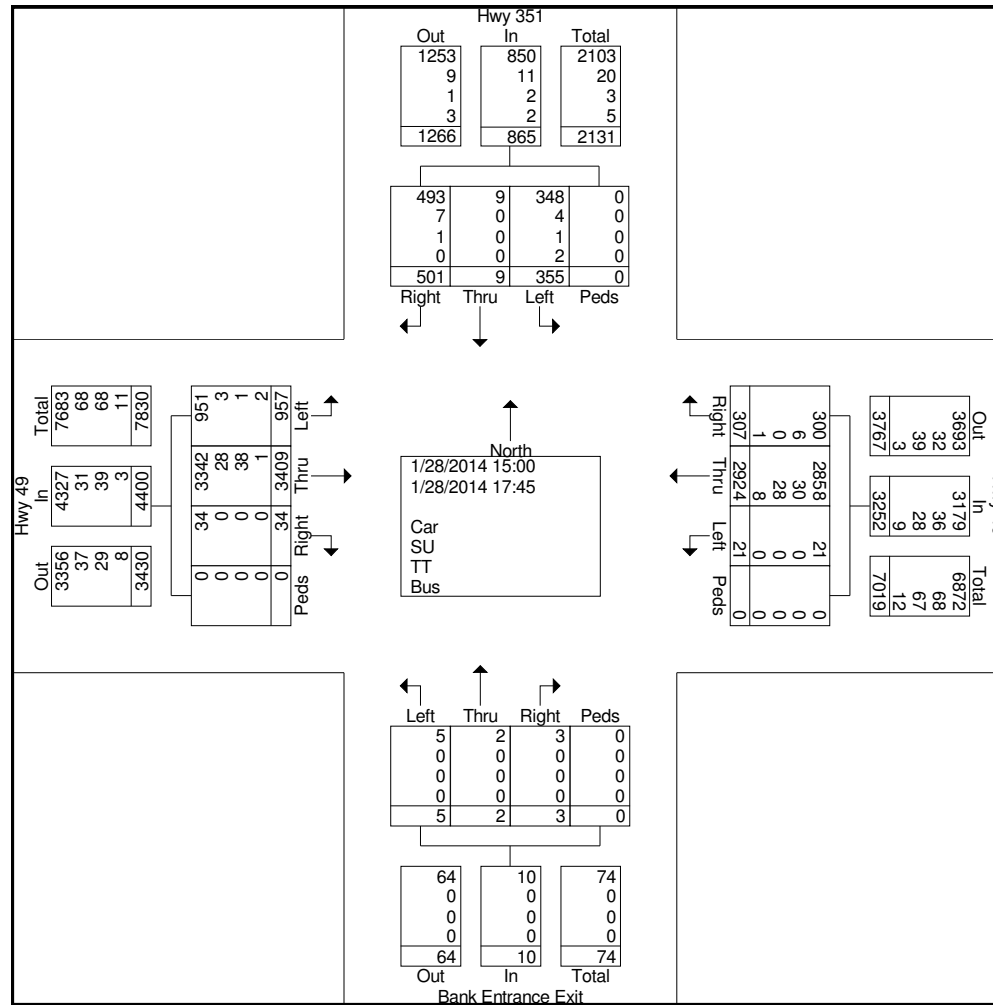
Latitude: N35.85742  
Longitude: W90.65641

Groups Printed- Car - SU - TT - Bus

Start Time	Hwy 351 From North					Hwy 49 From East					Bank Entrance Exit From South					Hwy 49 From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
15:00	41	0	24	0	65	21	193	2	0	216	1	0	0	0	1	1	257	49	0	307	589
15:15	27	0	23	0	50	24	226	4	0	254	0	0	0	0	0	1	257	53	0	311	615
15:30	43	2	25	0	70	26	267	5	0	298	0	0	0	0	0	6	226	69	0	301	669
15:45	47	1	27	0	75	23	256	2	0	281	2	0	1	0	3	2	262	78	0	342	701
Total	158	3	99	0	260	94	942	13	0	1049	3	0	1	0	4	10	1002	249	0	1261	2574
16:00	38	2	40	0	80	30	241	2	0	273	0	0	2	0	2	4	265	65	0	334	689
16:15	35	1	32	0	68	15	219	1	0	235	0	1	1	0	2	2	279	85	0	366	671
16:30	45	1	20	0	66	33	246	0	0	279	0	0	0	0	0	4	285	67	0	356	701
16:45	47	0	28	0	75	27	265	0	0	292	0	0	1	0	1	2	309	99	0	410	778
Total	165	4	120	0	289	105	971	3	0	1079	0	1	4	0	5	12	1138	316	0	1466	2839
17:00	43	0	25	0	68	26	274	0	0	300	0	0	0	0	0	5	321	89	0	415	783
17:15	38	0	32	0	70	32	250	2	0	284	0	1	0	0	1	4	404	128	0	536	891
17:30	52	0	49	0	101	29	272	2	0	303	0	0	0	0	0	2	298	78	0	378	782
17:45	45	2	30	0	77	21	215	1	0	237	0	0	0	0	0	1	246	97	0	344	658
Total	178	2	136	0	316	108	1011	5	0	1124	0	1	0	0	1	12	1269	392	0	1673	3114
Grand Total	501	9	355	0	865	307	2924	21	0	3252	3	2	5	0	10	34	3409	957	0	4400	8527
Apprch %	57.9	1	41	0		9.4	89.9	0.6	0		30	20	50	0		0.8	77.5	21.8	0		
Total %	5.9	0.1	4.2	0	10.1	3.6	34.3	0.2	0	38.1	0	0	0.1	0	0.1	0.4	40	11.2	0	51.6	
Car	493	9	348	0	850	300	2858	21	0	3179	3	2	5	0	10	34	3342	951	0	4327	8366
% Car	98.4	100	98	0	98.3	97.7	97.7	100	0	97.8	100	100	100	0	100	100	98	99.4	0	98.3	98.1
SU	7	0	4	0	11	6	30	0	0	36	0	0	0	0	0	0	28	3	0	31	78
% SU	1.4	0	1.1	0	1.3	2	1	0	0	1.1	0	0	0	0	0	0	0.8	0.3	0	0.7	0.9
TT	1	0	1	0	2	0	28	0	0	28	0	0	0	0	0	0	38	1	0	39	69
% TT	0.2	0	0.3	0	0.2	0	1	0	0	0.9	0	0	0	0	0	0	1.1	0.1	0	0.9	0.8
Bus	0	0	2	0	2	1	8	0	0	9	0	0	0	0	0	0	1	2	0	3	14
% Bus	0	0	0.6	0	0.2	0.3	0.3	0	0	0.3	0	0	0	0	0	0	0	0.2	0	0.1	0.2

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Page No : 2



# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

*Merging Innovation and Excellence*

Latitude: N35.85742  
Longitude: W90.65641

File Name : Hwy\_49\_@\_Hwy\_351\_151\_148399\_01-28-2014[1]  
Site Code : 20141514  
Start Date : 1/28/2014  
Page No : 1

Groups Printed- SU

	Hwy 351 From North					Hwy 49 From East					Bank Entrance Exit From South					Hwy 49 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
15:00	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	6
15:15	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	1	0	0	1	6
15:30	1	0	1	0	2	2	3	0	0	5	0	0	0	0	0	0	2	2	0	4	11
15:45	1	0	0	0	1	1	6	0	0	7	0	0	0	0	0	0	3	0	0	3	11
Total	3	0	1	0	4	4	17	0	0	21	0	0	0	0	0	0	7	2	0	9	34
16:00	1	0	1	0	2	0	4	0	0	4	0	0	0	0	0	0	6	0	0	6	12
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	4
16:30	1	0	1	0	2	1	2	0	0	3	0	0	0	0	0	0	2	0	0	2	7
16:45	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	1	0	1	3
Total	2	0	2	0	4	2	7	0	0	9	0	0	0	0	0	0	12	1	0	13	26
17:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	3
17:15	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	5
17:30	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
17:45	0	0	1	0	1	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	7
Total	2	0	1	0	3	0	6	0	0	6	0	0	0	0	0	0	9	0	0	9	18
Grand Total	7	0	4	0	11	6	30	0	0	36	0	0	0	0	0	0	28	3	0	31	78
Apprch %	63.6	0	36.4	0		16.7	83.3	0	0		0	0	0	0		0	90.3	9.7	0		
Total %	9	0	5.1	0	14.1	7.7	38.5	0	0	46.2	0	0	0	0	0	0	35.9	3.8	0	39.7	

# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

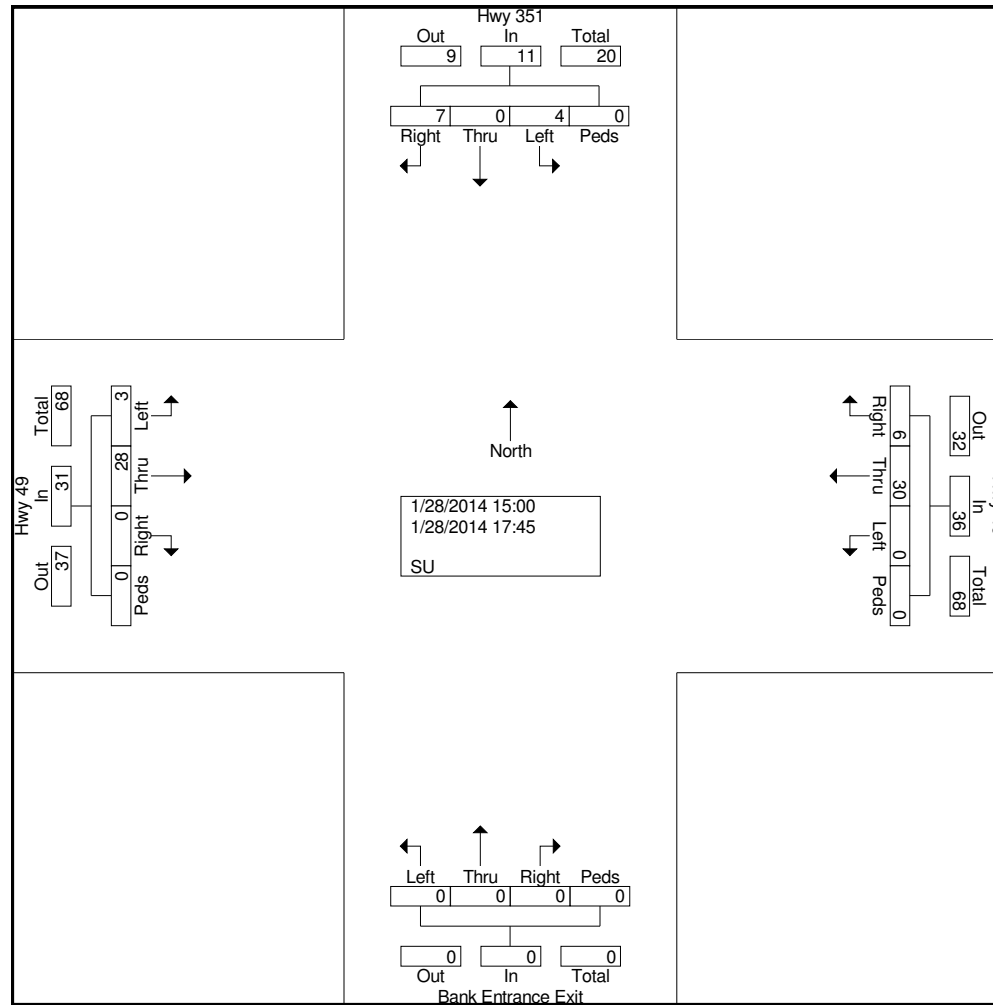
*Merging Innovation and Excellence*

File Name : Hwy\_49 @\_ Hwy\_351\_151\_148399\_01-28-2014[1]

