

Report for Wisconsin Department of Transportation

STH 15–Greenville to Hortonville
Outagamie County, Wisconsin
I.D. 6430-06-00

Highway 15 O-D Study

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1.01 INTRODUCTION

An origin-destination (O-D) study was conducted on Highway 15 (WIS 15) between Greenville and Hortonville on August 31, 2005. WIS 15 is a highly traveled two-lane highway that connects Appleton and the Fox Valley region to the areas north and west. The areas include Greenville, Hortonville, and New London as well as Antigo and Wausau at farther distances. The study specifically focuses on the area between Greenville and New London through Hortonville. The study corridor is shown in Figure 1.01-1.

Traffic levels along this corridor have been on the rise because of population growth and economic development. The increasing levels of traffic volumes along with other highway characteristics have begun to create traffic problems. Congestion levels and safety are of growing concern. Because of this, the Wisconsin Department of Transportation (WisDOT) has begun planning for improvements to the highway. This O-D study will help WisDOT understand the nature of the trips being made so that they may determine the best way to improve the corridor.

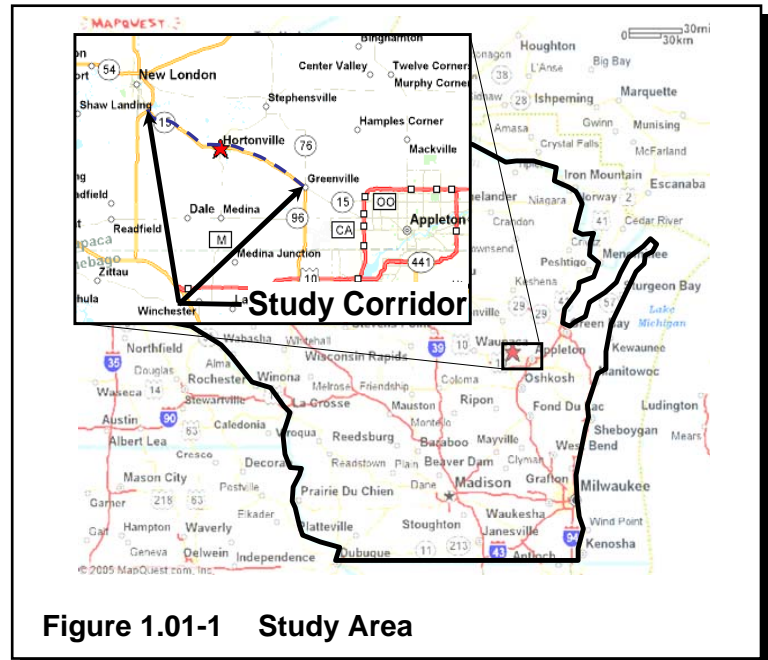


Figure 1.01-1 Study Area

1.02 STUDY HISTORY

In 2000, WisDOT performed the initial O-D survey. According to the WisDOT memo summarizing that survey, “the primary purpose of the survey was to determine the existing travel patterns which currently exist in the Greenville–Hortonville area with specific emphasis placed on the amount of traffic which has a direct orientation to these communities as well as traffic which does not.” In 2001, a corridor study was performed to inventory the existing conditions and identify needs. Beginning in 2002, WisDOT formed a local advisory committee made up of government officials, elected officials, citizens, and businesses to help develop alternatives to improve the corridor. In 2003, the alternatives were revised based on information gathered at public information meetings, through a value engineering study, and with the initial information gathered on costs and environmental impacts. In 2004, the project alternatives were finalized after working with agencies and other stakeholder interests. The final alternatives are illustrated in Figure 1.02-1 and include:

- No Build
- On-Alignment Capacity Expansion (Alternative 1)
- Northern Hortonville Bypass (Alternative 3)
- Southern Hortonville Bypass (Alternative 4)
- Far Southern Hortonville Bypass (Alternative 2)

