

IV. Travel Estimation Process

The travel demand estimates that were used in this conformity analysis are the end result of a model chain that begins by forecasting and distributing population, households and employment for the SPC region. The model chain is iterative in nature. Estimates from the travel demand models are periodically cycled back as inputs to the socio-economic forecasting models.

SPC completed its ninth cycle of population, household and employment forecasts in the spring of 2011 (Cycle 9 forecast). The Cycle 9 forecast of population, employment and households was adopted with the 2040 Plan in June 2011. The Cycle 9 forecast replaced the Cycle 8 forecast, which was adopted in 2007. Modifications to the Cycle 9 forecast were completed in the spring of 2012 to reflect data from the 2010 decennial Census, which was not available from the US Census Bureau when the Cycle 9 forecast was developed in 2011. The updated forecast, which is being called the Cycle 9a forecast, was used to revise the highway and transit trip forecasts for the travel demand model for this conformity assessment. The Cycle 9a forecast was adopted by SPC on June 25, 2012, concurrent with adoption of the 2013-2016 TIP. The base year for the Cycle 9a forecast is 2010. The horizon year is 2040. With each cycle, models are revised to take advantage of the latest data and to incorporate evolving modeling techniques.

SPC uses an integrated economic-demographic forecasting model to develop regional estimates of future population and employment. That model, known as REMI (Regional Economic Models, Inc.), integrates an economic forecast with a demographic forecast for economic sub-regions of the United States. Based on historical analysis of the regional economy and a forecast of the U.S. economy, REMI forecasts regional employment, production, and other regional economic variables. REMI also utilizes historical data on population to forecast regional population growth or decline based on a traditional cohort-survival model. Then, based on the economic forecast, REMI determines the amount of migration in or out of the region for workers and their dependents, to produce a complete population forecast. The model is recursive in nature. The population forecast is used to revise the employment estimate. The new employment estimate is then used to allow for further changes in economic migration. This cycle continues until the economic and demographic forecasts balance out. SPC first used the REMI model for forecasting in 1992, when the Cycle 4a forecasts were produced.

In 1992-93, SPC developed a model to allocate regional forecasts of population, households and employment to the traffic analysis zones in the region. The allocation model, known as MERLAM (Mature Economic Region Land Use Allocation Model) uses simple algorithms and an extensive database to allocate population and employment. The model's algorithms include a number of policy-sensitive variables. The database includes land use and attractiveness measures. The land use database provides essential baseline information on each traffic analysis zone.

REGIONAL POPULATION

COUNTY	2010	2040	CHANGE 2010-2040	% CHANGE 2010-2040
Allegheny	1,223,348	1,435,868	+212,520	+17.4%
<i>Pittsburgh City</i>	305,704	335,106	+29,402	+9.6%
<i>non-Pittsburgh</i>	917,644	1,100,762	+183,118	+20.0%
Armstrong	68,941	75,762	+6,821	+9.9%
Beaver	170,539	194,653	+24,114	+14.1%
Butler	183,862	237,949	+54,087	+29.4%
Fayette	136,606	148,157	+11,551	+8.5%
Greene	38,686	42,031	+3,345	+8.6%
Indiana	88,880	103,341	+14,461	+16.3%
Lawrence	91,108	105,045	+13,937	+15.3%
Washington	207,820	269,981	+62,161	+29.9%
Westmoreland	365,169	443,931	+78,762	+21.6%
TOTAL	2,574,959	3,056,718	+481,759	+18.7%

TABLE 1

SPC July 2012

2010 and 2040 population estimates based on REMI forecast.
Population allocation to counties based on SPC MERLAM process.

REGIONAL HOUSEHOLDS

COUNTY	2010	2040	CHANGE 2010-2040	% CHANGE 2010-2040
Allegheny	533,960	660,311	+126,351	+23.7%
<i>Pittsburgh City</i>	136,217	159,870	+23,653	+17.4%
<i>non-Pittsburgh</i>	397,743	500,441	+102,698	+25.8%
Armstrong	28,713	32,890	+4,177	+14.5%
Beaver	71,383	86,015	+14,632	+20.5%
Butler	72,835	99,345	+26,510	+36.4%
Fayette	55,997	63,192	+7,195	+12.8%
Greene	14,724	16,613	+1,889	+12.8%
Indiana	35,005	43,249	+8,244	+23.6%
Lawrence	37,126	44,621	+7,495	+20.2%
Washington	85,089	114,860	+29,771	+35.0%
Westmoreland	153,650	196,852	+43,202	+28.1%
TOTAL	1,088,482	1,357,948	+269,466	+24.8%

TABLE 2

SPC July 2012

2010 and 2040 household estimates based on SPC MERLAM process.
Household allocation to counties based on SPC MERLAM process.