Site Code : 20141514

Start Date : 1/28/2014

Page No : 2



# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

*Merging Innovation and Excellence*

Latitude: N35.85742  
Longitude: W90.65641

File Name : Hwy\_49\_@\_Hwy\_351\_151\_148399\_01-28-2014[1]  
Site Code : 20141514  
Start Date : 1/28/2014  
Page No : 1

Groups Printed- TT

	Hwy 351 From North					Hwy 49 From East					Bank Entrance Exit From South					Hwy 49 From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
15:00	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	7
15:15	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	5
15:30	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	4
15:45	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8	9
Total	1	0	1	0	2	0	9	0	0	9	0	0	0	0	0	0	14	0	0	14	25
16:00	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	7	0	0	7	13
16:15	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
16:30	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	5
16:45	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	3	1	0	4	7
Total	0	0	0	0	0	0	12	0	0	12	0	0	0	0	0	0	16	1	0	17	29
17:00	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	3
17:15	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
17:30	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	6
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	0	8	0	0	8	15
Grand Total	1	0	1	0	2	0	28	0	0	28	0	0	0	0	0	0	38	1	0	39	69
Apprch %	50	0	50	0		0	100	0	0		0	0	0	0		0	97.4	2.6	0		
Total %	1.4	0	1.4	0	2.9	0	40.6	0	0	40.6	0	0	0	0	0	0	55.1	1.4	0	56.5	

# The Traffic Group, Inc

9900 Franklin Square Drive, STE H  
Baltimore, MD 21236

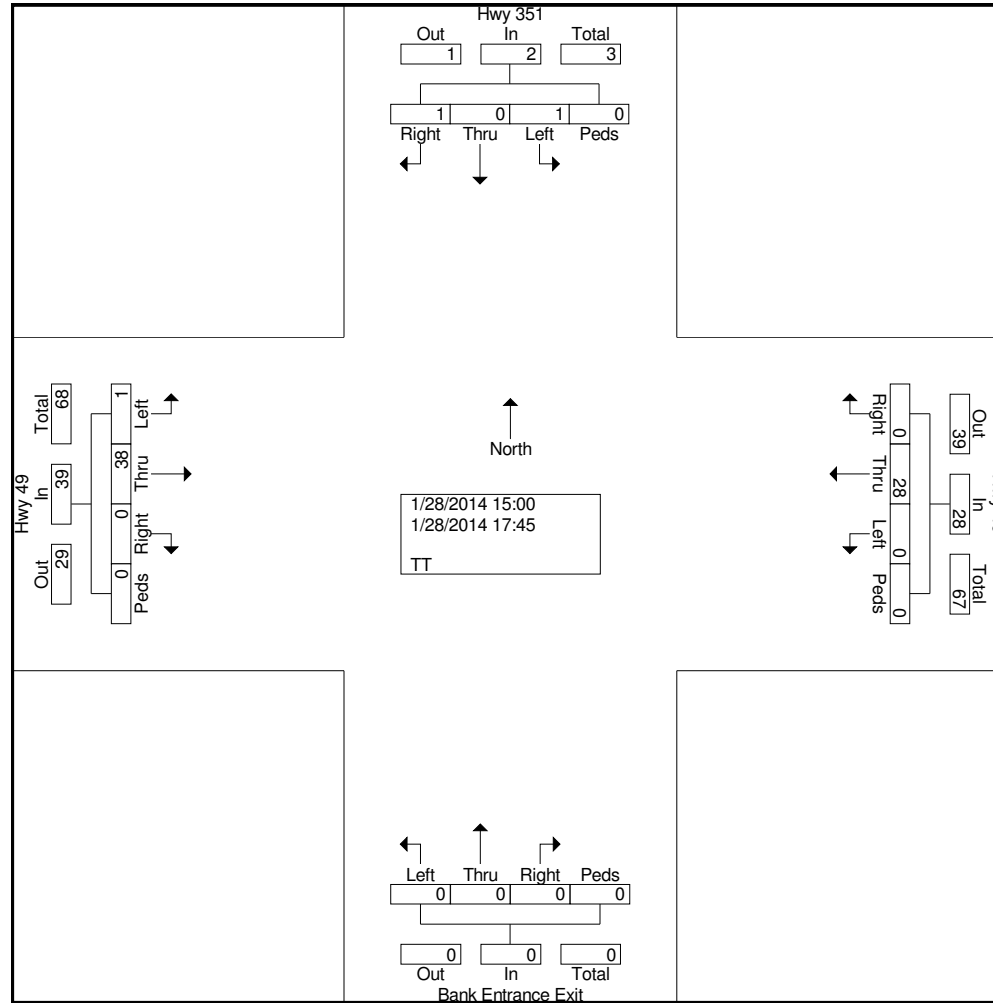
*Merging Innovation and Excellence*

File Name : Hwy\_49 @\_ Hwy\_351\_151\_148399\_01-28-2014[1]

Site Code : 20141514

Start Date : 1/28/2014

Page No : 2





The Traffic Group  
Leg 1  
24 Hour Outbound: 3619  
VOLUME SUMMARY  
Mon 1/27/2014

Page: 1

Site Reference: ADR101025>01  
Site ID: 000020141514  
Location: Hwy 351 Leg 1

File: D0127000.prn  
City:  
County:

TIME	1 SOUTH	Total
23:15	7	7
23:30	7	7
23:45	5	5
24:00	1	1
Hour Total	20	20
DAY TOTAL	20	20
PERCENTS	100.0%	100%
AM Times		
AM Peaks		
PM Times	23:15	
PM Peaks	20	

The Traffic Group  
Leg 1  
24 Hour Outbound: 3619  
VOLUME SUMMARY  
Tue 1/28/2014

Page: 2

Site Reference: ADR101025>01  
Site ID: 000020141514  
Location: Hwy 351 Leg 1

File: D0127000.prn  
City:  
County:

TIME	1 SOUTH	Total
00:15	3	3
00:30	5	5
00:45	2	2
01:00	2	2
Hour Total	12	12
01:15	1	1
01:30	1	1
01:45	3	3
02:00	2	2
Hour Total	7	7
02:15	2	2
02:30	0	0
02:45	0	0
03:00	2	2
Hour Total	4	4
03:15	1	1
03:30	2	2
03:45	4	4
04:00	6	6
Hour Total	13	13
04:15	6	6
04:30	5	5
04:45	8	8
05:00	11	11
Hour Total	30	30
05:15	19	19
05:30	24	24
05:45	25	25
06:00	34	34
Hour Total	102	102
06:15	57	57
06:30	50	50
06:45	109	109
07:00	129	129
Hour Total	345	345
07:15	130	130
07:30	147	147
07:45	159	159
08:00	146	146
Hour Total	582	582

08:15	83	83
08:30	106	106
08:45	90	90

2014-1513  
2014-1514  
2014-1515  
2014-1516

The Traffic Group  
 Leg 1  
 24 Hour Outbound: 3619  
 VOLUME SUMMARY  
 Tue 1/28/2014

Page: 3

Site Reference: ADR101025>01  
 Site ID: 000020141514  
 Location: Hwy 351 Leg 1

File: D0127000.prn  
 City:  
 County:

TIME	1 SOUTH	Total
09:00	106	106
Hour Total	385	385
09:15	79	79
09:30	61	61
09:45	71	71
10:00	84	84
Hour Total	295	295
10:15	67	67
10:30	71	71
10:45	71	71
11:00	80	80
Hour Total	289	289
11:15	58	58
11:30	50	50
11:45	70	70
12:00	83	83
Hour Total	261	261
12:15	66	66
12:30	80	80
12:45	62	62
13:00	79	79
Hour Total	287	287
13:15	69	69
13:30	59	59
13:45	68	68
14:00	60	60
Hour Total	256	256
14:15	69	69
14:30	52	52
14:45	65	65
15:00	61	61
Hour Total	247	247
15:15	72	72
15:30	57	57
15:45	65	65
16:00	79	79
Hour Total	273	273
16:15	81	81
16:30	66	66
16:45	71	71

17:00	78	78
Hour Total	296	296

The Traffic Group  
 Leg 1  
 24 Hour Outbound: 3619  
 VOLUME SUMMARY  
 Tue 1/28/2014

Page: 4

Site Reference: ADR101025>01  
 Site ID: 000020141514  
 Location: Hwy 351 Leg 1

File: D0127000.prn  
 City:  
 County:

TIME	1 SOUTH	Total
17:15	66	66
17:30	76	76
17:45	89	89
18:00	82	82
Hour Total	313	313
18:15	80	80
18:30	65	65
18:45	65	65
19:00	24	24
Hour Total	234	234
19:15	36	36
19:30	28	28
19:45	16	16
20:00	19	19
Hour Total	99	99
20:15	22	22
20:30	18	18
20:45	15	15
21:00	26	26
Hour Total	81	81
21:15	20	20
21:30	15	15
21:45	10	10
22:00	10	10
Hour Total	55	55
22:15	8	8
22:30	9	9
22:45	6	6
23:00	11	11
Hour Total	34	34
DAY TOTAL	4500	4500
PERCENTS	100.0%	100%
AM Times	07:15	
AM Peaks	582	
PM Times	17:30	
PM Peaks	327	

The Traffic Group  
Leg 1  
24 Hour Outbound: 13910  
VOLUME SUMMARY  
Mon 1/27/2014

Page: 1

Site Reference: ADR101659>02  
Site ID: 000020141514  
Location: Hwy 49 Leg 2

File: D0127001.prn  
City:  
County:

TIME	1 SOUTH	Total
01:15	10	10
01:30	24	24
01:45	22	22
02:00	21	21
Hour Total	77	77
02:15	19	19
02:30	10	10
02:45	7	7
03:00	16	16
Hour Total	52	52
03:15	7	7
03:30	22	22
03:45	11	11
04:00	9	9
Hour Total	49	49
04:15	16	16
04:30	18	18
04:45	51	51
05:00	42	42
Hour Total	127	127
05:15	56	56
05:30	85	85
05:45	103	103
06:00	124	124
Hour Total	368	368
06:15	173	173
06:30	187	187
06:45	331	331
07:00	305	305
Hour Total	996	996
07:15	377	377
07:30	548	548
07:45	745	745
08:00	841	841
Hour Total	2511	2511
08:15	488	488
08:30	369	369
08:45	409	409
09:00	424	424
Hour Total	1690	1690

09:15	369	369
09:30	405	405
09:45	380	380



The Traffic Group  
 Leg 1  
 24 Hour Outbound: 13910  
 VOLUME SUMMARY  
 Mon 1/27/2014

Page: 2

Site Reference: ADR101659>02  
 Site ID: 000020141514  
 Location: Hwy 49 Leg 2

File: D0127001.prn  
 City:  
 County:

TIME	1 SOUTH	Total
10:00	372	372
Hour Total	1526	1526
10:15	319	319
10:30	308	308
10:45	367	367
11:00	376	376
Hour Total	1370	1370
11:15	322	322
11:30	316	316
11:45	364	364
12:00	392	392
Hour Total	1394	1394
12:15	416	416
12:30	367	367
12:45	402	402
13:00	299	299
Hour Total	1484	1484
13:15	332	332
13:30	318	318
13:45	394	394
14:00	288	288
Hour Total	1332	1332
14:15	372	372
14:30	309	309
14:45	321	321
15:00	294	294
Hour Total	1296	1296
15:15	331	331
15:30	398	398
15:45	518	518
16:00	479	479
Hour Total	1726	1726
16:15	429	429
16:30	402	402
16:45	506	506
17:00	552	552
Hour Total	1889	1889
17:15	555	555
17:30	570	570
17:45	510	510

18:00	433	433
Hour Total	2068	2068

The Traffic Group  
 Leg 1  
 24 Hour Outbound: 13910  
 VOLUME SUMMARY  
 Mon 1/27/2014

Page: 3

Site Reference: ADR101659>02  
 Site ID: 000020141514  
 Location: Hwy 49 Leg 2

File: D0127001.prn  
 City:  
 County:

TIME	1 SOUTH	Total
18:15	363	363
18:30	338	338
18:45	277	277
19:00	197	197
Hour Total	1175	1175
19:15	198	198
19:30	214	214
19:45	171	171
20:00	191	191
Hour Total	774	774
20:15	168	168
20:30	150	150
20:45	126	126
21:00	167	167
Hour Total	611	611
21:15	108	108
21:30	112	112
21:45	92	92
22:00	76	76
Hour Total	388	388
22:15	73	73
22:30	65	65
22:45	51	51
23:00	38	38
Hour Total	227	227
23:15	44	44
23:30	44	44
23:45	52	52
24:00	41	41
Hour Total	181	181
DAY TOTAL	23311	23311
PERCENTS	100.0%	100%
AM Times	07:30	
AM Peaks	2622	
PM Times	17:00	
PM Peaks	2187	

The Traffic Group  
Leg 1  
24 Hour Outbound: 13910  
VOLUME SUMMARY  
Tue 1/28/2014

Page: 4

Site Reference: ADR101659>02  
Site ID: 000020141514  
Location: Hwy 49 Leg 2

File: D0127001.prn  
City:  
County:

TIME	1 SOUTH	Total
00:15	23	23
00:30	31	31
00:45	32	32
01:00	24	24
Hour Total	110	110
DAY TOTAL	110	110
PERCENTS	100.0%	100%
AM Times	00:15	
AM Peaks	110	
PM Times		
PM Peaks		

The Traffic Group  
Leg 4  
24 Hour Outbound: 15720  
VOLUME SUMMARY  
Mon 1/27/2014

Page: 1

Site Reference: ADR101484>04  
Site ID: 000020141514  
Location: Hwy 49 Leg 4

File: D0127002.prn  
City:  
County:

TIME	1 SOUTH	Total
01:15	5	5
01:30	11	11
01:45	11	11
02:00	9	9
Hour Total	36	36
02:15	4	4
02:30	3	3
02:45	3	3
03:00	4	4
Hour Total	14	14
03:15	5	5
03:30	6	6
03:45	10	10
04:00	8	8
Hour Total	29	29
04:15	12	12
04:30	10	10
04:45	21	21
05:00	23	23
Hour Total	66	66
05:15	21	21
05:30	37	37
05:45	47	47
06:00	58	58
Hour Total	163	163
06:15	109	109
06:30	136	136
06:45	161	161
07:00	195	195
Hour Total	601	601
07:15	185	185
07:30	267	267
07:45	322	322
08:00	271	271
Hour Total	1045	1045
08:15	273	273
08:30	252	252
08:45	218	218
09:00	220	220
Hour Total	963	963

09:15	205	205
09:30	230	230
09:45	201	201

The Traffic Group  
Leg 4  
24 Hour Outbound: 15720  
VOLUME SUMMARY  
Mon 1/27/2014

Page: 2

Site Reference: ADR101484>04  
Site ID: 000020141514  
Location: Hwy 49 Leg 4

File: D0127002.prn  
City:  
County:

TIME	1 SOUTH	Total
10:00	251	251
Hour Total	887	887
10:15	264	264
10:30	242	242
10:45	232	232
11:00	265	265
Hour Total	1003	1003
11:15	291	291
11:30	248	248
11:45	235	235
12:00	281	281
Hour Total	1055	1055
12:15	313	313
12:30	375	375
12:45	282	282
13:00	329	329
Hour Total	1299	1299
13:15	290	290
13:30	282	282
13:45	271	271
14:00	322	322
Hour Total	1165	1165
14:15	372	372
14:30	319	319
14:45	324	324
15:00	353	353
Hour Total	1368	1368
15:15	422	422
15:30	373	373
15:45	386	386
16:00	381	381
Hour Total	1562	1562
16:15	442	442
16:30	419	419
16:45	436	436
17:00	444	444
Hour Total	1741	1741
17:15	552	552
17:30	597	597
17:45	493	493

18:00	365	365
Hour Total	2007	2007



The Traffic Group  
 Leg 4  
 24 Hour Outbound: 15720  
 VOLUME SUMMARY  
 Mon 1/27/2014

Page: 3

Site Reference: ADR101484>04  
 Site ID: 000020141514  
 Location: Hwy 49 Leg 4

File: D0127002.prn  
 City:  
 County:

TIME	1 SOUTH	Total
18:15	333	333
18:30	323	323
18:45	249	249
19:00	207	207
Hour Total	1112	1112
19:15	231	231
19:30	230	230
19:45	164	164
20:00	183	183
Hour Total	808	808
20:15	150	150
20:30	149	149
20:45	145	145
21:00	154	154
Hour Total	598	598
21:15	135	135
21:30	131	131
21:45	108	108
22:00	73	73
Hour Total	447	447
22:15	72	72
22:30	68	68
22:45	67	67
23:00	37	37
Hour Total	244	244
23:15	39	39
23:30	41	41
23:45	25	25
24:00	18	18
Hour Total	123	123
DAY TOTAL	18336	18336
PERCENTS	100.0%	100%
AM Times	07:30	
AM Peaks	1133	
PM Times	17:00	
PM Peaks	2086	

The Traffic Group  
Leg 4  
24 Hour Outbound: 15720  
VOLUME SUMMARY  
Tue 1/28/2014

Page: 4

Site Reference: ADR101484>04  
Site ID: 000020141514  
Location: Hwy 49 Leg 4

File: D0127002.prn  
City:  
County:

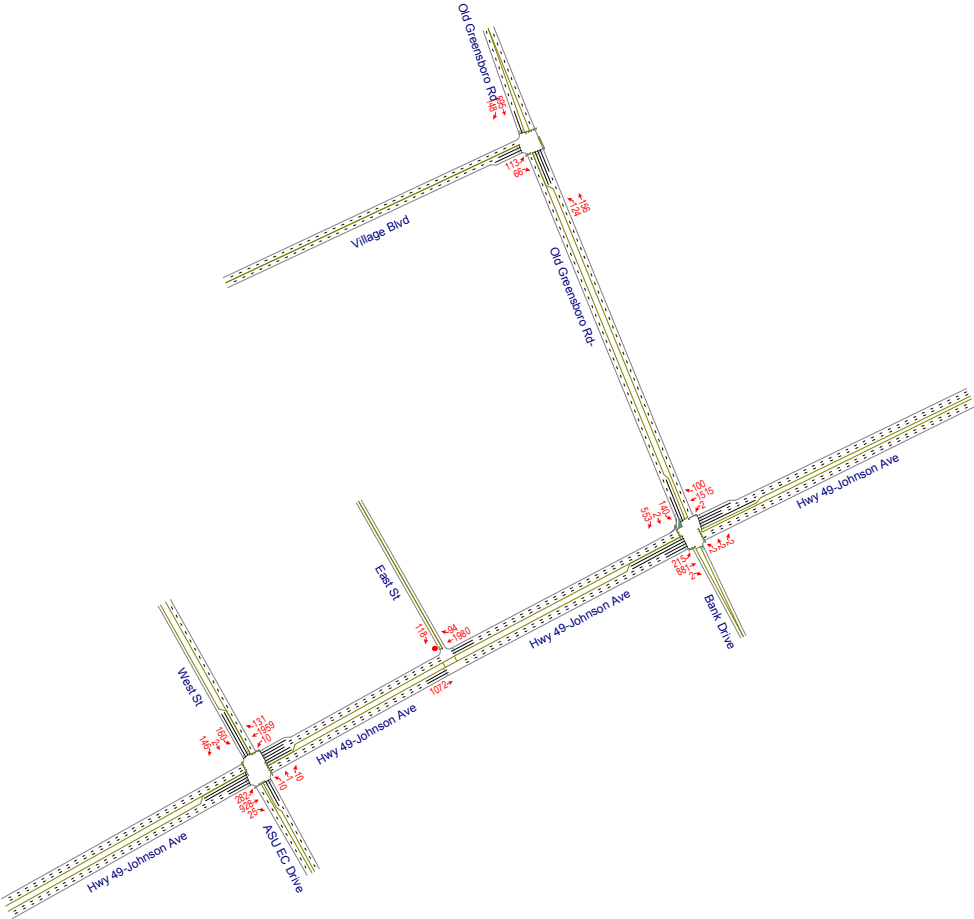
TIME	1 SOUTH	Total
00:15	27	27
00:30	15	15
00:45	15	15
01:00	15	15
Hour Total	72	72
DAY TOTAL	72	72
PERCENTS	100.0%	100%
AM Times	00:15	
AM Peaks	72	
PM Times		
PM Peaks		

# Capacity & Level of Service Calculations



PETERS & ASSOCIATES  
ENGINEERS, INC.