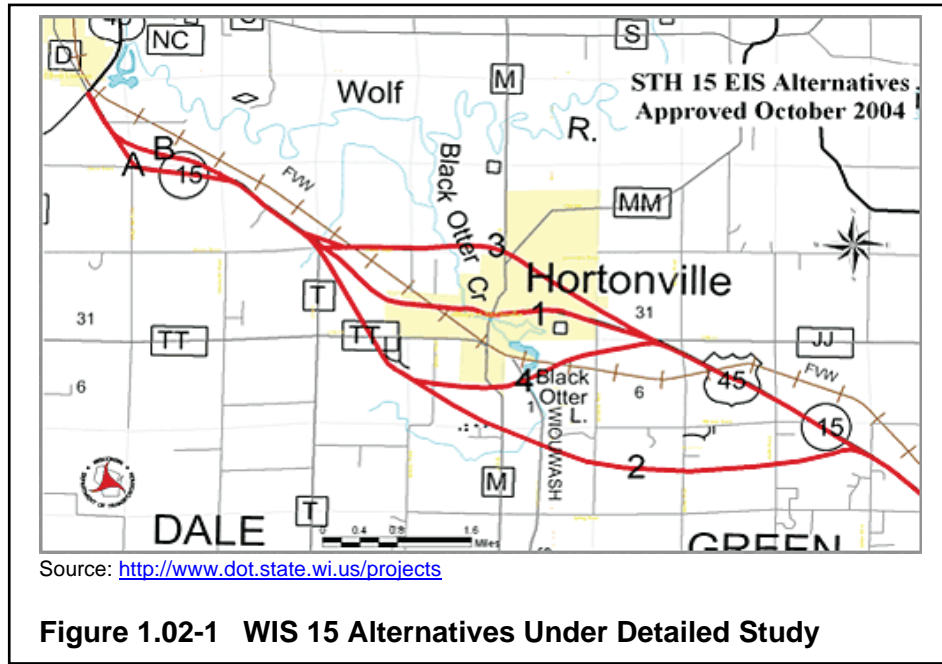


Figure 1.02-1 WIS 15 Alternatives Under Detailed Study

1.03 STUDY IMPORTANCE

WisDOT needed to conduct an updated O-D study to help define the purpose and need of the project. Two major changes had occurred between 2000 and 2005. First, in 2000, US 45 ran north along WIS 76, joined WIS 15 through the study corridor all the way to New London as shown as a dashed line in Figure 1.03-1. Then in 2001, US 45 was redirected away from the WIS 15 corridor and along a new route to the southeast. This redirection of US 45 was expected to change the traffic composition as well as the overall volumes on the WIS 15 corridor. Secondly, growth and development continued to occur over the 5-year period, and baseline traffic volumes were predicted to continue to increase.

Based on these changes to the corridor traffic along with a desire for up-to-date, accurate information on area traffic patterns, WisDOT commissioned the 2005 WIS 15 O-D Study.

