

**Traffic Impact Study
Hardin Valley at Schaeffer Road Development
Knox County, Tennessee**

CCI Project No. 00621-0001

February 16, 2006



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EXECUTIVE SUMMARY

This report provides a summary of the traffic impact study that was performed for a proposed commercial development, to be located off Hardin Valley Road at the intersection with Cherahala Boulevard in West Knox County. The project site is located on the south side of Hardin Valley Road just east of the Pellissippi Parkway / Hardin Valley Road interchange.

The proposed plan for this development includes a 43,400 square foot supermarket, a 4,000 square foot bank, and two 5,000 square foot high-turnover sit-down restaurants. There are two proposed entrances to the development with one entrance located at the intersection of Hardin Valley Road and Cherahala Boulevard and the other at the intersection of Hardin Valley Road and Charlevoix Road. An internal access road is included within the site and runs from the Cherahala Boulevard intersection to the west through the site.

The purpose of this study was the evaluation of the traffic operational and safety impact of the proposed development upon the area roadways. Of particular interest were the intersections of Hardin Valley Road with Cherahala Boulevard, Charlevoix Road, and the Pellissippi Parkway Northbound Ramps (Schaeffer Road).

The following is a listing and discussion of potential improvements that should be considered to minimize the anticipated traffic impact of the proposed development:

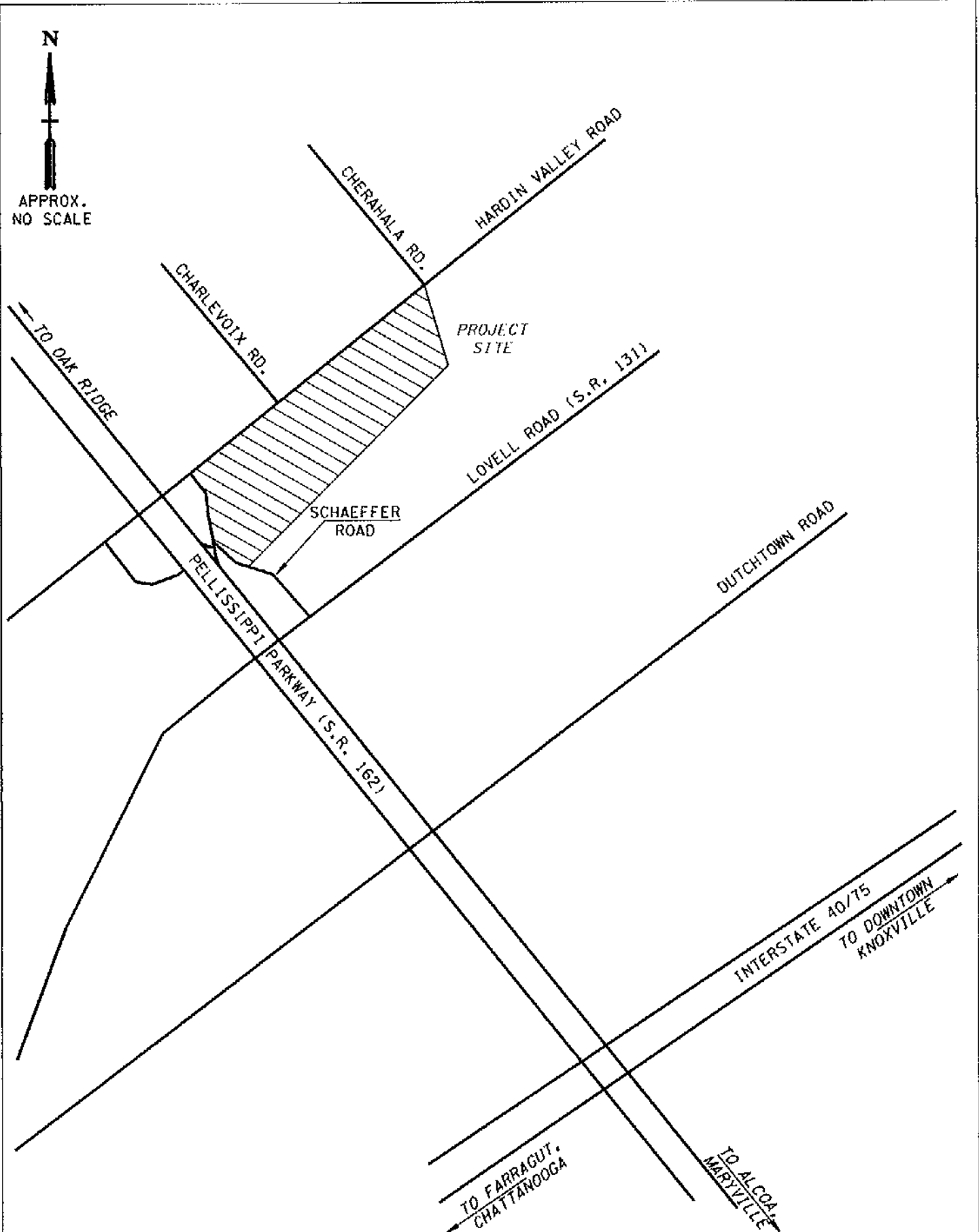
1. Install a two-phase actuated signal at the intersection of Hardin Valley Road and Cherahala Boulevard. In addition, signal coordination with the existing signal at Hardin Valley Road and Pellissippi Parkway / Schaeffer Road should be provided.
2. Provide the following lane configurations at Hardin Valley Road and Cherahala Boulevard:
 - Northbound Site Driveway: Provide one dedicated left-turn lane and one shared through-right lane exiting the proposed development.
 - Southbound Cherahala Boulevard: Re-stripe the existing southbound approach to this intersection to provide a three-lane approach accommodating dedicated right-turn, through, and left-turn lanes. Adequate pavement exists to accommodate this change with pavement marking modifications.
3. Provide a northbound shared through /left-lane and a dedicated right-turn lane at the intersection of Hardin Valley Road and Charlevoix Road intersection. In addition, the coordination of the signals on either side of this intersection, as recommended above, is needed to ensure adequate gaps to improve the LOS of this intersection.

INTRODUCTION AND PURPOSE OF STUDY

This report provides a summary of the traffic impact study that was performed for a proposed commercial development, to be located off Hardin Valley Road at the intersection with Cherahala Boulevard in West Knox County. The project site is located on the south side of Hardin Valley Road just east of the Pellissippi Parkway / Hardin Valley Road interchange. FIGURE 1 is a location map that identifies the project site in relation to the roadways in the vicinity of the proposed development.

The proposed plan for this development includes a 43,400 square foot supermarket, a 4,000 square foot bank, and two 5,000 square foot high-turnover sit-down restaurants. There are two proposed entrances to the development with one entrance located at the intersection of Hardin Valley Road and Cherahala Boulevard and the other at the intersection of Hardin Valley Road and Charlevoix Road. An internal access road is included within the site and runs from the Cherahala Boulevard intersection to the west through the site. FIGURE 2 provides a site layout of the proposed development.

The purpose of this study was the evaluation of the traffic operational and safety impact of the proposed development upon the area roadways. Of particular interest were the intersections of Hardin Valley Road with Cherahala Boulevard, Charlevoix Road, and Schaeffer Road.



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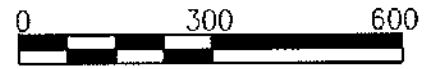
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FIGURE 1
SITE LOCATION MAP

