CHAPTER 4 • TRAVEL DEMAND FORECASTING

4-0 Travel Demand Forecasting

Travel forecasts for the US 35 study are based on the OKI/MVRPC regional travel demand model. The OKI/MVRPC model is a trip-based model, encompassing the eleven-county Dayton-Cincinnati region. The model was last updated in 2000 as part of the North-South Transportation Initiative. At that time the base year forecasts were validated to 1995 conditions using traffic counts collected circa 1995. A detailed description of the structure and characteristics of the OKI/MVRPC model, as well as the model validation results, are available in the NSTI documentation¹.

While the overall regional validation of the model showed a good fit of the estimates to the observed traffic counts, an examination of the traffic volumes estimated for US 35 showed two main problems:

- The model under-predicts traffic on US-35, particularly in the section between I-75 and the Southwest Expressway (Steve Whalen Road). This under-prediction appears to be at least partially due to the geometry of the network; mainly the fact that some highway trips are shorter, distance-wise, when using local downtown streets than when using I-75. This is problematic because the model assigns trips based not just on shortest travel time but on a combination of time and distance.
- Because 1995 counts were not available for many of the US 35 ramps, it was not possible to ascertain the extent to which the ramp volumes were accurately estimated.

Thus, while it was clear that the model underestimated the volume on US-35 between I-75 and the Southwest Expressway, the lack of ramp counts and observed Origin-Destination trip data made it difficult to determine the source of the problem. It was nevertheless determined that there existed a routing problem, mainly that trips were moving from the north to south part of downtown not via the I-75/US-35 interchange but through local downtown streets.

To correct this problem, a method was developed to update the model estimates for US 35 based on recent traffic counts on the ramps and the highway mainline. The model update consists of corrective additive factors to better predict the ramp volumes. These factors are required only on those ramps that appear to be severely over or under predicted. The factors were developed using the 1995 volume estimates, and are applied to the 2030 volume estimates to obtain the horizon year baseline volumes.

Prior to estimating the corrective factors, a thorough review was conducted of the ramp and mainline counts that would be used to pivot off the 1995 traffic volume estimates. This step was critical because traffic counts are typically not "internally consistent". This means that raw traffic counts typically do not obey volume conservation laws, that is, the total observed volume entering an interchange is not equal to the total observed volume exiting the interchange, as they should be. Such problems result from measurement errors, as well as from variations in traffic volumes by day of the week and even by season. When comparing the model estimates to counts that have not been "rationalized" (i.e., made internally consistent), the error of the estimation gets confounded with the error inherent in the counts, hence making it difficult to ascertain the performance of the model.

Hence, the development of the 2030 volume estimates for the US 35 study consisted of the following steps:

- i. Rationalization of the traffic counts
- ii. Development of a volume pivot model
- iii. Application of the pivot model to 2030 model estimates

Each of these steps is described in the next sections of this chapter.

¹ Please see *OKI/MVRPC Version 6.0 Model Development Report*, North-South Transportation Initiative, performed for the Ohio-Kentucky-Indiana Regional Council of Governments and the Miami Valley Regional Planning Commission, by Parsons Brinckerhoff Ohio, Inc, December 2002.

4-1 Traffic Count Rationalization

The method proposed to correct the US-35 volume estimates consists of a series of ramp volume additive factors, developed by comparing base year volume estimates with observed counts. The first step in developing this method is to ensure that the observed counts are rational and internally consistent. For this study, the available traffic counts span from 1995 to 2003 – most mainline counts are from 1995 to 1999, while the ramp counts are from 2003. Figures 4-1 to 4-4 show all available counts.

An initial examination of the count data showed that it was not necessary to factor the observed volumes to establish a baseline year. This is because there was no clear discernible growth pattern between the various years, possibly due to the sparseness of data on any one year. Another confounding factor was that the 1999 counts were already corrected for seasonal differences, using factors that were not US-35 specific but based on Ohio State facility averages. Thus it was considered that any volume differences due to traffic growth were likely to be well within the error of the counts and of the estimation.

A thorough examination of each interchange was conducted to flag instances where the count data was not rational. This showed several inconsistencies in the count data, among which are:

- i. The thru traffic on US-35 at I-75 is listed as approximately 34,600 vehicles, yet based on the volumes before and after the interchange as well as the ramp volumes it was determined that the through volume was more likely to be around 10,000 vehicles per day (see Figure 4-5).
- ii. Although on a daily basis one expects traffic volumes to be symmetric by direction², there were some interchanges where the count data showed large imbalances. Figure 4-5 shows for example a 4,000 vehicle volume difference between the direction going from US-35 westbound to I-75 northbound and the opposite direction, I-75 southbound to US-35 eastbound. The ramps at the Woodman Road interchange also show a large directional imbalance (see Figure 4-6).
- iii. At the Jefferson St./Patterson Blvd. interchange, consecutive ODOT stations show a gain in ADT volume of about 6,000 vehicles, yet the ramp data show a loss of about 1,000 vehicles.
- iv. In several instances consecutive mainline counts show no change in traffic volume, even though there are entry or exit ramps between the two count locations (see again Figure 4-6), or the total change in traffic is not consistent with the ramp counts (see Figure 4-7, the Smithville Rd. interchange).

In order to rationalize these and other inconsistencies, it was assumed that the most accurate data were the 2003 ramp counts, given that we know they were all taken approximately at about the same time of year and are available for all ramps in the freeway study section. Less accuracy was assigned to the 1999 and 1995 mainline counts, at least in a qualitative way.

² Directional symmetry results if over the course of a day, most trips are round trips (i.e., they start and end at home), and travelers use the same route for the outbound and the inbound trip.