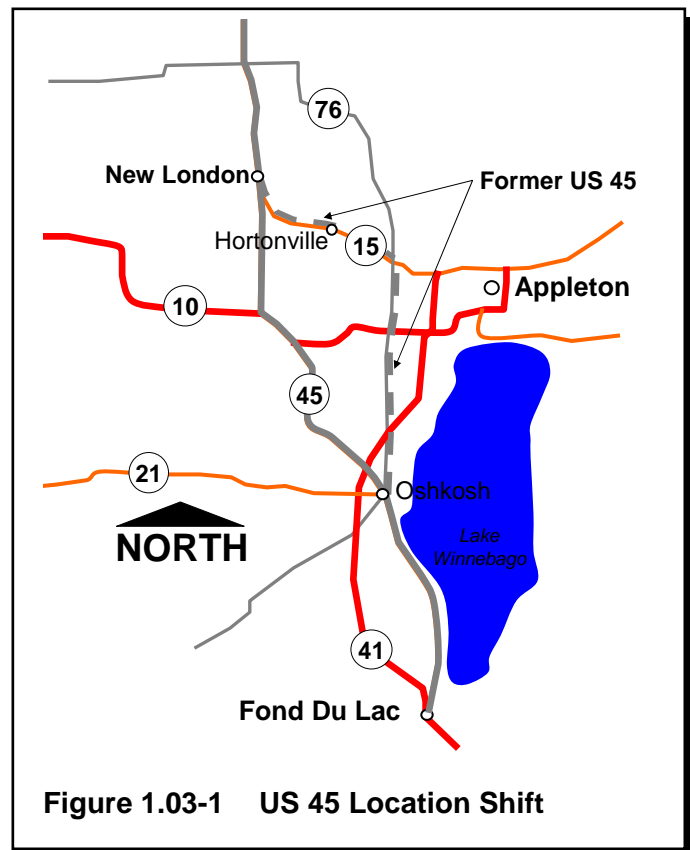


Figure 1.03-1 US 45 Location Shift

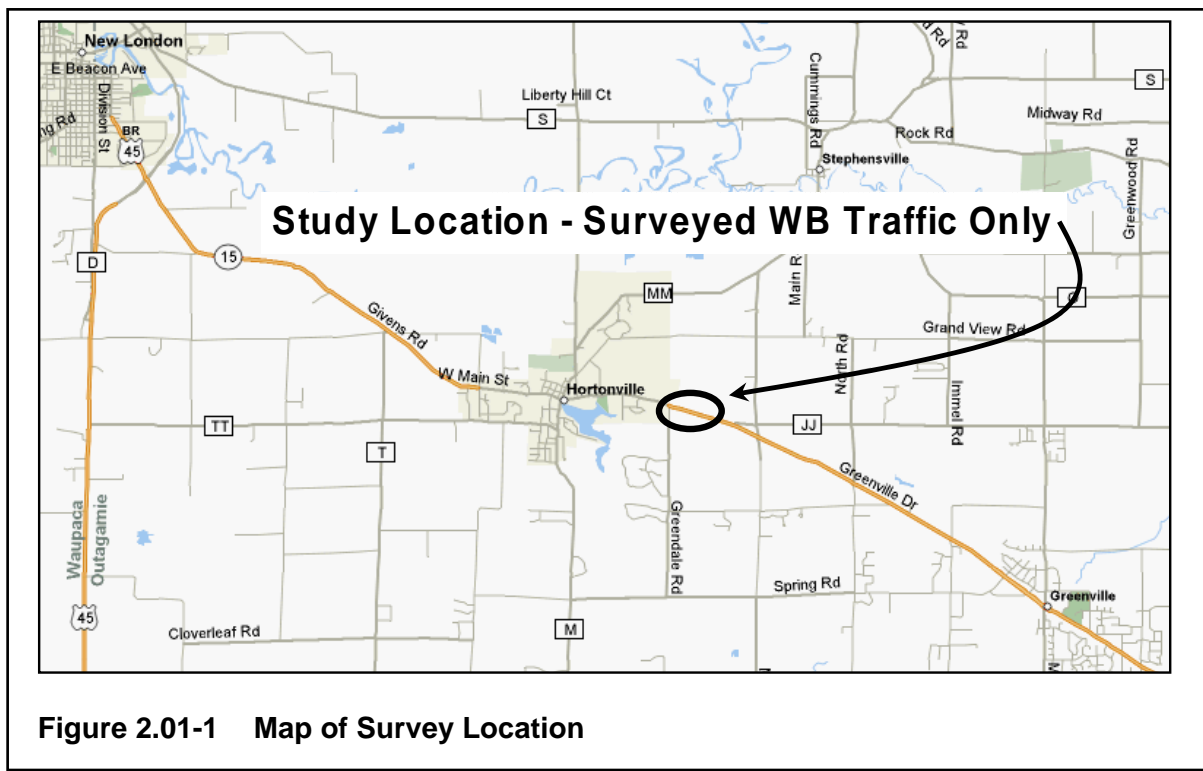
2.01 APPROACH

The O-D study is expected to help determine whether a bypass of Hortonville would help alleviate the congestion and safety problems along the study corridor. The O-D study team stopped westbound traffic on WIS 15 before Hortonville (as shown in Figure 2.01-1) and handed each driver a survey. Local authorities and the police department were made aware of the study and the traffic control measures that would be used (see Table 2.01-1).

Officials Notified
City of Appleton City Clerk
City of New London Administrator
Hortonville Police
Outagamie County Highway Commissioner
Town of Greenville Administrator
Village of Hortonville Administrator
Wisconsin State Patrol

Table 2.01-1 Notified about the O-D Study

The study stopped traffic as it approached the survey station using cones, barrels, and Portable Changeable Message Sign (PCMS). After the vehicle was stopped, the motorist was handed a survey. The survey asked the motorists where they were coming from, where they were going to, the type of vehicle they were driving and how many people were in the vehicle. The motorist completed the surveys at their leisure and returned the postage-paid mailer to WisDOT. A copy of the survey form is included in Appendix A.