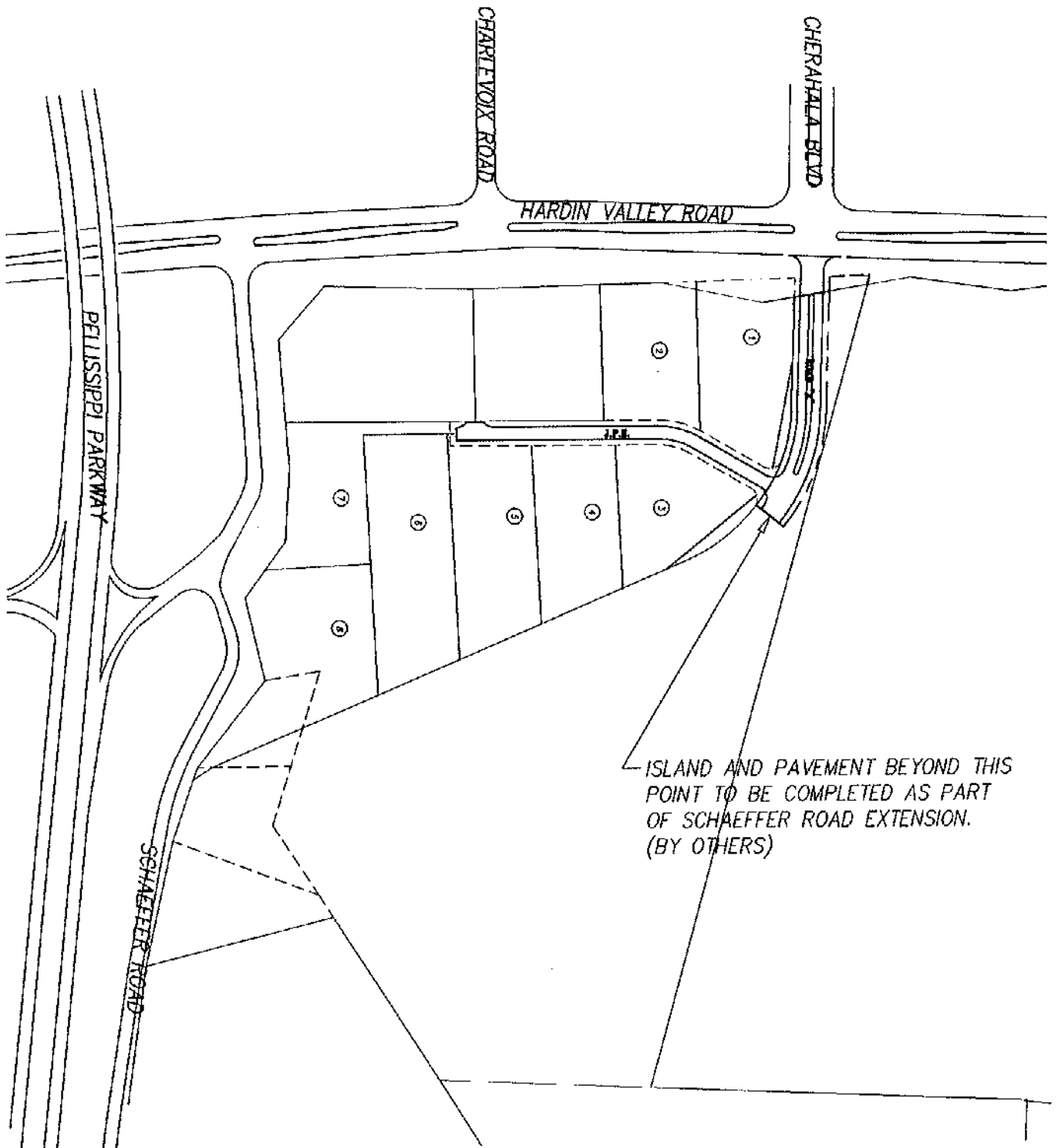
HARDIN VALLEY AT SCHAEFFER ROAD
TRAFFIC IMPACT STUDY



KGIS
NORTH



SCALE: 1" = 300'



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FIGURE 2
SITE PLAN

10606 HARDIN VALLEY ROAD
TRAFFIC IMPACT STUDY

EXISTING CONDITIONS

Existing Roadway Conditions

Hardin Valley Road is a multi-lane highway that is maintained by Knox County. It is classified as a Minor Arterial Facility by the Knoxville-Knox County Metropolitan Planning Commission. The roadway pavement generally consists of four traffic lanes of approximately twelve feet in width with a grass median and paved shoulders on each side. Turn lanes are provided at selected locations. The speed limit on Hardin Valley Road is 45 mph.

Traffic control at the three existing study intersections includes side street STOP control at the Hardin Valley Road and Cherahala Blvd. and Charlevoix Road intersections, and signalization at the Hardin Valley Road and Pellissippi Parkway northbound/ Schaeffer Road intersection. This signal is an actuated three-phase signal with a westbound protected-permitted left-turn phase.

Existing Traffic Data

Traffic count stations for collecting average daily traffic data (ADT) are located in the vicinity of the development and several years of this data were used to establish estimates of future background growth on Hardin Valley Road. A nearby count station is located on Hardin Valley west of the proposed project site, just west of the Pellissippi Parkway interchange. The most recent data available from TDOT for this station is shown in TABLE 1.

Count Year	TDOT Count Station/Location
	Station T 84 Hardin Valley Road West of Pellissippi Parkway
2002	7179
2003	7533
2004	7761

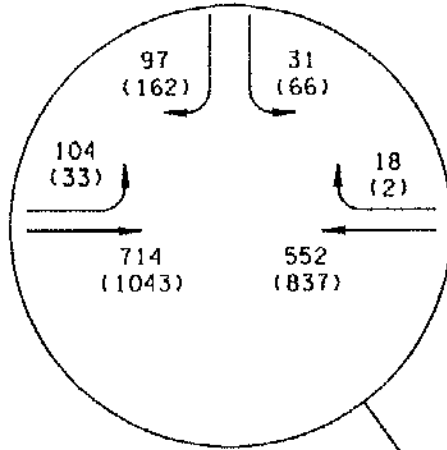
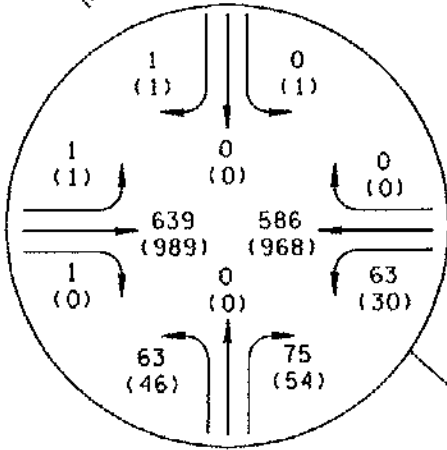
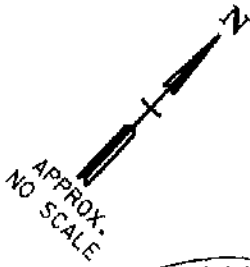
In order to collect more refined data, and to establish a basis for trip distribution patterns, turning movement traffic counts were collected at the following intersections: Hardin Valley at Cherahala Blvd., Hardin Valley Road at Charlevoix Road, and Hardin Valley Road at Pellissippi Parkway southbound

ramps (Schaeffer Road). The counts were conducted during the midday (M.D.) and afternoon (P.M.) peak traffic hours. Raw data summary sheets for these counts are contained in the APPENDIX.

In addition to helping establish trip distribution patterns, these turning movement counts were used to establish the existing-background traffic volumes for this study. FIGURE 3 provides a summary of this information adjusted to an average weekday basis using adjustment factors developed by the University of Tennessee Transportation Research Center (See APPENDIX).

Existing Level-of-Service

Capacity analyses employing the methods of the Highway Capacity Manual were conducted for the study intersections utilizing the 2006 background volumes and existing intersection traffic control. The EVALUATIONS section of this report may be referenced for summaries of these analyses, while the results are summarized in detail on computer printouts contained in the APPENDIX. Also contained in the APPENDIX is a section entitled "Intersection Capacity and Level of Service Concepts", which provides a description of the utilized procedures.



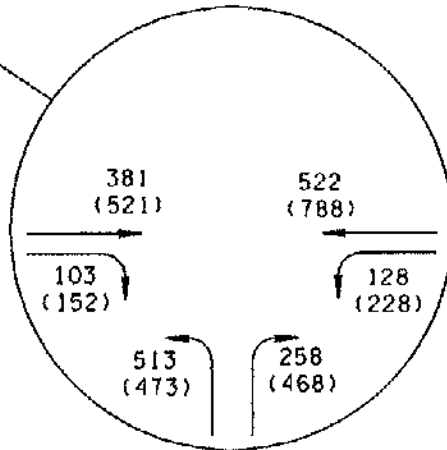
CHARLEVOIX RD.

CHERAHALA RD.

PELLISSIPPI PKWY.
NORTHBOUND RAMP
(SCHAEFFER RD.)

HARDIN VALLEY RD.

FUTURE ENT.



VOLUME LEGEND

TOP NO. - MID-DAY PEAK HOUR (12:00 - 1:00 A.M.)

(BOTTOM NO.) - P.M. PEAK HOUR (5:00 - 6:00 P.M.)

THE DATA SHOWN ARE THE RAW TRAFFIC COUNT DATA TIMES A FACTOR TO ADJUST TO AN AVERAGE WEEKDAY VOLUME FROM COUNTS TAKEN IN FEBRUARY. SEE APPENDIX FOR RAW COUNT DATA AND FACTOR TABLE. (FACTORS DEVELOPED BY THE UNIVERSITY OF TENNESSEE TRANSPORTATION RESEARCH CENTER).



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FIGURE 3
EXISTING BACKGROUND TRAFFIC

HARDIN VALLEY AT SCHAEFFER ROAD
TRAFFIC IMPACT STUDY

PROPOSED CONDITIONS

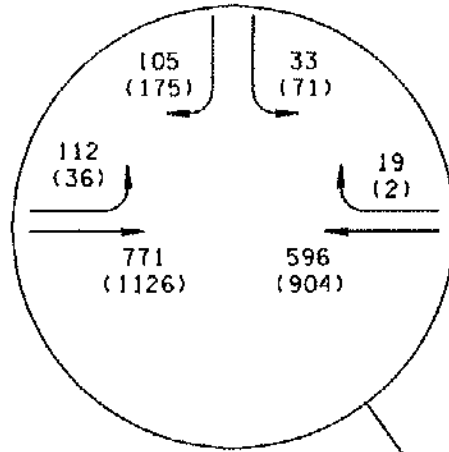
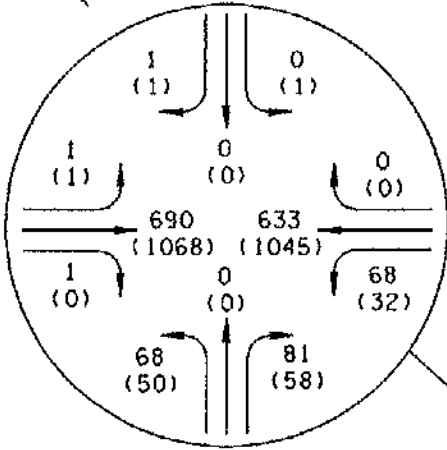
Background Traffic Growth

The anticipated time for full build-out of the proposed development is estimated as two years. Therefore, year 2008 was established as the appropriate design/analysis year for this study. In order to determine traffic volumes resulting solely from background traffic growth to this year, it was necessary to establish an annual growth rate for existing traffic. The TDOT ADT values, previously mentioned, were used in conjunction with engineering judgment to approximate a 4 percent annual growth factor for the existing traffic volumes. FIGURE 4 contains the background traffic volumes that would result from a four percent annual growth rate.

