



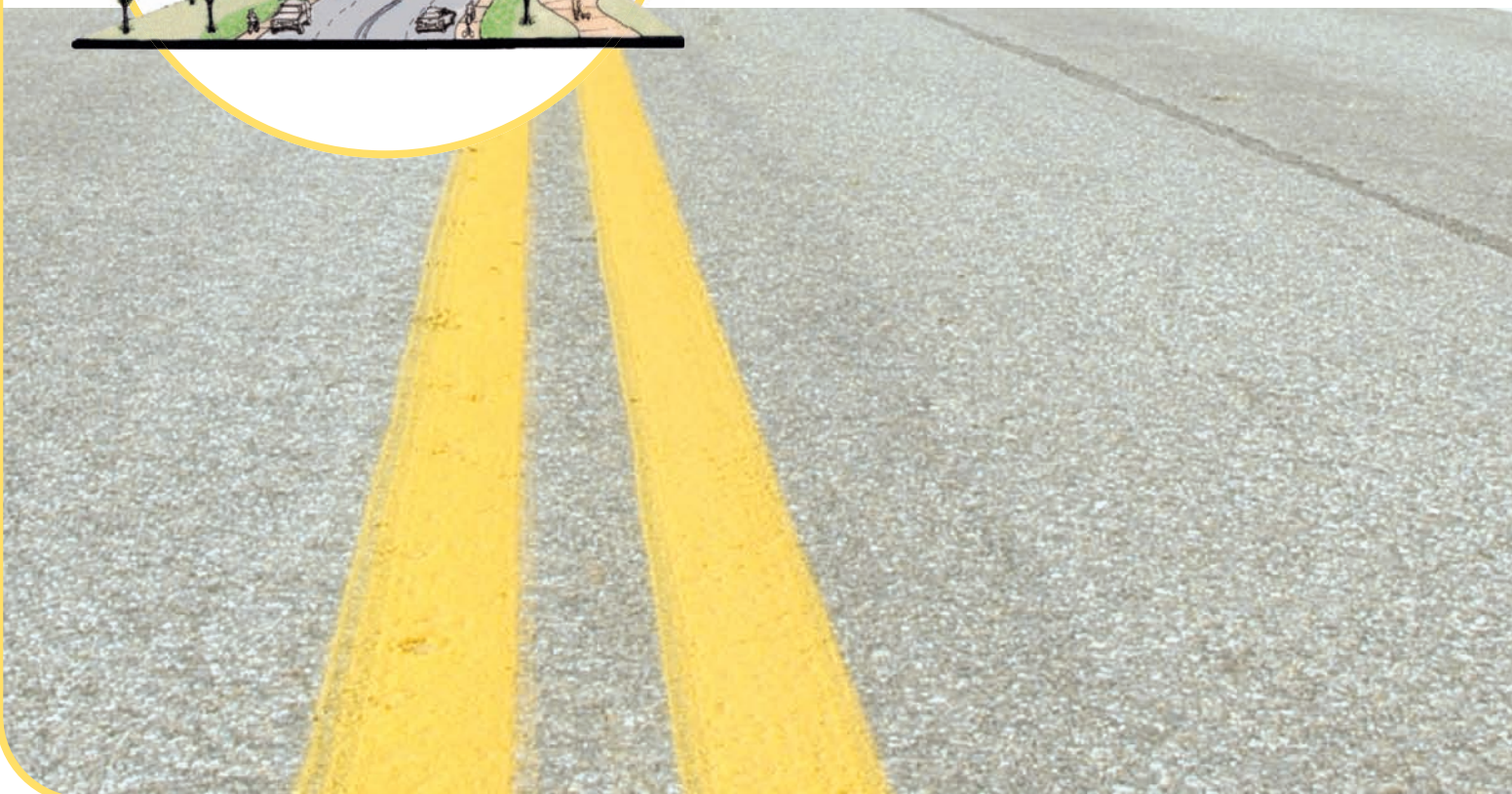
DELAWARE VALLEY
REGIONAL PLANNING
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APRIL 2007



US 202

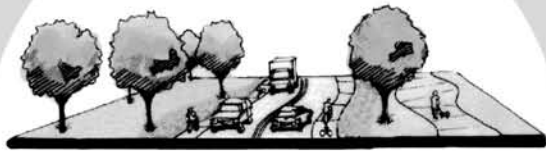
SECTION 700 - TRAFFIC STUDY





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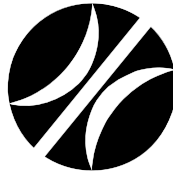


US 202

SECTION 700 - TRAFFIC STUDY



Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty, and intercity agency which provides continuing, comprehensive, and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer counties in New Jersey. DVRPC provides technical assistance and services, conducts high priority studies that respond to the request and demands of member state and local governments, fosters cooperation among various constituents to forge a consensus on diverse regional issues, determines and meets the needs of the private sector, and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the commission.



Our logo is adapted from the official DVRPC seal, and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. This report was primarily funded by the Pennsylvania Department of Transportation. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

TABLE OF CONTENTS

- EXECUTIVE SUMMARY 1
- I. INTRODUCTION 3
- II. CHARACTERISTICS THE US 202 CORRIDOR 5
 - A. Current Average Daily Traffic Volumes 7
 - B. Current AM and PM Peak Hour Traffic Volumes 11
- III. IMPROVEMENT ALTERNATIVES FOR US 202 SECTION 700 19
 - A. No-Build Alternative 19
 - B. US 202 Section 700 Parkway Alternative 19
 - C. Widen Upper State Road Alternative 20
 - D. Combination Alternative 20
- IV. TRAVEL FORECASTING PROCEDURES 21
 - A. Socio-Economic Projections 21
 - 1. Population Forecasting 21
 - 2. Employment Forecasting 22
 - 3. US 202 Section 700 Study Area Forecasts 22
 - B. DVRPC's Travel Simulation Process 24
 - 1. Trip Generation 25
 - 2. Evans Iterations 25
 - 3. Trip Distribution 27
 - 4. Modal Split 27
 - 5. Highway Assignment 27
 - 6. Transit Assignment 28
 - C. Traffic Assignment Validation 28
- V. PROJECTED TRAFFIC VOLUMES 29
 - A. Daily Traffic Forecasts 29
 - 1. No-Build Alternative 29
 - 2. US 202 Parkway Alternative 37
 - 3. Widen Upper State Road Alternative 38
 - 4. Combination Alternative 39
 - B. AM and PM Peak Hour Forecasts 39
 - 1. No-Build Alternative 40
 - 2. Parkway Alternative 45
 - 3. Combination Alternative 53
- VI. SUMMARY 59

LIST OF TABLES

1. Study Area Population and Employment	23
2. Current and 2020 Average Daily Traffic Volumes in the US 202 Section 700 Corridor	33
3. Current and 2020 Average Daily Traffic Volumes North of the Section 700 Corridor	36

LIST OF FIGURES

1. US 202 Section 700 Study Area	6
2. Current Average Daily Traffic Volumes	9
3. Intersection Locations for AM and PM Peak Hour Turning Movement Counts and Forecasts	13
4. Current AM and PM Peak Hour Intersection Turning Movement Counts	15
5. DVRPC's Travel Simulation Modeling Process	26
6. Current and 2020 AADT Volumes for the No-Build and Build Alternatives	31
7. 2020 No-Build Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts	41
8. 2020 Parkway Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts	47
9. 2020 Combination Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts	55

EXECUTIVE SUMMARY

This report documents 2020 traffic forecasts for the US 202 Section 700 corridor. US 202 Section 700 extends from PA 63, Welsh Road, in Montgomery County to the Doylestown Bypass (US 202 / PA 611 Bypass) in Bucks County. The Delaware Valley Regional Planning Commission's (DVRPC) regional travel forecasting models were used to prepare 2020 traffic volume estimates for study area roadways under a No-Build and three Build alternatives. The build alternatives include widening Upper State and Shady Retreat roads, relocating US 202 on a new alignment with controlled-access at-grade Parkway of both four-lane and two-lane cross-section, and widening Upper State Road with a new alignment connector.

Section 700 of US 202 currently experiences recurring congestion and delays and backups at many critical intersections. Considerable growth in population and employment in many of the municipalities in and around the Section 700 corridor will exacerbate this situation. With no improvement to Section 700, traffic volumes along US 202 are projected to increase by about 3,000 to 4,000 vehicles per day over current volumes. Parallel facilities, including Upper State, Stump, and Lower State roads, will also experience 2020 traffic volumes that are significantly higher than current conditions.

Constructing the US 202 Parkway will result in lower traffic volumes on existing US 202 Section 700 and all of its parallel facilities within the study area. The other improvement alternatives considered for the US 202 Section 700 corridor, Widen Upper State Road and the Combination Alternative also provide traffic relief to existing US 202 Section 700 and its parallel facilities, compared to the No-Build Alternative. These traffic volume reductions, however, are generally less than the relief provided by the proposed US 202 Section 700 Parkway.

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I. INTRODUCTION

This report, requested by the Pennsylvania Department of Transportation (PENNDOT), documents 2020 traffic forecasts for the US 202 Section 700 corridor. In preparation for projecting future traffic volumes, traffic counts throughout the study area were collected by PENNDOT's consultants and the Delaware Valley Regional Planning Commission (DVRPC). Municipal and county planners were contacted to identify the significant proposed residential and commercial developments within the corridor. DVRPC's regional traffic simulation model was focused on the corridor and used to prepare 2020 traffic volume estimates for study area roadways under a No-Build and three Build alternatives.

A focused travel simulation model was conducted using DVRPC's regional travel forecasting models. The traffic zones in the study area were subdivided into smaller zones to better reflect the highway network and land use characteristics of the study area. The model's highway network within the study area was reviewed and modified as needed to reflect the detailed nature of the traffic improvements to be tested.

Chapter II of this report documents the existing characteristics of the US 202 corridor, including current daily and AM and PM peak traffic volumes. The alternatives analyzed in this study are described in Chapter III. Chapter IV explains the travel forecasting methodology, with a brief discussion of the traffic simulation model used to develop the traffic projections. The regional demographic and employment forecasts which form the basis for the traffic forecasts are also presented in the chapter. Finally, Chapter V presents an analysis of the requested travel forecasts for the US 202 corridor. These forecasts represent projected 2020 daily traffic volumes and AM and PM peak hour intersection turning movements for 42 intersections in the corridor.

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II. CHARACTERISTICS THE US 202 CORRIDOR

US 202 stretches from Wilmington, Delaware, to Bangor, Maine. In the DVRPC region, US 202 covers 61 miles, traversing 27 municipalities in Delaware, Chester, Montgomery, and Bucks counties and provides connections to the states of Delaware and New Jersey. Within Pennsylvania, it provides a circumferential route around the Philadelphia metropolitan area and connects the county seats of Chester, Montgomery, and Bucks counties. It also serves as a major commuter route and is a vital link for business and industry. The cross-section of US 202 varies from a two-lane arterial to a six-lane freeway.

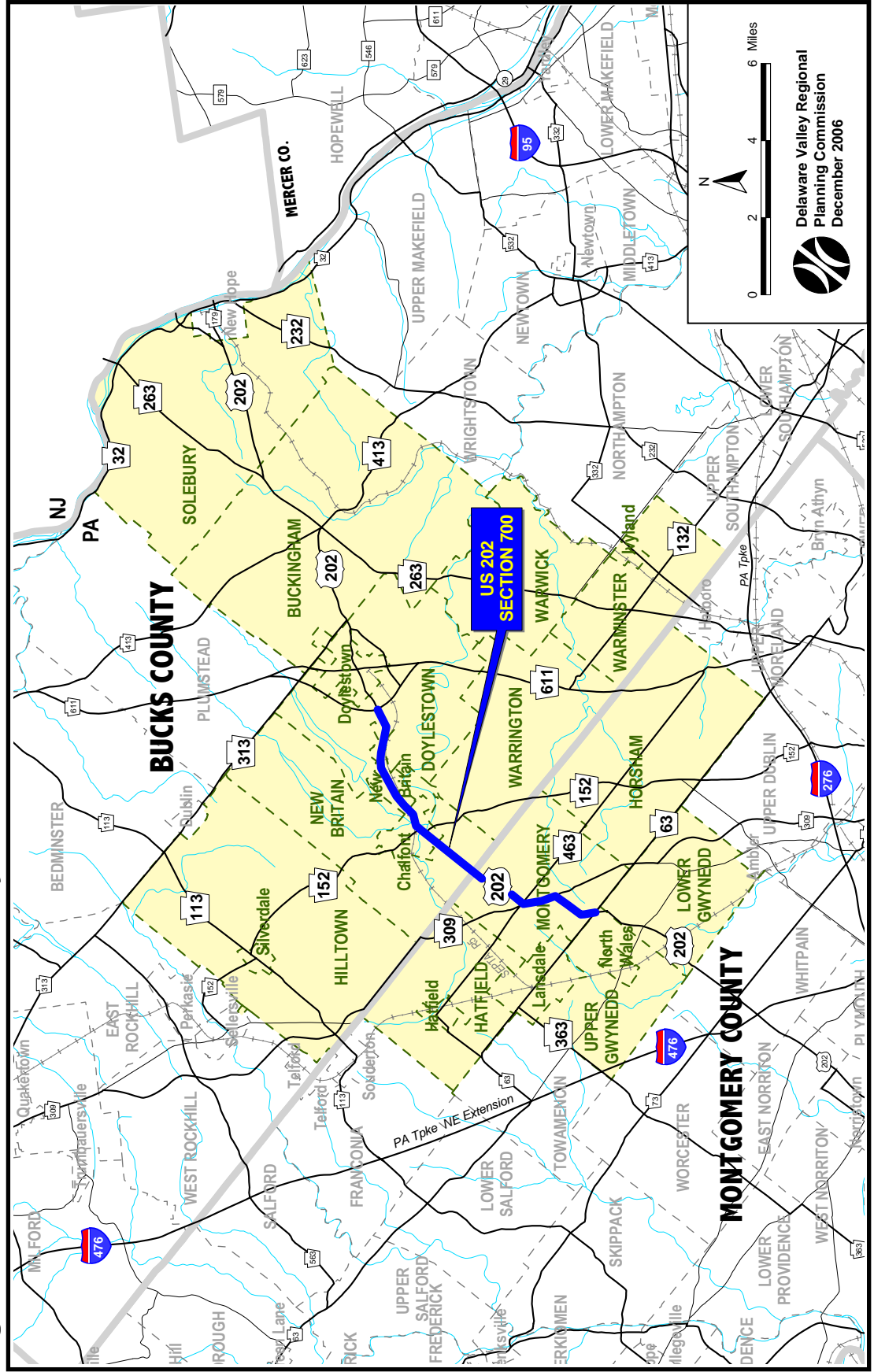
US 202 is part of the National Highway System (NHS) which was defined under the 1995 National Highway System Designation Act. The National Highway System consists of interconnected urban and rural principal arterials and highways that serve major population centers, international border crossings, ports, airports, public transportation facilities, other intermodal transportation facilities, and other major travel destinations; meet national defense requirements; and serve interstate and interregional travel.

For planning purposes, US 202 has been divided into seven major sections (100 through 700). The limits of Section 700 are from PA 63, Welsh Road, in Montgomery County to the Doylestown Bypass (US 202 / PA 611 Bypass) in Bucks County. US 202 Section 700 passes through the municipalities of Montgomery Township, New Britain Township, Chalfont Borough, New Britain Borough, Doylestown Township, and Doylestown Borough. Other municipalities in the greater study area include Hatfield Borough and Township, Horsham Township, Lansdale Borough, Lower Gwynedd Township, North Wales Borough, and Upper Gwynedd Township in Montgomery County and Buckingham Township, Hilltown Township, Ivyland Borough, Silverdale Borough, Solebury Township, Warminster Township, Warrington Township, and Warwick Township in Bucks County. Figure 1 displays the US 202 Section 700 study area.

Section 700 of US 202 is a two-lane principle arterial, except for an approximately one-mile four-lane section in Montgomery Township, which carries a shared designation of US 202 / PA 309. Adjacent land uses include both residential and commercial. Throughout this section there are numerous intersections with other major roadways, minor arterials, local roads, and the driveways of abutting land-uses. North of Section 700, US 202 joins the PA 611 Bypass, then splits off as the US 202 Bypass. Both of these bypasses are four-lane freeways. North of PA 313 (Swamp Road), US 202 again becomes a two-lane principal arterial.

Additional capacity in the Section 700 corridor has been proposed because of the historic and projected growth trends along the Section 700 corridor and the current congestion levels along US 202. Recurring congestion and the resulting delays and backups at many critical intersections are curbing US 202's role as a key circumferential arterial in the regional highway network. As congestion levels have increased along Section 700, more and more traffic is being diverted to parallel facilities, which are classified as minor arterials, collectors, or local roads.

Figure 1. US 202 Section 700 Study Area



An extensive traffic counting effort was conducted in order to determine the current traffic volumes throughout the study area. Daily traffic volumes were counted at over 120 locations, and AM and PM peak hour intersection turning movements were recorded at over 30 key intersections in the Section 700 corridor. Most counts were taken in 2005 or 2006.

A. Current Average Daily Traffic Volumes

Figure 2 shows the current average annual daily traffic (AADT) volumes for the significant facilities in the study area. Daily traffic volumes along Section 700 of US 202 range from 15,800 vehicles per day (vpd) to 34,300 vpd. The highest volume on Section 700 occurs where US 202 and PA 309 coincide. The lowest volumes on Section 700 are between PA 463 (Horsham / Cowpath Road) and PA 152 (Limekiln Pike).

North of Section 700, where US 202 joins the PA 611 Bypass, it carries 31,700 vpd. After it splits off from PA 611, the US 202 Bypass carries between 9,700 and 12,800 vpd. North of Swamp Road, US 202 carries considerably higher volumes despite its two-lane cross section. Average daily volumes range from 10,500 to 21,300 vpd in this area.

Although there are several parallel facilities to Section 700 of US 202, none serve as many vehicles as Section 700. Upper State/Shady Retreat Road carries between 8,400 and 15,900 vehicles per day; Stump Road carries 1,800 to 15,500 vpd; and Lower State Road carries 5,500 to 11,800 vehicles per day. Of these, only Lower State Road serves its higher volumes on the north side of County Line Road. The other parallel facilities of Hartman, Kenas, and Folly roads, carry 5,800 vpd or less.

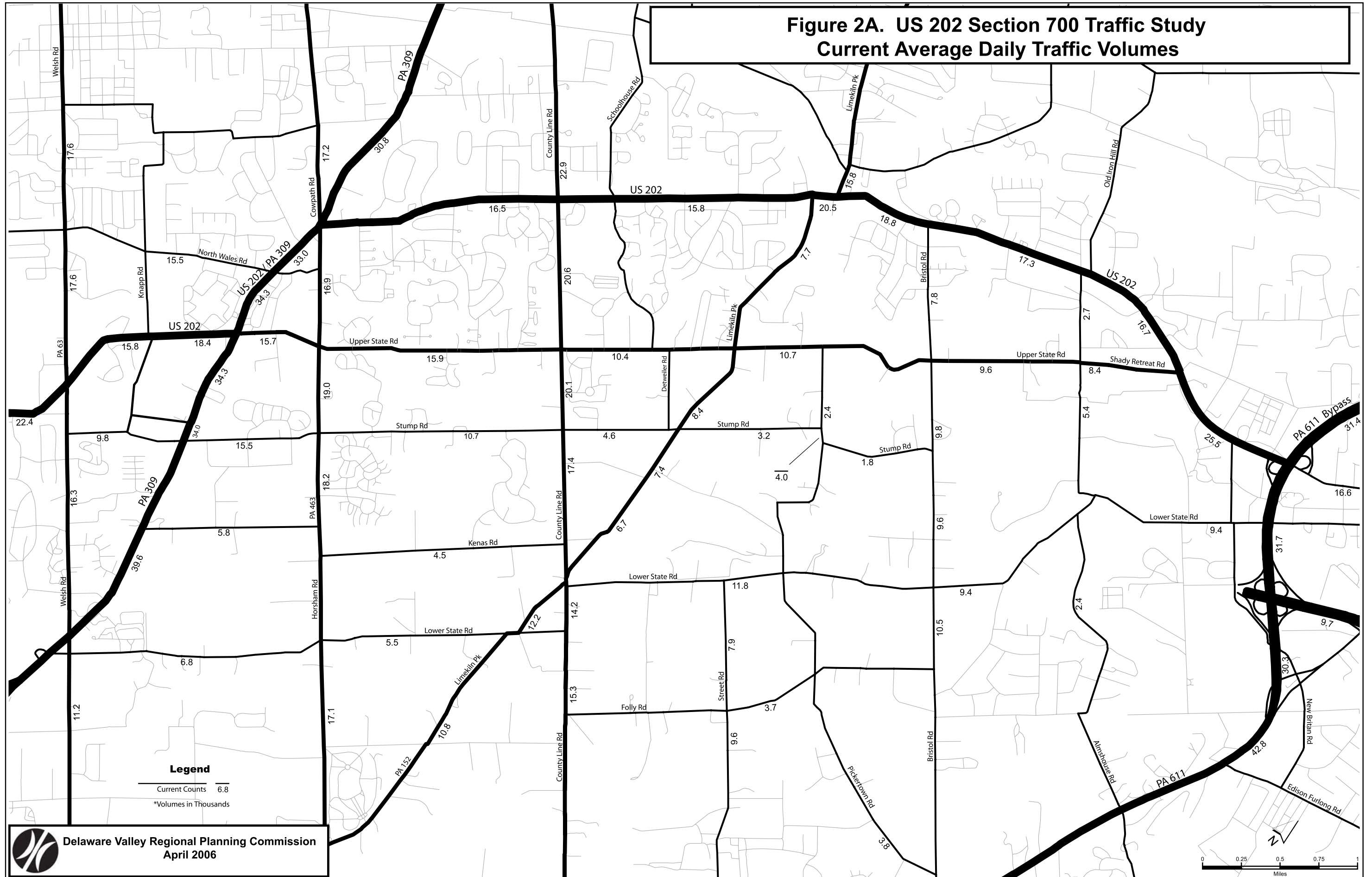
PA 309 crosses Section 700 near its southern end and the PA 611 Bypass intersects Section 700 at its northern end. These four-lane facilities carry the highest volumes of the crossing facilities in the study area. PA 309 carries between 30,800 and 39,600 vpd and PA 611 carries between 30,300 and 42,800 vehicles per day.