REGIONAL EMPLOYMENT

COUNTY	2010				
	RETAIL	MANU- FACTURING	SERVICES	OTHER	TOTAL
Allegheny	135,446	39,155	612,386	74,764	861,751
<i>Pittsburgh City</i>	33,054	10,175	298,587	15,606	357,422
<i>non-Pittsburgh</i>	102,392	28,980	313,799	59,158	504,329
Armstrong	4,624	1,720	16,330	5,280	27,954
Beaver	11,905	8,212	41,046	6,346	67,509
Butler	19,890	11,877	59,390	15,679	106,836
Fayette	11,784	3,532	36,708	7,497	59,521
Greene	2,652	708	13,342	5,748	22,450
Indiana	8,606	2,969	23,175	11,679	46,429
Lawrence	7,003	4,094	23,878	4,480	39,455
Washington	18,642	7,788	58,894	14,110	99,434
Westmoreland	34,922	19,268	104,074	22,479	180,743
TOTAL	255,474	99,323	989,223	168,062	1,512,082
COUNTY	2040				
	RETAIL	MANU- FACTURING	SERVICES	OTHER	TOTAL
Allegheny	149,133	36,278	850,416	100,945	1,136,772
<i>Pittsburgh City</i>	31,656	9,231	363,402	22,157	426,446
<i>non-Pittsburgh</i>	117,477	27,047	487,014	78,788	710,326
Armstrong	4,816	1,631	20,970	6,120	33,537
Beaver	12,600	6,559	53,866	9,950	82,975
Butler	23,325	10,159	87,541	20,244	141,269
Fayette	11,129	3,137	45,486	9,979	69,731
Greene	2,742	648	17,311	5,740	26,441
Indiana	9,075	2,644	30,773	11,733	54,225
Lawrence	7,596	3,897	33,581	6,165	51,239
Washington	22,508	6,838	90,919	18,914	139,179
Westmoreland	37,657	18,894	142,747	27,972	227,270
TOTAL	280,581	90,685	1,373,610	217,762	1,962,638
COUNTY	PERCENT CHANGE 2010-2040				
	RETAIL	MANU- FACTURING	SERVICES	OTHER	TOTAL
Allegheny	+10.1%	-7.3%	+38.9%	+35.0%	+31.9%
<i>Pittsburgh City</i>	-4.2%	-9.3%	+21.7%	+42.0%	+19.3%
<i>non-Pittsburgh</i>	+14.7%	-6.7%	+55.2%	+33.2%	+40.8%
Armstrong	+4.2%	-5.2%	+28.4%	+15.9%	+20.0%
Beaver	+5.8%	-20.1%	+31.2%	+56.8%	+22.9%
Butler	+17.3%	-14.5%	+47.4%	+29.1%	+32.2%
Fayette	-5.6%	-11.2%	+23.9%	+33.1%	+17.2%
Greene	+3.4%	-8.5%	+29.7%	-0.1%	+17.8%
Indiana	+5.4%	-10.9%	+32.8%	+0.5%	+16.8%
Lawrence	+8.5%	-4.8%	+40.6%	+37.6%	+29.9%
Washington	+20.7%	-12.2%	+54.4%	+34.0%	+40.0%
Westmoreland	+7.8%	-1.9%	+37.2%	+24.4%	+25.7%
TOTAL	+9.8%	-8.7%	+38.9%	+29.6%	+29.8%

TABLE 3

SPC July 2012

2010 and 2040 employment estimates based on REMI forecast.
 Employment allocation to counties based on SPC MERLAM process.

Air Quality Conformity Determination

*2013-2016 Transportation Improvement Program and 2040 Long Range Transportation Plan
Southwestern Pennsylvania Commission – July 2012*

The attractiveness measures are used to determine each zone's relative attractiveness for different types of development. By varying the attractiveness measures and by altering the values of the model's policy variables, MERLAM is able to estimate the impact of various regional land use and development scenarios. SPC updated the databases and streamlined the MERLAM allocation process early in 2011. The Cycle 9a forecasts were allocated to traffic zones through the use of MERLAM.

SPC's Cycle 9a base year (2010) estimates, and 2040 forecasts, of population, employment, and households were used to estimate regional travel demand for this conformity assessment. SPC developed its travel estimation models to take full advantage of the capabilities of the TP+ software package. TP+ is a library of programs used for transportation planning.