Location	Obse	Observed Traffic Volumes (ADT)			
LUCATION	1995	1999	2003	Target ⁽¹⁾	
Off-ramp to NB I-675			2,857	2,857	
On-ramp from SB I-675			10,385	10,385	
Off-ramp to SB I-675			4,312	4,312	
On-ramp from NB I-675			9,012	9,012	
On-ramp from Dayton-Xenia Rd			3,409	3,409	
Off-ramp to Woodman	6,954		7,546	7,546	
On-ramp from Woodman	9,130		8,391	8,391	
Off-ramp to Smithville	3,541		5,026	5,026	
On-ramp from Smithville (NB)			3,813	3,813	
On-ramp from Smithville (SB)			3,372	3,372	
Off-ramp to Whalen	8,400		8,690	8,690	
Off-ramp to NB Whalen			717	717	
Off-ramp to SB Whalen			1,616	1,616	
On-ramp from SB Whalen			1,463	1,463	
Off-ramp to Whalen			6,357	6,357	
On-ramp from Whalen NB			2,916	2,916	
Off-ramp to Keowee after Whalen NB off-ramp merge			9,273	9,273	
On-ramp from Whalen NB @ US 35			3,862	3,862	
Off-ramp to Keowee			5,961	5,961	
On-ramp form Keowee			2,878	2,878	
On-ramp from Wayne	8,900		4,256	4,256	
Off-ramp to Jefferson	5,500		9,581	9,581	
On-ramp from Jefferson	2,600		3,462	3,462	
On-ramp from Ludlow	3,600		3,785	3,785	
Off-ramp to Perry	3,400		2,821	2,821	
Off-ramp to NB I-75			15,048	15,048	
Off-ramp to SB I-75			13,271	13,271	
On-ramp from SB I-75, before split w/collector			8,147	8,147	
Collector			1,530	1,530	
On-ramp from NB I-75			9,518	9,518	
(1) Final rationalized target traffic volume develope	d for the pivo	t method.			

Figure4-1 Westbound Ramp Traffic Counts

Figure 4-2 Westbound Mainline Traffic Counts

Location	Observed Traffic Volumes (ADT)			
Location	1995	1999	2003	Target ⁽¹⁾
Off-ramp to NB I-675 to On-ramp from SB I-675				16,600
On-ramp from SB I-675 to On-ramp @ Dayton-Xenia Rd		34,600		35,000
On-ramp @ Dayton-Xenia Rd to Off-ramp @ Woodman		34,600	33,464	39,400
Off-ramp @ Woodman to On-ramp @ Woodman		34,600		29,600
On-ramp @ Woodman to Off-ramp @ Smithville				38,200
Off-ramp @ Smithville to On-ramp @ Smithville		35,300		33,200
On-ramp @ Smithville to Off-ramp to NB Whalen	33,850		32,418	37,000
Off-ramp to NB Whalen to On-ramp from SB Whalen		31,000		28,300
On-ramp from SB Whalen to On-ramp from NB Whalen	26,800		25,200	29,800
On-ramp from NB Whalen to Off-ramp @ Jefferson		35,500	29,053	33,600
Off-ramp @ Jefferson to On-ramp @ Keowee/Wayne				26,000
On-ramp @ Keowee/Wayne to On-ramp @ Jefferson		39,900		31,300
On-ramp @ Jefferson to Off-ramp @ Perry				34,800
Off-ramp @ Perry to On-ramp @ Main		36,500		31,900
On-ramp @ Main to Off-ramp to NB I-75				35,700
Off-ramp to NB I-75 to On-ramp from I-75 SB				9,000
Off-ramp to NB I-75 to On-ramp from I-75 SB		34,600		9,000
Off-ramp to NB I-75 to On-ramp from I-75 SB				9,000
On-ramp from I-75 SB to McGee Blvd.				25,100
On-ramp from I-75 SB to McGee Blvd.		25,600		25,100

(1) Final rationalized target traffic volume developed for the pivot method.

Figure	4-3	Fastbound	Ramn	Traffic	Counts
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Location	Observed Traffic Counts (ADT)			T)
Elication	1995	1999	2003	Target ⁽¹⁾
Collector from Broadway			2,022	2,022
Off-ramp to SB I-75				
Off-ramp to SB I-75, after split with collector			10,901	10,901
Off-ramp to NB I-75			7,996	7,996
On-ramp from SB I-75			19,178	16,178
On-ramp from NB I-75			12,100	12,100
Off ramp to Perry			4,069	4,069
Off ramp to Jefferson			3,951	3,951
On ramp from Ludlow	4,500		3,998	3,998
On-ramp from Jefferson	7,000		9,453	7,453
Off-ramp to Keowee	4,500		5,899	5,899
On-ramp from Keowee			5,258	5,258
Off-ramp to Whalen			5,631	5,631
Off-ramp to Whalen, NB			1,759	1,759
Off-ramp to Whalen, SB			3,872	3,872
On-ramp from SB Whalen			688	688
On-ramp from NB Whalen			1,979	1,979
Off-ramp to Smithville (SB)	3,740		4,065	4,065
Off-ramp to Smithville (NB)			2,248	2,248
On-ramp from Smithville	11,501		4,683	4,683
Off-ramp to Woodman	10,103		7,121	7,121
On-ramp from Woodman	7,500		11,435	9,435
Off-ramp to Dayton-Xenia Rd	3,946		3,646	3,646
Off-ramp to SB I-675			9,381	9,381
On-ramp from NB I-675			4,639	4,639
Off-ramp to NB I-675			9,977	9,977
On-ramp from SB I-675			2,872	2,872

(1) Final rationalized target traffic volume developed for the pivot method. Target volumes that differ from the 2003 volumes are shown in **BOLD**.

Figure 4-4 Eastbound Mainline Traffic Counts

Location	Obse	rved Traffic	Volumes (Al	DT)
Location	1995	1999	2003	Target ⁽¹⁾
McGee Blvd. to Off-ramp to I-75 SB		25,600		25,600
McGee Blvd. to Off-ramp to I-75 SB				25,600
Off-ramp to I-75 SB to On-ramp from I-75 NB				8,700
off ramp to I-75 SB to On ramp from I-75 NB		34,600		8,700
off ramp to I-75 SB to On ramp from I-75 NB				8,700
On-ramp from I-75 NB to Off-ramp @ Perry				37,000
Off-ramp @ Perry to Off-ramp @ Patterson		36,500		33,500
Off-ramp @ Patterson to On-ramp @ Main				29,000
On-ramp @ Main to On-ramp @ Jefferson				31,000
On-ramp @ Jefferson to Off-ramp @ Keowee				40,400
Off-ramp @ Keowee to On-ramp @ Keowee		35,500	29,053	34,500
On-ramp @ Keowee to Off-ramp to SB Whalen	38,350		38,039	39,800
Off-ramp to SB Whalen to On-ramp from NB Whalen		42,000		34,100
On-ramp from NB Whalen to Off-ramp @ Smithville	33,850		35,076	36,800
Off-ramp @ Smithville to On-ramp @ Smithville		35,300		32,800
On-ramp @ Smithville to Off-ramp @ Woodman				37,500
Off-ramp @ Woodman to On-ramp @ Woodman		34,600		30,400
On-ramp @ Woodman to Off-ramp to Dayton-Xenia Rd		34,600	36,901	39,400
Off-ramp to Dayton-Xenia Rd to Off-ramp to SB I-675		34,600		35,700
Off-ramp to SB I-675 to On-ramp from NB I-675				16,600

(1) Final rationalized target traffic volume developed for the pivot method.



