



TECHNICAL NOTE

PROJECT:	SCI-823 Portsmouth Bypass PID: 19415
SUBJECT:	Portsmouth Bypass Travel Demand Forecasting
DATE	February 21 , 2014

1. Introduction

- 1.1. Task 3b of the Portsmouth Bypass proposal submitted to ODOT by the consultant team included a travel time and safety assessment. This included (**task 3b1**) modeling the existing road network surrounding the proposed location of the Portsmouth Bypass, (**task 3b2**) determining the impact on traffic of constructing the Bypass and (**task 3b3**) collecting current traffic data to feed into the traffic model and validate the results of the model.

2. Tasks conducted

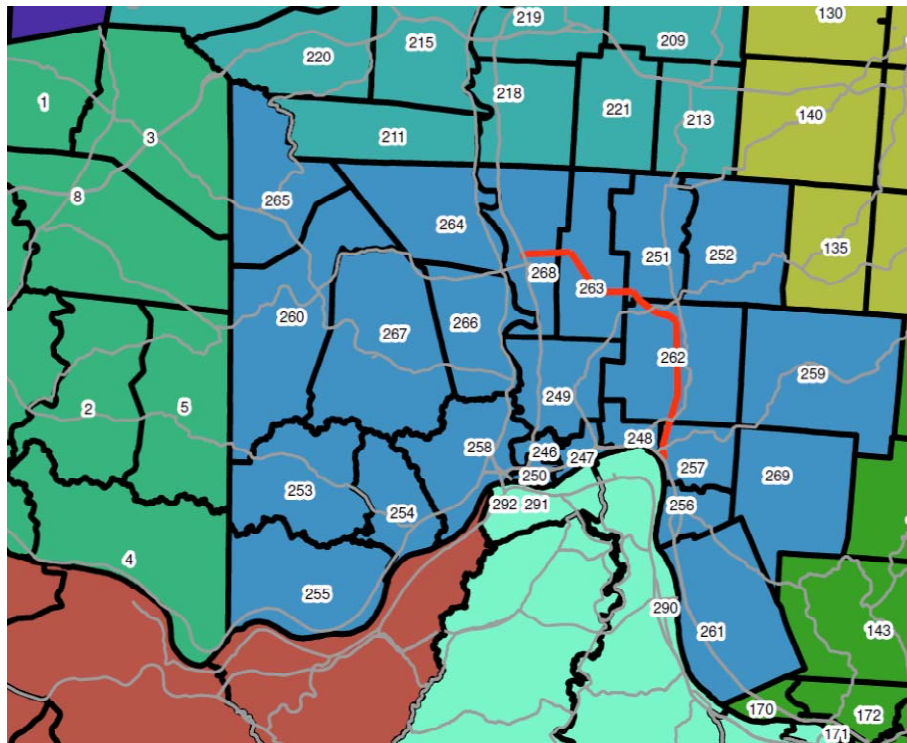
- 2.1. **Task 3b1** – included a planning-level assessment of the merits of the project. Typically for a public private partnership project which uses an availability payment mechanism a traffic study is undertaken in order to provide information to assist in the design of the facility and to estimate ongoing maintenance and rehab costs (e.g. Traffic volumes, truck composition, ESALs, etc) as well as providing input to the structure of the availability payment mechanism.
- 2.2. The Consultant Team undertook an assessment of the existing traffic movements in the region including a review of available traffic models to understand the impact of the Portsmouth Bypass on future traffic distribution and travel time savings in the region and the resulting impact on the local network with respect to maintenance requirements.
- 2.3. Task 3b1 involved the compilation and analysis of historic and newly collected data in order to assess existing road network conditions (travel times, volumes by vehicle type, ESALs, safety). This also involved the processing and reconciliation of the new traffic data collected in Task 3b3. This data forms the basis for developing the traffic model described in Task 3b2.