Travel simulations for the ten-county SPC travel model region are produced with a standard four-step chain of transportation models developed by SPC for TP+ processing. The four steps include trip generation, trip distribution, modal split and travel assignment models. Travel was simulated for 2010 and 2040 based on socio-economic data from SPC's Cycle 9a forecasts. County-level socio-economic data is shown in Table 1 (population), Table 2 (households), and Table 3 (employment). Simulated 2010 travel was validated with 2008 and 2009 traffic counts, 2009 VMT, and 2010 transit ridership data.

SPC's trip generation model simulates person trip productions and attractions for three trip purposes (home-based work, home-based other, and non-home based) and truck trip productions and attractions for three truck classes (light, medium and heavy). Person trip productions are estimated by applying household trip rates to Cycle 9a household data in a cross-classification model stratified by household size and auto ownership. Person trip attractions are estimated by applying trip rates stratified by households and by three employment categories. In some instances, attraction trip rates are further stratified by area. Home-based work trip control totals are averaged production and attraction totals. Home-based other attractions were balanced to match productions. Non-home based person trips and truck trips are estimated by applying trip rates stratified by employment category. These rates are applied to Cycle 9a employment data.

Gravity models were calibrated to distribute person trips and truck trips by each trip generation category. Impedances are a weighted sum of highway travel time and distance to reflect out-of-pocket trip cost. Travel time includes running time, terminal time, and a penalty for major river crossings. Home-based work trips were distributed with peak-period impedances; all other trips were distributed with off-peak impedances.

A control total of air passenger-related travel to and from the Pittsburgh International Airport was derived from independent airport planning studies for existing and forecast years. A gravity model to distribute these trips was calibrated with air enplanement data reported for 2000. These trips were then added to home-based other trips.

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The home-based work component of the mode split model was initially developed by SPC in 1995, when calibration of a home-based work trip auto occupancy and mode split model was completed. In addition to estimating the number of person trips using transit, the home-based work mode split model also stratifies non-transit trips by four levels of auto occupancy (drive alone, two person carpools, three person carpools, and vehicles with four or more occupants). Based on those stratifications, the model then converts home-based highway person trips into vehicle trips for use in highway assignment. The model is sensitive to the presence of high-occupancy vehicle (HOV) facilities in the highway network. The 2005-2009 Census American Community Survey Journey-to-Work (JTW) data reported that, regionwide, 10.8 percent of persons traveling to work were in HOVs (vehicles with two or more occupants). Table 4 compares actual JTW percentages with the model simulation by trip attraction districts. Actual numbers of trips, while shown in the table, should not be compared because JTW data only represents persons working at their primary job rather than all home-based work trips.

The auto occupancy component of the mode split model could not be used for non-work trips because the JTW survey data includes only work trips, and there were no other available data sources for calibration. Non-work highway person trips were converted to vehicle trips by applying vehicle occupancy rates developed by SPC and stratified by trip purpose and attraction district.

Three travel impedances by auto and transit modes are included in the mode split model. These are run time (total in-vehicle time), "excess" time (total out-of-vehicle time), and cost (out-of-pocket cost). For home-based work trips, the impedances are based on restrained highway travel times and peak period transit service. For home-based other and non-home based trips, impedances are based on free-flow highway times and mid-day transit service.

Table 5 compares observed and simulated transit route trips. Since the base year for the forecast is 2010, simulated network assignment summaries for 2010 and observed data for an average month (April) in 2010 were used for the comparisons. The route trip data and corridor definitions were obtained from Port Authority of Allegheny County and other transit providers in the region. Table 5 shows that, regionally, simulated route trips are within thirteen percent of observed data.

Overall, it was determined that transit mode split and transit assignment results were reasonably close to observed data.