Of the two-lane facilities that intersect US 202 Section 700, both Horsham and County Line roads serve relatively high volumes of traffic. Horsham Road carries between 16,900 and 19,000 vpd and County Line Road carries between 14,200 and 22,900 vpd. Other crossing facilities include Limekiln Pike, which carries between 6,700 and 15,800 vpd; Bristol Road, which carries between 7,800 and 10,500 vpd; and Almshouse Road, which serves between 2,400 and 5,400 vpd.

North of Section 700, major facilities that intersect with US 202 include PA 611 / Main Street in Doylestown and PA 313 (Swamp Road). Within Doylestown Borough, PA 611 carries between 13,200 and 15,300 vpd. Swamp Road serves between 13,800 and 21,000 vehicle per day.

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**Figure 2A. US 202 Section 700 Traffic Study
Current Average Daily Traffic Volumes**



B. Current AM and PM Peak Hour Traffic Volumes

Numerous intersection turning movement counts were conducted throughout the study area to determine AM and PM peak hour volumes. Figure 3 shows the locations of the major study area intersections for which turning movement counts and forecasts are available. This intersection location figure also includes the new intersections that would result from construction of the Build alternatives. Figure 4 displays the counted AM and PM peak hour traffic volumes, including turning movements, at 30 key intersections in the US 202 Section 700 corridor.

Along US 202 Section 700 in the AM peak hour, northbound volumes range from 287 to 936 vehicles per hour (vph), with the highest volumes occurring where US 202 and PA 309 are coincident and in the area north of PA 152 (Limekiln Pike). Southbound volumes are generally higher and range from 426 to 1,587 vph, with the highest volumes at US 202 / PA 309 and between the two Limekiln Pike intersections with Section 700.

PM peak hour volumes along US 202 Section 700 are generally higher than the corresponding AM peak hour volume, especially in the northbound direction. Northbound PM peak hour volumes range from 471 to 1,523 vph, while southbound volumes are between 371 and 1,351 vph.

Along Upper State Road, heavy volumes are observed in the southbound direction in both the AM and PM peak hours and in the northbound direction in the PM peak hour. The AM peak hour volumes in the northbound direction range from 329 to 559 vph, while the southbound AM peak hour volumes are as high as 1,024 vph. During the PM peak hour, volumes are between 432 and 1,089 in the southbound direction and between 538 and 993 vph. The heaviest peak hour volumes on Upper State Road occur at its southern end, at its intersections with PA 309, Horsham Road, and County Line Road. The lowest volumes are at its northern terminus, just north of Bristol Road, where Upper State Road becomes Shady Retreat Road.

The peak hour traffic volumes on Stump Road have a similar pattern to Upper State Road, but with somewhat lower volumes. Again, the lowest volumes tend to occur in the northbound direction during the AM peak hour. The heaviest volumes are the southbound AM peak hour volumes and the northbound PM peak hour volumes.

Along the cross streets in the study area, the eastbound direction tends to serve the highest volumes during the AM peak hour and the westbound direction the heaviest volumes during the PM peak hour. Within the US 202 Section 700 corridor area, the highest volumes on most cross streets occur between their intersections with Upper State and Stump roads. This is true for both the AM and PM peak hours in both directions.

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Figure 3. US 202 Section 700 Traffic Study Intersection Locations for AM and PM Peak Hour Turning Movement Counts and Forecasts

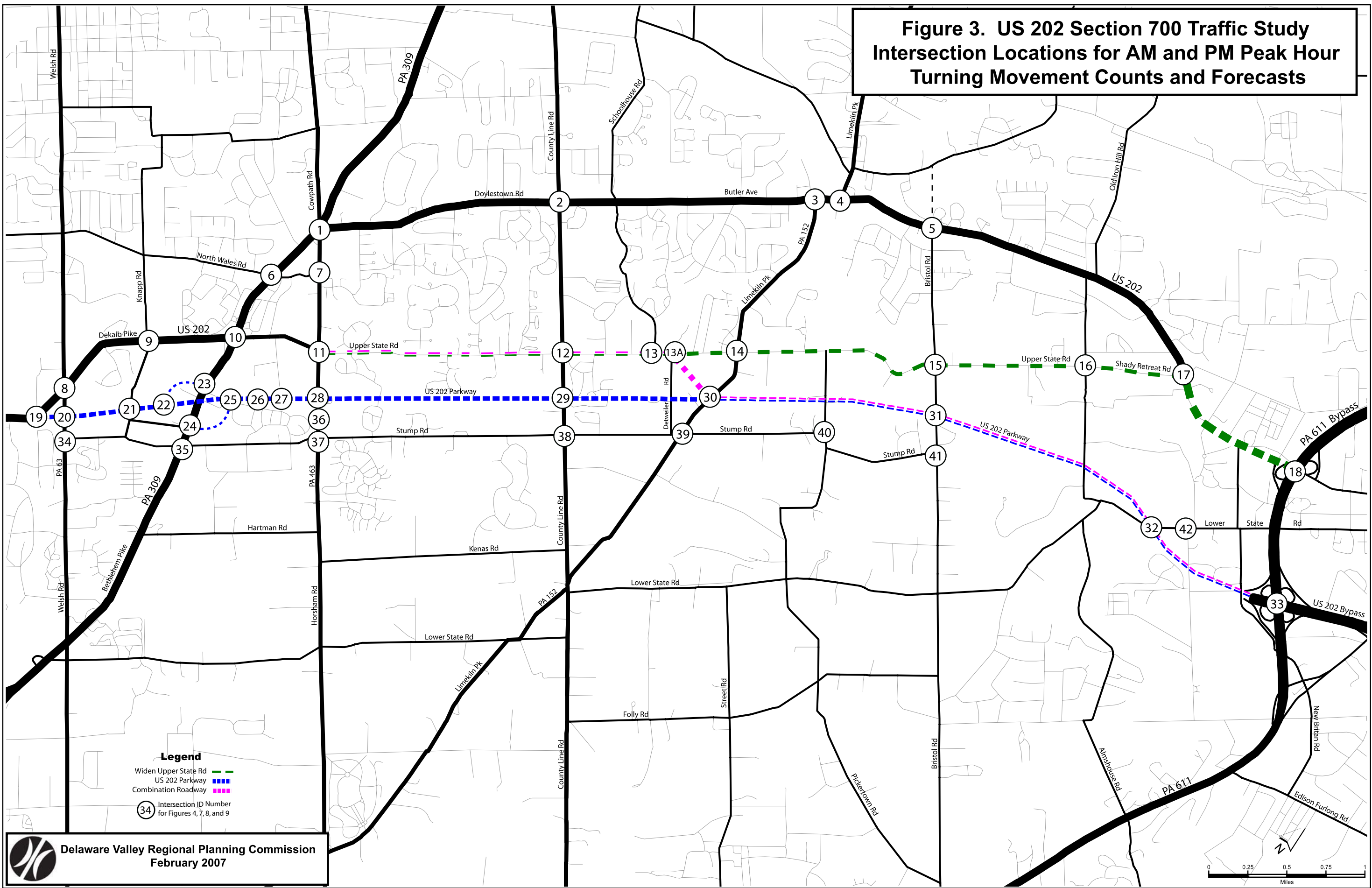


Figure 4A. US 202 Section 700 Traffic Study, Current AM and PM Peak Hour Intersection Turning Movement Counts

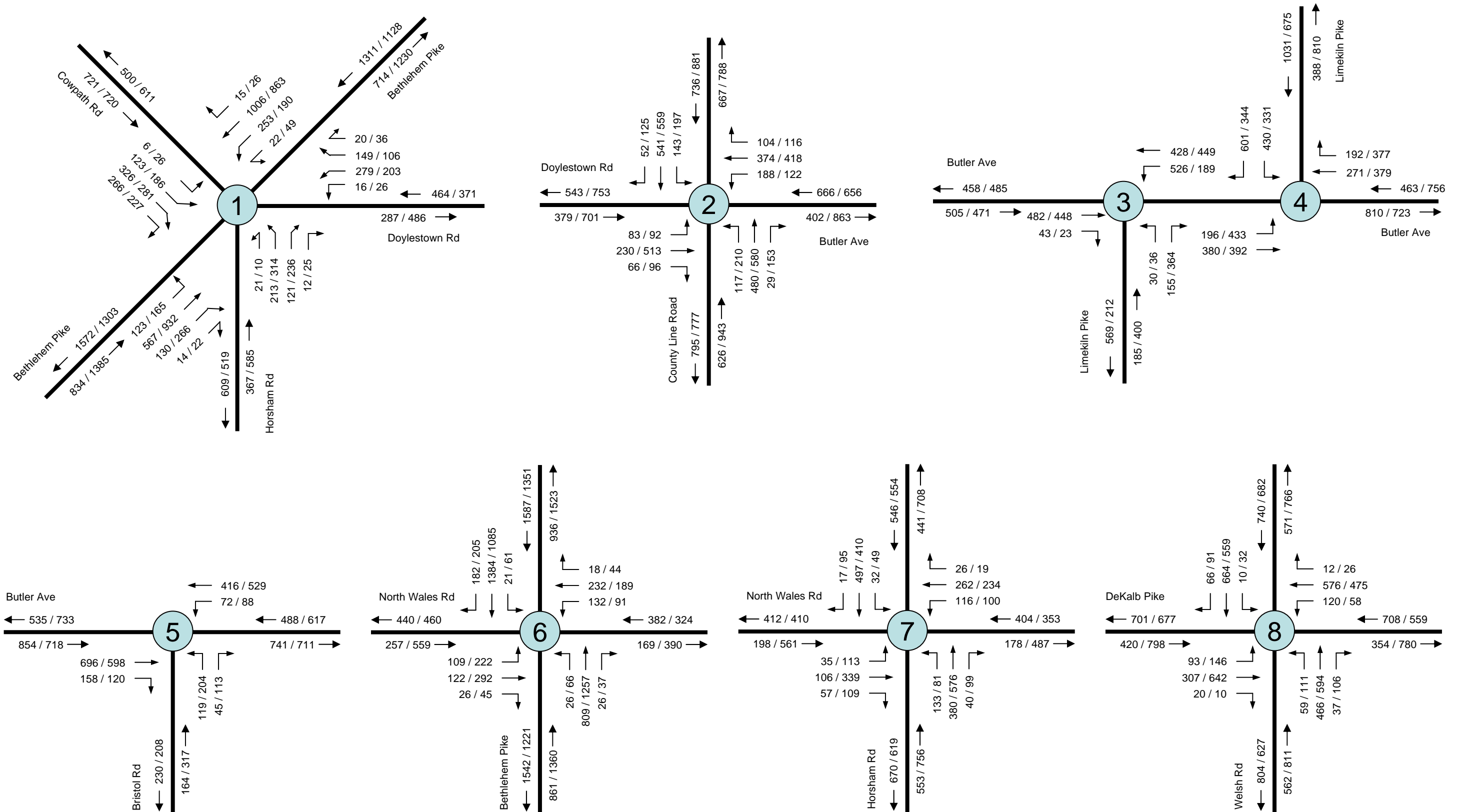


Figure 4B. US 202 Section 700 Traffic Study, Current AM and PM Peak Hour Intersection Turning Movement Counts

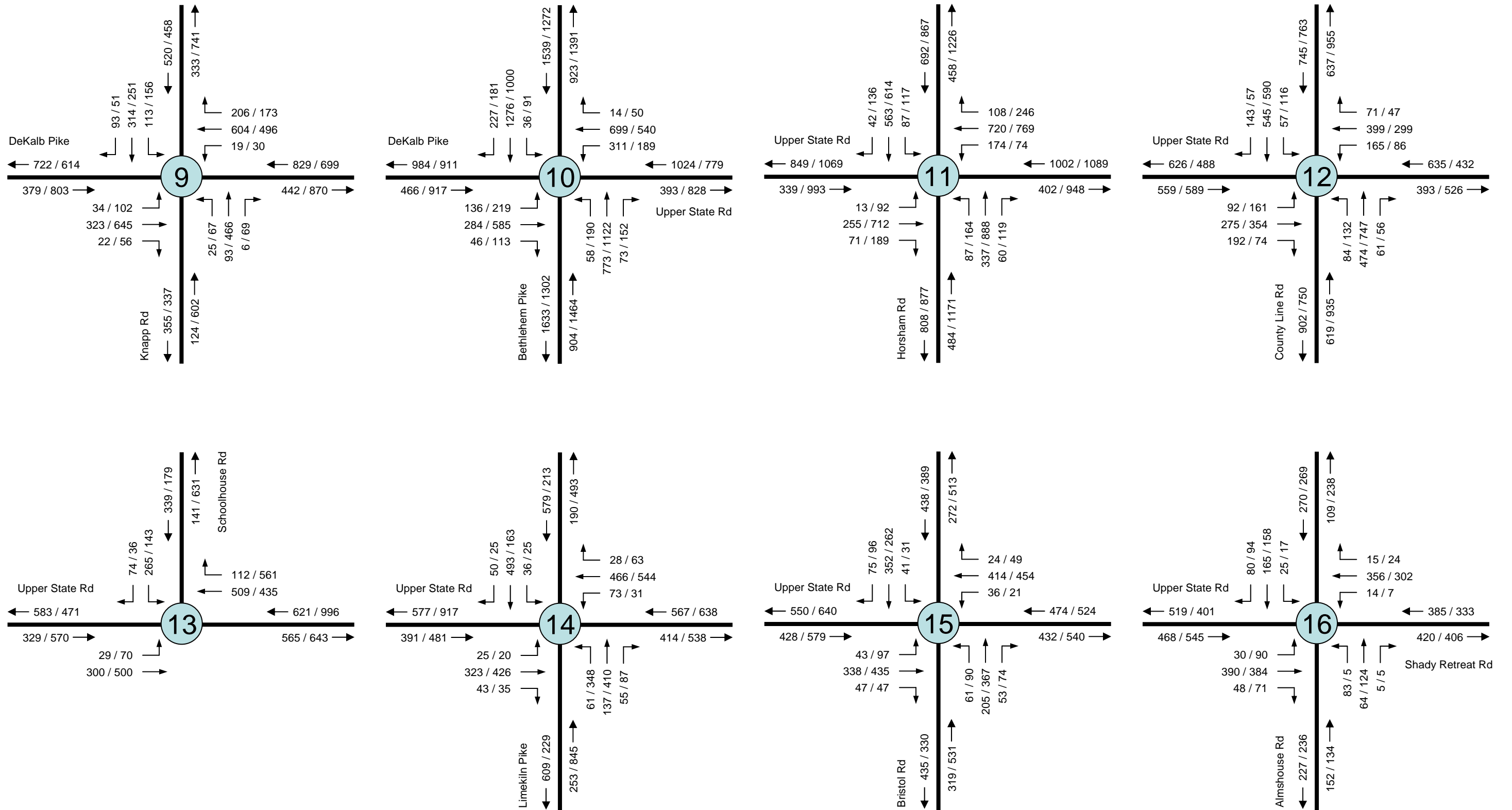


Figure 4C. US 202 Section 700 Traffic Study, Current AM and PM Peak Hour Intersection Turning Movement Counts

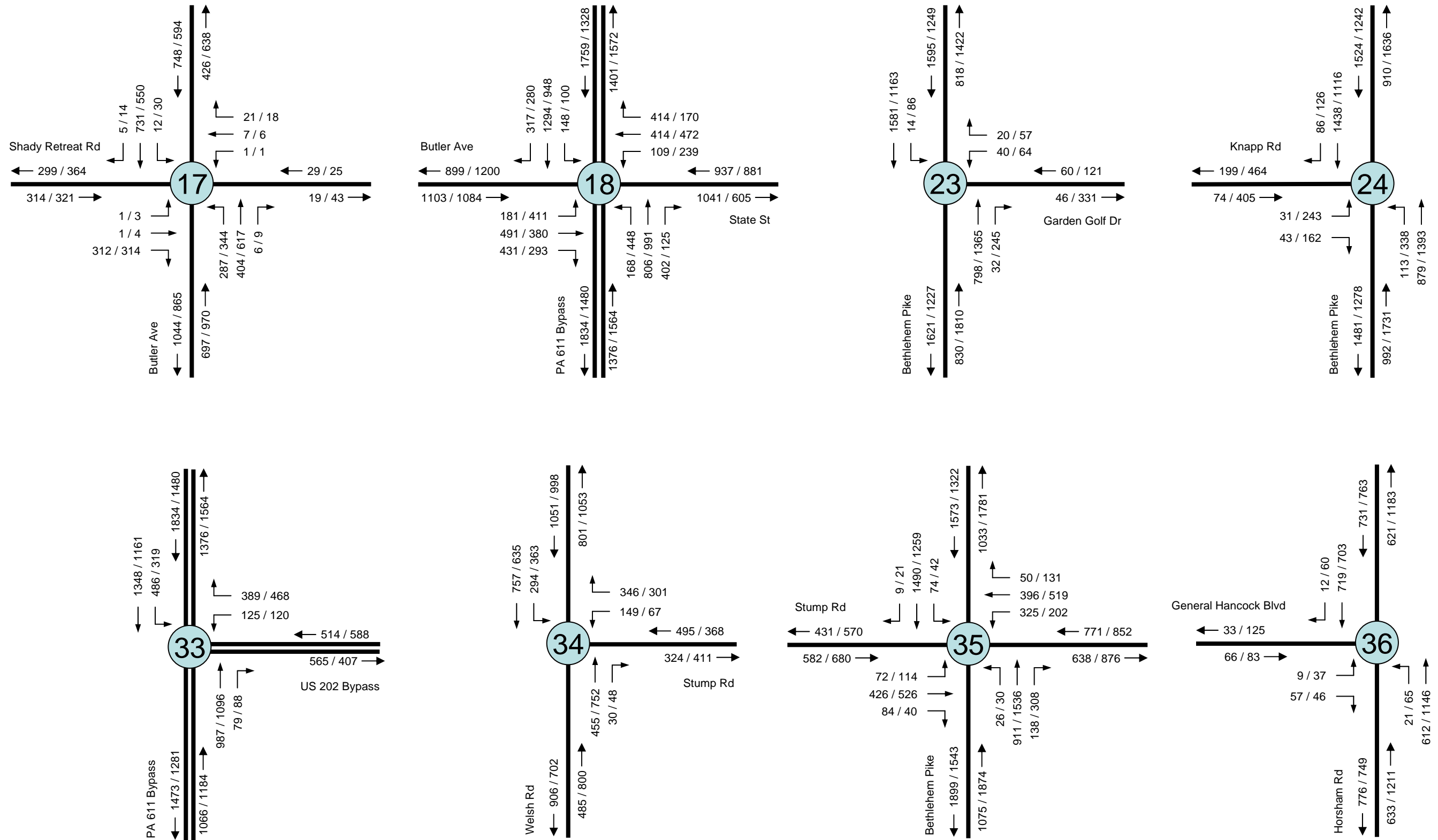
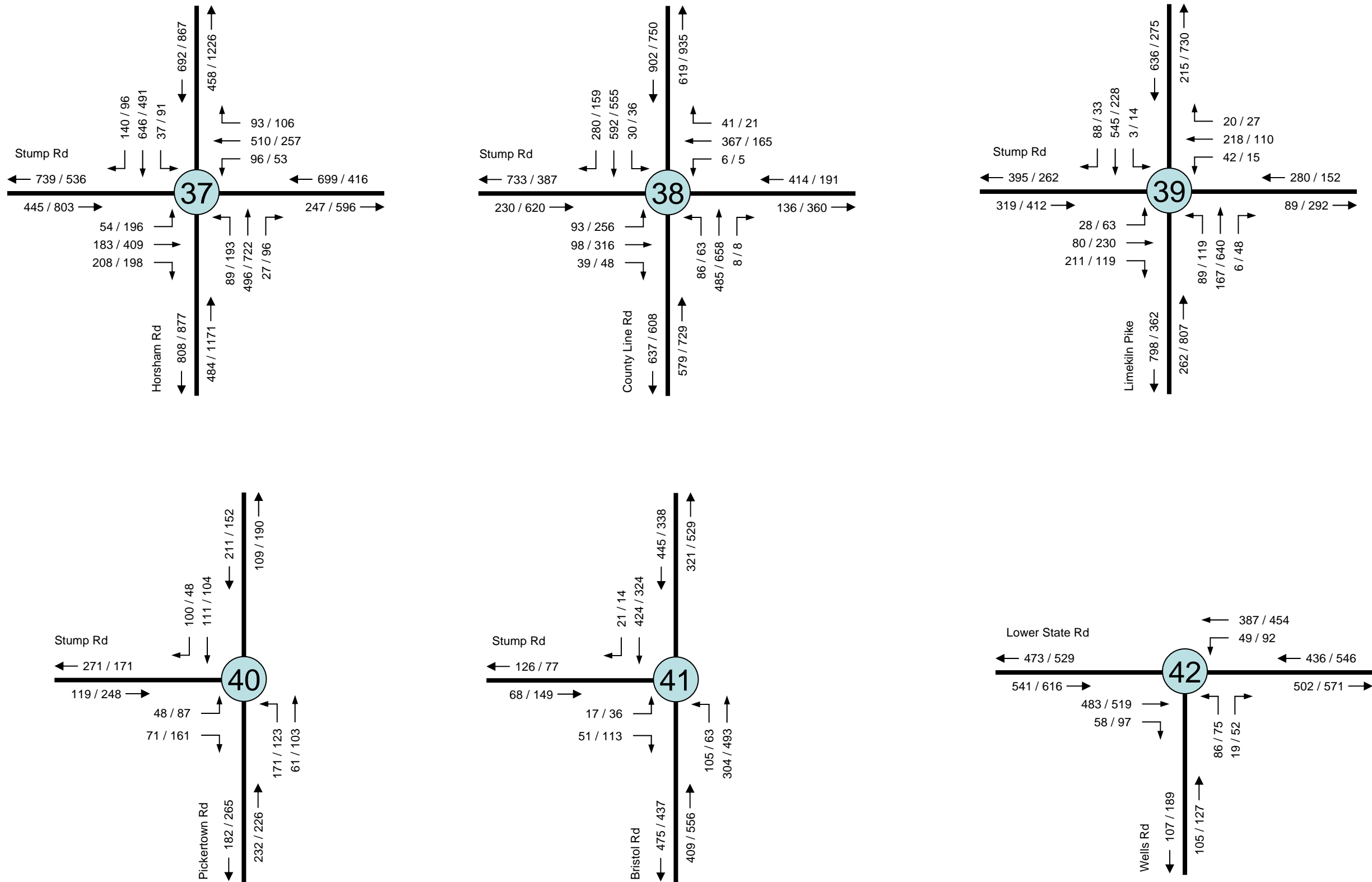


Figure 4D. US 202 Section 700 Traffic Study, Current AM and PM Peak Hour Intersection Turning Movement Counts



III. IMPROVEMENT ALTERNATIVES FOR US 202 SECTION 700

Previous planning efforts, including an Environmental Impact Statement completed in the late 1990s, evaluated over a dozen different alternatives for their ability to safely and more effectively accommodate the travel demand in the Section 700 corridor. These included a No-Build (or No Action) alternative, a Congestion Management System alternative, a Transportation Systems Management alternative, widening existing US 202, Widening existing US 202 with a Chalfont runaround, widening Upper State and Shady Retreat roads, relocating US 202 on a new alignment between Upper State and Stump roads, widening Upper State Road with a new alignment connector, widening Stump Road with new alignment connectors, a relief corridor northwest of US 202, a new alignment southeast of Stump Road, and a mass transit alternative. There were also several different variations on the new alignment between Upper State and Stump roads, including an at-grade four-lane arterial and four-lane expressways with interchanges at various locations.