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Lanes, Volumes, Timings  
7: Old Greensboro Rd & Village Blvd

12/2/2016

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø4
Lane Configurations	←←	←	←←	↑↑	↑↑		
Volume (vph)	113	66	124	156	595	148	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	
Storage Length (ft)	0	120	150			0	
Storage Lanes	2	1	2			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	3221	1485	3221	3320	3221	0	
Flt Permitted	0.950		0.191				
Satd. Flow (perm)	3221	1485	648	3320	3221	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		66			45		
Link Speed (mph)	30			30	30		
Link Distance (ft)	1428			1800	516		
Travel Time (s)	32.5			40.9	11.7		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Adj. Flow (vph)	113	66	124	156	595	148	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	113	66	124	156	743	0	
Turn Type	NA	Prot	pm+pt	NA	NA		
Protected Phases	7	7	5	2	6	4	
Permitted Phases	4		2				
Detector Phase	7	7	5	2	6		
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.5	9.5	21.5	21.5	21.5	21.5	
Total Split (s)	21.5	21.5	21.5	43.5	22.0	21.5	
Total Split (%)	33.1%	33.1%	33.1%	66.9%	33.8%	33%	
Maximum Green (s)	16.0	16.0	16.0	38.0	16.5	16.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	Max	C-Max	Max	None	
Walk Time (s)			5.0	5.0	5.0	5.0	
Flash Dont Walk (s)			11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)			0	0	0	0	
Act Effct Green (s)	7.6	7.6	48.6	49.7	16.5		
Actuated g/C Ratio	0.12	0.12	0.75	0.76	0.25		
v/c Ratio	0.30	0.28	0.08	0.06	0.87		
Control Delay	27.8	11.1	3.1	3.0	37.0		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	27.8	11.1	3.1	3.0	37.0		
LOS	C	B	A	A	D		
Approach Delay	21.7			3.1	37.0		
Approach LOS	C			A	D		
Queue Length 50th (ft)	21	0	5	7	139		

Lanes, Volumes, Timings  
7: Old Greensboro Rd & Village Blvd

12/2/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø4
Queue Length 95th (ft)	46	36	14	18	#285		
Internal Link Dist (ft)	1348			1720	436		
Turn Bay Length (ft)		120	150				
Base Capacity (vph)	792	415	1537	2538	851		
Starvation Cap Reductn	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.14	0.16	0.08	0.06	0.87		

Intersection Summary

Area Type: Other

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NBT, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 26.8

Intersection LOS: C

Intersection Capacity Utilization 43.2%

ICU Level of Service A

Analysis Period (min) 60

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Old Greensboro Rd & Village Blvd



Lanes, Volumes, Timings  
8: Hwy 49-Johnson Ave & East St

12/2/2016



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑			↑
Volume (vph)	0	1072	1980	94	0	118
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (ft)	150			0	120	0
Storage Lanes	0			0	0	1
Taper Length (ft)	25				25	
Satd. Flow (prot)	0	4771	4737	0	0	1512
Flt Permitted						
Satd. Flow (perm)	0	4771	4737	0	0	1512
Link Speed (mph)		45	45		30	
Link Distance (ft)		944	1160		784	
Travel Time (s)		14.3	17.6		17.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1072	1980	94	0	118
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1072	2074	0	0	118
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 57.0%

ICU Level of Service B

Analysis Period (min) 60

# HCM Unsignalized Intersection Capacity Analysis

## 8: Hwy 49-Johnson Ave & East St

12/2/2016




Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↑↑↑↑	↑↑↑↑			↗	
Volume (veh/h)	0	1072	1980	94	0	118	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	0	1072	1980	94	0	118	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage veh							
Upstream signal (ft)		944	1160				
pX, platoon unblocked	0.72				0.76	0.72	
vC, conflicting volume	2074				2384	707	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1137				968	0	
tC, single (s)	4.2				6.9	7.0	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	100				100	85	
cM capacity (veh/h)	436				191	780	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	357	357	357	792	792	490	118
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	94	118
cSH	1700	1700	1700	1700	1700	1700	780
Volume to Capacity	0.21	0.21	0.21	0.47	0.47	0.29	0.15
Queue Length 95th (ft)	0	0	0	0	0	0	13
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.4
Lane LOS							B
Approach Delay (s)	0.0			0.0			10.4
Approach LOS							B
Intersection Summary							
Average Delay			0.4				
Intersection Capacity Utilization			57.0%		ICU Level of Service		B
Analysis Period (min)			60				



# Lanes, Volumes, Timings

## 35: ASU EC Drive/West St & Hwy 49-Johnson Ave













12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔↔↔		↔↔	↔↔↔	↔	↔	↔↔		↔↔	↔	
Volume (vph)	282	928	25	10	1959	131	10	1	10	160	2	146
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	120		120	120		0	200		0
Storage Lanes	2		0	2		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	3221	4752	0	3221	4771	1485	1660	2869	0	3221	1489	0
Flt Permitted	0.088			0.288			0.247			0.950		
Satd. Flow (perm)	298	4752	0	976	4771	1485	432	2869	0	3221	1489	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				147		150			146	
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1212			944			499			808	
Travel Time (s)		18.4			14.3			11.3			18.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	282	928	25	10	1959	131	10	1	10	160	2	146
Shared Lane Traffic (%)												
Lane Group Flow (vph)	282	953	0	10	1959	131	10	11	0	160	148	0
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Split	NA	
Protected Phases	7	4			8			2		6	6	
Permitted Phases	4			8		8	2					
Detector Phase	7	4		8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	21.5		21.5	21.5	21.5	21.5	21.5		21.5	21.5	
Total Split (s)	11.2	56.8		45.6	45.6	45.6	21.7	21.7		21.5	21.5	
Total Split (%)	11.2%	56.8%		45.6%	45.6%	45.6%	21.7%	21.7%		21.5%	21.5%	
Maximum Green (s)	5.7	51.3		40.1	40.1	40.1	16.2	16.2		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max		Max	Max	
Walk Time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0		0	0	0	0	0		0	0	
Act Effct Green (s)	51.3	51.3		40.1	40.1	40.1	16.2	16.2		16.0	16.0	
Actuated g/C Ratio	0.51	0.51		0.40	0.40	0.40	0.16	0.16		0.16	0.16	
v/c Ratio	0.88	0.39		0.03	1.02	0.19	0.14	0.02		0.31	0.41	
Control Delay	54.2	15.3		18.5	99.0	3.3	41.8	0.1		39.0	10.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	54.2	15.3		18.5	99.0	3.3	41.8	0.1		39.0	10.5	
LOS	D	B		B	F	A	D	A		D	B	
Approach Delay		24.2			92.7			20.0			25.3	
Approach LOS		C			F			B			C	
Queue Length 50th (ft)	47	128		2	~489	0	6	0		46	1	

# Lanes, Volumes, Timings

35: ASU EC Drive/West St & Hwy 49-Johnson Ave

12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#151	184		8	#703	39	25	0		87	73	
Internal Link Dist (ft)		1132			864			419			728	
Turn Bay Length (ft)	200			120		120	120			200		
Base Capacity (vph)	319	2440		391	1913	683	69	590		515	360	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.88	0.39		0.03	1.02	0.19	0.14	0.02		0.31	0.41	

## Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 63.5

Intersection LOS: E

Intersection Capacity Utilization 73.7%

ICU Level of Service D

Analysis Period (min) 60






~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.


Splits and Phases: 35: ASU EC Drive/West St & Hwy 49-Johnson Ave

 ø2 (R)	 ø6	 ø4
21.7 s	21.5 s	56.8 s
	 ø7	 ø8
	11.2 s	45.6 s

# Lanes, Volumes, Timings

41: Bank Drive/Old Greensboro Rd- & Hwy 49-Johnson Ave













12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←←←	←←←	←←←	←←←	←←←	←←←	←←←	←←←	←←←	←←←	←←←	←←←
Volume (vph)	215	881	2	2	1515	100	2	2	2	140	2	553
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	250		0	250		150	0		0	175		0
Storage Lanes	2		0	1		1	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	3221	4771	0	1660	4771	1485	0	1642	0	1577	1584	1485
Flt Permitted	0.950			0.310				0.984		0.950	0.954	
Satd. Flow (perm)	3221	4771	0	542	4771	1485	0	1642	0	1577	1584	1485
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						164		2				488
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1160			1322			487			1800	
Travel Time (s)		17.6			20.0			7.4			27.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	215	881	2	2	1515	100	2	2	2	140	2	553
Shared Lane Traffic (%)										49%		
Lane Group Flow (vph)	215	883	0	2	1515	100	0	6	0	71	71	553
Turn Type	Prot	NA		Perm	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	7	4			8		2	2		6	6	
Permitted Phases				8		8						6
Detector Phase	7	4		8	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		21.5	21.5	21.5	21.5	21.5		21.5	21.5	21.5
Total Split (s)	12.2	46.2		34.0	34.0	34.0	22.2	22.2		21.6	21.6	21.6
Total Split (%)	13.6%	51.3%		37.8%	37.8%	37.8%	24.7%	24.7%		24.0%	24.0%	24.0%
Maximum Green (s)	6.7	40.7		28.5	28.5	28.5	16.7	16.7		16.1	16.1	16.1
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5		5.5		5.5	5.5	5.5
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None	None	C-Max	C-Max		Max	Max	Max
Walk Time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)		11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)		0		0	0	0	0	0		0	0	0
Act Effct Green (s)	6.7	40.7		28.5	28.5	28.5		16.7		16.1	16.1	16.1
Actuated g/C Ratio	0.07	0.45		0.32	0.32	0.32		0.19		0.18	0.18	0.18
v/c Ratio	0.90	0.41		0.01	1.00	0.17		0.02		0.25	0.25	0.83
Control Delay	95.6	17.3		21.5	81.2	1.4		26.3		34.6	34.5	19.4
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Delay	95.6	17.3		21.5	81.2	1.4		26.3		34.6	34.5	19.4
LOS	F	B		C	F	A		C		C	C	B
Approach Delay		32.6			76.2			26.3			22.5	
Approach LOS		C			E			C			C	
Queue Length 50th (ft)	63	119		1	~315	0		2		36	36	32

# Lanes, Volumes, Timings

41: Bank Drive/Old Greensboro Rd- & Hwy 49-Johnson Ave

12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#153	175		7	#509	16		14		87	87	#309
Internal Link Dist (ft)		1080			1242			407			1720	
Turn Bay Length (ft)	250			250		150				175		
Base Capacity (vph)	239	2157		171	1510	582		306		282	283	666
Starvation Cap Reductn	0	0		0	0	0		0		0	0	0
Spillback Cap Reductn	0	0		0	0	0		0		0	0	0
Storage Cap Reductn	0	0		0	0	0		0		0	0	0
Reduced v/c Ratio	0.90	0.41		0.01	1.00	0.17		0.02		0.25	0.25	0.83

## Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 51.2

Intersection LOS: D

Intersection Capacity Utilization 84.1%

ICU Level of Service E

Analysis Period (min) 60






~ Volume exceeds capacity, queue is theoretically infinite.

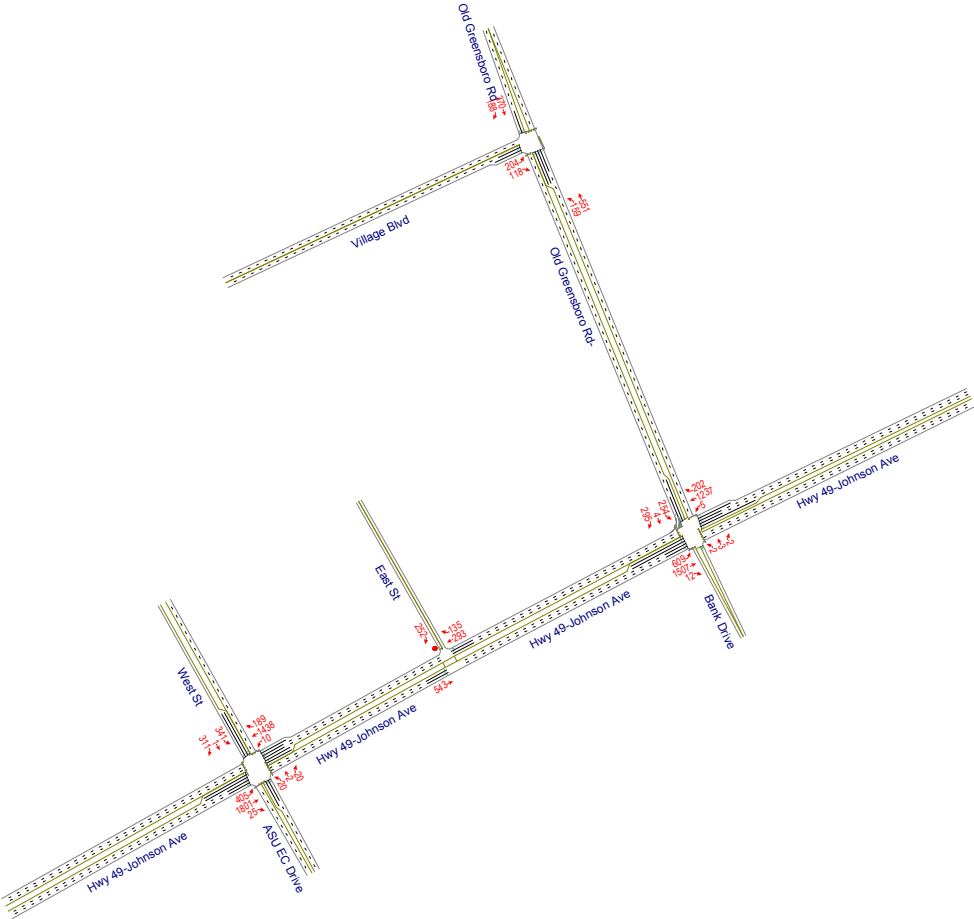
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 41: Bank Drive/Old Greensboro Rd- & Hwy 49-Johnson Ave