HOV MODEL VALIDATION
Auto Person Trip Attractions

District	2005-2009 Census ACS Journey to Work		2010 SPC Estimated		Percent HOV	
	<u>SOV</u>	<u>HOV</u>	<u>SOV</u>	<u>HOV</u>	<u>JTW</u>	<u>SPC</u>
PGH CBD	-	-	49,204	21,075	-	30.2%
PGH EAST	-	-	123,788	11,583	-	8.7%
PGH NORTH	-	-	33,456	3,079	-	8.6%
PGH SOUTH	-	-	39,819	3,311	-	7.8%
PGH TOTAL	179,837	32,340	246,267	39,048	15.2%	13.8%
ALLEG EAST	73,246	8,569	120,826	8,220	10.5%	6.4%
ALLEG SOUTH	142,364	15,990	239,342	18,575	10.1%	7.3%
ALLEG NORTH	93,500	10,465	155,974	11,722	10.1%	7.2%
ALLEG TOTAL	309,110	35,024	516,142	38,517	10.2%	7.1%
BUTLER	68,098	6,663	113,128	7,731	8.9%	6.4%
ARMSTR EAST	9,600	1,153	20,088	1,260	10.7%	5.9%
ARMSTR WEST	5,258	656	9,839	721	11.1%	6.5%
WESTMORELAND	116,289	11,246	195,039	12,304	8.8%	6.0%
WASHINGTON	62,834	6,389	104,209	7,484	9.2%	6.8%
BEAVER SOUTH	14,984	1,532	19,409	1,210	9.3%	5.7%
BEAVER NORTH	28,932	2,972	53,735	3,272	9.3%	5.8%
FAYETTE	35,202	3,373	65,725	3,602	8.7%	5.0%
GREENE	8,637	1,100	22,731	1,900	11.3%	7.9%
INDIANA	27,170	3,288	50,274	2,980	10.8%	5.6%
LAWRENCE	25,537	2,537	44,400	2,158	9.0%	4.7%
OUTSIDE ALLEG	402,541	40,909	698,577	44,622	9.2%	6.0%
GRAND TOTAL	891,488	108,273	1,460,986	122,187	10.8%	7.8%

TABLE 4

SPC July 2012

TRANSIT ROUTE TRIP VALIDATION BY CORRIDOR

SUB-CORRIDOR NAME	ACTUAL OCT 2009	ASSIGNMENT 2010	ASSIGN / ACTUAL
ALLEGHENY VALLEY	3,658	2,126	0.58
NORTH HILLS	18,881	14,814	0.78
HOV LANE EXPRESS	3,734	7,136	1.91
OHIO VALLEY	10,529	13,112	1.25
TOTAL NORTH HILLS	36,802	37,188	1.01
WEST END - CARNEGIE	6,860	3,472	0.51
BANKSVILLE - GREENTREE	3,861	5,629	1.46
SOUTH HILLS LRV	25,475	18,907	0.74
AIRPORT SERVICE	2,231	4,450	1.99
WEST LIBERTY AVENUE	3,755	3,978	1.06
MT. WASHINGTON - HILLTOP	2,822	948	0.34
SAW MILL RUN - SOUTH BUSWAY	6,139	6,498	1.06
SOUTHSIDE	13,982	10,919	0.78
TOTAL SOUTH HILLS - WEST END	65,125	54,801	0.84
SECOND AVENUE	5,473	3,161	0.58
MON VALLEY EXPRESS	485	1,778	3.67
HOMESTEAD LOCAL AND EXPRESS	5,626	5,558	0.99
MCKEESPORT LOCAL	1,332	1,667	1.25
MONROEVILLE - EAST PITTSBURGH	589	966	1.64
TOTAL SOUTHEAST	13,505	13,130	0.97
FIFTH AVENUE	20,451	14,228	0.70
FORBES AVENUE - SQUIRREL HILL	22,643	21,262	0.94
EAST SUBURBAN - BLVD OF ALLIES	10,244	10,572	1.03
EAST BUSWAY	14,849	21,659	1.46
BIGELOW BLVD - PENN HILLS	7,139	3,222	0.45
HILL DISTRICT - CENTER AVENUE	10,153	3,070	0.30
BUTLER STREET - EAST LIBERTY	5,858	3,211	0.55
HOMEWOOD - PENN / LIBERTY	11,841	7,442	0.63
TOTAL EAST END	103,178	84,666	0.82
INCLINES	1,661	1,340	0.81
OTHER PORT AUTHORITY	14,541	10,398	0.72
TOTAL PORT AUTHORITY SYSTEM	234,812	201,523	0.86
NON-PORT AUTHORITY ROUTES	15,007	14,885	0.99
TOTAL TRANSIT NETWORK	249,819	216,408	0.87

TABLE 5

SPC July 2012

Air Quality Conformity Determination

*2013-2016 Transportation Improvement Program and 2040 Long Range Transportation Plan
Southwestern Pennsylvania Commission – July 2012*

A gravity model was calibrated for distributing internal/external vehicle trips (trips with one end inside and one end outside the region). To generate the internal/external trips to be distributed, relationships were initially developed between internal person trip ends by county and Journey to Work data from the 2000 decennial Census for work trips destined to the region from the external area. These trip patterns were factored to match PennDOT and SPC traffic count data by external cordon segment, as shown on Map 4. Table 6 compares simulated external cordon segment volumes to PennDOT and SPC traffic count data from various years and factored to a 2010 value using factors supplied by PennDOT. The total simulated volume regionwide is about two percent higher than the observed volume.