Figure 4-5 – Traffic Counts for the US-35 / I-75 Interchange

Figure 4-6 – Traffic Counts at the Woodman Road Interchange







The process of rationalizing the counts consisted of going along the freeway section, in the direction of traffic flow, adding and subtracting observed volumes from the entry and exit ramps, and comparing the resulting target mainline volumes to the actual observed volumes. This process was repeated several times for each direction (eastbound and westbound), at each time determining the most likely change in either the ramp data or the initial and final thru volumes that would result in the least error between the target volumes and the observed mainline counts.

It was assumed that the observed traffic volumes west of I-675 and east of I-75 were accurate. These provided the initial and final volumes to match. Although every attempt was made to reconcile the count data and keep the target ramp volumes equal to the 2003 counts, in a few instances it was necessary to use a different target volume in order to approximately match the initial (i.e. upstream) and final (i.e. downstream) observed volumes. Such instances are detailed below:

- i. On-Ramp from southbound I-75 to eastbound US-35: this volume was reduced by 3,000 vehicles, since it was determined that the observed count resulted in mainline target volumes consistently above the observed volumes. Note also that this is one of the ramp counts that violate the directional symmetry rule.
- ii. Eastbound On-Ramp at Jefferson Street: this target volume was reduced from 9,453 vehicles to 7,453 vehicles to avoid overestimating the downstream mainline volumes.
- iii. Eastbound On-Ramp at Woodman Drive: this target volume was reduced from 11,435 vehicles to 9,435 vehicles to make the interchange more consistent with the directional symmetry rule.

The target mainline volumes were obtained by adding and subtracting the volumes at entry and exit ramps, starting at the most upstream location for each direction, namely west of the I-75 interchange for the eastbound direction and east of the I-675 interchange for the westbound direction. The extent to which these target volumes deviated from the traffic counts was measured by the root mean square error (RMSE). The RMSE compares the target volume to the traffic count at each location (averaged when there are multiple counts). This resulted in a percent RMSE of 0.45 in the westbound direction and 0.35 in the eastbound direction. These errors are comparable to the errors obtained for a well-validated regional model. They should be considered relatively large given that this exercise is essentially trying to smooth measurement and other types of error in the counts themselves. This result underscores the fact that count data are highly prone to errors, and that even after smoothing out the most obvious discrepancies there remains a large degree of error in the counts.

4-2 Pivot Model Development

Pivot models are often used to adjust intersection turning-volume estimates produced by regional travel demand models. The method developed here to adjust the US-35 volume estimates is similar to those used for intersections. It consists of developing additive factors for the estimated ramp volumes to reduce the observed estimation error. These factors are then applied to the volumes estimated for the horizon year (2030 for this study) to arrive at the final design volumes.

Pivot methods are advantageous where it is believed that the pattern of errors observed in the base year is likely to be observed also in the horizon year. In the present case, the underestimation of mainline volumes on US-35 carries forward, given that as discussed above is likely due to the specific assignment method chosen for the OKI/MVRPC model. The problem could also be partially due to the trip distribution model: the current set of distribution models were estimated with Cincinnati data, as no Dayton trip origin-destination data were available at the time these models were calibrated. If so, this shortcoming would also be reflected in the horizon year. The pivot method relies heavily on the count data, and for this reason a thorough review of the available counts was conducted, as discussed in the previous section.

The main disadvantage of the method is that, since the corrective factors are invariant, they may mask changes in ramp volumes that result from changes in the household and employment growth pattern. For this reason the estimated corrected volumes should be examined for reasonableness in light of the expected demographic changes, and further corrective action taken when warranted.

Figures 4-8 and 4-10 show the additive corrective factors determined by comparing the OKI/MVRPC model 1995 volume estimates and the target volumes developed above. A correction was applied only where deemed absolutely necessary. This resulted in RMS errors for the ramps of 0.57 in the eastbound direction and 0.52 in the westbound direction. These errors are considerably smaller than are typically obtained for ramps in a regional travel demand model.

Figures 4-9 and 4-11 show mainline raw and adjusted 1995 volume estimates, in addition to the target volumes. The resulting RMSE is approximately 0.20 for both the westbound and the eastbound directions.

· ·				Adjusted
	Target	Raw 1995		1005
Location	Volume	Estimated	Adjustment	Estimated
	volume	Volume		Volumo
Collector from Broadway	2 022	2 305	0	2 305
Off-ramp to SB 1-75	2,022	4.348	0	4.348
Off-ramp to SB 1-75, after split with collector	10.901	4.073	6.000	10.073
Off-ramp to NB I-75	7,996	2,578	5,000	7,578
On-ramp from SB I-75	16,178	302	15,000	15,302
On-ramp from NB I-75	12,100	9,343	2,000	11,343
Off ramp to Perry	4,069	4,043	0	4,043
Off ramp to Jefferson	3,951	0	4,000	4,000
On ramp from Ludlow	3,998	7,920	-4,000	3,920
On-ramp from Jefferson	7,453	6,142	0	6,142
Off-ramp to Keowee	5,899	5,025	0	5,025
On-ramp from Keowee	5,258	6,691	0	6,691
Off-ramp to Whalen	5,631	232	5,000	5,232
Off-ramp to Whalen, NB	1,759	64	2,000	2,064
Off-ramp to Whalen, SB	3,872	167	3,000	3,167
On-ramp from SB Whalen	688	1,736	-1,000	736
On-ramp from NB Whalen	1,979	1,160	1,000	2,160
Off-ramp to Smithville (SB)	4,065	1,793	2,000	3,793
Off-ramp to Smithville (NB)	2,248	897	1,000	1,897
On-ramp from Smithville	4,683	4,710	0	4,710
Off-ramp to Woodman	7,121	6,949	0	6,949
On-ramp from Woodman	9,435	8,857	0	8,857
Off-ramp to Dayton-Xenia Rd	3,646	4,020	0	4,020
Off-ramp to SB I-675	9,381	6,219	3,000	9,219
On-ramp from NB I-675	4,639	1,959	2,500	4,459
Off-ramp to NB I-675	9,977	9,007	0	9,007
On-ramp from SB I-675	2,872	1,128	2,500	3,628