The study began at 10:30 A.M. and ended around 5:20 P.M. to capture at least one peak hour. The study had to be terminated because of the substantial queuing that was occurring. From shortly before 10:30 A.M. to about 3:30 P.M., surveys were steadily handed out without any large effect on traffic queuing. Occasionally when queues would grow beyond a half mile, vehicles were waved on without a survey being distributed to them. During this morning- to midafternoon period, vehicles were being completely stopped while the surveyors introduced themselves as representing WisDOT and asked the motorist to fill out the survey and drop it in the mail. By 3:30 traffic volumes increased making it difficult to completely stop traffic. During this period, motorists were slowed to a rolling queue and simply handed the survey form and waived on. Table 2.02-2 shows how many surveys were distributed each hour. By 4:30 traffic volumes grew to a point where substantial queues occurred. During this period surveys were given to a smaller percentage of the vehicles since vehicles were often waved on to reduce queuing.

Time Period	Number of Surveys Distributed
10:30 to 11 A.M.	143
11 A.M. to 12 P.M.	283
12 to 1:00 P.M.	358
1 to 2 P.M.	335
2 to 3 P.M.	455
3 to 4 P.M.	381
4 to 5 P.M.	212
5 to 5:30 P.M.	42

Table 2.02-2 Number of Surveys Distributed

Traffic counters were also set out. A primary and a backup counter were installed in each direction. They were programmed to start counting for 7 days starting shortly after the survey ended. The counters collected data into one-hour bins.

3.01 RESULTS

The results of the O-D study were entered into a database and the survey result tallied. Every question was recorded for every returned survey. From this database, the results were gathered and summarized. Additionally, the 7-day traffic count data was downloaded and used to factor the O-D results.

3.02 RESPONSE RATE

According to the Manual of Traffic Engineering Studies, "...[a] 25-35% return is common from this type of survey. A 30% return is considered excellent; a return of at least 20% is needed to maintain the accuracy of this type of study." This study had an excellent return rate. About 2,200 surveys were distributed and more than 900 were returned. Table 3.02-1 summarizes the response rate by hour. The survey team handed out the highest number of surveys between 2 and 3 PM. After this period, the numbers tapered off because excessive queues began to develop and the surveyors needed to wave vehicles through. The best response hour was 5 P.M.

		Number of Surveys				
Hour		Distributed	Returned	Incomplete	Usable	Response Rate
10	(10:30 - 11:00)	143	71	4	67	50%
11	(11:00 - 12:00)	283	129	3	126	46%
12	(12:00 - 1:00)	358	150	5	145	42%
1	(1:00 - 2:00)	335	121	2	119	36%
2	(2:00 - 3:00)	455	186	2	184	41%
3	(3:00 - 4:00)	381	145	5	140	38%
4	(4:00 - 5:00)	212	98	5	93	46%
5	(5:00 - 5:30)	42	23	0	23	55%
TOTAL		2209	923	26	897	42%

Table 3.02-1 Survey Return Rate

3.03 ORIGINS AND DESTINATIONS

Table 3.03-1 summarizes the breakdown of destination location by hour. On average, over the 8-hour time period, only 41 percent of vehicles were traveling to Hortonville. The remaining vehicles were traveling elsewhere in Outagamie County or outside of the county. This segment of the traveling public would be likely to use a Hortonville bypass if one was constructed. Table 3.03-2 shows a normalized percent, 40.99%, of vehicles traveling to Hortonville. Table 3.03-3 is similar to Table 3.03-1; however, it focuses on the destinations of heavy trucks. At 36 percent, even fewer trucks are destined for Hortonville.