- 2.4. **Task 3b2** – An understanding of future traffic levels will be a factor in the calculation of any potential availability payment if the Project is procured as a PPP. Task 3b2 involved the calibration and validation of the transport model.
- 2.5. This task included: (i) a network review to confirm lane and intersection configuration; (ii) review of current and future demographics and socio-economic data; (iii) calibration of the traffic model using the OD data and other data sources; (iv) validation of the model against the counts, classification and travel time data.
- 2.6. Following the model development, forecasts were prepared for various time horizons to predict traffic on the bypass, diversion from existing roadways and travel time savings.
- 2.7. A Tranplan traffic model was constructed in 2000. Most of the traffic work was undertaken seven or more years ago. The model was developed by Gannett Flemming prior to 2001. The model was adjusted by Transystems in subsequent years. An available 2003 report is a forecast of the traffic volumes in 2008 and 2028 based on the data collected in 1999 and the Tranplan model. It only shows the volumes on the Bypass and intersecting roads assuming a completed project. The consultant team did not know the validity of the previous forecasts and model, the certified traffic is just for the bypass and therefore would not enable assessing the impact on the existing routes.
- 2.8. The existing transport model is a useful starting point, however the team needed to update and validate the model to current conditions. For this task new traffic counts and travel time runs were required at select locations within the roadway network surrounding the project area. There was an OD survey conducted in 1999 and counts performed in 2004 (but they are not comprehensive), neither of which are current to the extent that they can be used to update/validate the network to current or future projected conditions. The consultant team developed forecasts with and without the bypass in order to assess the time savings and resulting impact of the Portsmouth Bypass on the local network and predict expected traffic volumes that will use the new facility.
- 2.9. **Task 3b3** – The consultant team will conducted traffic volume counts in the form of 48 hour tube counts at 20 locations as well as 5 separate classification counts. The team also conducted a number of travel time runs on certain routes. Further details are provided in the *DLZ Traffic Data Collection Memo*.

3. Traffic Model Zone System

- 3.1. Forecasts for the Portsmouth Bypass and the impact to the existing alternative routes were developed using a sub-area model developed by the Ohio Department of Transportation (ODOT) which was derived from the Ohio statewide model. The Portsmouth Bypass is designed as a four-lane limited-access divided highway which will bypass the City of Portsmouth and the Village of New Boston in Scioto County. The project's south terminus connects to US Route 52 south of State Route 140 (Webster St). The alignment goes north, paralleling State Route 335 toward the Greater Portsmouth Regional Airport and Minford. From Minford the Bypass alignment goes north-west to US Route 23, connecting north of Lucasville. The Bypass is grade separated with interchanges at U.S. Route 52, State Route 140 (Webster St), Airport Road, Lucasville-Minford Road (County Route 28), and at U.S. Route 23.
- 3.2. ODOT provided the base and future year trip tables and base transportation networks used to develop the consultant team forecasts for the Bypass. The original subarea model contained 24 zones in Scioto County, plus zones in Adams, Highland, Pike, Ross, Vinton, Jackson, Gallia, and Lawrence Counties in Ohio and external zones in Kentucky and West Virginia. The model area and zones are shown in **Figure 1**.

Figure 1: Scioto County Area Zone System



- 3.3. Traffic Analysis Zones represent geographical areas within the modeling region. The zones represent all the travel activity of an area from the mid-point of the zone called the centroid. Some of the zones in the existing model were too big to adequately differentiate the existing facilities from each other and the bypass. To account for this, some of the zones within Scioto

County were disaggregated into smaller zones. The trip tables developed in the subarea process from the statewide model were disaggregated based on census population data. Table 1 details the disaggregation of the Scioto County Zone System to form the modeled zone system used by the consultant team.

Table 1: Zone splits for Portsmouth Bypass Study

Zone	New Sub Zones (Trip %)
249	364 (0.42), 365 (0.58)
251	369 (0.48), 370 (0.52)
257	445 (0.60), 446 (0.20), 447 (0.20)
262	310 (0.33), 311 (0.31), 312 (0.20), 313 (0.16)
363	317 (0.40), 318 (0.38), 319 (0.22)
268	366 (0.04), 367 (0.78), 368 (0.18)

4. Socio Economic Data

- 4.1. Although the model does not follow a traditional four-step modeling process, the socio economic data was obtained from ODOT to compare to the trip tables. **Table 2** shows the population and employment forecasts for the immediate study area. The table shows negative employment growth in the region and all the larger employment zones in the county are also decreasing. The population is forecast to grow slightly from 2000 to 2030 at 1.0% per year.