Trip Generation

In order to estimate the expected traffic volumes to be generated by the proposed development, the data and procedures of *Trip Generation, Seventh Edition* (Institute of Transportation Engineers, 2003) were utilized. The generated trips from the supermarket were determined based on the weekday AM Peak Hour of Generator (midday generated trips), and the PM Peak Hour of Adjacent Street Traffic One Hour Between 4 and 6 PM (evening generated trips) average rates for Supermarket (Land Use Code 850, Volume 3, pages 1526 and 1528). The generated trips from the bank were determined based on the weekday AM Peak Hour of Generator (midday generated trips), and the PM Peak Hour of Adjacent Street Traffic One Hour Between 4 and 6 PM (evening generated trips) average rates for Drive-In Bank (Land Use Code 912, Volume 3, pages 1687 and 1688). The generated trips from the restaurants were determined based on the weekday AM Peak Hour of Generator (midday generated trips), and the PM Peak Hour of Adjacent Street Traffic One Hour Between 4 and 6 PM (evening generated trips) average rates for High-Turnover (Sit-Down) Restaurant (Land Use Code 932, Volume 3, pages 1725 and 1726). TABLE 2 summarizes the trip generation that was performed for the proposed development.

APPROX.
NO SCALE



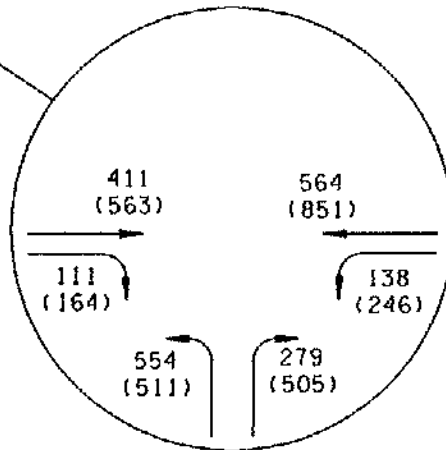
CHARLEVOIX RD.

CHERAHALA RD.

PELLISSIPPI PKWY.
NORTHBOND RAMP
SCHAEFFER RD.

HARDIN VALLEY RD.

FUTURE ENT.



VOLUME LEGEND

TOP NO. - M.D. PEAK HOUR
 (BOTTOM NO.) - P.M. PEAK HOUR
 PROJECTION BASED ON 2 PERCENT GROWTH
 FULL BUILDOUT IN 2008



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FIGURE 4
 BACKGROUND TRAFFIC, PROJECTED 2008

HARDIN VALLEY AT SCHAEFFER ROAD
 TRAFFIC IMPACT STUDY

TABLE 2					
TRIP GENERATION SUMMARY					
GENERATION FOR SUPERMARKET – I.T.E. CODE 850 ¹					
	Total New Trips	% Entering	% Exiting	Number Entering	Number Exiting
Weekday					
M.D. Peak	436	49%	51%	214	222
P.M. Peak	453	51%	49%	231	222
GENERATION FOR DRIVE-IN BANK – I.T.E. CODE 912 ²					
	Total New Trips	% Entering	% Exiting	Number Entering	Number Exiting
Weekday					
M.D. Peak	128	51%	49%	65	63
P.M. Peak	183	50%	50%	92	92
GENERATION FOR HIGH TURNOVER (SIT-DOWN) RESTAURANT ³					
	Total New Trips	% Entering	% Exiting	Number Entering	Number Exiting
Weekday					
M.D. Peak	135	52%	48%	70	65
P.M. Peak	109	61%	39%	66	43
¹ Supermarket – Generation based on 43,400 square feet.					
² Drive-In Bank – Generation based on 4,000 square feet.					
³ High Turnover (Sit-Down) Restaurant – Generation based on 2 at 5,000 square feet each.					

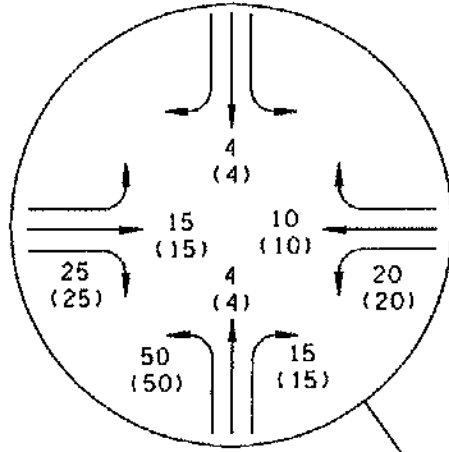
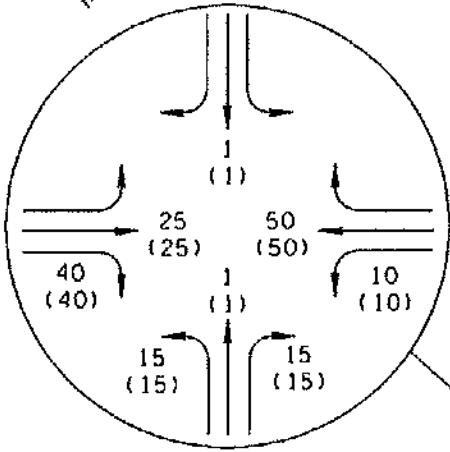
To account for shared or internal trips between the various land uses, a reduction in the total number of trips generated was applied to the trip generation. According to data from the *Trip Generation Handbook, Second Edition* (Institute of Transportation Engineers, 2004) the percentage of internal trips for the mid-day and P.M. peak hours is estimated to be 29% and 20%, respectively.

Trip Distribution and Assignment

FIGURE 5 provides a summary of the trip generation patterns developed for the proposed site driveway intersections and study intersections, which were based on existing patterns in the area and engineering judgment. FIGURE 6 provides the generated traffic volumes as assigned to the local roadway network in accordance with these patterns. Through volumes at the site driveways have been reduced by 30% to

account for anticipated pass-by trips, or trips already on the adjacent roadways that will be attracted into the development. FIGURE 7 shows the volumes reflecting the existing traffic, the background traffic growth, and the newly generated traffic from the development. These are the combined volumes used in the analysis of full build-out conditions.

APPROX.
NO SCALE



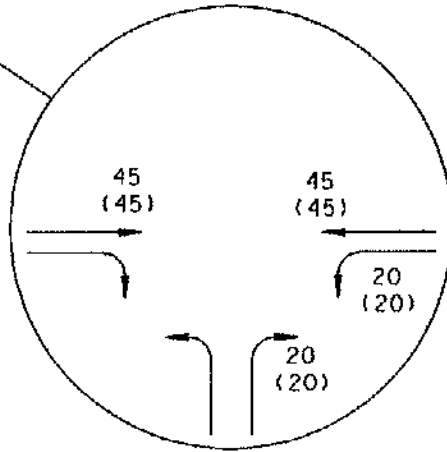
CHARLEVOIX RD.

CHERAHALA RD.

PELLISSIPPI PKWY.
NORTHBOUND RAMP
SCHAEFFER RD.

HARDIN VALLEY RD.

ENTRANCE



VOLUME LEGEND

TOP NO. - M.D. PEAK HOUR
 (BOTTOM NO.) - P.M. PEAK HOUR
 PROJECTION BASED ON 2 PERCENT GROWTH
 FULL BUILDOUT IN 2008



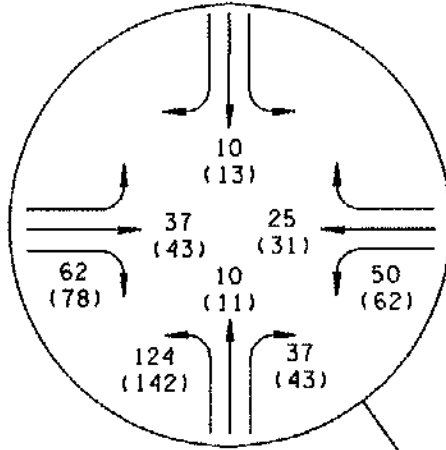
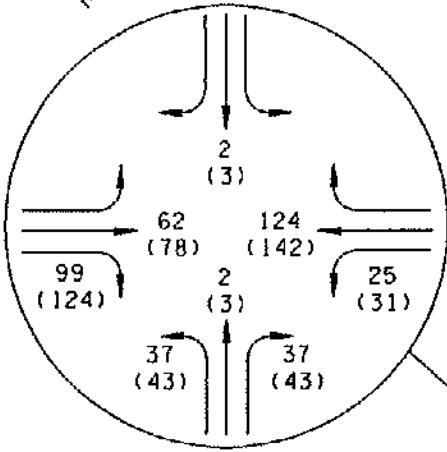
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FIGURE 5
 TRIP DISTRIBUTION PERCENTAGES

HARDIN VALLEY AT SCHAEFFER ROAD
 TRAFFIC IMPACT STUDY

APPROX.
NO SCALE



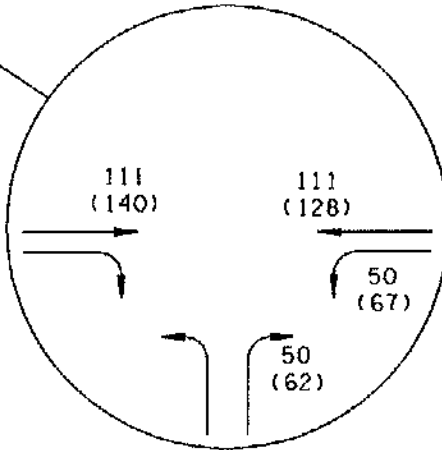
PELLISSIPPI PKWY.
NORTHBOUND RAMP
SCHAEFFER RD.