Hour	Total responses	Destination						Average Hourly Weekday Traffic (2005)*	Would Use a Bypass**	
		Hortonville	%	Elsewhere in Outagamie County	%	Outside Outagamie County	%			
10 (10:30 - 11:00)	67	32	48%	10	15%	25	37%	656	343	
11 (11:00 - 12:00)	126	50	40%	27	21%	49	39%	696	420	
12 (12:00 - 1:00)	145	65	45%	20	14%	60	41%	740	408	
1 (1:00 - 2:00)	119	45	38%	18	15%	56	47%	795	494	
2 (2:00 - 3:00)	184	71	39%	25	14%	88	48%	1000	614	
3 (3:00 - 4:00)	140	51	36%	27	19%	62	44%	1216	773	
4 (4:00 - 5:00)	93	47	51%	12	13%	34	37%	1328	657	
5 (5:00 - 5:30)	23	11	48%	4	17%	8	35%	1268	662	
TOTAL	897	372	41%	143	16%	382	43%			
								ADT	14743	8629

* Average of Tuesday, Wednesday, and Thursday traffic from traffic counts
** Estimated as the percentage with destinations elsewhere in Outagamie County or outside Outagamie County

Table 3.03-1 Survey Results: Destination by Hour (All Vehicles)

Table 3.03-4 describes where traffic was coming from when it reached the interview station. About half of the surveyed traffic began in Appleton. Nearly 20 percent of traffic originated in Greenville. The remaining 30 percent came from elsewhere in the county or from outside the county.

Normalized Traffic			
TIME	% of Responses with Hortonville as Destination	Hourly West Bound Volume	Number of Vehicles Destine for Hortonville
10	48%	372	179
11	40%	381	152
12	45%	375	169
1	38%	372	141
2	39%	404	158
3	36%	527	190
4	51%	473	241
5	48%	455	218
Total	41%	3359	1377
Normalized Percent	40.99%	% of West Bound Traffic from 10 AM to 5 PM Destine for	

Table 3.03-2 Normalized Traffic to Hortonville

DESTINATION BREAKDOWN - HEAVY TRUCKS								
Hour	Total responses	Destination - Heavy Trucks						
		Hortonville	%	Elsewhere in Outagamie County	%	Outside Outagamie County	%	
10 (10:30 - 11:00)	2	0	0%	2	100%	2	100%	
11 (11:00 - 12:00)	11	4	36%	4	36%	3	27%	
12 (12:00 - 1:00)	8	3	38%	0	0%	5	63%	
1 (1:00 - 2:00)	9	2	22%	1	11%	6	67%	
2 (2:00 - 3:00)	3	2	67%	0	0%	1	33%	
3 (3:00 - 4:00)	3	1	33%	0	0%	2	67%	
4 (4:00 - 5:00)	3	2	67%	1	33%	0	0%	
5 (5:00 - 5:30)	0	0	0%	0	0%	0	0%	
TOTAL	39	14	36%	8	21%	19	49%	

Table 3.03-3 Survey Results: Destination of Heavy Trucks by Hour

Hour	Total responses	Origin							
		Greenville	%	Appleton	%	Elsewhere in Outagamie County	%	Outside Outagamie County	%
10 (10:30 - 11:00)	67	10	15%	33	49%	16	24%	8	12%
11 (11:00 - 12:00)	126	24	19%	65	52%	21	17%	16	13%
12 (12:00 - 1:00)	145	24	17%	77	53%	31	21%	13	9%
1 (1:00 - 2:00)	119	20	17%	57	48%	24	20%	18	15%
2 (2:00 - 3:00)	184	29	16%	105	57%	24	13%	26	14%
3 (3:00 - 4:00)	140	35	25%	66	47%	22	16%	17	12%
4 (4:00 - 5:00)	93	23	25%	47	51%	16	17%	7	8%
5 (5:00 - 5:30)	23	5	22%	9	39%	4	17%	5	22%
TOTAL	897	170	19%	459	51%	158	18%	110	12%

Table 3.03-4 Survey Results: Origin by Hour (All Vehicles)

3.04 VEHICLE TYPE

Table 3.04-1 shows the percent breakdown of vehicle types. Light trucks include pick-ups, vans, and mini-vans while heavy trucks include any vehicles larger such as 2 Ds, 3 AX and 3-S2s. A little over half (55.1 percent) the vehicles surveyed were passenger cars. The majority (40.6 percent) of the remaining vehicles were light trucks/vans. Only 4.3 percent of the vehicles recorded were heavy trucks.