Figure 4-8 Additive (Corrective Factors and A	Adjusted 1995 Ramp	Volumes – Fastbound ADT

Figure 4-9 Adjusted 1995 Mainline Volumes - Eastbound ADT

Location	Target	1995 ADT Volume Es	stimates
Location	Volumes	Raw	Adjusted
McGee Blvd. to Off-ramp to I-75 SB	25,600	13,876	24,876
Off-ramp to I-75 SB to On-ramp from I-75 NB	8,700	9,529	9,530
On-ramp from I-75 NB to off-ramp to Perry	37,000	19,175	36,175
Off-ramp to Perry to off-ramp to Jefferson	33,500	15,130	32,132
Off-ramp to Jefferson to On-ramp from Ludlow	29,000	15,130	28,132
On-ramp from Ludlow to on-ramp from Jefferson	31,000	23,049	32,052
On-ramp from Jefferson to Off-ramp to Keowee	40,400	29,193	38,194
Off-ramp to Keowee to On-ramp from Keowee	34,500	24,166	33,169
On-ramp from Keowee to Off-ramp to SB Whalen	39,800	30,858	39,860
Off-ramp to SB Whalen to On-ramp from NB Whalen	34,100	30,624	34,628
On-ramp from NB Whalen to Off-ramp to Smithville SB	36,800	33,523	37,524
Off-ramp to Smithville SB to Off-ramp to Smithville NB	32,800	31,730	33,731
Off-ramp to Smithville NB to On-ramp from Smithville	30,800	30,833	31,834
On-ramp from Smithville to Off-ramp to Woodman	37,500	35,540	36,544
Off-ramp to Woodman to On-ramp from Woodman	30,400	28,593	29,595
On-ramp from Woodman to Off-ramp to Dayton-Xenia Rd	39,400	37,448	38,452
Off-ramp to Dayton-Xenia Rd to Off-ramp to SB I-675	35,700	33,433	34,432
Off-ramp to SB I-675 to On-ramp from SB I-675	16,600	18,205	16,206
On-ramp from SB I-675 to On-ramp from NB I-675	19,600	19,333	19,834
East of the I-675 interchange	20,600	21,292	24,293

		Dow 1005		Adjusted
L a satism	Target	Raw 1995	A ali:	1995
Location	Volume	Estimated	Adjustment	Estimated
		volume		Volume
Off-ramp to NB I-675	2,857	1,171	2,500	3,671
On-ramp from SB I-675	10,385	6,057	4,000	10,057
Off-ramp to SB I-675	4,312	1,453	3,000	4,453
On-ramp from NB I-675	9,012	6,066	3,000	9,066
On-ramp from Dayton-Xenia Rd	3,409	5,580	-2,000	3,580
Off-ramp to Woodman	7,546	9,080	-2,000	7,080
On-ramp from Woodman	8,391	5,635	2,000	7,635
Off-ramp to Smithville	5,026	4,225		4,225
On-ramp from Smithville (NB)	3,813	1,724	1,500	3,224
On-ramp from Smithville (SB)	3,372	1,724	1,500	3,224
Off-ramp to Whalen	8,690	6,348	3,000	9,348
Off-ramp to NB Whalen	717	5,029	-4,000	1,029
Off-ramp to SB Whalen	1,616	417	1,000	1,417
On-ramp from SB Whalen	1,463	1,353		1,353
Off-ramp to Whalen	6,357	902	6,000	6,902
On-ramp from Whalen NB	2,916	42	3,000	3,042
Off-ramp to Keowee after Whalen NB off-ramp merge	9,273	944	9,000	9,944
On-ramp from Whalen NB @ US 35	3,862	0	4,000	4,000
Off-ramp to Keowee	5,961	944	5,000	5,944
On-ramp form Keowee	2,878	2,007		2,007
On-ramp from Wayne	4,256	4,625		4,625
Off-ramp to Jefferson	9,581	6,697	3,000	9,697
On-ramp from Jefferson	3,462	2,558		2,558
On-ramp from Ludlow	3,785	786	3,000	3,786
Off-ramp to Perry	2,821	5,049	-2,000	3,049
Off-ramp to NB I-75	15,048	1,621	12,000	13,621
Off-ramp to SB I-75	13,271	9,793	2,000	11,793
On-ramp from SB I-75, before split w/collector	8,147	4,715	3,000	7,715
Collector	1,530	4,935	-3,000	1,935
On-ramp from NB I-75	9,518	4,831	5,000	9,831

Figure 4-10 Additive Corrective Factors and Adjusted 1995 Ramp Volumes – Westbound ADT

Figure 4-11 Adjusted 1995 Mainline Volumes – Westbound ADT

Leastion	Target	1995 ADT Volume E	stimates
Location	Volumes	Raw	Adjusted
East of the I-675 Interchange	20,600	18,375	22,875
Off-ramp to NB I-675 to On-ramp from NB I-675 *	16,600	17,204	19,204
On-ramp from NB I-675 to Off-ramp to I-675 SB *	30,000	23,261	28,270
Off-ramp to I-675 SB to On-ramp from I-675 SB	25,000	21,808	23,817
On-ramp from SB I-675 to On-ramp from Dayton-Xenia Rd	35,000	27,871	33,874
On-ramp from Dayton-Xenia Rd to Off-ramp to Woodman	39,400	33,453	37,454
Off-ramp to Woodman to On-ramp from Woodman	29,600	24,369	30,374
On-ramp from Woodman to Off-ramp to Smithville	38,200	30,003	38,009
Off-ramp to Smithville to On-ramp from Smithville (NB)	33,200	25,780	33,784
On-ramp from Smithville (NB) to On-ramp from Smithville (SB)	35,200	27,502	37,008
On-ramp from Smithville to Off-ramp to NB Whalen	37,000	29,228	40,231
Off-ramp to NB Whalen to On-ramp from SB Whalen	28,300	22,880	30,883
On-ramp from SB Whalen to On-ramp from NB Whalen	29,800	24,234	32,236
On-ramp from NB Whalen to Off-ramp to Jefferson	33,600	24,234	36,236
Off-ramp to Jefferson to On-ramp from Wayne	26,000	17,538	26,539
On-ramp from Wayne to On-ramp from Jefferson	31,300	22,165	31,164
On-ramp from Jefferson to Off-ramp to Perry	34,800	24,722	33,722
Off-ramp to Perry to On-ramp from Ludlow	31,900	19,674	30,673
On-ramp from Ludlow to Off-ramp to NB I-75	35,700	20,459	34,459
Off-ramp to NB I-75 to On-ramp from I-75 SB	9,000	9,043	9,045
On-ramp from I-75 SB to McGee Blvd.	25,100	13,657	24,656

* Includes volumes on the mainline and on the barrier-separated lane.