Table 2: Year 2000 and Year 2030 Population and Employment Data for Scioto County

Zone	District	2000 Population	2000 Employment	2030 Population	2030 Employment	Population Growth Rate (% per year)	Employment Growth Rate (% per year)
246	Portsmouth	4,020	2,303	4,651	2,068	0.49%	-0.36%
247	New Boston	5,445	1,276	6,298	1,145	0.49%	-0.36%
248	Portsmouth	4,581	2,765	5,298	2,480	0.49%	-0.36%
249	Rosemount	3,650	410	4,222	367	0.49%	-0.37%
250	Portsmouth	2,025	232	2,342	207	0.49%	-0.38%
251	Clarktown/Minford	2,208	6,550	2,554	5,878	0.49%	-0.36%
252	Clarktown/Minford	1,637	1,242	1,893	1,114	0.49%	-0.36%
253	West Scioto	2,390	266	2,764	238	0.49%	-0.37%
254	West Scioto	588	127	1,531	163	3.24%	0.84%
255	West Scioto	1,545	199	4,022	256	3.24%	0.84%
256	Sciotodale/Wheelersburg	917	386	2,387	497	3.24%	0.85%
257	Sciotodale/Wheelersburg	5,422	655	14,117	846	3.24%	0.86%
258	West Portsmouth	1,102	149	2,870	191	3.24%	0.83%
259	East Scioto	1,084	57	2,822	73	3.24%	0.83%
260	West Scioto	5,375	1,827	6,562	1,809	0.67%	-0.03%
261	Ironton/ Franklin Furnace	4,076	350	4,977	347	0.67%	-0.03%
262	Airport Area	4,307	492	5,258	487	0.67%	-0.03%
263	Clarktown/Minford	3,173	897	4,164	937	0.91%	0.15%
264	North Scioto	4,593	260	6,027	272	0.91%	0.15%
265	North Scioto	3,122	230	4,097	239	0.91%	0.13%
266	North Scioto	6,382	1,091	6,712	1,036	0.17%	-0.17%
267	West Scioto	1,359	3,923	1,429	3,724	0.17%	-0.17%
268	Lucasville	4,188	1,601	4,404	1,520	0.17%	-0.17%
269	East Scioto	3,786	2,039	3,981	1,936	0.17%	-0.17%
	Scioto County Total	76,975	29,327	105,382	27,830	1.05%	-0.17%