Vehicle Type	No. of Vehicles	Percent of Total
(1) Passenger Car	494	55.1 percent
(3) Light Truck/Van	364	40.6 percent
(5) Heavy Truck	39	4.3 percent
Total	897	100.0 percent

Table 3.04-1 Vehicle Type

3.05 TRIP PURPOSE

The surveys collected pertinent data as to why the trip was made by each motorist. Six reasons to travel were provided on the survey form. The motorist's travel options included home, work, school, shopping, recreation, and other. In Table 3.05-1 are the trip purposes broken down showing the total trips to and from each O-D location. The most common "coming from" trip purpose was the "work" trip (42 percent) while the most common "going to" was the "home" trip (60 percent). There was a large

Coming From	Number of Response Going To						Total	Percent
	(0) Home	(1) Work	(4) School	(8) Shopping	(9) Recreation	(7) Other		
(0) Home	7	42	50	13	18	37	167	19%
(1) Work	257	76	4	1	5	35	378	42%
(4) School	43	3	5	0	1	2	54	6%
(8) Shopping	123	11	2	2	0	5	143	16%
(9) Recreation	8	1	0	0	0	1	10	1%
(7) Other	98	12	2	1	0	29	142	16%
Total	536	145	63	17	24	109	894	100%
Percent	60%	16%	7%	2%	3%	12%	100%	

Table 3.05-1 Trip Purpose

proportion of trips going to “home”/coming from “work” trips because the morning rush hour was not surveyed. Going to “work” and “other” were also popular destinations. There was only a small number of motorists traveling to and from school due to the fact that the public schools were not in session at the time the survey was conducted.

3.06 VEHICLE OCCUPANCY

Vehicle occupancy information was also recorded from the surveys handed to motorists. Vehicle occupancy refers to the average number of people traveling in each of the vehicles recorded throughout the WIS 15 corridor. Table 3.06-1 shows the results of the survey. The majority of the vehicles (64.9 percent) had only one occupant. Only 1.9 percent of the vehicles recorded had five or more occupants.

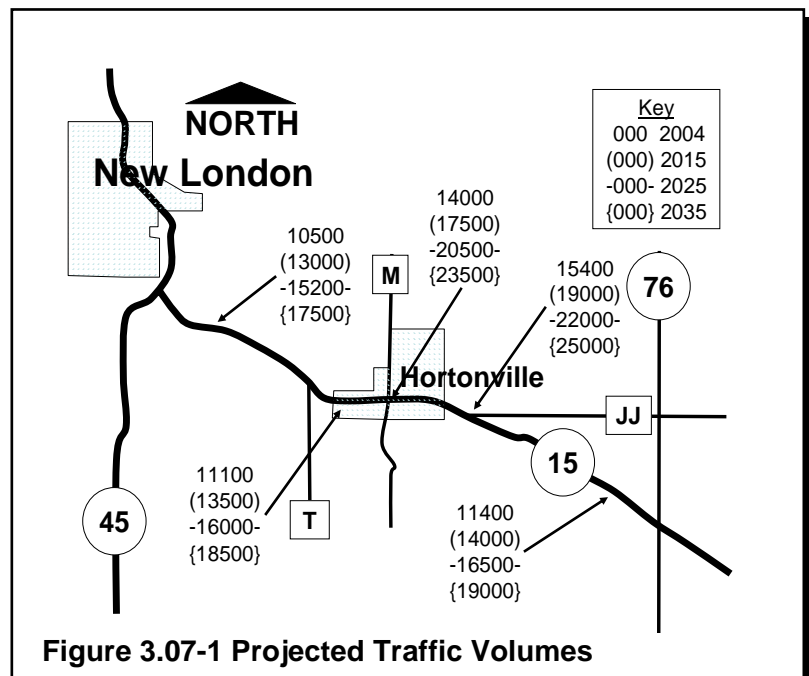
Vehicle Occupancy	No. of Vehicles	Percent of Total
1	581	64.9%
2	192	21.5%
3	71	7.9%
4	34	3.8%
5 or More	17	1.9%
Total	895	100.0%

Table 3.06-1 Vehicle Occupancy

3.07 TRAFFIC COUNT DATA

Because of population growth and economic development in the Fox Valley area, traffic volumes are projected to increase along this study corridor. Traffic counts taken in 2004 show that average daily traffic (ADT) along this corridor ranged from 10,500 to 15,400 vehicles per day (vpd). WisDOT performed a traffic forecast and projected traffic volumes to increase from 17,500 to 25,000 vpd by the year 2035. The traffic forecast is shown in the diagram in Figure 3.07-1.