4-3 2030 Traffic Forecasts

The production of traffic forecasts for US-35 for the year 2030 involves applying the OKI/MVRPC model to obtain initial horizon year volume estimates, and then applying the correction factors developed above to arrive at the final 2030 traffic volume estimates.

4-3a Baseline Forecast

The year 2030 input data required for the OKI/MVRPC model were prepared by the OKI Regional Council of Governments, the Miami Valley Regional Planning Commission and Parsons Brinckerhoff as part of the North-South Transportation Initiative. The input data comprises 2030 highway and transit networks (no build conditions, also known as existing + committed facilities), and socio-demographic data such as population and employment estimates. Please refer to the NSTI documentation for additional details.

Figures 4-12 to 4-15 show the raw 2030 model estimates and the adjusted, final 2030 traffic volume estimates. In addition to the baseline volumes, the final product includes the calculation of the volume to capacity ratio and of the level of service. Peaking factors were applied to the ADT volume estimates to obtain the highest peak hour volumes. The ramp peaking factors, obtained from the 2003 traffic counts, are shown in Figures 4-16 and 4-17 (eastbound and westbound respectively). Since the tables show that the evening peak is more congested than the morning peak, the PM peak hour was used for design purposes. Since there were no count data on the mainline west of I-75 or east of I-675, a mainline evening peak factor of 0.085 was assumed for these freeway segments³. The mainline peak hour volumes to the most upstream mainline location volume. The final estimated peak hour volumes, as well as the volume/capacity ratio and level of service for each mainline segment are shown in Figures 4-18 and 4-19.

³ Data from ODOT Office of Technical Services show that, for urban freeways and expressways, approximately 8.5% of the daily traffic occurs between 5:00 PM and 6:00 PM, the evening peak hour.

Leastion	2030 ADT Volum	2030 ADT Volume Estimates			
Location	Raw	Adjusted			
Collector from Broadway	706	706			
Off-ramp to SB I-75	11,272	11,272			
Off-ramp to SB I-75, after split with collector	3,027	9,027			
Off-ramp to NB I-75	8,951	13,951			
On-ramp from SB I-75	3,209	16,209			
On-ramp from NB I-75	9,347	11,347			
Off ramp to Perry	8,508	8,508			
Off ramp to Jefferson	0	4,000			
On ramp from Ludlow	7,395	3,395			
On-ramp from Jefferson	5,930	5,930			
Off-ramp to Keowee	6,162	6,162			
On-ramp from Keowee	7,428	7,428			
Off-ramp to Whalen	335	5,335			
Off-ramp to Whalen, NB	95	2,095			
Off-ramp to Whalen, SB	242	3,242			
On-ramp from SB Whalen	1,891	891			
On-ramp from NB Whalen	1,329	2,329			
Off-ramp to Smithville (SB)	1,953	3,953			
Off-ramp to Smithville (NB)	976	1,976			
On-ramp from Smithville	4,568	4,568			
Off-ramp to Woodman	8,465	8,465			
On-ramp from Woodman	10,173	10,173			
Off-ramp to Dayton-Xenia Rd	4,689	4,689			
Off-ramp to SB I-675	7,426	10,426			
On-ramp from NB I-675	2,459	4,959			
Off-ramp to NB I-675	10,662	10,662			
On-ramp from SB I-675	1,568	4,068			

Figure	4-12	2030	Raseline	Ramn	Volume	Fetimates	Fasthound	ΔΠΤ
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Figure 4-13 2030 Baseline Mainline Volume Estimates, Eastbound ADT

Location	2030 Volume Estimates (ADT)			
Location	Raw	Adjusted		
McGee Blvd. to Off-ramp to I-75 SB	29,516	40,516		
Off-ramp to I-75 SB to On-ramp from I-75 NB	18,249	18,244		
On-ramp from I-75 NB to off-ramp to Perry	30,804	45,800		
Off-ramp to Perry to off-ramp to Jefferson	22,294	37,292		
Off-ramp to Jefferson to On-ramp from Ludlow	22,294	33,292		
On-ramp from Ludlow to on-ramp from Jefferson	29,689	36,687		
On-ramp from Jefferson to Off-ramp to Keowee	35,620	42,617		
Off-ramp to Keowee to On-ramp from Keowee	29,456	36,455		
On-ramp from Keowee to Off-ramp to SB Whalen	36,887	43,883		
Off-ramp to SB Whalen to On-ramp from NB Whalen	36,553	38,548		
On-ramp from NB Whalen to Off-ramp to Smithville SB	39,771	41,768		
Off-ramp to Smithville SB to Off-ramp to Smithville NB	37,818	37,815		
Off-ramp to Smithville NB to On-ramp from Smithville	36,842	35,839		
On-ramp from Smithville to Off-ramp to Woodman	41,408	40,407		
Off-ramp to Woodman to On-ramp from Woodman	32,947	31,942		
On-ramp from Woodman to Off-ramp to Dayton-Xenia Rd	43,117	42,115		
Off-ramp to Dayton-Xenia Rd to Off-ramp to SB I-675	38,428	37,426		
Off-ramp to SB I-675 to On-ramp from SB I-675	20,339	16,338		
On-ramp from SB I-675 to On-ramp from NB I-675	21,907	20,406		
East of the I-675 interchange	24,369	25,365		