		
ø2 (R)	ø6	ø4
22.2 s	21.6 s	46.2 s
		
	ø7	ø8
	12.2 s	34 s



Lanes, Volumes, Timings  
7: Old Greensboro Rd & Village Blvd

12/2/2016

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø4
Lane Configurations	LT,TH,RT	LT,TH	LT,TH,RT	LT,TH	LT,TH	LT,TH,RT	
Volume (vph)	204	118	159	551	370	188	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	
Storage Length (ft)	0	120	150			0	
Storage Lanes	2	1	2			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	3221	1485	3221	3320	3151	0	
Flt Permitted	0.950		0.253				
Satd. Flow (perm)	3221	1485	858	3320	3151	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		118			132		
Link Speed (mph)	30			30	30		
Link Distance (ft)	1428			1800	516		
Travel Time (s)	32.5			40.9	11.7		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Adj. Flow (vph)	204	118	159	551	370	188	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	204	118	159	551	558	0	
Turn Type	NA	Prot	pm+pt	NA	NA		
Protected Phases	7	7	5	2	6	4	
Permitted Phases	4		2				
Detector Phase	7	7	5	2	6		
Switch Phase							
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.5	9.5	21.5	21.5	21.5	21.5	
Total Split (s)	21.5	21.5	21.5	43.5	22.0	21.5	
Total Split (%)	33.1%	33.1%	33.1%	66.9%	33.8%	33%	
Maximum Green (s)	16.0	16.0	16.0	38.0	16.5	16.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	Max	C-Max	Max	None	
Walk Time (s)			5.0	5.0	5.0	5.0	
Flash Dont Walk (s)			11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)			0	0	0	0	
Act Effct Green (s)	9.4	9.4	44.6	44.6	16.5		
Actuated g/C Ratio	0.14	0.14	0.69	0.69	0.25		
v/c Ratio	0.44	0.37	0.11	0.24	0.62		
Control Delay	27.9	9.2	3.9	4.4	19.7		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	27.9	9.2	3.9	4.4	19.7		
LOS	C	A	A	A	B		
Approach Delay	21.1			4.3	19.7		
Approach LOS	C			A	B		
Queue Length 50th (ft)	38	0	8	34	76		

Lanes, Volumes, Timings  
7: Old Greensboro Rd & Village Blvd

12/2/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø4
Queue Length 95th (ft)	72	48	21	70	147		
Internal Link Dist (ft)	1348			1720	436		
Turn Bay Length (ft)		120	150				
Base Capacity (vph)	792	454	1409	2277	898		
Starvation Cap Reductn	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.26	0.26	0.11	0.24	0.62		

Intersection Summary

Area Type: Other

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 13.1

Intersection LOS: B

Intersection Capacity Utilization 41.8%

ICU Level of Service A

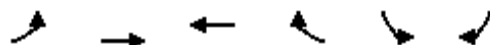
Analysis Period (min) 60

Splits and Phases: 7: Old Greensboro Rd & Village Blvd



Lanes, Volumes, Timings  
8: Hwy 49-Johnson Ave & East St

12/2/2016



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑			↑
Volume (vph)	0	543	293	135	0	252
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (ft)	150			0	120	0
Storage Lanes	0			0	0	1
Taper Length (ft)	25				25	
Satd. Flow (prot)	0	4771	4547	0	0	1512
Flt Permitted						
Satd. Flow (perm)	0	4771	4547	0	0	1512
Link Speed (mph)		45	45		30	
Link Distance (ft)		944	1160		784	
Travel Time (s)		14.3	17.6		17.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	543	293	135	0	252
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	543	428	0	0	252
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 32.3% ICU Level of Service A

Analysis Period (min) 60



# HCM Unsignalized Intersection Capacity Analysis

## 8: Hwy 49-Johnson Ave & East St

12/2/2016
































Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↑↑↑↑	↑↑↑↓			↗	
Volume (veh/h)	0	543	293	135	0	252	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	0	543	293	135	0	252	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage veh							
Upstream signal (ft)		944	1160				
pX, platoon unblocked							
vC, conflicting volume	428				542	165	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	428				542	165	
tC, single (s)	4.2				6.9	7.0	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	100				100	70	
cM capacity (veh/h)	1121				468	847	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	181	181	181	117	117	194	252
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	135	252
cSH	1700	1700	1700	1700	1700	1700	847
Volume to Capacity	0.11	0.11	0.11	0.07	0.07	0.11	0.30
Queue Length 95th (ft)	0	0	0	0	0	0	32
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	11.0
Lane LOS							B
Approach Delay (s)	0.0			0.0			11.0
Approach LOS							B
Intersection Summary							
Average Delay			2.3				
Intersection Capacity Utilization			32.3%		ICU Level of Service		A
Analysis Period (min)			60				

# Lanes, Volumes, Timings

## 35: ASU EC Drive/West St & Hwy 49-Johnson Ave













12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  			 		 		
Volume (vph)	405	1801	25	10	1438	189	20	2	20	341	1	311
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	120		120	120		0	200		0
Storage Lanes	2		0	2		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	3221	4761	0	3221	4771	1485	1660	2869	0	3221	1485	0
Flt Permitted	0.121			0.145			0.241			0.950		
Satd. Flow (perm)	410	4761	0	492	4771	1485	421	2869	0	3221	1485	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				164		29			311	
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1212			944			499			808	
Travel Time (s)		18.4			14.3			11.3			18.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	405	1801	25	10	1438	189	20	2	20	341	1	311
Shared Lane Traffic (%)												
Lane Group Flow (vph)	405	1826	0	10	1438	189	20	22	0	341	312	0
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Split	NA	
Protected Phases	7	4			8			2		6	6	
Permitted Phases	4			8		8	2					
Detector Phase	7	4		8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	21.5		21.5	21.5	21.5	21.5	21.5		21.5	21.5	
Total Split (s)	13.4	46.4		33.0	33.0	33.0	22.1	22.1		21.5	21.5	
Total Split (%)	14.9%	51.6%		36.7%	36.7%	36.7%	24.6%	24.6%		23.9%	23.9%	
Maximum Green (s)	7.9	40.9		27.5	27.5	27.5	16.6	16.6		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max		Max	Max	
Walk Time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0		0	0	0	0	0		0	0	
Act Effct Green (s)	40.9	40.9		27.5	27.5	27.5	16.6	16.6		16.0	16.0	
Actuated g/C Ratio	0.45	0.45		0.31	0.31	0.31	0.18	0.18		0.18	0.18	
v/c Ratio	0.94	0.84		0.07	0.99	0.33	0.26	0.04		0.60	0.60	
Control Delay	63.4	26.5		23.8	68.7	7.4	41.4	9.7		39.0	9.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	63.4	26.5		23.8	68.7	7.4	41.4	9.7		39.0	9.6	
LOS	E	C		C	E	A	D	A		D	A	
Approach Delay		33.2			61.3			24.8			25.0	
Approach LOS		C			E			C			C	
Queue Length 50th (ft)	71	324		2	295	10	10	0		92	1	

# Lanes, Volumes, Timings

## 35: ASU EC Drive/West St & Hwy 49-Johnson Ave

12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#198	#520		9	#483	76	37	10		155	112	
Internal Link Dist (ft)		1132			864			419			728	
Turn Bay Length (ft)	200			120		120	120			200		
Base Capacity (vph)	433	2165		150	1457	567	77	552		572	519	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.94	0.84		0.07	0.99	0.33	0.26	0.04		0.60	0.60	

### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 42.0

Intersection LOS: D

Intersection Capacity Utilization 75.7%






ICU Level of Service D

Analysis Period (min) 60

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.





























### Splits and Phases: 35: ASU EC Drive/West St & Hwy 49-Johnson Ave

		
ø2 (R)	ø6	ø4
22.1 s	21.5 s	46.4 s
		
	ø7	ø8
	13.4 s	33 s

# Lanes, Volumes, Timings

41: Bank Drive/Old Greensboro Rd- & Hwy 49-Johnson Ave













12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  			  			 			 	
Volume (vph)	609	1507	12	5	1237	202	2	3	2	254	4	295
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	250		0	250		150	0		0	175		0
Storage Lanes	2		0	1		1	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	3221	4766	0	1660	4771	1485	0	1656	0	1577	1584	1485
Flt Permitted	0.950			0.159				0.986		0.950	0.954	
Satd. Flow (perm)	3221	4766	0	278	4771	1485	0	1656	0	1577	1584	1485
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				151		2				295
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1160			1322			487			1800	
Travel Time (s)		17.6			20.0			7.4			27.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	609	1507	12	5	1237	202	2	3	2	254	4	295
Shared Lane Traffic (%)										49%		
Lane Group Flow (vph)	609	1519	0	5	1237	202	0	7	0	130	128	295
Turn Type	Prot	NA		Perm	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	7	4			8		2	2		6	6	
Permitted Phases				8		8						6
Detector Phase	7	4		8	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		21.5	21.5	21.5	21.5	21.5		21.5	21.5	21.5
Total Split (s)	25.0	56.1		31.1	31.1	31.1	22.4	22.4		21.5	21.5	21.5
Total Split (%)	25.0%	56.1%		31.1%	31.1%	31.1%	22.4%	22.4%		21.5%	21.5%	21.5%
Maximum Green (s)	19.5	50.6		25.6	25.6	25.6	16.9	16.9		16.0	16.0	16.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5		5.5		5.5	5.5	5.5
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None	None	C-Max	C-Max		Max	Max	Max
Walk Time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)		11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)		0		0	0	0	0	0		0	0	0
Act Effct Green (s)	19.5	50.6		25.6	25.6	25.6		16.9		16.0	16.0	16.0
Actuated g/C Ratio	0.20	0.51		0.26	0.26	0.26		0.17		0.16	0.16	0.16
v/c Ratio	0.97	0.63		0.07	1.01	0.41		0.02		0.52	0.51	0.61
Control Delay	89.6	19.4		31.4	102.7	12.0		30.9		46.8	46.4	10.6
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Delay	89.6	19.4		31.4	102.7	12.0		30.9		46.8	46.4	10.6
LOS	F	B		C	F	B		C		D	D	B
Approach Delay		39.4			89.7			30.9			27.4	
Approach LOS		D			F			C			C	
Queue Length 50th (ft)	200	245		2	~295	25		3		81	78	0

# Lanes, Volumes, Timings

## 41: Bank Drive/Old Greensboro Rd- & Hwy 49-Johnson Ave

12/2/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#370	350		14	#475	110		17		164	161	116
Internal Link Dist (ft)		1080			1242			407			1720	
Turn Bay Length (ft)	250			250		150				175		
Base Capacity (vph)	628	2412		71	1221	492		281		252	253	485
Starvation Cap Reductn	0	0		0	0	0		0		0	0	0
Spillback Cap Reductn	0	0		0	0	0		0		0	0	0
Storage Cap Reductn	0	0		0	0	0		0		0	0	0
Reduced v/c Ratio	0.97	0.63		0.07	1.01	0.41		0.02		0.52	0.51	0.61

### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 55.4

Intersection LOS: E

Intersection Capacity Utilization 71.5%

ICU Level of Service C

Analysis Period (min) 60






~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

### Splits and Phases: 41: Bank Drive/Old Greensboro Rd- & Hwy 49-Johnson Ave

 ø2 (R)	 ø6	 ø4
22.4 s	21.5 s	56.1 s
	 ø7	 ø8
	25 s	31.1 s



PETERS & ASSOCIATES  
ENGINEERS, INC.