An estimate of through trips (vehicle trips with both ends outside the region) is the final component of trips needed for the regional trip matrices. Results from SPC's 2006 External Cordon Survey provided traffic volume estimates for the major travel corridors crossing the region's boundary. The growth in through trips for forecast years is based on the increase in trips in the modeled area (all except Allegheny) for the appropriate time period.

SPC assigns vehicle trips to the TP+ -based highway networks with a multi-iteration equilibrium assignment process which includes capacity restraint after each iteration. The impedances used for capacity restraint are highway-based costs, which include weighted values of time and distance. Through trips and medium and heavy duty truck trips are pre-loaded on the network with a one pass assignment that attracts these vehicles to high-level facilities in the network and keeps them there through iterations of capacity restraint. Also, the highway assignment procedure permits only HOV trips to use HOV facilities. The accuracy of the travel estimation process was validated with 2008 and 2009 traffic counts at PennDOT permanent traffic count stations in the region and 2009 highway VMT data.

PennDOT maintains eleven permanent traffic count stations in the region as shown on Map 4. A comparison of current traffic counts at each location to assigned 2010 link volumes is made in Table 7. The total simulated volume for all eleven stations is about six percent higher than the observed volume.

VMT from a 2010 traffic assignment, stratified by functional class and county, was compared to 2009 VMT estimates made by PennDOT. Regionwide, there was a nine percent difference between observed and simulated VMT. That comparison is shown in Table 8.

Overall, it was determined that highway assignment results were reasonably close to the observed data.

TRAVEL MODEL VALIDATION External Cordon Volume Comparisons

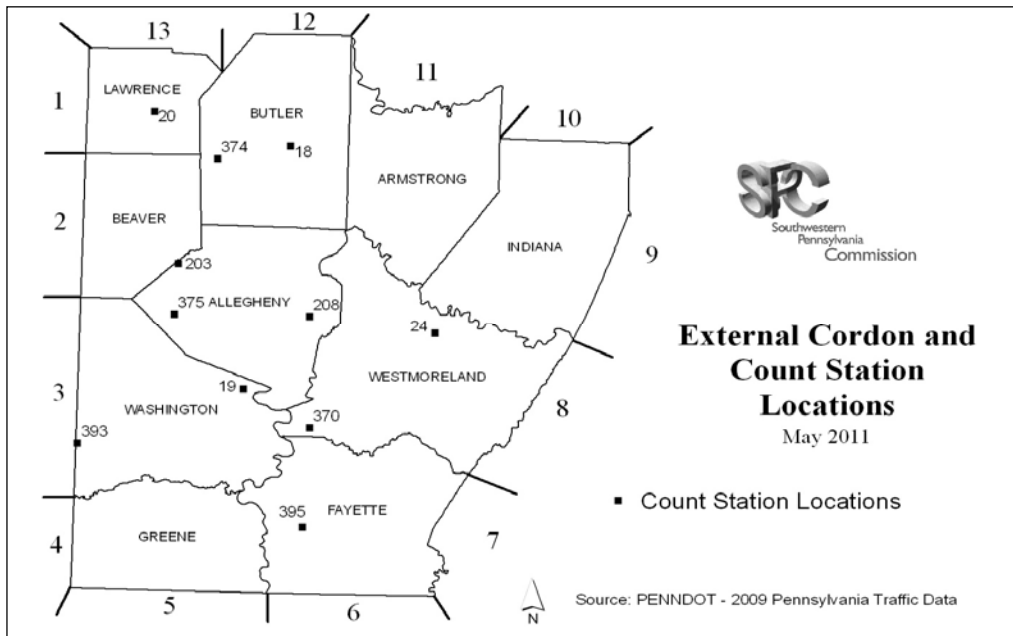
CORDON SEGMENT	COUNTY	OBSERVED VOLUME	SIMULATED VOLUME	SIMULATED / OBSERVED
1	Lawrence	36,921	33,377	0.90
2	Beaver	23,993	27,082	1.13
3	Washington	61,582	60,215	0.98
4	Greene	1,307	1,574	1.20
Western Boundary Total		123,803	122,248	0.99
5	Greene	32,843	33,474	1.02
6	Fayette	16,868	14,574	0.86
Southern Boundary Total		49,711	48,048	0.97
7	Fayette	8,500	16,140	1.90
8	Westmoreland	48,985	44,348	0.91
9	Indiana	28,242	25,885	0.92
Eastern Boundary Total		85,727	86,373	1.01
10	Indiana	11,569	12,717	1.10
11	Armstrong	14,794	18,132	1.23
12	Butler	21,294	24,385	1.15
13	Lawrence	52,184	53,231	1.02
Northern Boundary Total		99,841	108,465	1.09
TOTAL		359,082	365,134	1.02

Table 6

SPC July 2012

Observed volume is from SPC 2005 - 2006 external cordon counts, factored to 2010 values, and from factored PennDOT data.
Simulated volume from SPC assigned 2010 trips.