Most of these alternatives have been eliminated from consideration. For transportation planning purposes and documenting environmental impacts, traffic forecasts have been requested by PENNDOT and their consultants for a No-Build and three Build alternatives. The build alternatives include widening Upper State and Shady Retreat roads, relocating US 202 on a new alignment with a controlled-access at-grade Parkway of both four-lane and two-lane cross-section, and widening Upper State Road with a new alignment connector.

A. No-Build Alternative

In this alternative, no improvements to US 202 Section 700 are considered. The No-Build Alternative does, however, assume the implementation of various planned and programmed improvements to other regional facilities. Generally, the facility improvements included in the travel simulation model network are projects included in DVRPC's Long Range Transportation Plan. Significant projects affecting the Section 700 study area include: widening County Line Road from US 202 to Kulp Road, widening Horsham Road (PA 463) from North Wales Road to PA 611, constructing a two-lane extension of Bristol Road from US 202 to Park Avenue, widening US 202 Section 600 from Johnson Highway to Bethlehem Pike (PA 309), and intersection improvements at the US 202 / PA 309 / PA 463 (Five Points) intersection. Other projects which may affect travel patterns through the study area include construction of the PA 309 Connector from Sumneytown Pike (PA 63) to County Line Road and intersection improvements at the US 202 / PA 313 (Pools Corner) intersection. These projects are also included as part of each of the Build alternatives.

B. US 202 Section 700 Parkway Alternative

This alternative was developed by a US 202 Section 700 Community Task Force comprised of representatives from Buckingham, Doylestown, Lower Gwynedd,

Montgomery, New Britain, Solebury, Upper Gwynedd, and Warrington townships; Chalfont, Doylestown, and New Britain boroughs; Bucks and Montgomery county planning commissions; elected officials; and various state and federal resource agencies. Together, they specified a new alignment parkway for US 202 Section 700 that would have four travel lanes from PA 63 (Welsh Road) to PA 463 (Horsham Road) and two lanes from PA 463 to PA 611. The US 202 Parkway would be controlled-access, meaning that no access to private properties along the Parkway would be provided. Access to and from the Parkway would only occur at its intersections with Welsh, Knapp, Horsham, and County Line roads; Limekiln Pike; Bristol and Lower State roads, and the PA 611 and US 202 Bypasses via an existing cloverleaf interchange. Additional connections would allow for vehicles movements between the 202 Parkway and PA 309 and between the Parkway and General Hancock Boulevard. In addition, an independent shared-use path would also be provided to accommodate pedestrians and bicyclists.

C. Widen Upper State Road Alternative

This alternative would provide a continuous four-lane arterial roadway within the Section 700 corridor. Upper State Road is currently four lanes from PA 63 to PA 463. This alternative would widen Upper State Road from Horsham Road (PA 463) to Almshouse Road, where Upper State Road becomes Shady Retreat Road. Shady Retreat Road would also be widened to four lanes from Almshouse Road to Butler Avenue (US 202), and Butler Avenue would be widened from Shady Retreat Road to its interchange with the PA 611 Bypass. A two-lane center left-turn lane would also be provided along Upper State Road from PA 463 to County Line Road and along Butler Avenue from Shady Retreat Road to PA 611. Access to private properties abutting Upper State/Shady Retreat Road would continue to be provided.

D. Combination Alternative

This alternative includes a combination of Upper State Road widening and a new alignment Parkway. Under this alternative, Upper State Road would be widened between Horsham and County Line roads to four travel lanes with a center turn lane. Upper State Road would also be widened to four travel lanes between County Line Road and Detweiler Road, and then transition onto a new alignment just north of Detweiler Road. The new alignment portion of this alternative would be a two-lane, controlled-access parkway with at-grade intersections at Limekiln Pike, Bristol Road, and Lower State Road, terminating at the US 202 / PA 611 Bypass interchange.

IV. TRAVEL FORECASTING PROCEDURES

DVRPC's travel simulation models are used to forecast future travel patterns. These models utilize a system of traffic zones that follow Census boundaries and rely on demographic and employment data, land use, and transportation network characteristics to simulate trip making patterns throughout the region.

A. Socio-Economic Projections

DVRPC's long-range population and employment forecasts are revised periodically to reflect changing market trends, development patterns, local and national economic conditions, and available data. The completed forecasts reflect all reasonably known current information and the best professional judgement of predicted future conditions. The revised forecasts adopted by the DVRPC Board in February 2005 are an update to municipal forecasts that were last completed in 2000.

DVRPC uses a multi-step, multi-source methodology to produce its forecasts at the county level. County forecasts serve as control totals for municipal forecasts, which are disaggregated from county totals. Municipal forecasts are based on an analysis of historical data trends adjusted to account for infrastructure availability, environmental constraints to development, local zoning policy, and development proposals. Municipal population forecasts are constrained using density ceilings and floors. County, and where necessary, municipal input is used throughout the process to derive the most likely population forecasts for all geographic levels.

1. Population Forecasting

Population forecasting at the regional level involves review and analysis of six major components: births, deaths, domestic in-migration, domestic out-migration, international immigration, and changes in group quarters populations (e.g., dormitories, military barracks, prisons, and nursing homes). DVRPC uses both the cohort survival concept to age individuals from one age group to the next, and a modified Markov transition probability model based on the most recent US Census and the US Census' recent Current Population Survey (CPS) research to determine the flow of individuals between the Delaware Valley and the outside world. For movement within the region, Census and IRS migration data, coupled with CPS data, are used to determine migration rates between counties. DVRPC relies on county planning offices to provide information on any known, expected, or forecasted changes in group quarters populations. These major population components are then aggregated and the resulting population forecasts are reviewed by member governments for final adjustments based on local knowledge.

2. Employment Forecasting

Employment is influenced by local, national, and global political and socio-economic factors. The US Census Bureau provides the most reasonable and consistent time series data on county employment by sector, and serves as DVRPC's primary data source for employment forecasting. Employment sectors include mining, agriculture, construction, manufacturing, transportation, wholesale, retail, finance/insurance, service, government, and military. Other supplemental sources of data include the Bureau of Economic Analysis, the Bureau of Labor Statistics, Occupational Privilege tax data, and other public and private sector forecasts. As in the population forecasts, county level total employment is used as a control total for sector distribution and municipal level forecasts. Forecasts are then reviewed by member counties for final adjustments based on local knowledge.

3. US 202 Section 700 Study Area Forecasts

As part of the US 202 Section 700 traffic study, DVRPC staff reviewed its most recent current population and employment estimates, its long-range population and employment forecasts, and all proposed land-use developments in the study area known to Bucks and Montgomery County Planning Commission staff. Based on this review, DVRPC developed 2020 municipal-level population and employment forecasts for use as inputs to the traffic simulation models. Because the long-range forecasts were recently updated, only very minor revisions were made to the 2020 population and employment forecasts for use in this study. Table 1, summarizes the population and employment forecasts used for the improvement alternatives in the US 202 Section 700 Traffic Study. The travel forecasts for all future year alternatives are based on a single land-use development scenario and thus have the same 2020 population and employment projections.

Between 2000 and 2020, the total population in the greater study area is projected to increase by 61,550 residents to 313,488. On the Bucks County side, the municipalities with the greatest number of new residents include Warminster, Warrington, Warwick, and Buckingham townships. All of these townships are projected to add 5,000 or more new residents between 2000 and 2020. Warminster Township will add over 8,600 people during this time. The fastest growing study area municipalities in Montgomery County in terms of population growth are Montgomery, Horsham, and Upper Gwynedd townships. None of these, however, will add more than 4,700 residents between 2000 and 2020.

The study area will also add over 40,000 new jobs between 2000 and 2020, an increase of 25 percent. Municipalities that are projected to add 4,000 or more new jobs include Horsham, Montgomery, and Hatfield townships in Montgomery County and Warrington and Doylestown townships in Bucks County.

In 2000, about 56 percent of the study area's population and 39 percent of its jobs were located in the Bucks County portion of the study area. By 2020, the Bucks County portion will account for 60 percent of the population and 42 percent of the study area employment.

Table 1. Study Area Population and Employment

Municipality	Population				Employment					
	2000		2020		2000		2020		2000 - 2020 Growth	
	Abs.	Pct.	Abs.	Pct.	Abs.	Pct.	Abs.	Pct.		
Hatfield Borough	2,605	2,500	-105	-4.0%	1,950	1,999	49	2.5%		
Hatfield Township	16,712	18,970	2,258	13.5%	13,473	17,494	4,021	29.8%		
Horsham Township	24,232	27,420	3,188	13.2%	28,938	33,957	5,019	17.3%		
Lansdale Borough	16,071	16,420	349	2.2%	10,604	11,085	481	4.5%		
Lower Gwynedd Township	10,422	12,080	1,658	15.9%	8,519	10,182	1,663	19.5%		
Montgomery Township	22,025	26,740	4,715	21.4%	17,127	21,677	4,550	26.6%		
North Wales Borough	3,342	3,210	-132	-3.9%	1,780	1,808	28	1.6%		
Upper Gwynedd Township	14,243	17,377	3,134	22.0%	14,119	16,670	2,551	18.1%		
Montgomery County Municipalities	109,652	124,717	15,065	13.7%	96,510	114,872	18,362	19.0%		
Buckingham Township	16,442	21,470	5,028	30.6%	5,211	7,151	1,940	37.2%		
Chalfont Borough	3,900	4,662	762	19.5%	1,963	2,032	69	3.5%		
Doylestown Borough	8,227	8,580	353	4.3%	11,259	11,790	531	4.7%		
Doylestown Township	17,619	21,430	3,811	21.6%	8,026	12,097	4,071	50.7%		
Hilltown Township	12,100	16,270	4,170	34.5%	4,359	6,015	1,656	38.0%		
Ivyland Borough	492	630	138	28.0%	1,368	1,313	-55	-4.0%		
New Britain Borough	3,125	3,170	45	1.4%	1,047	1,284	237	22.6%		
New Britain Township	10,698	15,440	4,742	44.3%	3,610	6,974	3,364	93.2%		
Silverdale Borough	1,000	1,090	90	9.0%	306	320	14	4.6%		
Solebury Township	7,743	11,730	3,987	51.5%	1,168	2,576	1,408	120.5%		
Warminster Township	31,383	39,989	8,606	27.4%	13,546	15,087	1,541	11.4%		
Warrington Township	17,580	25,120	7,540	42.9%	7,963	12,617	4,654	58.4%		
Warwick Township	11,977	19,190	7,213	60.2%	2,497	5,050	2,553	102.2%		
Bucks County Municipalities	142,286	188,771	46,485	32.7%	62,323	84,306	21,983	35.3%		
Study Area Total	251,938	313,488	61,550	24.4%	158,833	199,178	40,345	25.4%		

B. DVRPC's Travel Simulation Process

For the US 202 study, a focused simulation process was employed. A focused simulation process allows the use of DVRPC's regional simulation models but includes a more detailed representation of the study area. Local streets not included in the regional network, but of interest in this study, are added to the highway network. Traffic zones inside the study area are subdivided so that traffic from existing and proposed land use developments may be loaded more precisely on the network. The focusing process increases the accuracy of the travel forecasts within the detailed study area. At the same time, all existing and proposed highways throughout the region, and their impact on both regional and interregional travel patterns, become an integral part of the simulation process.

DVRPC's travel models follow the traditional steps of trip generation, trip distribution, modal split, and traffic assignment. However, an iterative feedback loop is employed from traffic assignment to the trip distribution step. The feedback loop ensures that the congestion levels used by the models when determining trip origins and destinations are equivalent to those that result from the traffic assignment step. Additionally, the iterative model structure allows trip making patterns to change in response to changes in traffic patterns, congestion levels, and improvements to the transportation system.

The DVRPC travel simulation process uses the Evans Algorithm to iterate the model. Evans re-executes the trip distribution and modal split models based on updated highway speeds after each iteration of highway assignment and assigns a weight to each iteration. This weight is then used to prepare a convex combination of the link volumes and trip tables for the current iteration and a running weighted average of the previous iterations. This algorithm converges rapidly to the equilibrium solution on highway travel speeds and congestion levels. About seven iterations are required for the process to converge to the equilibrium state for US 202 Section 700 travel patterns.

The DVRPC travel simulation models are disaggregated into separate peak, midday, and evening time periods. This disaggregation begins in trip generation where factors are used to separate daily trips into peak, midday, and evening travel. The enhanced process then utilizes completely separate model chains for peak, midday, and evening travel simulation runs. Time of day sensitive inputs to the models such as highway capacities and transit service levels are disaggregated to be reflective of time-period specific conditions. Capacity factors are used to allocate daily highway capacity to each time period. Separate transit networks were used to represent the difference in transit service over the course of a day.

The enhanced model is disaggregated into separate model chains for the peak (combined AM and PM), midday (the period between the AM and PM peaks), and evening (the remainder of the day) periods for the trip distribution, modal split, and travel assignment phases of the process. The peak period is defined as 7:00 AM to 9:00 AM and 3:00 PM to 6:00 PM. Peak period and midday travel are based on a series of factors which

determine the percentage of daily trips that occur during those periods. Evening travel is then defined as the residual after peak and midday travel are removed from daily travel.

External-local productions at the nine-county cordon stations are disaggregated into peak, midday, and evening components using percentages derived from the temporal distribution of traffic counts taken at each cordon station.

Figure 4 provides a flow chart of the travel demand forecasting process. The first step in the process involves generating the number of trips that are produced by and destined for each traffic zone and cordon station throughout the nine-county region.

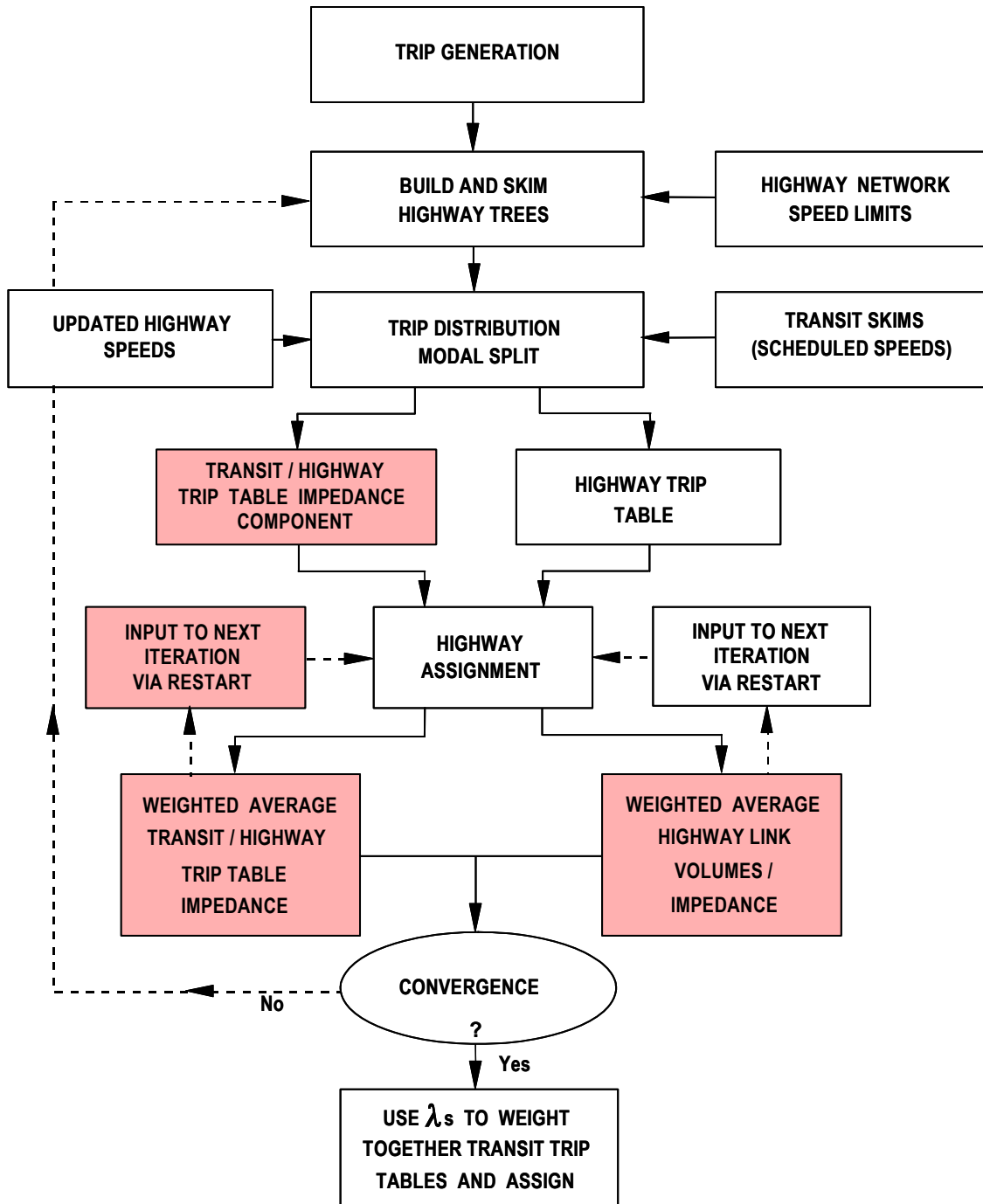
1. Trip Generation

Both internal trips (those made within the DVRPC region) and external trips (those which cross the boundary of the region) must be considered in the simulation of regional travel. For the simulation of travel demand, internal trip generation is based on zonal forecasts of population and employment, whereas external trips are extrapolated from cordon line traffic counts and other sources. The latter also include trips which pass through the Delaware Valley region. Estimates of internal trip productions and attractions by zone are established for each trip purpose on the basis of trip rates applied to the zonal estimates of demographic and employment data. Trip purposes include work and non-work trips, light and heavy truck trips, and taxi trips. This part of the DVRPC model is not iterated on highway travel speed. Rather, estimates of daily trip making by traffic zone are calculated and then disaggregated into peak, midday, and evening time periods.

2. Evans Iterations

The iterative portion of the Evans forecasting process involves updating the highway network restrained link travel speeds, rebuilding the minimum time paths through the network, and skimming the interzonal travel time for the minimum paths. Then the trip distribution, modal split, and highway assignment models are executed in sequence for each pass through the model chain. After convergence is reached, the transit trip tables for each iteration are weighted together and the weighted average table assigned to the transit network. The highway trip tables are loaded onto the network during each Evans iteration. For each time period, seven iterations of the Evans process are performed to ensure that convergence on travel times is reached.

Figure 5. DVRPC's Travel Simulation Modeling Process



EVANS ALGORITHM ONLY

3. Trip Distribution

Trip distribution is the process whereby the zonal trip ends established in the trip generation analysis are linked together to form origin-destination patterns in the trip table format. Peak, midday, and evening trip ends are distributed separately. For each Evans iteration, a series of seven gravity-type distribution models are applied at the zonal level. These models follow the trip purpose and vehicle type stratifications established in trip generation.

4. Modal Split

The modal split model is also run separately for the peak, midday, and evening time periods. The modal split model calculates the fraction of each person-trip interchange in the trip table which should be allocated to transit, and then assigns the residual to the highway side. The choice between highway and transit usage is made on the basis of comparative cost, travel time, and frequency of service, with other aspects of modal choice being used to modify this basic relationship. In general, the better the transit service, the higher the fraction assigned to transit, although trip purpose and auto ownership also affect the allocation. The model subdivides highway trips into auto drivers and passengers. Auto driver trips are added to the truck, taxi, and external vehicle trips in preparation for assignment to the highway network.

5. Highway Assignment

For highway trip, the final step in the focused simulation process is the assignment of vehicle trips to the highway network representative of the alternative being modeled. For peak, midday, and evening travel, the assignment model produces the future traffic volumes for individual highway links that are required for the evaluation of the alternatives. The regional nature of the highway network and trip table underlying the focused assignment process allow the diversion of travel into and through the study area to various points of entry and exit in response to the improvements made in the transportation system.