Tables 3.07-1 and 3.07-2 illustrate the seven-day traffic count results (see Appendix B for the raw traffic count results). Table 3.07-1 shows the total daily counts for the eastbound (EB) and westbound (WB) directions of WIS 15. The highest daily traffic count occurred on Friday, September 2. The least amount of traffic occurred on the Sunday of Labor Day weekend, September 4. Table 3.07-2 is a more detailed table containing data from every hour of the Tuesday, Wednesday, and Thursday study days. The representative weekday traffic volume occurred on Tuesday, Wednesday, and Thursday, with



volumes of 7362, 7381, 14743 occurring. The greatest traffic volumes were at 3 P.M. and 5 P.M. with 4 P.M. being the peak hour. This data also shows more traffic traveling eastbound during these hours. Figures 3.07-2 and 3.07-3 illustrate the traffic count data from the tables. These graphs show the morning and afternoon peaking characteristics.

In order by weekday							
		Labor Day					
	Sunday 9/4/2005	Monday 9/5/2005	Tuesday 9/6/2005	Wednesday 8/31 + 9/7	Thursday 9/1/2005	Friday 9/2/2005	Saturday 9/3/2005
WB	3776	4287	7483	7065	7537	7570	4250
EB	3759	3299	7341	7031	7771	8544	4741
TOTAL	7535	7586	14824	14096	15308	16114	8991

Table 3.07-1 Traffic Counts

	Average Weekday Volume (of Tuesday, Wednesdays, Thursday)		
	WB	EB	Total
6:00 AM	648	248	895
7:00 AM	766	533	1299
8:00 AM	481	248	728
9:00 AM	412	231	643
10:00 AM	372	284	656
11:00 AM	381	315	696
12:00 PM	375	365	740
1:00 PM	372	423	795
2:00 PM	404	596	1000
3:00 PM	527	689	1216
4:00 PM	473	855	1328
5:00 PM	455	814	1268
ADT	7362	7381	14743