TRAVEL MODEL VALIDATION External Cordon and Count Station Locations



Map 4

SPC July 2012

**TRAVEL MODEL VALIDATION
TRAFFIC VOLUME COMPARISONS**

COUNT STATION	COUNTY	ROUTE	OBSERVED VOLUME	SIMULATED VOLUME	SIM/OBS
18	Butler	PA 38	6,414	5,940	0.93
19	Washington	PA 88	5,712	9,872	1.73
20	Lawrence	PA 65	7,401	9,892	1.34
24	Westmoreland	US 22	17,992	31,560	1.75
203	Allegheny	PA 65	20,589	24,067	1.17
208	Allegheny	I-376	64,510	58,618	0.91
370	Westmoreland	I-70	31,319	25,694	0.82
374	Butler	I-79	32,253	34,338	1.06
375	Allegheny	US 22/30	23,249	24,504	1.05
393	Washington	I-70	29,812	32,923	1.10
395	Fayette	PA 21	10,736	7,389	0.69
TOTAL			249,987	264,797	1.06

Table 7

SPC July 2012

Observed volume is "Average Weekday Traffic" from 2008 and 2009 PennDOT data.
Simulated volume from SPC assigned 2010 trips.

TRAVEL MODEL VALIDATION - VMT COMPARISONS

COUNTY	Observed VMT (000)			
	INTERSTATE	ARTERIAL	COLLECTOR LOCAL	TOTAL
Allegheny	5,800	12,806	6,373	24,980
Armstrong	0	1,143	477	1,620
Beaver	688	1,747	1,280	3,715
Butler	960	2,408	1,447	4,815
Fayette	0	1,669	1,027	2,697
Greene	321	360	496	1,177
Indiana	0	1,392	744	2,136
Lawrence	241	979	777	1,997
Washington	1,749	2,081	1,412	5,241
Westmoreland	2,064	4,293	2,540	8,896
TOTAL	11,823	28,878	16,573	57,274
COUNTY	Simulated VMT (000)			
	INTERSTATE	ARTERIAL	COLLECTOR LOCAL	TOTAL
Allegheny	5,441	15,424	4,587	25,452
Armstrong	0	1,505	715	2,220
Beaver	317	2,537	1,022	3,877
Butler	1,087	2,727	1,815	5,630
Fayette	0	1,980	978	2,958
Greene	560	333	646	1,539
Indiana	0	1,611	937	2,548
Lawrence	257	1,168	639	2,063
Washington	2,333	2,396	1,744	6,472
Westmoreland	1,822	4,864	2,832	9,517
TOTAL	11,817	34,545	15,915	62,276
COUNTY	Simulated/Observed VMT			
	INTERSTATE	ARTERIAL	COLLECTOR LOCAL	TOTAL
Allegheny	0.94	1.20	0.72	1.02
Armstrong	---	1.32	1.50	1.37
Beaver	0.46	1.45	0.80	1.04
Butler	1.13	1.13	1.25	1.17
Fayette	---	1.19	0.95	1.10
Greene	1.74	0.93	1.30	1.31
Indiana	---	1.16	1.26	1.19
Lawrence	1.07	1.19	0.82	1.03
Washington	1.33	1.15	1.24	1.23
Westmoreland	0.88	1.13	1.12	1.07
TOTAL	1.00	1.20	0.96	1.09

TABLE 8

SPC July 2012

Observed VMT from 2009 PennDOT data.
 Simulated VMT from SPC assigned 2010 link VMT.

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The above models were used to produce regional person trip matrices for 2010 from the Cycle 9a base year estimates. In addition, trip productions and attractions were generated for 2040 from the Cycle 9a 2040 forecasts. Prior to trip distribution, productions and attractions for 2013, 2015, 2016, 2018, 2025, and 2035 were developed by interpolating between 2010 and 2040. Trip distribution for each scenario was based on the characteristics of the transportation network defined for the scenario.

Free-flow highway speeds and link capacities are selected from a look-up table that is stratified by roadway facility type and area type. SPC has developed a model to calculate area type based on population and employment densities. In general, free-flow speed and capacity decreases with increasing development density. The area type model provides an automated procedure for updating area type codes in the network based on changes in existing and future development densities. The area type model was applied for each scenario using population and employment densities estimated for the scenario year.