For each Evans iteration, highway trips are assigned to the network representative of a given alternative by determining the best (minimum time) route through the highway network for each zonal interchange and then allocating the interzonal highway travel to the highway facilities along that route. This assignment model is "capacity restrained" in that congestion levels are considered when determining the best route. The Evans equilibrium assignment method is used to implement the capacity constraint. When the assignment and associated trip table reach equilibrium, no path faster than the one actually assigned for each trip can be found through the network, given the capacity restrained travel times on each link.

6. Transit Assignment

After equilibrium is achieved, the weighted average transit trip tables are assigned to the transit network to produce link and route passenger volumes. The transit person trips produced by the modal split model are "linked" in that they do not include any transfers that occur either between transit trips or between auto approaches and transit lines. The transit assignment procedure accomplishes two major tasks. First, the transit trips are "unlinked" to include transfers, and second, the unlinked transit trips are associated with specific transit facilities to produce link, line, and station volumes. These tasks are accomplished simultaneously within the transit assignment model, which assigns the transit trip matrix to minimum impedance paths built through the transit network. There is no capacity restraining procedure in the transit assignment model.

C. Traffic Assignment Validation

Before a focused simulation model can be used to predict future trip making patterns, its ability to replicate existing conditions is validated. The simulated highway assignment outputs are compared to current traffic counts taken on roadways serving the study area. The focused simulation model was executed with current conditions and the results compared with recent traffic counts. Based on this analysis, the focused model produced accurate traffic volumes. The validated model was then executed for the No-Build and each Build alternative with socio-economic and land use inputs reflective of 2020 conditions.

The following tabulation summarizes the aggregate error in the assigned daily traffic volumes. A total of 121 locations in the study area with available daily traffic counts were used for model validation. Twenty-two of these locations are along US 202, 32 are on parallel and other north-south facilities, and 67 are on intersecting streets and other east-west facilities. The total assigned traffic on all facilities, 1.70 million vehicles, is within four percent of the total counted volume of 1.77 million vehicles, as shown below:

<u>Facilities</u>	<u>Number of Locations</u>	<u>Counted Volume</u>	<u>Validation Volume</u>	<u>Difference</u>	<u>Percent Difference</u>
Existing US 202	22	377,533	380,190	2,657	0.7 %
Parallel Facilities	32	271,583	240,962	-30,621	-11.3 %
Crossing Facilities	67	1,117,671	1,080,210	-37,461	-3.4 %
All Facilities	121	1,766,787	1,701,362	-65,425	-3.7 %

V. PROJECTED TRAFFIC VOLUMES

Projected traffic volumes for selected locations in the study area are presented and analyzed in this chapter. Average daily traffic volumes for 2020 for the No-Build and all Build alternatives are provided for the areas surrounding the US 202 Section 700 corridor. Additionally, daily forecasts are provided for the No-Build, Parkway, and Combination alternatives for selected locations north of the Section 700 corridor, in order to quantify the impacts of the new alignment alternatives on US 202 and other facilities north of Section 700.

In addition, AM and PM peak hour intersection turning movement forecasts are provided for the No-Build, Parkway, and Combination alternatives for each intersection with a turning movement count shown in Figure 4. Peak hour forecasts are also provided for new intersections that would result from construction of the US 202 Parkway and Combination alternatives. Intersection turning movement forecasts were not requested for the Widen Upper State Road Alternative.

A. Daily Traffic Forecasts

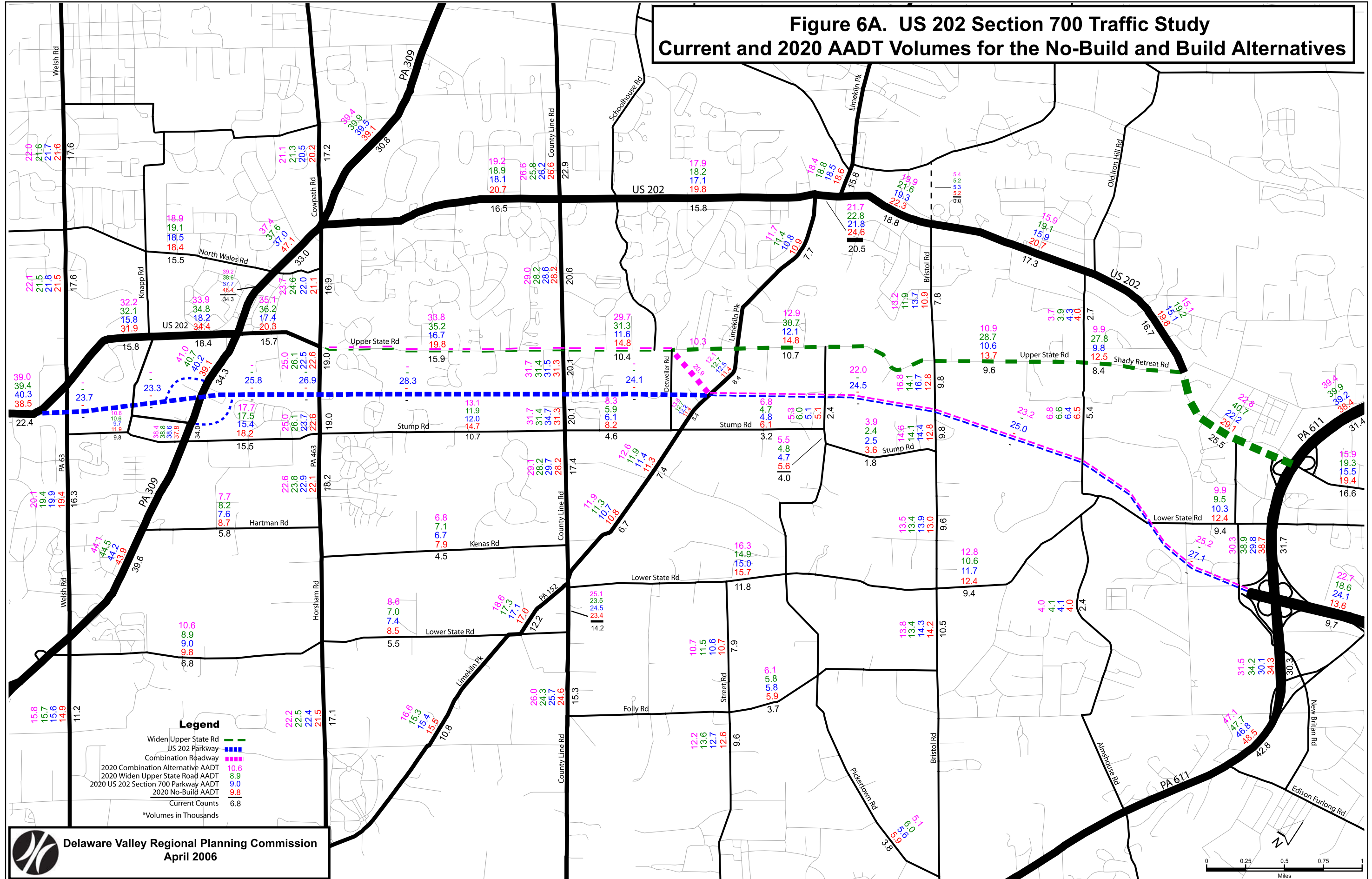
Figure 6 compares the current average daily traffic volumes to the 2020 projected volumes. In the figure, current volumes are shown in black, underneath the lines representing the highway links. Traffic volumes for the No-Build Alternative are shown in red, above the line. The Parkway Alternative volumes are shown in blue, above the No-Build volumes, followed by the Widen Upper State Road and Combination alternatives, in green and purple, respectively. Table 2 provides these same volumes within the US 202 Section 700 corridor along with comparisons between No-Build and current volumes and between Build and No-Build alternatives. Table 3 provides similar comparisons for the facilities north of Section 700, except that no forecasts for the Widen Upper State Road Alternative are provided in this area.

1. No-Build Alternative

Under the No-Build Alternative, 2020 daily traffic volumes on US 202 Section 700 are projected to be about 3,000 - 4,000 vehicles per day higher than current volumes. Between Horsham/Cowpath Road and the PA 611 Bypass, volumes on US 202 will range from 19,400 to 29,100 vehicles per day. The highest volumes will occur between Shady Retreat Road and PA 611 Bypass and between the two Limekiln Pike intersections in Chalfont Borough.

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**Figure 6A. US 202 Section 700 Traffic Study
Current and 2020 AADT Volumes for the No-Build and Build Alternatives**

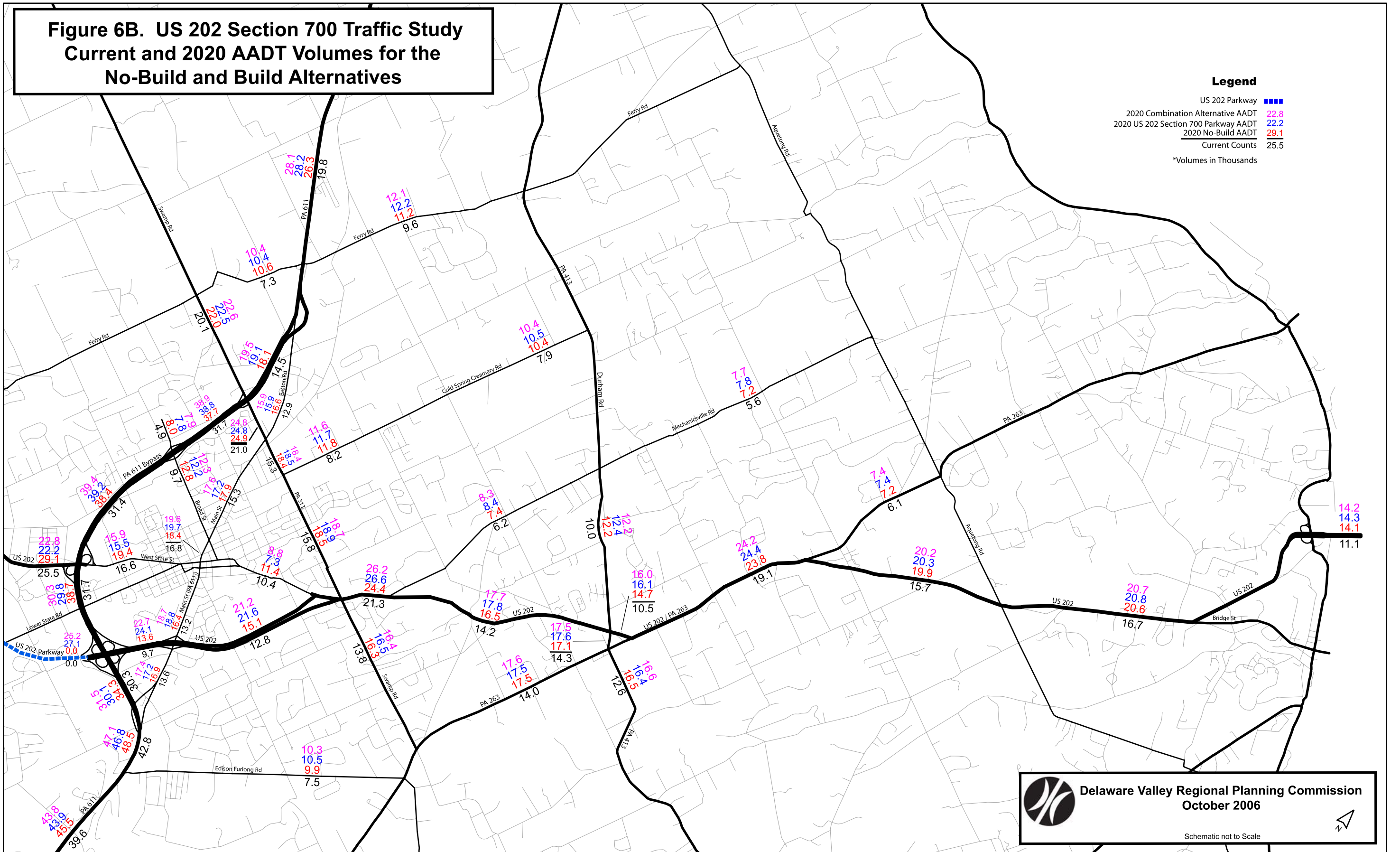


**Figure 6B. US 202 Section 700 Traffic Study
Current and 2020 AADT Volumes for the
No-Build and Build Alternatives**

Legend

US 202 Parkway	■■■■
2020 Combination Alternative AADT	22.8
2020 US 202 Section 700 Parkway AADT	22.2
2020 No-Build AADT	29.1
Current Counts	25.5

*Volumes in Thousands



**Table 2. US 202 Section 700 Traffic Study
Current and 2020 Average Daily Traffic Volumes in the US 202 Section 700 Corridor**

Road Section	Current AADT	2020 Average Daily Traffic Volumes				No-Build - Count Diff.		Pkwy - No-Build Diff.		U.State - No-Bld Diff.		Combo - No-Bld Diff.	
		No-Build	Parkway	Upper State	Combination	Diff.	% Diff.	Diff.	% Diff.	Diff.	% Diff.	Diff.	% Diff.
North - South Roads													
Existing US 202 (DeKalb Pike, Doylestown Road, Butler Avenue, State Street)													
Sumneytown Pike to PA 63 (Welsh Road)	22,432	38,500	40,300	39,400	39,000	16,068	71.6%	1,800	4.7%	900	2.3%	500	1.3%
PA 63 (Welsh Road) to Montgomeryville Mall Driveway	15,831	31,900	15,800	32,100	32,200	16,069	101.5%	-16,100	-50.5%	200	0.6%	300	0.9%
Montgomeryville Mall Driveway to PA 309 (Bethlehem Pike)	18,442	34,400	18,200	34,800	33,900	15,958	86.5%	-16,200	-47.1%	400	1.2%	-500	-1.5%
PA 463 (Horsham Road) to County Line Road	16,474	20,700	18,100	18,900	19,200	4,226	25.7%	-2,600	-12.6%	-1,800	-8.7%	-1,500	-7.2%
County Line Road to PA 152 (Limekiln Pike) West	15,751	19,800	17,100	18,200	17,900	4,049	25.7%	-2,700	-13.6%	-1,600	-8.1%	-1,900	-9.6%
PA 152 (Limekiln Pike) West to PA 152 (Limekiln Pike) East	20,485	24,600	21,800	22,800	21,700	4,115	20.1%	-2,800	-11.4%	-1,800	-7.3%	-2,900	-11.8%
PA 152 (Limekiln Pike) East to Bristol Road	18,807	22,300	19,300	21,600	19,900	3,493	18.6%	-3,000	-13.5%	-700	-3.1%	-2,400	-10.8%
Bristol Road to Almshouse Road	17,313	20,700	15,900	19,100	15,900	3,387	19.6%	-4,800	-23.2%	-1,600	-7.7%	-4,800	-23.2%
Almshouse Road to Shady Retreat Road	16,686	19,800	15,100	19,200	15,100	3,114	18.7%	-4,700	-23.7%	-600	-3.0%	-4,700	-23.7%
Shady Retreat Road to PA 611 Bypass	25,538	29,100	22,200	40,700	22,800	3,562	13.9%	-6,900	-23.7%	11,600	39.9%	-6,300	-21.6%
US 202 Business (State Street) - PA 611 Bypass to PA 611 (Easton Road)	16,642	19,400	15,500	19,300	15,900	2,758	16.6%	-3,900	-20.1%	-100	-0.5%	-3,500	-18.0%
US 202 Bypass - PA 611 Bypass to PA 611 (Easton Road)	9,698	13,600	24,100	18,600	22,700	3,902	40.2%	10,500	77.2%	5,000	36.8%	9,100	66.9%
Upper State Road													
PA 309 (Bethlehem Pike) to PA 463 (Horsham Road)	15,733	20,300	17,400	36,200	35,100	4,567	29.0%	-2,900	-14.3%	15,900	78.3%	14,800	72.9%
PA 463 (Horsham Road) to County Line Road	15,913	19,800	16,700	35,200	33,800	3,887	24.4%	-3,100	-15.7%	15,400	77.8%	14,000	70.7%
County Line Road to Detweiler Road	10,390	14,800	11,600	31,300	29,700	4,410	42.4%	-3,200	-21.6%	16,500	111.5%	14,900	100.7%
Detweiler Road to PA 152 (Limekiln Pike)	10,390	14,800	11,600	31,300	10,300	4,410	42.4%	-3,200	-21.6%	16,500	111.5%	-4,500	-30.4%
PA 152 (Limekiln Pike) to Bristol Road	10,693	14,800	12,100	30,700	12,900	4,107	38.4%	-2,700	-18.2%	15,900	107.4%	-1,900	-12.8%
Bristol Road to Almshouse Road	9,624	13,700	10,600	28,700	10,900	4,076	42.4%	-3,100	-22.6%	15,000	109.5%	-2,800	-20.4%
Almshouse Road to PA 611 Bypass	8,369	12,500	9,800	27,800	9,900	4,131	49.4%	-2,700	-21.6%	15,300	122.4%	-2,600	-20.8%
US 202 Parkway													
PA 63 (Welsh Road) to Knapp Road	0	0	23,700	0	0	0	-----	23,700	-----	0	-----	0	-----
Knapp Road to PA 309 jughandle 1	0	0	23,300	0	0	0	-----	23,300	-----	0	-----	0	-----
PA 309 jughandle 1 to jughandle 2	0	0	23,200	0	0	0	-----	23,200	-----	0	-----	0	-----
Jughandle 2 to Costco Drive/Amy Court	0	0	25,800	0	0	0	-----	25,800	-----	0	-----	0	-----
Costco Drive/Amy Court to PA 463 (Horsham Road)	0	0	26,900	0	0	0	-----	26,900	-----	0	-----	0	-----
PA 463 (Horsham Road) to County Line Road	0	0	28,300	0	0	0	-----	28,300	-----	0	-----	0	-----
County Line Road to Detweiler Road	0	0	24,100	0	0	0	-----	24,100	-----	0	-----	0	-----
Detweiler Road to PA 152 (Limekiln Pike)	0	0	24,100	0	20,900	0	-----	24,100	-----	0	-----	20,900	-----
PA 152 (Limekiln Pike) to Bristol Road	0	0	24,500	0	22,000	0	-----	24,500	-----	0	-----	22,000	-----
Bristol Road to Lower State Road	0	0	25,000	0	23,200	0	-----	25,000	-----	0	-----	23,200	-----
Lower State Road to PA 611 Bypass	0	0	27,100	0	25,200	0	-----	27,100	-----	0	-----	25,200	-----
Stump Road													
PA 63 (Welsh Road) to PA 309 (Bethlehem Pike)	9,750	11,900	9,700	10,600	10,600	2,150	22.1%	-2,200	-18.5%	-1,300	-10.9%	-1,300	-10.9%
PA 309 (Bethlehem Pike) to PA 463 (Horsham Road)	15,483	18,200	15,400	17,500	17,700	2,717	17.5%	-2,800	-15.4%	-700	-3.8%	-500	-2.7%
PA 463 (Horsham Road) to County Line Road	10,703	14,700	12,000	11,900	13,100	3,997	37.3%	-2,700	-18.4%	-2,800	-19.0%	-1,600	-10.9%
County Line Road to PA 152 (Limekiln Pike)	4,630	8,200	6,100	5,900	8,300	3,570	77.1%	-2,100	-25.6%	-2,300	-28.0%	100	1.2%
PA 152 (Limekiln Pike) to Pickertown Road	3,239	6,100	4,800	4,700	6,800	2,861	88.3%	-1,300	-21.3%	-1,400	-23.0%	700	11.5%
Pickertown Road to Bristol Road	1,839	3,600	2,500	2,400	3,900	1,761	95.8%	-1,100	-30.6%	-1,200	-33.3%	300	8.3%
Hartman Road													
PA 309 (Bethlehem Pike) to PA 463 (Horsham Road)	5,763	8,700	7,600	8,200	7,700	2,937	51.0%	-1,100	-12.6%	-500	-5.7%	-1,000	-11.5%
Kenas Road													
PA 463 (Horsham Road) to County Line Road	4,503	7,900	6,700	7,100	6,800	3,397	75.4%	-1,200	-15.2%	-800	-10.1%	-1,100	-13.9%
North Wales Road													
PA 63 (Welsh Road) to PA 309 (Bethlehem Pike)	15,476	18,400	18,500	19,100	18,900	2,924	18.9%	100	0.5%	700	3.8%	500	2.7%

**Table 2. US 202 Section 700 Traffic Study
Current and 2020 Average Daily Traffic Volumes in the US 202 Section 700 Corridor**