Location	2030 ADT Volume Estimates		
Location	Raw	Adjusted	
Off-ramp to NB I-675	1,246	3,746	
On-ramp from SB I-675	7,350	11,350	
Off-ramp to SB I-675	1,197	4,197	
On-ramp from NB I-675	7,604	10,604	
On-ramp from Dayton-Xenia Rd	7,365	5,365	
Off-ramp to Woodman	10,253	8,253	
On-ramp from Woodman	6,744	8,744	
Off-ramp to Smithville	4,477	4,477	
On-ramp from Smithville (NB)	1,956	3,456	
On-ramp from Smithville (SB)	1,956	3,456	
Off-ramp to Whalen	7,140	10,140	
Off-ramp to NB Whalen	5,726	1,726	
Off-ramp to SB Whalen	455	1,455	
On-ramp from SB Whalen	1,585	1,585	
Off-ramp to Whalen	959	6,959	
On-ramp from Whalen NB	47	3,047	
Off-ramp to Keowee after Whalen NB off-ramp merge	1,005	10,005	
On-ramp from Whalen NB @ US 35	2	4,002	
Off-ramp to Keowee	1,003	6,003	
On-ramp form Keowee	2,513	2,513	
On-ramp from Wayne	5,472	5,472	
Off-ramp to Jefferson	7,305	10,305	
On-ramp from Jefferson	5,429	5,429	
On-ramp from Ludlow	1,684	4,684	
Off-ramp to Perry	5,182	3,182	
Off-ramp to NB I-75	2,198	14,198	
Off-ramp to SB I-75	10,908	12,908	
On-ramp from SB I-75, before split w/collector	8,974	11,974	
Collector	3,028	2,028	
On-ramp from NB I-75	5,177	10,177	

Figure 4 44 2020	Deceline Domo	Valuma Estimatos	Maathaund ADT
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Location	2030 Volume Estimates (ADT)			
Location	Raw	Adjusted		
East of the I-675 Interchange	19,214	23,714		
Off-ramp to NB I-675 to On-ramp from NB I-675 *	17,968	19,968		
On-ramp from NB I-675 to Off-ramp to I-675 SB *	25,572	30,572		
Off-ramp to I-675 SB to On-ramp from I-675 SB	24,375	26,375		
On-ramp from SB I-675 to On-ramp from Dayton-Xenia Rd	31,722	37,725		
On-ramp from Dayton-Xenia Rd to Off-ramp to Woodman	39,088	43,090		
Off-ramp to Woodman to On-ramp from Woodman	28,836	34,837		
On-ramp from Woodman to Off-ramp to Smithville	35,580	43,581		
Off-ramp to Smithville to On-ramp from Smithville (NB)	31,103	39,104		
On-ramp from Smithville (NB) to On-ramp from Smithville (SB)	33,059	42,560		
On-ramp from Smithville to Off-ramp to NB Whalen	35,013	46,016		
Off-ramp to NB Whalen to On-ramp from SB Whalen	27,873	35,876		
On-ramp from SB Whalen to On-ramp from NB Whalen	29,458	37,461		
On-ramp from NB Whalen to Off-ramp to Jefferson	29,461	41,463		
Off-ramp to Jefferson to On-ramp from Wayne	22,155	31,158		
On-ramp from Wayne to On-ramp from Jefferson	27,629	36,630		
On-ramp from Jefferson to Off-ramp to Perry	33,055	42,059		
Off-ramp to Perry to On-ramp from Ludlow	27,871	38,877		
On-ramp from Ludlow to Off-ramp to NB I-75	29,556	43,561		
Off-ramp to NB I-75 to On-ramp from I-75 SB	16,449	16,455		
On-ramp from I-75 SB to McGee Blvd.	27,573	36,578		

Includes volumes on the mainline and on the barrier-separated lane.

	Proportio	Proportion of ADT		
Location	AM	PM		
	(7:00 to 8:00)	(5:00 to 6:00)		
Collector from Broadway	4.9%	10.1%		
Off-ramp to SB I-75	7.0%	8.5%		
Off-ramp to SB I-75, after split with collector	8.7%	6.7%		
Off-ramp to NB I-75	8.1%	7.3%		
On-ramp from SB I-75	7.2%	8.4%		
On-ramp from NB I-75	7.3%	8.4%		
Off ramp to Perry	11.2%	5.1%		
Off ramp to Jefferson	12.1%	6.6%		
On ramp from Ludlow	2.2%	13.0%		
On-ramp from Jefferson	3.9%	10.8%		
Off-ramp to Keowee	7.3%	7.5%		
On-ramp from Keowee	4.4%	10.7%		
Off-ramp to Whalen	6.7%	8.3%		
Off-ramp to Whalen, NB	6.7%	8.3%		
Off-ramp to Whalen, SB	6.7%	8.3%		
On-ramp from SB Whalen	6.7%	8.3%		
On-ramp from NB Whalen	6.7%	8.3%		
Off-ramp to Smithville (SB)	3.4%	7.4%		
Off-ramp to Smithville (NB)	4.7%	8.1%		
On-ramp from Smithville	8.5%	7.6%		
Off-ramp to Woodman	4.2%	7.5%		
On-ramp from Woodman	4.4%	7.4%		
Off-ramp to Dayton-Xenia Rd	7.1%	9.3%		
Off-ramp to SB I-675	7.2%	9.9%		
On-ramp from NB I-675	8.5%	7.4%		
Off-ramp to NB I-675	7.0%	8.6%		
On-ramp from SB I-675	4.8%	13.9%		

Figure 4-16 Ramp Peak Hour Factors - Eastbound

	Proportion of ADT		
Location	AM	PM	
	(7:00 to 8:00)	(5:00 to 6:00)	
Off-ramp to NB I-675	13.8%	5.5%	
On-ramp from SB I-675	7.1%	8.8%	
Off-ramp to SB I-675	6.1%	7.8%	
On-ramp from NB I-675	11.7%	7.4%	
On-ramp from Dayton-Xenia Rd	11.3%	7.7%	
Off-ramp to Woodman	4.2%	8.6%	
On-ramp from Woodman	5.0%	7.2%	
Off-ramp to Smithville	3.1%	6.4%	
On-ramp from Smithville (NB)	6.4%	7.5%	
On-ramp from Smithville (SB)	5.8%	5.6%	
Off-ramp to Whalen	6.7%	8.3%	
Off-ramp to NB Whalen	6.7%	8.3%	
Off-ramp to SB Whalen	6.7%	8.3%	
On-ramp from SB Whalen	6.7%	8.3%	
Off-ramp to Whalen	6.7%	8.3%	
On-ramp from Whalen NB	6.7%	8.3%	
Off-ramp to Keowee after Whalen NB off-ramp merge	6.7%	8.3%	
On-ramp from Whalen NB @ US 35	6.7%	8.3%	
Off-ramp to Keowee	9.4%	6.3%	
On-ramp form Keowee	6.1%	8.9%	
On-ramp from Wayne	5.6%	7.8%	
Off-ramp to Jefferson	12.3%	5.5%	
On-ramp from Jefferson	4.3%	9.2%	
On-ramp from Ludlow	3.6%	15.1%	
Off-ramp to Perry	18.2%	5.1%	
Off-ramp to NB I-75	6.6%	7.1%	
Off-ramp to SB I-75	6.4%	8.6%	
On-ramp from SB I-75, before split w/collector	7.6%	8.4%	
Collector	8.5%	5.3%	
On-ramp from NB I-75	5.1%	9.2%	