CHARLEVOIX RD.

HARDIN VALLEY RD.

CHERAHALA RD.

ENTRANCE



VOLUME LEGEND

TOP NO. - M.D. PEAK HOUR
 (BOTTOM NO.) - P.M. PEAK HOUR
 PROJECTION BASED ON 2 PERCENT GROWTH
 FULL BUILDOUT IN 2008

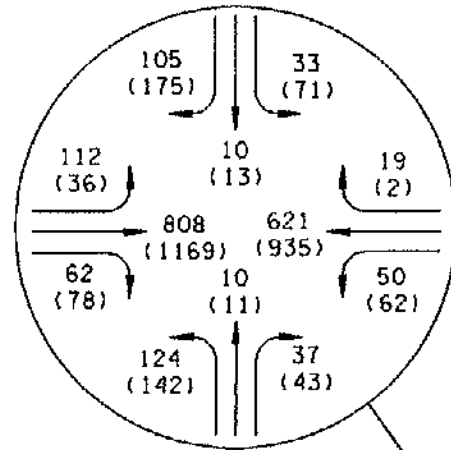
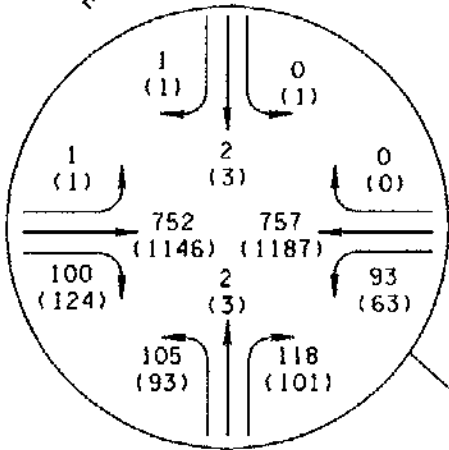
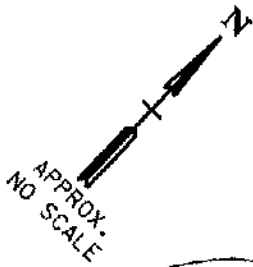


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FIGURE 6
 TRIP ASSIGNMENT

HARDIN VALLEY AT SCHAEFFER ROAD
 TRAFFIC IMPACT STUDY



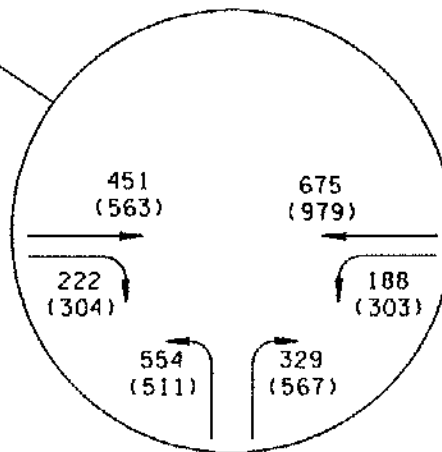
CHARLEVOIX RD.

CHERAHALA RD.

PELLISSIPPI PKWY.
NORTHBOUND RAMP
SCHAEFFER RD.

HARDIN VALLEY RD.

ENTRANCE



VOLUME LEGEND

TOP NO. - M.D. PEAK HOUR
 (BOTTOM NO.) - P.M. PEAK HOUR
 PROJECTION BASED ON 2 PERCENT GROWTH
 FULL BUILDOUT IN 2008



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FIGURE 7
 COMBINED VOLUMES FOR ANALYSIS

HARDIN VALLEY AT SCHAEFFER ROAD
 TRAFFIC IMPACT STUDY

Capacity Analyses

Intersection capacity analyses were conducted for the three study intersections utilizing the methods of the Highway Capacity Manual (HCM 2000). These analyses employed the unsignalized and signalized methodologies, as appropriate, with the traffic data from FIGURE 7.

The results are shown on TABLE 3, with brief summary/explanations provided below:

1. The existing signalized intersection of Hardin Valley Road at Pellissippi Northbound ramp/Schaeffer Road will operate adequately under anticipated Year 2008 combined traffic conditions with existing roadway and signal conditions.
2. The intersection of Hardin Valley Road and Charlevoix Road will experience significant (level-of-service "F") side street delay issues under anticipated Year 2008 combined traffic conditions. This is true both for existing roadway conditions and an alternate 2 which would provide a northbound right-turn lane. However, the presence of the nearby signal at the Pellissippi Northbound ramp/Schaeffer Road intersection, probably helps this intersection by creating gaps in traffic. Therefore, actual delay and levels-of-service for this intersection would probably be less than the values shown on the print-outs.
3. The intersection of Hardin Valley Road and Charlevoix Road will experience significant (level-of-service "F") side street delay issues under anticipated Year 2008 combined traffic conditions. This situation can only be reasonably addressed by implementing an alternate 2, signalized operation. Such an alternate would also include some additional side street turning lanes.

TABLE 3 SUMMARY OF INTERSECTION CAPACITY ANALYSES					
Intersection	Time Period	Existing Background	Year 2008 Background	Year 2008 Combined	
				Alt. 1 *	Alt. 2 **
Hardin Valley Road at Pellissippi N.B. Ramp / Schaeffer Road SIGNALIZED CONTROL	M.D.	C 22.7	C 24.4	C 25.2	Not Applicable
	P.M.	C 23.2	C 25.5	C 32.3	
Hardin Valley Road at Charlevoix Road / Business Entrance SIDE ST. STOP CONTROL	M.D.	C 20.1	C 23.0	F 65.2	D 32.1
	P.M.	D 30.1	E 37.9	F 227.1	F 90.1
Hardin Valley Road at Cherahala Boulevard / New Entrance SIDE STREET STOP CONTROL & SIGNAL (ALT. 2)	M.D.	B 13.1	B 13.8	F 240.7	SIGNAL B 10.4 B 12.5
	P.M.	C 18.7	C 21.0	F 688.8	
<p>Results reflect Level-of-Service and Average Vehicular Delay (seconds):</p> <ul style="list-style-type: none"> - Side Street Stop Control – Values shown for side street movements - Signalized Control – Values shown for full intersection <p>See APPENDIX for detailed computed print-out summaries</p> <p>* Basic Traffic Lanes (See Computer Print-outs)</p> <p>** Alternative 2 Improvements Evaluated:</p> <ul style="list-style-type: none"> - Charlevoix Road – Add Northbound Right-turn lane - Cherahala Boulevard – Add Northbound Left-turn lane, Southbound Through lane and traffic signal 					

Traffic Signal Warrant Analyses

The intersection of Hardin Valley Road and Cherahala Boulevard was evaluated for possible justification of signalization using the traffic signal warrants from the Manual on Uniform Traffic Control Devices. This evaluation was based on the Year 2008 projected traffic conditions, shown on FIGURE 7. For a detailed summary, please see the signal warrant computer print-out summary contained in the APPENDIX. The intersection met the Peak Hour Volume Warrant (Warrant No. 3) under the projected traffic conditions (with site generated traffic).

CONCLUSIONS AND RECOMMENDATIONS

The primary conclusion of this study was that the additional traffic generated by the proposed development will have a significant impact on the traffic operation at the intersections of Hardin Valley Road and Charlevoix Road and Hardin Valley Road and Cherahala Boulevard. Evaluation of these intersections found that both intersections are anticipated to incur peak hour levels-of service of "F" once the proposed development is constructed and generating traffic. Geometric and traffic control improvements at these intersections are recommended in order to mitigate the traffic impact of the proposed development. The intersection of Hardin Valley Road at Pellissippi Parkway / Schaeffer Road will continue to operate adequately with the existing roadway and signal conditions under the projected traffic volumes.