Road Section	Current AADT	2020 Average Daily Traffic Volumes				No-Build - Count Diff.		Pkwy - No-Build Diff.		U.State - No-Bld Diff.		Combo - No-Bld Diff.	
		No-Build	Parkway	Upper State	Combination	Diff.	% Diff.	Diff.	% Diff.	Diff.	% Diff.	Diff.	% Diff.
General Hancock Boulevard													
Amy Court to PA 463 (Horsham Road)	3,211	4,100	3,500	4,000	3,900	889	27.7%	-600	-14.6%	-100	-2.4%	-200	-4.9%
Lower State Road													
PA 63 (Welsh Road) to PA 463 (Horsham Road)	6,789	9,800	9,000	8,900	10,600	3,011	44.4%	-800	-8.2%	-900	-9.2%	800	8.2%
PA 463 (Horsham Road) to PA 152 (Limekiln Pike)	5,462	8,500	7,400	7,000	8,600	3,038	55.6%	-1,100	-12.9%	-1,500	-17.6%	100	1.2%
PA 152 (Limekiln Pike) to County Line Road	4,424	6,700	5,800	5,300	7,000	2,276	51.4%	-900	-13.4%	-1,400	-20.9%	300	4.5%
County Line Road to Bristol Road	11,839	15,700	15,000	14,900	16,300	3,861	32.6%	-700	-4.5%	-800	-5.1%	600	3.8%
Bristol Road to Almshouse Road	9,391	12,400	11,700	10,600	12,800	3,009	32.0%	-700	-5.6%	-1,800	-14.5%	400	3.2%
Almshouse Road to PA 611 Bypass	9,405	12,400	10,300	9,500	9,900	2,995	31.8%	-2,100	-16.9%	-2,900	-23.4%	-2,500	-20.2%
Folly Road													
County Line Road to Bristol Road	3,714	5,900	5,800	5,800	6,100	2,186	58.9%	-100	-1.7%	-100	-1.7%	200	3.4%
East - West Roads													
PA 63 (Welsh Road)													
Broad Street to North Wales Road	17,567	21,600	21,700	21,600	22,000	4,033	23.0%	100	0.5%	0	0.0%	400	1.9%
North Wales Road to Existing US 202 (DeKalb Pike)	17,596	21,500	21,800	21,500	22,100	3,904	22.2%	300	1.4%	0	0.0%	600	2.8%
Existing 202 (DeKalb Pike) to US 202 Parkway	16,314	19,400	20,300	19,400	20,100	3,086	18.9%	900	4.6%	0	0.0%	700	3.6%
US 202 Parkway to PA 309 (Bethlehem Pike)	16,314	19,400	19,900	19,400	20,100	3,086	18.9%	500	2.6%	0	0.0%	700	3.6%
Lower State Road to Cedar Hill Road	11,160	14,900	15,600	15,700	15,800	3,740	33.5%	700	4.7%	800	5.4%	900	6.0%
PA 309 (Bethlehem Pike)													
PA 63 (Welsh Road) to Stump Road	39,606	43,900	44,200	44,500	44,100	4,294	10.8%	300	0.7%	600	1.4%	200	0.5%
Stump Road to Knapp Road	33,991	37,800	38,600	38,800	38,400	3,809	11.2%	800	2.1%	1,000	2.6%	600	1.6%
Knapp Road to Parkway/PA 309 Jughandle 1	34,330	39,100	40,100	40,700	41,000	4,770	13.9%	1,000	2.6%	1,600	4.1%	1,900	4.9%
Parkway/PA 309 Jughandle 1 to Existing US 202 South (DeKalb Pike)	34,330	39,100	40,200	40,700	41,000	4,770	13.9%	1,100	2.8%	1,600	4.1%	1,900	4.9%
Existing US 202 South (DeKalb Pike) to North Wales Road	34,266	48,400	37,700	38,600	39,200	14,134	41.2%	-10,700	-22.1%	-9,800	-20.2%	-9,200	-19.0%
North Wales Road to PA 463 (Horsham Road)	33,011	47,100	37,000	37,600	37,400	14,089	42.7%	-10,100	-21.4%	-9,500	-20.2%	-9,700	-20.6%
PA 463 (Horsham Road) to Broad Street	30,846	39,100	39,500	39,900	39,400	8,254	26.8%	400	1.0%	800	2.0%	300	0.8%
PA 463 (Horsham Road)													
Broad Street to Existing US 202 North (Doylestown Road)	17,193	20,200	20,500	21,300	21,100	3,007	17.5%	300	1.5%	1,100	5.4%	900	4.5%
Existing US 202 North (Doylestown Road) to North Wales Road	15,350	18,900	19,300	20,700	20,000	3,550	23.1%	400	2.1%	1,800	9.5%	1,100	5.8%
North Wales Road to Upper State Road	16,911	21,100	22,000	24,600	23,700	4,189	24.8%	900	4.3%	3,500	16.6%	2,600	12.3%
Upper State Road to US 202 Parkway	18,972	22,600	22,500	26,100	25,000	3,628	19.1%	-100	-0.4%	3,500	15.5%	2,400	10.6%
US 202 Parkway to General Hancock Boulevard	18,972	22,600	23,700	26,100	25,000	3,628	19.1%	1,100	4.9%	3,500	15.5%	2,400	10.6%
General Hancock Boulevard to Stump Road	18,321	21,400	22,700	23,600	22,300	3,079	16.8%	1,300	6.1%	2,200	10.3%	900	4.2%
Stump Road to Lower State Road	18,166	22,100	22,900	23,800	22,600	3,934	21.7%	800	3.6%	1,700	7.7%	500	2.3%
Lower State Road to PA 152 (Limekiln Pike)	17,116	21,500	22,400	22,500	22,200	4,384	25.6%	900	4.2%	1,000	4.7%	700	3.3%
PA 152 (Limekiln Pike) to Norristown Road	18,242	25,100	25,800	25,700	25,300	6,858	37.6%	700	2.8%	600	2.4%	200	0.8%
County Line Road													
PA 309 (Bethlehem Pike) to Walnut Street	17,268	21,200	21,000	20,700	21,600	3,932	22.8%	-200	-0.9%	-500	-2.4%	400	1.9%
Walnut Street to Existing US 202 (Doylestown Road)	22,863	26,600	26,200	25,800	26,600	3,737	16.3%	-400	-1.5%	-800	-3.0%	0	0.0%
Existing US 202 (Doylestown Road) to Upper State Road	20,620	28,200	28,600	28,200	29,000	7,580	36.8%	400	1.4%	0	0.0%	800	2.8%
Upper State Road to US 202 Parkway	20,124	31,300	31,500	31,400	31,700	11,176	55.5%	200	0.6%	100	0.3%	400	1.3%
US 202 Parkway to Stump Road	20,124	31,300	34,700	31,400	31,700	11,176	55.5%	3,400	10.9%	100	0.3%	400	1.3%
Stump Road to Kenas Road	17,414	28,200	29,700	28,200	29,100	10,786	61.9%	1,500	5.3%	0	0.0%	900	3.2%
Kenas Road to PA 152 (Limekiln Pike)	19,470	30,200	31,400	30,300	31,200	10,730	55.1%	1,200	4.0%	100	0.3%	1,000	3.3%
PA 152 (Limekiln Pike) to Lower State Road South	14,180	23,400	24,500	23,500	25,100	9,220	65.0%	1,100	4.7%	100	0.4%	1,700	7.3%
Lower State Road South to Folly Road	15,273	24,600	25,700	24,300	26,000	9,327	61.1%	1,100	4.5%	-300	-1.2%	1,400	5.7%

**Table 2. US 202 Section 700 Traffic Study
Current and 2020 Average Daily Traffic Volumes in the US 202 Section 700 Corridor**

Road Section	Current AADT	2020 Average Daily Traffic Volumes				No-Build - Count Diff. % Diff.		Pkwy - No-Build Diff. % Diff.		U.State - No-Bld Diff. % Diff.		Combo - No-Bld Diff. % Diff.	
		No-Build	Parkway	Upper State	Combination								
PA 152 (Limekiln Pike)													
Park Avenue to Existing US 202 (Butler Avenue)	15,843	18,600	18,500	18,800	18,400	2,757	17.4%	-100	-0.5%	200	1.1%	-200	-1.1%
Existing US 202 (Butler Avenue) to Upper State Road	7,657	10,900	10,800	11,400	11,700	3,243	42.4%	-100	-0.9%	500	4.6%	800	7.3%
Upper State Road to US 202 Parkway	8,350	11,400	12,500	12,700	12,100	3,050	36.5%	1,100	9.6%	1,300	11.4%	700	6.1%
US 202 Parkway to Stump Road	8,350	11,400	12,200	12,700	13,800	3,050	36.5%	800	7.0%	1,300	11.4%	2,400	21.1%
Stump Road to Woodlawn Road	7,446	11,300	11,400	11,900	12,600	3,854	51.8%	100	0.9%	600	5.3%	1,300	11.5%
Woodlawn Road to County Line Road	6,718	10,800	10,700	11,300	11,900	4,082	60.8%	-100	-0.9%	500	4.6%	1,100	10.2%
County Line Road to Lower State Road	12,178	17,000	17,100	17,300	18,600	4,822	39.6%	100	0.6%	300	1.8%	1,600	9.4%
Lower State Road to PA 463 (Horsham Road)	10,763	15,500	15,400	15,300	16,600	4,737	44.0%	-100	-0.6%	-200	-1.3%	1,100	7.1%
Street Road													
Lower State Road to Folly Road	7,854	10,700	10,600	11,500	10,700	2,846	36.2%	-100	-0.9%	800	7.5%	0	0.0%
Folly Road to Elbow Road	9,640	12,600	12,700	13,600	12,200	2,960	30.7%	100	0.8%	1,000	7.9%	-400	-3.2%
Pickertown Road													
Upper State Road to Stump Road North	2,396	5,100	5,100	6,000	5,300	2,704	112.9%	0	0.0%	900	17.6%	200	3.9%
Stump Road North to Stump Road South	3,986	5,600	4,700	4,800	5,500	1,614	40.5%	-900	-16.1%	-800	-14.3%	-100	-1.8%
Folly Road to Bristol Road	3,843	5,900	5,600	6,000	5,100	2,057	53.5%	-300	-5.1%	100	1.7%	-800	-13.6%
Bristol Road													
Park Avenue to Existing US 202 (Butler Avenue)	0	5,200	5,300	5,200	5,400	5,200	-----	100	1.9%	0	0.0%	200	3.8%
Existing US 202 (Butler Avenue) to Upper State Road	7,780	10,900	13,700	11,900	13,200	3,120	40.1%	2,800	25.7%	1,000	9.2%	2,300	21.1%
Upper State Road to US 202 Parkway	9,752	12,800	16,700	14,100	16,800	3,048	31.3%	3,900	30.5%	1,300	10.2%	4,000	31.3%
US 202 Parkway to Stump Road	9,752	12,800	14,400	14,100	14,600	3,048	31.3%	1,600	12.5%	1,300	10.2%	1,800	14.1%
Stump Road to Lower State Road	9,587	13,000	13,900	13,400	13,500	3,413	35.6%	900	6.9%	400	3.1%	500	3.8%
Lower State Road to Folly Road	10,543	14,200	14,300	13,400	13,800	3,657	34.7%	100	0.7%	-800	-5.6%	-400	-2.8%
Almshouse Road													
Existing US 202 (Butler Avenue) to Upper State/Shady Retreat Road	2,713	4,000	4,300	3,900	3,700	1,287	47.4%	300	7.5%	-100	-2.5%	-300	-7.5%
Upper State Road to Lower State Road	5,367	6,500	6,400	6,600	6,800	1,133	21.1%	-100	-1.5%	100	1.5%	300	4.6%
Lower State Road to PA 611 (Easton Road)	2,399	4,000	4,100	4,100	4,000	1,601	66.7%	100	2.5%	100	2.5%	0	0.0%
PA 611 Bypass / PA 611 (Easton Road)													
PA 611 Bypass - Broad Street to Existing US 202 Business (State Street)	31,391	38,400	39,200	39,900	39,400	7,009	22.3%	800	2.1%	1,500	3.9%	1,000	2.6%
PA 611 Bypass - Existing US 202 Business to Existing US 202 Bypass	31,741	38,700	29,800	38,900	30,300	6,959	21.9%	-8,900	-23.0%	200	0.5%	-8,400	-21.7%
PA 611 Bypass - Existing US 202 Bypass to PA 611 (Easton Road)	30,305	34,300	30,100	34,200	31,500	3,995	13.2%	-4,200	-12.2%	-100	-0.3%	-2,800	-8.2%
PA 611 (Easton Road) - PA 611 Bypass to Edison Furlong Road	42,818	48,500	46,800	47,700	47,100	5,682	13.3%	-1,700	-3.5%	-800	-1.6%	-1,400	-2.9%

**Table 3. US 202 Section 700 Traffic Study
Current and 2020 Average Daily Traffic Volumes North of the Section 700 Corridor**

Road Section	Current AADT	2020 Ave. Daily Traffic Volumes			No-Build - Count		Pkwy - No-Build		Combo - No-Build	
		No-Build	Parkway	Combination	Diff.	% Diff.	Diff.	% Diff.	Diff.	% Diff.
US 202 & US 202 Bypass										
Butler Ave - Shady Retreat Road to PA 611 Bypass	25,538	29,100	22,200	22,800	3,562	13.9%	-6,900	-23.7%	-6,300	-21.6%
US 202 Parkway - Lower State Road to PA 611 Bypass	0	0	27,100	25,200	0	-----	27,100	-----	25,200	-----
State Street - PA 611 Bypass to Easton Road (PA 611)	16,642	19,400	15,500	15,900	2,758	16.6%	-3,900	-20.1%	-3,500	-18.0%
State Street - Easton Rd (PA 611) to Swamp Rd (PA 313)	10,364	11,400	7,300	8,800	1,036	10.0%	-4,100	-36.0%	-2,600	-22.8%
US 202 Bypass - PA 611 Bypass to Easton Road (PA 611)	9,698	13,600	24,100	22,700	3,902	40.2%	10,500	77.2%	9,100	66.9%
US 202 Bypass - Easton Rd (PA 611) to Swamp Rd (PA 313)	12,777	15,100	21,600	21,200	2,323	18.2%	6,500	43.0%	6,100	40.4%
Doylestown-Buckingham Pike - Swamp Rd (PA 313) to Mechanicsville Rd	21,300	24,400	26,600	26,200	3,100	14.6%	2,200	9.0%	1,800	7.4%
Doylestown-Buckingham Pike - Mechanicsville Road to Durham Rd (PA 413)	14,181	16,500	17,800	17,700	2,319	16.4%	1,300	7.9%	1,200	7.3%
Doylestown-Buckingham Pike - Durham Rd to York Rd (PA 263)	10,508	14,700	16,100	16,000	4,192	39.9%	1,400	9.5%	1,300	8.8%
York Road - Quarry Road to Upper York Road	19,087	23,800	24,400	24,200	4,713	24.7%	600	2.5%	400	1.7%
Lower York Road - Upper York Road to Aquetong Rd	15,729	19,900	20,300	20,200	4,171	26.5%	400	2.0%	300	1.5%
Lower York Road - Aquetong Road to Bridge Street, New Hope	16,671	20,600	20,800	20,700	3,929	23.6%	200	1.0%	100	0.5%
US 202 Bridge over Delaware River	11,076	14,100	14,300	14,200	3,024	27.3%	200	1.4%	100	0.7%
PA 611 Bypass & PA 611 Business										
PA 611 Bypass - PA 611 Business to Swamp Road	14,510	18,100	19,100	19,500	3,590	24.7%	1,000	5.5%	1,400	7.7%
PA 611 Bypass - Swamp Road to Broad Street	31,693	37,700	38,800	38,900	6,007	19.0%	1,100	2.9%	1,200	3.2%
PA 611 Bypass - Broad Street to State Street	31,391	38,400	39,200	39,400	7,009	22.3%	800	2.1%	1,000	2.6%
PA 611 Bypass - State Street to US 202 Bypass	31,741	38,700	29,800	30,300	6,959	21.9%	-8,900	-23.0%	-8,400	-21.7%
PA 611 Bypass - US 202 Bypass to Easton Road	30,305	34,300	30,100	31,500	3,995	13.2%	-4,200	-12.2%	-2,800	-8.2%
PA 611 (Easton Road) - Ferry Road to Curly Hill Road	19,848	26,300	28,200	28,100	6,452	32.5%	1,900	7.2%	1,800	6.8%
PA 611 (Easton Road) - PA 611 Bypass to Swamp Road	12,872	16,600	15,900	15,900	3,728	29.0%	-700	-4.2%	-700	-4.2%
PA 611 (Main Street) - Swamp Road to Broad Street	15,290	17,900	17,200	17,600	2,610	17.1%	-700	-3.9%	-300	-1.7%
PA 611 (Main Street) - Broad Street to State Street	16,811	18,400	19,700	19,600	1,589	9.5%	1,300	7.1%	1,200	6.5%
PA 611 (Main Street) - State Street to US 202 Bypass	13,248	16,400	18,800	18,700	3,152	23.8%	2,400	14.6%	2,300	14.0%
PA 611 (Easton Road) - US 202 Bypass to PA 611 Bypass	13,592	16,900	17,200	17,400	3,308	24.3%	300	1.8%	500	3.0%
PA 611 Business (Easton Road) - PA 611 Bypass to Edison Furlong Road	42,818	48,500	46,800	47,100	5,682	13.3%	-1,700	-3.5%	-1,400	-2.9%
PA 611 (Easton Road) - South of Bristol Road	39,573	45,500	43,900	43,800	5,927	15.0%	-1,600	-3.5%	-1,700	-3.7%
PA 313 (Swamp Road)										
PA 313 - Ferry Road to PA 611 Bypass	20,053	22,200	22,500	22,600	2,147	10.7%	300	1.4%	400	1.8%
PA 313 - PA 611 Bypass to PA 611 Business (Main Street)	21,020	24,900	24,800	24,800	3,880	18.5%	-100	-0.4%	-100	-0.4%
PA 313 - PA 611 Business (Main Street) to Cold Spring Creamery Road	15,323	18,400	18,500	18,400	3,077	20.1%	100	0.5%	0	0.0%
PA 313 - Cold Spring Creamery Road to State Street	15,822	18,500	18,900	18,700	2,678	16.9%	400	2.2%	200	1.1%
PA 313 - State Street to Spring Valley Road	13,795	16,300	16,500	16,400	2,505	18.2%	200	1.2%	100	0.6%
Other Facilities										
Ferry Road - Swamp Road to PA 611	7,275	10,600	10,400	10,400	3,325	45.7%	-200	-1.9%	-200	-1.9%
Ferry/Point Pleasant Road - PA 611 to PA 413	9,574	11,200	12,200	12,100	1,626	17.0%	1,000	8.9%	900	8.0%
Cold Spring Creamery Road - North of Swamp Road	8,153	11,800	11,700	11,600	3,647	44.7%	-100	-0.8%	-200	-1.7%
Cold Spring Creamery Road - South of PA 413	7,945	10,400	10,500	10,400	2,455	30.9%	100	1.0%	0	0.0%
Mechanicsville Road - US 202 to PA 413	6,225	7,400	8,400	8,300	1,175	18.9%	1,000	13.5%	900	12.2%
Mechanicsville Road - North of PA 413	5,575	7,200	7,800	7,700	1,625	29.1%	600	8.3%	500	6.9%
Broad Street - West of PA 611 Bypass	4,889	8,000	7,800	7,900	3,111	63.6%	-200	-2.5%	-100	-1.3%
Broad Street - East of PA 611 Bypass	9,748	12,800	12,200	12,300	3,052	31.3%	-600	-4.7%	-500	-3.9%
Durham Road (PA 413) - Mechanicsville Road to US 202	10,030	12,200	12,400	12,200	2,170	21.6%	200	1.6%	0	0.0%
Durham Road (PA 413) - US 202 to PA 263	14,261	17,100	17,600	17,500	2,839	19.9%	500	2.9%	400	2.3%
Durham Road (PA 413) - US 263 to Upper Mountain Road	12,631	16,500	16,400	16,600	3,869	30.6%	-100	-0.6%	100	0.6%
York Road (PA 263) - PA 313 to PA 413	14,038	17,500	17,500	17,600	3,462	24.7%	0	0.0%	100	0.6%
Upper York Road (PA 263) - US 202 to Aquetong Road	6,087	7,200	7,400	7,400	1,113	18.3%	200	2.8%	200	2.8%
Edison Furlong Road west of York Road (PA 263)	7,531	9,900	10,500	10,300	2,369	31.5%	600	6.1%	400	4.0%

Even higher growth is projected for US 202 between Sumneytown Pike and PA 309. These links are part of Section 600 of US 202, which is widened to two-lanes per direction under the No-Build Alternative. Volumes here will range from 31,900 to 38,500 vpd, which represent increases of about 16,000 vpd over current traffic volumes. Somewhat smaller increases, about 14,000 vpd, occur in the area where US 202 and PA 309 share a designation (between Upper State Road and the Five-Points intersection).

Traffic volumes on US 202 north of Doylestown will also increase under the No-Build Alternative. Increases range from 2,300 to 4,700 vehicles per day. In this area, the largest increase occurs between Quarry and Upper York roads, while the highest volume, 24,400 vpd, occurs between PA 313 (Swamp Road) and Mechanicsville Road, in Buckingham Township.

Traffic volume increases on facilities parallel to Section 700 are similar to those on US 202, with most locations experiencing an additional 3,000 to 4,000 vpd under the No-Build alternative. The highest increases tend to occur on Upper State Road, where traffic volumes increase by 3,900 to 4,600 vpd over current volumes. Upper State Road will carry between 12,500 and 20,300 vpd. The highest volume occurs between PA 309 and PA 463 and decreases as one moves from south to north. This same pattern is evident in the current volumes.

Stump Road traffic volumes also decrease as one moves north from PA 309, from a high of 18,200 vpd down to 3,600 vpd at Bristol Road. In contrast, Lower State Road volumes tend to peak between County Line and Bristol roads. The 2020 No-Build volume here is 15,700 vpd. Volumes range from 6,700 to 9,800 vpd south of County Line Road, and are 12,400 vpd between Bristol Road and the PA 611 Bypass.

Traffic volume increases on crossing facilities under the No-Build Alternative are much more varied compared to facilities parallel to US 202 Section 700. Except for the portion of PA 309 that is coincident with US 202, the highest increases on crossing facilities occur on the portions of County Line Road that are widened under the No-Build Alternative. East of US 202, traffic volume increases on County Line Road range from 9,200 to 11,200 vpd. The highest increase, as well as the highest future volume, occurs between Upper State and Stump roads. County Line Road will carry between 21,200 and 31,300 vpd in 2020 under the No-Build Alternative.

Of the crossing facilities, only PA 309 and PA 611/PA 611 Bypass will carry higher volumes than County Line Road. PA 309 will carry between 39,100 and 47,100 vpd, while PA 611 Bypass will carry as much as 48,500 vpd where PA 611 and the PA 611 Bypass come together south of Doylestown Borough.

2. US 202 Parkway Alternative

The proposed US 202 Section 700 Parkway is projected to carry between 23,200 and 28,300 vehicles per day in 2020. The highest volumes occur between Horsham and

County Line roads, and between Lower State Road the PA 611 Bypass. The lowest volume occurs between the two Parkway connectors to PA 309.