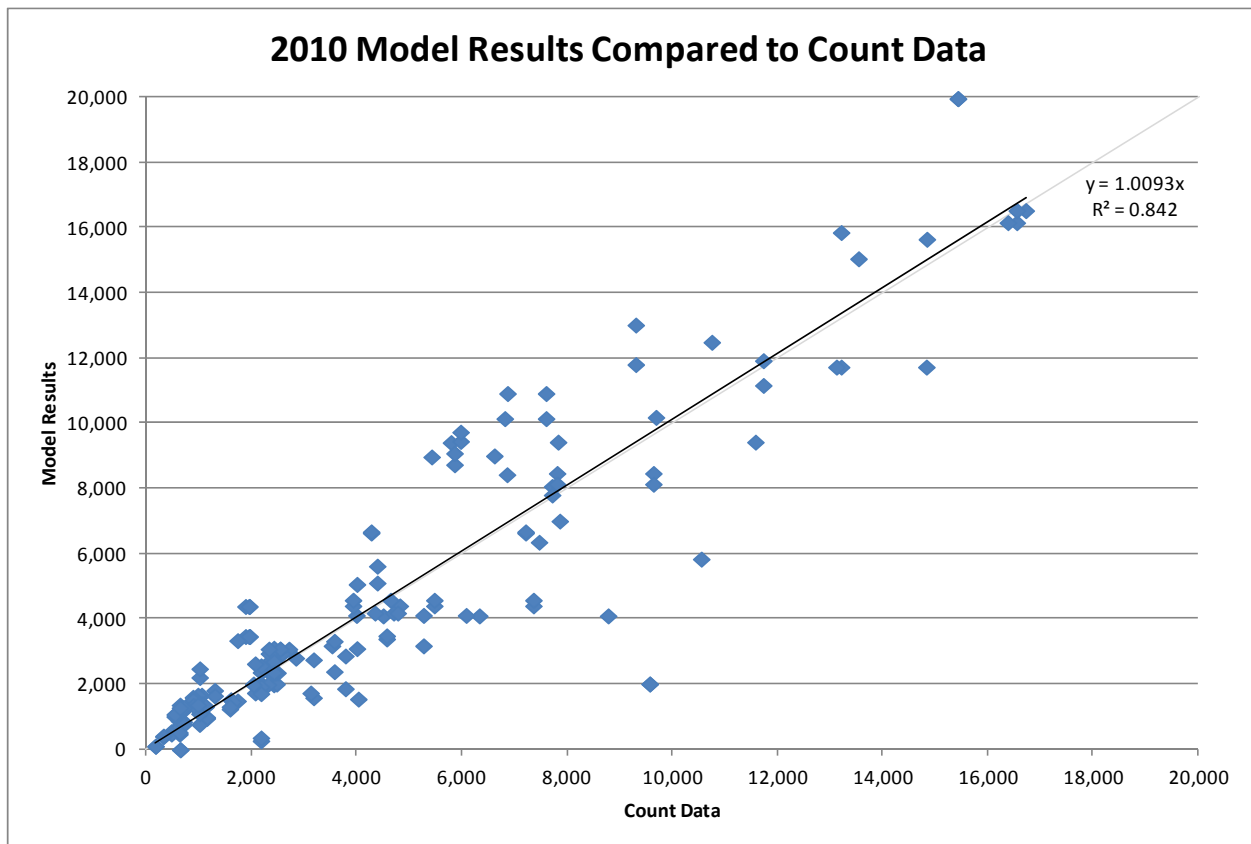
5. Data Collection

- 5.1. Travel time runs were conducted to obtain an accurate assessment of the travel time in the region, and new traffic count data were collected to supplement the existing count data available in the area. This data was used to validate the model performance. A technical report detailing the traffic data and travel time collection is included as **Appendix A**.

6. Model Validation

- 6.1. The transportation network was adjusted for better highway loading and more accurate speeds as compared to existing and new data collection. The external zones over the Ohio River were also adjusted to match the counts on the three Ohio River crossings in the study area. Although the data used in the validation data were collected in 2011 and 2012, because of the slow growth in the region these data were used to validate the base year (2010) model performance.
- 6.2. **Figure 2** shows the correspondence between the 2010 model performance and 2011/2012 count data across different facilities in the region. The scatter plot shows a very strong correlation between the count and the model performance.