# Traffic Signal Warrants and Results

Traffic Signal Warrants Analysis

INTERSECTION CONFIGURATION						Required Vol. for Warrant:		major	minor
						Warrant			
CITY:	Jonesboro, Arkansas	No. Lanes	Major:	2	Minor:	1	1A	420	105
CO.:	Craighead			---		---	1B	630	52
HWY.,Mjr.:	Johnson Avenue	Accidents > 5/yr?		( Y or N )		N	1AB (80% 1 & 2)	336	84
ST.,Minor:	West Street	Speed =>40, or Pop. < 10 K				Y		504	41
Projected FBO						Factor out "RTs" (Y or N)?:YES	2 (4 Hr.)	(see formula)	
Traffic Conditions						Major: EB	N	WB	N
December 2, 2016						Minor: SB	Y	NB	Y
Study performed by: RMT						Adj. Factor:	0.7		

Traffic Signal Warrants Analysis

CITY: Jonesboro, Arkansas  
CO.: Craighead  
HWY.,Mjr.: Johnson Avenue  
ST.,Minor: West Street  
Projected FBO  
Traffic Conditions

MAJOR ST.						MINOR ST.						FINAL RESULTS: Traffic Signal Warrants Analysis											
(direction)						(direction)						Projected FBO											
Direction: EB WB						NB SB						Traffic Conditions											
												Major St.: Johnson Avenue											
												Minor St.: West Street											
												VOLUME COMB. 4 Hr. Peak											
												420 630 336 504											
												105 52 84 41											
												#8-1 #8-2											
												HOUR SUM MAX. 1A 1B 1AB 2 3											
ENDING TIME	Existing + Projected	man. results	Existing + Projected	man. results	RESULTS SUM	Existing + Projected	man. results	Existing + Projected	man. results	'#2'	'#3'	HOUR	SUM MAJOR	MAX. MINOR	1A	1B	1AB	2	3				
7:00	1309	1309	2022	2022	3331	9	9	166	166	60	75	7:00	3331	166	1	1	1	1	1	1			
8:00	1242	1242	1729	1729	2971	4	4	133	133	60	75	8:00	2971	133	1	1	1	1	1	1			
9:00	1212	1212	1538	1538	2750	3	3	160	160	60	75	9:00	2750	160	1	1	1	1	1	1			
10:00	1448	1448	1534	1534	2982	5	5	224	224	60	75	10:00	2982	224	1	1	1	1	1	1			
11:00	1612	1612	1548	1548	3160	4	4	261	261	60	75	11:00	3160	261	1	1	1	1	1	1			
12:00	1949	1949	1784	1784	3733	5	5	285	285	60	75	12:00	3733	285	1	1	1	1	1	1			
13:00	1899	1899	1783	1783	3683	5	5	309	309	60	75	13:00	3683	309	1	1	1	1	1	1			
14:00	2095	2095	1776	1776	3871	4	4	300	300	60	75	14:00	3871	300	1	1	1	1	1	1			
15:00	2278	2278	1952	1952	4230	5	5	375	375	60	75	15:00	4230	375	1	1	1	1	1	1			
16:00	2391	2391	1976	1976	4367	6	6	403	403	60	75	16:00	4367	403	1	1	1	1	1	1			
17:00	2408	2408	1912	1912	4320	7	7	356	356	60	75	17:00	4320	356	1	1	1	1	1	1			
18:00	1782	1782	1450	1450	3232	8	8	380	380	60	75	18:00	3232	380	1	1	1	1	1	1			
19:00	1411	1411	1050	1050	2461	5	5	332	332	60	75	19:00	2461	332	1	1	1	1	1	1			
20:00	1155	1155	866	866	2021	4	4	237	237	60	75	20:00	2021	237	1	1	1	1	1	1			
21:00	796	796	610	610	1406	3	3	190	190	60	115	21:00	1406	190	1	1	1	1	1	1			
* Note: Manual value is used if available. Results have been factored for machine count error.												15 15 15 15 15											
												This intersection SATISFIES the warrants for signalization as outlined in the "M.U.T.C.D."											

\* Note: Manual value is used if available.  
Results have been factored for machine count error.

# Traffic Signal Warrants Analysis

CITY:	Jonesboro, Arkansas
CO.:	Craighead
HWY.,Mjr.:	Hwy 351
ST.,Minor:	Village Blvd.
	<b>Projected Full Build Traffic Conditions</b>
December 2, 2016	Study performed by <b>RMT</b>

No. Lanes	Major: 2	Minor:	1
	---		---
Accidents > 5/yr?	( Y or N )		N
Speed =>40, or Pop. < 10 K			Y
Factor out "RTs" (Y or N): YES			
Major:	NB		SB
Minor:	EB	Y	WB

	Warrant		
	1A	420	105
	1B	630	52
	1AB (80% 1 & 2)	336	84
		504	41
	2 (4 Hr.)	(see formula)	
N	3 (Peak Hr.)	" "	
Y	Adj. Factor:	0.7	

CITY: Jonesboro, Arkansas  
CO.: Craighead  
HWY.,Mjr.: Hwy 351  
ST.,Minor: Village Blvd.  
Projected Full Build  
Traffic Conditions

\* Note: Manual value is used if available.  
Results have been factored for machine count error.



## CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES

### Section 4C.01 Studies and Factors for Justifying Traffic Control Signals

#### Standard:

- 01 An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.
- 02 The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:

Warrant 1, Eight-Hour Vehicular Volume  
 Warrant 2, Four-Hour Vehicular Volume  
 Warrant 3, Peak Hour  
 Warrant 4, Pedestrian Volume  
 Warrant 5, School Crossing  
 Warrant 6, Coordinated Signal System  
 Warrant 7, Crash Experience  
 Warrant 8, Roadway Network  
 Warrant 9, Intersection Near a Grade Crossing

- 03 The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

#### Support:

- 04 Sections 8C.09 and 8C.10 contain information regarding the use of traffic control signals instead of gates and/or flashing-light signals at highway-rail grade crossings and highway-light rail transit grade crossings, respectively.

#### Guidance:

- 05 *A traffic control signal should not be installed unless one or more of the factors described in this Chapter are met.*
- 06 *A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.*
- 07 *A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.*
- 08 *The study should consider the effects of the right-turn vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-street traffic count when evaluating the count against the signal warrants listed in Paragraph 2.*
- 09 *Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics should dictate whether an approach is considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment indicates that it should be considered a one-lane approach because the traffic using the left-turn lane is minor, the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles.*
- 10 *Similar engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.*
- 11 *At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants. Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal, a traffic control signal installed under projected conditions should have an engineering study done within 1 year of putting the signal into stop-and-go operation to determine if the signal is justified. If not justified, the signal should be taken out of stop-and-go operation or removed.*
- 12 *For signal warrant analysis, a location with a wide median, even if the median width is greater than 30 feet, should be considered as one intersection.*

## Option:

- 13 At an intersection with a high volume of left-turn traffic from the major street, the signal warrant analysis may be performed in a manner that considers the higher of the major-street left-turn volumes as the “minor-street” volume and the corresponding single direction of opposing traffic on the major street as the “major-street” volume.
- 14 For signal warrants requiring conditions to be present for a certain number of hours in order to be satisfied, any four sequential 15-minute periods may be considered as 1 hour if the separate 1-hour periods used in the warrant analysis do not overlap each other and both the major-street volume and the minor-street volume are for the same specific one-hour periods.
- 15 For signal warrant analysis, bicyclists may be counted as either vehicles or pedestrians.

## Support:

- 16 When performing a signal warrant analysis, bicyclists riding in the street with other vehicular traffic are usually counted as vehicles and bicyclists who are clearly using pedestrian facilities are usually counted as pedestrians.

## Option:

- 17 Engineering study data may include the following:
  - A. The number of vehicles entering the intersection in each hour from each approach during 12 hours of an average day. It is desirable that the hours selected contain the greatest percentage of the 24-hour traffic volume.
  - B. Vehicular volumes for each traffic movement from each approach, classified by vehicle type (heavy trucks, passenger cars and light trucks, public-transit vehicles, and, in some locations, bicycles), during each 15-minute period of the 2 hours in the morning and 2 hours in the afternoon during which total traffic entering the intersection is greatest.
  - C. Pedestrian volume counts on each crosswalk during the same periods as the vehicular counts in Item B and during hours of highest pedestrian volume. Where young, elderly, and/or persons with physical or visual disabilities need special consideration, the pedestrians and their crossing times may be classified by general observation.
  - D. Information about nearby facilities and activity centers that serve the young, elderly, and/or persons with disabilities, including requests from persons with disabilities for accessible crossing improvements at the location under study. These persons might not be adequately reflected in the pedestrian volume count if the absence of a signal restrains their mobility.
  - E. The posted or statutory speed limit or the 85<sup>th</sup>-percentile speed on the uncontrolled approaches to the location.
  - F. A condition diagram showing details of the physical layout, including such features as intersection geometrics, channelization, grades, sight-distance restrictions, transit stops and routes, parking conditions, pavement markings, roadway lighting, driveways, nearby railroad crossings, distance to nearest traffic control signals, utility poles and fixtures, and adjacent land use.
  - G. A collision diagram showing crash experience by type, location, direction of movement, severity, weather, time of day, date, and day of week for at least 1 year.
- 18 The following data, which are desirable for a more precise understanding of the operation of the intersection, may be obtained during the periods described in Item B of Paragraph 17:
  - A. Vehicle-hours of stopped time delay determined separately for each approach.
  - B. The number and distribution of acceptable gaps in vehicular traffic on the major street for entrance from the minor street.
  - C. The posted or statutory speed limit or the 85<sup>th</sup>-percentile speed on controlled approaches at a point near to the intersection but unaffected by the control.
  - D. Pedestrian delay time for at least two 30-minute peak pedestrian delay periods of an average weekday or like periods of a Saturday or Sunday.
  - E. Queue length on stop-controlled approaches.

**Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume**

## Support:

- 01 The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.
- 02 The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.
- 03 It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed.

**Standard:**

- 04 The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:

- A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or
- B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

**Option:**

- 05 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 4C-1 may be used in place of the 100 percent columns.