Traffic volumes on existing US 202 Section 700 are reduced relative to the No-Build Alternative with construction of the US 202 Parkway. Traffic volume reductions range from 2,600 to 6,900 vpd, with the largest reductions occurring between Shady Retreat Road and the PA 611 Bypass and between Bristol Road and Almshouse Road. Even larger reductions, as much as 16,200 vpd, occur on US 202 Section 600, south of PA 309.

Construction of the US 202 Parkway does, however, increase traffic volumes along existing US 202 north of the study area, relative to the No-Build Alternative. The largest increase, 10,500 vpd, occurs along the US 202 Bypass, between the PA 611 Bypass and PA 611 (Main Street) interchanges. The 2020 volume here, 24,100 vpd, will be easily accommodated by the four-lane, limited-access 202 expressway. As one moves further north, the traffic volume increases along US 202 are less and less pronounced. Between Main Street and Swamp Road, the volume with the Parkway is 6,500 vpd higher than the No-Build volume; just north of Swamp Road this difference drops to 2,200 vpd. Once north of Durham Road, there is very little difference between Build and No-Build volumes on US 202.

Traffic volumes on facilities parallel to US 202 Section 700 are also reduced with construction of the US 202 Parkway, relative to the No-Build Alternative. Volumes along Upper State Road are reduced by 2,700 to 3,100 vpd. Stump Road volumes are reduced by 1,100 to 2,800 vpd, and volumes on Lower State Road by 700 to 2,100 vpd. Other parallel roads that experience reduced traffic with the US 202 Parkway include Hartman, Kenas, and Folly roads.

Volumes on crossing facilities are generally higher with the Parkway than the No-Build volumes, as these facilities are used to access the Parkway. Except for a few locations on Bristol and County Line roads, these increases are generally 1,500 vpd or less. The one crossing facility with significantly lower volumes under the Parkway Alternative is the PA 611 Bypass. The volume between the existing US 202 interchange and the 202 Parkway interchange is reduced by 8,900 vpd, relative to the No-Build Alternative, while the volume south of the 202 Parkway interchange is reduced by 4,200 vpd.

3. Widen Upper State Road Alternative

The Widen Upper State Road Alternative results in an additional 15,000 to 16,500 vpd on Upper State and Shady Retreat roads, compared to the No-Build Alternative. Average daily volumes range from 27,800 to 36,200 vpd. The highest occurs between PA 309 and PA 463, and volumes tend to decrease as one moves north.

Traffic volumes on US 202 Section 700 under this alternative are generally lower than No-Build volumes, but higher than the corresponding volume under the Parkway Alternative. The one exception is the US 202 link between Shady Retreat Road and the PA 611

Bypass, which is widened as part of this alternative and projected to carry 40,700 vpd in 2020. Stump Road and Lower State Road also experience lower traffic volumes under this alternative compared to the No-Build Alternative.

Traffic volumes on the cross streets are similar to those under the Parkway Alternative, with most locations having differences less than 1,000 vpd. Notable differences include Horsham Road from US 202 to General Hancock Boulevard, which carries between 1,400 and 3,600 vpd more than under the Parkway Alternative; County Line Road east of the proposed Parkway which carries between 1,000 and 3,300 vpd less than under the Parkway Alternative; and the PA 611 Bypass, which carries as much as 9,100 vpd more under the Widen Upper State Road Alternative than it does under the Parkway Alternative.

4. Combination Alternative

The 2020 daily traffic volumes on the new alignment portion of US 202 under the Combination Alternative range from 20,900 to 25,200 vpd. The lowest volume occurs just north of Detweiler Road where the new alignment portion begins, and the highest volume occurs between Lower State Road and the PA 611 Bypass. These volumes are between 1,800 and 3,200 vpd less than the corresponding volume under the Parkway Alternative. Volumes on Upper State / Shady Retreat Road range from 29,700 to 35,100 south of Detweiler Road and between 9,900 and 12,900 north of Detweiler Road.

Volumes on existing US 202 Section 700 under the Combination Alternative are similar to those of the Widen Upper State Road Alternative south of PA 152 and similar to the Parkway Alternative volumes north of PA 152. They range from 15,100 to 22,800 vpd. The traffic relief on existing US 202 Section 700 compared to the No-Build Alternative is similar to, but slightly less than, the relief from the Parkway Alternative.

The portion of Upper State Road that is widened under this alternative experiences traffic volume increases of 14,000 to 14,900 vpd, compared to the No-Build Alternative. North of Detweiler Road, however, traffic volumes are 1,900 to 4,500 vpd less than the corresponding volumes under the No-Build Alternative. Stump Road experiences some minor relief south of County Line Road, while the only portion of Lower State Road to see relief is the link between Almshouse Road and the PA 611 Bypass.

Traffic volumes on the crossing facilities under the Combination Alternative do not vary much from those of the other Build alternatives. Again, the volumes south of Detweiler Road are similar to those of the Widen Upper State Road Alternative and the volumes north of Detweiler Road are similar to the Parkway Alternative volumes.

B. AM and PM Peak Hour Forecasts

Year 2020 AM and PM peak hour volumes, including intersection turning movements, for the No-Build, Parkway, and Combination alternatives are discussed in this section. Generally, the relationships between current and future peak hour volumes and between

the various future year alternatives, follow the same patterns and trends as the daily traffic volumes. However, the percentage of daily traffic that occurs during the 2020 AM and PM peak hours, especially in the peak direction, is somewhat less than the percentage under current conditions. This is consistent with the “peak spreading” that occurs as traffic volumes increase. As congestion levels rise, a greater percentage of traffic is shifted to the “shoulders” of the peak period, i.e. immediately before and after the peak hour.

The intersection location map provided in Figure 3 can also be used to identify the individual intersections for which peak hour traffic forecasts are provided. These intersection turning movement forecasts will be used by PENNDOT’s consultants to determine how well traffic operates for the given alternative, including average travel speed and delay along individual facilities and queue lengths at the intersection approaches. These traffic statistics may be used to refine the details for individual intersections under the Build Alternatives, such as the provision of left-turn pockets.

1. No-Build Alternative

AM and PM peak hour traffic forecasts for the No-Build Alternative are shown in Figure 7. Under the No-Build Alternative, 2020 AM peak hour volumes along US 202 Section 700 range from 460 to 1,380 vehicles per hour in the northbound direction and 540 to 2,180 vph in the southbound direction. The highest AM peak hour volumes occur along Bethlehem Pike, just north of the North Wales Road intersection, in both the northbound and southbound directions. Along the two-lane portion of Section 700, the highest AM peak hour volume, 1,080 vph, occurs between the two PA 152 intersections in the southbound direction.

Section 700 PM peak hour volumes for the No-Build Alternative range from 570 to 2,000 vph in the northbound direction and from 580 to 1,850 vpd in the southbound direction. The northbound PM peak hour volumes are higher than the corresponding AM peak hour volumes south of PA 152, and lower than the AM volume north of PA 152. In the southbound direction, the AM peak hour has higher volumes south of the Five-Points intersection, the PM peak hour has higher volumes north of PA 152, while no clear trend is evident between Five-Points and PA 152.

Southbound volumes along Upper State Road are between 720 and 1,200 vph in the AM peak hour and between 600 and 1,320 in the PM peak. Northbound volumes range from 520 to 710 in the AM peak and from 670 and 1,190 in the PM peak hour under the No-Build Alternative. The highest volumes generally occur between PA 309 and PA 463. Stump Road also has its highest volumes between PA 309 and PA 463, except for the southbound AM peak hour, where the highest volume, 920 vph, occurs just south of Bristol Road.

The cross streets in the Section 700 corridor, on average, serve higher peak hour traffic volumes than US 202 or its parallel facilities. In the AM peak hour, eastbound volumes exceed 2,100 vpd on both PA 309 and PA 611; they exceed 1,100 vph on both PA 63 and

Figure 7A. US 202 Section 700 Traffic Study, 2020 No-Build Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

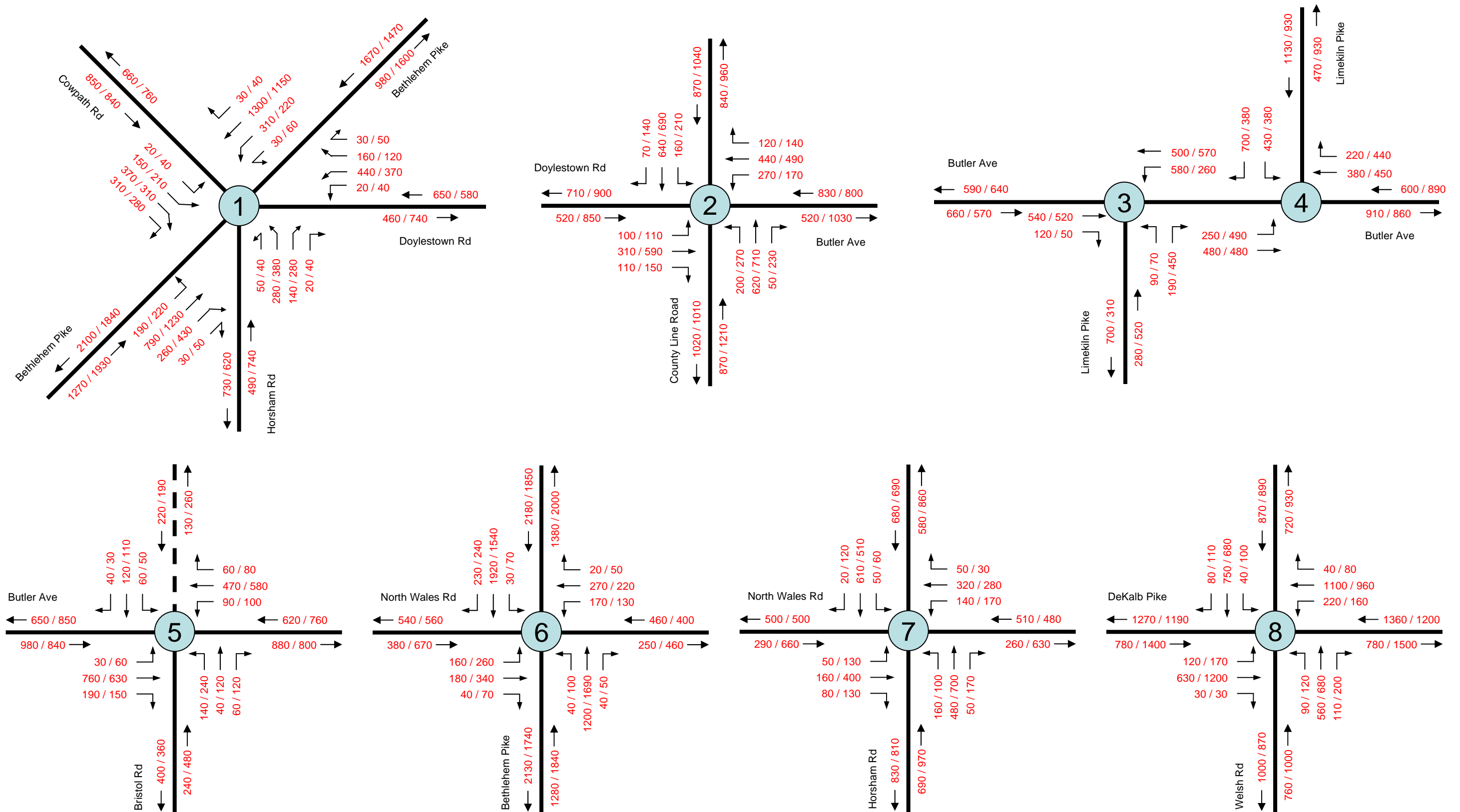


Figure 7B. US 202 Section 700 Traffic Study, 2020 No-Build Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

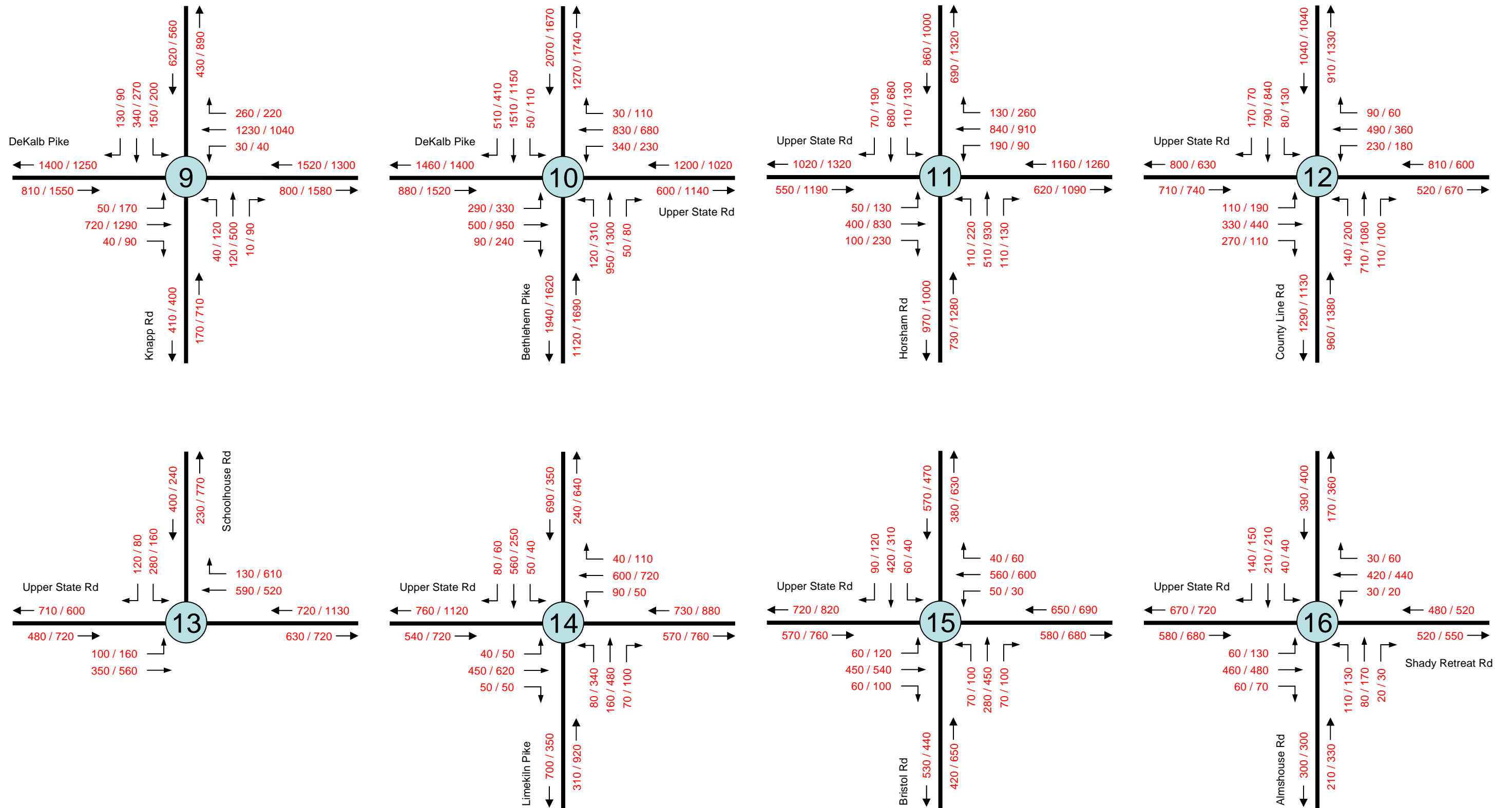


Figure 7C. US 202 Section 700 Traffic Study, 2020 No-Build Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

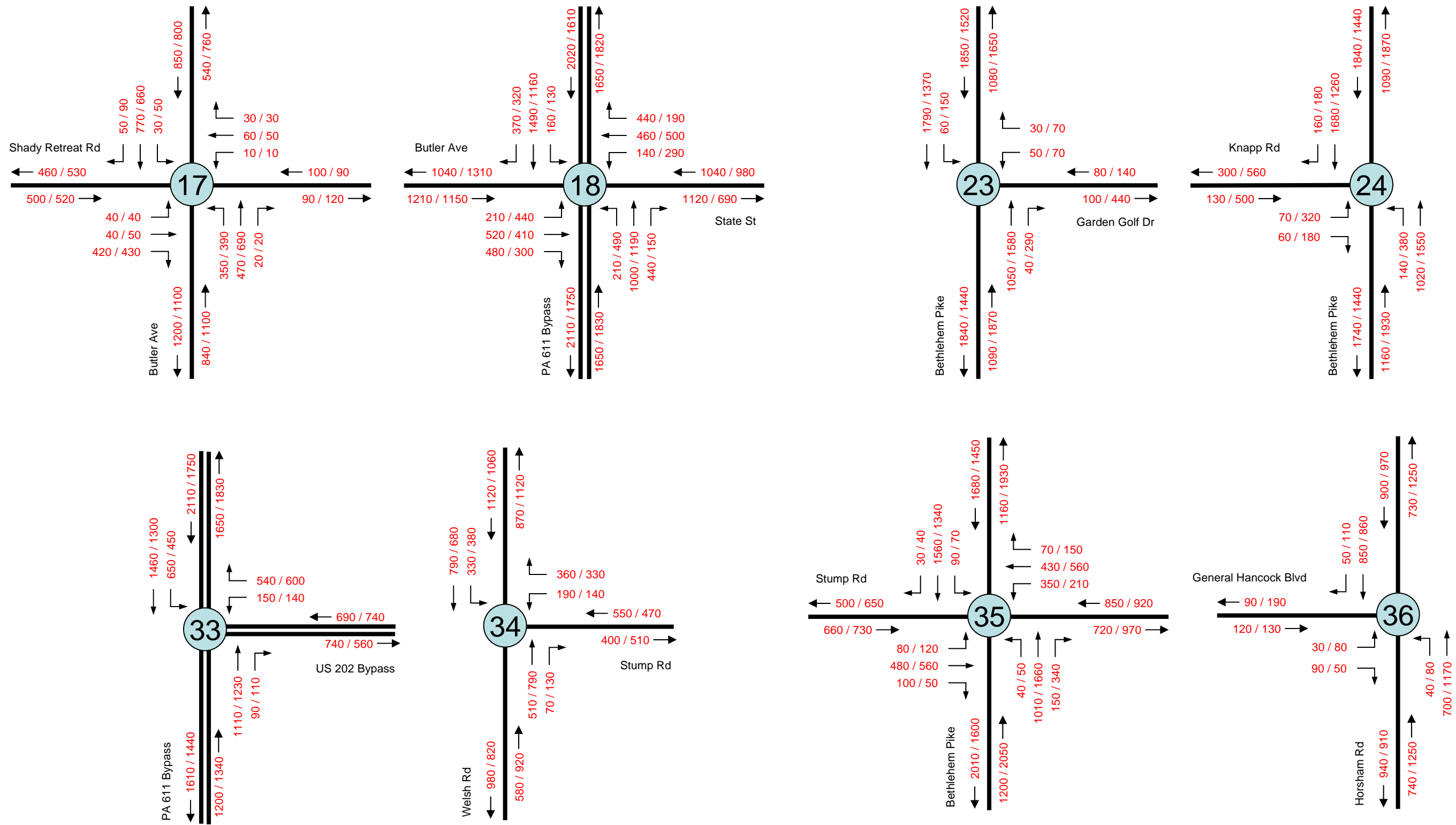
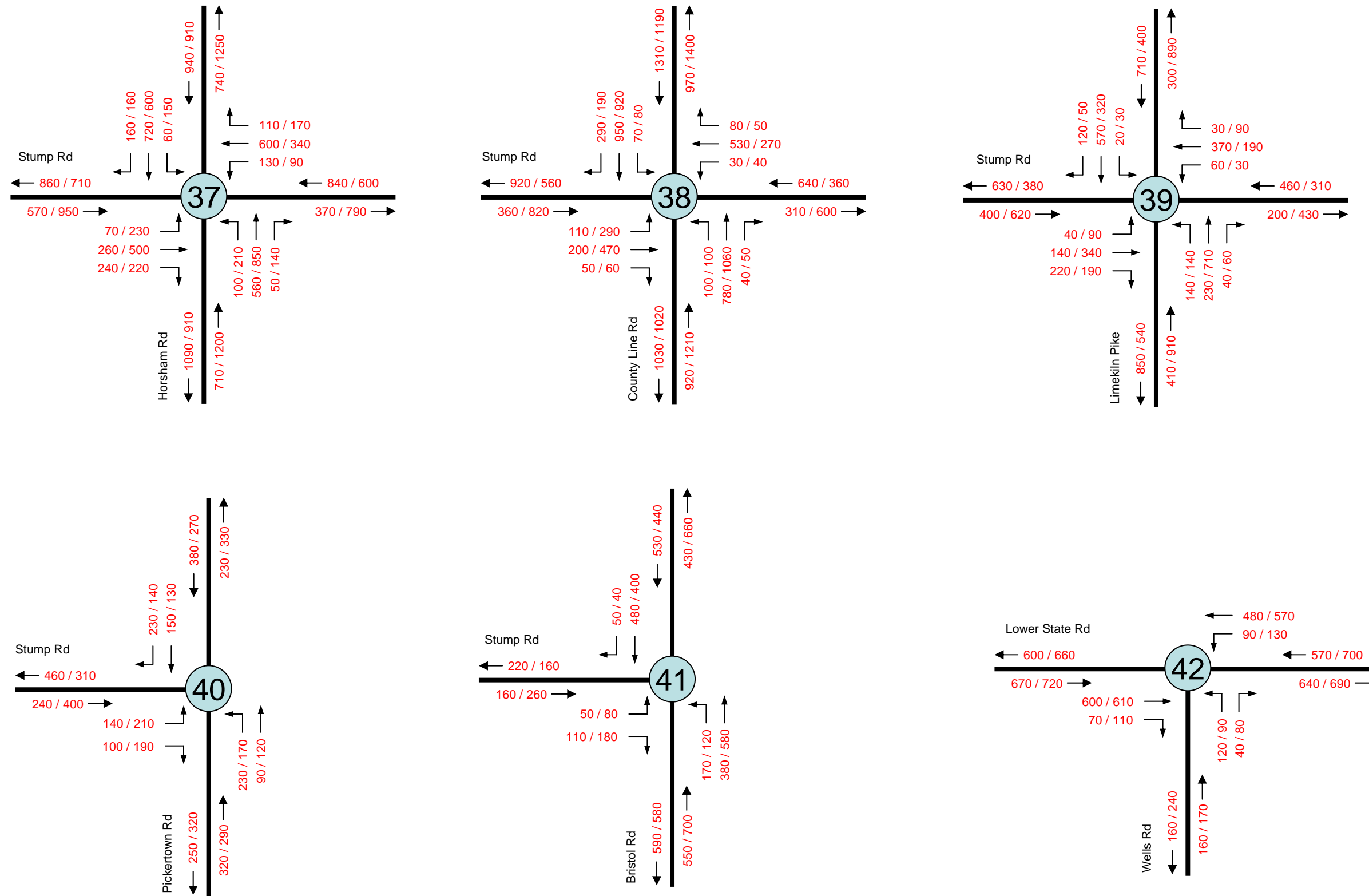


Figure 7D. US 202 Section 700 Traffic Study, 2020 No-Build Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts



County Line Road, and reach as high as 970 vph on Horsham Road. Except for a few locations on Horsham Road, the PM peak hour volumes in the eastbound direction are lower than those of the AM peak hour. However, in the westbound direction the higher volumes occur during the PM peak. These volumes reach 2,050 vph on PA 309, 1,830 vph on PA 611, 1,400 vph on County Line Road, 1,320 on Horsham Road, 1,120 vph on Welsh Road, 920 vph on PA 152, and 660 vph on Bristol Road.