The following is a listing and discussion of potential improvements that should be considered to mitigate the anticipated traffic impact of the proposed development:

1. Install a two-phase actuated signal at the intersection of Hardin Valley Road and Cherahala Boulevard. In addition, signal coordination with the existing signal at Hardin Valley Road and Pellissippi Parkway / Schaeffer Road should be provided.
2. Provide the following lane configurations at Hardin Valley Road and Cherahala Boulevard:
 - Northbound Site Driveway: Provide one dedicated left-turn lane and one shared through-right lane exiting the proposed development.
 - Southbound Cherahala Boulevard: Re-stripe the existing southbound approach to this intersection to provide a three-lane approach accommodating dedicated right-turn, through, and left-turn lanes. Adequate pavement exists to accommodate this change with pavement marking modifications.
3. Provide a northbound shared through /left-lane and a dedicated right-turn lane at the intersection of Hardin Valley Road and Charlevoix Road intersection. In addition, the coordination of the signals on either side of this intersection, as recommended above, is needed to ensure adequate gaps to improve the LOS of this intersection.

APPENDIX

APPENDIX

Intersection Capacity and Level of Service Concepts

In a general sense, a roadway is similar to a pipeline or other material-carrying conduit in that it has a certain capacity for the amount of material (vehicles) that it can efficiently carry. As the number of vehicles in a given time period gradually increases, the quality of traffic flow gradually decreases. On roadway sections this results in increasing turbulence in the traffic stream, and at intersections it results in increasing stops and delay. As the volumes begin to approach the capacity of the facility, these problems rapidly magnify, with resulting serious levels of congestions, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Federal Highway Administration has published the Year 2000 Highway Capacity Manual (HCM2000), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these techniques is the idea of level of service (LOS). This concept establishes a rating system that quantifies the quality of traffic flow, as perceived by motorists and/or passengers. The general system is similar to a school grade scale, and is outlined as follows:

<u>Level of Service(LOS)</u>	<u>General Quality of Traffic Flow</u>	<u>Description of Corresponding Conditions</u>
A	Excellent	Roadways – Free flow, high maneuverability Intersections – Very few stops, very low delay
B	Very Good	Roadways – Free flow, slightly lower maneuverability Intersections – Minor stops, low delay
C	Good	Roadways – Stable flow, restricted maneuverability Intersections – Significant stops, significant delay
D	Fair	Roadways – Marginally stable flow, congestion seriously restricts maneuverability Intersections – High stops, long but tolerable delay
E	Poor	Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability Intersections – All vehicles stop, very long queues and very long intolerable delay
F	Very Poor	Roadways – Forced flow, stoppages may be lengthy, congestion severely restricts maneuverability Intersections – All vehicles stop, extensive queues and extremely long intolerable delay

*Unstable flow is such that minor fluctuations or disruptions can result in rapid degradation to LOS F.

Additional parameters that may be used to evaluate intersection operations:

v/c -- Volume to capacity ratio -- A parameter which is an approximate indicator of the overall sufficiency of a roadway or intersection ($v/c = 1.00$ equals a condition where the capacity of the facility is 100 percent saturated)

x/c -- Critical v/c ratio for a signalized intersection -- A parameter which reflects the v/c ratio for the critical lane groups for a signalized intersection.

v/c or x/c values greater than 0.90 often reflect conditions where some congestion and increasing delays are likely, while values greater than 1.00 reflect conditions where volumes exceed capacity, and if these conditions persist for long periods of time, very serious congestion and long delays will be unavoidable.

TRIP GENERATION SUMMARY

Hardin Valley Rd at Shaffer Rd TIS
 Project No.: 00621-0001
 2/15/2006

	Supermarket	Drive-in Bank	High-Turnover (Sit-Down) Restaurant	
ITE Code	850	912	932	
Size				
Units				
Sq. Ft.	43,400	4,000	10,000	
Trip Rate				
Weekday, trips/day	102.24	246.49	127.15	
Directional Dist: Entering	50%	50%	50%	
Directional Dist: Exiting	50%	50%	50%	
Total Weekday Trips	4,437.2	986.0	1,271.5	6,694.7
Weekday Trips Entering	2,218.6	493.0	635.8	
Weekday Trips Exiting	2,218.6	493.0	635.8	
Adjacent Street				
AM Peak, trips/hr	3.25	12.34	11.52	
Directional Dist: Entering	61%	56%	52%	
Directional Dist: Exiting	39%	44%	48%	
Total AM Trips	141.1	49.4	115.2	305.8
AM Trips Entering	86.0	27.6	59.9	
AM Trips Exiting	55.0	21.7	55.3	
PM Peak, trips/hr	10.45	45.74	10.92	
Directional Dist: Entering	51%	50%	61%	
Directional Dist: Exiting	49%	50%	39%	
Total PM Trips	453.5	183.0	109.2	745.7
PM Trips Entering	231.3	91.5	66.6	389.4
PM Trips Exiting	222.2	91.5	42.6	356.3
Peak of Generator				
AM Peak, trips/hr	10.05	31.99	13.53	
Directional Dist: Entering	49%	51%	52%	
Directional Dist: Exiting	51%	49%	48%	
Total AM Trips	436.2	128.0	135.3	699.4
AM Trips Entering	213.7	65.3	70.4	349.4
AM Trips Exiting	222.4	62.7	64.9	350
PM Peak, trips/hr	12.02	53.46	18.8	
Directional Dist: Entering	53%	51%	55%	
Directional Dist: Exiting	47%	49%	45%	
Total PM Trips	521.7	213.8	188.0	923.5
PM Trips Entering	276.5	109.1	103.4	
PM Trips Exiting	245.2	104.8	84.6	

↑
PM
↑

↑
Mid-day
↑

Internal Trips

Retail-Retail = 29% midday
 = 20% PM Peak

Pass-by Trips

Supermarket = 30% PM
 g

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Schaeffer					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/15/2006					Jurisdiction	Knox County					
Time Period	MD Peak (existing)					Analysis Year	2006					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	1	2	0	1	0	1	0	0	0
Lane group		TR		L	T		L		R			
Volume (vph)		381	103	128	522		513		258			
% Heavy veh		0	0	0	0		0		0			
PHF		0.90	0.90	0.90	0.90		0.90		0.90			
Actuated (P/A)		P	P	P	P		P		P			
Startup lost time		2.0		2.0	2.0		2.0		2.0			
Ext. eff. green		2.0		2.0	2.0		2.0		2.0			
Arrival type		3		3	3		3		3			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Pad/Bike/RTOR Volume	0		0				0		0	0		
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N		N
Parking/hr												
Bus stops/hr		0		0	0		0		0			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Phasing	WB Only	EW Perm	03	04	NB Only	06	07	08				
Timing	G = 10.0	G = 25.0	G =	G =	G = 30.0	G =	G =	G =				
	Y = 5	Y = 6	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25							Cycle Length C = 82.0					
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate		537		142	580		570		287			
Lane group cap.		1068		423	1765		660		906			
v/c ratio		0.50		0.34	0.33		0.86		0.32			
Green ratio		0.30		0.49	0.49		0.37		0.56			
Unif. delay d1		23.4		12.5	12.8		24.1		9.6			
Delay factor k		0.50		0.50	0.50		0.50		0.50			
Increm. delay d2		1.7		2.1	0.5		14.1		0.9			
PF factor		1.000		1.000	1.000		1.000		1.000			
Control delay		25.1		14.6	13.3		38.2		10.5			
Lane group LOS		C		B	B		D		B			
Approch. delay		25.1		13.6			28.9					
Approach LOS		C		B			C					
Intersec. delay		22.7		Intersection LOS							C	

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Schaeffer					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/15/2006					Jurisdiction	Knox County					
Time Period	PM Peak (existing)					Analysis Year	2006					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	1	2	0	1	0	1	0	0	0
Lane group		TR		L	T		L		R			
Volume (vph)		521	152	228	788		473		468			
% Heavy veh		0	0	0	0		0		0			
PHF		0.90	0.90	0.90	0.90		0.90		0.90			
Actuated (P/A)		P	P	P	P		P		P			
Startup lost time		2.0		2.0	2.0		2.0		2.0			
Ext. eff. green		2.0		2.0	2.0		2.0		2.0			
Arrival type		3		3	3		3		3			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Ped/Bike/RTOR Volume	0		0				0		0	0		
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N		N
Parking/hr												
Bus stops/hr		0		0	0		0		0			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Phasing	WB Only	EW Perm	03	04	NB Only	06	07	08				
Timing	G = 12.0	G = 25.0	G =	G =	G = 30.0	G =	G =	G =				
	Y = 5	Y = 6	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 84.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate		748		253	876		526		520			
Lane group cap.		1040		371	1809		645		923			
v/c ratio		0.72		0.68	0.48		0.82		0.56			
Green ratio		0.30		0.50	0.50		0.36		0.57			
Unif. delay d1		26.4		14.7	13.9		24.5		11.4			
Delay factor k		0.50		0.50	0.50		0.50		0.50			
Increm. delay d2		4.3		9.7	0.9		10.9		2.5			
PF factor		1.000		1.000	1.000		1.000		1.000			
Control delay		30.7		24.5	14.8		35.4		13.9			
Lane group LOS		C		C	B		D		B			
Approch. delay		30.7		17.0			24.7					
Approach LOS		C		B			C					
Intersec. delay		23.2		Intersection LOS							C	