**Guidance:**

- 06 The combination of Conditions A and B is intended for application at locations where Condition A is not satisfied and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

**Standard:**

- 07 The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:

- A. The vehicles per hour given in both of the 80 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; and
- B. The vehicles per hour given in both of the 80 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

**Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume**

**Condition A—Minimum Vehicular Volume**

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

**Condition B—Interruption of Continuous Traffic**

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

<sup>a</sup> Basic minimum hourly volume

<sup>b</sup> Used for combination of Conditions A and B after adequate trial of other remedial measures

<sup>c</sup> May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

<sup>d</sup> May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Option:

- 08 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

### **Section 4C.03 Warrant 2, Four-Hour Vehicular Volume**

Support:

- 01 The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

**Standard:**

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.**

Option:

- 03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-2 may be used in place of Figure 4C-1.

### **Section 4C.04 Warrant 3, Peak Hour**

Support:

- 01 The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

**Standard:**

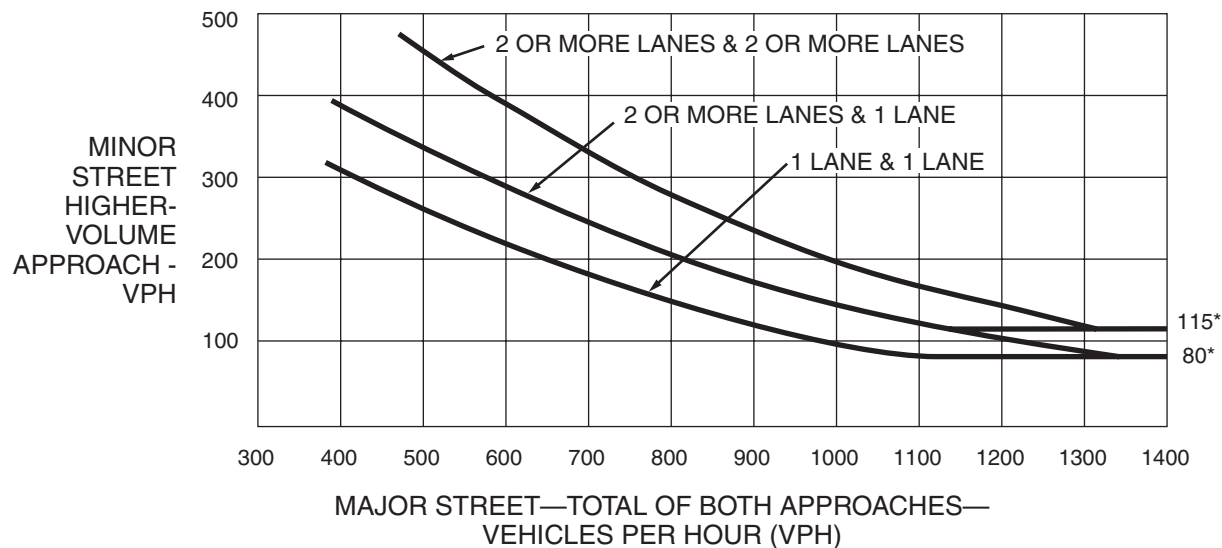
- 02 **This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.**
- 03 **The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:**
- A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:**
    - 1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and**
    - 2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and**
    - 3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.**
  - B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.**

Option:

- 04 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-4 may be used in place of Figure 4C-3 to evaluate the criteria in the second category of the Standard.
- 05 If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

*Guidance:*

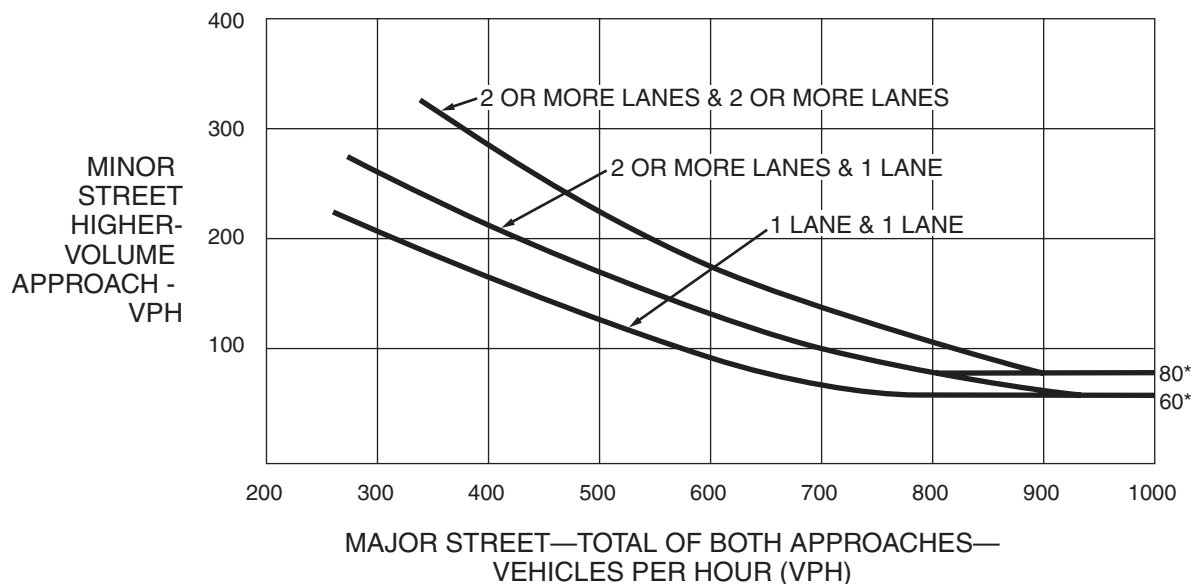
- 06 *If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated.*

**Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume**

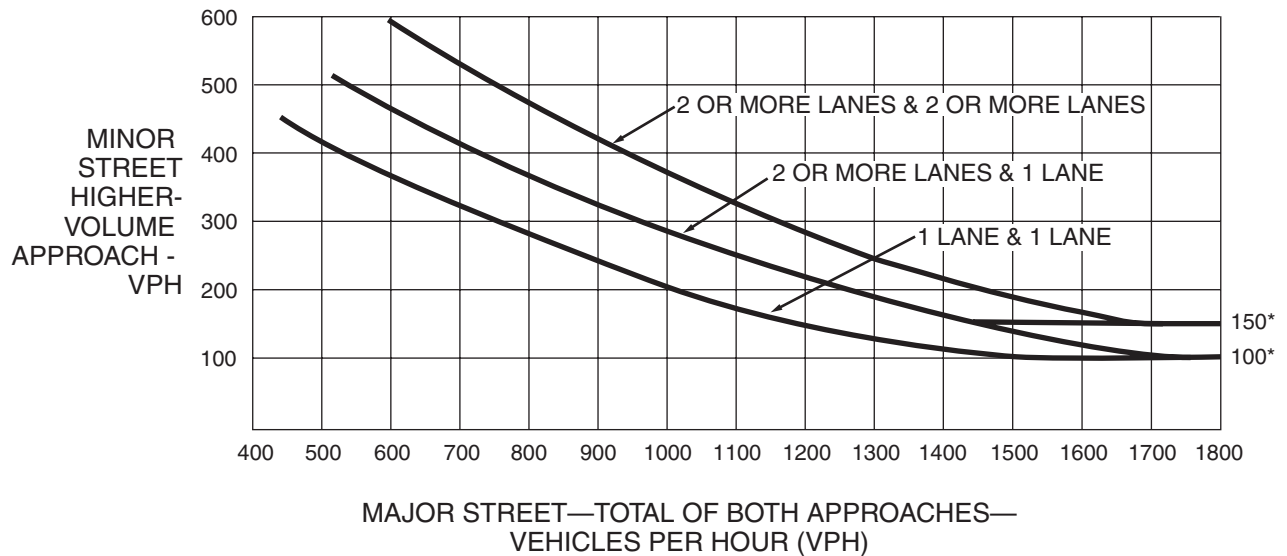
\*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

**Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)**

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

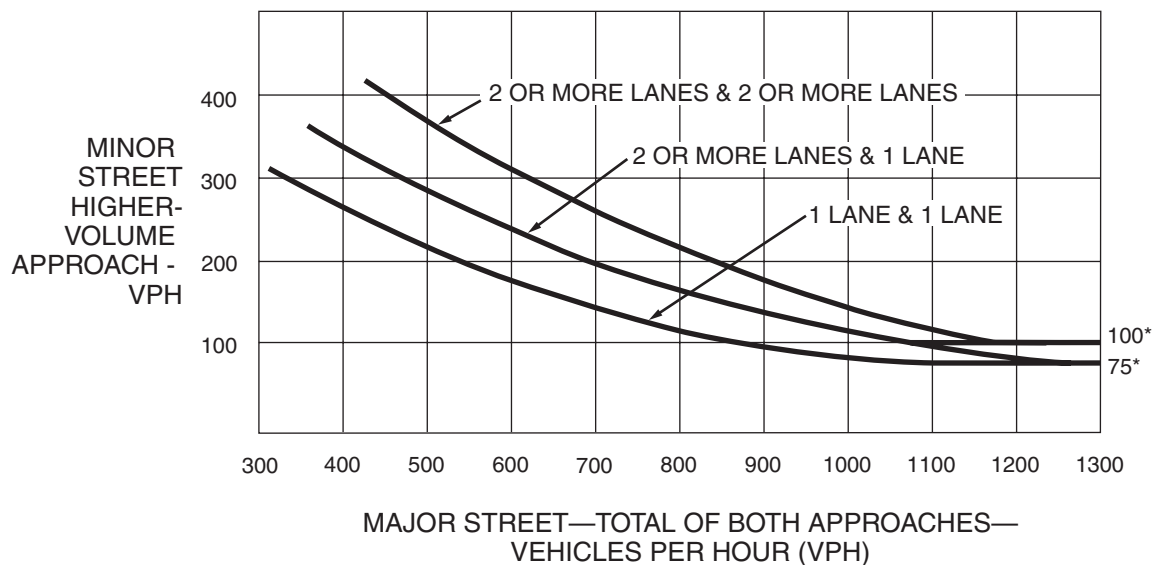


\*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

**Figure 4C-3. Warrant 3, Peak Hour**

\*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**  
 (COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



\*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.



## Section 4C.05 Warrant 4, Pedestrian Volume

### Support:

- 01 The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

### Standard:

- 02 **The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:**
- A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or
  - B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

### Option:

- 03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-6 may be used in place of Figure 4C-5 to evaluate Criterion A in Paragraph 2, and Figure 4C-8 may be used in place of Figure 4C-7 to evaluate Criterion B in Paragraph 2.

### Standard:

- 04 **The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**
- 05 **If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E.**

### Guidance:

- 06 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*
- A. *If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.*
  - B. *If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.*
  - C. *Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.*

### Option:

- 07 The criterion for the pedestrian volume crossing the major street may be reduced as much as 50 percent if the 15th-percentile crossing speed of pedestrians is less than 3.5 feet per second.
- 08 A traffic control signal may not be needed at the study location if adjacent coordinated traffic control signals consistently provide gaps of adequate length for pedestrians to cross the street.