2. Parkway Alternative

Peak hour traffic forecasts for the proposed US 202 Section 700 Parkway are displayed in Figure 8. Along the parkway, the southbound direction carries heavier traffic volumes during the AM peak hour and the northbound direction is heavier in the PM peak hour. Southbound AM volumes range from 790 to 1,360 vehicles per hour, although only the portion south of Welsh Road carries less than 1,000 vph. The highest volume occurs between Horsham and County Line roads. Northbound AM volumes range from 620 to 1,020 vph. In the northbound direction, only the Parkway link between Lower State Road and the PA 611 Bypass carries more than 1,000 vehicles during the AM peak hour.

During the PM peak hour most locations along the Parkway carry over 1,000 vph in both the northbound and southbound directions. Northbound volumes range from 940 to 1,300 vph, while southbound volumes are between 710 and 1,200 vph.

Peak hour traffic volumes on existing US 202 Section 700 and its parallel routes are lower under this alternative, compared to the No-Build Alternative traffic forecasts. During the AM peak hour, Section 700 volumes range from 390 to 1,170 vpd in the northbound direction and from 420 to 1,780 vph in the southbound direction. PM peak hour volumes are between 530 and 1,690 vph northbound and between 470 and 1,520 vph southbound.

Southbound volumes along Upper State Road are between 600 and 1,010 vph in the AM peak hour and between 530 and 1,130 in the PM peak. Northbound volumes range from 450 to 650 in the AM peak and from 600 and 910 in the PM peak hour under the 202 Parkway Alternative. Stump Road volumes during the AM peak hour range from 130 to 640 vph northbound and from 200 to 840 vph southbound. PM peak hour volumes on Stump Road range from 240 to 870 vpd northbound and from 140 to 820 vph southbound.

The portion of Bethlehem Pike that is designated as both US 202 and PA 309 carries significantly lower peak hour volumes under this alternative, compared to the No-Build Alternative. Its highest peak hour volume is 1,780 vehicles, compared to 2,180 vph under the No-Build Alternative. Portions of PA 309 south of the proposed Parkway, however, carry higher volumes compared to the No-Build Alternative. These tend to be only about 100 vph higher than the corresponding No-Build volume. Most of the other cross-street locations tend to carry marginally higher peak hour volumes, in the range of 50 to 100 vph, compared to the No-Build volumes.

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Figure 8A. US 202 Section 700 Traffic Study, 2020 Parkway Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

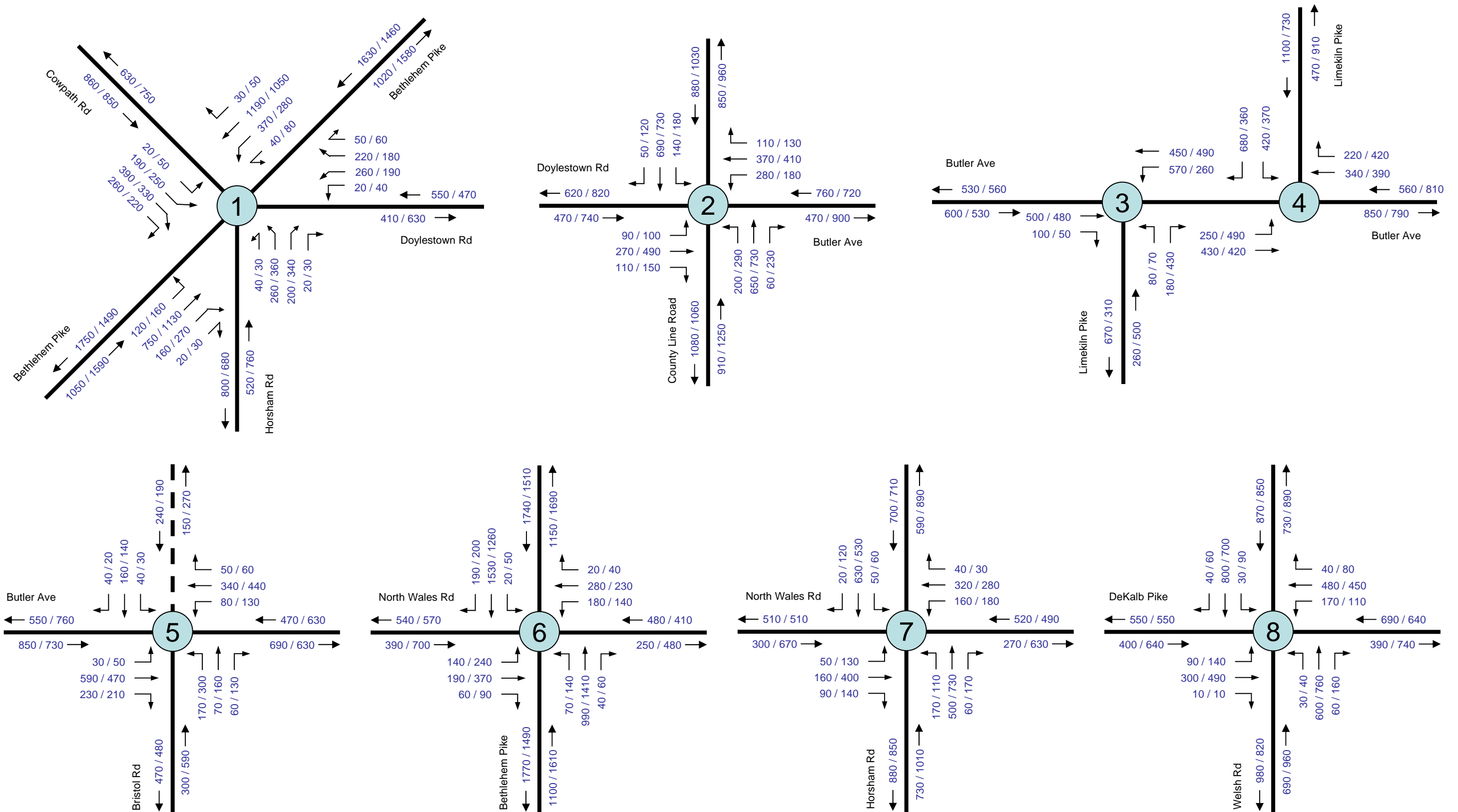


Figure 8B. US 202 Section 700 Traffic Study, 2020 Parkway Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

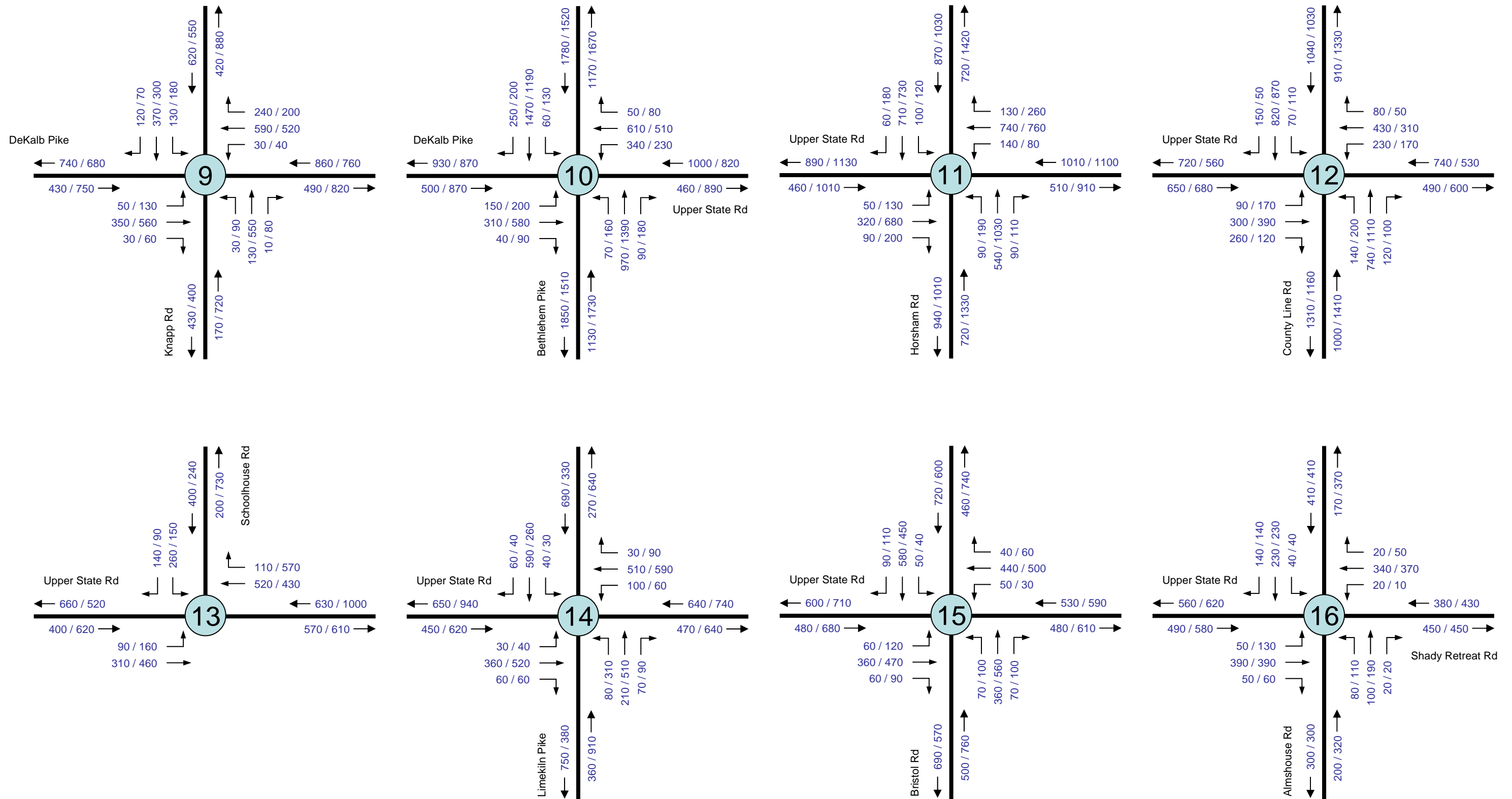


Figure 8C. US 202 Section 700 Traffic Study, 2020 Parkway Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

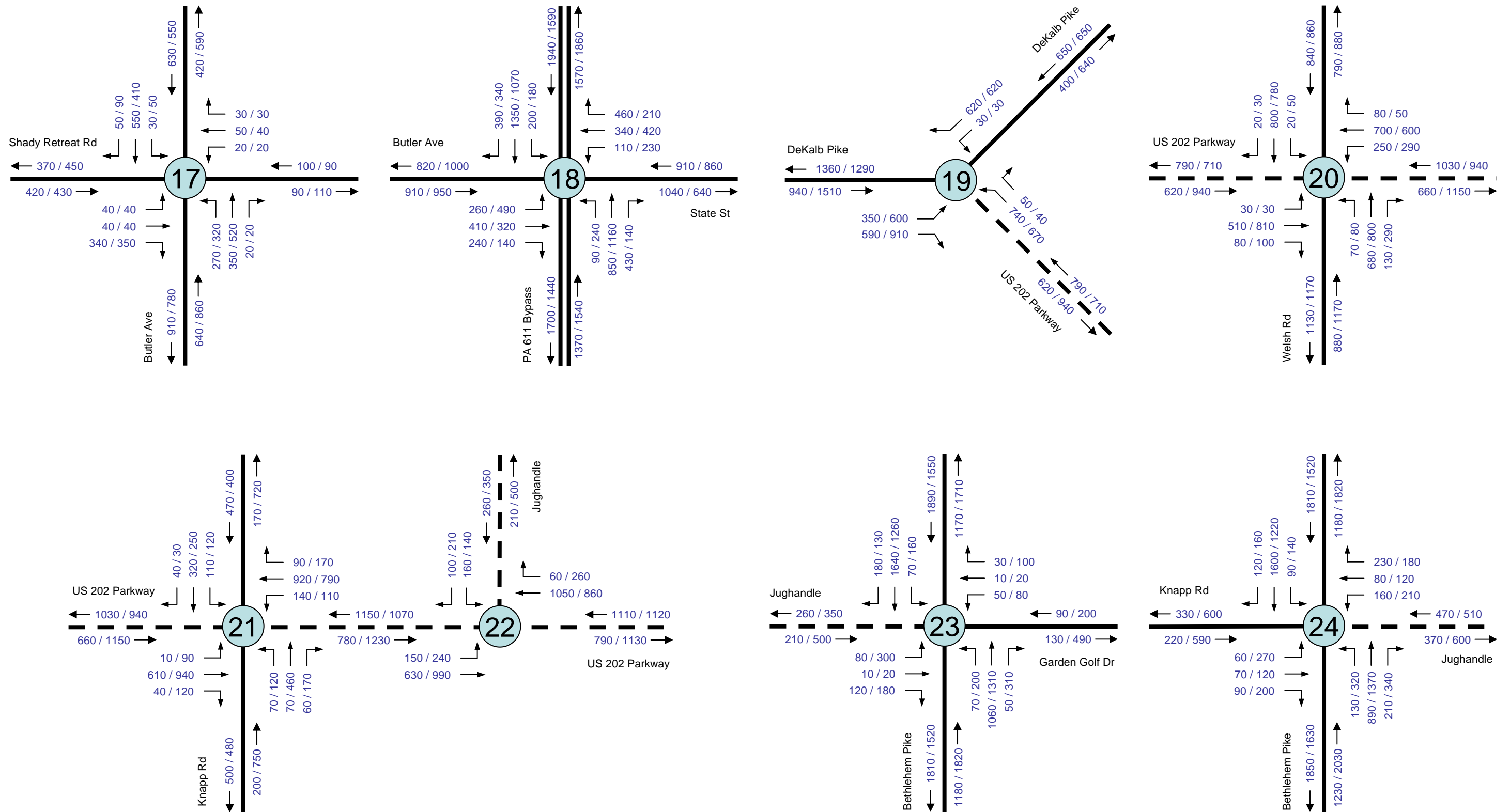


Figure 8D. US 202 Section 700 Traffic Study, 2020 Parkway Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

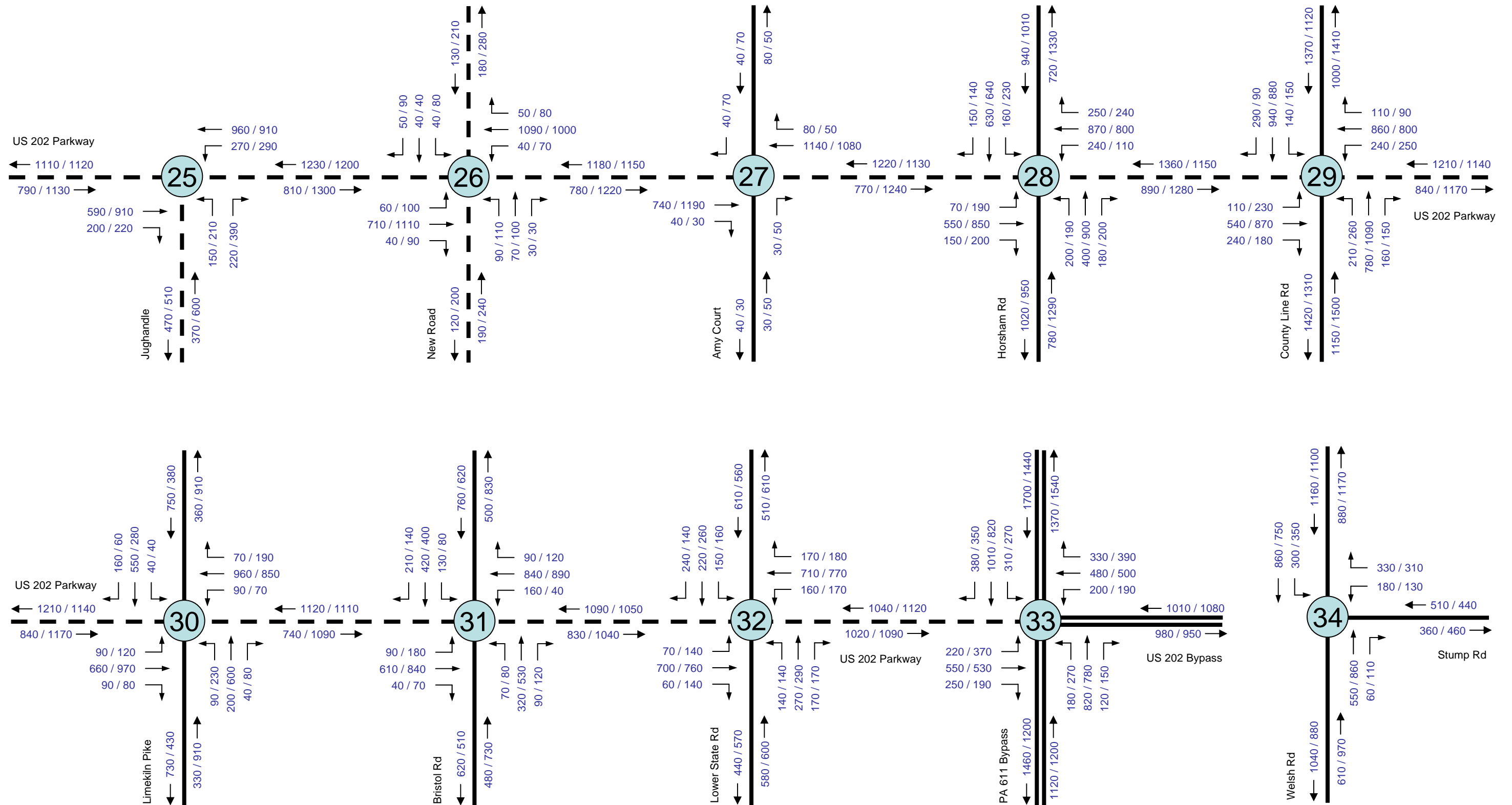
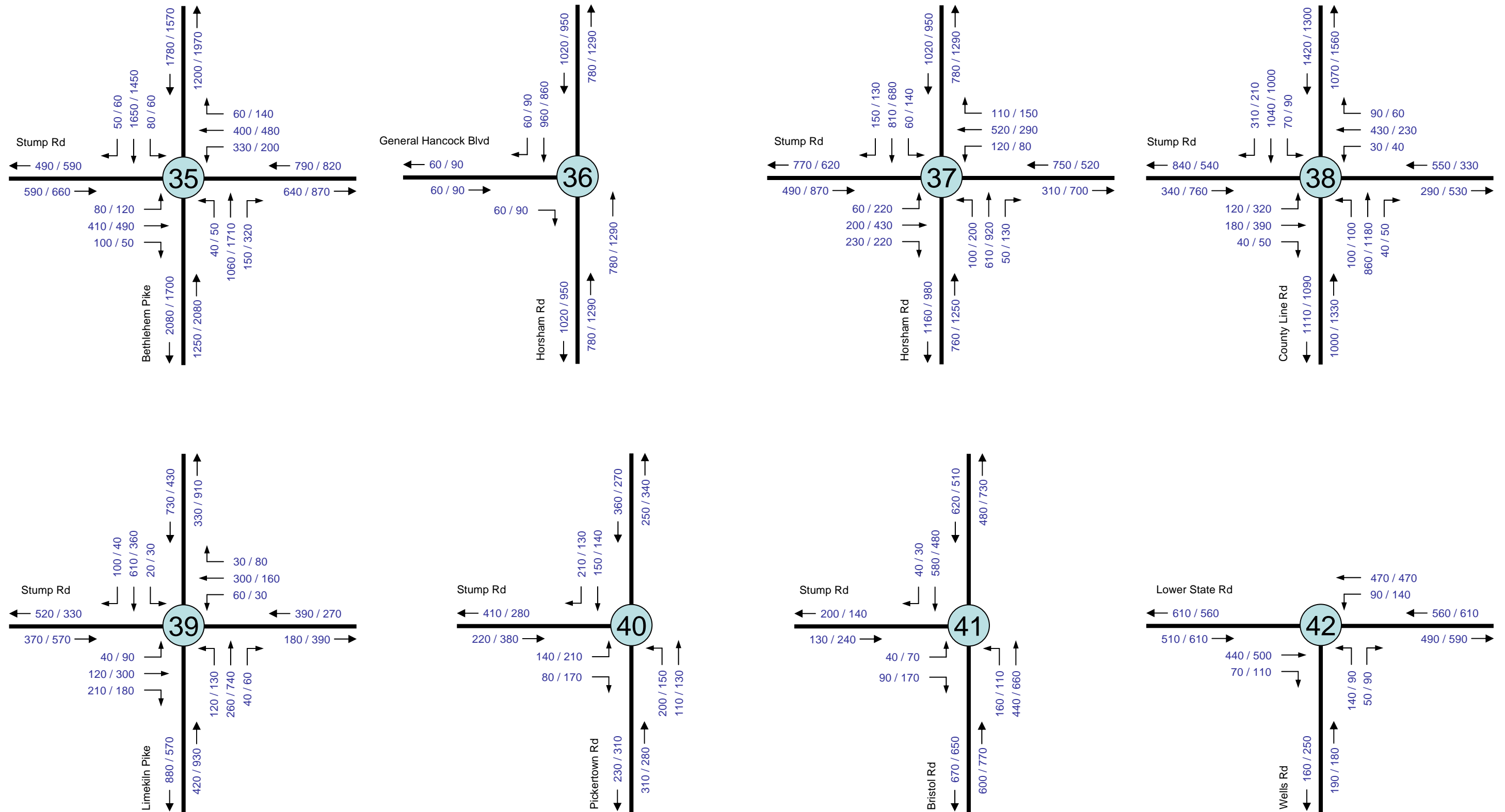


Figure 8E. US 202 Section 700 Traffic Study, 2020 Parkway Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts



3. Combination Alternative

Peak hour volumes on the new alignment portion of the Combination Alternative are similar to, but lower than, the corresponding volumes under the 202 Parkway Alternative. These volumes are shown in Figure 9. AM peak hour volumes range from 680 to 960 vph in the northbound direction and from 980 to 1,070 in the southbound direction. PM peak hour volumes are between 970 and 1,010 vph northbound and between 990 and 1,060 vph southbound.