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Schaeffer					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/15/2006					Jurisdiction	Knox County					
Time Period	MD Peak (background)					Analysis Year	2008					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	1	2	0	1	0	1	0	0	0
Lane group		TR		L	T		L		R			
Volume (vph)		411	111	138	564		554		279			
% Heavy veh		0	0	0	0		0		0			
PHF		0.90	0.90	0.90	0.90		0.90		0.90			
Actuated (P/A)		P	P	P	P		P		P			
Startup lost time		2.0		2.0	2.0		2.0		2.0			
Ext. eff. green		2.0		2.0	2.0		2.0		2.0			
Arrival type		3		3	3		3		3			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Ped/Bike/RTOR Volume	0		0				0		0	0		
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N		N
Parking/hr												
Bus stops/hr		0		0	0		0		0			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Phasing	WB Only	EW Perm	03	04	NB Only	06	07	08				
Timing	G = 10.0	G = 25.0	G =	G =	G = 32.0	G =	G =	G =				
	Y = 5	Y = 6	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 84.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate		580		153	627		616		310			
Lane group cap.		1043		391	1723		688		923			
v/c ratio		0.56		0.39	0.36		0.90		0.34			
Green ratio		0.30		0.48	0.48		0.38		0.57			
Unif. delay d1		24.8		13.6	13.9		24.4		9.5			
Delay factor k		0.50		0.50	0.50		0.50		0.50			
Increm. delay d2		2.1		2.9	0.6		16.6		1.0			
PF factor		1.000		1.000	1.000		1.000		1.000			
Control delay		27.0		16.6	14.5		41.0		10.5			
Lane group LOS		C		B	B		D		B			
Approch. delay		27.0		14.9			30.8					
Approach LOS		C		B			C					
Intersec. delay		24.4		Intersection LOS							C	

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Schaeffer					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/15/2006					Jurisdiction	Knox County					
Time Period	PM Peak (background)					Analysis Year	2008					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	1	2	0	1	0	1	0	0	0
Lane group		TR		L	T		L		R			
Volume (vph)		563	164	246	851		511		505			
% Heavy veh		0	0	0	0		0		0			
PHF		0.90	0.90	0.90	0.90		0.90		0.90			
Actuated (P/A)		P	P	P	P		P		P			
Startup lost time		2.0		2.0	2.0		2.0		2.0			
Ext. eff. green		2.0		2.0	2.0		2.0		2.0			
Arrival type		3		3	3		3		3			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Ped/Bike/RTOR Volume	0		0				0		0	0		
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N		N
Parking/hr												
Bus stops/hr		0		0	0		0		0			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Phasing	WB Only	EW Perm	03	04	NB Only	06	07	08				
Timing	G = 12.0	G = 25.0	G =	G =	G = 30.0	G =	G =	G =				
	Y = 5	Y = 6	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 84.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate		808		273	946		568		561			
Lane group cap.		1040		351	1809		645		923			
v/c ratio		0.78		0.78	0.52		0.88		0.61			
Green ratio		0.30		0.50	0.50		0.36		0.57			
Unif. delay d1		27.0		16.6	14.2		25.3		11.8			
Delay factor k		0.50		0.50	0.50		0.50		0.19			
Increm. delay d2		5.7		15.5	1.1		15.9		1.2			
PF factor		1.000		1.000	1.000		1.000		1.000			
Control delay		32.7		32.2	15.3		41.2		13.0			
Lane group LOS		C		C	B		D		B			
Approch. delay		32.7		19.1			27.2					
Approach LOS		C		B			C					
Intersec. delay		25.5		Intersection LOS							C	

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Schaeffer					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/16/2006					Jurisdiction	Knox County					
Time Period	MD Peak (combined)					Analysis Year	2008					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	1	2	0	1	0	1	0	0	0
Lane group		TR		L	T		L		R			
Volume (vph)		411	222	188	675		554		329			
% Heavy veh		0	0	0	0		0		0			
PHF		0.90	0.90	0.90	0.90		0.90		0.90			
Actuated (P/A)		P	P	P	P		P		P			
Startup lost time		2.0		2.0	2.0		2.0		2.0			
Ext. eff. green		2.0		2.0	2.0		2.0		2.0			
Arrival type		3		3	3		3		3			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Ped/Bike/RTOR Volume	0		0				0		0	0		
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N		N
Parking/hr												
Bus stops/hr		0		0	0		0		0			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Phasing	WB Only	EW Perm	03	04	NB Only	06	07	08				
Timing	G = 10.0	G = 25.0	G =	G =	G = 32.0	G =	G =	G =				
	Y = 6	Y = 6	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 84.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate		704		209	750		616		366			
Lane group cap.		1020		343	1723		688		923			
v/c ratio		0.69		0.61	0.44		0.90		0.40			
Green ratio		0.30		0.48	0.48		0.38		0.57			
Unif. delay d1		26.1		15.0	14.5		24.4		10.0			
Delay factor k		0.50		0.50	0.50		0.50		0.50			
Increm. delay d2		3.8		7.8	0.8		16.6		1.3			
PF factor		1.000		1.000	1.000		1.000		1.000			
Control delay		29.9		22.8	15.3		41.0		11.2			
Lane group LOS		C		C	B		D		B			
Apprch. delay		29.9		17.0			29.9					
Approach LOS		C		B			C					
Intersec. delay		25.2		Intersection LOS							C	

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Schaeffer					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/16/2006					Jurisdiction	Knox County					
Time Period	PM Peak (combined)					Analysis Year	2008					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	1	2	0	1	0	1	0	0	0
Lane group		TR		L	T		L		R			
Volume (vph)		563	304	303	979		511		567			
% Heavy veh		0	0	0	0		0		0			
PHF		0.90	0.90	0.90	0.90		0.90		0.90			
Actuated (P/A)		P	P	P	P		P		P			
Startup lost time		2.0		2.0	2.0		2.0		2.0			
Ext. eff. green		2.0		2.0	2.0		2.0		2.0			
Arrival type		3		3	3		3		3			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Ped/Bike/RTOR Volume	0		0				0		0	0		
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N		N
Parking/hr												
Bus stops/hr		0		0	0		0		0			
Unit Extension		3.0		3.0	3.0		3.0		3.0			
Phasing	WB Only	EW Perm	03	04	NB Only	06	07	08				
Timing	G = 15.0	G = 30.0	G =	G =	G = 30.0	G =	G =	G =				
	Y = 5	Y = 6	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 92.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate		964		337	1088		568		630			
Lane group cap.		1118		377	1966		589		895			
v/c ratio		0.86		0.89	0.55		0.96		0.70			
Green ratio		0.33		0.54	0.54		0.33		0.55			
Unif. delay d1		29.1		24.3	13.7		30.5		15.0			
Delay factor k		0.50		0.50	0.50		0.50		0.50			
Increm. delay d2		8.8		26.0	1.1		29.3		4.6			
PF factor		1.000		1.000	1.000		1.000		1.000			
Control delay		37.9		50.4	14.8		59.7		19.6			
Lane group LOS		D		D	B		E		B			
Approch. delay		37.9		23.2			38.6					
Approach LOS		D		C			D					
Intersec. delay		32.3		Intersection LOS							C	

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/15/2006
 Analysis Time Period: MD Peak (existing)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2006
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Charlevoix Rd
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		1	639	1	63	586	0
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		1	710	1	70	651	0
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							
Lanes		1	2	0	1	2	0
Configuration		L	T	TR	L	T	TR
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		63	0	75	0	0	1
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		70	0	83	0	0	1
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/ No /		
Lanes		0	1	0	1	1	0
Configuration		LTR			L	TR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
			7	8	9	10	11	12
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L	LTR			L	TR	
v (vph)	1	70	153			0	1	
C(m) (vph)	945	898	390			233	676	
v/c	0.00	0.08	0.39			0.00	0.00	
95% queue length	0.00	0.25	1.82			0.00	0.00	
Control Delay	8.8	9.3	20.1			20.5	10.3	
LOS	A	A	C			C	B	
Approach Delay			20.1			10.3		
Approach LOS			C			B		

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/15/2006
 Analysis Time Period: PM Peak (existing)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2006
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Charlevoix Rd
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		1	989	0	30	968	0
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		1	1098	0	33	1075	0
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							
Lanes		1	2	0	1	2	0
Configuration		L	T	TR	L	T	TR
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		46	0	54	1	0	1
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		51	0	60	1	0	1
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/ No /		
Lanes		0	1	0	1	1	0
Configuration		LTR			L TR		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
			7	8	9	10	11	12
Movement	1	4						
Lane Config	L	L		LTR		L		TR
v (vph)	1	33		111		1		1
C(m) (vph)	656	643		252		145		493
v/c	0.00	0.05		0.44		0.01		0.00
95% queue length	0.00	0.16		2.11		0.02		0.01
Control Delay	10.5	10.9		30.1		30.0		12.3
LOS	B	B		D		D		B
Approach Delay				30.1			21.2	
Approach LOS				D			C	

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/15/2006
 Analysis Time Period: MD Peak (background)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Charlevoix Rd
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		1	690	1	68	633	0
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		1	766	1	75	703	0
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							
Lanes		1	2	0	1	2	0
Configuration		L	T	TR	L	T	TR
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		68	0	81	0	0	1
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		75	0	90	0	0	1
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/ No /		
Lanes		0	1	0	1	1	0
Configuration		LTR			L	TR	