Figure 2: 2010 Model Results Compared to Count Data



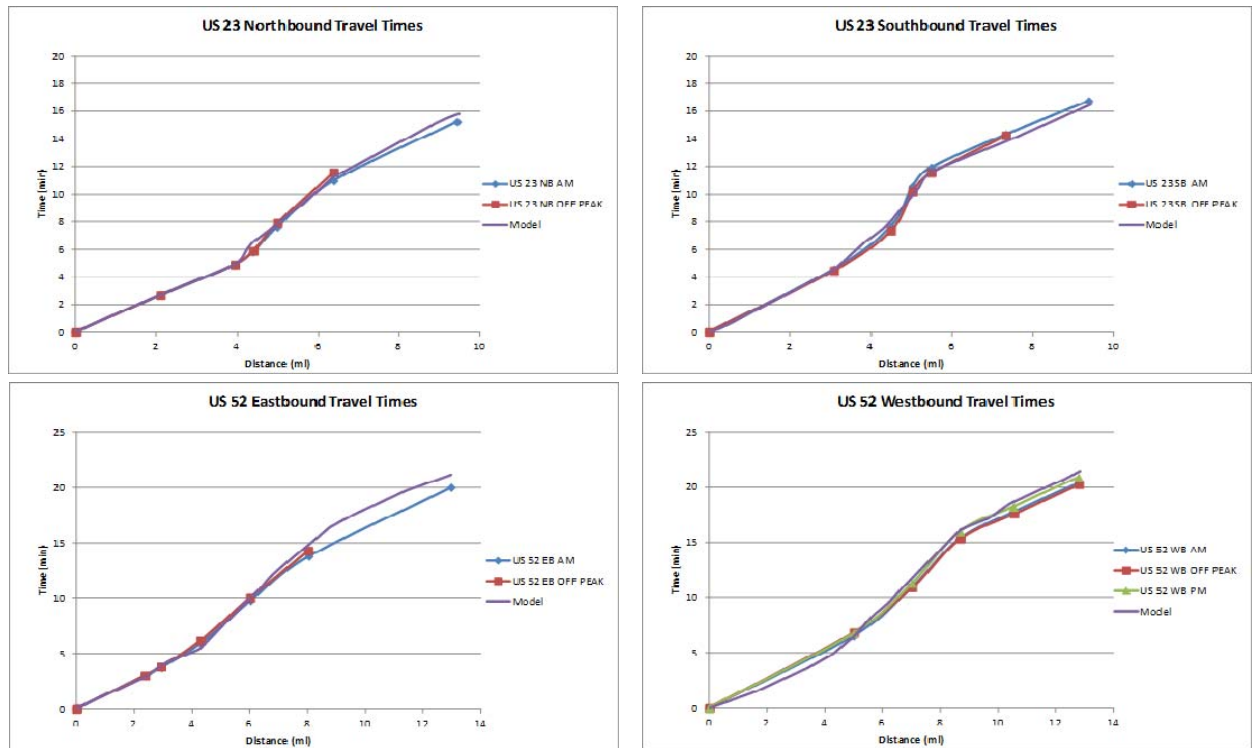
- 6.3. To further understand the forecasting ability of the model, three cut lines were developed to verify how traffic is moving through the study area. The three cut lines were defined by the two rivers in the region, the Ohio and the Scioto Rivers. The third cut line crosses east to west north of US 52. **Table 3** displays the 2010 model and count data along these cutlines.

Table 3: Cutline Comparison (Annual Average Weekday Traffic)

	2011-2012 Counts			2010 Model			Model/ Count
	Auto	Truck	Total	Auto	Truck	Total	
Ohio River							
Rte 852 - Carl D Perkins Bridge	4,520	1,054	5,574	4,551	1,344	5,895	
Rte 23	8,516	355	8,870	8,070	227	8,297	
Rte 10/852	7170	640	7,810	7,018	679	7,697	
Cutline Total	20,206	2,049	22,254	19,639	2,250	21,889	0.984
Scioto River							
SR 73 / 104 / 2nd St	3,741	205	3,946	7,586	283	7,869	
US 52	14,572	744	15,316	14,988	816	15,803	
SR 348	8,690	470	9,160	6,140	752	6,892	
Cutline Total	27,003	1,418	28,421	28,714	1,850	30,564	1.075
North of US 52							
SR 73	10,240	730	10,970	7,581	1,417	8,998	
US 23 Scioto Trail	16,980	2,320	19,300	15,416	1,208	16,624	
SR 139 Harrisonville Ave	8,590	210	8,800	9,800	944	10,744	
SR 355 Harding St	6,920	250	7,170	5,525	197	5,723	
SR 140 Webster St	6,080	300	6,380	4,101	252	4,352	
Cutline Total	48,810	3,810	52,620	42,423	4,019	46,441	0.883

- 6.4. As a final comparison the model travel times were compared to the travel time runs conducted as part of this study. The following charts show the strong correspondence between the model travel times and the travel time runs.

Figure 3: Travel Time Run Comparisons



7. Model Forecasts and Conclusions

- 7.1. The model was run with the build and no build bypass alternatives in the highway network for both the 2010 and 2030 trips tables.
- 7.2. The previous study presented the volumes on representative sections of US 23, US 52, SR 73, and other major routes in the region. Consistent with the previous study, the results from this study are presented for the same representative sections of highways in the study area. **Figure 4** shows the locations a study area map. The results are displayed in **Table 4** along with the results from the previous study. Table six shows the same forecast results split by vehicle type (auto, truck, and bus) The traffic growth on the Bypass in this study is slower than estimated in the previous study (0.51% per year traffic growth versus 0.82% per year in the previous study) as a reflection on the lower socio-economic growth estimated in the region over the past ten years. The population in the past ten years for Scioto County increased from 79,195 in 2000 to 79,499 in 2010¹, a growth rate of less than 0.04% per year.
- 7.3. The overall growth in Vehicle Miles Traveled (VMT) in the subarea model area match the annual Socio-economic growth of 1.0% per year forecast from 2000 to 2030. The VMT growth in the region is shown for both the build and the no build in **Table 5**.