Modal split model runs were made for each scenario using appropriate combinations of trip tables and transportation networks. Detailed modal split results for the 2013 network are presented in Table 9. The 2040 network modal split results are shown in Table 10. Table 11 summarizes regional trips by purpose and mode for each of the seven scenarios defined for this conformity assessment of the 2040 Plan and the 2013-2016 TIP. Table 12 summarizes modeled HOV trips for each scenario.

2013 MODAL SPLIT SUMMARY

DISTRICT	2013 Person Trip Attractions				2013 Auto Trip Attractions				2013 Transit Trip Attractions				2013 Transit/2013 Total Person			
	HBW	HBO	NHB	TOT	HBW	HBO	NHB	TOT	HBW	HBO	NHB	TOT	HBW	HBO	NHB	TOT
CBD	164956	93606	37444	296006	75979	53602	29172	158753	60640	12445	3174	76259	36.76%	13.30%	8.48%	25.76%
PGH E	173371	294568	106340	574279	137875	177190	76337	391402	21503	15694	6294	43491	12.40%	5.33%	5.92%	7.57%
PGH S	42159	64938	22678	129775	36906	40434	16935	94275	1606	1263	353	3222	3.81%	1.94%	1.56%	2.48%
PGH N	49965	107889	44336	202190	44138	70564	34270	148972	1789	1663	684	4136	3.58%	1.54%	1.54%	2.05%
PGH TOT	265495	467395	173354	906244	218919	288188	127542	634649	24898	18620	7331	50849	9.38%	3.98%	4.23%	5.61%
ALG E	145797	447555	119881	713233	133693	291133	82429	507255	2275	2795	1054	6124	1.56%	0.62%	0.88%	0.86%
ALG N	192129	576813	154399	923341	175389	372930	106076	654395	2484	2502	580	5566	1.29%	0.43%	0.38%	0.60%
ALG S	155121	488843	132167	776131	141986	315083	90849	547918	2759	3574	1148	7481	1.78%	0.73%	0.87%	0.96%
ALG W	139492	425782	103916	669190	125736	288739	74942	489417	1713	2733	555	5001	1.23%	0.64%	0.53%	0.75%
ALG TOT	632539	1938993	510363	3081895	576804	1267885	354296	2198985	9231	11604	3337	24172	1.46%	0.60%	0.65%	0.78%
OUTSIDE ALG	817830	2357336	623599	3798765	762149	1567478	444803	2774430	2938	3853	1530	8321	0.36%	0.16%	0.25%	0.22%
GRAND TOTAL	1880820	4857330	1344760	8082910	1633851	3177153	955813	5766817	97707	46522	15372	159601	5.19%	0.96%	1.14%	1.97%

TABLE 9

SPC, July 2012

2040 MODAL SPLIT SUMMARY

DISTRICT	2040 Person Trip Attractions			2040 Auto Trip Attractions			2040 Transit Trip Attractions			2040 Transit/2040 Total Person						
	HBW	HBO	TOT	HBW	HBO	TOT	HBW	HBO	TOT	HBW	HBO	TOT				
CBD	195110	109084	44883	349077	90615	62670	35081	188366	69697	14149	3685	87531	35.72%	12.97%	8.21%	25.07%
PGH E	197884	322438	115599	635921	157677	194068	83082	434827	23609	16993	6686	47288	11.93%	5.27%	5.78%	7.44%
PGH S	45902	69421	24207	139530	40134	43311	18127	101572	1731	1320	362	3413	3.77%	1.90%	1.50%	2.45%
PGH N	59086	121166	49262	229514	52064	79115	38056	169235	2082	1812	762	4656	3.52%	1.50%	1.55%	2.03%
PGH TOT	302872	513025	189068	1004965	249875	316494	139265	705634	27422	20125	7810	55357	9.05%	3.92%	4.13%	5.51%
ALG E	187520	548277	142870	878667	172088	356956	98303	627347	2725	3326	1254	7305	1.45%	0.61%	0.88%	0.83%
ALG N	267924	771858	202119	1241901	245172	499222	138966	883360	3010	3084	692	6786	1.12%	0.40%	0.34%	0.55%
ALG S	205796	612683	161483	979962	188606	394953	111010	694569	3330	4398	1298	9026	1.62%	0.72%	0.80%	0.92%
ALG W	181430	536908	129007	847345	164347	365379	93281	623007	1836	2924	639	5399	1.01%	0.54%	0.50%	0.64%
ALG TOT	842670	2469726	635479	3947875	770213	1616510	441560	2828283	10901	13732	3883	28516	1.29%	0.56%	0.61%	0.72%
OUTSIDE ALG	998766	2853113	738062	4589941	933225	1902652	527200	3363077	3333	4365	1704	9402	0.33%	0.15%	0.23%	0.20%
GRAND TOTAL	2339418	5944948	1607492	9891858	2043928	3898326	1143106	7085360	111353	52371	17082	180806	4.76%	0.88%	1.06%	1.83%