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Lengtion		Volume to	Level of
Location	PM Peak Volume	Capacity	Service
McGee Blvd. to Off-ramp to I-75 SB	3,444	0.68	D
Off ramp to I-75 SB to on ramp from I-75 NB	1,894	0.56	С
On-ramp from I-75 NB to off-ramp to Perry	4,210	0.83	D
Off-ramp to Perry to off-ramp to Jefferson	3,774	0.74	D
Off-ramp to Jefferson to On-ramp from Ludlow	3,509	0.69	D
On-ramp from Ludlow to on-ramp from Jefferson	3,950	0.77	D
On-ramp from Jefferson to Off-ramp to Keowee	4,592	1.35	F
Off-ramp to Keowee to On-ramp from Keowee	4,128	0.81	D
On-ramp from Keowee to Off-ramp to SB Whalen	4,926	1.45	F
Off-ramp to SB Whalen to On-ramp from NB Whalen	4,485	1.32	F
On-ramp from NB Whalen to Off-ramp to Smithville SB	4,751	1.40	F
Off-ramp to Smithville SB to Off-ramp to Smithville NB	4,459	1.31	F
Off-ramp to Smithville NB to On-ramp from Smithville	4,298	1.26	F
On-ramp from Smithville to Off-ramp to Woodman	4,644	1.37	F
Off-ramp to Woodman to On-ramp from Woodman	4,012	1.18	F
On-ramp from Woodman to Off-ramp to Dayton-Xenia Rd	4,769	1.40	F
Off-ramp to Dayton-Xenia Rd to Off-ramp to SB I-675	4,332	1.27	F
Off-ramp to SB I-675 to On-ramp from SB I-675	2,385	0.70	D
On-ramp from SB I-675 to On-ramp from NB I-675	2,951	0.87	E
East of the I-675 interchange	3,319	0.98	E

Figure 4-19 2030 Baseline Level of Service – Westbound

Location		Volume to	Level of
Location	PM Peak Volume	Capacity	Service
East of the I-675 Interchange	2,016	0.59	С
Off-ramp to NB I-675 to On-ramp from NB I-675 *	1,811	0.44	В
On-ramp from NB I-675 to Off-ramp to I-675 SB *	2,595	0.44	В
Off-ramp to I-675 SB to On-ramp from I-675 SB	2,267	0.67	D
On-ramp from SB I-675 to On-ramp from Dayton-Xenia Rd	3,262	0.96	E
On-ramp from Dayton-Xenia Rd to Off-ramp to Woodman	3,678	1.08	F
Off-ramp to Woodman to On-ramp from Woodman	2,969	0.87	E
On-ramp from Woodman to Off-ramp to Smithville	3,600	1.06	F
Off-ramp to Smithville to On-ramp from Smithville (NB)	3,316	0.98	E
On-ramp from Smithville (NB) to On-ramp from Smithville (SB)	3,576	1.05	F
On-ramp from Smithville to Off-ramp to NB Whalen	3,769	1.11	F
Off-ramp to NB Whalen to On-ramp from SB Whalen	2,930	0.86	E
On-ramp from SB Whalen to On-ramp from NB Whalen	3,061	0.90	E
On-ramp from NB Whalen to Off-ramp to Jefferson	3,393	1.00	E
Off-ramp to Jefferson to On-ramp from Wayne	2,830	0.55	С
On-ramp from Wayne to On-ramp from Jefferson	3,258	0.64	С
On-ramp from Jefferson to Off-ramp to Perry	3,756	0.74	D
Off-ramp to Perry to On-ramp from Ludlow	3,593	1.06	F
On-ramp from Ludlow to Off-ramp to NB I-75	4,300	0.84	E
Off-ramp to NB I-75 to On-ramp from I-75 SB	2,182	0.64	С
On-ramp from I-75 SB to McGee Blvd.	4,008	0.79	D

The PM Peak Volume includes vehicles on the mainline and on the barrier-separated lane. The reported volume/capacity ratio and its associated Level of Service correspond to the mainline lanes only. The barrier-separated lane is expected to operate at Level of Service A.

4-3b Highway Alternative Forecast

A detailed description of the improvements proposed for US-35 is available in Chapter 8 of this report. Briefly, two alternatives were considered, a three-lane continuity option and a four-lane continuity option. Figures 4-20 and 4-21 show the number of lanes proposed for each freeway section under each option.

The final estimated peak hour volumes, as well as the volume/capacity ratio and level of service for each mainline segment under the proposed highway improvements are shown in Figures 4-22 through 4-25. These peak hour volumes were obtained by applying the pivot model and the peaking factors described above. In cases where a ramp with a non-zero adjustment factor no longer existed, the volume adjustment was distributed among the remaining ramps, in such a way that the trend of traffic changes observed by comparing the 2030 baseline and alternative raw volume estimates is preserved. Peaking factors for the new proposed ramps were assumed to be equal to the peaking factors of similar ramps.

Figure 4-20 Alternative Lane Configurations - Eastbound

Location	Three-Lane	Four-Lane
Location	Continuity	Continuity
On-ramp from I-75 NB to Off-ramp to Ludlow	4	4
Off-ramp to Ludlow to Off-ramp to Wayne & Keowee	3	4
Off-ramp to Wayne & Keowee to On-ramps from Main & Keowee	3	4
On-ramp from Main & Keowee to Off-ramp to Whalen	4	5
Off-ramp to Whalen to On-ramp from Whalen	3	4
On-ramp from Whalen to Off-ramp to Smithville SB	3	4
Off-ramp to Smithville SB to On-ramp from Smithville	3	4
On-ramp from Smithville to Off-ramp to Woodman	3	4
Off-ramp to Woodman to On-ramp from Woodman	3	4
On-ramp from Woodman to Off-ramp to Dayton-Xenia Rd	3	4
Off-ramp to Dayton-Xenia Rd to Off-ramp to SB I-675	3	4
Off-ramp to SB I-675 to On-ramp from SB I-675	2	2
On-ramp from SB I-675 to On-ramp from NB I-675	2	2