¹ Scioto County, Ohio County Profiles, Office of Policy, Research and Strategic Planning (www.development.ohio.gov/research/files/s0/Scioto.pdf)

- 7.4. Overall the model predicts that the AADT on the Bypass will be 12,592 in 2010 and 13,945 in 2030. The build alternative on average has the effect of reducing traffic on the surrounding routes. The amount of traffic reduction depends on the location of the facility in relation to the Bypass. On US 52, the bypass will have limited impact on the western end (Linkage C-1) but is forecast to have a considerable impact on US 52 East of New Boston, reducing the daily traffic almost 6,000 vehicles per day or 17% over the no build alternative. The bypass will have the largest impact on the routes closest to the bypass. The bypass is forecast to reduce traffic on SR 355 near the airport (Linkage E2) by over 80% per day over the no build alternative. Similarly, it is expected to reduce traffic on US 23 north of Rosemont by one-third and on Lucasville-Minford Rd by almost 30% per day over the no-build alternative.

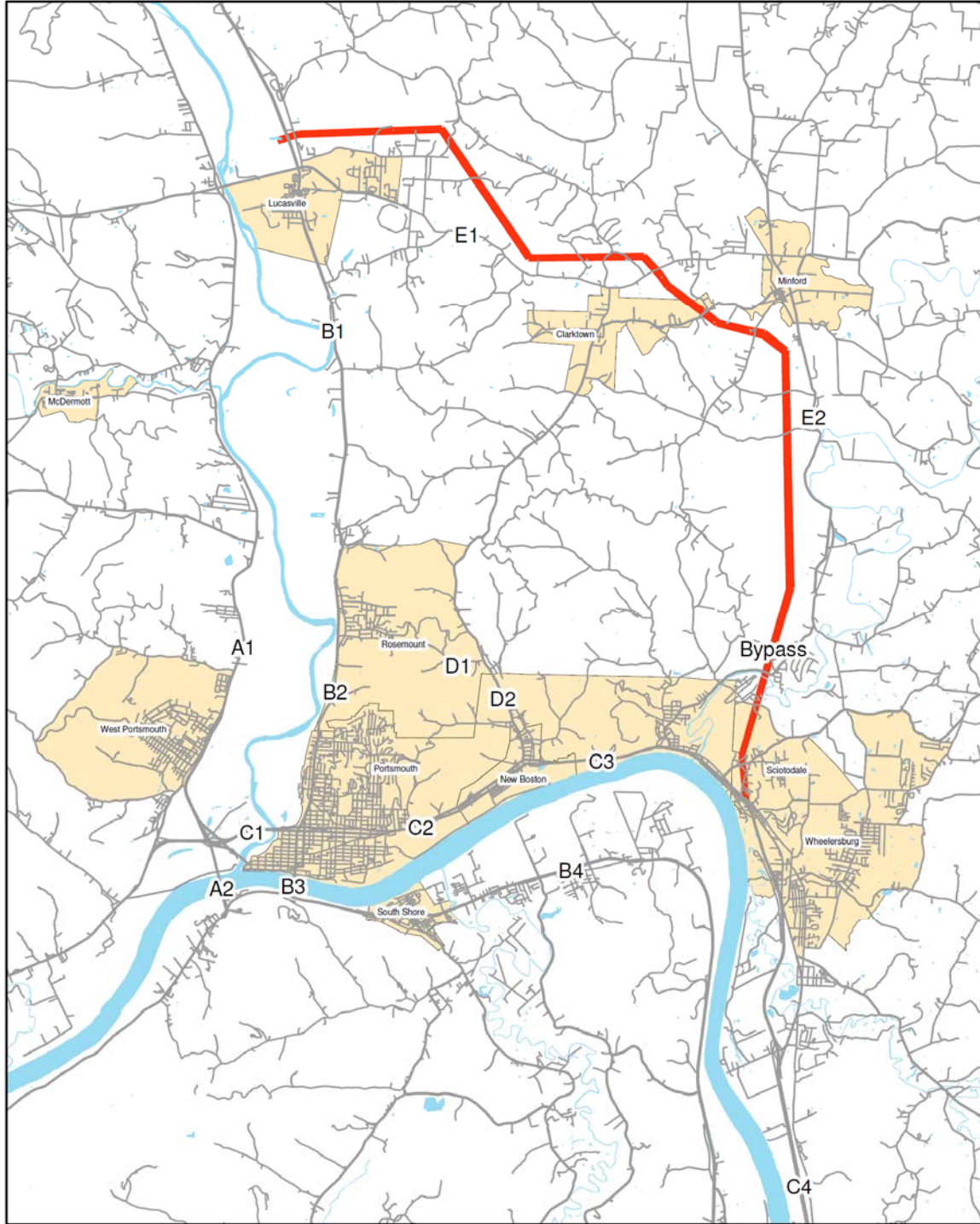


Table 4: Model Forecast Results (Average Annual Weekday Traffic)

Linkage		2000 Study				2011/12 Count Data	2010 Base	2010 Build	2030 No Build	2030 Build	Note
		No Build 2000	No Build 2025	"Existing Year"- 2000	"Design Year"- 2025						
A1	SR 73/SR 104: North of Dry Run Rd (CR 57)	9,398	10,359	7,802	9,799	9,483	8,998	8,807	10,125	9,900	
A2	SR 852: Carl D Perkins Bridge	7,200	8,597	5,400	7,000	5,575	5,895	5,740	8,471	8,283	
B1	US 23: North of Rosemount	15,621	21,657	9,561	12,009	13,495	17,451	11,760	19,451	12,993	