TABLE 10

SPC July 2012

TRAVEL MODEL RESULTS
Trips By Purpose and Mode

YEAR	SCENARIO	--- Total Person Trip Attractions ---			
		HBW	HBO	NHB	TOTAL
2013	2013 Existing Year	1,880,820	4,857,330	1,344,760	8,082,910
2015	2015 Johnstown Analysis Year	1,914,827	4,937,994	1,364,282	8,217,103
2016	2016 TIP Year	1,931,725	4,978,119	1,373,898	8,283,742
2018	2018 Ozone Budget Year	1,965,708	5,058,808	1,393,386	8,417,902
2025	2025 Interim Year #1	2,084,887	5,341,126	1,461,797	8,887,810
2035	2035 Interim Year #2	2,254,570	5,743,780	1,558,928	9,557,278
2040	2040 LRP Horizon Year	2,339,418	5,944,948	1,607,492	9,891,858
YEAR	SCENARIO	--- Auto Vehicle Trip Attractions ---			
		HBW	HBO	NHB	TOTAL
2013	2013 Existing Year	1,633,851	3,177,153	955,813	5,766,817
2015	2015 Johnstown Analysis Year	1,664,426	3,230,659	969,706	5,864,791
2016	2016 TIP Year	1,679,567	3,257,261	976,565	5,913,393
2018	2018 Ozone Budget Year	1,710,137	3,310,895	990,458	6,011,490
2025	2025 Interim Year #1	1,816,188	3,498,075	1,039,258	6,353,521
2035	2035 Interim Year #2	1,968,563	3,764,978	1,108,496	6,842,037
2040	2040 LRP Horizon Year	2,043,928	3,898,326	1,143,106	7,085,360
YEAR	SCENARIO	--- Transit Person Trip Attractions ---			
		HBW	HBO	NHB	TOTAL
2013	2013 Existing Year	97,707	46,522	15,372	159,601
2015	2015 Johnstown Analysis Year	98,498	46,932	15,540	160,970
2016	2016 TIP Year	98,988	47,141	15,594	161,723
2018	2018 Ozone Budget Year	99,849	47,348	15,697	162,894
2025	2025 Interim Year #1	103,590	48,911	16,136	168,637
2035	2035 Interim Year #2	108,379	51,235	16,758	176,372
2040	2040 LRP Horizon Year	111,353	52,371	17,082	180,806
YEAR	SCENARIO	--- Transit / Total Person Trips ---			
		HBW	HBO	NHB	TOTAL
2013	2013 Existing Year	5.19%	0.96%	1.14%	1.97%
2015	2015 Johnstown Analysis Year	5.14%	0.95%	1.14%	1.96%
2016	2016 TIP Year	5.12%	0.95%	1.14%	1.95%
2018	2018 Ozone Budget Year	5.08%	0.94%	1.13%	1.94%
2025	2025 Interim Year #1	4.97%	0.92%	1.10%	1.90%
2035	2035 Interim Year #2	4.81%	0.89%	1.07%	1.85%
2040	2040 LRP Horizon Year	4.76%	0.88%	1.06%	1.83%

TABLE 11

SPC July 2012

HOV MODEL RESULTS
Vehicle Trips By Auto Occupancy Level
(Home-Based Work Trips Only)

YEAR	SCENARIO	- - - - HBW Vehicle Trips by Occupancy - - - -					TOTAL
		1	2	3	4+		
2013	2013 Existing Year	1,506,700	110,662	11,855	5,116	1,634,333	
2015	2015 Johnstown Analysis Year	1,535,017	112,631	12,074	5,194	1,664,916	
2016	2016 TIP Year	1,549,110	113,545	12,174	5,256	1,680,085	
2018	2018 Ozone Budget Year	1,577,450	115,484	12,365	5,327	1,710,626	
2025	2025 Interim Year #1	1,675,656	122,205	13,140	5,662	1,816,663	
2035	2035 Interim Year #2	1,817,610	131,027	14,184	6,207	1,969,028	
2040	2040 LRP Horizon Year	1,887,552	135,600	14,759	6,485	2,044,396	

TABLE 12

SPC July 2012