The greatest differences in peak hour traffic volumes between this alternative and the 202 Parkway Alternative occur on the portion of Upper State Road between PA 309 and the southern terminus of the new alignment portion of US 202 under the Combination Alternative. This is especially true in the southbound direction during the AM Peak, where Combination Alternative volumes are as much as 860 vph higher than the corresponding Parkway Alternative volume. Peak hour volumes along existing US 202 Section 700 south of PA 309 are also significantly higher under this alternative compared to the 202 Parkway Alternative, by as much as 700 vph. They also tend to be slightly higher on the portion of Bethlehem Pike that carries both PA 309 and US 202, on the two-lane portion of existing US 202 north of the Five-Points intersection, and along Stump Road.

For the crossing facilities, the peak hour volumes under the Combination Alternative are generally higher than the 202 Parkway Alternative volumes along Horsham Road and Limekiln Pike. In contrast, the County Line Road volumes tend to be higher under the Parkway Alternative. Both PA 63 and PA 309 have some portions that have higher peak hour volumes and some that have lower volumes under the Combination Alternative relative to the No-Build Alternative. For the other crossing facilities, peak hour volumes are very similar between these two alternatives.

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Figure 9A. US 202 Section 700 Traffic Study, 2020 Combination Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

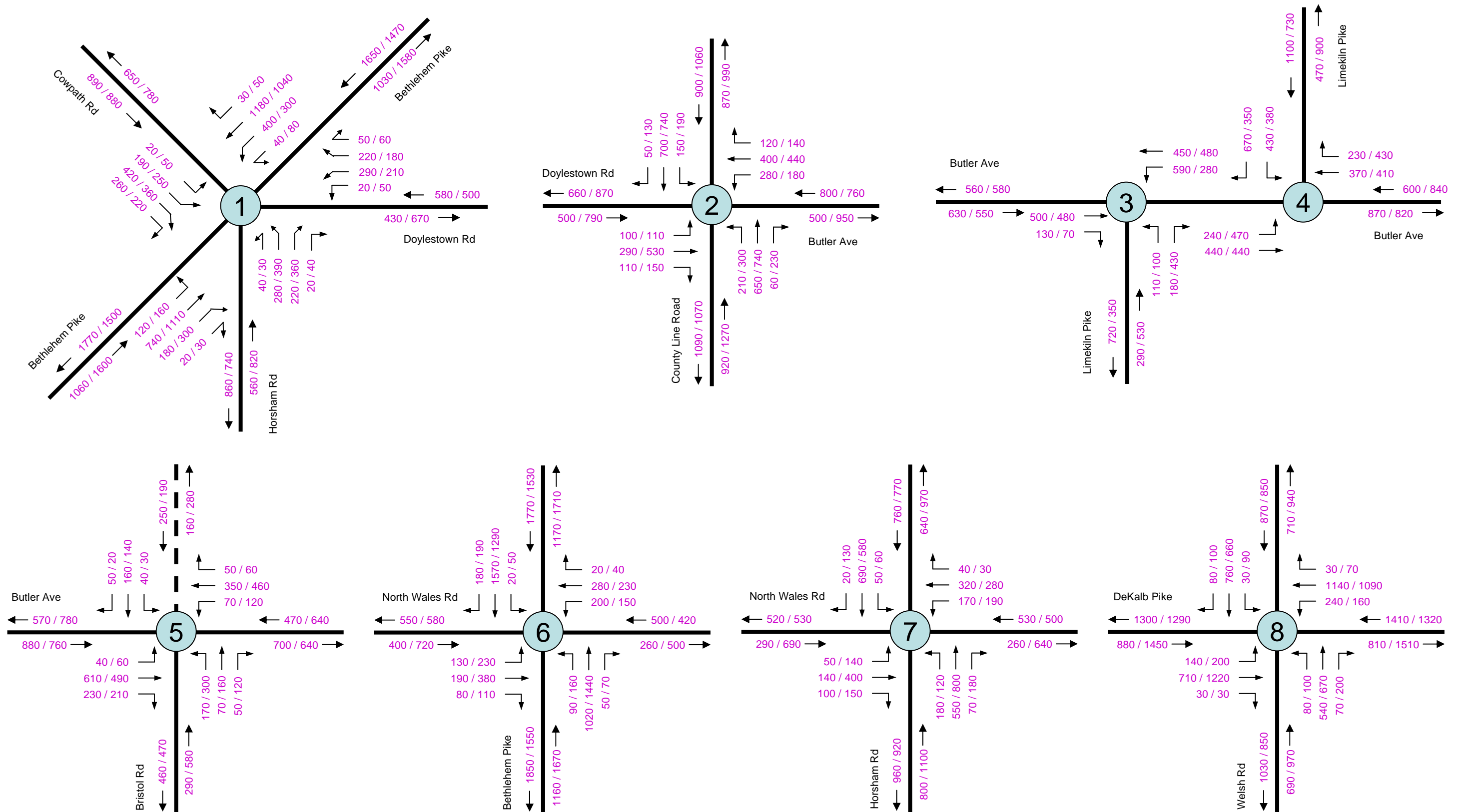


Figure 9B. US 202 Section 700 Traffic Study, 2020 Combination Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

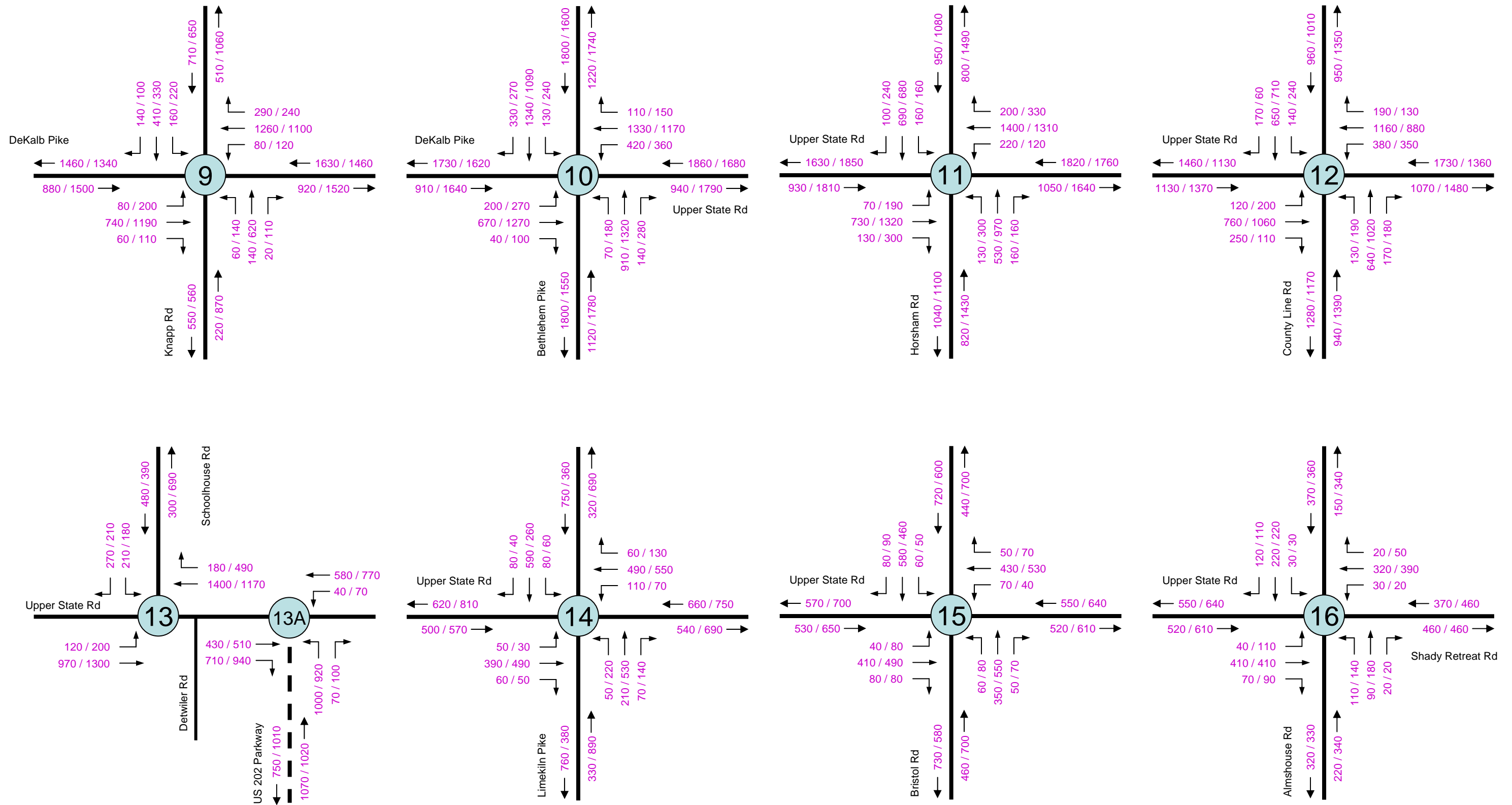


Figure 9C. US 202 Section 700 Traffic Study, 2020 Combination Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts

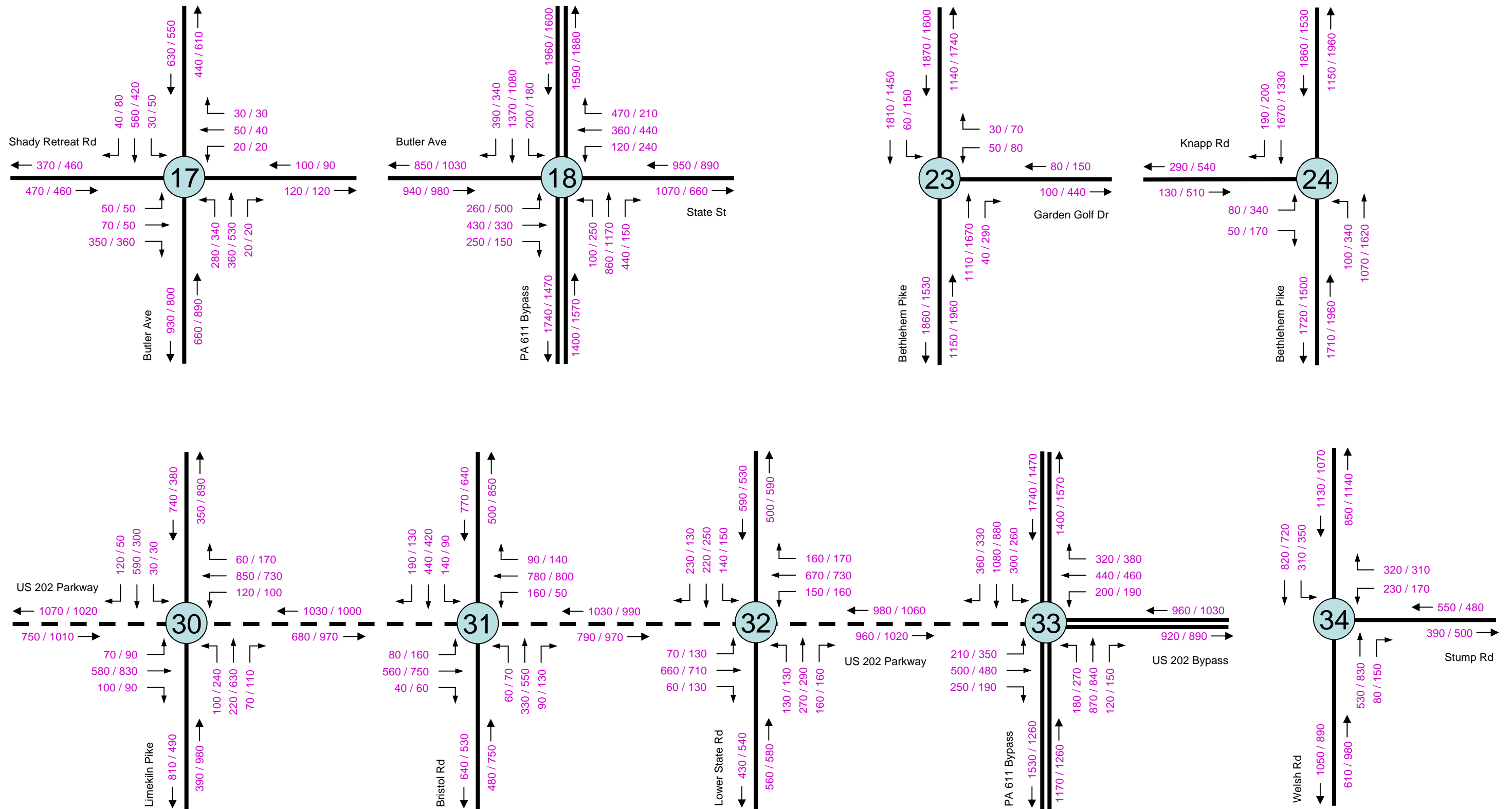
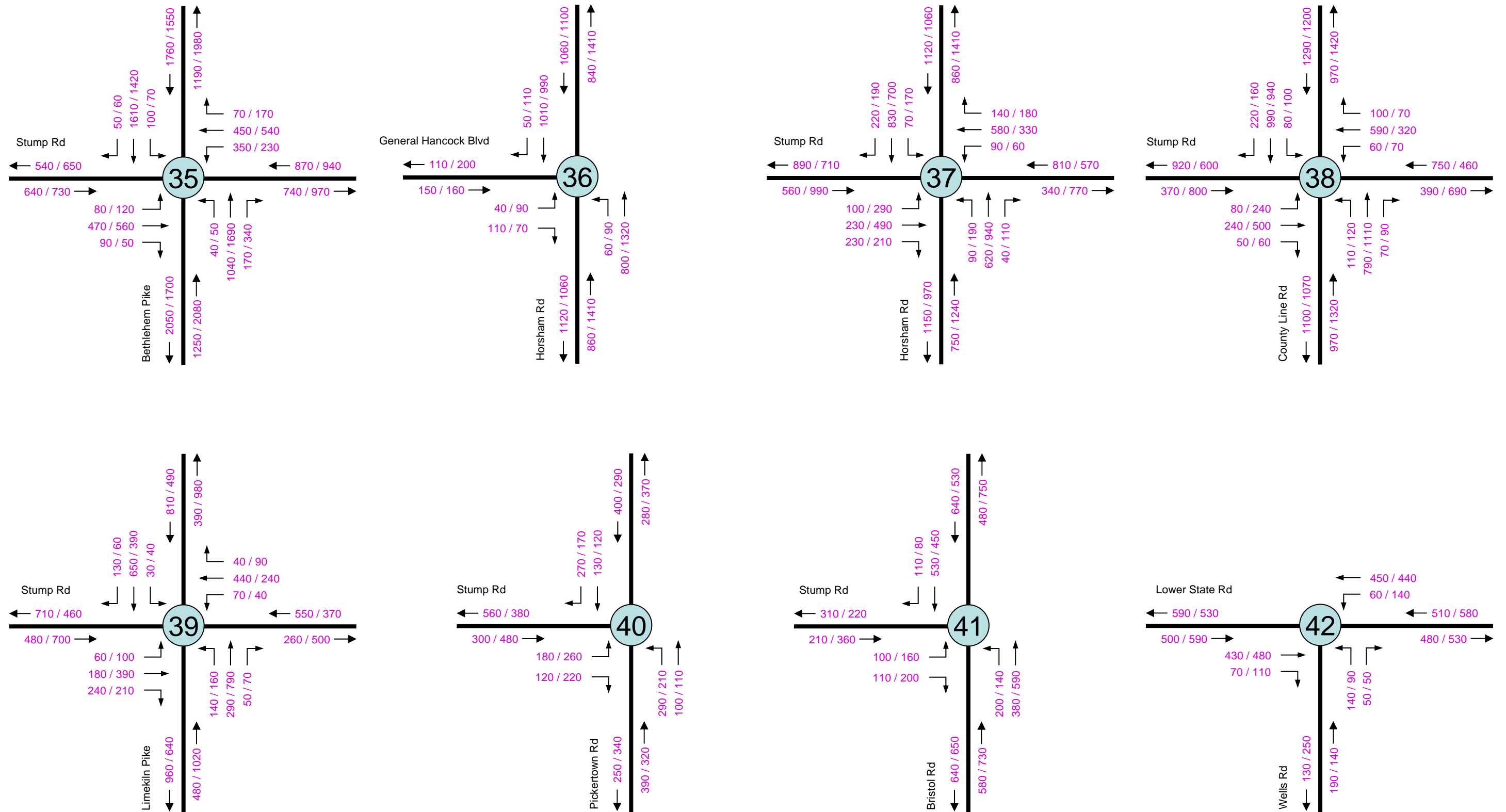


Figure 9D. US 202 Section 700 Traffic Study, 2020 Combination Alternative AM and PM Peak Hour Intersection Turning Movement Forecasts



VI. SUMMARY

Section 700 of US 202 currently experiences recurring congestion and delays and backups at many critical intersections. Considerable growth in population and employment in many of the municipalities in and around the Section 700 corridor will exacerbate this situation. By 2020, the study area will be home to over 300,000 residents and nearly 200,000 jobs, increases of about 25 percent over 2000 levels. With no improvement to Section 700, traffic volumes along US 202 are projected to increase by about 3,000 to 4,000 vehicles per day over current volumes. Even larger growth will occur along Upper State Road, the nearest parallel route to US 202 Section 700. Other parallel facilities, including Stump and Lower State roads, will also experience 2020 traffic volumes that are 2,000 to 4,000 vpd higher than current conditions. Under the No-Build Alternative, 2020 traffic volumes along the two-lane portion of US 202 Section 700 will be at least 19,800 vpd and as high as 24,600 vpd. Upper State Road will carry between 12,500 and 19,800 vpd.

Constructing the US 202 Parkway will result in lower traffic volumes on existing US 202 Section 700 and all of its parallel facilities within the study area. Volumes on the two-lane portion Section 700 will be reduced by 2,600 to 6,900 vpd, compared to the No-Build Alternative. In some locations, Section 700 volumes will be lower than even the current daily traffic volume. Volumes along Upper State Road will be reduced by 2,700 to 3,100 vpd; Stump Road volumes by 1,100 to 2,800 vpd; and Lower State Road volumes by 700 to 2,100 vpd. The 202 Parkway itself will carry between 23,200 and 28,300 vehicles per day in 2020.

The other improvement alternatives considered for the US 202 Section 700 corridor, Widen Upper State Road and the Combination Alternative also provide traffic relief to existing US 202 Section 700 and its parallel facilities, compared to the No-Build Alternative. These traffic volume reductions, however, are generally less than the relief provided by the proposed US 202 Section 700 Parkway. For example, on US 202 between Limekiln Pike and Bristol Road, the 202 Parkway volume is 3,000 vehicles per day less than the No-Build volume. The Widen Upper State Road Alternative volume is 700 vpd less than the No-Build volume and the Combination Alternative volume is 2,400 vpd less than the No-Build volume. Between the Five-Points intersection and County Line roads, the reduction is 2,600 vpd for the 202 Parkway compared to 1,800 and 1,500 vpd for the Widen Upper State Road and Combination alternatives, respectively.

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US 202 Section 700 Traffic Study

Publication Number: 07009

Date Published: April 2007

Geographic Area Covered: The municipalities of Hatfield Borough, Hatfield Township, Horsham Township, Lansdale Borough, Lower Gwynedd Township, Montgomery Township, North Wales Borough, and Upper Gwynedd Township in Montgomery County and Buckingham Township, Chalfont Borough, Doylestown Borough, Doylestown Township, Hilltown Township, Ivyland Borough, New Britain Borough, New Britain Township, Silverdale Borough, Solebury Township, Warminster Township, Warrington Township, and Warwick Township in Bucks County, Pennsylvania.

Key Words: US 202, Section 700, 202 Parkway, Combination Alternative, Widen Upper State Road, Traffic Forecasts, Travel Simulation.

ABSTRACT

This report documents 2020 traffic forecasts for the US 202 Section 700 corridor in Bucks and Montgomery counties in Pennsylvania. Average daily and AM and PM peak hour forecasts are provided for a No-Build and three Build alternatives. The Build alternatives include a US 202 Parkway on a new alignment, Widening Upper State Road, and a Combination Alternative comprised of some Upper State Road widening and a portion of the new alignment Parkway.

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