Figure 4-21 Alternative Lane Configurations - Westbound

Location	Three-Lane Continuity	Four-Lane Continuity
Off-ramp to NB I-675 to Off-ramp to I-675 SB	3	3
Off-ramp to I-675 SB to On-ramps from I-675 & Dayton/Xenia Rd	2	2
On-ramp from Dayton-Xenia Rd to Off-ramp to Woodman	3	4
Off-ramp to Woodman to On-ramp from Woodman	3	4
On-ramp from Woodman to Off-ramp to Smithville	3	4
Off-ramp to Smithville to On-ramps from Smithville	3	4
On-ramps from Smithville to Off-ramp to Whalen	3	4
Off-ramp to Whalen to On-ramps from Whalen	3	4
On-ramps from Whalen to Off-ramp to Keowee	3	4
Off-ramp to Keowee to Off-ramp to Jefferson	3	4
Off-ramp to Jefferson to On-ramp from Wayne	3	4
On-ramp from Wayne to On-ramp from Ludlow	3	4
On-ramp from Ludlow to Off-ramp to NB I-75	4	4

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Leastion	Peak		
Location	Volume	V/C	LOS
On-ramp from I-75 NB to Off-ramp to Ludlow	4,111	0.60	С
Off-ramp to Ludlow to Off-ramp to Wayne & Keowee	3,422	0.67	D
Off-ramp to Wayne & Keowee to On-ramps from Main & Keowee	2,890	0.57	С
On-ramp from Main & Keowee to Off-ramp to Whalen	4,246	0.62	С
Off-ramp to Whalen to On-ramp from Whalen	3,822	0.75	D
On-ramp from Whalen to Off-ramp to Smithville SB	4,111	0.81	D
Off-ramp to Smithville SB to On-ramp from Smithville	3,775	0.74	D
On-ramp from Smithville to Off-ramp to Woodman	4,158	0.82	D
Off-ramp to Woodman to On-ramp from Woodman	3,568	0.70	D
On-ramp from Woodman to Off-ramp to Dayton-Xenia Rd	4,308	0.84	E
Off-ramp to Dayton-Xenia Rd to Off-ramp to SB I-675	3,826	0.75	D
Off-ramp to SB I-675 to On-ramp from SB I-675	1,830	0.54	С
On-ramp from SB I-675 to On-ramp from NB I-675	2,373	0.70	D

Figure 4-23 Three-Lane Continuity Alternative Volume and LOS Estimates – Westbound

Leastien	Peak		
Location	Volume	V/C	LOS
Off-ramp to NB I-675 to Off-ramp to I-675 SB	1,823	0.36	В
Off-ramp to I-675 SB to On-ramps from I-675 & Dayton/Xenia Rd	1,512	0.44	С
On-ramp from Dayton-Xenia Rd to Off-ramp to Woodman	3,747	0.73	D
Off-ramp to Woodman to On-ramp from Woodman	3,045	0.60	С
On-ramp from Woodman to Off-ramp to Smithville	3,682	0.72	D
Off-ramp to Smithville to On-ramps from Smithville	3,387	0.66	D
On-ramps from Smithville to Off-ramp to Whalen	3,805	0.75	D
Off-ramp to Whalen to On-ramps from Whalen	3,521	0.69	D
On-ramps from Whalen to Off-ramp to Keowee	3,966	0.78	D
Off-ramp to Keowee to Off-ramp to Jefferson	3,399	0.67	D
Off-ramp to Jefferson to On-ramp from Wayne	2,739	0.54	С
On-ramp from Wayne to On-ramp from Ludlow	3,154	0.62	С
On-ramp from Ludlow to Off-ramp to NB I-75	4,379	0.64	С

Figure 4-	24 Four-L	ane Continuit	y Alternative	Volume	Estimates -	- Eastbound
			,			

Leastion	Peak		
Location	Volume	V/C	LOS
On-ramp from I-75 NB to Off-ramp to Ludlow	4,238	0.62	С
Off-ramp to Ludlow to Off-ramp to Wayne & Keowee	3,527	0.52	С
Off-ramp to Wayne & Keowee to On-ramps from Main & Keowee	2,979	0.44	С
On-ramp from Main & Keowee to Off-ramp to Whalen	4,377	0.51	С
Off-ramp to Whalen to On-ramp from Whalen	3,940	0.58	С
On-ramp from Whalen to Off-ramp to Smithville SB	4,238	0.62	С
Off-ramp to Smithville SB to On-ramp from Smithville	3,892	0.57	С
On-ramp from Smithville to Off-ramp to Woodman	4,287	0.63	С
Off-ramp to Woodman to On-ramp from Woodman	3,679	0.54	С
On-ramp from Woodman to Off-ramp to Dayton-Xenia Rd	4,441	0.65	С
Off-ramp to Dayton-Xenia Rd to Off-ramp to SB I-675	3,945	0.58	С
Off-ramp to SB I-675 to On-ramp from SB I-675	1,886	0.55	С
On-ramp from SB I-675 to On-ramp from NB I-675	2,446	0.72	D

Figure 4-25 Four-Lane	Continuity	Alternative	Volume	Estimates -	Westbound
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Location	Peak		
Location	Volume	V/C	LOS
Off-ramp to NB I-675 to Off-ramp to I-675 SB	1,880	0.37	В
Off-ramp to I-675 SB to On-ramps from I-675 & Dayton/Xenia Rd	1,559	0.46	С
On-ramp from Dayton-Xenia Rd to Off-ramp to Woodman	3,863	0.57	С
Off-ramp to Woodman to On-ramp from Woodman	3,140	0.46	С
On-ramp from Woodman to Off-ramp to Smithville	3,796	0.56	С
Off-ramp to Smithville to On-ramps from Smithville	3,491	0.51	С
On-ramps from Smithville to Off-ramp to Whalen	3,922	0.58	С
Off-ramp to Whalen to On-ramps from Whalen	3,630	0.53	С
On-ramps from Whalen to Off-ramp to Keowee	4,089	0.60	С
Off-ramp to Keowee to Off-ramp to Jefferson	3,504	0.52	С
Off-ramp to Jefferson to On-ramp from Wayne	2,823	0.42	В
On-ramp from Wayne to On-ramp from Ludlow	3,252	0.48	С
On-ramp from Ludlow to Off-ramp to NB I-75	4,514	0.66	D