Delay, Queue Length, and Level of Service

Approach Movement	EB	WB	Northbound			Southbound		
			7	8	9	10	11	12
Lane Config	L	L	LTR			L	TR	
v (vph)	1	75	165			0	1	
C(m) (vph)	904	856	362			209	650	
v/c	0.00	0.09	0.46			0.00	0.00	
95% queue length	0.00	0.29	2.30			0.00	0.00	
Control Delay	9.0	9.6	23.0			22.2	10.5	
LOS	A	A	C			C	B	
Approach Delay				23.0			10.5	
Approach LOS				C			B	

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/15/2006
 Analysis Time Period: PM Peak (background)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Charlevoix Rd
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		1	1068	0	32	1045	0
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		1	1186	0	35	1161	0
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							
Lanes		1	2	0	1	2	0
Configuration		L	T	TR	L	T	TR
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		50	0	58	1	0	1
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		55	0	64	1	0	1
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/ No /		
Lanes		0	1	0	1	1	0
Configuration		LTR			L TR		

Delay, Queue Length, and Level of Service

Approach Movement	EB	WB	Northbound			Southbound		
			7	8	9	10	11	12
Lane Config	L	L	LTR			L TR		
v (vph)	1	35	119			1		
C(m) (vph)	609	596	224			126		
v/c	0.00	0.06	0.53			0.01		
95% queue length	0.00	0.19	2.80			0.02		
Control Delay	10.9	11.4	37.9			33.8		
LOS	B	B	E			D		
Approach Delay			37.9			23.3		
Approach LOS			E			C		

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: MD Peak (combined)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Road
 North/South Street: Charlevoix
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		1	752	100	93	757	0
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		1	835	111	103	841	0
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							
Lanes		1	2	0	1	2	0
Configuration		L	T	TR	L	T	TR
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		105	2	118	0	2	1
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		116	2	131	0	2	1
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/ No /		
Lanes		0	1	0	1	1	0
Configuration		LTR			L	TR	

Delay, Queue Length, and Level of Service

Approach Movement	EB	WB	Northbound			Southbound		
			7	8	9	10	11	12
Lane Config	L	L	LTR			L	TR	
v (vph)	1	103	249			0	3	
C(m) (vph)	803	734	285			145	185	
v/c	0.00	0.14	0.87			0.00	0.02	
95% queue length	0.00	0.49	7.67			0.00	0.05	
Control Delay	9.5	10.7	65.2			29.8	24.8	
LOS	A	B	F			D	C	
Approach Delay			65.2				24.8	
Approach LOS			F				C	

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: PM Peak (combined)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Road
 North/South Street: Charlevoix
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach Movement	Eastbound			Westbound		
	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	1146	124	63	1187	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	1	1273	137	70	1318	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Raised curb			/ 1		
RT Channelized?						
Lanes	1	2	0	1	2	0
Configuration	L	T	TR	L	T	TR
Upstream Signal?	No			No		

Minor Street: Approach Movement	Northbound			Southbound		
	7 L	8 T	9 R	10 L	11 T	12 R
Volume	93	3	101	1	3	1
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	103	3	112	1	3	1
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach: Exists?/Storage	No			/		
Lanes	0	1	0	1	1	0
Configuration	LTR			L TR		

Delay, Queue Length, and Level of Service

Approach Movement Lane Config	EB	WB	Northbound			Southbound		
	1 L	4 L	7 L	8 LTR	9 L	10 L	11 L	12 TR
v (vph)	1	70	218			1 4		
C(m) (vph)	531	490	167			79 94		
v/c	0.00	0.14	1.31			0.01 0.04		
95% queue length	0.01	0.50	12.77			0.04 0.13		
Control Delay	11.8	13.6	227.1			51.2 45.0		
LOS	B	B	F			F E		
Approach Delay			227.1			46.2		
Approach LOS			F			E		

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: MD Peak (comb - alt 1)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Charlevoix
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		1	752	100	93	757	0
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		1	835	111	103	841	0
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							
Lanes		1	2	0	1	2	0
Configuration		L	T	TR	L	T	TR
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		105	2	118	0	2	1
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		116	2	131	0	2	1
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage					/ No /		
Lanes		0	1	1	1	1	0
Configuration		LT		R	L	TR	

Delay, Queue Length, and Level of Service

Approach Movement	EB 1 L	WB 4 L	Northbound			Southbound		
			7 LT	8	9 R	10 L	11	12 TR
v (vph)	1	103	118		131	0		3
C(m) (vph)	803	734	187		543	145		185
v/c	0.00	0.14	0.63		0.24	0.00		0.02
95% queue length	0.00	0.49	3.62		0.94	0.00		0.05
Control Delay	9.5	10.7	52.4		13.7	29.8		24.8
LOS	A	B	F		B	D		C
Approach Delay				32.1			24.8	
Approach LOS				D			C	

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: PM Peak (comb - alt 1)
 Intersection: Hardin Valley at Charlevoix
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Charlevoix
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach Movement	Eastbound			Westbound		
	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	1146	124	63	1187	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	1	1273	137	70	1318	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Raised curb			/ 1		
RT Channelized?						
Lanes	1	2	0	1	2	0
Configuration	L	T	TR	L	T	TR
Upstream Signal?	No			No		

Minor Street: Approach Movement	Northbound			Southbound		
	7 L	8 T	9 R	10 L	11 T	12 R
Volume	93	3	101	1	3	1
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	103	3	112	1	3	1
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach: Exists?/Storage				/ No /		
Lanes	0	1	1	1	1	0
Configuration	LT		R	L		TR

Delay, Queue Length, and Level of Service

Approach Movement Lane Config	EB	WB	Northbound			Southbound		
	1 L	4 L	7 LT	8	9 R	10 L	11	12 TR
v (vph)	1	70	106		112	1		4
C(m) (vph)	531	490	105		383	79		94
v/c	0.00	0.14	1.01		0.29	0.01		0.04
95% queue length	0.01	0.50	6.37		1.20	0.04		0.13
Control Delay	11.8	13.6	166.2		18.2	51.2		45.0
LOS	B	B	F		C	F		E
Approach Delay			90.2			46.2		
Approach LOS			F			E		

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: MD Peak (combined)
 Intersection: Hardin Valley at Cherahala
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Cherahala
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		112	808	62	50	621	19
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		124	897	68	55	690	21
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?					No		
Lanes		1	2	0	1	2	1
Configuration		L	T	TR	L	T	R
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		124	10	37	33	10	105
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		137	11	41	36	11	116
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/		
Lanes		0	1	0	0	1	1
Configuration		LTR			LT R		

Delay, Queue Length, and Level of Service

Approach Movement	EB 1 L	WB 4 L	Northbound			Southbound		
			7	8 LTR	9	10 LT	11	12 R
v (vph)	124	55	189			47		
C(m) (vph)	898	722	144			147		
v/c	0.14	0.08	1.31			0.32		
95% queue length	0.48	0.25	11.69			1.28		
Control Delay	9.7	10.4	240.7			40.6		
LOS	A	B	F			E		
Approach Delay			240.7			20.0		
Approach LOS			F			C		

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: PM Peak (combined)
 Intersection: Hardin Valley at Cherahala
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Cherahala
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		36	1169	78	62	935	2
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		40	1298	86	68	1038	2
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							No
Lanes		1	2	0	1	2	1
Configuration		L	T	TR	L	T	R
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		142	11	43	71	13	175
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		157	12	47	78	14	194
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/		
Lanes		0	1	0	0	1	1
Configuration		LTR			LT R		

Delay, Queue Length, and Level of Service

Approach Movement	EB	WB	Northbound			Southbound		
			7	8	9	10	11	12
Lane Config	L	L	LTR			LT R		
v (vph)	40	68	216			92		
C(m) (vph)	676	501	94			100		
v/c	0.06	0.14	2.30			0.92		
95% queue length	0.19	0.47	19.42			5.39		
Control Delay	10.7	13.3	688.7			146.4		
LOS	B	B	F			F		
Approach Delay			688.7			58.2		
Approach LOS			F			F		

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: PM Peak (comb-alt. 1)
 Intersection: Hardin Valley at Cherahala
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Cherahala
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		36	1169	78	62	935	2
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		40	1298	86	68	1038	2
Percent Heavy Vehicles		0	--	--	0	--	--
Median Type/Storage		Raised curb			/ 1		
RT Channelized?							
Lanes		1	2	0	1	2	0
Configuration		L	T	TR	L	T	TR
Upstream Signal?		No			No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		142	11	43	71	13	175
Peak Hour Factor, PHF		0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR		157	12	47	78	14	194
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)		0			0		
Flared Approach: Exists?/Storage		No			/		
Lanes		1	1	0	1	1	1
Configuration		L		TR	L	T	R

Delay, Queue Length, and Level of Service

Approach Movement	EB	WB	Northbound		Southbound			
			7 L	8 R	9 TR	10 L	11 T	12 R
Lane Config	L	L	L		TR	L	T	R
v (vph)	40	68	157		59	78	14	194
C(m) (vph)	676	501	76		242	105	78	506
v/c	0.06	0.14	2.07		0.24	0.74	0.18	0.38
95% queue length	0.19	0.47	14.26		0.93	3.98	0.61	1.78
Control Delay	10.7	13.3	610.8		24.6	103.1	61.0	16.5
LOS	B	B	F		C	F	F	C
Approach Delay				450.7			42.3	
Approach LOS				F			E	