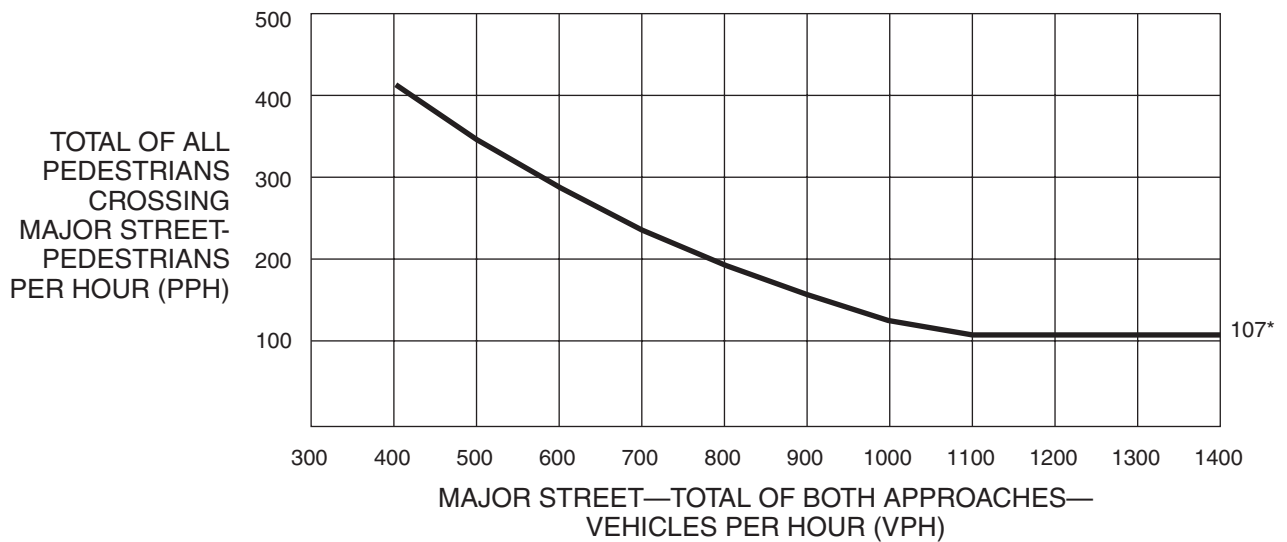
## Section 4C.06 Warrant 5, School Crossing

### Support:

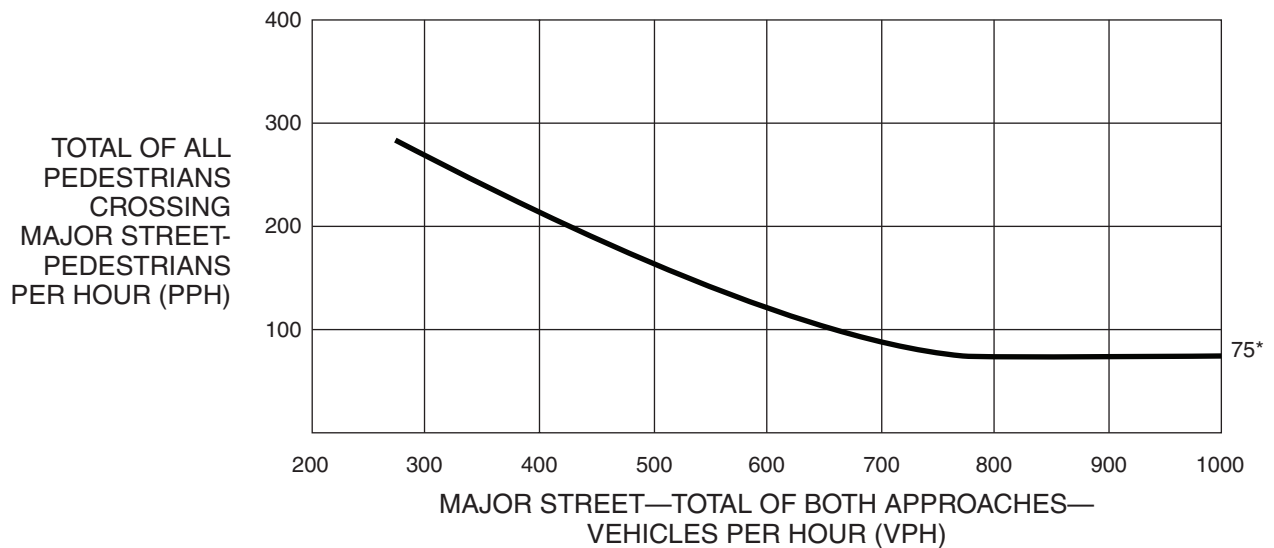
- 01 The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word “schoolchildren” includes elementary through high school students.

### Standard:

- 02 **The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.**

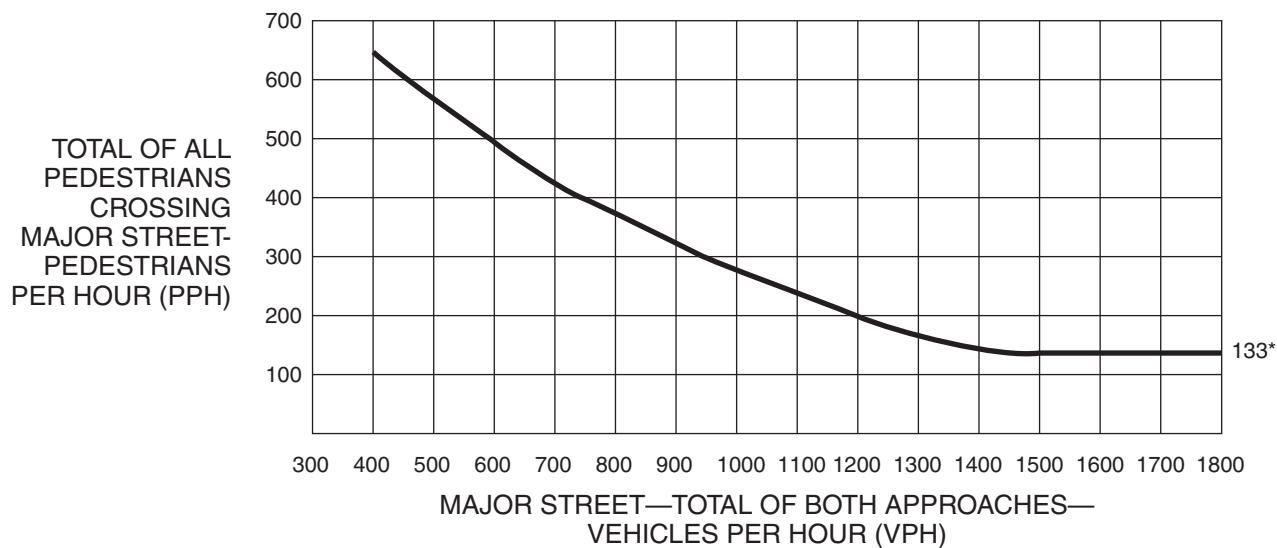
**Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume**

\*Note: 107 pph applies as the lower threshold volume.

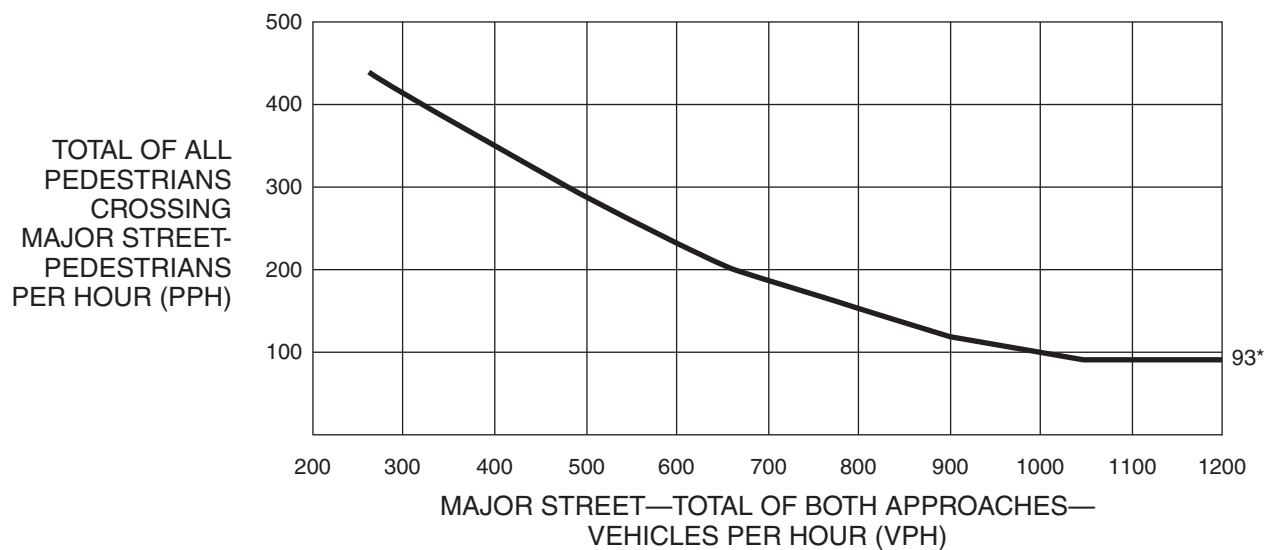
**Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)**

\*Note: 75 pph applies as the lower threshold volume.



**Figure 4C-7. Warrant 4, Pedestrian Peak Hour**

\*Note: 133 pph applies as the lower threshold volume.

**Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)**

\*Note: 93 pph applies as the lower threshold volume.

- 03 **Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.**
- 04 **The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**

*Guidance:*

- 05 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*
- A. *If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.*
  - B. *If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.*
  - C. *Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.*

#### **Section 4C.07 Warrant 6, Coordinated Signal System**

**Support:**

- 01 Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

**Standard:**

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:**
- A. **On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.**
  - B. **On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.**

*Guidance:*

- 03 *The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.*

#### **Section 4C.08 Warrant 7, Crash Experience**

**Support:**

- 01 The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

**Standard:**

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:**
- A. **Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and**
  - B. **Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and**
  - C. **For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.**

Option:

- 03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

### **Section 4C.09 Warrant 8, Roadway Network**

Support:

- 01 Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

**Standard:**

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:**
- A. **The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or**
  - B. **The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).**
- 03 **A major route as used in this signal warrant shall have at least one of the following characteristics:**
- A. **It is part of the street or highway system that serves as the principal roadway network for through traffic flow.**
  - B. **It includes rural or suburban highways outside, entering, or traversing a city.**
  - C. **It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.**

### **Section 4C.10 Warrant 9, Intersection Near a Grade Crossing**

Support:

- 01 The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

*Guidance:*

- 02 *This signal warrant should be applied only after adequate consideration has been given to other alternatives or after a trial of an alternative has failed to alleviate the safety concerns associated with the grade crossing. Among the alternatives that should be considered or tried are:*
- A. *Providing additional pavement that would enable vehicles to clear the track or that would provide space for an evasive maneuver, or*
  - B. *Reassigning the stop controls at the intersection to make the approach across the track a non-stopping approach.*

**Standard:**

- 03 **The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:**
- A. **A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and**
  - B. **During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13.**

*Guidance:*

- 04 *The following considerations apply when plotting the traffic volume data on Figure 4C-9 or 4C-10:*
- A. *Figure 4C-9 should be used if there is only one lane approaching the intersection at the track crossing location and Figure 4C-10 should be used if there are two or more lanes approaching the intersection at the track crossing location.*



**PETERS & ASSOCIATES**  
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