B2	US 23: between Portsmouth and Rosemount	16,614	16,914	15,087	20,082	15,640	16,624	16,391	18,014	17,763	
B3	US 23: Bridge over Ohio River	7,379	9,445	7,800	11,600	8,871	8,297	8,297	10,731	10,731	
B4	US 23: in KY (<i>not modeled in new model</i>)	15,800	18,042	13,400	18,400	9,247	1,539	1,384	2,083	1,894	1
C1	US 52: between Portsmouth and SR 73	15,500	18,683	15,600	19,400	15,316	15,803	15,758	16,666	16,620	
C2	US 52: just west of New Boston	21,400	27,438	22,400	24,800	26,440	35,637	35,825	37,334	37,539	
C3	US 52: east of New Boston	23,951	32,133	16,538	20,884	33,120	32,710	27,482	34,902	28,943	
C4	US 52: north of SR 253 / KY 10	27,600	37,661	30,200	37,200	13,702	21,087	21,600	24,927	25,511	2
D1	CR 377: Rosemount Rd east of Rosemount	9,413	12,520	2,600	3,700	NA	9,461	3,997	10,499	4,286	
D2	SR 139: Harrisonville Ave north of New Boston	14,600	20,029	8,200	8,700	8,800	10,744	5,232	11,828	5,566	
E1	SR 728: Lucasville-Minford Rd est of CR 30	5,634	6,992	1,235	1,717	4,887	6,008	4,280	6,386	4,521	
E2	SR 355: near airport	4,961	6,756	899	1,025	5,145	6,037	1,105	6,479	1,183	
Bypass	Bypass: US 52 - SR 140							9,079		10,200	
Bypass	Bypass: SR 140 - TR 234 (Shumway Hollow Rd)	0	0	15,905	19,528			12,592		13,945	
Bypass	Bypass: TR 234 - TR 28 (Lucasville-Minford Rd)							8,029		9,032	
Bypass	Bypass: TR 28 - US 23							8,743		9,797	

¹ This is US 23 in KY, trip tables do not show intra KY trips

² Both the ODOT 2011 permanent count and Portsmouth bypass count are 13,700 - 14,440

Table 5: Vehicle Miles Traveled (VMT) growth in region

Regional VMT from Model	Forecast Year 2010	Forecast Year 2030	Annual Growth Rate
No build	20,958,735	25,356,871	0.96%
Build	20,972,651	25,371,910	0.96%