Table 3.07-2 Average Weekday Volume

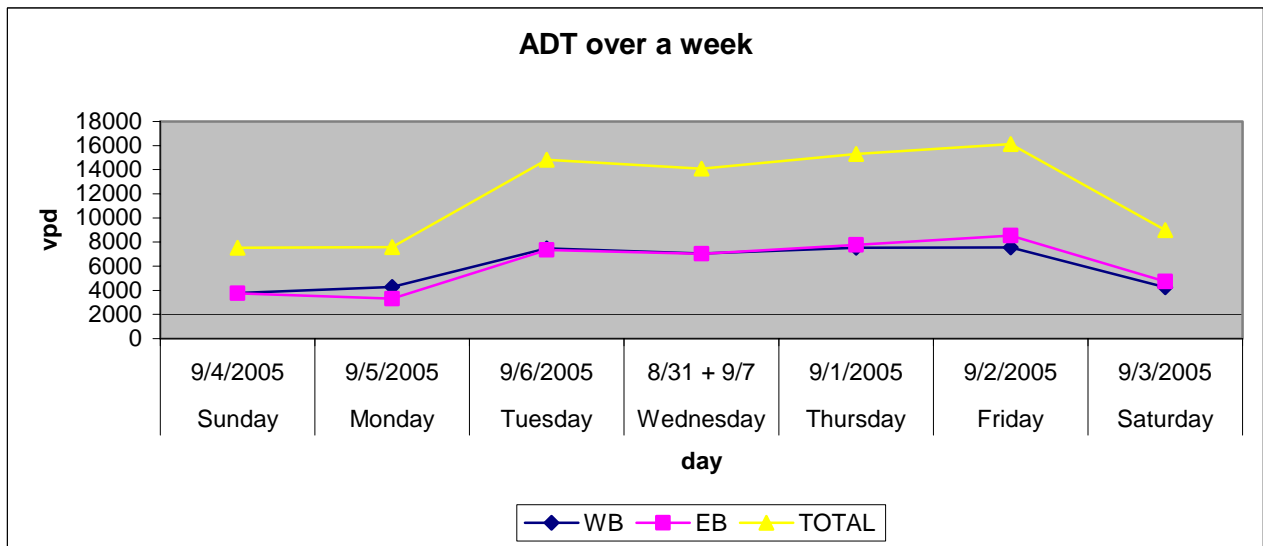


Figure 3.07-2 Average Daily Traffic over a Week by Traffic Counter

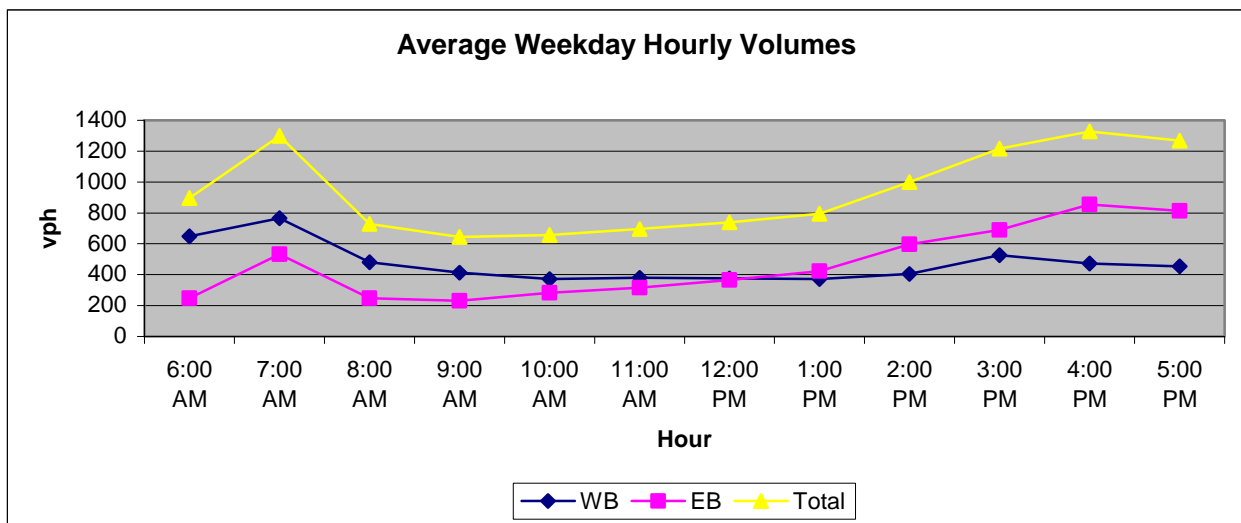


Figure 3.07-3 Average Weekday Hourly Volumes by Traffic Counter

4.01 KEY OBSERVATIONS

Analysis of the O-D study results provides a general overview of the trip-making behavior of all drivers traveling westbound through the WIS 15 corridor. The following list highlights the key findings of the study.

1. The survey response rate was 42 percent.
2. Only 41 percent of the surveyed vehicles were traveling to Hortonville. The remaining vehicles were going somewhere else in Outagamie County or outside of the county.
3. A little over half of the vehicles surveyed (55.1 percent) were passenger cars. Light trucks/vans made up 40.6 percent while heavy trucks only contributed 4.3 percent.
4. The most common “coming from” trip purpose was “work” (42 percent) while the most common “going to” purpose was “home” (60 percent).
5. The majority of the vehicles traveling (64.9 percent) had only one occupant.
6. The traffic count data showed that the peak times for traffic are during the 7 -8 A.M. and 4-5 P.M. hours.
7. Average weekday volume based on the September traffic count information is approximately 14,700.

4.02 CONCLUSIONS

The most important data to come out of this study is the estimated number of vehicles that would use a bypass of Hortonville if one were built. The O-D study conducted in the year 2000 found that, on average of all vehicles, “...43% would find traveling beyond Hortonville to be more convenient. The amount of heavy trucks traveling beyond the community has a somewhat greater percentage of 52%” In contrast, our new study showed that, on average, 59 percent of all vehicles and 64 percent of heavy trucks would be likely to use a bypass.