TWO-WAY STOP CONTROL SUMMARY

Analyst: Scott Boles
 Agency/Co.: Cannon & Cannon
 Date Performed: 2/16/2006
 Analysis Time Period: MD Peak (comb-alt. 1)
 Intersection: Hardin Valley at Cherahala
 Jurisdiction: Knox County
 Units: U. S. Customary
 Analysis Year: 2008
 Project ID: Hardin Valley at Schaeffer Rd, 621-01
 East/West Street: Hardin Valley Rd
 North/South Street: Cherahala
 Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach Movement	Eastbound			Westbound		
	1 L	2 T	3 R	4 L	5 T	6 R
Volume	112	808	62	50	621	19
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	124	897	68	55	690	21
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Raised curb			/ 1		
RT Channelized?						
Lanes	1	2	0	1	2	0
Configuration	L	T	TR	L	T	TR
Upstream Signal?	No			No		

Minor Street: Approach Movement	Northbound			Southbound		
	7 L	8 T	9 R	10 L	11 T	12 R
Volume	124	10	37	33	10	105
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	137	11	41	36	11	116
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach: Exists?/Storage	No			/		
Lanes	1	1	0	1	1	1
Configuration	L		TR	L	T	R

Delay, Queue Length, and Level of Service

Approach Movement Lane Config	EB	WB	Northbound			Southbound		
	1 L	4 L	7 L	8	9 TR	10 L	11 T	12 R
v (vph)	124	55	137		52	36	11	116
C(m) (vph)	898	722	119		321	154	122	646
v/c	0.14	0.08	1.15		0.16	0.23	0.09	0.18
95% queue length	0.48	0.25	8.38		0.57	0.86	0.29	0.65
Control Delay	9.7	10.4	199.0		18.4	35.4	37.4	11.8
LOS	A	B	F		C	E	E	B
Approach Delay				149.3				18.7
Approach LOS				F				C

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Cherahala					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/16/2006					Jurisdiction	Knox County					
Time Period	MD Peak (comb - alt. 2)					Analysis Year	2008					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	2	0	1	2	0	1	1	0	1	1	1
Lane group	L	TR		L	TR		L	TR		L	T	R
Volume (vph)	112	808	62	50	621	19	124	10	37	33	10	105
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3		3	3		3	3		3	3	3
Unit Extension	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	12.0
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	0
Unit Extension	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Phasing	EW Perm	02	03	04	NS Perm	06	07	08				
Timing	G = 40.0	G =	G =	G =	G = 15.0	G =	G =	G =				
	Y = 6	Y =	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 67.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate	124	967		56	711		138	52		37	11	117
Lane group cap.	421	2137		298	2150		319	375		308	425	362
v/c ratio	0.29	0.45		0.19	0.33		0.43	0.14		0.12	0.03	0.32
Green ratio	0.60	0.60		0.60	0.60		0.22	0.22		0.22	0.22	0.22
Unif. delay d1	6.6	7.5		6.1	6.8		22.3	20.8		20.7	20.3	21.8
Delay factor k	0.50	0.50		0.50	0.50		0.50	0.50		0.50	0.50	0.50
Increm. delay d2	1.8	0.7		1.4	0.4		4.2	0.8		0.8	0.1	2.4
PF factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
Control delay	8.4	8.1		7.5	7.2		26.6	21.6		21.5	20.4	24.1
Lane group LOS	A	A		A	A		C	C		C	C	C
Approch. delay	8.2			7.2			25.2			23.3		
Approach LOS	A			A			C			C		
Intersec. delay	10.4			Intersection LOS						B		

SHORT REPORT												
General Information						Site Information						
Analyst	Scott Boles					Intersection	Hardin Valley at Cherahala					
Agency or Co.	Cannon & Cannon					Area Type	All other areas					
Date Performed	2/16/2006					Jurisdiction	Knox County					
Time Period	PM Peak (comb - alt. 2)					Analysis Year	2008					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	2	0	1	2	0	1	1	0	1	1	1
Lane group	L	TR		L	TR		L	TR		L	T	R
Volume (vph)	36	1169	78	62	935	2	142	11	43	71	13	175
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3		3	3		3	3		3	3	3
Unit Extension	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	12.0
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	0
Unit Extension	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Phasing	EW Perm	02	03	04	NS Perm	06	07	08				
Timing	G = 40.0	G =	G =	G =	G = 15.0	G =	G =	G =				
	Y = 6	Y =	Y =	Y =	Y = 6	Y =	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 67.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adj. flow rate	40	1386		69	1041		158	60		79	14	194
Lane group cap.	267	2140		153	2159		318	374		305	425	362
v/c ratio	0.15	0.65		0.45	0.48		0.50	0.16		0.26	0.03	0.54
Green ratio	0.60	0.60		0.60	0.60		0.22	0.22		0.22	0.22	0.22
Unif. delay d1	6.0	8.9		7.4	7.6		22.7	20.9		21.4	20.3	22.9
Delay factor k	0.50	0.50		0.50	0.50		0.50	0.50		0.50	0.50	0.50
Increm. delay d2	1.2	1.5		9.3	0.8		5.5	0.9		2.1	0.1	5.6
PF factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
Control delay	7.2	10.4		16.8	8.4		28.2	21.8		23.5	20.5	28.5
Lane group LOS	A	B		B	A		C	C		C	C	C
Apprch. delay	10.3			8.9			26.4			26.7		
Approach LOS	B			A			C			C		
Intersec. delay	12.5			Intersection LOS						B		

TRAFFIC SIGNAL WARRANT ANALYSIS - VOLUME WARRANTS

Intersection : Hard's Valley Road and Cheaha Road
 City or County : Knox County
 State : Tennessee
 Date of Count :
 Day of Week of Count : Average Weekday

Year: 2008
 Adjusting factor for day of week and month of year of count :
 Number of Lanes :
 Major Street : 2
 Minor Street : 2
 Yes
 1.00

Time	Major Street			Mirror Street		
	Actual Volume	Adjusted Total	Actual Volume	Adjusted Total	Actual Volume	Adjusted Total
Beginning	App #1	App #2	Total	Volur.	Volur.	Volur.
6:00 am	0	0	0	0	0	0
7:00	0	0	0	0	0	0
8:00	0	0	0	0	0	0
9:00 am	0	0	0	0	0	0
10:00	0	0	0	0	0	0
11:00	0	0	0	0	0	0
12:00 noon	882	1672	1672	171	171	171
1:00	0	0	0	0	0	0
2:00	0	0	0	0	0	0
3:00 pm	0	0	0	0	0	0
4:00	0	0	0	0	0	0
5:00	1283	2282	2282	196	196	196
6:00 pm	0	0	0	0	0	0
7:00	0	0	0	0	0	0
8:00	0	0	0	0	0	0

Time	Warrant #1A (8 Hr. - Min. Vol.)		Warrant #1B (8 Hr. - Intersection)		Combination (Warrants 1A & 1B)		Warrant #2 (Four Hour Vol.)		Warrant #3 (Peak Hour Vol.)		
	Major	Minor	Major	Minor	Major	Minor	Volume	Percent of Warrant	Volume	Percent of Warrant	
6:00 am	0	0	0	0	0	0	0	0	0	0	
7:00	0	0	0	0	0	0	0	0	0	0	
8:00	0	0	0	0	0	0	0	0	0	0	
9:00 am	0	0	0	0	0	0	0	0	0	0	
10:00	0	0	0	0	0	0	0	0	0	0	
11:00	0	0	0	0	0	0	0	0	0	0	
12:00 noon	388	122	263	244	332	153	80	214	100	171	
1:00	0	0	0	0	0	0	0	0	0	0	
2:00	0	0	0	0	0	0	0	0	0	0	
3:00 pm	0	0	0	0	0	0	0	0	0	0	
4:00	0	0	0	0	0	0	0	0	0	0	
5:00	543	140	352	280	453	175	80	245	100	196	
6:00 pm	0	0	0	0	0	0	0	0	0	0	
7:00	0	0	0	0	0	0	0	0	0	0	
8:00	0	0	0	0	0	0	0	0	0	0	
Warranting Volumes		Total Hours Meeting Warrant = 2		Warrant Met: No		Warranting Volumes		Total Hours Meeting Warrant = 2		Warrant Met: No	
420		140		630		70		504		112	
Total Hours Meeting Warrant = 2		Warrant Met: No		Total Hours Meeting Warrant = 2		Warrant Met: No		Warranting Volumes From MUTCD Pgs. 4-8		Total Hours Meeting Warrant = 2	
420		140		630		70		504		112	

Note: No adjustment made
 - Where more than one minor approach exists use the higher approach volume
 - Number of hours shown is the minimum meeting the MUTCD requirements. Additional hours outside of the count period may meet the MUTCD specified volume levels.
 Major Street volume is so low that no Minor Street warrant exists

Comments: (include any information which may be useful to the reviewer)

Analysis Prepared by: CANNON AND CANNON, INC.
 Alan L. Childers, P.E.
 Date: 02/19/08
 Time: 14:58
 Developed by: T. Darcy Sullivan, P.E.
 Distributed by: Tennessee Transportation Assistance Program (TTAP)
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