Table 6: Model Forecast Results (Average Annual Weekday Traffic) by Vehicle Type

Linkage		2011/12 Count Data				2010 Base				2010 Build				2030 No Build				2030 Build				Note
		Autos	Trucks	Buses	Total	Autos	Trucks	Buses	Total	Autos	Trucks	Buses	Total	Autos	Trucks	Buses	Total	Autos	Trucks	Buses	Total	
A1	SR 73/SR 104: North of Dry Run Rd (CR 57)	8,583	805	95	9,483	7,581	1,327	90	8,998	7,420	1,299	88	8,807	8,277	1,746	101	10,125	8,093	1,708	99	9,900	
A2	SR 852: Carl D Perkins Bridge	4,521	943	111	5,574	4,551	1,226	118	5,895	4,427	1,198	115	5,740	6,740	1,561	169	8,471	6,592	1,525	166	8,283	
B1	US 23: North of Rosemount	12,336	997	162	13,495	15,490	1,752	209	17,451	10,555	1,064	141	11,760	17,235	1,983	233	19,451	11,585	1,252	156	12,993	
B2	US 23: between Portsmouth and Rosemount	13,760	1,724	156	15,640	15,416	1,042	166	16,624	15,188	1,039	164	16,391	16,610	1,225	180	18,014	16,365	1,221	178	17,763	
B3	US 23: Bridge over Ohio River	8,516	266	89	8,871	8,070	144	83	8,297	8,070	144	83	8,297	10,592	31	107	10,731	10,592	31	107	10,731	
B4	US 23: in KY (<i>not modeled in new model</i>)	8,785	370	92	9,247	1,314	209	15	1,539	1,190	180	14	1,384	1,805	258	21	2,083	1,656	219	19	1,894	1
C1	US 52: between Portsmouth and SR 73	14,572	591	153	15,316	14,988	658	158	15,803	14,943	658	158	15,758	15,636	864	167	16,666	15,590	864	166	16,620	
C2	US 52: just west of New Boston	25,230	946	264	26,440	33,875	1,406	356	35,637	34,058	1,409	358	35,825	35,305	1,656	373	37,334	35,504	1,660	375	37,539	
C3	US 52: east of New Boston	32,060	729	331	33,120	30,734	1,649	327	32,710	26,251	956	275	27,482	32,691	1,862	349	34,902	27,528	1,126	289	28,943	
C4	US 52: north of SR 253 / KY 10	12,545	1,021	137	13,702	19,587	1,290	211	21,087	20,040	1,344	216	21,600	23,273	1,405	249	24,927	23,781	1,475	255	25,511	2
D1	CR 377: Rosemount Rd east of Rosemount	NA	NA	NA	NA	8,527	840	95	9,461	3,814	143	40	3,997	9,474	920	105	10,499	4,064	179	43	4,286	
D2	SR 139: Harrisonville Ave north of New Boston	8,590	122	88	8,800	9,800	837	107	10,744	5,040	140	52	5,232	10,791	919	118	11,828	5,333	177	56	5,566	
E1	SR 728: Lucasville-Minford Rd est of CR 30	4,537	302	49	4,887	5,742	206	60	6,008	4,074	163	43	4,280	6,061	260	64	6,386	4,271	205	45	4,521	
E2	SR 355: near airport	4,949	146	51	5,145	5,758	219	60	6,037	1,077	17	11	1,105	6,142	272	65	6,479	1,150	22	12	1,183	
Bypass	Bypass: US 52 - SR 140									8,137	850	91	9,079					9,161	937	102	10,200	
Bypass	Bypass: SR 140 - TR 234 (Shumway Hollow Rd)									11,443	1,024	126	12,592					12,654	1,151	139	13,945	
Bypass	Bypass: TR 234 - TR 28 (Lucasville-Minford Rd)									7,127	821	80	8,029					8,044	897	90	9,032	
Bypass	Bypass: TR 28 - US 23									7,818	837	87	8,743					8,782	917	98	9,797	

¹ This is US 23 in KY, trip tables do not show intra KY trips

² Both the ODOT 2011 permanent count and Portsmouth bypass count are 13,700 - 14,440